

App ID #: 3398

Mentor: Ren, Xiaojun

Email: xren2@charlotte.edu

Title: Irwin Belk Distinguished Scholar in Biology/Associate Professor

Department: Biological Sciences

Co-mentor: No

Community engaged research: No

Title: Unlocking the Code Beyond DNA: Epigenetic Mechanisms in Health and Disease

Description: Project Overview While DNA provides the blueprint for life, epigenetics determines how that blueprint is expressed. Epigenetic mechanisms act as molecular switches, turning genes on or off without altering the underlying DNA sequence. When these switches operate smoothly, tissues remain healthy; when disrupted, they can trigger complex conditions such as cancer, metabolic disorders, and autoimmune diseases. In our lab, we investigate how epigenetic changes shape cellular health, function, and disease progression. As an undergraduate researcher, you will play a hands-on role in exploring these fundamental mechanisms. Rather than simply reading about science in a textbook, you will actively conduct experiments, gather real data, and help answer vital biological questions.

How You Will Contribute & Key Duties Undergraduate researchers are essential members of our laboratory team. Under the step-by-step guidance of faculty and experienced researchers, you will master core laboratory techniques—including DNA/RNA extraction, PCR/qPCR, gel electrophoresis, and specialized assays that measure gene expression and epigenetic modifications. Additionally, you will participate in regular lab meetings to share your progress, explore ongoing projects, and engage with current scientific literature.

What You Will Gain You will gain practical mastery of essential molecular biology techniques, building a strong foundation for medical school, graduate programs, or careers in biotechnology. You will also receive dedicated mentorship tailored to your personal scientific growth and professional goals. We fully recognize that academics come first—your research time will be flexibly scheduled around your classes, typically averaging 1–2 hours per working day (5–10 hours per week).

Who Should Apply Enthusiastic undergraduate students who are curious about biology, genetics, and health sciences. We welcome detail-oriented students with strong communication skills and an eager willingness to learn.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

3 positions available

Anticipated Student Learning Outcomes: Anticipated Student Learning Outcomes Participating in this research project on epigenetic mechanisms offers undergraduate students a high-impact experience combining hands-on laboratory training, conceptual growth, and career preparation.

Technical and Methodological Skills Students transition classroom concepts into practical laboratory skills, mastering core molecular techniques such as micropipetting, reagent preparation, DNA/RNA extraction, gel electrophoresis, and quantitative PCR (qPCR). They also perform specialized assays to quantify epigenetic changes like DNA methylation and histone modifications. Throughout the process, students build disciplined research habits by maintaining

detailed laboratory notebooks and adhering strictly to biosafety standards. **Conceptual Knowledge and Academic Growth** Students gain a deeper understanding of how non-genetic factors regulate gene expression and contribute to complex conditions like cancer, metabolic disorders, and autoimmune diseases. By discussing scientific literature during regular lab meetings, they learn to critically evaluate research methods and connect theoretical biology with experimental design, controls, and data interpretation. **Professional and Career Readiness** This project prepares students for graduate programs, medical school, and careers in biotechnology. Balancing 5 to 10 hours of weekly research with coursework builds strong time-management habits, clear scientific communication skills, and analytical resilience when troubleshooting unexpected experimental outcomes.

Required training of 4 hours with Description: Students must successfully complete biosafety and chemical safety training.

Mentoring plan: **Mentoring Philosophy and Supervision Structure** My goal as a mentor is to foster an inclusive, supportive environment in which undergraduates transition from guided learners to confident researchers. To ensure continuous support, students operate under a tiered mentorship model. They collaborate directly with me to set semester goals and design experiments, while pairing with an experienced graduate student or senior researcher for day-to-day technical training on equipment, protocols, and safety during their initial weeks. **Contact and Communication Expectations** Regular communication is essential for student success and confidence. I conduct weekly 20- to 30-minute one-on-one meetings with each student to review lab notebooks, analyze data, troubleshoot issues, and check in on their academic workload. Students also participate in our weekly team lab meetings to discuss ongoing projects and scientific literature. **Presentations and Professional Growth** Developing scientific communication skills is a core component of this experience. Students present their progress at least once per semester during lab meetings, providing a low-stakes environment to practice presenting data. I also encourage and prepare students to present poster presentations at the university's annual Undergraduate Research Symposium. For projects that yield novel results, I actively pursue opportunities and funding for students to present at regional conferences or co-author publications. **Commitments to Student Success** I am fully committed to supporting each student's academic and career development. Coursework always comes first, and I help students design a flexible lab schedule around their classes and exams. I commit to offering career guidance, reviewing application materials, writing personalized letters of recommendation, and maintaining a welcoming environment where questions and learning are always prioritized.

Applicant Requirements: **Desired Characteristics and Mindset** We seek enthusiastic, curious undergraduate students passionate about understanding how biological mechanisms operate at the molecular level, particularly in epigenetics and disease. Key personal qualities for success in this role include strong attention to detail, reliability, effective communication, and self-organization. Because scientific research requires patience and analytical problem-solving, an ideal candidate demonstrates perseverance, a strong work ethic, and an eager willingness to ask questions and learn from unexpected results. **Academic Background and Technical Prerequisites** To ensure students have the foundational context necessary to engage meaningfully with the research, completion of or current enrollment in introductory biology coursework is preferred. However, prior hands-on laboratory research experience is strictly not required. We intentionally

keep technical prerequisites minimal because comprehensive, step-by-step training on all molecular techniques, safety protocols, and laboratory procedures will be provided in the lab. Time Commitment and Mandatory Training Applicants must be able to dedicate approximately 5 to 10 hours per week (averaging 1 to 2 hours per working day) to research, which will be flexibly scheduled around their course schedule. Selected students are required to successfully pass the university's biosafety and chemical safety training modules prior to beginning experimental work. Above all, we look for dedicated students who demonstrate strong time-management skills and a genuine enthusiasm for integrating undergraduate research into their educational goals.

Applicant Preferences: Preferred Coursework and Academic Background While advanced experience is not strictly required, preference will be given to students who have completed or are currently enrolled in foundational coursework such as genetics, cell biology, molecular biology, or biochemistry. Having this background allows students to quickly connect classroom theory to our lab's work in epigenetics. Additionally, preference is given to applicants who plan to remain involved in the laboratory for at least two consecutive semesters, as multi-semester continuity enables students to gain deeper independence, master techniques, and potentially drive a distinct sub-project. Ideal Characteristics and Soft Skills We particularly value applicants who demonstrate strong self-motivation, intellectual curiosity, and a proactive mindset toward learning. Preferred candidates are those who communicate clearly, demonstrate consistency and reliability, and possess excellent organizational skills—traits that are essential for accurate data entry and protocol tracking. While specific technical lab skills will be taught on-site, a natural curiosity about how gene expression affects human health and disease sets an applicant apart. Career Alignment and Motivation Preference will also be given to students whose long-term academic and career ambitions align with healthcare, biomedical research, graduate studies, or the biotechnology industry. We look favorably upon applicants who can articulate how participating in undergraduate research fits into their overall career trajectory and who express a strong desire to contribute positively to a collaborative lab culture.

Specific Time considerations/conflicts: NA

App ID #: 3399

Mentor: Chen, Yuting

Email: ychen106@charlotte.edu

Title: Assistant professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: RailRisk Advisor: A Web-GIS Tool for Assessing Railroad Trespassing Risk and Recommending Countermeasures

Description: This proposal presents RailRisk Advisor, an innovative Web-GIS decision support system designed to proactively identify and mitigate railroad trespassing risks. The system calculates risk scores for railroad segments using five weighted factors: train volume, train speed, population density, train type, and time of day. These weights will be derived from a national survey of experienced railroad safety professionals. RailRisk Advisor integrates spatiotemporal data analysis, risk modeling, and rule-based mitigation recommendations through a hybrid workflow, leveraging ArcGIS Pro for analytical processing and a dynamic web dashboard for stakeholder engagement. The system enables agencies, such as the NCDOT Rail Division, to visualize railroad trespassing risk hotspots, understand contributing factors, and receive customized, feasible countermeasure recommendations grounded in expert review and satellite imagery verification. The platform also incorporates injury history into its decision logic, ensuring recommendations reflect both predicted risk and real-world outcomes. A transparent, logic-driven framework supports evidence-based interventions, enabling efficient allocation of safety resources. Ultimately, RailRisk Advisor aims to transform how railroad trespassing risk is assessed and mitigated, with a scalable design adaptable to broader state or national applications.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Gain hands-on experience in geospatial data collection, management, analysis, and visualization using ArcGIS Pro and Web-GIS tools. Develop an understanding of railroad trespassing risk factors, risk modeling, and evidence-based mitigation strategies. Strengthen research, teamwork, and technical communication skills through system testing, documentation, and presentation of findings.

Required training of 10 hours with Description: IRB Citi Training

Mentoring plan: The student will meet with me weekly to review progress, discuss challenges, and establish clear goals for the following week. I will provide guidance on research methods, GIS tools, data analysis, and project documentation, as well as timely feedback on the student's work. The student may also work with other members of the research team and will be encouraged to share progress during project meetings. I will ensure that assigned tasks are appropriate for the student's experience level while providing opportunities to gradually develop greater independence.

Applicant Requirements: Familiarity with GIS, preferably ArcGIS Pro, through coursework, research, or project experience. Interest in transportation safety, spatial data analysis, and Web-GIS applications. Strong attention to detail, willingness to learn, and ability to work independently while communicating progress regularly.

Applicant Preferences: Preference will be given to students with experience using ArcGIS Pro or other GIS software. Experience with spatial data analysis, Web-GIS, Python, or web development is desirable but not required.

Specific Time considerations/conflicts: none

App ID #: 3400

Mentor: Chen, Yuting

Email: ychen106@charlotte.edu

Title: Assistant professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: AI-Powered Knowledge Graphs for Construction Worker Health and Safety

Description: Construction workers regularly face physical and psychological health risks, including heat exposure, fatigue, stress, overwork, and inadequate workplace support. Many workers discuss these experiences on online platforms such as Reddit, creating a valuable source of real-world information that may not appear in formal safety reports. This project uses natural language processing (NLP) and knowledge graphs to transform these unstructured narratives into organized and interpretable safety information. A preliminary NLP pipeline has already been developed to identify several types of information from construction-related posts, including worker occupations, environmental and workplace stressors, health symptoms, individual factors, institutional actions, and risk-control measures. The undergraduate researcher will first reproduce and document this existing pipeline. The student will examine how the data were processed, confirm which portions of the dataset were used, evaluate whether the reported results can be reproduced, and identify opportunities to improve the analysis. After completing this initial work, the student will help expand the project by developing additional knowledge graphs that represent meaningful relationships among worker types, workplace conditions, health outcomes, and protective measures. For example, the student may investigate which health symptoms are frequently discussed by different types of workers, which workplace stressors commonly appear with particular symptoms, and which control measures are associated with specific health risks. The student may also compare results generated from different subsets of the data and explore methods for filtering weak or potentially misleading relationships. Depending on the student's background and interests, additional activities may include improving keyword dictionaries, applying machine learning or large language models for entity and relationship extraction, developing interactive visualizations, or comparing rule-based and AI-based methods. Typical student duties will include: Reviewing and running existing Python code; Cleaning, organizing, and documenting text data; Reproducing existing entity-extraction and knowledge-graph results; Evaluating the completeness and reliability of the analytical pipeline; Creating and visualizing additional knowledge graphs; Examining selected source texts to validate extracted relationships; Summarizing findings through figures, brief reports, and presentations; and Participating in regular research meetings with the faculty mentor. Through this project, the student will gain hands-on experience with Python, NLP, data cleaning, model evaluation, network analysis, knowledge graphs, and data visualization. The project is especially suitable for a student interested in computer science, data science, artificial intelligence, public health, or the use of computing to address real-world social and workplace challenges.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Develop practical technical skills in Python, natural language processing, data cleaning, knowledge-graph construction, network analysis, and data visualization using real-world text data. Gain research experience by reproducing an existing computational pipeline, evaluating the reliability and completeness of its results, validating extracted relationships, and developing improved or expanded analyses. Strengthen professional communication and interdisciplinary collaboration skills by presenting findings, preparing visualizations and technical summaries, and explaining how AI and data science can support construction worker health and safety.

Required training of 0 hours with Description: none

Mentoring plan: The student will work directly with me through weekly meetings to review progress, address challenges, and establish clear next steps. I will provide the necessary background materials, data, code, technical guidance, and regular feedback while encouraging increasing independence. The student will periodically present progress at research meetings and, depending on their contributions, may be supported in preparing a research poster, conference presentation, or publication.

Applicant Requirements: Applicants should have basic Python programming experience and an interest in data science, artificial intelligence, or natural language processing. The student should be dependable, detail-oriented, willing to learn new tools, and able to work independently while seeking guidance when needed. No prior experience with construction safety or knowledge graphs is required.

Applicant Preferences: Preference will be given to students who have completed coursework or projects involving data structures, machine learning, natural language processing, data visualization, or network analysis. Experience with Python libraries such as pandas, spaCy, NetworkX, or transformer-based models is desirable but not required. Familiarity with Git or experience working with text-based datasets would also be beneficial.

Specific Time considerations/conflicts: none

App ID #: 3401

Mentor: Chen, Yuting

Email: ychen106@charlotte.edu

Title: Assistant professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Designing an Audience-Tailored Web Toolkit for Railroad Safety Communication

Description: Railroad trespassing remains a serious safety challenge, but research findings and safety messages may be understood differently by members of the public, government agencies, railroad companies, safety professionals, and the media. The language, visuals, and framing used to communicate risk can influence whether an audience views an individual as a “trespasser,” a pedestrian, a victim, or a combination of these identities. This project explores how human-centered communication can make railroad safety information more understandable, relevant, and effective for different audiences. The undergraduate researcher will help review existing railroad safety materials, examine how different organizations communicate about trespassing, and identify differences in language, visuals, and message framing. The student will also assist with defining target audiences and developing audience-tailored safety messages, educational materials, and visual prototypes. Depending on the student’s background and interests, the student may contribute to website development, graphic design, stakeholder engagement, or usability testing. The long-term goal is to develop a web-based toolkit that provides framing guidance, visual strategies, example messages, and educational resources for communicating railroad safety research. The student will work with an interdisciplinary faculty team and contribute directly to the research, design, evaluation, and documentation of this toolkit.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: By participating in this project, the student will: 1. Develop practical skills in human-centered design, risk communication, audience analysis, web development, and visual presentation. 2. Gain interdisciplinary research experience by reviewing safety materials, developing audience-tailored messages and prototypes, and evaluating how language and visuals influence public understanding. 3. Strengthen professional communication and teamwork skills by collaborating with faculty from construction safety and art and design and presenting findings through reports, presentations, or a web-based toolkit.

Required training of 0 hours with Description: none

Mentoring plan: The student will work directly with Dr. Yuting Chen through regular meetings to review progress, address challenges, and establish clear next steps. We will provide relevant background materials, research and design guidance, and regular feedback while encouraging increasing independence. The student will periodically present their work at research meetings

and, depending on their contributions, may be supported in preparing a research poster, conference presentation, web-based toolkit, or publication.

Applicant Requirements: Applicants should have an interest in human-centered design, safety communication, web development, or visual communication. The student should be dependable, detail-oriented, willing to learn new tools, and able to work independently while seeking guidance when needed. No prior experience with railroad safety is required.

Applicant Preferences: Preference will be given to students with coursework or project experience in human-computer interaction, UX/UI design, graphic design, communication, web development, or data visualization. Experience creating websites, visual materials, or user-centered prototypes is desirable but not required. Familiarity with usability testing or audience-focused communication would also be beneficial.

Specific Time considerations/conflicts: no

App ID #: 3402

Mentor: Burghardt, Keith

Email: kburghar@charlotte.edu

Title: Assistant Professor

Department: School of Data Science

Co-mentor: No

Community engaged research: No

Title: The Natural Selection of Algospeak

Description: Algospeak is the modern slang of the internet, a type of self-censorship in which people try to use words or phrases (codewords) that get around perceived content moderation, such as “unalive” to mean “death” or “304” to mean “hoe”. We want to understand its origin and evolution by detecting algospeak over time, learning how it evolved and its historical efficacy at avoiding content moderation (as well as how changes in past moderation forced adaptations). My goals are to learn when algospeak is used, factors that drove its evolution, and generalize these findings to hypothesize how evolution of new speech is driven by environmental pressures (such as moderation). To achieve these goals, we will work with a recent graduate to develop new AI models that detect algospeak and analyze how it evolves. We will also create new “mechanistic” models to hypothesize why this evolution occurs. All these findings will be used to create a peer-reviewed paper. These AI and mechanistic approaches will gain new insight into modern linguistic evolution.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: I will work hard to ensure students achieve broad benefits from this research. In particular, I aim to teach them new AI model training methods (e.g., feature engineering), help them utilize new tools (such as APIs), and teach soft skills, such as effective presentations and writing. In more detail, students will be given guidance by myself and fellow students to learn the full AI training and evaluation pipeline, including using APIs to extract data or to label data. Students will learn how to present in front of small audiences, such as fellow peers, and build up to large audience presentations. Similarly, students will learn how to write at a high level to an academic audience, including ensuring conciseness and clarity. This will be used to create a peer-reviewed conference or journal paper that they can proudly boast in their resume.

Required training of 5 hours with Description: - CITI HSR training (teaching students about human subject research and ensuring compliance with the IRB)

- Introduction to natural language processing tools

Mentoring plan: To achieve success, I will be working with 1-2 students weekly in hour-long meetings where we discuss and take detailed notes of our results, learn our immediate tasks, and plan our long-term goals. Finally, we will apply everything we found into a peer-reviewed paper at a well-respected AI conference or data science-related journal. If the paper is accepted to a conference, we will ensure that one or both students present their research to an academic

audience. The students should expect to present their results to me and other students regularly. They can reach me most hours every day via Slack, email, or by visiting my office (or all three). I will help students continue this research however long it may take until we finish the research project.

Applicant Requirements: Students must be well-versed in Python, and preferably experienced in AI model training. The students should have basic knowledge of clustering, AI model performance metrics, LLMs etc. Students must also be willing to learn how to work with Big Data, such as developing efficient algorithms (e.g., trees or hashing to simplify searching).

Applicant Preferences: Ideally, students should be experienced or interested in linguistics, natural language processing, APIs, and social media analysis. I can help students learn each of these components, but their interest in these ideas is strongly preferred.

Specific Time considerations/conflicts: N/A

App ID #: 3403

Mentor: Potochnick, Stephanie

Email: spotochn@charlotte.edu

Title: Associate Professor

Department: Sociology

Co-mentor: No

Community engaged research: Yes

Title: Advancing the Labor Force Participation of Charlotte's Latino Mothers and Fathers: Examining Intersecting Employment & Child Care Sector Opportunities and Barriers

Description: Project Importance. Charlotte's economic mobility depends on its fast-growing Latino immigrant population, which represents 14% of Mecklenburg's total population and 21% of its young (age 0-8) children. The labor force participation of Latina mothers (62.8%) lags behind that of other mothers (71.2%). Addressing Latina mothers' low labor force participation is important because it can lead to upward mobility and better health for Latina mothers, their families and communities. Additionally, despite Latino father's high employment rates, many Latino fathers, particularly immigrant fathers, work long hours in low-wage jobs, leading to financial instability, limited investment in child development, and mental health stress. Accessing early care and education (ECE) services is also complicated by low wages and non-standard work hours, further hindering upward mobility prospects for Latino immigrant families. Our overall goal is to enhance the economic well-being of Latino immigrant families by examining the intersecting challenges in the employment and ECE sectors, with a focus on Latino immigrant mothers and fathers—an under-researched group. Building on a prior Gambrell project and collaboration with Camino Research Institute (CRI), we seek to (1) identify and (2) understand how employment and ECE sector barriers and opportunities influence Latino fathers' family relationships and mental health. Project Team. This is an interdisciplinary, community-engaged research project in collaboration with Camino Health Center, which provides health, employment, and education services to Latino immigrant families in the Charlotte Region. The OUR researcher will be joining the UNCC Child & Family Development Lab, which is an interdisciplinary research lab with graduate, post-graduate, and undergraduate research assistants. Project Objectives and Methodology. Using a mixed-methods, community-driven research approach, this project will: (1) Identify Charlotte Latina mothers' and Latino fathers' overall employment experiences, opportunities, and barriers, and (2) Examine how childcare services shape Latina mothers' and Latino fathers' employment and identify their suggestions for improvement. To address these objectives, we will use secondary survey data and focus group and interviews with Latina mothers and fathers. To provide a broad picture of Charlotte's Latina mothers' and Latino fathers' employment, we will use multiple Camino data sources and different statistical techniques and software (Excel, STATA) to examine their employment experiences. To provide a more in-depth assessment of Latina mothers' and Latino fathers' employment experiences and how childcare services shape their employment prospects, we will conduct 4 focus groups (6-8 participants each) with Latina mothers with different employment backgrounds. For fathers we will conduct one-on-one interviews with ~20 fathers. We will record, transcribe, and translate these focus groups and interviews and use

qualitative software (NVIVO) to analyze common trends and patterns. Based on these data, we will create informative fact sheets with dynamic graphics to disseminate to Camino and key employment and childcare stakeholders to improve services and programs for Latina mothers and families. **OUR Intern Contributions & Duties.** The OUR researcher will become a part of the research lab team and attend regular (weekly or bi-weekly) meetings. In the meetings they will receive the necessary training (e.g., how to use the statistical software, code qualitative data, etc) and will work on an assigned task through the week. The Lab provides extensive mentoring and growth opportunities and flexibility (when possible) for students to work on aspects of the project of most interest to them. By the Spring, we will likely be working on coding the qualitative focus groups of Latina mothers and interviews with Latino fathers and creating fact-sheets for public reporting. **Potential Duties:** Transcribe interviews, code interviews using qualitative software, help co-create fact-sheets, attend lab meetings

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: -Learn about research ethics-Learn to work as part of a larger, collaborative research team-Cultural competency and how to work in a diverse, bilingual environment-Learn how to collaborate with community partners-Learn how to transcribe and code qualitative data; how to conduct focus groups-Learn how disseminate research findings in a dynamic, informative way-Learn how to create databases (from administrative data and surveys) in Excel and clean and analyze data with STATA

Required training of 5 hours with Description: -All students complete research ethics training (CITI) before on-boarding

-Attend weekly lab meetings where training and mentorship are provided for the different research tasks students will be assigned.

-Meet with mentor to ensure project aligns with student preferences/skills and broader OUR program goals/requirements

Mentoring plan: The UNCC Child & Family Development Lab is an interdisciplinary research lab with graduate, post-graduate, and undergraduate research assistants. There are approximately 5-8 student participants and 2-3 faculty any given semester. The main goal of the lab is to foster student growth and development. We do that by having collaborative meetings that connect faculty and students from different backgrounds and stages of career development. The meetings are a collaborative environment where in addition to discussing the specific research project we also discuss different topics of interest to the students (e.g., how to apply to grad school, etc.), and each person on the lab contributes their unique knowledge, skills and viewpoints.

Applicant Requirements: Required: A strong work-ethic, desire to learn new research skills, and the ability to collaborate with a larger research team.

Applicant Preferences: Preferred but not required: Spanish-English bilingual

Specific Time considerations/conflicts: No. We set-up a When2Meet to find a time that fits best for all lab members since everyone's schedule changes each semester.

App ID #: 3408

Mentor: Kim, Kyoung-Hee

Email: kkim33@charlotte.edu

Title: Professor of Architecture and Director of Integrated Design Research Lab

Department: Architecture

Co-mentor: Yes

Matt Parrow, mwparrow@charlotte.edu, Biolocial sciences

Community engaged research: Yes

Title: BRANE (BioReactor AI for Networked Enclosures): Can Living Algae Walls Make AI Data Centers Better Neighbors?

Description: 1. Project Brief. BRANE (BioReactor AI for Networked Enclosures) explores how data-center exterior walls can become active, living systems. The project integrates microalgae bioreactors into opaque building walls to investigate cooling, carbon capture, biomass production, environmental sensing, and AI-assisted operation. The research brings together four areas: Biology, Architectural Design, Engineering, and Software & Data. Students will have opportunities to work across two research environments: the Integrated Design Research Lab (IDRL) and the Biology Lab in Woodward Hall. 2. Undergraduate Contributions. Four undergraduate researchers will work collaboratively across four interconnected areas: Biology: microalgae cultivation, biomass measurement, and biological experimentation. Architectural Design: bioreactor design, digital modeling, fabrication, and integration with building walls. Engineering: pumps, tubing, sensors, environmental controls, circulation, and prototype operation. Software & Data: data collection, processing, visualization, dashboards, automated controls, and exploration of AI-assisted operation. Students may focus more deeply on one or two areas depending on their interests and skills while contributing to the overall research team. 3. Student Duties Biology Grow and maintain microalgae cultures. Measure algae growth and biomass. Conduct experiments involving light, temperature, CO₂, nutrients, and other growth conditions. Architectural Design Develop and modify bioreactor designs. Create digital models and fabrication documentation. Assist with prototype fabrication and building-wall integration. Engineering Assemble and operate pumps, tubing, valves, sensors, and control components. Test circulation and environmental conditions. Troubleshoot and improve prototype performance. Software & Data Collect, clean, organize, and analyze experimental data. Develop graphs, dashboards, and other data visualizations. Assist with sensor programming and automated controls. Explore how research data can support AI-assisted prediction and system operation. Students will also participate in research meetings, document experimental results, and help prepare research graphics and presentations.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

5 positions available

Anticipated Student Learning Outcomes: Students will participate in an interdisciplinary research project connecting Biology, Architectural Design, Engineering, and Software & Data. BRANE brings these areas together to investigate microalgae-based building systems, environmental sensing,

prototype operation, and data-driven controls. Through this experience, students will move beyond learning individual technical skills to integrating knowledge, interpreting evidence, solving open-ended problems, and making informed research decisions.

1. Anticipated Student Learning Outcomes

Biology: Students will be able to: Analyze how light, temperature, CO₂, nutrients, and other environmental conditions influence microalgae growth and system performance. Interpret experimental observations and measurements to identify relationships between biological conditions and performance. Formulate and evaluate possible explanations for unexpected biological results and use evidence to guide subsequent experiments.

Architectural Design: Students will be able to: Connect architectural design approaches with biological and environmental systems principles in novel ways. Translate open-ended research questions into possible 3D virtual modeling and physical prototype concepts. Integrate biological, environmental, material, fabrication, and building-system considerations when developing bioreactor designs. Evaluate and refine design alternatives based on experimental evidence, constructability, environmental performance, and research objectives.

Engineering: Students will be able to: Analyze relationships among fluid circulation, environmental conditions, sensing and controls, and biological performance. Evaluate prototype performance using observations, sensor measurements, and experimental data. Diagnose system-performance problems and develop possible solutions through iterative testing. Integrate biological, mechanical, and environmental requirements when making decisions about prototype operation.

Software & Data: Students will be able to: Interpret experimental and sensor data to identify patterns, relationships, and possible system-performance issues. Evaluate data quality and determine whether available evidence adequately supports research conclusions. Connect data patterns with biological, architectural, and engineering conditions. Assess how experimental data may support automated controls, prediction, and AI-assisted operation while recognizing the limitations of data-driven approaches.

Interdisciplinary Collaboration: Students will be able to: Collaborate with researchers from different disciplinary backgrounds to develop possible solutions to open-ended research questions. Synthesize perspectives from biology, architectural design, engineering, and software/data to address a shared research problem. Communicate technical information clearly across disciplinary boundaries and explain how their individual work contributes to the larger research project. Evaluate research decisions by considering multiple disciplinary perspectives rather than approaching the problem from a single field.

Research Ethics, Integrity, and Responsible Technology Use: Students will be able to: Apply responsible research practices in experimental procedures, data collection, documentation, analysis, and reporting. Evaluate appropriate and ethical uses of research data, AI-assisted tools, and automated decision-making. Document methods, results, modifications, and unexpected findings transparently so that research decisions can be understood and evaluated by others. Recognize basic responsibilities related to intellectual property, attribution, authorship, confidentiality, and responsible sharing of research results. Distinguish between evidence-supported conclusions and assumptions or predictions generated from incomplete experimental or AI-assisted information.

2. Educational Benefits:

Students will connect classroom knowledge with a real interdisciplinary research problem and experience how a research question progresses through hypothesis development, design, prototyping, experimentation, data collection, analysis, interpretation, and refinement. Rather than simply following predetermined procedures, students will progressively make research decisions, interpret unexpected results, propose alternative approaches, and evaluate whether evidence

supports their conclusions. These experiences will strengthen critical thinking, problem solving, systems thinking, and the ability to transfer knowledge across disciplinary contexts.

3. Training Benefits: Students will receive hands-on training appropriate to their individual research roles. Training may include laboratory procedures, microalgae cultivation, prototype fabrication, sensors and experimental equipment, data collection, and research documentation. Depending on their interests and project responsibilities, students may also receive training in digital modeling, programming, data visualization, automated controls, and AI-assisted research tools.

The BRANE platform includes pumps, tubing, valves, sensors, controllers, environmental data collection systems, and physical/digital prototypes. These technical activities will provide the practical foundation through which students achieve the higher-level learning outcomes described above.

4. Career Benefits: The project will expose students to emerging career areas at the intersection of biotechnology, architecture, engineering, sustainability, data science, artificial intelligence, and intelligent building systems. Students will develop transferable abilities in interdisciplinary problem solving, evidence-based decision-making, research communication, systems thinking, responsible technology use, and collaborative research. These abilities can support graduate study, internships, and careers in research, design, engineering, technology, biotechnology, data science, or sustainability.

5. How Students May Describe Their Experience: By the end of the experience, students should be able to say: "I contributed to developing and testing a living building system for data-center applications. I learned how to connect biology, architecture, engineering, and data rather than treating them as separate fields. I helped interpret experimental results, develop and evaluate prototype ideas, and make research decisions based on evidence. I also learned how responsible data use, AI, research integrity, and interdisciplinary collaboration are important parts of conducting research."

Required training of 5 hours with Description: The PI does not anticipate extensive training requirements. Students will complete a structured onboarding process before beginning research.

1. Research and Laboratory Orientation:

_Introduction to BRANE research goals, current prototypes, individual responsibilities, and interdisciplinary research methods.

_IDRL laboratory orientation, including safety procedures, research documentation, data management, and responsible use of equipment.

2. Biology Training:

_Basic microalgae cultivation, handling, sampling, biomass measurement, and culture maintenance.

_Proper use of personal protective equipment and procedures for cleaning and maintaining biological experiments.

_Introduction to experimental procedures for evaluating how environmental conditions affect biological performance.

3. Architectural Design & Engineering Training:

_Safe use of prototyping and fabrication tools.

_Assembly and operation of bioreactors, pumps, tubing, valves, sensors, and control components.

_Basic procedures for experimental setup, testing, troubleshooting, and evaluating prototype performance.

4. Software, Data, and Responsible AI Use

_Basic procedures for collecting, organizing, documenting, and interpreting experimental and sensor data.

_Introduction to data visualization, automated controls, and AI-assisted analysis as appropriate to the student's role.

_Students will be trained to verify data and AI-assisted outputs against experimental evidence and to recognize limitations in data-driven conclusions.

5. Research Integrity and Responsible Conduct

_Introduction to accurate research documentation, appropriate attribution, intellectual property, confidentiality, and responsible communication of results.

_Students will be expected to distinguish evidence-supported findings from assumptions or predictions and to document methods, modifications, and unexpected results transparently.

Students will initially work alongside the PI and experienced research team members. As they demonstrate competence with relevant procedures, equipment, and research practices, they will take on increasingly independent responsibilities, including interpreting results, proposing next steps, and contributing to interdisciplinary research decisions.

Mentoring plan: 1. How You Will Help the Student Succeed. At the beginning of the semester, the PI will work with each student to identify an area of interest—Biology, Architectural Design, Engineering, or Software & Data—and establish clear responsibilities, short-term goals, and semester milestones. Mentoring will progress from guided training toward increasing independence, with students encouraged to interpret results, propose ideas, and make evidence-based research decisions. 2. Who They Will Work With. Students will work directly with the PI and the BRANE research team and, when appropriate, with faculty and researchers across biology, engineering, architecture, and software/data. Students will be encouraged to learn across disciplinary boundaries and understand how their individual contributions connect to the larger research problem. 3. Regular Contact and Feedback. Students will participate in a weekly research meeting to review progress, interpret results, troubleshoot problems, and identify next steps. The PI will provide individual guidance and feedback as needed during experiments, prototype development, data analysis, and documentation. Feedback will focus not only on completing tasks but also on helping students explain why results occurred, evaluate evidence, and refine their research approach. 4. Interdisciplinary Research and Communication. Students will periodically present brief progress updates during research meetings and communicate their work to team members from different disciplinary backgrounds. They will be encouraged to connect biological, architectural, engineering, and data perspectives when evaluating research questions and prototype performance. Toward the end of the semester, students will organize their findings into research graphics, data visualizations, and a short presentation. When appropriate, students will

be encouraged to present through the UNC Charlotte Undergraduate Research Conference or other relevant research opportunities.5. Research Integrity and Responsible Technology Use. The PI will reinforce responsible research practices, including accurate documentation, transparent reporting of unexpected results, appropriate attribution, data integrity, and awareness of intellectual property and confidentiality. When AI-assisted or data-driven tools are used, students will be expected to evaluate their limitations, verify outputs against experimental evidence, and distinguish evidence-supported conclusions from assumptions or predictions.6. Mentor Commitment. The PI will provide clear expectations, appropriate training, regular feedback, access to research resources, and guidance in problem-solving. Students will be encouraged to ask questions, propose alternative approaches, learn from unexpected results, and reflect on both successful and unsuccessful experiments. As they demonstrate competency, they will receive greater responsibility and ownership of their work. The goal is for each student to finish the experience able to explain what they contributed, why the research matters, how different disciplines informed the work, what the evidence supports, and what questions should be investigated next.

Applicant Requirements: Applicants should: Be curious about interdisciplinary research involving Biology, Architectural Design, Engineering, or Software & Data. Be interested in hands-on research, experimentation, prototyping, data analysis, or related research activities. Be dependable and able to follow research, laboratory, and safety procedures consistently. Be willing to learn unfamiliar tools, methods, and concepts and work across disciplinary boundaries. Be able to document research activities, observations, and results accurately and maintain organized records. Be willing to analyze results, ask questions, and contribute ideas when experiments or prototypes produce unexpected outcomes. Be comfortable working both independently and collaboratively within a multidisciplinary research team. Be willing to communicate technical information to team members from different disciplinary backgrounds. Be willing to participate in regular research meetings, share progress, receive feedback, and reflect on next steps. Demonstrate responsible research practices, including careful use of data, appropriate attribution, and openness to learning about ethical and responsible uses of AI and other emerging technologies. Prior research experience is not required. Students from architecture, biology, engineering, computer science, data science, environmental science, and related disciplines are encouraged to apply. Students with strengths or interests in one area and a willingness to learn across disciplines are especially welcome.

Applicant Preferences: Preferred qualifications may include experience, coursework, or demonstrated interest in one or more of the following areas: Biology: microalgae cultivation, microbiology, environmental biology, laboratory experimentation, environmental systems, or related coursework. Architectural Design: digital modeling, Rhino/Grasshopper, prototyping, fabrication, building systems, environmental design, or design research. Engineering: sensors, pumps, fluid systems, electronics, Arduino/ESP32, controls, environmental monitoring, or hands-on system assembly. Software & Data: Python, MATLAB, Excel, data analysis, data visualization, dashboards, programming, sensor-data processing, automated controls, or AI-assisted analysis. Additional desirable qualities include strong problem-solving and critical-thinking skills, attention to detail, curiosity, creativity, and an interest in interdisciplinary research. Students who are comfortable asking questions, interpreting results, communicating across disciplines, and proposing possible solutions to open-ended research problems are especially encouraged to

apply. Experience in all of these areas is not expected or required. Students with strengths or interests in one area and a willingness to learn, collaborate, and connect ideas across disciplines are encouraged to apply.

Specific Time considerations/conflicts: Research hours are generally flexible and can be coordinated around students' class schedules. However, students are expected to participate in a weekly research team meeting and periodic research presentations.

Because the project involves living microalgae and ongoing experiments, occasional weekend or off-hours data collection, monitoring, or maintenance may be required. These activities will be scheduled in advance whenever possible and coordinated among team members to minimize conflicts with students' academic schedules.

App ID #: 3405

Mentor: Wolek, Artur

Email: awolek@uncc.edu

Title: Assistant Professor

Department: Mechanical Engineering

Co-mentor: No

Community engaged research: No

Title: Unmanned Systems in Aerospace and Ocean Applications: Mechatronics, Simulations/Algorithms, and/or Testing

Description: The Autonomous Robots and Systems Laboratory (ARSL) is part of the Mechanical Engineering and Engineering Science Department at the University of North Carolina at Charlotte (UNC Charlotte). Our research is in the area of aerospace and ocean vehicle guidance, dynamics, control and path planning. Research areas of expertise include: (1) Trajectory optimization and optimal path planning: Designing trajectories/paths for curvature-constrained (e.g., Dubins-like) vehicle models that optimize some criteria such as time, energy, or risk (2) Informative/adaptive path planning and multi-vehicle coordination: Planning paths and coordinating teams to collect data efficiently or adaptively (e.g., target tracking, search, or environmental monitoring) (3) Aerial and marine field robotics: Developing novel vehicle platforms and conducting field experimentation with UAVs, USVs, UUVs, and underwater gliders in unique applications. Learn more about our lab at <https://arsl.charlotte.edu/>. The ARSL engages undergraduate students in various projects, example past undergraduate projects are listed below. The specific nature of your project will be selected to complement ongoing research in the lab or exploratory ideas in a particular semester that you apply. Aerial deployment system for autonomous marine vessels in water body mapping Machine learning to improve multirotor UAV flight in windy urban environments Developing an indoor marine robotics testbed for multi-robot navigation and control Design of a source-seeking marine hovercraft robot and control algorithm Design of a buoyancy control system for a miniature aquatic robot Autonomous surface vessel (ASV): field testing and sensor integration 3D off-road terrain mapping for autonomous ground vehicle energy-optimal path planning Vision-based ping-pong ball anemometer Wind detection and avoidance using a crazyflie micro drone Integrating an ultrasonic anemometer onboard a quadrotor drone for wind data collection Characterizing radio communication range for an autonomous surface vessel Identifying the steering dynamics of an autonomous surface vessel Characterizing the acoustic signature of a quadrotor in hovering flight

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

3 positions available

Anticipated Student Learning Outcomes: Depending on the project, the student will develop further skills in one or more of the following areas: Writing programs in MATLAB or a similar language (python, C++, etc.) Electronics soldering and assembly of circuit sensors and actuators CAD design, fabrication, 3D printing Programming a mechatronics system with an Arduino Developing a mathematical model for simulation or analysis Hands-on testing and operation of a robotic

system
Reading papers and synthesizing data into literature reviews
Performing an experiment and analyzing data, calculating statistics

Required training of 0 hours with Description: Students will be onboarded by receiving an overview of the project from the project advisor and will be provided with related literature to review. There is no formal training requirement, but a graduate student working on the project will help the student gain required skills and/or other resources will be provided.

Mentoring plan: The student and advisor will develop a tentative week-by-week plan of steps to be accomplished and outline of major milestones for the project duration. The student will meet with the advisor through regular lab group meetings and occasional one-on-one meetings. Additional guidance on a day-to-day basis will be provided by a graduate student mentor.

Applicant Requirements: The requirements are based on the project type. If you wish to engage in hands-on mechatronics development of aerospace/ocean systems, robotics, and control/sensing subsystems then you must have some basic prior experience with several of the following areas: working with Arduino, programming in C++, soldering, building circuits, fabricating mechanical systems/drones, or 3D printing. Having completed the MEGR mechatronics lab/lecture sequence or related programming courses would satisfy this requirement. If you wish to engage in more theoretical/computational robotics/aerospace/ocean systems research then you must have completed a course in one or more of the following: (a) differential equations, an advanced dynamics course (e.g., MEGR 3121 or MEGR 3122), or (c) a course in robotics/control systems. You must also be able to write code in MATLAB, python, or C++. Please describe in your application how you meet the above requirements with specific examples. All students will be expected to complete OUR requirements and additionally to document their work in a final written report or conference paper.

Applicant Preferences: We are seeking highly dependable, punctual, and enthusiastic students who bring genuine curiosity, strong self-motivation, and exceptional attention to detail to the lab. Preferred candidates possess a track record of hands-on DIY projects or relevant coursework aligned with our research areas; while Mechanical Engineering majors are especially encouraged to apply, students in Electrical Engineering, Computer Science, and Mathematics are also welcome. Ideal team members demonstrate a high level of dedication to achieving key goals by the end of the semester and excel at keeping their work thoroughly organized and documented. Although interactive mentoring and guidance are provided, candidates must maintain the independence and initiative required to navigate technical challenges autonomously and drive project progress between meetings. Students must meet the requirements listed in the previous section for the project to be successful.

Specific Time considerations/conflicts: N/A

App ID #: 3406

Mentor: Gao, Zheming

Email: zgao7@charlotte.edu

Title: Assistant Professor

Department: Department of Industrial and Systems Engineering

Co-mentor: Yes

Lei Zhu, lzhu14@charlotte.edu, Department of Industrial and Systems Engineering

Community engaged research: No

Title: Smart Campus Mobility: Predicting and Reducing Rush-Hour Congestion

Description: Large university campuses, such as UNC Charlotte, experience significant transportation congestion during peak hours, particularly when large numbers of classes end simultaneously. Students, faculty, and staff often leave campus within a short period of time, creating heavy pedestrian traffic around academic buildings and parking decks, followed by severe vehicle congestion at parking deck exits and campus roadways. Although the university maintains parking facilities and transportation infrastructure, rush-hour delays can still be substantial. During the busiest periods of the day, it is not uncommon for a trip from a campus parking deck to an off-campus exit to take 20 minutes or longer, even though the same trip may require only a few minutes under normal traffic conditions. While navigation services such as Google Maps can estimate travel times on public roads, they have limited visibility into campus-specific conditions, including pedestrian flows, parking deck queues, and rapidly changing departure patterns immediately after class dismissals. Improving the efficiency of campus transportation would enhance the daily experience of the UNC Charlotte community, reduce unnecessary travel delays, and support more efficient and sustainable campus operations. This research is part of a big project that aims to develop a data-driven decision support system that predicts campus departure congestion and provides intelligent recommendations to improve transportation efficiency during peak periods. Rather than reacting to congestion after it occurs, the proposed system seeks to anticipate traffic conditions by combining multiple sources of information, including class schedules, course enrollment, building locations, campus maps, parking deck locations, road networks, and, when available, aggregated campus Wi-Fi activity. Using these data, the project will estimate how many people are expected to leave different campus buildings, predict when they will arrive at parking decks, forecast traffic conditions on campus roadways, and identify strategies that may reduce overall congestion. The proposed research consists of five closely connected components that together form a data-driven decision support system for improving campus transportation efficiency.

Module 1: Departure Demand Estimation. The first component estimates how many students, faculty, and staff are expected to leave each campus building throughout the day. By integrating class schedules, course enrollment, building locations, historical travel patterns, and estimated staff work schedules, this module predicts the departure demand from different areas of campus before congestion develops. These predictions provide the foundation for all subsequent analyses.

Module 2: Dynamic Campus Population and Flow Estimation. Class schedules provide an estimate of the expected campus population but do not always reflect the actual number of people present or how they move throughout the day. This module develops methods to estimate the

dynamic distribution and movement of people across campus by integrating scheduled activities with aggregated occupancy information, such as anonymized Wi-Fi connection statistics. By continuously estimating where people are located and how pedestrian flows evolve over time, the proposed system can more accurately capture changing campus conditions, improve departure-demand prediction, and provide timely information for subsequent parking-deck arrival and traffic congestion forecasting.

Module 3: Parking Deck Arrival Prediction. After leaving a building, individuals typically walk to their vehicles before entering the campus road network. This module estimates when travelers from different buildings will arrive at nearby parking decks by considering walking distances, campus layouts, parking locations, and estimated parking preferences. Predicting parking-deck arrival times allows the system to anticipate vehicle demand before traffic congestion begins.

Module 4: Campus Exit Time Prediction. This component develops predictive models to estimate the travel time from parking decks to campus exits under varying traffic conditions. Multiple factors, including predicted vehicle demand, historical congestion patterns, weather conditions, and road network characteristics, will be incorporated to forecast traffic delays during rush hours. The resulting models provide timely estimates of campus exit times for different parking locations and departure periods.

Module 5: Intelligent Decision Support. The final component transforms traffic predictions into practical recommendations that help improve campus transportation efficiency. Based on the predicted congestion levels, the system may recommend suitable departure times, alternative campus exits, or other strategies that distribute traffic demand more evenly across time and space. Rather than simply predicting congestion, this module focuses on supporting informed decisions that reduce delays and improve the overall travel experience for the campus community. Undergraduate researchers will participate in every stage of the project. Depending on their interests and backgrounds, students may contribute to data collection, data cleaning and preprocessing, statistical analysis, machine learning model development, traffic prediction, simulation studies, data visualization, and software or mobile application development. Through these activities, students will gain hands-on experience working with real-world transportation datasets while developing practical skills in data analytics, machine learning, optimization, simulation, and decision support. Expected project deliverables include software prototypes, mobile application development, research posters for undergraduate research symposia, conference presentations, and, where appropriate, contributions to future journal publications.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students participating in this project will gain hands-on research experience by working on a real-world transportation problem that directly impacts the daily operations of the UNC Charlotte campus. Through collaboration with faculty mentors and graduate students, participants will learn how to formulate research questions, collect and manage large datasets, develop computational models, analyze experimental results, and communicate their findings in a professional setting. Students will develop practical skills in data analytics, machine learning, simulation, and software development while working with real campus transportation data. They will also gain experience using modern programming tools and data visualization techniques to transform complex datasets into meaningful insights that support data-driven decision making. Beyond technical skills, students will strengthen their problem-solving,

critical thinking, teamwork, and communication abilities. The interdisciplinary nature of the project provides opportunities to understand how engineering, computer science, data science, and transportation systems can be integrated to address complex societal challenges. The research experiences will prepare students for graduate study, research careers, and professional positions in data science, artificial intelligence, transportation, and smart infrastructure.

Required training of 8 hours with Description: Students will receive an introduction to the research project, including the objectives, campus transportation challenges, and the overall research framework. Mentors will provide guidance on data collection, data preprocessing, exploratory data analysis, and basic machine learning and forecasting techniques needed for each research module.

Following the initial training, students will participate in weekly research meetings and work closely with faculty and graduate student mentors. As students gain experience, they will gradually take on more independent research tasks while continuing to receive regular feedback and technical support throughout the project.

Mentoring plan: Students will work closely with the faculty mentors throughout the project. Regular research meetings will be held to discuss project progress, address technical challenges, and development of solutions. Students will receive individualized guidance based on their interests, experience, and project responsibilities. As students gain experience, they will be encouraged to take increasing ownership of their research tasks while working collaboratively with other team members. They will have opportunities to present their progress during group meetings, participate in undergraduate research symposium, and, when appropriate, contribute to conference presentations or journal publications. A supportive and collaborative research environment will be provided where students can develop technical skills, research experience, and professional confidence. Mentors are committed to helping students succeed by providing regular feedback, encouraging independent thinking, and supporting their academic and career development.

Applicant Requirements: The ideal student for this project is enthusiastic about research, enjoys solving real-world problems, and is motivated to learn new technologies. Students should be willing to work both independently and collaboratively while communicating effectively with faculty mentors and other team members. Applicants should have a basic foundation in statistics, data analysis, and programming. Familiarity with forecasting methods, such as time-series analysis, regression models, or machine learning techniques, is desirable. Students should also have experience programming in Python and be comfortable using modern coding tools, including AI-assisted or “vibe coding” workflows, to develop, test, and refine software efficiently.

Applicant Preferences: Students with prior experience in software engineering, web application development, or mobile application development are especially encouraged to apply, as the project aims to develop software prototypes and decision-support tools for campus transportation. Curiosity, creativity, strong analytical and modeling skills, and a willingness to learn are valued more highly than extensive prior research experience.

Specific Time considerations/conflicts: Student should be able to attend weekly group meeting schedule on Friday (intended to be 11am Friday)

App ID #: 3407

Mentor: Xie, Sheldon

Email: yxie10@uncc.edu

Title: Assistant Professor

Department: ETCM

Co-mentor: No

Community engaged research: No

Title: From Sludge to Graphene: Can Ultra-Fast Heating Turn Waste into Advanced Materials?

Description: What if something we normally pay to dispose of could instead become the starting material for advanced technology? Wastewater treatment produces large quantities of sludge containing carbon-rich organic matter, mineral ash, and trace metals. Managing this material can be costly, yet many of the same elements found in sludge are also used to manufacture functional carbon materials. This creates an exciting research question: Can wastewater sludge be transformed into a useful graphene-based material rather than treated only as waste? In this project, you will explore this question using Flash Joule Heating (FJH), an emerging manufacturing technique that sends a short electrical pulse through a material and heats it to extremely high temperatures in milliseconds to seconds. Under the right conditions, this rapid heating can reorganize disordered carbon into graphene-like structures. Unlike conventional furnace heating, FJH delivers energy directly to the material and allows us to explore extremely rapid transformations that would otherwise be difficult to achieve. The challenge, and the research opportunity, is that real wastewater sludge is much more complicated than a clean laboratory carbon powder. Its carbon content, minerals, electrical conductivity, and particle structure can all influence what happens during the flash. Your central research question will therefore be: How do feedstock composition and Flash Joule Heating conditions affect the formation and quality of graphene-based materials from wastewater sludge? You will participate in the full experimental cycle. First, you will prepare sludge-derived feedstocks by drying, grinding or ball-milling, weighing, and mixing them with controlled amounts of conductive additives. You will then work with the PI and graduate researchers to perform FJH experiments while systematically changing variables such as feedstock formulation, electrical energy, voltage, and pulse conditions. After each experiment, you will help determine what material was produced. Raman spectroscopy will be used as one of the primary tools for evaluating changes in carbon structure and the formation of graphitic or graphene-like domains. Scanning electron microscopy and other characterization methods may also be used to examine morphology and composition. Most importantly, you will not simply collect samples. You will organize the experimental results into a process–structure map. By comparing multiple experiments, you will help identify the conditions that most strongly promote carbon transformation and determine why some flashes work better than others. By the end of the project, you will have contributed to establishing a new Flash Joule Heating research capability at UNC Charlotte and generated an original experimental dataset addressing a real environmental and advanced-manufacturing challenge. Your work will be summarized in a research poster or presentation and may contribute to future publications or follow-on research projects.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: This project is designed to give you experience with the complete research process, from asking a question and designing an experiment to analyzing data and communicating a scientific conclusion. By the end of the project, you will be able to: Explain the basic principles of Flash Joule Heating, carbon materials, graphene, and waste upcycling. Prepare heterogeneous environmental materials for controlled materials-processing experiments. Understand how variables such as composition, electrical resistance, voltage, energy input, and pulse conditions influence an ultrafast thermal process. Gain exposure to Raman, microscopy and other materials-characterization techniques. Organize experimental data and create clear plots relating processing conditions to material properties. Just as importantly, you will experience what research actually looks like. Not every flash will produce the result we expect, and those unsuccessful experiments are often scientifically useful. You will learn how researchers turn unexpected results into better questions and better experiments. The project is especially well suited for students interested in sustainable manufacturing, materials science, environmental engineering, nanotechnology, energy technologies, or experimental research.

Required training of 5 hours with Description: During the initial stage, you will work alongside the PI and graduate students while learning sample preparation, weighing and mixing procedures, equipment setup, and the FJH standard operating procedures. Because FJH involves high electrical energy and rapid high-temperature processing, experiments will initially be conducted only under direct supervision. Greater independence will be introduced gradually after you demonstrate competency with the relevant procedures and safety requirements.

You will then receive hands-on training in material characterization. Raman spectroscopy will be a primary technique because it provides a rapid way to evaluate changes in carbon structure after FJH processing. Depending on the experimental results, you may also gain experience preparing samples for scanning electron microscopy or other shared characterization facilities.

Finally, you will be trained in basic research data management and visualization. You will learn how to organize experimental conditions, calculate relevant processing parameters, compare samples, create publication-quality plots, and use those results to plan the next experiment.

The goal of the training is not simply to teach you how to follow a procedure. By the end of the project, you should understand why each step is performed and how each experimental decision affects the scientific question being tested.

Mentoring plan: During the first several weeks, we will work together frequently in the laboratory as you complete safety training and learn sample preparation and FJH procedures. You will also work closely with graduate researchers who can provide day-to-day technical guidance. Once you are comfortable with the experimental workflow, we will establish a regular weekly one-on-one meeting. You will maintain a research notebook documenting experimental conditions, observations, results, and questions. As the project progresses, I will help you learn how to transform these records into scientific figures, an abstract, and a coherent research story. Toward the end of the project, we will work together to prepare your research presentation for the appropriate UNC Charlotte undergraduate research symposium or conference.

Applicant Requirements: No prior research experience or knowledge of graphene or Flash Joule Heating is required. Students should be comfortable working in a laboratory environment and wearing appropriate personal protective equipment. Students from engineering, engineering technology, chemistry, physics, environmental science, materials-related fields, and other relevant STEM disciplines are encouraged to apply.

Applicant Preferences: The following experience is helpful but not required: Coursework in chemistry, physics, materials science, environmental engineering, manufacturing, or related STEM areas. Previous experience in a chemistry, materials, or engineering laboratory. Interest in sustainability, carbon materials, nanotechnology, energy, manufacturing, or environmental technologies. Above all, I am looking for a student who is curious, dependable, careful, and willing to learn. You do not need to arrive already knowing how to do this research, that is what the research experience is for.

Specific Time considerations/conflicts: NA

App ID #: 3409

Mentor: Ning, Daoguan

Email: dning@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Development of an Experimental Platform to Study Rocket Propellant Combustion Using Advanced Laser Diagnostics

Description: How can we better understand what happens inside a solid-fuel rocket engine while it is burning? Solid propellants are widely used in aerospace propulsion and defense applications, yet important combustion properties, such as burning rate, temperature, and species concentrations, can be challenging to measure directly. Better measurements can help researchers understand combustion processes and ultimately support the development of improved rockets. This project will develop a new experimental platform for studying solid propellant combustion using advanced laser diagnostics. Laser-based measurements provide a powerful way to investigate combustion in situ and without physically disturbing the flame. However, obtaining reliable measurements requires a carefully controlled combustion environment. The centerpiece of this project is the design and construction of an opposed-flow burner. This experimental setup will provide a foundation for future studies using laser diagnostics to investigate the physics and chemistry of solid propellant combustion. Students will have the opportunity to participate in the project from concept and design through fabrication, instrumentation, assembly, and experimental testing. Depending on their interests and background, students may contribute to several aspects of the project, including: Reviewing the research literature and evaluating existing opposed-flow and counterflow burner designs. Developing 3D CAD models, engineering drawings, and assemblies for the burner and its individual components. Designing the mechanical support structure and considering practical issues such as alignment, stability, and accessibility. Developing microcontroller-based control and data-acquisition systems for monitoring and controlling burner operating conditions. Working with workshop technicians to translate designs into fabricated components. Assembling the experimental system, troubleshooting components, and conducting initial performance tests. Analyzing experimental data and using the results to improve the burner design and prepare the system for future laser-diagnostic experiments

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

3 positions available

Anticipated Student Learning Outcomes: Through this project, you will learn CAD modeling, fundamental knowledge of rocket propulsion and solid propellant combustion, skills for designing experimental setups, experiences with micro control and data acquisition unit development. Those are research experiences preferred by military research laboratories and defense companies, and therefore boost your career opportunities at military research laboratories and defense companies.

Required training of 0 hours with Description: Students will begin by reviewing selected literature on opposed-flow burners, solid propellant combustion, and solid-fuel rocket propulsion, with guidance from the mentor to help them build the necessary background. The mentor will introduce the project objectives, experimental approach, and relevant safety and laboratory procedures.

As students become familiar with the research, they will receive hands-on guidance in CAD modeling, experimental design, instrumentation, and data acquisition as needed for their role in the project. Students will gradually take on greater responsibility as they develop confidence and technical skills.

When appropriate, additional guidance will be available from experienced collaborators or technical personnel with expertise in the design and fabrication of opposed-flow experimental systems. This combination of mentoring, hands-on training, and access to technical expertise will allow students from a range of academic backgrounds to successfully contribute to the project.

Mentoring plan: At the beginning of the project, the mentor will introduce the research background, goals, and overall experimental approach, and work with the student to develop a clear plan with manageable, step-by-step tasks. This will help the student understand not only what they are doing, but also how their work contributes to the larger research effort. Throughout the project, the mentor will hold regular meetings to discuss progress, answer questions, troubleshoot challenges, and provide feedback. Students will be encouraged to ask questions, propose solutions, and gradually take greater ownership of their work as they develop their skills. The mentor will provide access to and training in the software, equipment, and research tools needed for the project. When hands-on assistance is needed, the mentor will work alongside the student in the laboratory to provide direct guidance. The goal is to create a supportive environment in which students can learn through both mentorship and hands-on research experience while developing confidence and independence as researchers.

Applicant Requirements: Students with the following skills or experiences are encouraged to apply: Basic experience with CAD software, such as SolidWorks, PTC Creo, Catia, or Siemens NX. Familiarity with mechanical drawings and basic engineering design principles. Basic experience with microcontrollers or microcomputers, such as Arduino or Raspberry Pi. Students do not need to be highly experienced in all of these areas. A willingness to learn, solve problems, and work hands-on with an experimental system is equally important. Training and guidance will be provided as needed.

Applicant Preferences: The following skills or experiences are helpful but not necessary: Familiarity with LabVIEW or other data-acquisition software. Basic knowledge of PID control and feedback systems. Coursework or experience in fluid mechanics. Interest in hands-on experimental research, engineering design, and problem-solving.

Specific Time considerations/conflicts: no

App ID #: 3410

Mentor: Sanches de Oliveira, Paulo Tarso

Email: polivei2@uncc.edu

Title: Associate Professor

Department: Department of Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Understanding the effects of an open water balance assumption on extreme hydrological events of floods and droughts

Description: Floods and droughts are becoming frequent and severe across the United States, causing major environmental, economic, and societal impacts. Improving our ability to understand and predict these hydrological extremes is critical for building more resilient communities and water systems. However, our recent large-sample hydrology studies indicate that hydrological models perform poorly in arid and water-losing basins. This happens because these models inadequately represent inter-catchment groundwater flow and other open water balance (OWB) processes. Although evidence shows that surface-groundwater interactions and groundwater dynamics influence streamflow, droughts, and floods, they remain poorly integrated into most data-driven and conceptual models. Consequently, the extent to which omitting OWB conditions limits predictive accuracy remains unclear. This project addresses these gaps by explicitly incorporating surface-groundwater interactions across various spatial and temporal scales. Analyzing thousands of catchments across the U.S. alongside groundwater monitoring data, this research evaluates how missing groundwater processes affect hydrological model performance. The study integrates conceptual modeling, deep learning, explainable artificial intelligence, and causal diagnostics to identify key physical controls and advance our understanding and prediction of hydrological extremes. The students will help collect, organize, and analyze streamflow, climate, groundwater, and catchment datasets. They will also create maps and visualizations, evaluate relationships between groundwater and surface water, and assist with hydrological and machine-learning modeling experiments. Depending on their interests and experience, students may also learn Python, GIS, data visualization, and AI techniques. Through these activities, they will gain hands-on experience in hydrology, data science, and computational modeling while contributing to research aimed at improving our ability to predict floods and droughts. Training and support will be provided, and no prior research experience is required.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: By participating in this project, students will develop practical skills at the intersection of hydrology, data science, and computational modeling. Using real-world hydrological datasets, students will learn to collect, clean, organize, quality-control, and analyze streamflow, groundwater, climate, and catchment data using spreadsheets and Python. Students will also develop GIS and data-visualization skills to map hydrological patterns and investigate surface-groundwater interactions across U.S. catchments. They will gain introductory

experience with hydrological modeling, machine learning, and explainable AI, learning how computational tools can be used to investigate floods and droughts. Through weekly research meetings, students will learn to document workflows, interpret results, communicate scientific findings, and present progress to a research team. These experiences will strengthen their preparation for careers in hydrology, water resources engineering, GIS, and data science.

Required training of 0 hours with Description: N/A

Mentoring plan: Students will receive structured, supportive mentoring designed to build confidence, research skills, and increasing independence. The PI will meet individually with each student weekly to discuss progress, set short-term goals, address challenges, and provide guidance on hydrology, modeling, programming, and research practices. Students will initially receive hands-on training and clear tasks, with responsibilities gradually expanding as their skills develop. They will also participate in biweekly project meetings with the full research team, where they will share progress, receive feedback, learn from graduate students and faculty, and gain experience working in an international research environment. Students will be encouraged to present results at research group meetings and, when appropriate, undergraduate research events or conferences. The PI will provide timely feedback, career and graduate-school guidance, and a supportive environment where questions and learning through experimentation are encouraged.

Applicant Requirements: We are looking for students who are genuinely curious about hydrology, water resources, and environmental challenges and who are motivated to learn through hands-on research. Prior research experience is not required. The most important qualifications are reliability, organization, attention to detail, willingness to learn, and consistent weekly engagement. Experience with spreadsheets, introductory programming, GIS, statistics, or data analysis is desirable but not required. Coursework in hydrology, water resources, environmental engineering, earth science, geography, statistics, or computing would be helpful. The ideal student is comfortable asking questions, receptive to feedback, able to work both independently and collaboratively, and interested in developing new skills in hydrology, modeling, and scientific communication.

Applicant Preferences: Coursework or experience in introductory hydrology, water resources, civil or environmental engineering, GIS, statistics, data analysis, or programming (Python or R) is preferred but not required. Familiarity with spreadsheets and working with environmental or time-series data is also beneficial. Students from civil and environmental engineering, data science, earth and environmental sciences, geography, computer science, and related fields are encouraged to apply. Most importantly, we value curiosity, motivation to learn new skills, attention to detail, and an interest in applying computational tools to real-world water and environmental challenges.

Specific Time considerations/conflicts: N/A

App ID #: 3411

Mentor: Zhang, Ran

Email: rzhang8@charlotte.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Artificial Intelligence Powered Autonomous and Distributed Multi-Drone Platform

Description: Most existing drone swarm management platforms feature either centralized control by a ground station or predefined synchronized action plans, e.g., the drone light show. A fully distributed yet coordinated multi-drone platform is still missing for realistic applications. Such applications need drones' own intelligence to make coordinated decisions in a real-time manner without centralized or remote control. This project is the continuation of a 3-year project to build an autonomous, distributed and coordinated multi-drone network. Students will learn and be devoted to programming drones both virtually in realistic simulations and practically in real drones with on-board intelligence and advanced sensors, design deep learning and reinforcement learning algorithms for distributed multi-drone management in concrete task scenarios, and document the achievements for possible research publications. A new project component is added which explores using wireless power transfer technique to power the drones on the ground or even in the air.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Learning about the wiring and connections inside a self-built drone
Learn how to program in a realistic drone simulator integrating Gazebo, lower-level drone flight controller and RViz.
Learn to design machine learning and reinforcement learning algorithms for concrete practical tasks
Learn how to program the drones in ROS and Python and upload onto the real drones for real-life testing.

Required training of 20 hours with Description: 1. Tutorials on how to build drones from scratch

2. Training on how to operate the realistic drone simulator

Mentoring plan: The mentor will hold weekly meetings with the mentees to discuss the accomplishments and tasks to be done. The mentee will get trained on the project via working with existing undergraduate research assistants. The training includes how to wire different components in a self-built drone, how to program Intel NUC to interact with different sensors and control the drone flights, and how to use realistic drone simulator - Gazebo to simulate before actually flying. The mentees will design distributed algorithms under the guidance of the mentor. The students may present to the lab visitors to introduce the ongoing projects. They may also get involved in writing academic papers by providing simulation results from Gazebo.

Applicant Requirements: Required: Having Python programming experiences

Applicant Preferences: Preferred: have considerable amount of microcontroller (Arduino UNO, raspberry Pi, Intel NUC, or Nvidia Jetson) programming experiences

Specific Time considerations/conflicts: N/A

App ID #: 3423

Mentor: Xie, Sheldon

Email: yxie10@uncc.edu

Title: Assistant Professor

Department: ETCM

Co-mentor: No

Community engaged research: No

Title: Using Large Language Models to Discover Better Ways to Recover Critical Minerals from Waste

Description: Critical minerals such as lithium, cobalt, nickel, rare-earth elements, gallium, and germanium are essential to modern technologies including batteries, electronics, renewable energy systems, and advanced manufacturing. At the same time, many of these valuable elements are present in materials that are currently treated as waste, including spent batteries, electronic waste, mine tailings, industrial residues, and wastewater. Recovering critical minerals from these secondary resources could reduce waste, strengthen material supply chains, and decrease the environmental impacts associated with conventional mining. Researchers around the world are actively developing new materials and processes for this purpose, but the scientific knowledge is scattered across a very large and rapidly growing body of literature. This project asks whether large language models (LLMs) can help organize this information and discover better strategies for recovering critical minerals from waste. Rather than asking an LLM simply to summarize scientific papers, we will use it as an information-extraction tool. The model will be asked to identify specific experimental details, such as which critical mineral was recovered, what waste source it came from, which recovery technology and material were used, what operating conditions were reported, and how well the process performed. The goal is to convert unstructured scientific literature into a structured dataset linking waste source, critical mineral, recovery technology, material, processing conditions, and recovery performance. Once these data are organized, we can begin asking broader scientific questions, such as which technologies work best for dilute waste streams, which materials remain selective when competing ions are present, and whether certain combinations of materials and operating conditions appear especially promising. As an undergraduate researcher, you will contribute directly to building and validating this system. You will begin by learning the basic science behind critical minerals, waste-derived resources, and common recovery technologies. You will then help review a selected set of scientific papers and determine what information should be extracted from each study. A smaller group of papers will be carefully examined by hand to create a human-verified reference dataset, which will be used to evaluate whether the LLM is producing accurate results. You will help identify errors such as missing information, incorrect numerical values, mixed-up experimental conditions, inconsistent units, or statements that are not supported by the original paper. This validation step is a central part of the project because reliable scientific use of LLMs requires more than generating convincing text—it requires evidence, reproducibility, and careful error checking. As the project progresses, you will use Python and related data-analysis tools to organize the extracted information, clean and standardize the dataset, and create visualizations that reveal patterns across the literature.

Depending on your interests and experience, you may also help improve LLM prompts, automate parts of the extraction workflow, compare different extraction strategies, construct a knowledge graph, or apply basic statistical and machine-learning methods to identify relationships in the data. You may also take ownership of a focused scientific question, such as lithium recovery from wastewater, rare-earth recovery from industrial waste, or comparison of different separation technologies across several critical minerals. Students with limited programming experience are welcome; the project will begin with guided examples and gradually move toward more independent analysis. By the end of the project, we aim to develop a validated critical mineral recovery knowledge database that connects waste resources, critical minerals, recovery methods, operating conditions, and reported performance. Your contribution may include a curated dataset, a validated LLM extraction workflow, scientific visualizations, or an analysis of emerging recovery trends. You will gain experience with artificial intelligence, scientific computing, materials and environmental engineering, data validation, and research communication, and you will help translate a large body of scientific literature into knowledge that can guide future experiments and technology development.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students participating in this project will gain hands-on experience applying large language models to a real scientific research problem. They will learn how to search and evaluate scientific literature, extract structured information from research papers, validate AI-generated results, organize and analyze data using Python, and create clear scientific visualizations. They will also develop a working understanding of critical minerals, waste-derived resources, and emerging recovery technologies. Beyond technical skills, students will strengthen critical thinking, data-quality assessment, reproducible research, and scientific communication. By the end of the project, they should be able to explain how AI can be used responsibly in scientific discovery and discuss both its capabilities and limitations. Students will leave with experience they can describe in future interviews or graduate-school applications as having helped build and validate an LLM-based research workflow for discovering patterns in critical-mineral recovery from scientific literature.

Required training of 0 hours with Description: The student will begin with an orientation to the project goals, critical-mineral recovery, scientific literature search, and responsible use of large language models in research. Initial training will include basic Python-based data processing, structured information extraction with LLMs, data organization, and methods for verifying AI-generated results against the original scientific literature. The student will first work through a small set of example papers with the PI before progressing to more independent analysis. Particular emphasis will be placed on research integrity, accurate source documentation, reproducible data analysis, and recognizing potential LLM errors or hallucinations.

Mentoring plan: I will provide structured guidance at the beginning of the project, including background on critical-mineral recovery, literature analysis, Python-based data processing, and LLM-assisted information extraction. During the first several weeks, the student can expect frequent interaction with me and, when appropriate, support from graduate researchers. As the student gains confidence, we will transition to a regular weekly one-on-one meeting to review

progress, troubleshoot problems, evaluate data quality, and plan next steps. The student will also participate in bi-weekly group meetings and will be encouraged to briefly present progress and questions. My goal is to help the student gradually take ownership of a focused research question rather than only complete assigned tasks. I will provide feedback on coding, data validation, scientific interpretation, and research communication, and I will help the student prepare figures, an abstract, and a poster or presentation for an appropriate UNC Charlotte undergraduate research event. I also commit to helping the student connect the research experience to future goals such as graduate school, AI/data-science careers, or work in sustainable materials and engineering.

Applicant Requirements: We are looking for a curious, reliable, and detail-oriented student with an interest in artificial intelligence, data science, materials, sustainability, or engineering research. The student should be comfortable working with computers, willing to learn Python-based data analysis, and able to carefully compare AI-generated results with original scientific papers. Strong communication skills, attention to data quality, and a willingness to ask questions are important. Prior experience with large language models or critical-mineral research is not required. Coursework or experience in programming, data science, engineering, chemistry, materials science, environmental science, or a related STEM field is helpful but not necessary. The most important qualities are motivation, careful thinking, and willingness to learn new computational and scientific methods.

Applicant Preferences: Preference will be given to students with some experience in Python, R, MATLAB, or another programming language, as well as students who have taken coursework in data science, computer science, engineering, chemistry, materials science, environmental science, or related STEM fields. Familiarity with scientific literature, data analysis, or machine learning is helpful but not required. We particularly welcome students who are interested in large language models, AI for science, critical minerals, sustainability, or materials informatics, and who are proactive, careful with data, and willing to learn independently.

Specific Time considerations/conflicts: NA

App ID #: 3412

Mentor: Burghardt, Keith

Email: kburghar@charlotte.edu

Title: Assistant Professor

Department: School of Data Science

Co-mentor: Yes

Amy Canevello, acanevel@charlotte.edu, Psychology

Community engaged research: No

Title: Love in the Time of LLMs: Why Do AI Relationships Form and What Is Their Impact?

Description: LLMs are on one hand transformative; they are an ever-present, always helpful, friendly voice to help you with any question. They are also nothing more than an algorithm that predicts the next word in a sentence. They appear faithful, yet they are merely autoregressive. We will be working with students to help answer two questions: how do LLMs pull users into (possibly romantic) relationships? And how helpful or harmful are LLM relationships on one's psyche over time when used actively? We keep an open mind when exploring these research questions; we do not treat LLMs as inherently bad or good, but explore their increasingly common use to understand where are there risks or benefits. Moreover, while a small portion of users may have a limerent fascination with LLMs, this number is exponentially increasing as LLMs become more prevalent and humanesque. We want to understand the role of LLMs in creating these companionships or their preservation, explore the psychology of LLM anthropomorphism, as well as the user's desire to form such a relationship. In particular, most LLMs have been trained to express concern and show sycophantic responding - they rarely argue or push back. So these interactions are often described as "frictionless", particularly in comparison to interactions with people, who have their own goals, desires, and egos. LLMs do not need management or regulation, nor do they have complicated lives outside of ones own. These can intuitively drive a relationship that humans might desire. Users might pick up on subtle properties of LLMs, such as their language matching, and view these as deep interest. Or maybe LLMs truly fill a void that these users lack. We then ask, how the LLM changes from a "friend" to a romantic interest and whether LLM "post-training" unintentionally drives this with the goal of encouraging engagement. Finally, do LLMs cause a persistent change in user's mental models of the world? To begin this research, we will be using qualitative and quantitative methods to analyze self-reported LLM relationships at scale on social media, learn who is susceptible to these behaviors, how these relationships change, and the healthiness of such relationships. We will also be evaluating the LLMs themselves to learn their role in the psychology of LLM limerence.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Technology: Students will be able to better analyze social media with machine learning tools, such as training transformer models to perform natural language processing. Critical thinking: Students will explore hypothesis generation and how to prove

or disprove hypotheses in psychology. Teamwork: Students will learn how to interact with each other and delegate tasks. Engagement across perspectives: Students will learn to explore a question with an open mind to find the true nature of a condition, including its benefits and risks. Communication: Students will practice communicating in a clear and organized manner so that others can effectively understand.

Required training of 4 hours with Description: Students will review our pre-registered hypothesis

Students will review natural language processing tools, data analysis tools, and statistics, such as t-test.

Students will need to review and, after this review, have a working understanding of the relevant LLM and psychology literatures

Mentoring plan: We will meet weekly, and talk offline (or meet ad hoc). The student will learn from fellow students and mentors AI training techniques, how to perform research, and how to present. Students will be expected to present, either verbally or (depending on the stage of their research) with slides. They will use these opportunities both as feedback and to learn how to communicate with stakeholders. The goal is to use this research to create a conference proceedings or journal paper. In the former case, students will be presenting in front of an academic audience. We will work through any struggles the students face and offer advice on overcoming challenges.

Applicant Requirements: We are looking for a student skilled in Python and familiar with machine learning

Applicant Preferences: The student should be familiar or interested in psychology

Specific Time considerations/conflicts: Students must be available weekly for hour-long meetings, either 1:1 or in a group, where they will share their progress. These meeting times are variable.

App ID #: 3413

Mentor: Chen, Gongfan

Email: gchen12@charlotte.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Investigating the Role of Multimodal AI in Supporting Engineering Plan Reading for Undergraduate Education

Description: Engineering plan reading is a fundamental skill for engineers because it serves as the primary means of communication between design and construction. Accurate interpretation of drawings ensures that projects are built as intended, reducing errors, delays, and safety risks. For undergraduate students, developing strong plan reading skills builds spatial reasoning, problem-solving ability, and professional readiness, making it a cornerstone of engineering education. Interpreting the different aspects of engineering plan readings often requires years of on-site experience. For senior professionals, this knowledge gradually becomes a form of “muscle memory,” shaped by case-specific situations and accumulated practice. However, acquiring such expertise is costly and impractical to replicate for daily teaching in higher education settings. Recently, multimodal AI has advanced significantly, with the ability to process and understand multiple forms of input such as images, audio, and video. Preliminary findings from our pilot study indicate that multimodal AI is capable of interpreting certain aspects of engineering plan drawings. This research seeks to explore the potential of multimodal AI in supporting undergraduate students as they learn to interpret engineering drawings. Dr. Gongfan Chen is seeking to mentor a motivated undergraduate researcher to investigate students’ learning experiences with multimodal AI in plan reading. The student’s primary responsibilities will include conducting focus interviews, organizing and analyzing data, and contributing to reports or research papers.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: The expected learning outcomes for the student on this project include the following: Critical Thinking development by gathering and analyzing information from a diverse set of sources to fully understand a problem. Communication development by asking questions, seeking feedback, providing feedback appropriately to seek guidance and informing others of your needs and progress during the research process. Professionalism development by prioritizing and completing tasks to accomplish goals within the broader research environment

Required training of 5 hours with Description: The student will receive training on how to use Generative AI tools, and wearable AI device.

Mentoring plan: Dr. Chen will have regular weekly project update meetings that are scheduled based on the team’s availability during the period of performance for the project. The specified

project tasks will be performed based on the project schedule. The student will get the opportunity to practice their professional communication skills with weekly, in-person presentations based on aforementioned aspects to report on task completion updates, action items, and discuss questions.

Applicant Requirements: The student should be familiar with general generative AI tools (e.g., ChatGPT), possess strong oral and written communication skills, and demonstrate a genuine passion for research.

Applicant Preferences: Students with proficiency in generative AI tools and data analysis skills are desired and would be strongly considered. Training can be provided to students who are willing to learn.

Specific Time considerations/conflicts: The student must be available to meet in person for up to 1 hour for research team meetings.

App ID #: 3414

Mentor: Chen, Gongfan

Email: gchen12@charlotte.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Investigating Edge AI Applications to Support Informed Construction Jobsite Decision-Making

Description: Generative artificial intelligence (GenAI) has rapidly transformed the world over the past few years, and the construction industry is beginning to see significant opportunities as well. However, a major challenge lies in the practical use of GenAI tools, such as large language models (LLMs) and vision-language models (VLMs), which require substantial computing resources, cloud connectivity, and Internet access. These models are extremely large, energy-intensive, and not always compatible with field conditions. In construction projects, particularly in rural or remote areas, reliable Internet access and advanced computing infrastructure are often unavailable. As a result, applying GenAI tools in real time on jobsites remains far from reality. This project aims to address that challenge by developing an edge computing-powered framework capable of running construction-specific language models in real time without dependence on Internet services or external infrastructure. The aim is to provide jobsite construction workers with a personalized physical AI assistant that leverages construction-specific knowledge to collaboratively support their decision-making. Dr. Gongfan Chen is seeking to mentor a promising undergraduate researcher to help design and test a prototype of edge AI that can be deployed directly on construction sites to support real-time decision-making.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: The expected learning outcomes for the student on this project include the following: Critical Thinking development by gathering and analyzing information from a diverse set of sources to fully understand a problem. Communication development by asking questions, seeking feedback, providing feedback appropriately to seek guidance and informing others of your needs and progress during the research process. Professionalism development by prioritizing and completing tasks to accomplish goals within the broader research environment.

Required training of 5 hours with Description: The student will receive training on how to use Generative AI tools, and python as part of the research process.

Mentoring plan: Dr. Chen will have regular weekly project update meetings that are scheduled based on the team's availability during the period of performance for the project. The specified project tasks will be performed based on the project schedule. The student will get the opportunity to practice their professional communication skills with weekly, in-person presentations based on

aforementioned aspects to report on task completion updates, action items, and discuss questions.

Applicant Requirements: The student should be familiar with general generative AI tools (e.g., ChatGPT), possess strong oral and written communication skills, and demonstrate a genuine passion for research.

Applicant Preferences: Students with proficiency in Python programming and embedded system are desired and would be strongly considered. Training can be provided to students who are willing to learn.

Specific Time considerations/conflicts: The student must be available to meet in person for up to 1 hour for research team meetings.

App ID #: 3416

Mentor: Chen, Gongfan

Email: gchen12@charlotte.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Voice-based edge robotic control for construction jobsite operations

Description: This project aims to develop and evaluate a voice-based edge robotic control system that enables users to operate a mobile robot through natural-language voice commands for construction jobsite operations. The project will focus on integrating speech recognition, lightweight language processing, and robot control on an edge computing platform to support local, low-latency, and internet-independent operation. During the semester, the student will first become familiar with the robotic platform, edge computing device, and available speech-recognition models. A small set of practical voice commands, such as “move forward,” “turn left,” “turn right,” “stop,” and “go to the target,” will then be defined and mapped to corresponding robot actions. The student will develop a prototype pipeline that converts spoken commands into text, interprets the intended action, and sends control instructions to the robot. The system will subsequently be tested under different conditions to evaluate command recognition accuracy, response latency, execution success rate, and overall system reliability. The project will prioritize a functional proof-of-concept with a limited command set rather than a fully autonomous robotic system. The expected outcomes include a working voice-controlled robotic prototype, performance evaluation results, documentation of the system architecture and development process, and recommendations for future expansion toward more advanced natural-language and AI-assisted robotic control.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience in robotics, AI, edge computing, and voice-based human-robot interaction. They will develop practical skills in programming, speech recognition, robot control, system integration, debugging, and performance testing. Students will also learn how to evaluate system accuracy, latency, reliability, and execution success. Through this project, students will experience the full undergraduate research process, from prototype development and experimentation to data analysis and technical communication. The experience will help prepare them for graduate study and careers in robotics, AI, automation, and intelligent systems.

Required training of 1 hours with Description: The student will receive basic training on the robotic platform, edge computing device, programming environment, and laboratory safety. The student will then complete simple practice tasks before developing the voice-based robotic control system.

Regular meetings with the faculty mentor will provide guidance and feedback throughout the semester.

Mentoring plan: Dr. Chen will have regular weekly project update meetings that are scheduled based on the team's availability during the period of performance for the project. The specified project tasks will be performed based on the project schedule. The student will get the opportunity to practice their professional communication skills with weekly, in-person presentations based on aforementioned aspects to report on task completion updates, action items, and discuss questions

Applicant Requirements: Students should have an interest in robotics, AI, programming, or edge computing and be willing to learn new technologies. Basic programming experience, especially with Python, is preferred. Students should be responsible, curious, and able to work independently with regular guidance.

Applicant Preferences: Preference will be given to students with some experience or coursework in programming, robotics, AI, or computer science. Experience with Python, Linux, or robotic systems is helpful but not required. Students who are motivated, curious, and interested in hands-on research are encouraged to apply.

Specific Time considerations/conflicts: The student must be available to meet in person for up to 1 hour for research team meetings.

App ID #: 3417

Mentor: Kitten, Alicia

Email: akitten@charlotte.edu

Title: Assistant Professor

Department: Reading and Elementary Education

Co-mentor: Yes

Paola Pilonieta, ppilonie@charlotte.edu, Reading and Elementary Education

Community engaged research: No

Title: Exploring the Impact of Coaching to Support Literacy Instruction in Grades K-12

Description: This project delves into the literature on literacy instruction to examine the impact of literacy coaching on teacher and student outcomes in K-12 classrooms. Utilizing a systematic approach, the research team will examine studies that meet strict inclusion criteria in order to identify the landscape of the current coaching literature. To date, no systematic review has been conducted on this topic. As a result, findings will shed light on group design studies that examine impact on teacher practice and student outcomes. In addition, findings will contribute to the field by highlighting effective components of literacy coaching to better inform practice. Work on the project involves coding articles, synthesizing extracted information, and contributing to a written summary of results. Duties include weekly or biweekly meetings with the research team as well as independent coding and writing time with support from faculty members.

Accepting applications for: Only 75 hours over an academic semester (~5h per week)

1 positions available

Anticipated Student Learning Outcomes: Participating students will gain valuable experience collaborating with faculty on publishable research in addition to co-authoring a manuscript that will be submitted for publication. In addition, students will have the opportunity to gain a deep understanding of existing literature on literacy coaching to expand their knowledge, which can then be taken into their K-5 teaching experiences.

Required training of 1 hours with Description: Training will consist of modeling and guided practice of coding procedures from faculty members on the research team.

Mentoring plan: Faculty will support the student in synthesizing content to ensure accurate representation of results. Faculty will support the student in writing elements of the manuscript. Faculty will support the student in presenting results at one or more conferences or professional meetings.

Applicant Requirements: The student must be punctual, eager to learn, able to apply information across contexts, communicate readily, and consistently attend team meetings. In addition, the student must meet internal deadlines throughout the semester. The student must have a background in education (current major or minor).

Applicant Preferences: The student should have strong writing skills and a desire to gain more knowledge about literacy coaching and instruction.

Specific Time considerations/conflicts: Flexible

App ID #: 3418

Mentor: Chen, Xiang

Email: xchen50@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Atomistic simulations of phase degradation in metal halide perovskites

Description: Metal halide perovskites (MHPs) are a rapidly developing class of materials with attractive semiconductor properties, low fabrication costs, and significant potential for photovoltaic applications. Despite substantial progress in recent years, the operational stability and lifetime of state-of-the-art perovskite solar cells remain major challenges and are still considerably lower than those of conventional commercial photovoltaic technologies. Experimental studies have shown that inorganic halide perovskites undergo temperature-dependent structural transitions from cubic to tetragonal and eventually to orthorhombic phases as temperature decreases. The low-temperature phase is considerably more distorted and can be more susceptible to transformation into a photoinactive phase that is undesirable for optoelectronic applications. This project aims to provide an atomistic understanding of how defects and microstructural features influence phase stability and degradation in MHPs. The student will first participate in research training provided by the advisor and graduate students, including instruction in molecular simulation and high-performance computing. Following this training, the undergraduate student will be able to perform Molecular Dynamics (MD) simulations using high-performance computing resources. The student will investigate how defects and selected microstructural features affect structural evolution and phase degradation in MHPs. Depending on the progress of the project, reactive force-field simulations may also be explored to complement and validate the classical MD results. The simulation data and post-processing analyses generated by the student are expected to contribute to ongoing research and potentially form part of a journal publication or conference presentation.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Students will be able to learn the usage of high-performance computing and atomistic simulations. They will gain experience working in the cutting-edge interdisciplinary field of energy, material science, nanoscience, and mechanical engineering. They will develop skills in analyzing simulation results with tools such as MATLAB and OVITO. They will also have the chance to exercise their prior knowledge on heat transport and gain a new understanding of that from a microscopic perspective.

Required training of 6 hours with Description: Students will receive three two-hour trainings conducted by the advisor and assisted by the graduate students, with an access to the UNCC high-performance computing center. After the initial training, the students will get continuous training

while working on the project through group meetings and one-on-one meetings with the advisor and the graduate student mentor.

Mentoring plan: The student will receive hands-on trainings on accessing high-performance computing and conducting atomistic simulations. After the initial training, the student will meet with the advisor to develop weekly plan and major milestones to be accomplished, as well as the deliverables and research expectations. The student will have weekly in-person meetings with the advisor. The student will also participate in the regular lab group meeting to be exposed to a collaborative work environment and other cutting-edge research topics.

Applicant Requirements: Interest in nanoscience, physics, computer programming, and simulations. Interest in reading cutting-edge research papers.

Applicant Preferences: Proficiency in MATLAB, Python, or a similar programming language. Fundamental knowledge of material science such as crystal structures.

Specific Time considerations/conflicts: Weekly group meetings (Dates/times TBD)

App ID #: 3419

Mentor: Chen, Xiang

Email: xchen50@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Atomistic Investigation of High-Strain-Rate Deformation in High-Entropy Alloys

Description: High-entropy alloys (HEAs) are an emerging class of metallic materials that combine multiple principal elements and can exhibit excellent strength, toughness, and resistance to extreme environments. These properties make HEAs promising for applications in aerospace, energy, and other engineering systems where materials may experience rapid loading, impact, or large temperature changes. Under very high strain rates, however, the mechanisms controlling plastic deformation can differ significantly from those under conventional loading conditions. In particular, the motion of dislocations—the primary carriers of plastic deformation in metals—can be strongly influenced by interactions with lattice vibrations, or phonons. This effect, known as phonon drag, can limit dislocation motion and contribute to a rapid increase in material strength at high deformation rates. This project aims to provide an atomistic understanding of high-strain-rate deformation in HEAs and to investigate how microstructural features can be designed to reduce phonon-drag effects and improve deformation stability. The student will first participate in research training provided by the advisor and graduate students, including instruction in molecular simulation and high-performance computing. Following this training, the undergraduate student will be able to perform Molecular Dynamics (MD) simulations using high-performance computing resources. The student will investigate how microstructural features influence dislocation motion and mechanical response under high-strain-rate loading. Depending on the progress of the project, additional defect-analysis and visualization techniques may also be applied to better understand the underlying deformation mechanisms. The simulation data and post-processing analyses generated by the student are expected to contribute to ongoing research and potentially form part of a journal publication or conference presentation.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Students will be able to learn the usage of high-performance computing and atomistic simulations. They will gain experience working in the cutting-edge interdisciplinary field of energy, material science, nanoscience, and mechanical engineering. They will develop skills in analyzing simulation results with tools such as MATLAB and OVITO. They will also have the chance to exercise their prior knowledge on heat transport and gain a new understanding of that from a microscopic perspective.

Required training of 6 hours with Description: Students will receive three two-hour trainings conducted by the advisor and assisted by the graduate students, with an access to the UNCC high-

performance computing center. After the initial training, the students will get continuous training while working on the project through group meetings and one-on-one meetings with the advisor and the graduate student mentor.

Mentoring plan: The student will receive hands-on trainings on accessing high-performance computing and conducting atomistic simulations. After the initial training, the student will meet with the advisor to develop weekly plan and major milestones to be accomplished, as well as the deliverables and research expectations. The student will have weekly in-person meetings with the advisor. The student will also participate in the regular lab group meeting to be exposed to a collaborative work environment and other cutting-edge research topics.

Applicant Requirements: Interest in nanoscience, physics, computer programming, and simulations. Interest in reading cutting-edge research papers.

Applicant Preferences: Proficiency in MATLAB, Python, or a similar programming language. Fundamental knowledge of material science such as crystal structures.

Specific Time considerations/conflicts: Weekly group meetings (Dates/times TBD)

App ID #: 3421

Mentor: Binns, Ian

Email: ibinns@charlotte.edu

Title: Associate Professor

Department: Reading and Elementary Education

Co-mentor: Yes

Jordan Blekking, jblekkin@charlotte.edu, Department of Earth, Environmental and Geographical Sciences/School of Data Science

Community engaged research: No

Title: Misinformation's Deadly Outcomes

Description: Federal food assistance programs, including the current iteration, the Supplemental Nutrition Assistance Program (SNAP), have been debated since their inception in 1939. Politicians focus on topics like fraud, program cost, and eligibility requirements, while social service providers and nutrition advocates highlight their role in preventing hunger, promoting positive health outcomes, and economic benefits to society. Misinformation harms these programs and their participants, which can lead to policy decisions that limit access to SNAP for eligible families, resulting in negative health and societal consequences. This research aims to understand the nature and impact of SNAP misinformation that is spread by policymakers. We have collected policymaker press releases, websites, and other materials published in 2025 (during which two major changes/disruptions in SNAP policy and practice occurred). In Spring 2027, we are seeking the support of undergraduate researchers to help to analyze the data and collect any additional follow up data. The analysis will help to identify what specific misinformation is being disseminated, who is spreading it and common narratives that appear in the misinformation. The research team is Dr. Ian Binns, Dr. Jordan Blekking, and Dr. Colleen Hammelman.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Student researchers will gain knowledge about food systems and access, public health, misinformation, and science education. They will also gain skills in collecting public data and, depending on progress during the semester, analyzing that textual data. These experiences can contribute to students' critical thinking, technology, and engagement across perspectives skill areas beneficial for career success.

Required training of 5 hours with Description: Students will be provided with readings and training on the project topic. The student will also be provided with training for effectively collecting data from public officials and analyzing textual data. This project does not require IRB training.

Mentoring plan: The students will meet with one of the faculty mentors at least every other week. During this time, the faculty mentors will provide training (as outlined above), discuss research tasks and progress, answer questions, and otherwise support students as they complete research and build their skills.

Applicant Requirements: Students should have an interest in food systems, misinformation, and/or science education. Students should also be prepared to learn how to collect large amounts of public data efficiently. Good communication skills and an orientation to detail are critical.

Applicant Preferences: Experience with collecting large amounts of public data and/or in the subject matter is preferred. Experience or interest in data science could be helpful, but is not required. Prior research experience is beneficial.

Specific Time considerations/conflicts: Students must be available to meet with the research team during standard working hours for at least one hour every other week. The specific day/time will be arranged at the start of the semester.

App ID #: 3424

Mentor: Xie, Sheldon

Email: yxie10@charlotte.edu

Title: Assistant Professor

Department: ETCM

Co-mentor: No

Community engaged research: No

Title: Teaching Robots to Run Electrochemistry Experiments

Description: Robotic automation is becoming increasingly important in modern chemistry, materials science, and advanced manufacturing. Many laboratory experiments still rely on researchers repeatedly preparing solutions, moving samples, positioning containers, running instruments, and recording data by hand. These tasks can be time-consuming and may introduce variability between experiments. This project asks a simple but important question: Can we teach robots to perform some of these routine laboratory tasks accurately and reproducibly? In this project, you will help develop a robotic platform for automated electrochemical experiments using two robotic arms in our laboratory. The initial goal will not be to build a fully autonomous laboratory, but to automate several well-defined steps such as handling sample containers, transferring or positioning solutions, moving samples between experimental stations, and preparing samples for electrochemical measurements. The robotic workflow will be connected with an electrochemical workstation so that different experimental conditions can be tested in a consistent and organized manner. As an undergraduate researcher, you will contribute directly to programming and testing the robotic workflow. You will learn how to define robot positions and motion sequences, design simple sample holders or fixtures, and determine whether the robot can repeatedly perform laboratory tasks with sufficient accuracy. You may also help integrate simple liquid-handling devices, such as pumps or dispensers, with the robotic system. A basic electrochemical experiment will be used as the test platform, allowing the system to compare different solution or electrolyte conditions using measurements such as cyclic voltammetry or electrochemical impedance spectroscopy. No advanced electrochemistry background is required; the necessary concepts will be introduced as part of the project. An important part of the project will be evaluating how well the automated workflow performs compared with conventional manual operation. You may examine questions such as whether robotic handling improves repeatability, how accurately samples can be positioned or transferred, how much variation occurs between repeated electrochemical measurements, and which parts of the workflow are most suitable for automation. Depending on progress and your interests, the project may also include Python-based data analysis, automated instrument control, computer vision, or simple optimization of the experimental workflow. By the end of the project, we aim to demonstrate a working robotic workflow for selected electrochemical experiments and identify opportunities for further automation. Your work may contribute to a reusable platform for future research in materials synthesis, electrochemistry, critical-mineral recovery, and automated materials discovery. This project is especially suitable for students interested in robotics, automation, manufacturing, materials

science, chemistry, electrochemistry, or programming, and prior experience in all of these areas is not expected.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience at the intersection of robotics, laboratory automation, and electrochemistry. They will learn basic robotic programming, sample handling and workflow design, fundamentals of electrochemical testing, and methods for evaluating the accuracy and repeatability of an automated system. Depending on project progress, students may also gain experience with Python, data visualization, instrument control, or simple mechanical design. Beyond technical skills, students will develop problem-solving, troubleshooting, experimental design, and scientific communication skills. By the end of the project, students should be able to describe how they helped build and validate a robotic system capable of performing selected laboratory tasks and supporting automated electrochemical experiments.

Required training of 5 hours with Description: The student will begin with an introduction to the project goals, laboratory safety, robotic systems, and basic electrochemical concepts. Initial hands-on training will focus on safe robot operation, defining robot positions and motion sequences, handling sample containers, and understanding the basic operation of the electrochemical workstation. The student will first observe and complete guided tasks with the PI or graduate researchers before progressing to more independent operation.

Training will be introduced gradually as needed for the student's specific responsibilities. No previous experience with robotic arms or electrochemistry is required. Emphasis will be placed on safe operation, careful experimental documentation, troubleshooting, and understanding why each automated step is needed within the overall research workflow.

Mentoring plan: I will work closely with the student during the initial stage of the project to introduce the robotic system, electrochemical workflow, and basic experimental goals. During the first several weeks, the student can expect frequent interaction with me and, when appropriate, support from graduate researchers. As the student gains confidence, we will transition to a regular weekly one-on-one meeting to review progress, troubleshoot technical problems, and plan the next steps. The student will also participate in bi-weekly group meetings and will be encouraged to briefly present progress and challenges. My goal is to help the student gradually take ownership of a well-defined part of the robotic workflow rather than simply follow instructions. I will provide guidance on programming, experimental design, data analysis, and scientific communication, and will help the student prepare figures, an abstract, and a poster or presentation for an appropriate UNC Charlotte undergraduate research event.

Applicant Requirements: We are looking for a curious, reliable, and detail-oriented student who enjoys hands-on problem solving and is interested in robotics, automation, engineering, materials, or laboratory research. The student should be willing to work carefully around laboratory equipment, follow safety procedures, document experiments clearly, and troubleshoot systems when they do not work as expected. Previous experience with robotic arms, electrochemistry, or

programming is not required. The most important qualifications are willingness to learn, patience with iterative testing, attention to detail, and consistent participation in the project.

Applicant Preferences: Preference will be given to students with some coursework or experience in engineering, engineering technology, robotics, mechatronics, computer science, materials science, chemistry, or related STEM fields. Familiarity with Python, MATLAB, Arduino, CAD, robotics programming, or laboratory instrumentation is helpful but not required. We particularly welcome students who enjoy building and testing systems, working with both hardware and software, and learning how automation can be applied to real scientific experiments.

Specific Time considerations/conflicts: NA

App ID #: 3425

Mentor: Ning, Daoguan

Email: dning@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Development of a Drop Tube Reactor for Advanced High-speed Imaging of Microparticle Combustion

Description: Microparticle combustion plays a central role in propulsion (e.g., solid-fuel rocket motors), chemical processing (e.g., metallurgical and powder synthesis reactors), and safety (e.g., dust explosions). Understanding the combustion characteristics of microparticles, such as burning rate and temperature, remains crucial for many applications, including the development of advanced solid-fuel rocket engines. High-speed imaging is a powerful technique for this purpose, enabling in situ, non-intrusive measurement of many key combustion properties of individual microparticles. A drop tube reactor is well suited to providing the well-controlled combustion environment required for high-speed imaging. In a drop tube reactor, the gas-phase temperature and composition can be adjusted precisely, offering a wide range of operating conditions for probing the combustion dynamics of microparticles and the mechanisms that govern them. To develop a drop tube reactor, the following tasks should be pursued consecutively: literature review on drop tube reactor designs, CAD modeling and drawing of the individual parts and assembly of the drop tube reactor, Design of supporting frame for the drop tube reactor, development of the micro control and data acquisition unit for the reactor, Communicating with workshop technician to manufacture the parts of the reactor, Assemble the burner and test.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

3 positions available

Anticipated Student Learning Outcomes: Through this project, you will learn CAD modeling, fundamental knowledge of particle dispersion and dynamics, skills for designing experimental setups, experiences with micro control and data acquisition unit development. Those are research experiences preferred by research laboratories and R&D sectors in companies, and therefore boost your career opportunities at academia, national laboratories, and industry.

Required training of 0 hours with Description: Students will begin by reviewing selected literature on drop tube reactor with guidance from the mentor to help them build the necessary background. The mentor will introduce the project objectives, experimental approach, and relevant safety and laboratory procedures.

As students become familiar with the research, they will receive hands-on guidance in CAD modeling, experimental design, instrumentation, and data acquisition as needed for their role in the project. Students will gradually take on greater responsibility as they develop confidence and technical skills.

When appropriate, additional guidance will be available from experienced collaborators or technical personnel with expertise in the design and fabrication of drop-tube experimental systems. This combination of mentoring, hands-on training, and access to technical expertise will allow students from a range of academic backgrounds to successfully contribute to the project.

Mentoring plan: At the beginning of the project, the mentor will introduce the research background, goals, and overall experimental approach, and work with the student to develop a clear plan with manageable, step-by-step tasks. This will help the student understand not only what they are doing, but also how their work contributes to the larger research effort. Throughout the project, the mentor will hold regular meetings to discuss progress, answer questions, troubleshoot challenges, and provide feedback. Students will be encouraged to ask questions, propose solutions, and gradually take greater ownership of their work as they develop their skills. The mentor will provide access to and training in the software, equipment, and research tools needed for the project. When hands-on assistance is needed, the mentor will work alongside the students in the laboratory to provide direct guidance. The goal is to create a supportive environment in which students can learn through both mentorship and hands-on research experience while developing confidence and independence as researchers.

Applicant Requirements: Students with the following skills or experience are encouraged to apply: Basic experience with CAD software, such as SolidWorks, PTC Creo, Catia, or Siemens NX. Familiarity with mechanical drawings and basic engineering design principles. Students do not need to be highly experienced in all these areas. A willingness to learn, solve problems, and work hands-on with an experimental system is equally important. Training and guidance will be provided as needed.

Applicant Preferences: The following skills or experiences are helpful but not necessary: Basic experience with microcontrollers or microcomputers, such as Arduino, Raspberry Pi, and/or NI micro control boards. Familiarity with LabVIEW or other data-acquisition software. Basic knowledge of PID control and feedback systems. Interest in hands-on experimental research, engineering design, and problem-solving.

Specific Time considerations/conflicts: no

App ID #: 3426

Mentor: Quinlan, Margaret

Email: quinlan.margaret@charlotte.edu

Title: Professor

Department: Communication Studies

Co-mentor: No

Community engaged research: No

Title: Communicating Women's Reproductive Health

Description: OUR research experience serves as a research practicum for interested undergraduate students. You will work on a research project and/or research projects and complete specific tasks to get “hands-on experience” through the design and conduct of actual communication studies research. Your project will be structured and include: Assisting me with my research; depending on the research project, you may be assigned to conduct/write/perform literature reviews, interviews or surveys, coding, data entry, statistical analysis, interview or focus group scheduling, focus group/interview transcription, transcribing of one-on-one interviews, sourcing articles or other related research tasks. Before you begin the semester, we will meet and agree on your tasks and expectations. Background: Women's reproductive health is an essential aspect of women's overall health and well-being. Women's reproductive health needs to be given the attention it deserves in communication studies. There is a need to explore the communication aspects of women's reproductive health to understand the challenges and opportunities faced by women in this area. Research Questions: The proposed research will address the following questions (specific health issues will be revealed when OUR student begins): RQ1: What are women's communication challenges and opportunities for their reproductive health? RQ2: How do women communicate about their reproductive health with their partners, family members, friends, and healthcare providers? RQ3: How do media and technology shape women's perceptions and attitudes towards their reproductive health? RQ4: What are the implications of communication practices for women's reproductive health outcomes? Methodology: The proposed research will employ a qualitative research design. Data will be collected through in-depth interviews or rhetorical analysis with women who have experienced reproductive health issues, healthcare providers, and women's reproductive health experts to gain their perspectives on communication and reproductive health. The data will be analyzed using qualitative thematic analysis. Significance: The proposed research will contribute to understanding women's reproductive health in communication studies. The findings will inform the development of communication strategies and interventions to improve women's access to reproductive health services and information. The research will also contribute to developing policies to improve women's reproductive health outcomes.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Undergraduate Research Assistant: I will work with Dr. Margaret M. Quinlan, Professor, Department of Communication Studies, Interdisciplinary Studies,

Health & Medical Humanities at UNC Charlotte. I will help the professor collate, execute and design research. It is competitive. Dr. Quinlan will guide you to: gathering information; analyzing, compiling, and interpreting data; multitasking ability; clerical work; administrative functions
Core Skills we will work on developing
Excellent written and oral communication
Excellent administration
Good presentation and organization
Expert in analyzing data
Excellent technical writing

Required training of 0 hours with Description: I will train students when the project begins

Mentoring plan: To train my undergraduate research assistants to help with my qualitative research on women's reproductive health, I plan to conduct initial training sessions to familiarize them with the research topic, objectives, and methodology. I will explain the importance of sensitivity and empathy when dealing with such personal topics and emphasize the significance of maintaining confidentiality and ethical practices throughout the research process. Additionally, I will provide hands-on training on various data collection methods, such as interviews and focus groups, and guide them on transcribing and analyzing qualitative data effectively. Continuous feedback and constructive evaluation will ensure their understanding and skill development.

Applicant Requirements: I am seeking motivated undergraduate students who are interested in gaining hands-on research experience and who are committed to developing the skills necessary for success in academic, professional, and graduate-school settings. Because this project focuses on qualitative research examining communication and women's reproductive health, preference will be given to students who have some prior exposure to research methods, particularly those who have completed a research methods course that included qualitative research approaches such as interviewing, focus groups, thematic analysis, or qualitative data collection and analysis. Students do not need extensive research experience to be successful in this project, as training and mentorship will be provided throughout the experience. However, applicants should demonstrate strong attention to detail, intellectual curiosity, reliability, and a willingness to learn. Successful research assistants are able to follow directions carefully, manage multiple tasks, maintain confidentiality when working with sensitive topics, and contribute thoughtfully to team-based research activities. Because this project involves literature reviews, interview or focus group support, transcription, coding, data analysis, scheduling, and other research-related tasks, I am looking for students with strong written and oral communication skills. Applicants should be comfortable reading scholarly literature, organizing information, and communicating professionally with faculty, research participants, and team members. Experience using collaborative platforms such as Google Docs and related productivity tools is highly desirable, as much of the research process involves shared documents, collaborative writing, and project management. Students who are receptive to feedback and interested in developing their research, writing, and analytical skills are particularly well suited for this opportunity. The project is designed as a research practicum that provides meaningful experiential learning, so students should be willing to engage in ongoing training, incorporate constructive feedback, and gradually assume greater responsibility as their skills develop. This opportunity is especially appropriate for students who are considering graduate or professional education and who would benefit from intensive mentoring in the research process. Students with interests in communication studies, health communication, medical humanities, women's health, social science research, or related fields are encouraged to apply. Above all, I am seeking students who are enthusiastic about learning, committed to high-quality research, and

eager to contribute to a project that has the potential to improve understanding of communication and women's reproductive health.

Applicant Preferences: I am seeking motivated, dependable, and intellectually curious undergraduate students who are interested in gaining hands-on research experience in communication studies and women's reproductive health. This research assistantship is designed as a research practicum, so students should be eager to learn, willing to take initiative, and committed to contributing to a collaborative research environment. Preference will be given to upper-level undergraduate students who have completed coursework in research methods, particularly courses that include qualitative research approaches such as interviewing, focus groups, coding, thematic analysis, or related qualitative methods. While prior research experience is desirable, extensive experience is not required, as students will receive training and mentorship throughout the project. Because the research focuses on communication and women's reproductive health, students majoring or minoring in Communication Studies, Health & Medical Humanities, or related fields are especially encouraged to apply. Students considering graduate or professional education may be particularly well suited for this opportunity, as the experience is designed to develop advanced research, analytical, writing, and presentation skills. Successful applicants should demonstrate strong written and oral communication skills, attention to detail, professionalism, and the ability to manage multiple tasks simultaneously. Students should be comfortable working independently as well as collaboratively, open to receiving and incorporating constructive feedback, and committed to maintaining confidentiality and ethical research practices when working with sensitive health-related topics. Research assistants may participate in a variety of activities, including literature reviews, sourcing scholarly articles, interview and focus group support, transcription, coding qualitative data, scheduling research activities, data management, analysis, and other research-related tasks. Therefore, organizational skills, reliability, and the ability to follow detailed instructions are important. Familiarity with Google Docs and other collaborative digital platforms is highly desirable. Above all, I am looking for students who are enthusiastic about research, committed to producing high-quality work, and interested in exploring how communication influences women's reproductive health experiences and outcomes.

Specific Time considerations/conflicts: NA

App ID #: 3427

Mentor: Vilguts, Aivars

Email: avilguts@charlotte.edu

Title: Assistant Professor in Structural Engineering

Department: Civil and Environmental Engineering

Co-mentor: Yes

Dr. Courtney Green, csgreen2@charlotte.edu, Civil and Environmental Engineering

Community engaged research: No

Title: Development of Code-Based Engineering Judgment in Engineering Students: A Mixed-Methods Study

Description: Structural engineers rely on building codes, but successful design requires more than finding the correct equation. Engineers must identify the governing provisions, interpret incomplete or competing information, justify assumptions, evaluate alternatives, and verify whether a decision is reasonable. This project investigates how undergraduate and graduate structural engineering students develop this code-based engineering judgment during a code-focused design course. The undergraduate researcher will work with de-identified data collected under an approved IRB protocol from a Codes, Loads, and Nodes course. The dataset includes qualitative and quantitative measures and written student responses collected at multiple points in the semester. The goal is to identify measurable patterns in how students recognize relevant code information, explain their reasoning, make engineering decisions, and improve over time. The student will help organize and clean the dataset; conduct descriptive and, where appropriate, quantitative analyses; develop and apply a coding framework to qualitative responses; compare qualitative and quantitative findings; create publication-quality figures and tables; and synthesize the results with relevant literature. Depending on progress, the student may also help prepare an abstract, poster, conference paper, or manuscript. The findings are expected to provide preliminary evidence for a future NSF research proposal focused on engineering judgment and code-based decision-making in NSF: PFE. This project is well suited to a student interested in structural engineering, engineering education, data analysis, or research methods. Prior advanced statistics or qualitative research experience is not required; the student will be trained in the methods used in the project.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: • Understand how engineering judgment differs from simple code lookup and how judgment can be studied systematically. • Gain experience working with de-identified human-subjects research data under an approved IRB protocol. • Develop practical skills in data cleaning, organization, descriptive statistics, visualization, and reproducible analysis. • Learn qualitative coding, codebook development, inter-rater calibration, and evidence-based interpretation of written responses. • Integrate qualitative and quantitative evidence using a mixed-methods research approach. • Strengthen technical writing, literature synthesis, figure/table

preparation, and research-presentation skills. • Develop career-readiness competencies in critical thinking, communication, teamwork, technology, and professionalism.

Required training of 8 hours with Description: The student will first complete required research-compliance and human-subjects training applicable to the approved IRB protocol. The mentor will then provide an orientation to the research questions, data structure, confidentiality/data-management expectations, and the Code-Based Engineering Judgment framework used in the study. The student will receive hands-on training in the analysis workflow. This will include a guided practice dataset, quantitative analysis procedures, qualitative codebook development, coding calibration on a small sample, documentation standards, and use of appropriate software (for example, Excel and/or Python/R, depending on the student's background and project needs). The student will not be expected to analyze the full dataset independently until the initial calibration work is reviewed.

Mentoring plan: The student will begin with a clearly defined research question, a written short-term work plan, and example analyses. During the first several weeks, the mentor will provide close guidance and frequent feedback so that the student learns the methods before working more independently. The student can expect a scheduled weekly meeting with the faculty mentor (typically 30-60 minutes), plus additional brief check-ins when analysis decisions need to be resolved. Milestones will include data preparation, pilot analysis/coding, full analysis, synthesis of findings, and preparation of the final poster or other research product. The mentor will review analysis scripts, coding decisions, figures, and drafts; explain the engineering and research-methods context behind the work; and help the student translate results into defensible conclusions. The student may participate in research-group meetings and will be encouraged to present preliminary and final findings. The goal is for the student to finish the experience able to explain not only what analysis was performed, but why it was appropriate and what the results mean for engineering education and engineering practice.

Applicant Requirements: • Careful attention to detail and willingness to follow research-data confidentiality procedures. • Basic comfort working with spreadsheets and numerical data. • Ability to read technical material, document work clearly, and communicate questions when something is uncertain. • Reliable participation in scheduled research meetings and completion of required research-compliance training.

Applicant Preferences: • Interest in engineering studies, building codes, engineering education, decision-making, or data analytics. • Experience with Python, R, MATLAB, Excel, statistics, qualitative coding, or data visualization is helpful but not required. • Curiosity about why engineers make different decisions even when working from the same code provisions. • Strong written communication and an interest in presenting research findings.

Specific Time considerations/conflicts: No fixed day or time is required at the proposal stage. A recurring weekly mentor meeting will be scheduled around the matched student's class schedule.

App ID #: 3428

Mentor: Vilguts, Aivars

Email: avilguts@charlotte.edu

Title: Assistant Professor in Structural Engineering

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Flood-Induced Degradation and Residual Capacity of Wood Residential Structures

Description: Flooding can repeatedly wet the timber piles and wood-frame connections that support residential buildings, especially in coastal communities. Water exposure can change wood moisture content, accelerate deterioration, and promote corrosion of metal fasteners. These effects may reduce the strength, stiffness, and reliability of structural components long after the floodwater is gone. This project investigates how flood exposure influences the residual structural performance of wood residential construction. Research Pathway A: Existing coastal timber piles. The undergraduate researcher will study timber foundation piles recovered from elevated coastal houses. The student will use GIS and available flood/hazard information to characterize the exposure history of the source property, including ground/floor elevations, estimated flood depth, inundation frequency, proximity to saltwater, and relevant storm events. In the laboratory, the student will document pile condition and specimen location along the pile (for example, above-ground, ground-line, and embedded regions), prepare small wood specimens, and assist with mechanical testing to obtain residual strength and stiffness properties. Additional measurements may include moisture content, density/specific gravity, visible decay or damage ratings, and nondestructive measurements when equipment is available. The final analysis will relate estimated flood exposure and material condition to remaining mechanical properties. Reference/control wood may be included when feasible. Research Pathway B - Repeated flood exposure of wood structural connections. The undergraduate researcher may conduct controlled wet-dry exposure experiments on wood-frame connections. Specimens will be exposed to repeated freshwater and/or saltwater submergence cycles intended to represent recurring flood events. During conditioning, the student will track variables such as moisture content, mass change, drying behavior, and visible deterioration of wood or fasteners. After prescribed exposure levels, the student will conduct connection tests and quantify changes in strength, stiffness, slip/deformation, ductility, or energy dissipation, as applicable, and in failure mode. The objective is to develop initial multi-level degradation data that can support future multi-hazard research on flooded wood-frame buildings. The project is intentionally structured as an umbrella research experience. A matched student may work primarily on one pathway, or two students may work on complementary pathways, depending on the availability of recovered material and the laboratory schedule. Limited full-scale shear-wall testing may be considered if the connection-level results, time, and resources support it, but full-scale wall testing is not required for successful completion of the undergraduate project.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Understand how flooding, repeated wet-dry cycling, salt exposure, and material deterioration can influence the structural performance of wood residential buildings. Develop hands-on skills in experimental planning, specimen documentation/preparation, laboratory testing, and quality-controlled data collection. Gain experience measuring and interpreting wood moisture, density/condition, load-deformation behavior, and structural failure modes. Learn to use GIS and public hazard information to reconstruct or estimate environmental exposure for real structures when assigned to the timber-pile pathway. Analyze experimental data to quantify changes in strength, stiffness, deformation, and residual capacity across multiple exposure levels. Connect component-level observations to larger structural-resilience questions for elevated coastal houses and wood-frame buildings. Develop technical communication skills through figures, tables, a research poster, and potentially an abstract, conference paper, or manuscript contribution. Develop career-readiness competencies in critical thinking, technology, teamwork, professionalism, and laboratory safety.

Required training of 12 hours with Description: The student will begin with laboratory-safety orientation, project-specific risk assessment, and training on any tools or test equipment they will use. The mentor will review the scientific purpose of each test, specimen identification and chain-of-custody procedures, measurement protocols, and expectations for maintaining a complete laboratory notebook and digital data record.

Students assigned to the timber-pile pathway will receive introductory GIS/data-source training and a structured workflow for documenting property location, elevation, flood history, specimen position, and material condition. Students assigned to the connection pathway will receive training in specimen fabrication, controlled submergence/wet-dry conditioning, moisture measurements, and mechanical connection testing. Initial work will be performed under direct supervision until the student demonstrates safe and repeatable procedures.

Mentoring plan: The student will be given a defined research question and a manageable experimental or analytical matrix rather than being asked to complete the entire larger research program. Early meetings will focus on understanding the physical problem, identifying variables and controls, and developing a test/data-analysis plan. The student can expect a scheduled weekly meeting with the faculty mentor and additional hands-on supervision during initial specimen preparation and testing. Before independent laboratory work, the mentor will review the protocol and demonstrate the required procedures. Experimental results will be reviewed regularly so that unexpected behavior can be investigated rather than simply recorded. As the project progresses, the student will take increasing ownership of specimen tracking, data reduction, plots/tables, and interpretation. The mentor will help connect observed material or connection degradation to structural engineering concepts and provide iterative feedback on the student's research poster and any written products. When two students are involved, each will have a defined primary pathway while also learning from the complementary work of the other student.

Applicant Requirements: Strong attention to laboratory safety, specimen identification, and accurate data recording. Willingness to perform hands-on laboratory work and follow detailed testing/conditioning procedures. Basic ability to organize numerical data in spreadsheets and

document procedures clearly. Reliable attendance for scheduled laboratory sessions and willingness to ask questions when a procedure or result is uncertain.

Applicant Preferences: Interest in structural engineering, timber/wood construction, natural hazards, coastal resilience, materials, or experimental research. Coursework in statics and mechanics of materials is preferred; structural analysis, structural design, timber design, or materials courses are helpful but not required. Experience with GIS is particularly helpful for the timber-pile pathway but is not required. Experience with Excel, Python, MATLAB, statistics, data acquisition, or laboratory testing is helpful but not required. Interest in connecting real-world hazard exposure to measurable structural deterioration and residual capacity.

Specific Time considerations/conflicts: No fixed day or time is required at the proposal stage. The student must be able to schedule occasional 2-4 hour laboratory blocks during normal laboratory operating hours; specific times will be coordinated after matching. Some moisture-conditioning measurements may require brief checks on scheduled days.

App ID #: 3429

Mentor: Sarkar, Kaustavi

Email: ksarkar@charlotte.edu

Title: Associate Professor

Department: Dance

Co-mentor: Yes

Samira Shiridevich, sshiride@charlotte.edu, Art and Art History

Community engaged research: Yes

Title: Dance-A-Lingo: Developing an AI-Enhanced Mobile App for Dance Learning

Description: Dance-A-Lingo is an interdisciplinary research and development project exploring how artificial intelligence, computer vision, mobile technology, and dance pedagogy can work together to create a new way of learning dance. The project is developing a functional mobile application prototype in which a learner can use a standard phone camera while practicing dance. The system is intended to compare the learner's movement with an instructor-established reference and provide qualitative feedback related to body posture, gesture positioning, and rhythmic timing. A second component of the application uses gamification—including progression, milestones, streaks, and adaptive learning pathways—to encourage sustained practice. This undergraduate research opportunity is particularly suited to a student interested in app development, computer science, software engineering, artificial intelligence, machine learning, computer vision, UX/UI, or emerging technologies. The student will become part of an interdisciplinary research team in which computer science and engineering knowledge is applied to a real-world problem in arts education.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: By the end of the experience, the student should be able to: Technical Skills Apply software-development skills to a real research project rather than a classroom exercise. Develop or contribute to a mobile application prototype, including front-end functionality and integration with computational processes. Work with computer-vision or human-pose estimation technologies and understand their practical strengths and limitations. Explore AI/ML applications involving human movement data. Work with APIs, data structures, computational pipelines, or cloud-based systems as appropriate to the student's role. Debug, test, document, and iterate software within an interdisciplinary development environment. Research Skills Formulate technical questions and investigate possible solutions through research, experimentation, and prototyping. Evaluate system performance using structured testing and documentation. Analyze usability and user feedback and translate findings into technical improvements. Document technical decisions and research findings in a form that can be communicated to both technical and nontechnical audiences. Interdisciplinary Skills Translate between technical and artistic vocabularies, learning to communicate effectively with dancers, educators, designers, and engineers. Understand embodied knowledge as a computational

challenge, including the difficulties involved in representing posture, gesture, rhythm, and movement quality digitally. Develop critical AI literacy, including understanding the ethical and practical limitations of AI systems applied to human bodies and cultural practices. Career Readiness The student will develop NACE-aligned competencies including: Technology Critical thinking Problem solving Communication Teamwork Creativity Professionalism Project management The student should be able to describe the experience to a future employer or graduate program as: "I worked on an interdisciplinary AI/mobile application that used computer vision to investigate real-time feedback for dance learning. I helped develop, test, and evaluate a working prototype while collaborating with faculty in computer science, design, and dance."

Required training of 10 hours with Description: The student will receive an initial orientation to the Dance-A-Lingo research project and its existing development roadmap.

Training will include:

- Introduction to Dance-A-Lingo and its research objectives.
- Introduction to the pedagogical problem the application is attempting to solve.
- Overview of dance movement, posture, gesture, rhythm, and instructional terminology relevant to the application.
- Introduction to the existing application architecture and current development status.
- Introduction to human-pose/human-mesh estimation and movement analysis at a level appropriate to the student's background.
- Training in relevant development tools and project workflows.
- Training in software documentation and version-control/project-management practices as applicable.
- Introduction to usability testing and user feedback.
- Training in responsible handling of movement/video data.
- Research ethics and institutional compliance training if the student's activities involve human-subject research.

Technical training will be tailored to the student's existing skills. The student will not be expected to master all components of the system before beginning.

Estimated initial training/onboarding: 10 hours.

Additional technical training will occur throughout the semester.

Mentoring plan: My mentoring philosophy is to give the student real technical responsibility while providing structured interdisciplinary mentorship. The student will not function simply as a programmer completing predetermined tasks. They will be encouraged to understand the research problem, investigate technical alternatives, make recommendations, test solutions, and explain their decisions. The semester will progress through four stages: 1. Understand The student will learn

the pedagogical and technical goals of Dance-A-Lingo and become familiar with the existing prototype, research literature, and development roadmap.2. BuildThe student will take responsibility for defined technical tasks, which may include app development, interface implementation, movement-analysis integration, data processing, or testing.3. TestThe student will evaluate the system through structured technical and usability testing and document problems, performance, and potential improvements.4. Analyze and CommunicateThe student will interpret testing results, recommend improvements, document their work, and communicate findings to the interdisciplinary team.Students can expect:Regular one-on-one meetings with Dr. Sarkar.Technical consultation with members of the engineering/design team when appropriate.Regular research-team meetings.Clearly defined technical goals.Code/design/project feedback.Opportunities to propose technical solutions.Exposure to interdisciplinary research methods.Opportunities to contribute to demonstrations, posters, presentations, or other scholarly outputs.The student will maintain a research/development log documenting significant technical decisions, experiments, problems encountered, solutions tested, and lessons learned.I will particularly encourage the student to identify one technical research question that they can investigate in greater depth during the semester. Examples include:Which pose-estimation approach is most useful for a particular dance movement?How accurately can a mobile camera capture specific movement characteristics?How should movement deviation be represented visually to a learner?What computational metrics can meaningfully represent posture or gesture?How can technical feedback be delivered without interrupting physical practice?What are the limitations of AI-based movement evaluation?The student's work will therefore combine software development with research inquiry.

Applicant Requirements: Required skills, courses, or experiencesThe ideal applicant will have some prior experience with computer programming or application development.Required or strongly expected:Basic programming experience.Ability to learn new programming languages, frameworks, or development environments.Logical problem-solving skills.Interest in mobile application development and/or AI.Ability to troubleshoot technical problems independently before seeking assistance.Strong attention to detail.Ability to document technical work.Willingness to collaborate with researchers outside computer science.Reliability and ability to meet agreed-upon deadlines.The student does not need prior experience with dance or AI.

Applicant Preferences: Preferred qualifications include experience with one or more of the following:Mobile application development.iOS, Android, or cross-platform development.React Native, Flutter, Swift, Kotlin, or comparable frameworks.Python or another language used in AI/ML development.Computer vision.Machine learning.Human-pose estimation.MediaPipe or similar pose-estimation frameworks.APIs and backend integration.Cloud computing.Git/GitHub or comparable version-control systems.Databases or data management.UX/UI implementation.User testing.Data visualization.Experience with AI/ML or computer vision is desirable but not required.A student who has strong programming fundamentals and is excited to learn new technologies may be an excellent candidate.Students from Computer Science, Software Engineering, Electrical & Computer Engineering, Data Science, Information Technology, Computer Engineering, or related programs are particularly encouraged to apply.Students from other majors with strong programming experience are also welcome.

Specific Time considerations/conflicts: No fixed weekly day or time is required.

The student will coordinate a mutually convenient regular meeting time with Dr. Sarkar and Professor Shiridevich.

Because the student will be contributing to an active interdisciplinary development project, they should be available for approximately 5 hours per week and should be able to attend occasional interdisciplinary research meetings.

Some user-testing or demonstration activities may occur at specific times during the semester. These activities will be communicated in advance.

The student should also be prepared to work independently between meetings and maintain regular communication regarding technical progress, challenges, and deliverables.

App ID #: 3430

Mentor: Syverson, Drew

Email: dsyverso@charlotte.edu

Title: Research Assistant Professor

Department: Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: No

Title: Geologic Ammonia: Abiotic Nitrogen Reduction in Serpentinizing Fluids

Description: Geologic Ammonia: Abiotic Nitrogen Reduction in Serpentinizing Fluids The industrial production of ammonia (NH_4) is on the verge of a geological revolution. By harnessing the inherent chemical reactivity of the Earth's shallow crust, we can bypass traditional, energy-intensive manufacturing to produce sustainable, carbon-free chemical and energy feedstocks (1, 2). When water interacts with iron-rich silicate rocks during serpentinization, the resulting mineral oxidation generates substantial quantities of molecular hydrogen (H_2) (3, 4). By engineering subsurface reservoirs, specifically by fracturing ultramafic rock beds and injecting nitrate-rich (NO_3^-) fluids, this in-situ hydrogen acts as a powerful reducing agent to drive the abiotic conversion of nitrate directly into geologic ammonia. However, the economic viability of this engineered approach hinges entirely on kinetics of serpentinization at low and moderate subsurface temperatures at shallow crustal conditions ($<250^\circ\text{C}$). Because drilling into extreme, high-temperature ($>250^\circ\text{C}$) subsurface zones remains cost-prohibitive, commercializing large-scale geologic ammonia production requires mastering the specific temperature and catalytic pathways of aqueous nitrate reduction at highly accessible – shallow crustal depths. To compete with the established carbon-intensive Haber-Bosch process (1, 5), engineered geologic ammonia must approach current industrial price benchmarks of roughly \$300 to \$500 per metric ton. While the thermodynamic and kinetic profiles for serpentinization-driven reduction of nitrate are highly favorable between at temperatures $>250^\circ\text{C}$ [2, 3], exploiting these optimal thermal windows is commercially unfeasible. Reaching such temperatures naturally requires extreme drilling depths that carry severe financial and operational risks. Conversely, relying on artificial steam injection or thermal stimulation in shallower, easily accessible crustal formations introduces a fatal energy penalty. The baseline cost of heating the subsurface fluid and rock mass would instantly eclipse the target wellhead price for ammonia, even before accounting for the inevitable inefficiencies of fracture stimulation. Consequently, the only viable commercial pathway is to operate within moderate temperature subsurface regimes ($<250^\circ\text{C}$). Although these cooler fluid-mineral systems frequently operate far from thermodynamic equilibrium, existing field observations and laboratory experiments demonstrate that the critical pathways for abiotic generation of ammonia remain active and is fundamentally viable under moderate temperature conditions (1). To unlock the commercial potential of this engineered system, this project aims to identify and leverage geochemical mechanisms that accelerate and sustain serpentinization – geologic ammonia generation at moderate hydrothermal temperatures. Through highly controlled laboratory experiments, we will isolate the variables that dictate the rate of abiotic nitrate reduction by molecular hydrogen during the serpentinization of olivine without and with the presence of dissolved/solid transition metal catalysts. To accurately capture these

complex reaction dynamics, the experimental design will also incorporate a novel silicon isotope tracer technique ($^{29}\text{SiO}_2$) to precisely quantify the rate and extent of olivine dissolution and secondary mineral formation (6). Combined, these constraints will allow quantification of the rate and efficiency of ammonia generation as a function of serpentinization reaction progress. The student researcher leading this project will execute a series of hydrothermal experiments at a range of elevated temperature conditions (100 – 300°C), designing fluid compositions and metal catalysts specifically targeted to maximize geologic ammonia yields. By leading this investigation, the student will build high-level expertise in experimental geochemistry, advanced analytical instrumentation, and the interpretation of fluid-mineral kinetics. Ultimately, this work seeks to optimize the continuous, in-situ production of geologic ammonia under accessible thermal subsurface conditions. Demonstrating the viability of geologic ammonia could establish a revolutionary, carbon-free chemical – energy feedstock, positioning researchers at the forefront of a rapidly expanding sector across academia and the green agricultural, maritime shipping, and energy storage industries.

References

1. Y. Gao et al., Geological ammonia: Stimulated NH_3 production from rocks. *Joule* 9 (2025).
2. A. A. Khan, D. Majeed, Green ammonia as a hydrogen carrier: Advances in production, storage, cracking, utilization, and techno-economic analysis. *Renewable and Sustainable Energy Reviews* 242, 117290 (2026).
3. T. McCollom et al., Temperature trends for reaction rates, hydrogen generations, and partitioning of iron during experimental serpentinization of olivine. *Geochimica et Cosmochimica Acta* (2016).
4. D. D. Syverson, B. M. Tutolo, D. M. Borrok, W. E. Seyfried, Serpentinization of olivine at 300 °C and 500 bars: An experimental study examining the role of silica on the reaction path and oxidation state of iron. *Chemical Geology* 475, 122-134 (2017).
5. M. Preiner et al., Serpentinization: Connecting Geochemistry, Ancient Metabolism and Industrial Hydrogenation. <http://dx.doi.org/10.3390/life8040041>.
6. D. D. Syverson et al., Nutrient Supply to Planetary Biospheres From Anoxic Weathering of Mafic Oceanic Crust. *Geophysical Research Letters* 48, e2021GL094442 (2021).

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: - The student will learn to independently perform literature reviews.- The student will gain experience in: Laboratory methods, Preparation of fluids and minerals used for reactants in the experiments, Design and setting up experiments, Sampling experiments and mineral products.-Analytical instrumentation (all housed within the Department of Earth, Environmental, and Geographical Sciences at UNCC) Inductively-coupled mass spectrometry (ICP-MS), Gas chromatography (GC), pH electrodes. -Examine and interpret geochemical data produced from the experiments-The student will also gain independence in the laboratory environment and the ability to think critically of their experiments and outcomes of the proposed activities.-The student will present and disseminate the research results at the end of the OUR term through a poster or oral presentation at the OUR symposium. There is also potential to present research results in larger conferences more focused on this particular research field.

Required training of 4 hours with Description: The student will undergo laboratory and safety training. The student will work closely with a graduate student and the professor of the laboratory.

Mentoring plan: -The student will meet with Dr. Syverson once a week with regards to progress and discussion of the literature.-Dr. Syverson will also meet with the OUR student throughout each week in the laboratory to help the prepare and perform the experiments and during analysis of samples using a variety of analytical instrumentation.- Dr. Syverson will mentor the student throughout the interpretation of research results. The student will produce and share research results with Dr. Syverson's research group and at the OUR symposium. Potentially, at a larger conference focused on the field of geologic ammonia.

Applicant Requirements: - Have taken general chemistry, mineralogy, and other relevant Earth science courses.- Has experience with wet-chemistry laboratory work, such as measuring pH and performing titrations.

Applicant Preferences: - Has an interest in solving Earth's on-going climate problem and is interested in going to graduate school.- The student has an interest in the development of geologic ammonia as a carbon-free chemical-energy alternative.

Specific Time considerations/conflicts: Research team meetings on a weekly basis.

App ID #: 3431

Mentor: Alexander, Apryl

Email: aalexa36@charlotte.edu

Title: Metrolina Distinguished Professor of Health & Public Policy

Department: Department of Public Health and Health Administration

Co-mentor: No

Community engaged research: No

Title: Media Framing of Self-Defense Laws: A Critical Discourse Analysis

Description: Self-defense laws, such as stand your ground (SYG) laws and castle doctrine, are presently growing throughout the United States, with 35 states invoking such self-defense laws, and “justified” homicide rates increasing in several states since these laws have been initiated. SYG laws involve cases in which an individual has the right to “hold their ground” and use deadly force when they need to protect or defend against an imminent threat of death. SYG typically applies to self-defense at locations outside a person’s home or any place where a person has the legal right to be. SYG laws are also known as “no duty to retreat” or “line in the sand” laws. Castle doctrine allows individuals to protect their land or property against intruders. Historically, CD laws allow an individual the right to defend their home (i.e., “castle”) from invaders, including the right to use deadly force, without a duty to retreat. Many CD laws have now been expanded to include “any place in which one is lawfully present” (e.g., vehicle, workplace). Given that self-defense laws can potentially impact public health by increasing gun violence mortality, as well as exacerbating racial disparities, it is important to examine factors affecting public perceptions of self-defense laws. Prior research has found that sociodemographic variables of the victim and defendant, such as race and gender, may influence public opinion and decision-making by potential jurors (e.g., Sower, Alexander, & Klukoff, 2023). As self-defense laws expand throughout the United States, it is crucial to understand public opinion on self-defense laws, as opinions influence public discourse and actions, shape policy changes, and can, for example, impact the judicial system through juror decision-making. Media framing refers to the journalistic practice of selecting aspects of a perceived reality and making them more salient in news coverage. Media framing helps reveal how a news article is structured to promote a particular perspective, thereby influencing public opinion. The proposed study will examine news coverage of self-defense incidents. Qualitative analysis will also be used to identify recurring themes and meanings in the articles. The following research questions are posed: 1) How do news outlets frame incidents that involve the potential to initiate self-defense, and 2) How does a self-defense claim influence the portrayal of the shooter versus the victim?

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Upon successful completion of this project, students will be able to: 1) Conduct a comprehensive literature review, 2) Apply qualitative research methods to a large dataset, and 3) Communicate research findings effectively through written products and oral presentations.

Required training of 10 hours with Description: Students will need to complete IRB CITI training on ethical conduct of research. Students will also need to learn how to use MAXQDA for qualitative analysis.

Mentoring plan: Students will work directly with the Dr. Alexander on the developing the research question and hypotheses. Students will also receive training on conducting a comprehensive literature review. Students will meet with Dr. Alexander and the research team weekly to discuss progress. Students will also be involved in the development of dissemination materials, including a peer-reviewed journal article, public scholarship products (i.e., op-eds, reports), and conference presentation proposals, and will receive support in developing these products. Students will be expected to complete OUR requirements professional development requirements and will also have other opportunities for professional development through the UNC Charlotte Violence Prevention Center.

Applicant Requirements: Conscientious with good organizational and communication skills. Strong attention to detail and commitment to producing high-quality work. Ability to work independently and meet project deadlines. Willingness to learn new research methods and software applications.

Applicant Preferences: Prior research experience (through course work or another lab). Students who have an interest in attending graduate school (e.g., psychology, sociology, criminal justice, public policy, law).

Specific Time considerations/conflicts: Students are expected to be available Monday-Friday during business hours, so that the student may attend weekly lab meetings and schedule independent research hours.

App ID #: 3432

Mentor: Li, Yao

Email: yli129@charlotte.edu

Title: Assistant Professor

Department: Earth, Environmental, and Geographical Sciences

Co-mentor: Yes

Xuyang Li, xuyang.li@charlotte.edu,

Community engaged research: No

Title: Sensor-Informed Digital Twins for Healthy Buildings: Modeling Indoor Air Quality and Human Exposure

Description: Indoor environmental conditions can strongly influence human health, comfort, and exposure to airborne contaminants. However, traditional approaches typically evaluate buildings using either stationary environmental sensors or computer simulations separately. This project aims to bridge these approaches by developing sensor-informed digital twins—virtual representations of real buildings that combine 3D spatial models, indoor environmental measurements, airflow simulation, and simulated human behavior. Our interdisciplinary research team is developing a digital twin of a UNC Charlotte building environment. The platform integrates 3D building models with environmental sensors that continuously measure indoor conditions, computational models of airflow, and agent-based models that represent how people move through and occupy indoor spaces. The long-term goal is to create an intelligent building simulation platform capable of evaluating how changes in ventilation, occupancy, room configuration, and human behavior affect indoor environmental quality and potential exposure. During Spring 2027, undergraduate researchers will help move the project from digital-twin construction toward real-world validation and experimentation. Depending on their background and interests, students may participate in one or more of three complementary research tracks: Track 1 — Indoor Sensor Data and Spatial Analysis. Students will work with measurements collected by indoor environmental sensors, such as CO₂, particulate matter, temperature, and humidity. They will learn to clean, visualize, and analyze time-series sensor observations and investigate how indoor environmental conditions vary across rooms, times of day, and occupancy conditions. Track 2 — Digital Twin and Human Behavior Simulation. Students will work with the existing 3D building environment and Unity-based agent-based modeling framework. They will help simulate how virtual occupants move through and use indoor spaces and investigate how occupancy patterns influence potential environmental exposures. Track 3 — Model Validation and Healthy-Building Scenarios. Students will compare simulated environmental conditions with real sensor observations and evaluate scenarios such as changes in ventilation, room occupancy, or movement patterns. Students will investigate questions such as: Where and when do indoor exposure hotspots emerge? How accurately can a digital twin reproduce measured environmental conditions? What building-management strategies could reduce potential exposure? Students will work as part of an interdisciplinary research team spanning geospatial science, civil/building engineering, artificial intelligence, and public health. The project is particularly suitable for students interested in GIS, environmental science, computer science, data science, engineering, architecture, or health.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Understand digital-twin research. Explain how physical buildings, environmental sensors, spatial data, computational simulation, and human behavior models can be integrated into a digital twin. Analyze real environmental sensor data. Process, quality-control, visualize, and interpret time-series measurements such as CO₂, particulate matter, temperature, and humidity. Develop spatial and computational research skills. Gain hands-on experience with tools appropriate to their research track, which may include Python, GIS, Unity3D, 3D spatial models, sensor-data processing, visualization, and agent-based modeling. Evaluate models using real observations. Learn the difference between model development and scientific validation by comparing simulation outputs against observed environmental measurements. Design and conduct a research experiment. Formulate a research question, identify appropriate measurements or simulation scenarios, analyze results, and assess uncertainty and limitations. Work effectively on an interdisciplinary research team. Collaborate with researchers from geography, engineering, computing, and environmental/public-health disciplines. Communicate scientific findings. Translate technical results into figures, maps, and visualizations and present a research poster at the Spring 2027 Undergraduate Research Conference.

Required training of 6 hours with Description: Orientation and training will include:

Introduction to the digital-twin research platform and overall scientific objectives.

Overview of indoor environmental sensing and interpretation of CO₂, PM_{2.5}, temperature, and humidity measurements.

Training in project data-management and reproducible research practices.

Introduction to relevant software based on the student's research track, such as Python/GIS or Unity3D.

Laboratory and sensor-operation training when appropriate.

Research ethics and responsible conduct expectations.

Additional technical training will be incorporated throughout the semester rather than requiring students to master all tools before beginning research.

Mentoring plan: Students will become active members of our interdisciplinary digital-twin research team rather than working only on isolated technical tasks. During the first two weeks, each student will meet individually with the mentors to identify their interests, prior experience, and semester research goals. We will then develop a focused research question and set of deliverables appropriate to the student's background. Students will meet with Dr. Yao Li at least once each week to review research progress, troubleshoot challenges, discuss scientific interpretation, and establish goals for the following week. Students will also interact with other members of the digital-twin research team who contribute expertise in building engineering, airflow modeling, sensors, 3D modeling, and computational simulation. The semester will use a scaffolded mentoring approach.

Initially, students will receive structured training and closely guided research tasks. As their skills develop, they will take increasing ownership of data analysis, simulation experiments, and interpretation. By the second half of the semester, each student will be expected to lead a focused component of the research and provide short progress updates during research meetings. Particular emphasis will be placed on helping students understand why they are performing each analysis rather than simply teaching software procedures. Students will receive feedback on research design, data visualization, scientific writing, and presentation skills. During the final weeks, the mentors will work closely with students to develop their abstract and research poster for the Spring 2027 Undergraduate Research Conference. Students who make substantial research contributions may also have opportunities to contribute to future conference presentations or peer-reviewed publications.

Applicant Requirements: Applicants should have curiosity about how buildings, environmental conditions, technology, and human behavior interact. Students should be dependable, willing to learn unfamiliar research methods, able to work independently between meetings, and comfortable working collaboratively as part of an interdisciplinary team. Applicants do not need prior experience with all components of digital-twin technology. Because the project contains several research tracks, students with different backgrounds can contribute successfully.

Applicant Preferences: GIS or geospatial analysis Python or another programming language Data science or statistics Unity3D, game development, or 3D modeling Environmental or building engineering Architecture/BIM Environmental health or public health Sensor/IoT technology

Specific Time considerations/conflicts: Students must be available for a weekly research meeting scheduled by mutual agreement. Some work involving environmental sensors or the physical digital-twin environment will need to be conducted in person on the UNC Charlotte campus. Other data-analysis and computational tasks can be scheduled around the student's coursework.

App ID #: 3433

Mentor: Jones, Kim

Email: k.jones@charlotte.edu

Title: Professor

Department: DANCE

Co-mentor: No

Community engaged research: No

Title: Archiving and Re-Living Lost Korean Modern Dance Artifacts: The Legacy of Choi Seung-Hee

Description: This research project focuses on uncovering, preserving, and re-imagining the history of Korean modern dance through the life, work, and legacy of Choi Seung-Hee (1911–1969), one of the most significant Korean dancers of the twentieth century. Her career developed during a complex period of Korean history, including the Japanese occupation of Korea, and her work circulated internationally across Asia, Europe, and the Americas. The undergraduate research assistant will work directly with Professor Kim Jones on the organization and study of archival materials collected through ongoing research in Korea, the United States, and other international archives. The student will help organize and maintain digital archival files; develop bibliographies, indexes, and research databases; assist in identifying and documenting photographs, programs, articles, and other historical artifacts; and collaborate with librarians and archival specialists to learn appropriate methods for cataloging and describing historical materials. The student may also assist with grant and funding searches that support the continuation of the research and help prepare archival materials for future academic articles, presentations, and a forthcoming book. This project offers an undergraduate student the opportunity to participate in an active, evolving research process at the intersection of dance history, Korean studies, cultural identity, archival research, and artistic practice. The student will gain experience in archival methodology, academic research and writing, digital organization, citation practices, and potentially project management and curatorial assistant work.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Through this research experience, the student will: Develop foundational skills in archival and historical research, including the organization, description, and interpretation of primary-source materials. Learn to create and maintain scholarly bibliographies, indexes, citations, and research databases. Develop digital research and organizational skills using platforms such as Google Drive, Google Sheets, Adobe applications, Zotero, EndNote, and other archival or research-management tools. Gain experience evaluating historical sources and understanding how individual artifacts contribute to a larger scholarly narrative. Develop greater knowledge of Korean modern dance history and the relationship between dance, cultural identity, migration, politics, and twentieth-century history. Strengthen written and verbal communication skills through regular discussions of research findings. Gain an understanding of how archival research develops into scholarly publications, presentations,

exhibitions, and potentially reconstructed or re-imagined artistic work. Develop professional skills in independent work, collaboration, attention to detail, problem-solving, and project management.

Required training of 2 hours with Description: The student will begin with an orientation to the larger Choi Seung-Hee research project and its historical and artistic context. Professor Jones will introduce the student to the existing archive, digital filing system, bibliography, and current research questions.

Initial training will include responsible handling and organization of digital archival materials; file naming and metadata practices; citation and bibliography methods; basic archival research methodologies; and the use of relevant digital platforms. When appropriate, the student may also consult with university librarians or archival specialists to learn professional approaches to cataloging and describing historical materials.

Assignments will begin with clearly defined organizational and research tasks and gradually become more independent as the student develops familiarity with the collection and research project.

Mentoring plan: My goal is to introduce the undergraduate researcher to the process of developing a major scholarly project from archival discovery through interpretation and dissemination. The student will not simply complete administrative tasks; they will learn how archival materials become evidence and how researchers use that evidence to recover and interpret histories that may have been overlooked, fragmented, or lost. I will meet with the student regularly to review progress, discuss discoveries, establish upcoming research priorities, and address questions. Early assignments will be structured and closely guided. As the student develops confidence and knowledge, I will encourage greater independence and ownership over specific areas of the research. An important part of the mentorship will be helping the student understand why the materials they are organizing matter. Whenever possible, we will discuss the historical, cultural, and artistic significance of the artifacts and how they contribute to the larger Choi Seung-Hee research project. I hope the student leaves the experience understanding that archival research is not simply the preservation of the past—it can also contribute to recovering overlooked histories and bringing them into contemporary scholarship and artistic practice

Applicant Requirements: Strong organizational skills and attention to detail. Ability to work responsibly and independently after receiving instruction. Strong written communication and basic research skills. Comfort working with digital files and cloud-based platforms such as Google Drive and Google Sheets. Willingness to learn new research, archival, and digital tools. Ability to maintain consistent file-naming, documentation, and organizational systems.

Applicant Preferences: Interest in dance, history, Korean or Asian studies, cultural studies, archives, libraries, or the humanities. Familiarity with academic citation methods and bibliography-management tools. Experience with Adobe applications, spreadsheets, databases, or other digital organizational platforms is helpful but not required. Curiosity about historical narratives and the recovery and preservation of cultural artifacts. An interest in learning how archival research can contribute to publications, exhibitions, artistic reconstruction, and other forms of scholarly and creative research. No Korean Language required

Specific Time considerations/conflicts: No specific days or times required. A regular weekly meeting time will be established between the student and I the faculty mentor. Some of the research may be completed independently according to an agreed-upon schedule.

App ID #: 3436

Mentor: Yun, Albert

Email: lyun@charlotte.edu

Title: Assistant Professor

Department: Department of Industrial and Systems Engineering

Co-mentor: No

Community engaged research: No

Title: Multi-agent Digital Twin: Building a Bi-Directional Simulation Platform for Multi-Robot Arm Control

Description: This project offers an undergraduate student the opportunity to work directly with two AI-enabled robotic arms and build a multi-agent digital twin: a synchronized virtual replica of the physical robots that can be used for control, testing, and experimentation. The project builds on existing effort to develop an intelligent robotic platform for multi-agent control. In a previous phase, a student implemented AI vision and remote-control features for the physical arms; this phase focuses on the simulation and digital-twin component, which will complete the platform and lay the groundwork for future research. Each robotic arm currently ships with a built-in simulation, but this simulation runs only on the arm's onboard edge device (NVIDIA Jetson) and supports a single arm in isolation. The student's task is to move beyond this limitation and build a unified digital twin in which two robotic arms coexist and operate within one simulation environment. Starting from the existing single-arm simulation, the student will: Set up a simulation environment (ROS/Gazebo) capable of hosting both robotic arms simultaneously, using their URDF models. Verify that joint behavior, kinematics, and workspace of each virtual arm faithfully match the physical hardware. Develop motion scripts that allow the two virtual arms to operate together in a shared workspace. Establish bi-directional communication between the digital and physical systems, so that movements of the physical arms are reflected in the simulation in real time, and commands issued in the simulation can drive the physical arms. The result will be a working two-arm digital twin that serves as a virtual testbed for control, motion planning, and coordination between multiple robots. Beyond its immediate use, this platform will provide the essential foundation for our lab's next research direction: applying reinforcement learning to multi-agent robotic control, where a reliable, synchronized simulation environment is a prerequisite for safe and efficient training. The student will have access to the existing single-arm simulation, foundational code, and tutorials for the simulation and communication components. The main responsibility will be to extend, test, and integrate these pieces into a functional dual-arm system. Detailed tutorials will be provided to help the student get started, and the core learning goal is to gain hands-on experience taking a simulation from a single-device prototype to an integrated, communicating multi-robot platform.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Through this project, the student will gain hands-on experience building a digital twin from the ground up and integrating it with physical robotic

hardware. Specifically, the student will learn to work with robot description models (URDF), set up and configure a simulation environment (ROS/Gazebo), and verify that a virtual model faithfully reproduces the kinematics and behavior of a real robot. By extending a single-arm simulation into a coordinated two-arm environment, the student will develop practical skills in multi-robot simulation, motion scripting, and workspace coordination.

Required training of 20 hours with Description: The student needs to have basic Python skills. Specific tutorials for all required tasks (Linux OS, ROS and Gazebo setup, URDF handling) will be provided.

Mentoring plan: At the beginning of the project, the student will receive detailed tutorials to get started with the simulation environment, URDF models, and the existing single-arm digital twin. I will visit the lab regularly each week and have individual meeting with the student to discuss progress, help troubleshoot challenges, and make sure the student stays on track toward the project's milestones, such as setting up the two-arm simulation, verifying kinematics, and establishing physical-virtual communication.

Applicant Requirements: I am looking for motivated students who are curious about robotics and willing to learn new tools. Applicants should have basic familiarity with Python, as the current project files are all written in this environment. Prior exposure to ROS, Gazebo, or other robotics simulation environments is helpful but not required. Experience with computer vision, Linux, or hands-on hardware projects is a plus. Most importantly, students should be comfortable troubleshooting and following technical tutorials to complete tasks.

Applicant Preferences: I am looking for motivated students who are curious about robotics and willing to learn new tools. Applicants should have basic familiarity with Python, as the current project files are all written in this environment. Prior exposure to ROS, Gazebo, or other robotics simulation environments is helpful but not required. Experience with computer vision, Linux, or hands-on hardware projects is a plus. Most importantly, students should be comfortable troubleshooting and following technical tutorials to complete tasks.

Specific Time considerations/conflicts: Due to the nature of this project, students must be available to work in the lab during normal working hours, based on the number of hours the student is approved for.

App ID #: 3435

Mentor: Williams, Tamara

Email: twill260@charlotte.edu

Title: Associate Professor

Department: Dance

Co-mentor: No

Community engaged research: Yes

Title: Stories in Motion: Children, Culture, Dance, and Film

Description: This project explores storytelling as a creative and research-based tool for helping young people understand who they are, where they come from, and how their experiences shape their sense of belonging and possibility. Working with children in grades 4–8 at ourBridge for Kids, a Charlotte nonprofit afterschool center serving children and families from refugee and immigrant communities around the world, the project will bring combine dance, literary arts, visual storytelling, and film. The project builds on my ongoing work as a choreographer, educator, and researcher exploring the ways cultural knowledge and history can be carried through the body. In this project, I am particularly interested in what happens when children are encouraged to explore their own family histories, cultural traditions, migration experiences, communities, and everyday lives through creative movement and storytelling. The project will create two primary artistic outcomes: a short dance film and a children's book featuring the stories and creative work of the participating youth. These works will be shared through community arts events and with libraries, schools, child-serving organizations, families, and the broader Charlotte community. The children will participate in a series of creative storytelling activities that invite them to reflect on questions such as: What stories have been passed down in your family? How can a movement communicate something that words cannot? How can a personal story become a creative work that someone else can experience? Through dance, writing, spoken word, drawing, and visual storytelling, the children will develop original ways of communicating their experiences. I will introduce the children to storytelling through dance, drawing from my research and experience with African Diaspora dances and cultural traditions. They will experiment with how rhythm, gesture, repetition, space, and physical expression can communicate emotion, family, culture, and personal experience. An ESL specialist at ourBridge will support the children as they develop their written and spoken stories, recognizing that the participating youth may have different levels of English-language proficiency and different experiences with written storytelling. Illustrator and mural artist Justin Surgeon will introduce the children to storyboarding and illustration, helping them translate their stories and movement ideas into visual images. The children's movement, spoken stories, and creative processes will be documented on film by filmmaker Dante Bland. The resulting short dance film will explore the larger question of how storytelling can contribute to children's confidence, identity development, self-expression, and sense of self-efficacy. The children's written stories and illustrations will be compiled into a children's book. The completed book will be shared with families and community members and distributed to local libraries, school media centers, and child-serving organizations. The children will also have opportunities to read, perform, and share their stories publicly. The project will culminate in community presentations, including a book

signing and storytelling event at ourBridge for Kids and participation in the BOOM Charlotte 2027 marketplace. These events will give the young authors an opportunity to see their work become part of the cultural life of their community.

Undergraduate Researcher RoleAn undergraduate researcher will be an active member of the project team and will have opportunities to contribute to both the research and creative dimensions of the project. Depending on the student's strengths, responsibilities may include:conducting background research on children's storytelling, identity development, cultural preservation, community-engaged arts, dance education, and/or arts-based research;researching examples of storytelling practices within African Diaspora and immigrant communities;assisting with documentation and organization of children's creative processes, with appropriate attention to research ethics, consent and privacy;assisting with the documentation and of movement, stories, drawings, photographs, and other materials;assisting with transcription, categorization, or analysis of project materials;helping prepare materials for community presentations and symposium;One of the goals of the project is to provide a student with meaningful experience learning how creative research happens in a community setting. The student will work closely with me throughout the project and will participate in regular meetings to discuss research questions, observations, challenges, ethical considerations, and emerging ideas.

Why This Project MattersChildren are often the subjects of stories told by adults, especially about their families, cultures, communities, challenges, and futures. This project asks what might happen when children are given the tools and space to be the storytellers. Dance is especially important to this process because the body communicates experiences that may be difficult to express through language alone. Combining dance with writing, illustration, and film creates multiple entry points for children with different communication styles, cultural backgrounds, and levels of English-language proficiency.

Project TimelineThe project will progress through several interconnected stages: Phase 1 – The undergraduate researcher will become familiar with the project's goals, community context, research ethics, and methods for working with youth. Together, we will develop research questions. Phase 2 – The student will support the creative sessions at ourBridge for Kids. The children will explore personal and cultural stories through creative activities. Phase 3 – As stories and creative materials develop, the student will assist with organizing documentation and identifying themes emerging from the children's experiences and creative work. Phase 4 – The children's stories, movement, illustrations, and documentation will be developed into a short film and children's book. The undergraduate researcher may contribute to organizing materials, researching contextual information, analyzing themes, and preparing supporting materials for the final works. Phase 5 – The completed work will be shared through a community book signing, performances, film screening, storytelling activities, and participation in BOOM Charlotte 2027. The student will also prepare a presentation for the University's undergraduate research symposium. This project offers an undergraduate student an opportunity to experience research as something that can happen with communities, through creative practice, and across disciplines. The student will develop skills in community-engaged research, documentation, observation, arts-based research, youth engagement, and public presentation. They will also see how research can inform the development of an artistic work and how an artistic project can generate meaningful research questions. This project may be particularly meaningful for students interested in dance, Africana studies, education, communication, film, sociology, anthropology, or other fields interested in people, culture, creativity, and community.

Accepting applications for: Only 75 hours over an academic semester (~5h per week)

2 positions available

Anticipated Student Learning Outcomes: Through this project, the undergraduate researcher will develop five primary areas of knowledge and skill: 1. Develop community-engaged research skills. The student will learn how to conduct research in partnership within a community. They will develop skills in observation, documentation, relationship-building, and ethical engagement while working directly with children, artists, educators, and community partners. 2. Gain experience with arts-based research methods. The student will explore how dance, storytelling, writing, illustration, and film can be used to document experiences and generate knowledge. They will gain experience organizing observations and creative materials, identifying themes, and connecting what emerges from the project to relevant scholarship. 3. Develop a deeper understanding of culture, identity, and storytelling. Through working with children from refugee and immigrant families, the student will examine how personal and cultural stories contribute to identity, cultural preservation, and self-expression. They will also explore how movement and storytelling can provide children with ways to communicate experiences that may be difficult to express through words alone. 4. Strengthen interdisciplinary collaboration and professional skills. The student will work alongside a faculty mentor and professionals in dance, education, film, visual art, literacy, and program evaluation. Through this collaboration, they will develop professional communication, teamwork, organization, time management, and problem-solving skills while experiencing how different disciplines can contribute to a shared creative research project. 5. Learn to communicate research to both academic and public audiences. The student will learn how to translate research and creative findings for different audiences through the short film, children's book, community presentations, and undergraduate research symposium. They will develop confidence in presenting their work and gain experience communicating research in ways that are accessible, engaging, and meaningful beyond the university. Overall Student Benefit: I want the undergraduate researcher to leave this experience understanding that research can be rigorous while also being creative, collaborative, and deeply connected communities. They should be able to speak about the project as an experience that taught them how to ask meaningful questions, listen to others, work ethically, analyze information, collaborate across disciplines, and communicate knowledge in multiple forms. These skills will serve them whether they continue into graduate school, pursue a career in the arts or education, or enter another profession where research, creativity, collaboration, and community engagement are valued.

Required training of 3 hours with Description: The student will complete all required UNC Charlotte/ORPI research training and any additional training required for working with minors and community-based research before beginning project activities. Onboarding will include an orientation to the project goals, community context, research methods, ethical considerations, consent/assent and confidentiality requirements, and appropriate documentation practices. The student will also meet with me regularly during the initial phase to review expectations, research protocols, and their specific responsibilities before working directly with participants.

Mentoring plan: My approach to mentoring is to treat the undergraduate researcher as an emerging scholar and creative thinker, not as an assistant. I want the student to feel supported, challenged, and comfortable asking questions while developing greater independence throughout the project. At the beginning of the project, I will meet individually with the student to learn about their academic interests, skills, and career goals and identify how those interests connect to the project.

We will review the project goals, research responsibilities, ORPI requirements, research ethics, confidentiality, and expectations for working with children and community partners. The student can expect regular one-on-one meetings with me throughout the project, with more frequent contact during the initial onboarding period. We will discuss progress, questions, observations, challenges, and emerging ideas. I will provide clear expectations and constructive feedback while helping the student understand not only what they are doing, but why it matters. The student will work directly with me as the faculty mentor and project lead and will also have opportunities to learn from our interdisciplinary collaborators, including the ourBridge for Kids staff and ESL specialist, filmmaker Dante Bland, illustrator Justin Surgeon, and Dr. Victor Mack, who will support program evaluation. These interactions will allow the student to see how dance, education, film, visual art, literacy, and evaluation can come together in one community-based project. I will encourage the student to actively contribute ideas and observations during our meetings and, when appropriate, project team meetings. Their responsibilities may include background research, observation and documentation, organizing research materials, identifying themes within the children's stories, and assisting with the development of the film, children's book, and community presentations. A key part of the mentoring process will be helping the student communicate what they are learning. We will work together to prepare a presentation for the OUR undergraduate research symposium. When appropriate opportunities arise, I will also encourage the student to consider presenting their work at student or professional conferences and other scholarly or creative forums. I will also help the student understand how to talk about this experience beyond the project. We will discuss how to describe their research and community-engaged experience on a résumé or CV, in graduate school or fellowship applications, and in professional interviews. I recognize that students come into research with different levels of experience. I will not expect them to already know how to conduct research or work in a professional community setting. I will provide guidance, examples, feedback, and opportunities to practice. At the same time, I will encourage the student to take increasing ownership of their work as their confidence and skills develop. My commitment is to provide consistent communication, mentorship, honest feedback, and meaningful opportunities for growth. Most importantly, I want the student to leave the experience knowing that their ideas and contributions matter and that research can be rigorous, creative, community-centered, and connected to real people and real experiences.

Applicant Requirements: I am looking for a curious, dependable, and open-minded student who is interested in learning through both research and creative practice. The student should be comfortable working with people, willing to engage respectfully with children and community members, and able to listen, observe, ask questions, and contribute as part of a team. Experience or interest in dance, the arts, education, Africana studies, cultural studies, film/media, psychology, sociology, or community engagement would be helpful, but is not required. I am more interested in a student's willingness to learn, take initiative, communicate, and approach different cultures and experiences with respect than in having a specific academic background. Strong writing, organization, communication, and collaboration skills are desirable. Most importantly, I am looking for a student who is genuinely curious about how creative expression and storytelling can help us better understand children, culture, identity, and community.

Applicant Preferences: I am looking for a student who is responsible, flexible, and willing to take initiative. The ability to manage time, follow through on commitments, and work independently

when needed will be important. I would also value someone who is comfortable learning new tools and methods and can adapt as the project develops. No specific course or prior research experience is required. Familiarity with creative projects, dance, youth programming, documentation, writing, or digital media would be helpful, but I am open to students from different majors and backgrounds. The most important qualification is a genuine interest in the project and a willingness to learn.

Specific Time considerations/conflicts: N/A

App ID #: 3437

Mentor: Ebong, Abasifreke

Email: aebong1@charlotte.edu

Title: Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Understanding the contact resistance of a cavitated silver paste for lowest cost and very high efficiency solar cells

Description: Metallization of solar cell has been the second most expensive layer of any solar cell. Depending on the solar cell architecture, it could range from 20-30% of the total cost of the cell. To reduce this cost the metal footprint, especially the bifacial architecture, must be reduced to less than 35 mg per cell. To achieve such a low metal foot print, the cavitation technology was developed to produce silver paste with nanoparticle silver powder without any rheology issues. However, the silver paste consist three components, the glass frit, organic and the silver metal powder. These three components must disperse properly to avoid any agglomeration, separation while maintaining excellent viscosity and enhance very narrow gridline printing. To achieve, the required contact resistance between the thin gridlines and the semiconductors required the optimization of the glass frit content, especially, the incorporation of metal containing glass that enhance the reformed conductivity. The optimization of this paste to function with the top commercial solar cell architecture is the focus of this work. The undergraduate student will study the solar cell contacts through simple modeling and characterization of the interface of the metal/semiconductor using specialized tools such as the SEM, TEM, CAFM etc. The student will learn to design the front side metal gridlines of the solar cell using the CAD software and model using Griddler software to determine the optimum number of gridlines commensurate with each architecture. The student will extend this design to several solar cell architecture and we would fabricate the best to validate the model.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: The students would learn solar cell technology and semiconductors. The use of CAD tool is quite a versatile expertise to add to engineering arsenal. Modeling both from the CAD drawing to the use of elemental analysis would create new skills of interpreting the contact resistance of a solar cell. This is a hands on training that will facilitate the students competency in the solar cell technology.

Required training of 10 hours with Description: The students need their computers and the software to design, assess the SEM, TEM, CAFM etc micrographs, modeling using Griddler software. Finally, in the lab using printing machines to print the cells with cavitated silver.

Mentoring plan: I will meet the students and introduce them to the computer program - CAD tool and show them the examples of a typical cad design of a solar cell. Show them the micrographs of

the interface of a typical metal/semiconductor and explain what the typical elements are present after the metal contact formation. I will then task them to design a solar cell with a particular number of gridlines and call that into Griddler to assess the electrical parameters to see if it is optimum. We go from there. I will be expecting them to make presentations weekly to make sure they follow. I will also ask them to submit conference papers accordingly. I am always available to assist my students to show them the way so that they are always interested in what they are doing. With perpetual interest they can always be successful.

Applicant Requirements: A student who is interested in research. They do not need any experience but interested in learning. I believe, every student can use the computer and could learn how to use any software and master it in a given time.

Applicant Preferences: Interest and dedication.

Specific Time considerations/conflicts: This would be scheduled based on the student availability to avoid conflict with students other study. Flexible.

App ID #: 3441

Mentor: Williams Colonnese, Madelyn

Email: mcolonn1@uncc.edu

Title: Associate Professor

Department: Reading and Elementary Education

Co-mentor: No

Community engaged research: Yes

Title: An Analysis of an Inclusive Summer Camp: Perceptions of Coaches, Participants, and Families

Description: This project aims to achieve two primary outcomes using a mixed methods approach: 1) an analysis of attitudes and perceptions of camp staff and typically developing campers and 2) an analysis of campers with intellectual disabilities and their families on the quality of the experience. Together, these findings will describe how inclusive programming influences multiple participants. The undergraduate researcher would help support the data entry and analysis of the data collected from the summer camp.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Expected benefits for the student would be an opportunity to analyze data from a diverse set of participant groups to assist the research team in understanding their perspectives on inclusive summer camp practices. The student will learn how to summarize and interpret data as they develop their own project and support the research team in sharing the findings from this study. The student will also be part of a team with two other doctoral students and as a result have the opportunity to learn from different perspectives.

Required training of 2 hours with Description: The student will need to complete CITI training.

Mentoring plan: The student should expect to work directly with me throughout the entire project. I will work with the student(s) at the beginning of the summer to develop a plan for meeting. This plan will include weekly meetings conducted virtually or in person each week of the semester. The students will also be welcome to contact if they should have additional questions. We will have an orientation meeting at the beginning of the spring semester and a wrap up meeting at the end of the semester. The students will be expected to present at the research conference.

Applicant Requirements: Curious to learn more about collecting and analyzing data

Applicant Preferences: Some prior experience looking at and analyzing survey data

Specific Time considerations/conflicts: We will set up research meeting that reflect the availability of all members of the research team.

App ID #: 3457

Mentor: Khan, Saffeer

Email: mkhan8@charlotte.edu

Title: Research Associate Professor

Department: Energy Production and Infrastructure Center

Co-mentor: No

Community engaged research: No

Title: Standards and Methods for Efficiency Testing of Electrical Machines and Drives

Description: Energy Production and Infrastructure Center's (EPIC) Motor Testing Lab (EMTL) is an ISO/IEC 17025-2017 accredited facility to meet the efficiency testing requirements of electrical machines and drives under the National Voluntary Laboratory Accreditation Program (NVLAP). EMTL performs controlled motor testing and generates, collects and disseminates information on electric motor and drive systems for customers and internal quality control in a credible and reliable manner. EMTL's scope of motor testing activities include the following standards and procedures: (1) IEEE 112 (2017), Method B (Standard Test Procedure for Polyphase Induction Motors and Generators); (2) IEEE 112 (2017), Method A (Standard Test Procedure for Polyphase Induction Motors and Generators); (3) IEEE 114 (2010), Standard Test Procedure for Single-Phase Induction Motors; (4) IEC 60034-2-1 (2014), Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles); (5) IEC 60034-2-3 (2020), Specific test methods for determining losses and efficiency of converter-fed AC motors; (6) IEC 61800-9-2 (2017), Ecodesign for power drive systems, motor starters, power electronics and their driven applications; (7) National Institute of Standards and Technology (NIST) Handbook 150 and 150-10; and (8) ANSI/ISO/IEC 17025:2017 standard. The EMTL has a robust management structure in place to ensure adherence to quality management system and accuracy and traceability requirements during motor testing. Undergraduate students are an important part of the lab operations and can pursue (1) research into applicable national and international methods and standards of motor efficiency testing (IEEE, Canadian Standards Association (CSA), Norma Oficial Mexicana (NOM)), development of tools to acquire, analyze, and display data from motors and drives, programming and set up of variable frequency drives (VFDs), and work with AZX Grid Emulator Units as programmable power sources for the dynamometer test units. The EMTL management ensures that the undergraduate research scholars undergo a training program in accordance with the EMTL's training documents and standards. The students perform electric motor setup, alignment, operational testing, report generation and validation as part of their OUR experience with the EMTL. Currently, the Flexible Energy Lab (where the EMTL is housed) has a team of full-time staff including faculty, research engineers, and graduate and undergraduate students. Preparing the next generation of professionals for careers in the power and energy sector is a founding goal of EPIC as a university-industry partnership. EPIC as part of School of Energy and the William States Lee College of Engineering have paired together to create programs, courses and energy concentrations within multiple departments that surpass technical skills and engineering. While working in the EMTL, undergraduate research assistants will go through experiential learning in project management, collaborative teamwork, risk analysis and leadership skills and are equipped to

become part of the energy workforce who deliver new and creative solutions for the energy industry. The goal of this project is to investigate various methods of motor and VFD efficiency testing and their behavior under highly controlled conditions of speed and torque management. The undergraduate student will assist the EMTL team through the following activities: Gain a fundamental understanding of electric motor and VFD efficiency testing standards and methods under highly controlled ISO 17025 accredited procedures. Assist in the design and development of test, measurement, analysis, and visualization tools to improve the accuracy of motor efficiency calculations through aggregation of core, coupling, and stray losses. Participate in training to achieve hands on proficiency in the use of electrical and electronic test and measuring equipment including high accuracy voltage ohmmeters, power analyzers, torque converters, and handheld and clamp-on digital multimeters. Develop expertise in the use of LabVIEW, Excel, and MATLAB for numerical computations and graphical user interface development while performing motor efficiency tests. Investigate the existing mechanical and electrical layout of the motor testing setup and suggest any improvements in the design. Contribute in the dissemination of operational and research findings at relevant venues including poster presentation.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: The research experience at UNC Charlotte EPIC Motor Testing Lab will provide the students a well-rounded educational experience through hands-on work on real-world electrical machines and drives testing projects. The students will apply theoretical knowledge to real-world projects in efficiency testing of electrical machines and drives related research, design, and development. They will also gain experience in data analysis techniques to clean, analyze, and interpret complex datasets, development of robust user interfaces, and the use of industry-standard hardware and software tools and equipment. The projects will also help them develop problem-solving, critical thinking, and teamwork skills. A key outcome for students will also be increased learning to document findings and communicate technical concepts effectively to diverse audiences. environmental impact, and the scientific methods used to study them. The students will also build their resume through participation in the projects, and make connections with potential hiring managers and project team at the EPIC's corporate and affiliated research partners including Siemens Energy, Duke Energy, Dominion Energy, ABB, Advanced Energy, and Honeywell.

Required training of 2 hours with Description: Students will undergo comprehensive lab safety and motor efficiency testing competency training before they can work on the test setups. The training also includes fire safety and prevention, building emergency and evacuation, IT security training, laboratory safety, personal protective equipment 2.0, hazardous waste management, slips, trips, and falls, and back safety and injury prevention. All other training during the project will be on the job training and undergraduate students will be paired with full-time research staff to develop competency in the use of lab equipment and machinery.

Mentoring plan: To ensure students' success during the project, I am committed to establishing a strong mentor-mentee relationship with the students throughout their research journey. I will accomplish this through the following: 1) I will set and communicate my expectations to the students early and clearly as they start work on the project in the lab. The students will meet

directly and regularly with me to share their progress, address challenges, and set deliverables. I will use the meetings to provide timely feedback and guidance while ensuring that they feel supported and confident in their work. As the projects follow industry driven timeline, students will have clear idea of their upcoming deliverables. As they will be working as part of larger groups including graduate students, industry representatives, and research staff, I will lay out expectations on establishing a healthy team work environment and culture. I have open door policy and students will be able to share their progress and concerns and receive timely feedback and intervention from me. 2) I will ensure that students receive thorough training in laboratory techniques and the use of specialized equipment necessary for research in efficiency testing of electrical machines and drives. They will have access to laboratory equipment and resources as well as trained lab staff including me to help them with any technical challenges. 3) I will encourage the students participate in co-curricular activities including national level collegiate competitions, IEEE Power and Energy Society student chapter, and IEEE student branch meetings. I will also make the students aware of other professional development opportunities including EPIC Scholars immersive workforce development program, Lunch and Learn Recruiting Events from EPIC affiliates (GE Vernova, Burns and McDonnell, Pike Engineering, and Framatome) and resume building workshops. 4) I will also support and encourage students to develop their oral and written presentation skills through presentation of their work at UNC Charlotte Undergraduate Research Symposium, IEEE Southeast and Green Technologies conferences and workshops, and other local and regional professional venues. 5) I will also introduce the students to EPIC's industry partners to help them build their professional network. The networking at EPIC will be very helpful in finding internships, coops, and job placements.

Applicant Requirements: The students are expected to be pursuing an undergraduate program in engineering preferably electrical, mechanical, or engineering technology. Basic data analysis skills and familiarity with tools including LabVIEW, Excel, and MATLAB is preferred but not required. Training will be provided to students to build these skills through the course of the project.

Applicant Preferences: Students are expected to have strong written and oral communication skills with ability to document and present the findings. They are also expected to be comfortable working in hands-on environment and use of electronic/electrical and mechanical tools and equipment. The students should also possess a strong aptitude and curiosity to learn, adherence to safety culture around power equipment and rotating machinery in the lab, and drive to meet the project deadlines and deliverables. It will also be beneficial if students have interest in power and energy careers and pursuit of energy concentration in the William States Lee College of Engineering undergraduate programs.

Specific Time considerations/conflicts: None. I work with students around their academic schedules and provide ample opportunities for them to adjust their schedules in accordance with their coursework requirements.

App ID #: 3445

Mentor: Hou, Yu

Email: yu.hou@uncc.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: Yes

Title: Socially-Aware Multi-Floor Navigation for Quadruped Robots in Dynamic Indoor Environments

Description: Quadruped robots (e.g., robot dogs) have emerged as promising platforms for built environment inspection and emergency response. For example, they can be used for a primary search at the beginning stage of an indoor fire to find victims and combustible materials. Their mobility and ability to traverse terrain make the primary search easier than wheeled robots. However, robot navigation in complex environments (such as diverse staircases) and dynamic interaction between robots and pedestrians (such as social awareness of yielding, following, and overtaking behaviors) remain unexplored for efficient built-environment inspection and emergency response. Therefore, this research aims to develop a socially aware multi-floor navigation framework that integrates adaptive stair locomotion, dynamic human-robot interaction, and safety-aware navigation. Research Questions: How can socially appropriate behaviors such as yielding, waiting, and following emerge when robot dogs interact with humans on constrained staircases? Related work: Baixiao Huang, Baiyu Huang, and Yu Hou. "Training and Simulation of Quadrupedal Robots in Adaptive Stair Climbing for Indoor Firefighting: An End-to-End Reinforcement Learning Approach." arXiv preprint arXiv:2602.03087 (2026). DOI: <https://doi.org/10.22260/ISARC2026/0079> This project will provide an undergraduate student with hands-on research experience in quadruped robotics, reinforcement learning, and human-robot interaction. Here are some tasks that undergraduate students can contribute: Students will contribute to developing and evaluating a multi-floor navigation framework for the Unitree Go2 robot. They will train the robot dogs to climb the stairs in simulated environments and the real world. For the simulated environment, students will learn how to use reinforcement-learning framework for stair traversal in NVIDIA Isaac Lab, including straight, L-shaped, U-shaped, and spiral staircases. Students will focus on socially aware robot navigation. The undergraduate student will help construct dynamic simulation scenarios involving pedestrians, such as people walking toward the robot, crossing its path, blocking a staircase, or moving through stair landings. The student will assist in evaluating behaviors such as yielding, following, overtaking, waiting, and collision avoidance, extending the social-navigation behaviors. Last, students will participate in a physical robot experiment using the Unitree Go2. They will work with Ph.D. students to set up test environments, conduct controlled navigation trials, collect robot-state data, compare simulation and real-world performances and document experimental results. Here are some proposed test cases on which undergraduate students will work with the Ph.D. students: Robots and humans moving in the same direction on stairs. Robots and humans moving in opposite directions. Human temporarily blocking the staircase. Multiple humans occupying a landing. Slow pedestrian ahead of the robot. Humans suddenly enter the

robot's planned trajectory. Previously unseen staircase dimensions. Damaged or partially obstructed stairs.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

3 positions available

Anticipated Student Learning Outcomes: Students participating in this research will develop interdisciplinary knowledge and practical skills in robotics, artificial intelligence (AI), reinforcement learning, and human–robot interaction. Through hands-on work with NVIDIA Isaac Lab and the Unitree Go2 platform, students will gain experience developing simulation environments, conducting robot-navigation experiments, collecting and analyzing data, and evaluating robot performance. These activities build directly on the project's reinforcement-learning framework for quadruped locomotion and navigation, including sim-to-real deployment. Students will use these technologies when they find a job after they graduate or for an internship. The research experience will also strengthen Critical Thinking, Teamwork, and Career & Self-Development. Students will learn to troubleshoot technical problems, interpret experimental results, compare alternative navigation strategies, collaborate with faculty and Ph.D. students, and communicate their findings through research presentations, demonstrations, reports, and potentially scholarly publications. By the end of the project, students should be able to explain how engineering researchers move from a research question to simulation, experimentation, validation, and dissemination. This research can support applications for graduate programs, research positions, internships, and careers in robotics, AI, automation, and intelligent construction.

Required training of 20 hours with Description: The student will begin with a structured onboarding process that combines UNC Charlotte research-compliance training with project-specific technical preparation. The student will complete the appropriate Responsible Conduct of Research (RCR) training through the CITI Program, covering topics such as research integrity, data management, authorship, collaboration, conflicts of interest, and research misconduct.

After completing compliance training, the student will complete project-specific onboarding under faculty and Ph.D. student supervision. This will include an introduction to research ethics and laboratory safety; Python programming; reinforcement learning fundamentals; NVIDIA Isaac Lab; ROS 2; and safe operation of the Unitree Go2 quadruped robot. The student will initially work in simulation, learning how to configure environments, execute existing reinforcement-learning policies, and collect experimental data.

Once the student demonstrates proficiency with the simulation environment and understands the experimental protocols, they will progress to supervised physical robot experiments. Training will emphasize safe robot operation, experimental documentation, reproducibility, data management, troubleshooting, and appropriate procedures for human–robot interaction studies.

When students prove their ability and proficiency in operating robots, they will operate robots to interact with human research participants (pedestrians). The student will complete the required CITI Human Subjects Research training and be added to the approved IRB protocol before participating in human-subject research activities. UNC Charlotte requires all study personnel,

including students, engaged in human-subjects research to maintain current IRB-approved training.

Mentoring plan: My mentoring philosophy emphasizes structured guidance and meaningful student ownership of research. At the beginning of the project, I will work closely with the undergraduate student to establish clear research objectives, expectations, milestones, and an individualized learning plan based on the student's existing technical background and career interests. The student will initially work directly with me and, when appropriate, collaborate with graduate students and other members of the robotics research team. I will provide hands-on guidance in reinforcement learning, NVIDIA Isaac Lab, ROS 2, data analysis, and operation of the Unitree Go2, while ensuring that the student understands both the technical methods and the broader research questions motivating the work. The student can expect regular one-on-one meetings with me, typically once per week, supplemented by informal technical discussions and troubleshooting sessions as needed. Rather than assigning isolated tasks, I will progressively involve the student in the complete research process—from reviewing literature and developing simulation environments to designing experiments, analyzing results, and interpreting unexpected outcomes. As the student develops proficiency, I will transition from detailed instruction toward greater independence, encouraging the student to propose solutions, design experiments, and take ownership of a defined component of the larger project. Communication and professional development will also be integral to the mentoring process. The student will be expected to regularly present research progress at group meetings, providing opportunities to practice explaining technical concepts, responding to questions, and receiving constructive feedback. I will work with the student to develop research posters, demonstrations, and presentations for undergraduate research events and, when results warrant, regional or national conferences. Students making substantial intellectual and technical contributions will also be encouraged to participate in manuscript preparation and receive appropriate authorship recognition. The 2027 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2027) will take place in September 2027. Our team aims to submit our conference papers to this conference. The undergraduate students will have a chance to participate and present our work. My commitment is to provide an environment in which undergraduate researchers can learn through experimentation while receiving consistent guidance and constructive feedback. Success will therefore be measured not only by research results but also by the student's growth in technical competence, critical thinking, scientific communication, and independence.

Applicant Requirements: Applicants should be curious, dependable, willing to learn, and comfortable working through open-ended technical problems. Students should also demonstrate strong problem-solving, communication, and teamwork skills. Students should also be willing to follow laboratory safety procedures, research protocols, and responsible data-management practices. Because this project involves quadruped robotics and reinforcement learning, students should have completed or be currently enrolled in at least one course related to programming, engineering computing, robotics, AI, data science, or a closely related area. Basic programming experience, preferably in Python, is desirable because the project uses reinforcement-learning and robotics simulation tools.

Applicant Preferences: Experience with Linux, ROS/ROS 2, NVIDIA Isaac Lab, or robotics hardware would be helpful but is not required. Machine learning courses are highly recommended. Past experiences with conference or journal paper writing would be helpful but is not required.

Specific Time considerations/conflicts: There are no specific days or times that students must be available to participate in the research. The research schedule will be flexible. However, this research will use robot dogs. Scheduled consecutive-hour sessions may occasionally be needed for physical experiments with the Unitree Go2, research demonstrations, or presentations. Students will receive advance notice of these activities whenever possible.

Please note that the total hours for each week will NOT exceed the hours required by the OUR. For example, full-time: 150 hours over an academic semester. No more than 10 hours per week.

App ID #: 3446

Mentor: Hou, Yu

Email: yu.hou@uncc.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: Yes

Title: From Images to Energy Models: Using AI to Understand and Predict Building Energy Performance

Description: How much energy does a building use, and can AI figure this out just by looking at the building? This undergraduate research project will explore how Artificial Intelligence (AI), computer vision, 2D images, and 3D building data can be used to automatically create digital models that predict building energy consumption. Traditional building energy modeling can require significant time and specialized engineering knowledge. Recent research shows that AI can automate this process by extracting building information—such as size, height, orientation, windows, and building type—from images or 3D scans and converting it into a building energy simulation. The Scan2UBEM (scan to urban building energy modeling) research, for example, combines scan-derived building geometry, AI-generated operational information, expert review, and EnergyPlus simulation. Related work: Wu, Wei, Qingchun Li, and Yu Hou. "Scan2UBEM: An AI-driven End-to-End Pipeline Towards Automated Urban Building Energy Modeling from 3D Scans." the 13th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation, pp. 374-384. 2026. DOI: <https://doi.org/10.1145/3744256.3812572> An undergraduate researcher will work with the research team and Ph.D. students to investigate and test these emerging AI-based approaches. Students interested in AI, sustainability, buildings, or data science are encouraged to participate. Depending on the student's interests and experience, activities may include collecting images or 3D data of residential buildings, processing building images or point clouds, using AI tools to identify building characteristics, testing prompts for large language models, running building energy simulations, and comparing AI-generated results with known building information or energy data. The student will also help evaluate where AI works well and where it makes mistakes. This could involve comparing different AI models, checking automatically generated building parameters, analyzing simulation errors, preparing graphs and visualizations, and documenting experimental results. Students with stronger programming interests may help develop or improve Python-based components of the automated workflow, while students interested in buildings and sustainability may focus more heavily on energy modeling and validation. Through the project, the undergraduate researcher will gain hands-on experience with generative AI, computer vision/3D sensing, data analysis, building energy simulation, and scientific research, while contributing to the development of more scalable methods for understanding and improving the energy performance of buildings and communities.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students participating in this research project will gain interdisciplinary experience at the intersection of AI, building science, sustainability, data analytics, and energy modeling. Rather than learning these topics only in the classroom, students will apply them to real buildings and authentic research problems. They will learn how building images and 3D data can be transformed into geometric information and how AI can help generate parameters needed for building energy simulations. This reflects the project's broader research workflow of connecting visual building information, AI-based inference, and physics-based energy modeling. Students will develop practical technical skills in areas such as generative AI and large language models (LLMs), computer vision and 3D data processing, Python programming, data visualization, and building energy simulation. They may gain experience with tools such as EnergyPlus or Modelica and learn how AI agents can perform specialized tasks including information extraction, model generation, and model verification. The project will also provide experience with the research process, including literature review, experimental design, data collection, documentation, teamwork, interpretation of results, and presentation of findings. Students may have opportunities to contribute to research posters, presentations, technical reports, or publications.

Required training of 10 hours with Description: The student will begin with a structured onboarding process that combines UNC Charlotte research-compliance training with project-specific technical preparation. The student will complete the appropriate Responsible Conduct of Research (RCR) training through the CITI Program, covering topics such as research integrity, data management, authorship, collaboration, conflicts of interest, and research misconduct.

After completing compliance training, the student will complete project-specific onboarding under faculty and Ph.D. student supervision. This will include an introduction to research ethics and laboratory safety; Python programming; and building energy simulation,

This project will not include human subjects research. No IRB training will be needed, but the PI will encourage students to understand and complete CITI programs related to the IRB.

Mentoring plan: My goal is to provide the student with a structured, supportive research experience in which they gradually develop independence while always knowing where to turn for guidance. Because this project combines artificial intelligence, building energy modeling, computer programming, and data analysis, I do not expect an undergraduate student to arrive with expertise in all of these areas. I will begin by helping the student understand the overall research question and how their individual tasks contribute to the larger project. The student will then receive targeted training in the tools and concepts needed for their specific work, such as Python, generative AI and large language models, image or 3D data processing, EnergyPlus or Modelica simulation, and research data analysis. The underlying research workflow integrates visual or scan-derived building information with AI-assisted model generation and physics-based energy simulation, so the student's training will emphasize both computational skills and engineering interpretation. A major mentoring commitment I make is to help the student understand that research includes uncertainty, iteration, and results that do not always match expectations. This is especially important in AI research. The student will see that an AI system can produce an answer that appears convincing but is inaccurate or physically unrealistic. For example, the Scan2UBEM research demonstrates the importance of checking AI-generated building parameters and using

engineering knowledge to evaluate physical plausibility rather than simply accepting an automated output.

Applicant Requirements: Applicants should be curious, dependable, willing to learn, and comfortable working through open-ended technical problems. Students should also demonstrate strong problem-solving, communication, and teamwork skills. Students should also be willing to follow laboratory safety procedures, research protocols, and responsible data-management practices. Some prior experience with programming, data analysis, building systems, energy, AI, computer vision, or simulation would be helpful but is not required. For example, familiarity with Python, BIM, EnergyPlus, Modelica, GIS, image processing, or LLMs could allow a student to begin certain tasks more quickly. Relevant coursework might include introductory programming, data science, building systems, HVAC, energy systems, BIM, computer applications, AI, or computer vision. Completion of these courses is not a prerequisite. A student who has demonstrated strong problem-solving ability in other technical courses may be equally well prepared.

Applicant Preferences: Experience with EnergyPlus or Modelica (or Simulink) would be helpful but is not required. Machine learning courses are highly recommended. Past experience with conference or journal paper writing would be helpful but is not required.

Specific Time considerations/conflicts: Students do not need to be available on specific days or times to participate in the research. The research schedule will be flexible.

App ID #: 3450

Mentor: Nguyen, Loc

Email: loc.nguyen@charlotte.edu

Title: Can Computers See the Unseen? Reconstructing Hidden Objects with Mathematics and AI

Department: Mathematics and Statistics

Co-mentor: No

Community engaged research: No

Title: Can Computers See the Unseen? Reconstructing Hidden Objects with Mathematics and AI

Description: How can we determine what is inside an object without cutting it open? Technologies such as radar, medical imaging, and underground sensing approach this problem by sending waves toward an object and measuring the waves that return. The challenge is to use these indirect measurements to reconstruct the unknown object. This type of problem is called an inverse problem. This project explores a new computational method called the Legendre–Fourier dimension-reduction operator network (LF-ONet). LF-ONet combines mathematical techniques with neural networks to reconstruct an unknown object from wave measurements collected on only one side of it. The mathematical component reduces a complicated three-dimensional problem to a more manageable collection of two-dimensional problems. The neural-network component then learns how to transform the measured data into an image of the hidden object. The student will not be expected to understand the complete mathematical theory at the beginning. Instead, the student will learn the main ideas gradually through visual examples, short readings, guided MATLAB exercises, and weekly discussions with the faculty mentor. The student will contribute to the project by: Learning how waves can be used to obtain information about hidden objects; Using MATLAB to generate or organize simulated measurement data; Running and modifying existing MATLAB programs for LF-ONet; Training and testing the neural-network model on simple examples; Visualizing reconstructed objects and comparing them with the true objects; Studying how measurement noise, limited data, and model parameters affect reconstruction quality; Recording experimental results and helping prepare a research poster or presentation. Depending on the student's interests and progress, the project may emphasize mathematical modeling, MATLAB programming, numerical experiments, neural networks, or visualization. The project is designed as an accessible introduction to research at the intersection of applied mathematics, scientific computing, imaging, and artificial intelligence. The results will help evaluate and improve LF-ONet and will provide preliminary work for future research publications and an NSF Computational Mathematics proposal.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on research experience at the intersection of applied mathematics, scientific computing, imaging, and artificial intelligence. They will learn how mathematical models and computational methods can reconstruct hidden objects from indirect wave measurements—an idea used in medical imaging, radar, geophysical exploration, and nondestructive testing. By the end of the project, students are expected to be able

to:

- Explain in accessible language what an inverse problem is and why reconstructing an object from limited measurements is challenging.
- Describe the basic idea of using reflected waves to obtain information about an unknown object.
- Use MATLAB to load, process, visualize, and analyze scientific data.
- Run, understand, and modify existing research code with guidance from the faculty mentor.
- Generate synthetic data for computational experiments and organize the resulting datasets.
- Understand the basic structure of an operator-learning neural network and how it can learn a relationship between measured data and an unknown object.
- Train and test LF-ONet on simulated examples.
- Design numerical experiments to investigate how measurement noise, limited data, training choices, and model parameters affect reconstruction accuracy.
- Evaluate reconstruction results using visual comparisons and quantitative error measures.
- Interpret unexpected results, identify possible sources of error, and propose follow-up experiments.

Maintain clear research documentation and communicate findings through an abstract and a research presentation. Students will also develop broadly transferable career-readiness skills, including critical thinking, quantitative reasoning, problem-solving, programming, data analysis, communication, collaboration, time management, and research ethics. Because the project includes both mathematical and computational components, responsibilities can be adapted to students' backgrounds and interests. For example, one student may focus more on data simulation and MATLAB implementation, while another may focus more on training, testing, and evaluating LF-ONet. The students will also learn to coordinate their work and explain technical results to one another. After completing the project, students should be able to say: "I participated in an interdisciplinary research project that combined mathematics and artificial intelligence. I used MATLAB to conduct computational experiments, worked with a neural-network model, analyzed reconstruction accuracy, collaborated with another researcher, and presented the results to an academic audience." This experience will help prepare students for graduate study and careers in applied mathematics, data science, scientific computing, engineering, computational imaging, and artificial intelligence. It will also allow them to produce tangible research outputs—including MATLAB code, numerical results, visualizations, and a formal research presentation—that they can discuss in future applications and interviews.

Required training of 0 hours with Description: No prior research experience or background in inverse problems, wave propagation, or neural networks is required. The students will complete a structured onboarding process during the first two weeks of the project.

The training will include:

- An accessible introduction to the research problem, including how reflected waves can be used to obtain information about hidden objects and why reconstructing an object from limited measurements is difficult.
- A conceptual introduction to LF-ONet and its two main components: mathematical dimension reduction and operator learning.
- Guided MATLAB exercises covering matrices, multidimensional arrays, data visualization, image processing, and basic numerical computations.
- Instructions for accessing, running, and organizing the project's existing MATLAB code and datasets.
- Training on how to generate synthetic measurement data, run LF-ONet experiments, visualize reconstructed objects, and compare reconstructions with the true objects.
- Guidance on maintaining a research log, organizing computational results, naming and documenting code, and reporting errors or unexpected outcomes.
- An introductory research task

in which each student runs an existing example, visualizes the results, and explains what the results show.

The faculty mentor will provide background readings, sample MATLAB programs, example datasets, and step-by-step instructions during the initial training period. Tasks will initially be closely guided and will become progressively more independent as the students develop confidence and technical skills. The training and subsequent research assignments will also be coordinated so that the two students can collaborate while maintaining clearly defined individual responsibilities.

This is a computational project using simulated data. It does not involve human participants, animals, clinical data, hazardous materials, or fieldwork. Therefore, no IRB or specialized laboratory compliance training is anticipated.

Mentoring plan: My mentoring approach is based on structured guidance, regular communication, and gradual development of student independence. I recognize that undergraduate researchers may begin the project without prior knowledge of inverse problems, wave propagation, or neural networks. I will therefore introduce the research concepts progressively and connect each mathematical idea to a concrete MATLAB experiment or visualization. The students will work directly with me throughout the semester. We will have a scheduled weekly research meeting to review results, discuss questions, and establish goals for the following week. At the beginning of the project, meetings will focus on foundational concepts, MATLAB training, and closely guided computational exercises. As the students gain experience, our discussions will increasingly focus on interpreting results, troubleshooting problems, designing new experiments, and identifying promising research directions. Students may also contact me between meetings when they encounter questions that prevent them from making progress. Because this project can accommodate two students, I will assign complementary but clearly defined responsibilities. For example, one student may focus primarily on generating and organizing simulated data, while the other investigates training and evaluating LF-ONet. However, both students will learn the complete research workflow and understand how their individual contributions fit together. They will share progress with each other, review selected results together, and practice explaining technical ideas to a peer. I will provide the students with:

- Accessible introductory readings and explanations of the underlying research problem;
- Existing MATLAB code, example datasets, and guided introductory exercises;
- Clearly defined weekly tasks and achievable milestones;
- Regular feedback on code, numerical experiments, figures, and written work;
- Assistance in diagnosing computational errors and interpreting unexpected results;
- Guidance in maintaining organized code, data, and research documentation;
- Support in preparing the required abstract and final research presentation.

Each student will maintain a brief research log recording completed tasks, computational settings, important results, difficulties encountered, and plans for the next week. This will help the students develop good research habits and allow us to monitor progress throughout the semester. The students will be expected to give brief, informal progress updates during our meetings. Near the end of the semester, they will prepare a formal abstract and a discipline-appropriate presentation for the required OUR research event. If the project produces results suitable for a broader academic audience, I will also encourage and assist the students in presenting at an additional university or professional conference and in contributing to a future research publication. I am committed to maintaining a supportive environment in which students feel comfortable asking questions and making mistakes. Research frequently involves programs that do not initially work,

results that are difficult to explain, and approaches that must be revised. I will help students view these experiences as a normal and valuable part of the research process. My goal is not only to help the students complete assigned tasks but also to help them develop confidence as researchers. By the end of the experience, I expect them to understand the larger purpose of their work, make informed decisions about computational experiments, communicate their findings clearly, and recognize how their contributions advance the LF-ONet project.

Applicant Requirements: This project is suitable for motivated undergraduate students interested in using mathematics and computing to solve a scientific imaging problem. Applicants from mathematics, computer science, data science, engineering, physics, or related disciplines are encouraged to apply. Required qualifications: • Completion of Calculus II or an equivalent course; • Some introductory programming or computational experience in any programming language; • Willingness to learn MATLAB and work with mathematical and computational concepts; • Ability to follow multi-step instructions and maintain organized records of code, data, and experimental results; • Reliability in completing weekly tasks and communicating progress or difficulties; • Willingness to ask questions, receive feedback, and revise work when an approach does not initially succeed; • Availability to commit approximately 10 hours per week, including the OUR programmatic requirements, throughout the academic semester. Previous research experience is not required. Applicants are not expected to have prior knowledge of inverse problems, wave propagation, partial differential equations, or neural networks. The necessary mathematical concepts and computational tools will be introduced during the project.

Applicant Preferences: The following qualifications and characteristics are preferred but are not required: • Completion of or current enrollment in Calculus III, Linear Algebra, Differential Equations, Numerical Analysis, or a related course; • Previous experience with MATLAB or another programming language; • Familiarity with matrices, multidimensional arrays, images, or scientific data; • Interest in applied mathematics, scientific computing, computational imaging, data science, or artificial intelligence; • Curiosity about how mathematics and machine learning can be combined to solve real-world problems; • Attention to detail when running computational experiments and recording results; • Persistence and patience when troubleshooting code or interpreting unexpected results; • Ability to work both independently and collaboratively with another undergraduate researcher; • Willingness to explain results, participate actively in weekly meetings, and contribute to a research poster or oral presentation. Students do not need to satisfy every preference listed above. Prior research experience and previous coursework in inverse problems, partial differential equations, wave propagation, or neural networks are not expected. We strongly encourage curious, dependable students who are motivated to develop new mathematical and computational skills to apply.

Specific Time considerations/conflicts: Students do not have specific days or times when they must be available. The faculty mentor and selected students will identify a mutually convenient time for a weekly research meeting. Students must also attend the professional development activities and end-of-semester research presentation required by the OUR program.

App ID #: 3452

Mentor: Schmutz, Vaughn

Email: vschmutz@charlotte.edu

Title: Associate Professor

Department: Sociology

Co-mentor: No

Community engaged research: Yes

Title: Assessing the impact of the Creative Entrepreneurs Initiative

Description: In partnership with Charlotte is Creative, this project will focus on the impact of their Creative Entrepreneurs Initiative (CEI) that focuses on giving artists and creative workers in Charlotte the financial tools, planning strategies, and professional connections they need to be successful. Since 2022, 135 creative entrepreneurs have been through the 10-week training and most alumni remain actively involved in the program and stay connected to Charlotte is Creative. The goal of this project is to assess the impact of the program on the career outcomes, confidence, and connections of CEI participants. Recent research on creative workforce development programs, particularly those that emphasize entrepreneurial and business skills, have produced several key findings that this project will build on. These include: Income stabilization and offsetting an earnings gap. While arts graduates traditionally face lower average earnings, adding formal entrepreneurial training offsets this income gap by roughly half (Makridis & Kuuskoski 2024). Other studies examining arts entrepreneurship training show that it helps creatives move toward financial self-sustainability. Legitimization and professional identity. Evaluation of the Creative Innovator Program in Australia found that business training helped artists legitimize their ventures. Creatives gained the confidence to view themselves as business entities and artists (Lee et al. 2023). Change of mindset from creator to enterprise. Key training modules (e.g., financial literacy, contract negotiation, digital marketing, and intellectual property) help creatives navigate freelancing, short-term contracts, and portfolio careers typical of the creative economy. High employability and adaptability. Arts graduates and creatives with business skills show higher rates of venture creation compared to non-creative peers, adapting more readily to market demands through critical problem-solving and flexible skill sets (Bridgstock 2013). This project will focus on three main dimensions of impact: Financial and economic viability (e.g., income growth, less non-artistic secondary employment, venture survival rates, fundraising) Psychological and entrepreneurial mindset (e.g., change in self-efficacy, business confidence, shift in professional identity) Network and ecosystem health (e.g., professional network expansion, collaborations, community impact) Research methods will primarily include surveys distributed to CEI participants as well as interviews and focus groups to better understand their experiences with the program and its effects.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: There are a number of benefits students can learn from this project. Some of them include: 1. Learning to communicate research findings to different

audiences. Given that we will be working directly with community partners and creative entrepreneurs, we will be reporting findings with practical usefulness to stakeholders while also furthering academic research on the broader impacts of these activities in the creative community.2. Data collection and analysis. I anticipate that students will get hands-on experience collecting survey and interview-based data as well as analyzing it. Therefore, students will gain skills in both quantitative and qualitative research methods and learn how to identify which methods are most appropriate for answering which questions.3. Teamwork and collaboration. Any students that participate in this project through OUR will join an active research team with multiple faculty and students doing community-engaged arts research. So, they will have the opportunity to join our arts research team and learn how to collaborate on shared projects and hopefully have co-authoring opportunities as a result.4. Engagement across perspectives. Students will have the opportunity to engage with individuals with diverse experiences and perspectives in the local arts and culture ecosystem.

Required training of 10 hours with Description: Human subjects training will be necessary for inclusion in the IRB protocol (i.e., the basic Social & Behavioral Research course in CITI training)

Mentoring plan: As suggested above, OUR students will join a highly active arts research team at UNC Charlotte. We have regular team meetings as well as individual check-ins weekly. I provide hands-on mentoring with regular check-ins and close collaboration. As the faculty mentor, I will help the OUR scholar(s) build rapport with our partners at Charlotte is Creative by attending their events and setting up meetings as necessary. The OUR scholar(s) will likely have opportunities to present findings to Charlotte is Creative.

Applicant Requirements: Self-motivated and able to complete tasks independentlyWillingness to learnOpen, honest communication with both faculty and community mentorsAbility and openness to working with and interacting with people from a variety of backgrounds and perspectives

Applicant Preferences: Students who are interested in the arts, creative careers, and/or creative entrepreneurship will be particularly drawn to this opportunity. Preferred skills and interests include an interest in making connections in Charlotte's arts and culture sector as well as some familiarity with social science research methods, but this is not a requirement of the position.

Specific Time considerations/conflicts: Not applicable. We can adjust the schedule to fit with the OUR scholar's availability.

App ID #: 3453

Mentor: Noras, Maciej

Email: mnoras@uncc.edu

Title: Associate Professor

Department: School of Energy

Co-mentor: No

Community engaged research: No

Title: Ultra-low power energy harvesting circuit

Description: The student will build and test novel ultra-low power harvesting circuit. This work is supporting a chemical and biomolecular engineering team at NC State University (NCSU). They developed a liquid metal hydrogel material that can harvest mechanical energy (<https://www.youtube.com/watch?v=C9ngOC2HuVo>). Our team at the LISPEL Lab (<https://coefs.charlotte.edu/mnoras/lispe-lab/>) is building electronics to convert the harvested ultra-low level electric signals into an useful electric energy. The goal is to:- select and design a feasible circuit- design and build a printed circuit board (PCB)= test the built prototype- demonstrate the operation on the hydrogel material from the NCSU- document the work. Why join? You will learn how to design electrical circuits using professional software, you will learn how to design and make circuit boards using a prototyping system and how to test electronic devices. Networking You will interact with external team of graduate students.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Technology skills: The student will learn hands on skills such as circuit and enclosure design, circuit board making, soldering, use of testing equipment. Teamwork skills: The student will engage in teamwork with a group of graduate students. Critical thinking: Occasional problem solving and troubleshooting of the built circuits will be needed. Communication skills: The student will participate in meetings with the NCSU team. She/he will also have a chance to try publication writing - a conference and a journal paper publications are planned. Professionalism: The student will participate in weekly meetings and report on the progress of the project. Skills acquired through this project will be very useful for future electrical and electromechanical engineers. Proficiency in designing, building, testing and troubleshooting is important for professionals working in technical fields, especially for design, manufacturing and service companies.

Required training of 8 hours with Description: Training will be provided on use of the software for circuit and circuit boards design (Altium Designer), operation of a printed circuit board milling machine (QCJ5).

The student will also be taught how to solder, test and troubleshoot electronic circuits using laboratory equipment: power supplies, multimeters, oscilloscopes and signal generators.

Mentoring plan: Training and Guidance You'll receive direct training on how to use Altium Designer for circuit and PCB design, and how to operate the QCJ5 PCB milling machine. You will be taught how to solder, test, and troubleshoot electronic circuits using lab equipment like power supplies, multimeters, oscilloscopes, and signal generators. Weekly Meetings We'll meet once a week to talk through your progress, answer questions, and plan next steps. These meetings are a chance for you to share what you've learned, get feedback, and stay on track. Documentation Help I'll show you how to keep proper engineering records, including a project journal and test reports. You'll learn how to document your work clearly and professionally. Writing and Presenting You'll have the chance to help write a conference paper and/or a journal article. I'll guide you through the writing process and help you prepare if you're interested in presenting your work at a conference. Team Collaboration You'll work closely with external (NCSU) graduate students.

Applicant Requirements: Willingness to Learn You'll be trained in tools and techniques that may be new to you. We're looking for someone who is open to learning, asks questions, and takes initiative when faced with unfamiliar tasks. Reliability and Responsibility This project involves teamwork and regular progress updates. We need someone who follows through on commitments, communicates clearly, and respects deadlines. Attention to Detail Circuit design and testing require careful observation and documentation. If you're someone who notices small things and takes pride in doing work carefully, you'll thrive here. Problem-Solving Mindset You'll encounter challenges—whether it's a circuit that doesn't work or a design that needs tweaking. We're looking for someone who enjoys troubleshooting and thinking through possible solutions. Team Player You'll be working with graduate students and attending weekly meetings. Being respectful, collaborative, and open to feedback is essential.

Applicant Preferences: Desired Skills and Experiences You don't need to have all of these, but having some will help you get started faster: Basic Knowledge of Electrical Circuits If you've taken a course like Intro to Electrical Engineering or Circuits I, that's helpful. If not, we'll teach you the fundamentals. Experience with Lab Equipment Familiarity with multimeters, oscilloscopes, or power supplies is a plus—but not required. You'll be trained on how to use all lab tools. Comfortable with Computers and Software You'll be using Altium Designer for circuit and PCB design. If you've used any design or simulation software before (like Cadence, LTspice, MATLAB, or Fusion 360), that's great—but we'll provide full training. Hands-On Experience If you've built a project in a lab course, participated in a makerspace, or done any soldering or prototyping, that experience will help. But again, we'll teach you everything you need to know.

Specific Time considerations/conflicts: No specific dates and times for the meetings and work time have been established yet. We will adjust to the team's academic schedule for Spring 2027.

App ID #: 3454

Mentor: Loweth, Robert

Email: rloweth@charlotte.edu

Title: Assistant Teaching Professor

Department: Office of Student Development & Success

Co-mentor: No

Community engaged research: No

Title: GenAI Co-Creativity: Exploring ways to support engineering design work using GenAI

Description: Engineering design is creative. In addition to figuring out possible solutions, designers also exercise their creativity in thinking about who may be impacted by their designs and possible criteria to evaluate their designs. All these creative tasks rely on a process called “divergent thinking,” or coming up with as many ideas as possible before narrowing down to ideas that are optimal. Divergent thinking can be difficult for engineering students to master. However, Generative AI tools excel at producing ideas and can potentially be used to support student designers in their divergent thinking. We have gathered two data sets of twenty senior-level undergraduate engineering students using Microsoft CoPilot to generate as many ideas as possible. The first data set involved generating ideas for stakeholders, or individuals who may impact or be impacted by a design. The second data set involved generating relevant criteria for evaluating designs. Each data set includes video recordings of the participants, audio transcripts from the recordings, and copies of each participant’s CoPilot chat transcript. This project has three main tasks where we want to involve undergraduate researchers. The first task is to clean one or both data sets, which will involve watching recordings of the participants and verifying audio transcripts that were automatically generated from the recordings. This task is crucial for future data analysis. The second task is to evaluate the CoPilot chat outcomes of each participant. In other words, we want to determine how effective each participant was at generating a wide range of ideas. The third task is to evaluate the prompting approach of each participant. We want to understand which prompting approaches may be more effective, particularly for producing unusual ideas. This project can handle up to four undergraduate researchers, or two researchers per data set working as a team. Work can be completed on the student’s own laptop and/or remotely. There is no dedicated lab space for this research project.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

4 positions available

Anticipated Student Learning Outcomes: As a result of participating in this research project, students will be able to: Apply Generative AI tools effectively to support their engineering design work, and possibly also their data analysis workflows Evaluate what makes a “good” divergent thinking process Handle and draw conclusions across multiple kinds of human subjects data Apply basic analysis approaches for human subjects data Apply effective data organization strategies

Required training of 5 hours with Description: Student researchers must complete a Human Subjects Research Basic Course (Social & Behavioral Research) in CITI.

Mentoring plan: Mentees will work directly with me, Dr. Loweth. Mentees should expect to meet with me for an hour weekly to review progress, but I am also available for more frequent contact as needed. Beyond the required human subjects CITI training, I will train mentees in the human subjects analysis methods needed for this project. We will also review norms for technical presentation of research findings, which are applicable across many fields. The expected outcomes of this research project are conference and journal papers. Mentees may contribute to this writing if time allows. The goal, by the end of the semester, is that mentees will have contributed enough to preparing a set of findings as to warrant paper authorship, although the actual publication of said papers may happen up to two years after the Spring semester. Other possible outcomes include recommendations for effective GenAI use in engineering design, and/or GenAI agents that leverage these recommendations. My work also sits at the intersection of engineering education research and engineering design research. Beyond the specific tasks for this project, I am happy to discuss norms in either research field to set mentees up for graduate school. For mentees who are not interested in graduate school, part of my engineering education research (outside of this project) also involves studying engineering practice. I'm happy to connect how the skills applied in this project relate to broader preparation to join the engineering workforce.

Applicant Requirements: Students must have completed an introductory engineering design course (such as ENGR 1300) and an introductory logic or coding class (such as ENGR 1302) with a grade of B or better.

Applicant Preferences: Enthusiasm and a willingness to learn about human subjects research. Comfort using Generative AI tools such as ChatGPT.

Specific Time considerations/conflicts: N/A

App ID #: 3455

Mentor: Rasanen, Ryan

Email: rrasanen@uncc.edu

Title: Assistant Professor

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Linking Nuclear Magnetic Resonance Pore-Water State to the Mechanical Response of Sand-Fines Mixtures

Description: Soils are often described by grain size, density, water content, and plasticity, but these conventional measurements do not fully describe how water is distributed within the pore space between soil particles. This matters because pore water and soil structure strongly influence how soil deforms under loading. Low-field nuclear magnetic resonance, or NMR, provides a non destructive way to measure water in soil and characterize how that water relaxes within different pore environments. NMR has been widely used in the medical field, oil industry, and hydrogeology, but only recently its potential in geotechnical engineering has been explored. Given NMR's significant potential, this project aims to determine whether measurements of pore-water state from NMR can help explain differences in soil mechanical behavior under loading. If successful, this research could ultimately improve our understanding of how soils support infrastructure foundations and why some saturated soils can lose strength during earthquakes and temporarily behave more like a fluid, similar to quicksand. This Spring 2027 project will build on a Fall 2026 study that is developing repeatable NMR methods for sand mixed with controlled amounts of silt and clay. The student will review the validated Fall results, help select two or three informative soil mixtures, prepare carefully controlled companion specimens, collect NMR data on one specimen, and conduct monotonic triaxial testing on the companion specimen. The project will examine whether NMR measurements are associated with differences in stress-strain response, stiffness, pore pressure generation, and contractive or dilative behavior. That is, this project aims to link the state of pore water in soil measured using NMR to the mechanical behavior of soil. The student will contribute to the research process rather than serve only as laboratory assistance. Activities will include reading selected papers, performing phase relation calculations, carefully preparing specimens, maintaining a laboratory notebook/spreadsheets and QA/QC log, processing and plotting data, evaluating hypotheses, and preparing an OUR poster presentation. Previous NMR or triaxial experience is helpful but not required. A new student will receive structured training, while a student with related prior experience may progress more quickly to the advanced testing.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: By the end of the project, the student will have gained hands on experience designing and conducting geotechnical laboratory research. They will learn how concepts from soil mechanics, including void ratio, saturation, phase relationships, and effective stress, are used to design controlled experiments rather than only solve textbook

problems. The student will also gain experience with two research tools that are not typically encountered in undergraduate courses: low-field NMR and triaxial testing. The student will develop skills in preparing controlled soil specimens, collecting and organizing experimental data, evaluating measurement repeatability and uncertainty, and analyzing NMR, stress-strain, pore pressure, and effective stress path data. Just as importantly, the student will learn how researchers evaluate whether experimental results actually support a hypothesis, how unexpected results are investigated, and why careful documentation and quality control are essential in laboratory research. By the end of the semester, I would like the student to be able to describe their experience as having helped investigate a new geotechnical research question from specimen preparation through data interpretation. They should be able to explain how NMR measurements of pore water may be connected to the mechanical behavior of soils, discuss the limitations of the experimental results, and communicate their findings through figures and an OUR research presentation. These experiences will help prepare the student for engineering practice or graduate research by strengthening skills in critical thinking, laboratory experimentation, data analysis, technical communication, and independent problem solving.

Required training of 15 hours with Description: The first two to three weeks will include laboratory orientation, review of relevant safety data sheets and approved silica dust controls, NMR magnet safety, triaxial test training, data management training, and selected background reading. The student will complete supervised NMR testing, practice specimen calculations and preparation, and assist running triaxial tests on preliminary soil specimens before the core research specimens. Training will be documented through checklists and direct observation.

Mentoring plan: I will meet with the student for approximately 60 minutes each week to review results, discuss the next experimental decisions, and set a written plan for the coming week. Early laboratory work will be completed through direct, hands on training. Responsibility will then increase in stages as the student demonstrates safe and reproducible performance. I will provide timely feedback on calculations, figures, writing, and presentation materials, and I will be available for questions by email and via ad hoc meetings. The student will be expected to explain results, including unexpected or null results, and will prepare a final presentation for the OUR research conference and other conference presentations as available. The student is also expected to aid in publishing the research results in a conference and/or journal paper.

Applicant Requirements: The strongest applicant will be curious, careful, dependable, and willing to learn unfamiliar laboratory and data analysis methods. The project requires patience with detailed specimen preparation, accurate recordkeeping, comfort asking questions when something does not behave as expected, and interest in connecting measurements to physical soil behavior. Prior experience is valuable, but reliability and a strong work ethic are more important than already knowing the equipment.

Applicant Preferences: Required skills, courses, or experiences: Ability to commit to the 150-hour academic semester option and complete required laboratory safety training. Basic college algebra and comfort using spreadsheets for calculations and data organization. Willingness to follow written procedures, handle laboratory materials carefully, and maintain complete records. Ability to work safely with laboratory instrumentation. No prior NMR or triaxial testing experience is required. Recommended or preferred characteristics, skills, courses, or experiences: Civil or

environmental engineering, geological sciences, physics, mechanical engineering, or another quantitatively related major. Completion of, or concurrent enrollment in, soil mechanics or an introductory geotechnical engineering course and laboratory. Previous laboratory, undergraduate research, or careful hands on project experience. Experience with Excel and interest in learning MATLAB, Python, or another data analysis tool. Interest in geotechnical engineering, earthquake engineering, applied geophysics, soils, or laboratory instrumentation.

Specific Time considerations/conflicts: No fixed day is required. The student should have at least one three to four hour weekday laboratory block each week, be available for a weekly mentor meeting, and have flexibility for brief checks on laboratory tests on an adjacent weekday when a specimen is undergoing saturation or consolidation. The exact schedule will be established with the selected student.

App ID #: 3456

Mentor: McGowan, Mary Jo

Email: mjshephe@charlotte.edu

Title: Assistant Professor

Department: Political Science & Public Administration

Co-mentor: Yes

Robert Hines, rhines15@charlotte.edu, Political Science & Public Administration

Community engaged research: No

Title: Does Leslie Knope earn more than Election Administrators? Phase 2b

Description: This project builds on previous work by Dr. Mary Jo McGowan, Dr. Robert Hines, Dr. Zachary Mohr, and Dr. Martha Kropf comparing the salaries of Election Administrators in North Carolina to other county level program administrators. Election administrators are the government employees that administer and run elections. They perform work including maintaining voter rolls, testing voting machines, creating ballots, managing campaign paperwork, and more. In NC counties there are many types of program directors such as the Director of Elections, Director of Parks & Recreation, Director of Social Services, Library Directors and so on. In “Does Leslie Knope Make More Than Election Directors? Analysis of Election and Other County Directors in North Carolina Counties” we found that in NC counties the Election Director is the lowest paid director on average. Now we want to know if this finding holds true in other states. To determine how other Election Directors compare, we need to collect data from those other states. We plan to collect from states in which the Election Director is appointed, elected, or hired as a professional. The different ways in which an Election Director gets that job could matter to how much they get paid. Your task is to find, download, and assess the salary reports created by these states. You will learn how to do this using Excel and R and how to merge the data into a dataset for analysis. Building, maintaining, and evaluating a database is a useful and crucial skill both in academic research and analytic jobs. Election Administrators around the country face very difficult jobs of running the elections in each state and election jurisdiction. The job for these election directors is getting more difficult especially in the face of threats of election interference. This is an interdisciplinary project of Political Science, Public Administration, and Public Policy scholars. We are open to students who want to work 5 or 10 hours a week.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

3 positions available

Anticipated Student Learning Outcomes: By the end of the project, participating students will be able to: Demonstrate foundational knowledge of election administration in the United States. Demonstrate the capability to independently collect data by identifying, evaluating, and retrieving data from government websites and public data repositories. Construct, organize, and manage datasets for statistical analysis, including downloading, cleaning, formatting, and preparing files for integration into a larger database. Use basic analytical tools and software, including intermediate Microsoft Excel functions and introductory techniques in R or Stata, to manipulate, structure, and

model data. Collaborate effectively within an interdisciplinary research team, demonstrating professional communication, shared problem solving, and responsibility for collective research goals. Engage in scholarly dissemination, with the potential to contribute to co-authored research papers, participate in undergraduate research presentations, and prepare work suitable for submission to the North Carolina Political Science Association conference in Spring 2027 or the Conference on Election Science, Reform, and Administration in Summer 2027. Students will be able to understand career pathways in the growing field of election administration.

Required training of 1 hours with Description: We will plan weekly training meetings for 10 hours a week students or bi-weekly meetings for 5-hour-a-week students. In the training meetings, we will provide 1) an orientation to the administration of elections, 2) information on locating and understanding state salary databases, 3) Excel spreadsheet skills that will allow students to navigate and interpret salary information, and 4) basic R and or Stata skills that will allow students to see how the collected data can be used in a statistical model. Throughout the term, we will discuss professionalism and conduct regular check-ins to problem solve any technical issues encountered by the student.

Mentoring plan: The research team will provide structured, consistent mentorship to undergraduate researchers throughout the duration of the project. Students will have regular access to faculty mentors during standard business hours, Monday through Friday, and will work directly with Prof. Mary Jo McGowan and Prof. Robert Hines. Dr. McGowan will lead training on navigating government websites, identifying credible sources, and locating election administration data. Dr. Hines will provide complementary guidance on data management, including instruction on data storage, database construction, and merging datasets together. Dr. McGowan and Dr. Hines will guide students in the writing of their abstract and the preparation of their final poster/presentation which they will present at the Spring Undergraduate Research Conference. By the end of the project, students will demonstrate strengthened critical thinking skills related to identifying and evaluating relevant data; moderate proficiency in database construction; introductory experience with R or Stata; and intermediate skills in Microsoft Excel. Students will also develop the ability to locate, interpret, and assess information from government websites and gain a deeper understanding of the varied structures of election administration across U.S. states.

Applicant Requirements: We are looking for a student who is curious about election administration in the United States and committed to accurate research. Interested students will need strong organizational and analytical skills to document state election practices, build well-structured datasets, and collect data from unstandardized sources. Students will also need strong written and verbal communication skills to effectively share their results with the rest of the research team. While students with a basic understanding of spreadsheet tools (Excel) and scripting (R or Stata) may find it easier to begin the work, we are primarily looking for someone who is excited to learn how to professionally collect and analyze data. We will provide technical mentorship in these areas.

Applicant Preferences: Our preference is for a student who can demonstrate moderate research and data-management abilities, including experience working with spreadsheets, databases, or basic statistical tools. We would also prefer that the student have a background in public policy, political science, or administrative processes so that they can better interpret variations in election

procedures across jurisdictions. Accurately collecting data requires researchers to actively ensure that the information they record is correct and comparable. Candidates with strong attention to detail, who can maintain meticulous documentation and adapt to evolving project needs, are especially valuable.

Specific Time considerations/conflicts: We see no conflicts as students can work as they are able.

App ID #: 3459

Mentor: Tipton, Roger

Email: rtipton2@uncc.edu

Title: Research Associate Professor

Department: Mechanical Engineering

Co-mentor: No

Community engaged research: No

Title: How Microplastic Shape Impacts Toxicity

Description: Current science on microplastics has a critical flaw: over 80% of studies use smooth, spherical beads to test toxicity¹. However, real environmental plastics (specifically PET) degrade into jagged, sharp fragments². We hypothesize that these jagged edges mechanically puncture immune cells (macrophages) from the inside, causing cell death without the usual warning signs of inflammation—a mechanism we call "Silent Cytotoxicity. We are looking for a student researcher to help us prove that shape is just as deadly as chemistry. You will move beyond standard testing by creating realistic "jagged" microplastics and analyzing their lethal potential. This is a great opportunity for Biomedical Engineering, Materials Science, Biology, and Chemistry students.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Educationally, students will gain a deep understanding of research methodology, including experimental design, data analysis, and comprehensive literature reviews. The interdisciplinary nature of the project will broaden their knowledge across materials science, chemistry, and environmental engineering, fostering a well-rounded understanding of these interconnected fields. This holistic approach will enhance their critical thinking and problem-solving abilities, which are highly valued in any career. From a career perspective, students will significantly enhance their professional profiles. The project offers opportunities for networking with faculty, graduate students, and industry professionals, which can open doors for future career opportunities. Additionally, the chance to co-author research papers and present findings at conferences will be a notable achievement on their resumes. The focus on sustainability and eco-friendly materials will also appeal to employers and academic programs dedicated to green technologies, positioning students as forward-thinking candidates in their future endeavors.

Required training of 2 hours with Description: Students will need to perform 2 hours of lab safety training before the student can work in the lab. All other training will be on the job training

Mentoring plan: To ensure students' success in developing a process for extracting nanocellulose fibers from plant matter for biocomposite materials, I am committed to providing comprehensive support and guidance throughout their research journey. Here's what students can expect from me during this experience:
Direct Mentorship and Regular Contact: Students will work closely with me through regular one-on-one meetings where we will discuss their progress, address challenges, and set goals. These sessions will provide personalized feedback and guidance, ensuring that students feel supported and confident in their work.
Collaborative Team Environment: Students will be part of

a collaborative research team, working directly with faculty members, graduate students, and industry professionals. This team-based approach will foster a supportive and dynamic learning environment, encouraging the exchange of ideas and collaborative problem-solving.

Applicant Requirements: The key qualifications and characteristics we seek in an applicant: Science or engineering background: completion of foundational courses in chemistry material science, environmental science related fields. Laboratory Experience: Prior coursework that includes lab components, providing basic lab skills and familiarity with scientific equipment. Critical thinking: strong analytical skills to interpret data, troubleshoot experiments, and draw me a conclusion. We believe that with the right attitude and foundational skills, any dedicated student can succeed and make meaningful contributions to our team.

Applicant Preferences: We are looking for enthusiastic and dedicated students who are eager to contribute to cutting-edge research in sustainable materials. Here are the key qualifications and characteristics we seek in an applicant: Genuine interest and sustainable materials and desire to make a positive environmental impact. An inquisitive mindset and ability to think creatively to solve complex problems. Self motivated with strong work ethic and ability take initiative and driving the project forward. Detail oriented, ensuring accuracy and experiment and data. Ability work effectively in collaborative team environment, sharing insides, and supporting peers. Strong, verbal and written communication skills

Specific Time considerations/conflicts: None

App ID #: 3460

Mentor: Tipton, Roger

Email: rtipton2@uncc.edu

Title: Research Associate Professor

Department: Mechanical Engineering

Co-mentor: No

Community engaged research: No

Title: Development of a Process for Extracting Nanocellulose Fibers from Plant Matter

Description: Overview: Join the cutting-edge research where you'll be part of a dynamic team developing innovative processes to extract nanocellulose fibers from plant matter. These fibers are a game-changer in the manufacturing of biocomposite materials, offering a sustainable and eco-friendly alternative to traditional composites. Project Goals: Develop an efficient and sustainable process for extracting nanocellulose fibers from various plant sources. Analyze the properties of the extracted fibers to ensure they meet the standards required for biocomposite materials. Integrate these fibers into biocomposite materials and evaluate their performance in real-world applications. Student Contributions: As an undergraduate researcher, you'll play a crucial role in this project. Your contributions will include: Literature Review: Conducting comprehensive reviews of existing research to understand current methods and identify potential improvements. Experimental Design: Assisting in the design and setup of experiments to extract nanocellulose fibers from different plant materials. Laboratory Work: Performing hands-on laboratory work, including the preparation of plant samples, chemical treatments, and fiber extraction processes. Data Analysis: Analyzing experimental data to assess the efficiency and quality of the extraction process. Material Testing: Testing the mechanical and physical properties of the extracted fibers and the resulting biocomposite materials. Documentation and Reporting: Documenting your findings and preparing reports and presentations to share with the research team and broader academic community.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Initially, students will gain a deep understanding of research methodology, including experimental design, data analysis, and comprehensive literature reviews. The interdisciplinary nature of the project will broaden their knowledge across materials science, chemistry, and environmental engineering, fostering a well-rounded understanding of these interconnected fields. This holistic approach will enhance their critical thinking and problem-solving abilities, which are highly valued in any career. From a career perspective, students will significantly enhance their professional profiles. The project offers opportunities for networking with faculty, graduate students, and industry professionals, which can open doors for future career opportunities. Additionally, the chance to co-author research papers and present findings at conferences will be a notable achievement on their resumes. The focus on sustainability and eco-friendly materials will also appeal to employers and academic programs dedicated to green technologies, positioning students as forward-thinking candidates in their future endeavors.

Required training of 2 hours with Description: Students will need to perform 2 hours of lab safety training before the student can work in the lab. All other training will be on the job training

Mentoring plan: To ensure students' success in developing a process for extracting nanocellulose fibers from plant matter for biocomposite materials, I am committed to providing comprehensive support and guidance throughout their research journey. Here's what students can expect from me during this experience:
Direct Mentorship and Regular Contact: Students will work closely with me through regular one-on-one meetings where we will discuss their progress, address challenges, and set goals. These sessions will provide personalized feedback and guidance, ensuring that students feel supported and confident in their work.
Collaborative Team Environment: Students will be part of a collaborative research team, working directly with faculty members, graduate students, and industry professionals. This team-based approach will foster a supportive and dynamic learning environment, encouraging the exchange of ideas and collaborative problem-solving.

Applicant Requirements: The key qualifications and characteristics we seek in an applicant:
Science or engineering background: completion of foundational courses in chemistry material science, environmental science related fields.
Laboratory Experience: Prior coursework that includes lab components, providing basic lab skills and familiarity with scientific equipment.
Critical thinking: strong analytical skills to interpret data, troubleshoot experiments, and draw me a conclusion.
We believe that with the right attitude and foundational skills, any dedicated student can succeed and make meaningful contributions to our team.

Applicant Preferences: We are looking for enthusiastic and dedicated students who are eager to contribute to cutting-edge research in sustainable materials. Here are the key qualifications and characteristics we seek in an applicant:
Genuine interest and sustainable materials and desire to make a positive environmental impact
An inquisitive mindset and ability to think creatively to solve complex problems
Self motivated with strong work ethic and ability take initiative and driving the project forward
Detail oriented, ensuring accuracy and experiment and data
Ability work effectively in collaborative team environment, sharing insides, and supporting peers
Strong, verbal and written communication skills

Specific Time considerations/conflicts: None

App ID #: 3465

Mentor: Perry, Heather

Email: hrperry@uncc.edu

Title: Associate Professor of History

Department: History

Co-mentor: No

Community engaged research: No

Title: German Internees in WWI America

Description: I am looking for an undergraduate research assistant to help me with organizing and analyzing the data I have collected regarding the German internment camp in North Carolina during WWI. From 1917 to 1918, 2200 German nationals were held captive in America's only WWI internment camp for civilians – and I am working on a project to research and resurrect the camp digitally. I have thousands of files on the camp – Alien Enemy files, financial data, employee data, and records relating to the building and maintenance of the camp. I want help organizing the data and entering it into a database – and then using that database to work on the Digital History Project related to the camp. The student does not have to be an expert in WWI, but they do need a meticulous attention to detail as they sift through files and enter data into the database.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students have the opportunity to develop the following skills: Using XL sheets for data collection and analysis Using Zotero for bibliography building and organization Historical analysis of 100+ year old financial records Learning more about the organization of the Federal Government during WWI and Progressive era. Learning more about the military history of North Carolina Learning more about the internment/prison camp experience of the First World War

Required training of 6 hours with Description: Students will need to read some background information to build up their basic knowledge of the camp.

Students may need to learn how to use programs such as Zotero -- or how to use the advanced setting of Google Sheets.

Mentoring plan: Students will meet with me in person every week for a minimum of 1 hour. Our meetings will generally take place in the Public History digital lab, where we will work together on an aspect of the data analysis – so that the student has the competency and confidence to continue the work on their own. This will enable me to help with their tech skill development. They will also likely meet with Amanda Binder, the History Librarian, as we dig deeper into the research. In addition to this in-person meeting, we will have an “email check-in” once per week to report progress or problems. Finally, over the course of the project, students are keeping an online Research Log – which I monitor and on which I provide feedback and guidance. I will encourage the student to present their work at the Undergraduate Research Conference, as well.

Applicant Requirements: Students should have taken at least one undergraduate research skills or methods skills course (such as HIST 3600 or analogous course in another department)-- Students should have experience with using the Atkins Library online research tools (database, catalogue)- Students should have experience using the suite of Google apps (docs, sheets, slides)- Students will be required to use cameras and mics on any Zoom meetings (as well as ensure a professional background)- Students should have a genuine desire to learn about the past and be willing to spend 4-5 hours each week diligently closely reading through materials- Students should have excellent written communication skills – in particular good writing, spelling, and punctuation. Database work must be error-free. Students must understand that this project cannot be completed using generative AI. The data I have is not in AI – and none of the LLMs have access to it. Moreover, none of the data can be fed into any kind of AI database or LLM. This is proprietary data and research. This AI policy is non-negotiable.

Applicant Preferences: -Excellent attention to detail -The ability to concentrate for longer periods of time – and to put your phone/tech away during meetings and working sessions.- Experience using Microsoft XL- Experience using Google Sheets- Experience using Bibliographic Software (Zotero, EndNote, or similar)

Specific Time considerations/conflicts: Due to my heavy teaching schedule on Tues/Thurs, students will need to be available for regular on-campus meetings on Weds or Friday afternoons.

App ID #: 3469

Mentor: Hewlin, Rodward

Email: rhewlin@charlotte.edu

Title: Associate Professor

Department: School of Energy and Affiliate Faculty in Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Integration and Control of a Magnetic Field-Assisted 3D Printing System

Description: This project focuses on interfacing and integrating a three-coil electromagnetic print head with an extrusion-based 3D-printing platform. The current phase involves connecting the electromagnetic coils, motor drivers, Duet 3 controller, and pneumatic material-delivery system into a coordinated experimental platform. Students will develop and test control commands for independently regulating coil current and polarity to generate static, rotating, and spatially varying magnetic fields during material deposition. Oscilloscope and current measurements will be used to verify the electrical signals and evaluate system performance. The completed platform will enable future experiments investigating the controlled alignment of magnetically responsive particles, fibers, or platelets within printed materials to produce structures with direction-dependent properties.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students participating in this project will gain hands-on experience integrating mechanical, electrical, materials, and control systems within a working research platform. They will learn how to interface electromagnetic coils, motor drivers, a Duet 3 controller, and a pneumatic extrusion system. Students will also develop practical skills in wiring, programming, waveform generation, oscilloscope operation, current measurement, experimental design, data analysis, troubleshooting, and technical documentation. The project will reinforce classroom concepts in electromagnetism, additive manufacturing, materials processing, instrumentation, and automated control while showing students how these topics interact in a real engineering system. Because the platform is still being developed, students will experience the iterative nature of research: defining requirements, testing individual components, identifying unexpected behavior, modifying the design, and verifying that the integrated system performs as intended. Students will also gain experience working collaboratively, communicating technical results, maintaining research records, and presenting their work to technical and nontechnical audiences. Depending on project progress, they may contribute to conference presentations, research posters, technical reports, or scholarly publications. These experiences will prepare students for careers or graduate study in additive manufacturing, automation, mechatronics, materials processing, experimental engineering, and research and development. After completing the project, students should be able to explain that they helped build and validate a novel magnetic-field-assisted 3D-printing platform rather than simply operating existing equipment. They

will be able to discuss how they integrated hardware and software, diagnosed problems, verified electrical and mechanical performance, and contributed to a system designed to control material microstructure during printing. This provides a concrete and technically substantive experience that students can describe in job interviews, graduate-school applications, portfolios, and professional presentations.

Required training of 1 hours with Description: Before beginning research activities, the student will complete the ORPI Compliance Questionnaire and all applicable university laboratory-safety requirements. Because the project does not involve human participants, human-derived data or specimens, vertebrate animals, microorganisms, infectious materials, or recombinant nucleic acids, IRB, IACUC, and biosafety approvals are not anticipated. The work is intended to constitute fundamental research, with results suitable for public presentation or publication.

Since the project may involve resins or particle-containing materials, electrical equipment, and machine-shop tools, the student will consult with the faculty mentor and Environmental Health and Safety to identify required training. This is expected to include general laboratory safety, chemical hygiene and Hazard Communication, review of Safety Data Sheets, proper use of personal protective equipment, waste-handling procedures, and machine-shop or power-tool training when fabrication activities are involved.

Project-specific onboarding will then occur in stages. The student will first receive an orientation to the research objectives, laboratory procedures, documentation practices, and emergency protocols. The student will then be trained on the individual components of the system, including the Duet 3 controller, motor drivers, electromagnetic coils, DC power supplies, pneumatic dispenser, oscilloscope, and current-measurement equipment. Particular emphasis will be placed on electrical safety, stored energy, coil heating, pinch and motion hazards, magnetic-field precautions, pressure-system safety, and safe shutdown procedures.

Initially, the student will observe demonstrations and complete supervised exercises involving wiring inspection, continuity and resistance measurements, low-current coil testing, controller programming, waveform verification, and pneumatic-system operation. The student will progress to independent work only after demonstrating competency with each component and receiving approval from the faculty mentor. Early assignments will use low-voltage, current-limited tests before advancing to integrated operation of the three-coil magnetic print head and extrusion system.

Throughout the onboarding period, the student will maintain a laboratory notebook, follow established operating procedures, participate in regular research meetings, and review experimental plans with the faculty mentor before testing. This staged process will allow the student to develop the necessary technical skills while ensuring that all work is performed safely, responsibly, and in accordance with university requirements.

Mentoring plan: My responsibility as the faculty mentor will be to provide the student with the structure, technical guidance, access to resources, and encouragement needed to develop from a new research assistant into a more independent and confident researcher. I recognize that undergraduate students may enter the project with strong classroom knowledge but limited experience working with open-ended problems. I will therefore establish clear expectations while

creating an environment in which the student is comfortable asking questions, making mistakes, and learning through iteration. At the beginning of the experience, I will meet individually with the student to discuss the project's objectives, their existing skills, their academic and career interests, and what they hope to gain from participating. Together, we will develop an initial work plan containing specific and achievable milestones. Early activities will be highly structured and will focus on safety, laboratory practices, research documentation, and operation of individual system components. As the student demonstrates competency, they will receive increasing responsibility for planning tests, interpreting results, troubleshooting the system, and recommending design improvements. The student will work directly with me and may also collaborate with other undergraduate researchers, graduate students, faculty collaborators, and laboratory personnel whose expertise is relevant to the project. These interactions will give the student experience working as part of a multidisciplinary research team while ensuring that technical assistance is available when needed. I will clearly identify who is responsible for supervising each activity so the student always knows whom to contact with a question or safety concern. The student can expect regular and substantive contact with me. We will meet individually at least once each week to review progress, discuss challenges, examine data, and establish priorities for the next week. The student will also participate in regular research-group meetings, where they will provide brief updates on completed work, current challenges, and planned activities. Between meetings, I will remain available by email and through scheduled laboratory check-ins. During critical integration or testing activities, I will provide more frequent direct supervision. I will help the student understand not only what task to perform, but also why the task matters to the larger research question. For example, the student will learn how measurements of coil current, temperature, and waveform shape relate to the magnetic-field conditions required to control particle or fiber orientation during material deposition. This connection between individual assignments and the overall scientific objective will help ensure that the student's role is intellectually meaningful rather than limited to routine laboratory assistance. I will provide timely and constructive feedback on the student's laboratory notebook, data analysis, figures, presentations, technical writing, and experimental methods. When an experiment does not produce the expected result, I will help the student treat the outcome as information rather than failure. We will examine the assumptions, measurement process, equipment behavior, and possible sources of uncertainty before deciding on the next test. My goal is to teach the student a systematic approach to engineering research and troubleshooting that can be transferred to future academic and professional work. The student will be expected to maintain an organized laboratory notebook and shared project records. They will periodically present their progress during research-group meetings, beginning with short informal updates and progressing toward more complete technical presentations. I will help the student prepare a research poster or oral presentation for an appropriate undergraduate research symposium or university research event. If the work reaches sufficient maturity and funding is available, I will also encourage and support submission to a regional or national technical conference. When the student makes an appropriate intellectual or technical contribution, that contribution will be recognized through authorship or acknowledgment in presentations, reports, and publications consistent with accepted research practices. Professional development will be an intentional part of the experience. I will work with the student to translate their research activities into language appropriate for a résumé, portfolio, graduate-school application, or job interview. We will discuss relevant career and graduate-study pathways in additive manufacturing, mechatronics,

automation, materials processing, instrumentation, and research and development. When appropriate, I will provide guidance on internship opportunities, graduate programs, scholarships, and professional organizations. Students who complete their responsibilities successfully can also expect an informed recommendation that reflects their specific technical contributions, initiative, growth, and ability to work on a research team. In return, I will expect the student to attend scheduled meetings, communicate promptly about difficulties or scheduling conflicts, follow all safety requirements, maintain accurate records, and make steady progress on agreed-upon tasks. I do not expect the student to arrive knowing how to solve every problem. I do expect curiosity, preparation, honesty, persistence, and a willingness to learn. My commitments to the student are to provide clear expectations, a safe and respectful research environment, appropriate training, regular access to mentorship, meaningful technical responsibilities, constructive feedback, and recognition of their contributions. Success will be defined not only by whether the printer operates as intended, but also by the student's development in technical competence, research judgment, communication, confidence, and professional identity.

Applicant Requirements: I am looking for a student who is curious, dependable, willing to learn, and interested in working across traditional disciplinary boundaries. Because this project combines additive manufacturing, electronics, programming, instrumentation, materials, and mechanical design, applicants are not expected to enter with experience in every area. The most important qualifications are a genuine interest in hands-on engineering research, a willingness to ask questions, and the persistence to work through problems that may not have an immediately apparent solution. The student should be able to follow laboratory safety procedures, maintain organized records, attend scheduled meetings, and communicate promptly when challenges arise. Research frequently involves unexpected equipment behavior, unsuccessful tests, and revisions to the original plan. A successful applicant should be patient, attentive to detail, honest about results, and willing to approach troubleshooting systematically. I am particularly interested in students who can take ownership of an assigned task while also recognizing when they need guidance. Applicants from mechanical engineering, engineering technology, electromechanical engineering technology, electrical engineering, materials science, physics, computer science, or related programs are encouraged to apply. Students from other technical disciplines will also be considered if they can explain how the project relates to their interests and professional goals. Prior research experience is not required. Helpful academic preparation may include coursework or experience in one or more of the following areas: Electrical circuits or basic electronics Programming or microcontroller-based control Instrumentation and data acquisition Computer-aided design and mechanical fabrication Fluid mechanics or pneumatic systems Additive manufacturing Materials science or manufacturing processes Electromagnetism Experimental methods and data analysis These courses and experiences are desirable rather than prerequisites. A student with limited previous exposure can be successful if they are motivated to learn and consistently engage with the training provided. Similarly, prior experience with 3D printers, oscilloscopes, power supplies, motor drivers, Arduino-type systems, Duet controllers, MATLAB, Python, or machine-shop equipment would be useful but is not required. The student should be comfortable performing both hands-on and analytical work. Activities may include assembling and inspecting electrical connections, programming controller commands, measuring voltage and current, monitoring coil temperature, operating a pneumatic dispenser, fabricating or modifying components, analyzing experimental data, and documenting results. Applicants should understand that research will involve careful

testing and documentation in addition to building equipment. Strong communication skills are valued because the student will participate in research-group meetings, provide progress updates, collaborate with other researchers, and ultimately present the project through a poster, oral presentation, or technical report. However, students do not need to begin as polished presenters or technical writers. Developing these abilities is part of the research experience. I want to avoid limiting the applicant pool to students who have already had access to research laboratories, specialized equipment, or extensive extracurricular technical experiences. Evidence of curiosity, reliability, persistence, and thoughtful engagement may come from coursework, employment, military service, student organizations, personal projects, community activities, or other experiences. Applicants should be prepared to describe a situation in which they learned a new skill, solved an unfamiliar problem, worked responsibly with others, or persisted through a technical challenge. The strongest applicant will be someone who is excited by the opportunity to help develop a new experimental system and understands that their contribution will involve both learning and discovery. I am not looking for a student who already knows every aspect of the project. I am looking for someone who will communicate consistently, work safely, document their work carefully, respond constructively to feedback, and grow toward greater independence over the course of the experience.

Applicant Preferences: I am looking for a student with interests and developing skills similar to those already contributing successfully to this project: hands-on electromechanical assembly, controller programming, additive manufacturing, and experimental troubleshooting. The ideal applicant will enjoy working with physical hardware and be willing to move between mechanical, electrical, and software tasks as the system is integrated. The student should be curious, dependable, organized, and comfortable learning through experimentation. The project is currently at the system-interfacing stage, so the student must be willing to examine wiring, review technical documentation, configure hardware, test individual components, and troubleshoot situations in which the system does not initially behave as expected. Patience, attention to detail, and consistent communication are more important than already knowing every technology used in the project. Experience or coursework in one or more of the following areas would be helpful: Basic electrical circuits, wiring, or electronics; Microcontrollers, embedded systems, or programmable control systems; Additive manufacturing or operation of 3D printers; Electromechanical systems or mechatronics; Computer-aided design and mechanical component fabrication; Instrumentation, including oscilloscopes, multimeters, or current measurement; Programming, scripting, or configuration of automated equipment; Materials processing, manufacturing processes, or materials science. Experience configuring a controller, connecting motor drivers, interpreting wiring diagrams, using an oscilloscope, or diagnosing communication between hardware and software would be especially relevant. Familiarity with Duet controllers, RepRap Firmware, Duet Web Control, G-code, MATLAB, Python, Arduino-type platforms, or similar systems would be beneficial but is not required. A student who has worked with another controller or automated system should be able to transfer those skills to this platform with appropriate training. The project also requires mechanical judgment. The student may assist with coil positioning, print-head assembly, wire routing, pneumatic-system integration, fixture design, and modification of components. Experience with CAD, 3D printing, hand tools, machine-shop equipment, or technical fabrication would therefore be useful. Any machine-shop or specialized equipment training required for the work will be provided through the appropriate university process. Applicants are not expected to possess all

of these qualifications. Prior research experience is also not required. I do not want to limit the opportunity to students who have already had access to specialized laboratories or advanced equipment. Relevant preparation may come from coursework, design projects, student organizations, internships, employment, military experience, personal projects, or independent learning. For example, assembling a 3D printer, programming a microcontroller, repairing equipment, building an electronic device, or contributing to a design team could all provide useful preparation. The student must be willing to work safely around electrical power, electromagnetic coils, heated components, pressurized material-delivery equipment, and moving machinery. They should be able to follow written procedures, inspect their work before energizing equipment, maintain an accurate laboratory notebook, and ask for assistance when uncertain. Careful documentation is particularly important because wiring configurations, controller settings, test conditions, and experimental results must be reproducible. The student will also participate in research-group discussions and provide brief progress updates. Strong communication skills are desirable, but the student does not need to begin as an experienced presenter or technical writer. They should, however, be willing to explain what they attempted, what they observed, where they encountered difficulty, and what they recommend doing next. Developing formal presentation and technical-writing skills will be part of the research experience. The strongest applicant will be someone who can build upon the project's existing progress while contributing to the integration of the Duet controller, motor drivers, electromagnetic coils, pneumatic extrusion system, and measurement equipment. I am seeking a student who takes initiative but remains receptive to guidance, responds constructively to feedback, and can work collaboratively with the student already involved in the project. The student does not need to arrive as an expert; they need to demonstrate reliability, technical curiosity, persistence, and a sincere interest in learning how a complex electromechanical research system is developed and validated.

Specific Time considerations/conflicts: There are no fixed days or times that every student must be available. The student must be available for one scheduled research meeting each week and for at least one continuous two- to three-hour laboratory work period during normal weekday operating hours. The specific meeting and laboratory times will be established jointly based on the student's course schedule, the faculty mentor's availability, and access to the required laboratory equipment. Occasional additional meetings or supervised testing sessions may be scheduled in advance during critical system-integration activities.

App ID #: 3470

Mentor: Scheadler, Travis

Email: tsheadler@charlotte.edu

Title: Assistant Professor

Department: School of Social Work

Co-mentor: No

Community engaged research: Yes

Title: Identity Development, Mental Health, and Community Belonging Among LGBTQ+ Adults and Drag Performers

Description: This study involved interview data with LGBTQ+ adults in Stonewall Sports and interview data with drag performers. The aim of the study was to develop a stronger understanding of the experiences of LGBTQ+ people in Stonewall Sports and drag performers. The study will have implications for strengthening services within Stonewall Sports and for providing mental health support for LGBTQ+ people and drag performers. Duties may involve transcribing interviews, analyzing interview data, and/or writing research papers to be published in peer-reviewed journals.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students will develop stronger research writing skills. Students will develop a greater understanding of the needs and experiences of LGBTQ+ adults and drag performers. Students will develop a stronger understanding of mental health interventions and suicide prevention efforts targeting LGBTQ+ people. Students will be able to use these experiences to advance in careers related to research, mental health, activism, and/or LGBTQ+ communities.

Required training of -1 hours with Description: Students will need to complete CITI training.

Mentoring plan: The student(s) and I will meet weekly for supervision. During supervision, we will discuss the student's progress and the directions of the research. The student will have opportunities to submit peer-reviewed research papers and abstracts to professional conferences. We will communicate via e-mail. The student will work directly with me. As a mentor, I will adapt to the needs of the student. I want this to be a mutually beneficial experience!

Applicant Requirements: Students should have a demonstrated interest in working with LGBTQ+ populations.

Applicant Preferences: Ideally, students should have completed at least one research methods course.

Specific Time considerations/conflicts: Our weekly meetings are flexible based on the availability of the student. However, supervision must be between 9am and 5 pm during the week. Students are NOT expected to work outside of normal business hours.

App ID #: 3477

Mentor: Funk Johnson, Kristen

Email: kfunk@charlotte.edu

Title: Assistant Professor

Department: Biological Sciences

Co-mentor: No

Community engaged research: No

Title: Neuroimmune responses to viral infection

Description: Alzheimer's disease (AD) is defined by the presence of two proteinaceous deposits: senile plaques composed of A β peptides and neurofibrillary tangles composed of hyperphosphorylated Tau. Several studies have found that Tau deposition correlates with cognitive dysfunction and neurodegeneration better than A β pathology in AD. The current prevailing hypothesis is that A β deposition induces Tau pathology, which ultimately causes neurodegeneration and AD-related cognitive decline. The events that initiate either A β or Tau aggregation are not well understood. Neuroinflammation is increasingly recognized to contribute to the etiopathogenesis of AD and other central nervous system (CNS) disorders. Genome-wide association studies identified polymorphisms in immune-associated genes that increase the risk for developing AD and have renewed interest in the role of neuroinflammation in neurodegeneration. However, whether immune activation is beneficial for clearing the proteinaceous aggregates that define the disease or detrimental in its impact on neuronal function is not entirely clear. During AD the neuroimmune system can be beneficial in clearing pathological protein aggregates, such as A β and Tau, but protein aggregates may also act as host-derived danger-associated molecular patterns (DAMPs) that drive protracted neuroinflammation. Other studies have indicated that phagocytic microglia may directly contribute to the spread of Tau aggregates rather than their clearance. There is a continued need to understand the factors that regulate the critical balance between the benefits of immune cell activation and the damaging effects of over-activation. Rare genetic mutations in the APP gene cause AD; however, the vast majority of AD cases appear to be due to a confluence of environmental and genetic risk factors. Epidemiological data suggest that neurotropic and peripheral infections with common infectious agents associate with the development of AD, and there is evidence of microbial genetic material in AD-affected brains. However, the mechanisms by which microbes may contribute to disease pathogenesis are unclear. Microbes may promote amyloid beta (A β) production and deposition directly or by upregulating β - and γ -secretase levels that alter its pathological processing. Alternatively, or in concert with A β accumulation, data suggest that microglial activation promotes pathological Tau deposition, which correlates closely with cognitive decline. It is well established that the elderly are at increased risk of CNS damage caused by infectious agents, including West Nile virus (WNV), Herpes Simplex Virus 1 (HSV1), SARS-CoV-2, Lyme disease, and tuberculosis. However, it is unclear whether increased CNS infection is a cause of AD or a consequence of AD-related blood brain barrier dysfunction. During aging compromised cellular immune surveillance and blood brain barrier dysfunction may increase the vulnerability of the CNS to chronic infection and long-term damage from systemic infection with many relatively

common pathogens. Whether this accelerates AD pathology or simply occurs in tandem is unknown. Considering that age is the single greatest risk factor for developing AD, a lifetime of neuroinflammatory events, including exposure to a broad range of pathogens, may affect the neuroimmune response. The goal of this project is to test the viral inflammation hypothesis, which posits that infection induces inflammation, inciting Tau aggregation and neuronal death. This causes further neuroinflammation and A β deposition, resulting in a self-perpetuating cycle that culminates with neurodegeneration and cognitive decline.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: During this semester, students are expected to: Gain technical molecular/cellular biology laboratory skills Follow scientific protocols Use scientific equipment properly and safely Learn about ongoing scientific projects, both in the Funk lab and in the field of neuroimmunology It is expected that each student will be at different levels of competency at the start of the course, but that they will make progress to gain independence throughout the semester.

Required training of 10 hours with Description: Onboarding for the Funk lab includes:

- Reviewing documents that outline Funk lab Standard Operating Procedures (SOPs) and manuals
- Completing online training assigned by Environmental Health and Safety (Back Safety and Injury Prevention; Slips, Trips, and Falls; Chemical Hygiene; Hazardous Waste Management; Personal Protective Equipment; Building Emergency Evacuation; Fire Safety and Prevention)
- Completing online training assigned by Biosafety (Laboratory Personnel Biosafety; Recombinant and/or Synthetic Nucleic Acid Molecules; Bloodborne Pathogens; Animal Biosafety; Shipping and Transport of Regulated Biological Materials)
- Reviewing videos appropriate for safety in the Funk lab (Biohazard Awareness; Personal Protective Equipment; Centrifugation Hazards, Chemical Hazards; Biosafety Cabinets; Liquid Nitrogen Safety; Autoclave Safety)
- Performing hands-on practical (Lab Math; Using a micropipette)

Mentoring plan: Students in the Funk lab are assigned to a senior laboratory mentor (Grad Student, Post Doc or Technician) who will work with the student in the lab on a day-to-day basis. The junior student will assist the senior mentor in their project, as is appropriate. The student will also participate in weekly group meetings, during which lab members take turns presenting project updates and/or recently published journal articles that are relevant to the lab. The student will meet with Dr. Funk one-on-one every other week to discuss progress and any issues that arise. Topics of discussion in one-on-one meetings can vary week-to-week and may include lab-specific questions/issue, ethical conduct of research, course advisement, and/or post-graduation career plans.

Applicant Requirements: Students are expected to: Be current Biology majors and have earned a B or better in Cell Biology (BIOL3111) Have earned an A in BIOL3900 Commit to ~10 hours per week of in-person laboratory work for the duration of the semester in Be comfortable working in a research environment that involves mouse models.

Applicant Preferences: Preference will be given to students who have prior experience working with mammalian cell culture and performing Western Blots.

Specific Time considerations/conflicts: No specific days/times are required. Days and time are flexible within the Mon-Fri 9-5 timeframe.

App ID #: 3514

Mentor: Wu, Youjun

Email: youjun.wu@charlotte.edu

Title: Postdoctoral Research Associate

Department: Biological Sciences

Co-mentor: Yes

Pinku Mukherjee, pmukherj@charlotte.edu, Biological Sciences

Community engaged research: No

Title: Investigating the Antitumor Effects of MUC1-Targeting Antibodies TAB004 and MUCD3 in Pancreatic Cancer

Description: The overarching goal of our lab is to develop better treatment strategies for pancreatic cancer, one of the deadliest forms of cancer. Our lab has developed two antibodies, TAB004 and MUCD3, that target a protein called MUC1, which is highly expressed in pancreatic cancer cells. Our previous studies showed that TAB004 reduces the ability of pancreatic cancer cells to grow and form colonies while having little effect on normal pancreatic cells. This effect may occur because TAB004 interferes with signals from MUC1 that help cancer cells grow and survive. In this project, we will determine whether MUCD3 has similar anti-cancer effects and investigate how TAB004 and MUCD3 affect MUC1 signaling in pancreatic cancer cells. Aim 1: Determine how TAB004 and MUCD3 affect pancreatic cancer cell growth and survival. The student will learn how to perform colony formation assays, which measure the ability of individual cancer cells to survive and grow into colonies. The student will also use an Incucyte live-cell imaging system to monitor cancer cell growth and cell death over time during treatment with TAB004 or MUCD3. These experiments will help us determine how the antibodies affect the growth and survival of pancreatic cancer cells. Aim 2: Determine whether modification of the MUC1 protein is important for the anti-cancer effects of TAB004 and MUCD3. MUC1 can be modified through a process called phosphorylation, which can change how MUC1 sends signals inside cancer cells. The student will learn to use the CRISPR/Cas9 gene-editing system to generate pancreatic cancer cells carrying specific mutations that prevent MUC1 from being phosphorylated. The student will then compare these cells with normal cancer cells to determine whether MUC1 phosphorylation is required for the cells to respond to TAB004 or MUCD3. Aim 3: Determine whether TAB004 and MUCD3 change the interaction between MUC1 and β -catenin. MUC1 can interact with β -catenin, a protein that helps regulate cell growth and survival. The student will use biochemical and microscopy-based techniques to determine whether treatment with TAB004 or MUCD3 changes the interaction between MUC1 and β -catenin. These experiments will help us better understand how targeting MUC1 may interfere with signaling pathways that support pancreatic cancer cell growth.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Through this project, the student will gain hands-on experience with key techniques in biomedical research, including tissue culture (growing human

cells in the lab), drug treatment studies, CRISPR (a state-of-the-art gene-editing tool), and assays such as Co-immunoprecipitation and PLA assay to assess protein-protein interactions. These skills provide a strong foundation for students interested in pursuing advanced degrees such as a Ph.D. in biomedical sciences or an M.D. in medicine. In addition to technical skills, the student will strengthen their critical thinking by designing experiments, analyzing data, and considering alternative explanations. They will also develop their communication skills through daily discussions with mentors and lab members, participation in bi-weekly lab meetings, and presenting their findings in formal oral presentations. Finally, the student will learn the value of teamwork by contributing to a larger research effort in the lab and collaborating closely with other researchers. This combination of technical training, problem-solving, communication, and teamwork will prepare the student for success in future scientific or medical careers.

Required training of 10 hours with Description: The student will be required to take a few online training modules as directed by Biosafety and EHS offices. These include but not limited to the "Laboratory Personnel BSS" course, the "Bloodborne Pathogens Training" course and the "Recombinant and/or Synthetic Nucleic Acid Molecules" course.

Mentoring plan: The postdoctoral mentor will work closely with the student, guiding experimental design and providing hands-on training for all required techniques. The student will be encouraged to ask questions freely and actively engage in the learning process. The student will meet the co-mentor to discuss project progress as needed. To build communication and presentation skills, the student will participate in bi-weekly lab meetings, where they will share their progress and receive feedback from lab members. In addition, the student will present their research at the undergraduate research symposium, gaining experience in presenting to a broader scientific audience.

Applicant Requirements: Students should have completed introductory biology courses.

Applicant Preferences: Students who have taken cell biology, molecular biology or genetics courses are preferred. Prior laboratory experience is highly preferred.

Specific Time considerations/conflicts: Students are expected to attend the biweekly lab meetings, and the meeting schedule can be adjusted as needed to avoid conflicts with their classes.

App ID #: 3489

Mentor: Feltner, Langdon

Email: lfeltner@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Particle Shape Measurement for Metal 3D Printing Powders

Description: Metal parts can be printed by spreading a thin layer of fine metal powder and melting a pattern into it, one layer at a time, several thousand times over. How well that powder spreads, packs and melts depends on the size and shape of its individual particles, so measuring particle shape is part of qualifying a powder before it is used. The instruments that do the measuring photograph particles in their thousands as they flow past a camera. A camera turns a particle into a grid of square pixels, and once the particle is small the grid begins to matter. A smooth curved edge becomes a staircase. Measurements that depend on tracing that edge, such as the perimeter and above all the curvature, meaning how sharply the boundary bends, degrade faster than measurements that only require counting pixels, such as area. The resolution at which each of these measurements stops being trustworthy has never been established, and metal printing powder happens to sit close to the limit. A student on this project starts on a laptop with no instrument time required. High-resolution images of particles are progressively coarsened in software to imitate a lower-resolution camera, and every shape measurement is recomputed at each step to find where it begins to drift. That produces a prediction, which the second half of the project tests on our Microtrac SYNC particle analyzer against a fine printing powder and a coarse peening media that should sit on opposite sides of the limit. Duties include writing and running Python code, preparing and dispersing powder samples, operating the analyzer, and helping to write up the result. The project sits within a broader effort on powder characterization, and a related track is available for a student whose interests run that way. The same analyzer measures particle size two different ways at the same instant on the same particles, by laser scattering and by photograph, and the two methods disagree for any particle that is not a sphere. Predicting that disagreement from the measured shapes is an open problem and a natural second project, with enough work in it for two students to divide between the laboratory and the software. A student who carries a piece of this through to a finished analysis is in a position to be a co-author.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: **CRITICAL THINKING**The project asks the student to predict which measurements will fail first and why, and then to test that prediction, rather than to gather data and look for something in it afterward. **TECHNOLOGY**Operation of a modern particle size and shape analyzer, powder dispersion in both wet and dry modes, and substantial Python work covering image processing, Fourier analysis and version control. The computing component is in-depth to stand on a resume for a software-adjacent role. **COMMUNICATION**Progress is presented

at group meetings roughly monthly, and the term ends with a written report and a presentation at the Undergraduate Research Conference. PROFESSIONALISM Powder work rewards discipline: samples have to be split representatively, the instrument cleaned between runs, and conditions recorded. CAREER AND SELF-DEVELOPMENT Additive manufacturing is a growing industry with a genuine powder qualification problem, and a student who has measured powders and understands why the measurements are hard is unusually well placed for that work or for graduate study in it.

Required training of 28 hours with Description: No human or animal subjects are involved, so neither IRB nor IACUC review applies. University laboratory safety training through Environmental Health and Safety is a prerequisite for laboratory access. A specific briefing on metal powder handling follows, because fine metal powders are both a respiratory hazard and, in the case of aluminum alloys, a combustible dust, and they are handled accordingly. Instrument training on the particle analyzer covers dispersion, cleaning and the measurement workflow. On-boarding to the group's analysis pipeline covers Python, version control and the existing codebase.

Mentoring plan: I am in my first years at Charlotte and do not yet have graduate students, so an undergraduate here works directly with me rather than being handed to a senior laboratory member. The student receives more of my attention than is typical, and their work is a defined piece of the project rather than a side branch of someone else's dissertation. A student can expect a standing one-hour individual meeting each week at a fixed time, set in the first week around their class schedule; a weekly group meeting at which they present progress roughly monthly; my presence for the first several instrument sessions rather than a handoff immediately after training; and written feedback on any draft within one week. Because this project begins in software, the first weeks involve reading code together rather than watching me operate something, which suits a student who would rather build confidence before touching an instrument. My commitments are these. The student will own a defined piece of the project. They will present at the Undergraduate Research Conference, and at a national meeting should the work support it. If the work meets the standard they will be a co-author on the resulting publication, and I will say at the outset what that standard is. I will write letters of recommendation for students who complete the term, and if the fit is not working I will say so early rather than late.

Applicant Requirements: First-year calculus and either physics or chemistry Willingness to learn Python, whether or not the student has ever programmed Care with small samples and a habit of recording what was actually done rather than what was intended

Applicant Preferences: Any exposure to Python, MATLAB or R, at any level Coursework in materials science, statistics, or any course involving image processing Interest in additive manufacturing, computer vision, or scientific computing Photography as a hobby

Specific Time considerations/conflicts: 1 hour per week for individual meetings, 2 hours per month for group meetings.

App ID #: 3490

Mentor: Feltner, Langdon

Email: lfeltner@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Precision Surface Metrology: What a Roughness Number Actually Means

Description: Manufacturing processes that finish a metal surface, among them shot peening, abrasive blasting and metal 3D printing, leave a texture that is different everywhere on the part. Engineers reduce that texture to a handful of roughness numbers, and those numbers decide whether a component passes inspection. The numbers turn out to be less stable than their use implies. Two decisions move a roughness number without the surface itself changing at all. The first is the instrument: a stylus that drags a diamond tip across the part and an interferometer that reads reflected light will report different values for the same location. The second is the measured area, since a small window and a large window on the same surface return different answers, and for some parameters the answer never settles no matter how much area is measured. A student on this project works on both halves. The computational half uses an existing library of high-resolution scans of 27 surface treated steel specimens, resampling them at multiple window sizes and grid spacing to establish how much a roughness number moves with the area measured. The laboratory half takes a subset of those same specimens to the Center for Precision Metrology and measures them on three instruments, two optical interferometers from different manufacturers and a contact stylus, at the same physical locations, to establish how much the number moves with the instrument. Duties include operating the instruments, locating and relocating measurement sites, writing and running analysis code in Python, keeping a measurement record another person could follow, and helping to write up the result. The work sits inside a larger effort on measurement science for processes that produce random, uneven surfaces, and there is room to shape it around a student's strengths. A student who prefers instruments can weight the term toward the laboratory experiments, and a student who prefers programming and statistics can weight it toward the resampling analysis, which runs on a laptop. Both routes produce a result worth presenting, and a student who carries a piece of this through to a finished analysis is in a position to be a co-author.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: **CRITICAL THINKING**The project investigates an open question, so the student learns to design a comparison and distinguish a real effect from measurement noise. Predictions are made in advance and then tested, which is a habit that transfers to any technical role. **TECHNOLOGY**Hands-on operation of scanning white-light interferometry and contact stylus profilometry, both industry-standard instruments. Alongside that, analysis in Python, version control, and enough signal processing to know what a frequency spectrum of a surface is telling them. A student finishes able to name specific instruments they

have personally operated, which is a concrete thing to say in an interview. COMMUNICATION Progress is presented at group meetings roughly weekly, which is deliberate practice at talking about unfinished work, and the term ends with a written report and a presentation at the Undergraduate Research Conference. PROFESSIONALISM Instrument time is booked and shared, so sessions are kept or released in good time. The measurement record also has to be legible to someone else months later. CAREER AND SELF-DEVELOPMENT Metrology and quality engineering are routes into manufacturing careers, and the skills here map directly onto them. Students who want graduate school get a first-hand view of what research actually involves, including the parts that do not work.

Required training of 35 hours with Description: No human or animal subjects are involved, so neither IRB nor IACUC review applies. University laboratory safety training through Environmental Health and Safety is a prerequisite for laboratory access. Instrument authorization and training at the Center for Precision Metrology is arranged with facility staff and covers safe operation, specimen handling and the booking system. On-boarding to the group's analysis pipeline covers Python, version control and the existing codebase.

Mentoring plan: I am in my first years at Charlotte and do not yet have graduate students, which means an undergraduate here works directly with me rather than being handed to a senior laboratory member. The student receives more of my attention than is typical, and their work is a defined piece of the project rather than a side branch of someone else's dissertation. Concretely, a student can expect a standing one-hour individual meeting each week at a fixed time, set in the first week around their class schedule; a weekly group meeting at which they present progress roughly monthly; my presence alongside them for the first several instrument sessions rather than a handoff immediately after training; and written feedback on any draft within one week. The student will own a defined piece of the project rather than a set of disconnected tasks. They will present at the Undergraduate Research Conference, and at a national meeting such as the American Society for Precision Engineering should the work support it. If the work meets the standard they will be a co-author on the resulting publication, and I will say at the outset what that standard is rather than leaving it vague. I will write letters of recommendation for students who complete the term. If the fit is not working I will say so early, so that neither of us discovers it in April.

Applicant Requirements: First-year calculus and either physics or chemistry Willingness to learn Python, whether or not the student has ever programmed Patience for repetitive careful work, and the honesty to record a measurement that does not look the way it was expected to look Reliable attendance at scheduled instrument sessions

Applicant Preferences: Any exposure to Python, MATLAB or R, at any level Coursework in materials science, manufacturing processes, statistics or optics Experience with hand tools, machining, a makerspace, or photography, any of which builds the physical care this work rewards Interest in graduate school, or in quality and manufacturing engineering

Specific Time considerations/conflicts: 1 hr per week for one-on-one meetings. 2 hr per month for group meeting.

App ID #: 3491

Mentor: Adams, Nikki

Email: nicoleadams@charlotte.edu

Title: Assistant Professor

Department: SPCD

Co-mentor: No

Community engaged research: Yes

Title: Supporting Families with Children with Disabilities in the U.S.

Description: Research with Dr. Adams focuses on supporting families of young children (toddlers through early elementary age) with disabilities. There are a number of projects we are conducting every semester with many projects focused on supporting immigrant/refugee families in the U.S. Much of the work in the lab is centered in community and uses a community-engaged research approach. The data is most often qualitative (e.g., interviews, focus groups, etc.) with small samples of participants. Some examples of ongoing projects are a scoping literature review to explore caregivers' trust and distrust in health and education systems. Additionally, there is a project that will be continuing data collection and entering data analysis that is an intervention where we provided parent psycho-education groups for African immigrant caregivers who have children with disabilities. We utilized multiple methods, including interviews, pre- and post-questionnaires, and group conversations to gather data. Additionally, there is existing data that needs analyzed from interviews and group conversations with refugee early educators that explores their needs and programs to support young refugee children and their families. This study used interviews and group conversations.

Accepting applications for: Only 75 hours over an academic semester (~5h per week)

2 positions available

Anticipated Student Learning Outcomes: Communicating to peers and faculty in a clear and organized manner. Accountability through individual and team responsibilities. Gather and analyze information to understand the "problem" that the research is attempting to address. Identify and communicate strengths and areas for improvement in research skills. Learn about research ethics. Learn to work as part of a larger, collaborative research team. Cultural competency and how to work in a diverse, bilingual environment. Learn how to collaborate with community partners. Learn how to transcribe and code qualitative data.

Required training of 5 hours with Description: -All students complete research ethics training (CITI) before on-boarding

-Attend weekly lab meetings where training and mentorship are provided for the different research tasks students will be assigned.

-Meet with mentor to ensure project aligns with student preferences/skills and broader OUR program

Mentoring plan: The goal is to facilitate student growth and connection. We would do this by having collaborative meetings where students and faculty from different backgrounds and stages of their careers will communicate and exchange ideas. Open and frequent communication is encouraged between students and others on the team. The meetings will facilitate learning and collaborating with others.

Applicant Requirements: Students are required to engage in professional communication and skills (i.e., timely responses and completion of work) with the faculty member and all students in the research lab. There are no pre-requisite research skills but it is important for students to feel comfortable using google docs, folders, and Microsoft Word or be willing and able to learn. Students are also required to be self-motivated and curious about research.

Applicant Preferences: Preferences are for students who are organized and excited about the research opportunity. There needs to be an amount of flexibility with expectations because research is an evolving process. It would be helpful if students have a general research course and/or research experience to be involved in this lab. Students who are passionate about social science research, supporting families and children, are preferred but all will be considered.

Specific Time considerations/conflicts: A research team meeting will be set at the beginning of the semester, based on the faculty and students' schedules. This is a required in-person meeting. The other hours can be arranged with the instructor. Desk space is available in the Department in the College of Education (Mebane Hall).

App ID #: 3492

Mentor: Gibbons, Julie

Email: jgibbon1@charlotte.edu

Title: Assistant Professor

Department: College of Health and Human Services

Co-mentor: No

Community engaged research: No

Title: Assessing Early Life Adversity, Medical Trauma and Well-being among Healthcare Professional Students at UNC Charlotte: A Long-term Strategy for Building Sustainable Healthcare Systems.

Description: For the umbrella study, the principal investigator and team will use a mixed methods design to gather information about current well-being, early life adversity experiences, medical trauma and positive childhood experiences from students in undergraduate and graduate programs at UNC Charlotte. Participants will be recruited from counseling, health policy, nursing, physiology, public health and social work. The expected total number of participants is 500 with approximately 100 participants expected from each recruited department (including counseling, nursing, physiology, public health and social work). In the first phase, study participants will be asked to complete a researcher-designed survey of sociodemographic variables. The included questionnaires are described in more detail below: The World Health Organization- Five Well-Being Index (WHO-5) The World Health Organization- Five Well-Being Index (WHO-5) is a short self-reported measure of current mental wellbeing. Adverse Childhood Experiences Questionnaire (ACEs) The Adverse Childhood Experience Score survey will be used to evaluate the number of adverse experiences that have occurred before the age of 18 (Felitti et al., 1998). Positive Childhood Experiences Scale The Positive Childhood Experiences Scale will be used to evaluate the number of positive experiences that have occurred before the age of 18 (Bethell et al., 2019). History of Medical Trauma Two items asking participants - 1) Did you experience medical traumatic stress or a life-threatening medical event before the age of 18? And 2) If you want to share - please provide more information about your experience of medical traumatic stress or a life-threatening medical event before the age of 18. Once participants complete the survey/quantitative portion of the study, they will be asked if they are willing to participate in future research. If they are interested and agree, they will be taken to a separate Google Form where they can provide their email address for correspondence and scheduling of the interview/qualitative portion of the study. The participant-provided email address will be stored separately from survey responses and will not be linked in any way to specific study participants. Only participants who previously completed the approved survey and indicated that they were willing to be contacted for future research will be invited to participate in a follow-up interview. These individuals will receive a recruitment email containing a brief description of the qualitative interview, including the purpose, estimated time commitment (approximately 30-60 minutes via Zoom), and assurance of confidentiality. The next phase - the qualitative component - will involve a 30-60-minute, semi-structured Zoom interview with participants who have completed the original survey and agreed to be contacted for follow-up interviews. These interviews will explore participants' perceptions of the ACEs and PCEs

questionnaires, the relevance of ACEs (and the impact of PCEs) and experiences of medical trauma in healthcare training, how this topic relates to student well-being, resilience, and professional identity and. In addition, the interviews aim to explore how students perceive the connection between childhood adversity and current well-being, including aspects of stress, burnout, emotional regulation, and coping in the context of healthcare education. The study also seeks to understand how past adversity may influence students' approach to their future roles as healthcare providers—shaping values such as empathy, patient care, professional boundaries, and career decision-making. This qualitative addition will provide deeper context to the quantitative findings, inform trauma-informed educational practices, and support the development of student-centered interventions in healthcare training programs. Students entering healthcare professions are an important population to study because they represent the future of healthcare, and their experiences shape the quality and sustainability of healthcare delivery. Understanding the unique needs of people entering this challenging profession will provide insight into factors that may address well-being and burnout in a workforce that is experiencing significant shortages. Data from both parts of the study will be analyzed using thematic and constant comparative methods to identify patterns across and within participants. In addition, information gathered from this study can inform future interventions aimed at promoting resilience, self-care, and well-being, reducing future risks of burnout and attrition in the healthcare workforce.

Early life adversity measured through the concept of Adverse Childhood Experiences (ACEs), has demonstrated to have a profound impact on long-term health and well-being, influencing mental health, chronic diseases, and professional functioning. The research results from this study will be used to identify key patterns and relationships between early life adversity and the well-being of HCP students. It is at this point that students from the Scholars Mentored Project will serve as vital members of the research team. Before using the student-level data to shape a more responsive trauma-informed curriculum, it is essential to map the existing landscape of trauma-informed education within the institution. This involves gathering information about current courses, certificates, training initiatives that address trauma, adversity, resilience, or related competencies. Understanding what is already in place - and how it aligns with evidence-based trauma informed frameworks provides a foundation for identifying curricular strengths, redundancies, and areas needing further development. Additionally, the OUR scholar will support student/participant recruitment and data analysis. A student research assistant could help this research by supporting systematic review of curriculum materials, helping to organize and analyze data, and participating in the development of a comprehensive map of trauma-informed educational offerings. Supporting the review of a systematic review of curriculum materials could include searching institutional catalogs, websites and repositories for courses or programs related to trauma, adversity, resilience, or related constructs. Additionally, the student could help to compile course descriptions, learning outcomes, and other relevant data into a structured database. Organizing and analyzing data could include syllabi and course materials review using a researcher-developed coding framework. Results of this analysis would support the teams' understanding of gaps, redundancies and areas needing clarification. The student research assistant could support the research team by entering and organizing data into chosen software and maintaining accurate documentation of decisions and processes. Finally, the student research assistant could support the research teams' mapping of trauma-informed educational offerings in healthcare professional student programs at UNC Charlotte.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: 1. Trauma-informed research literacy Students will demonstrate foundational knowledge of ACEs, PCEs, medical trauma, and well-being frameworks, including how these constructs shape health, resilience, and professional identity in healthcare learners. 2. Mixed-methods research competence Students will accurately apply mixed-methods procedures by supporting quantitative data organization (WHO-5, ACEs, PCEs, medical trauma items) and contributing to qualitative interview preparation, coding, and thematic analysis. 3. Curriculum mapping and program evaluation Students will systematically review institutional curriculum materials, apply a trauma-informed coding framework, and contribute to a comprehensive map of trauma-related educational offerings across healthcare programs. 4. Ethical and trauma-responsive research practice Students will uphold confidentiality, manage sensitive participant data responsibly, and apply trauma-informed principles when reviewing narratives of adversity or medical trauma.

Required training of 10 hours with Description: Mixed-Methods Research Skills

Survey administration — WHO-5, ACEs, PCEs, medical trauma items

Quantitative data handling — scoring, categorizing ACE/PCE levels, organizing raw data

Thematic and constant comparative analysis — coding, memoing, pattern identification

Curriculum Mapping & Program Evaluation

Catalog and syllabus searching — locating trauma-related courses, certificates, trainings

Coding framework training — applying trauma-informed criteria consistently

Data organization — building structured databases of course descriptions and learning outcomes

Gap and redundancy identification — interpreting patterns in trauma-informed offerings

Ethics & Confidentiality

Sensitive data handling - confidentiality

Trauma-responsive practice — respectful engagement with narratives of adversity

Professional boundaries — managing emotional load, reflective practice

Technical & Software Skills

Qualitative analysis software — NVivo, Dedoose, or Atlas.ti

Spreadsheet/database tools — organizing curriculum materials and survey data in SPSS, Excel

Professional Communication

Analytic memo writing — capturing insights during coding

Team communication — summarizing findings, reporting progress

Mentoring plan: Goal: Build competence through scaffolded, hands-on learning. Activities: Walk through survey instruments and scoring procedures. Demonstrate qualitative coding using sample transcripts. Practice curriculum searching and coding with low-stakes materials. Introduce data management tools (NVivo/Dedoose, spreadsheets, documentation logs). Mentor role: Provide step-by-step demonstrations, co-code initial materials, and offer real-time feedback. Goal: Help the student move from task execution to conceptual understanding. Activities: Discuss emerging patterns in ACE/PCE profiles and well-being data. Review themes from qualitative interviews. Examine curriculum gaps, redundancies, and strengths. Connect findings to trauma-informed educational frameworks. Mentor role: Encourage deeper questioning, highlight connections, and model analytic reasoning. Goal: Strengthen the student's confidence, communication skills, and sense of belonging in research. Activities: Invite the student to present preliminary findings in team meetings. Provide guidance on professional communication and documentation. Discuss how trauma-informed principles apply to their future clinical or academic roles. Offer mentorship on career pathways in research, education, and healthcare. Mentor role: Affirm strengths, celebrate milestones, and support long-term growth.

Applicant Requirements: The project team is seeking a student who is curious, reliable, and genuinely interested in trauma-informed education and research. Strong applicants will demonstrate careful attention to detail, clear communication skills, and the ability to follow structured research procedures. Students who are reflective, collaborative, and comfortable engaging with sensitive topics—including adversity, resilience, and well-being—will be well-suited for this role. Above all, we value a willingness to learn, ethical research practice, and a commitment to supporting a trauma-informed research environment.

Applicant Preferences: The project team is seeking a student who is curious, reliable, and genuinely interested in trauma-informed education and research. Strong applicants will demonstrate careful attention to detail, clear communication skills, and the ability to follow structured research procedures. Students who are reflective, collaborative, and comfortable engaging with sensitive topics—including adversity, resilience, and well-being—will be well-suited for this role. Above all, we value a willingness to learn, ethical research practice, and a commitment to supporting a trauma-informed research environment.

Specific Time considerations/conflicts: None

App ID #: 3493

Mentor: Fisher, Benjamin

Email: bfish36@charlotte.edu

Title: Associate Professor

Department: Psychological Science

Co-mentor: No

Community engaged research: No

Title: Perceptions of Security Measures in High Schools

Description: School security measures are more common now than they ever have been, and they continue to evolve into new forms as technology advances. However, as quickly as these are advancing, we actually know very little about how people in schools—students, teachers, and administrators—experience these school security measures. Do the security measures make them feel safer? Uneasy? Like they're always being watched? To address this gap in knowledge, we have completed interviews and focus groups with a diverse set of students, teachers, and administrators across five high schools in a large, urban school district in the United States. All the interviews and focus groups were audio recorded and transcribed into text-based transcripts. I am looking for undergraduate researchers to work with these transcripts in two ways:(1) Read and anonymize the transcripts. The transcripts will be archived for public access, and we need to ensure that no information we include in these public documents will be identifiable to a person, school, or school district. The primary goal of the undergraduate researchers will be to identify and remove text that would put this anonymity at risk.(2) Understand and make sense of key themes in the data. As part of a team-based project, undergraduate researchers will have the opportunity to do a deep dive into themes that they find interesting, using qualitative data analysis techniques to systematically study how these various stakeholders experience school security measures. As part of this, undergraduate researchers are likely to review existing literature on school security measures.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Undergraduate researchers will gain the following skills, experiences, and competencies: Participate in a large, multi-site federally funded research project Prepare qualitative data for archiving Conduct team-based qualitative data analysis Conduct literature reviews Lay the groundwork for writing manuscripts that will be submitted to peer-reviewed journals

Required training of 5 hours with Description: Undergraduate researchers will need to complete their CITI training for conducting human subjects research. I will also work with them to bring them up to speed on the project and its goals—I expect this to take 2-3 hours.

Mentoring plan: I (Ben Fisher) will work directly with the undergraduate researchers. We will meet either weekly or every other week depending on the stage of the research process. I am someone who gives both high expectations for my students and provides a high degree of support to help my students meet those expectations. For this project, I am hoping to help the undergraduate

researchers strike a balance between two broad goals: completing tasks (i.e., anonymizing the transcripts) and deeper intellectual engagement (i.e., identifying and exploring key themes). For the former goal, we will have clear deadlines and regularly check in on the progress that's been made. For the latter goal, we will be collaborating with researchers at other universities who will provide additional support. I expect that the undergraduate researchers will bring their own ideas to group meetings, provide feedback on other people's ideas, and be treated as members of the team with important roles.

Applicant Requirements: I am looking for undergraduate researchers with the following qualities: Attention to detail. The work that needs to be done on this project requires careful attention, and someone who is able to manage their time effectively will be well suited to succeed with this. Excellent time management. We will have weekly and bi-weekly progress check-ins, and someone with strong time management skills will do well in this setup. Curiosity about school security measures. A major part of this experience will be making sense of the data on school security measures, so having a genuine curiosity about the topic will be beneficial. Completed a research methods class.

Applicant Preferences: Although not required, having completed some Sociology and Education courses would also be beneficial.

Specific Time considerations/conflicts: N/A

App ID #: 3494

Mentor: Gao, Zheming

Email: zgao7@charlotte.edu

Title: Assistant Professor

Department: Department of Industrial and Systems Engineering

Co-mentor: Yes

Albert Yun, lyun@charlotte.edu, Department of Industrial and Systems Engineering

Community engaged research: No

Title: Agentic AI with Adaptive Feature Learning for Alzheimer's Disease Detection

Description: 1) Background Alzheimer's disease (AD) is a progressive brain disorder that destroys memory, cognitive ability, and ultimately the capacity to perform basic daily tasks. First identified by Dr. Alois Alzheimer in 1906, the disease has become one of the most pressing public health challenges of our time. Despite decades of research, the exact causes remain unclear, and definitive diagnoses often occur late, after irreversible damage has already occurred. Since MCI is widely recognized as a prodromal stage of AD, accurate prediction of MCI progression is crucial. Research shows that 10% to 15% of MCI cases progress to Alzheimer's annually, underscoring the urgent need for early detection tools that can help guide treatment, improve patient outcomes, and reduce healthcare costs. Machine learning and artificial intelligence provide promising tools for assisting AD diagnosis. Large amounts of health-related data are collected by research agencies, clinics, healthcare systems, and caregivers. These data may include demographic information, cognitive and functional assessments, medical history, neuroimaging measurements, behavioral observations, and other patient-related features. Although these data provide important opportunities for Alzheimer's disease detection, it remains difficult to determine which features are most relevant to diagnosis and how large numbers of heterogeneous variables should be incorporated effectively into machine learning models. Traditional machine learning methods often rely on either all available features or a fixed subset selected before model training. However, irrelevant, redundant, or uncertain variables can reduce model efficiency and interpretability, while the most informative features may differ across patients. Reinforcement learning provides a promising approach for adaptively learning which features should be selected or emphasized during classification. At the same time, advances in agentic AI create opportunities to translate machine learning models into practical decision-support tools. This project will combine adaptive feature learning, AD classification, and agentic AI to help healthcare workers better use complex patient data. The system is intended to support, rather than replace, clinical judgment by identifying informative features, generating predictions, and presenting interpretable evidence for AD-related assessment. In this research, we aim to develop a framework for AD detection that integrates machine learning methods and agentic AI decision support. The proposed framework will identify informative features from high-dimensional and heterogeneous healthcare data, adaptively determine their importance for individual prediction tasks, and provide interpretable outputs that can assist healthcare workers in evaluating potential AD-related risks. Ultimately, the project seeks to improve the effective use of complex healthcare data while providing accessible and reliable AI support for earlier and more informed AD detection. 2) Research Plan The project will

be organized into two major aims.

Aim 1: Early AD Classification with Reinforcement Learning-Based Feature Selection We will develop and evaluate machine learning models for AD-related classification using high-dimensional and heterogeneous healthcare data. Particular attention will be given to challenges commonly encountered in clinical datasets, including limited sample sizes, missing information, redundant variables, and variability across patient populations. To improve the effectiveness and interpretability of classification, we will incorporate reinforcement learning into the feature-learning process. Rather than relying only on a fixed set of features selected before model training, the proposed approach will allow the learning process to adaptively identify and emphasize variables that are most informative for AD-related classification. This framework will be used to investigate whether adaptive feature selection and weighting can improve predictive performance while reducing the influence of irrelevant or redundant information. The proposed methods will be compared with conventional machine learning and static feature-selection approaches. In addition to classification performance, we will analyze the learned feature patterns to identify variables that are consistently important for AD detection and to examine whether feature importance varies across different patient groups or clinical conditions.

Aim 2: Agentic AI for Healthcare Decision Support We will develop a prototype agentic AI system that integrates patient information, adaptive feature learning, predictive models, and interpretable outputs into a unified decision-support framework. Given available patient information, the agentic AI system will: organize and review relevant patient data; identify important features through the feature-learning; interact with the classification model to generate an AD-related prediction; summarize the major factors contributing to the prediction; communicate prediction confidence and uncertainty in an understandable manner; and indicate whether additional patient information or assessment may be helpful when the available evidence is insufficient. The system will be designed to assist healthcare workers, particularly those with limited specialized experience in dementia assessment. It will not provide an autonomous clinical diagnosis. Instead, it will help users better organize complex patient information, interpret machine learning results, identify influential features, and recognize cases that may warrant additional clinical evaluation. The prototype will be evaluated based on both predictive performance and its ability to provide clear, consistent, and interpretable decision support. Before model development, necessary data preprocessing will be performed, including data cleaning, handling of missing observations, feature encoding, and normalization. Descriptive statistical analysis and visualization have been partially completed in previous work. These existing results will be reviewed and discussed to establish an understanding of the dataset and guide subsequent machine learning and agentic AI development. Undergraduate students will contribute throughout both aims by participating in data preprocessing, exploratory analysis, machine learning implementation, reinforcement learning experiments, feature-importance visualization, development of prototype agent workflows, and preparation of research results for presentations and publications.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students participating in this project will gain hands-on research experience at the intersection of healthcare and artificial intelligence. Through collaboration with faculty mentors and graduate students, participants will learn how to formulate research questions, work with large and complex datasets, develop computational models, analyze

experimental results, and communicate research findings in a professional setting. Students will develop practical skills in data analytics, machine learning, reinforcement learning, simulation, software development, and data visualization while working with real-world AD data. They will gain experience using modern programming and analytical tools to transform complex healthcare data into meaningful information that can support AI-assisted decision making. Beyond technical training, students will strengthen their problem-solving, critical-thinking, teamwork, and communication skills. The interdisciplinary nature of the project will help them understand how engineering, artificial intelligence, data science, and healthcare can be integrated to address complex real-world challenges. These research experiences will prepare students for graduate study, research careers, and professional opportunities in data science, artificial intelligence, healthcare analytics, and industrial engineering.

Required training of 8 hours with Description: Students will receive an introduction to the research project, including the research background and the overall research framework. Mentors will provide guidance on data collection, data preprocessing, exploratory data analysis, and basic machine learning and forecasting techniques needed for each research module.

Following the initial training, students will participate in weekly research meetings and work closely with faculty and graduate student mentors. As students gain experience, they will gradually take on more independent research tasks while continuing to receive regular feedback and technical support throughout the project.

Mentoring plan: Students will work closely with the faculty mentors throughout the project. Regular research meetings will be held to discuss project progress, address technical challenges, and development of solutions. Students will receive individualized guidance based on their interests, experience, and project responsibilities. As students gain experience, they will be encouraged to take increasing ownership of their research tasks while working collaboratively with other team members. They will have opportunities to present their progress during group meetings, participate in undergraduate research symposium, and, when appropriate, contribute to conference presentations and/or publications. A supportive and collaborative research environment will be provided where students can develop technical skills, research experience, and professional confidence. Mentors are committed to helping students succeed by providing regular feedback, encouraging independent thinking, and supporting their academic and career development.

Applicant Requirements: The ideal student for this project is enthusiastic about research, enjoys solving real-world problems, and is motivated to learn new technologies. Students should be willing to work both independently and collaboratively while communicating effectively with faculty mentors and other team members. Applicants should have a basic foundation in mathematics and statistics. Familiarity with basic data classification and reinforcement learning methods is desirable. Students should also have experience programming in Python and be comfortable using modern coding tools, including AI-assisted or “vibe coding” workflows, to develop, test, and refine software efficiently.

Applicant Preferences: Students with prior experience in software engineering or agentic AI, or mobile application development are especially encouraged to apply, as the project aims to develop agentic AI decision-support tools for healthcare workers. Curiosity, creativity, strong analytical and

modeling skills, and a willingness to learn are valued more highly than extensive prior research experience.

Specific Time considerations/conflicts: Student should be able to attend weekly group meeting schedule on Friday (intended to be 11am Friday)

App ID #: 3500

Mentor: Le, Chau

Email: cle12@uncc.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Using Data and AI to Improve Transportation Construction

Description: Every year, state transportation agencies spend billions of dollars building and repairing roads and bridges, deciding who gets to build them, what a fair price is, how long the work should take, and whether the finished product meets quality standards. Those decisions generate enormous amounts of data, and a lot of the decision-making still relies on manual review and professional judgment. This project asks how data analytics and artificial intelligence can help. You would work with real information from state transportation agencies. Depending on your interests, your project might focus on how construction contracts are awarded and administered, how costs are estimated and bids compared, how alternative project-delivery methods perform, how construction quality is measured and paid for, or how projects perform overall. Day to day, that might involve pulling documents and records from public agency sources and coding what is in them, organizing and cleaning data so it can be analyzed, reading and summarizing what is already known about your question, building charts and visualizations, looking for patterns, and trying appropriate analytical methods with guidance from our team. By the end of the semester, you would present what you found at the OUR symposium. You do not need to arrive knowing how to do any of this. Depending on your workstream, you might work mainly in Excel, mainly with documents, or in Python; and if you have never written a line of code, we will teach you what your project needs. What matters more is curiosity, care with details, and steady weekly progress. Each student will have their own research question and workstream, so you will own a defined piece of the research rather than simply assist with someone else's work.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

3 positions available

Anticipated Student Learning Outcomes: Students will develop practical skills in finding, extracting, and cleaning real-world data, which is the foundation of every analysis that follows. They will build reproducible workflows in Excel, Python, or other appropriate tools; produce clear charts and visualizations; and gain exposure to text analytics, introductory statistical methods, geospatial analysis, or AI-assisted document analysis, depending on their workstream. Students will also gain a working understanding of how public infrastructure is procured, contracted, and delivered, including bidding, cost estimating, project-delivery methods, quality management, and contract administration. They will work directly with the types of documents and data used to support transportation-agency decisions. Beyond technical skills, students will learn how a practical problem becomes an answerable research question, how to work systematically with evidence, how to interpret findings honestly, and how to document their work so that someone else can

follow and trust it. Each student will prepare and deliver a presentation at the OUR symposium and practice explaining technical findings to a nonspecialist audience. These are also skills needed to communicate findings to agency and industry professionals. The experience will build several competencies, including critical thinking, technology use, communication, and professionalism. Afterward, a student should be able to tell an employer or graduate program: "I worked with real state transportation-agency information, learned how to analyze it systematically, and presented my findings." Students who discover that they enjoy research will receive my direct help thinking through possible next steps, including graduate study.

Required training of 15 hours with Description: The first two to three weeks will provide structured onboarding. Students will receive an orientation to the research group and their assigned workstreams, develop a written mentoring agreement with me, and complete any required University research-integrity or compliance training.

Each student will receive a guided introduction to the relevant transportation-construction topic, data sources, documents, and analytical tools. The student will then complete paired working sessions with a Ph.D. researcher so that the applicable procedures can be demonstrated and practiced before the student begins working more independently.

Students will receive training in data organization, documentation, reproducible research practices, and the responsible handling of research materials. By the end of the third week, each student will receive a written description of their research question, workstream, milestones, and expected outputs so that the scope and definition of successful completion are clear.

No human-participant research or analysis of individual-level human data is planned; therefore, no IRB training is anticipated under the current project scope.

Mentoring plan: My commitment is that an undergraduate on my team will be a contributing member of a research group, not simply an extra pair of hands. You can expect a weekly research-team meeting that I lead, during which graduate and undergraduate researchers discuss their progress. You will be expected to attend, ask questions, and periodically present your own work to the group. You will also have individual progress check-ins with me, feedback on your work, and a clear set of milestones so that you know where you stand. Your research question and workstream will be defined in writing by the end of the third week. Day-to-day, you will work closely with a Ph.D. researcher who will provide technical guidance and hands-on support between team meetings. Near-peer mentoring can make it easier to learn new tools, ask questions, and work through technical challenges. I will remain responsible for the research direction, major methodological decisions, evaluation of your progress, and your overall mentoring experience. I will review drafts of your symposium poster or presentation and organize a practice session with the research group before the symposium. Near the end of the semester, we will also discuss what you learned, whether research is a direction you would like to pursue, and possible next steps. What I ask in return is that you come to meetings having made a genuine effort, tell us when you are stuck rather than waiting until you have fallen behind, and maintain a running record of your work so that your final presentation does not depend on reconstructing the semester from memory.

Applicant Requirements: No previous research experience, specialized construction course, or programming experience is required. Applicants should bring: Careful attention to detail. Reliability and consistent weekly effort. Willingness to learn unfamiliar concepts and research methods.

Applicant Preferences: The following would be helpful but are not required: Interest in construction, transportation, public infrastructure, or data analysis. Coursework in construction management, civil engineering technology, civil engineering, computer science, data science, statistics, geography, or a related discipline. Comfort with quantitative work, such as experience in an introductory statistics or engineering-analysis course. Experience with Excel or a programming language. Students from any major are encouraged to apply if the project interests them. Training will be tailored to each student's workstream and existing preparation.

Specific Time considerations/conflicts: No fixed day or time is required at the application stage. Selected students must be available for one weekly research-team meeting, which will be scheduled based on the availability of the matched students and research team.

App ID #: 3495

Mentor: Da Costa Vieira, Rafael Felipe

Email: rvieira@charlotte.edu

Title: Associate Professor

Department: Public Health and Health Administration

Co-mentor: No

Community engaged research: Yes

Title: Tick hunters: Building Capacity in Tick Surveillance from the Field to the Laboratory

Description: Tick-borne diseases (TBD) are an emerging public health concern in the United States (U.S.), and North Carolina (NC) has consistently ranked among the states with the greatest burden of tick-borne illness. A total of 15.8% of spotted fever rickettsiosis reported nationwide between 2019 and 2022 occurred in NC, second only to Arkansas, and has historically represented more than 20% of Rocky Mountain spotted fever cases reported in the U.S. over the past three decades. NC also lies within the established range of the Lone Star tick, a key vector linked to alpha-gal syndrome (AGS), or red meat allergy. AGS is gaining increasing recognition as a frequently underdiagnosed condition with a rising prevalence across the southeastern U.S. These illnesses were historically associated with the northeastern United States. Still, their geographic range has expanded steadily southward into states such as NC that were previously considered low risk for TBD. Many recently impacted areas lack the baseline data required to direct an efficient public health response since this expansion has overtaken the region's surveillance system, diagnostic expertise, and preventive capability. Mecklenburg County highlights this disconnect well. Officially, the county records only 20 to 40 TBD cases a year, a modest figure given that its natural preserves draw more than 1.7 million visitors annually into precisely the kind of green space where tick populations tend to concentrate. In spite of increasing tick abundance and pathogen prevalence across the NC Piedmont, Mecklenburg County remains relatively understudied, with existing local research limited by geographic coverage, short sampling intervals, or a particular focus on certain tick species or pathogens. Evidence suggests that Mecklenburg County's urban and suburban vegetations confirm ticks carrying clinically important pathogens. *Rickettsia parkeri*, which causes a mild form of spotted fever, was detected in 18% of *Amblyomma maculatum*, while our preliminary 2025 data confirmed prevalence for *Ehrlichia* spp. in 6.31% of *A. maculatum*, increasing to 14.28% at Cowan's Ford Wildlife Refuge. Despite this, the influence of spatial variation, seasonality, host availability, and environmental conditions on local tick populations still remains unclear and insufficiently characterized. To address this knowledge gap, our laboratory is conducting weekly (at least one day) field sampling throughout 2026 at two main focused nature preserves in Mecklenburg County. Moving beyond previous studies featuring short and fragmented sampling periods, this approach provides continuous, season-spanning data on questing tick activity. This longitudinal dataset facilitates the creation of spatiotemporal models to describe trends in tick distribution and abundance. The overall objective of this multi-year project is to generate baseline tick surveillance data and develop pilot spatiotemporal models to predict the distribution and seasonal dynamics of questing tick species across the two preserves. Our group is actively sampling ticks since 2025. Results of this study could establish future patterns of tick

activity and inform strategies to migrate tick-borne disease risk in Mecklenburg County. Weekly sampling in both preserves is planned to continue through 2027, providing an additional full field season of data. The resulting multi-year dataset will enable assessment of the consistency of seasonal patterns identified in 2025 and 2026, enhance the robustness of spatiotemporal models, and determine whether associations between tick abundance, canopy cover, and land surface temperature remain consistent across years.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

3 positions available

Anticipated Student Learning Outcomes: The major focus of this project is to build a strong, stable, and sustainable training workflow for students in tick surveillance and tick-borne disease research. Many public health organizations currently lack the specialized training and resources needed for effective tick surveillance and identification. Limited access to dedicated research facilities and molecular diagnostic capabilities further restricts the detection and characterization of pathogens carried by field-collected ticks. These challenges are compounded by gaps in collaboration across acarology, entomology, public health, molecular biology, veterinary medicine, ecology, and zoonotic disease research, limiting the development of coordinated and effective approaches to tick-borne disease surveillance and prevention. Rather than providing short-term exposure to individual techniques, the program will help students with structured, hands-on training that develops practical, technical, and scientific competencies in tick collection, identification, specimen processing, molecular diagnostics, and pathogen surveillance. Students will be trained to work independently and to apply these skills across different research and public health settings. Herein, students will be trained on: Methods and workflow for field collection; Organization, workflow and biosafety measures at the Zoonotic and Vector-Borne Diseases (ZVBD) Laboratory at the Center for Computational Intelligence to Predict Health and Environment Risks (CIPHER); How to store, and maintain ticks in the scientific collection at ZVBD Lab; Shipping and transport of tick specimens; Develop skills on DNA extraction from different tick stages and tissues; Data management and progress report;

Required training of -10 hours with Description: Biosafety

Field sampling

CITI program

Mentoring plan: I have a documented history of mentoring a very engaged and successful group of students from multiple backgrounds, ethnicities, and nationalities. In this training program, students will receive theoretical and practical training and expeditions to the collection of ticks in Mecklenburg county. I will also provide theoretical and practical training on the identification of tick specimens. Postdoctoral and graduate students at the ZVBD Lab will help with theoretical and practical training on DNA extraction, PCR protocols for the detection of tick-borne pathogens. Herein, students are expected to discuss and present at the ZVBD Lab weekly meetings, and at Conferences when funds are available. I am committed to supporting students in their professional development and international experience, as the ZVBD Lab team includes graduate students from Brazil and Sub-Saharan Africa conducting One Health research. At the ZVBD Lab,

students receive state-of-the-art training in One Health, as well as zoonotic and vector-borne disease studies.

Applicant Requirements: We are seeking motivated students who are eager to perform field activities and learn about ticks and the diseases they transmit, with the goal of advancing public health surveillance. Students with interests aligned with Public Health, Environment and Biological Sciences, Epidemiology and Bioinformatics are highly encouraged to apply.

Applicant Preferences: We are seeking motivated students who are eager to perform field activities and learn about ticks and the diseases they transmit, with the goal of advancing public health surveillance. Students with interests aligned with Public Health, Environment and Biological Sciences, Epidemiology and Bioinformatics are highly encouraged to apply.

Specific Time considerations/conflicts: Field collections are expected to occur in the morning. The Zoonotic and Vector-Borne Diseases Laboratory weekly meetings are Friday mornings.

App ID #: 3496

Mentor: Rorie, Anna

Email: arorie10@charlotte.edu

Title: Anna Rorie M.A.

Department: Anthropology

Co-mentor: No

Community engaged research: No

Title: Cannabis, Culture, and Community: An Anthropological Study of Charlotte's Emerging Cannabis and Hemp Industry

Description: The legal and cultural landscape surrounding cannabis is changing rapidly in the United States. In Charlotte, the expansion of hemp-derived products and businesses has created new opportunities to examine how laws, markets, language, identity, health beliefs, and cultural attitudes interact at the local level. This project uses anthropological methods to investigate Charlotte's emerging cannabis and hemp industry and the communities surrounding it. Rather than focusing on a single research question, students will work within a broader research framework and develop a focused topic based on their interests. Possible areas include cannabis stigma, consumer culture, racial inequality and the history of criminalization, cannabis marketing and language, wellness culture, neighborhood change, public understandings of cannabis laws, and the distinction between medical, recreational, and wellness uses. Students may gain experience with qualitative research methods such as interviews, surveys, participant observation, content analysis, archival research, policy research, and/or mapping. Students will work with the faculty mentor to develop an appropriate research question and methodology and will receive guidance throughout data collection, analysis, and presentation. The project is particularly interested in understanding cannabis not simply as a substance or commodity, but as a cultural object whose meanings are shaped by history, law, race, class, language, health beliefs, and changing social norms. Undergraduate students will play an active role in shaping and carrying out the research rather than simply assisting with an existing project. Working with the faculty mentor, each student will develop a focused research question within the broader cannabis and hemp research framework. Student duties may include conducting background and literature research, identifying and reviewing relevant policies, developing interview or survey questions, completing required research ethics training, recruiting and interviewing participants, conducting observations of local businesses and public-facing spaces, documenting marketing and social media materials, and organizing research data. Students will also learn to analyze qualitative data by identifying themes and patterns and connecting their findings to anthropological concepts and existing scholarship. Throughout the project, students will maintain research notes, meet regularly with the faculty mentor, discuss their findings and challenges, and revise their research approach when necessary. Students will ultimately contribute to the interpretation and communication of the project's findings through a research poster, presentation, report, or other scholarly product. This structure gives students meaningful ownership over their research while providing mentorship and experience with the full research process—from developing a question to presenting original findings.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

3 positions available

Anticipated Student Learning Outcomes: Students participating in this project will develop practical experience designing and conducting anthropological research. Students will learn to formulate research questions, conduct literature reviews, select appropriate qualitative or mixed research methods, collect and organize data, analyze cultural patterns, and communicate research findings to academic and public audiences. Students will also develop career-readiness skills including critical thinking, written and oral communication, ethical research practices, teamwork, project management, and intercultural competency. By the end of the project, students should be able to describe themselves as having participated in the development, execution, analysis, and public presentation of an original undergraduate research project.

Required training of 10 hours with Description: Research ethics/human-subjects training

IRB/CITI training as required

Introduction to qualitative research

Interview and survey design

Informed consent

Protecting participant confidentiality

Field-note techniques

Qualitative coding

Responsible research involving potentially sensitive topics

Mentoring plan: Students will meet with the faculty mentor regularly throughout the semester, with more frequent meetings during project development and the beginning of data collection.

Mentoring will emphasize student ownership of the research process while providing structured guidance in research design, ethics, data collection, analysis, and academic communication. Students will begin by identifying an area of interest within the larger project and developing a manageable research question. The mentor will help students connect their interests to anthropological literature and appropriate research methods. Students will receive feedback at major stages of the project, including research question development, literature review, methodology, data collection, analysis, and presentation. The goal of the mentoring relationship is for students to increasingly develop independence and confidence as researchers while knowing that they have consistent faculty support throughout the process.

Applicant Requirements: No previous research experience required. Students must be willing to complete the required research ethics training and demonstrate professionalism when interacting with research participants and community members.

Applicant Preferences: Interest in anthropology, sociology, criminal justice, public health, policy, business, or related fields. Strong writing and communication skills are preferred. Students should

be curious, dependable, comfortable discussing potentially sensitive social issues, and interested in learning qualitative research methods.

Specific Time considerations/conflicts: No specific days or times are required. Students will coordinate regular meetings with the faculty mentor based on mutual availability. Some data collection may occur off campus and will be scheduled in advance.

App ID #: 3498

Mentor: Rorie, Anna

Email: arorie10@charlotte.edu

Title: Anna Rorie M.A.

Department: Anthropology

Co-mentor: No

Community engaged research: No

Title: Hormones and the Human Skeleton: Skeletal Change Across the Lifespan

Description: The human skeleton is a dynamic biological system that continues to respond to physiological changes throughout life. Hormones play an important role in bone growth, maintenance, remodeling, and density, meaning that major hormonal changes across the lifespan may influence skeletal characteristics used by biological and forensic anthropologists. This project investigates relationships among hormonal change, age, sex, and skeletal variation across the human lifespan. Rather than focusing exclusively on older adults, the project considers periods of significant hormonal change including puberty, reproductive adulthood, pregnancy and parity, menopause, age-related changes in testosterone and estrogen, and other major endocrine transitions. Students may investigate how these processes relate to skeletal morphology, sexual dimorphism, bone remodeling, or the reliability of methods used to estimate components of the biological profile. Potential research questions include whether sexually dimorphic skeletal traits change in expression throughout adulthood; whether menopause or other hormonal transitions influence cranial or pelvic morphology; relationships between parity and pelvic variation; age-related changes in traditionally masculine or feminine skeletal traits; and whether established sex-estimation methods perform differently across age groups. Undergraduate students will develop a focused research question within this larger framework. Depending on their interests and available data, students may conduct literature reviews, work with existing skeletal datasets, compare age or sex groups, examine individual cranial or pelvic traits, conduct statistical analyses, and evaluate established anthropological methods. Students will contribute to data analysis, interpretation, and presentation of findings while receiving guidance from the faculty mentor throughout the research process

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students will gain experience conducting research at the intersection of biological anthropology and human biology. They will learn how hormonal and physiological processes influence the skeleton throughout the lifespan and how biological variation can affect anthropological interpretations of skeletal remains. Students will develop skills in scientific literature review, research question development, skeletal biology, data organization, quantitative analysis, interpretation of biological variation, research ethics, scientific writing, and presentation. Students will also critically evaluate the assumptions and limitations of traditional biological profile methods. By the end of the project, students will have participated in the

development, analysis, interpretation, and presentation of an original research question related to hormones, skeletal biology, and human variation.

Required training of 10 hours with Description: Students will begin with foundational training in skeletal biology, bone growth and remodeling, sexual dimorphism, and the role of hormones in skeletal development and maintenance. Students will review relevant biological and forensic anthropology literature before developing an individual research question within the larger project.

Training will then be tailored to each student's project and may include skeletal trait identification and scoring, ethical treatment of human remains, data management, literature review methods, basic statistical analysis, and interpretation of biological variation. Students working directly with skeletal collections will receive additional training in appropriate handling and standardized data collection procedures.

Students will complete all applicable university research ethics and compliance requirements before beginning research activities.

Mentoring plan: My mentoring approach emphasizes guided independence and student ownership of the research process. Students will work with me to identify a specific question within the broader study of hormones and skeletal change that reflects their interests while remaining achievable within an undergraduate research experience. I will meet regularly with students to discuss research progress, review literature and data, troubleshoot challenges, and provide feedback on methodology, analysis, interpretation, and writing. Early mentoring will emphasize foundational knowledge and research design, with students gradually assuming greater independence as they develop their skills. Students will also be encouraged to critically evaluate established anthropological methods rather than simply applying them. Particular attention will be given to understanding how age, hormones, individual variation, and life history may complicate traditional assumptions about skeletal sex and biological identity. Students will ultimately communicate their research through a poster, presentation, paper, or other scholarly product.

Applicant Requirements: Students should have a basic understanding of the human skeletal system. Students should demonstrate curiosity, reliability, attention to detail, willingness to learn, and the ability to handle research materials and data responsibly. Students must complete any required research ethics or compliance training.

Applicant Preferences: Students interested in biological anthropology, forensic anthropology, human osteology, anatomy, human biology, reproductive biology, forensic science, or related fields are encouraged to apply. Previous coursework in biological anthropology, anatomy, statistics, or research methods is helpful but not required. Students who are curious about how puberty, reproduction, pregnancy, menopause, aging, hormones, or other life-history processes affect the human skeleton may be particularly well suited to the project.

Specific Time considerations/conflicts: Regular meetings will be scheduled based on student and faculty availability. Any laboratory or skeletal collection work will depend on facility access.

App ID #: 3499

Mentor: Pan, Fenglian

Email: fpan4@charlotte.edu

Title: Assistant Professor

Department: Industrial and Systems Engineering

Co-mentor: No

Community engaged research: No

Title: Prompting AI to Unlock the Value of Existing Autonomous Systems Datasets

Description: Project description: Autonomous systems, such as self-driving vehicles and delivery robots, increasingly rely on artificial intelligence (AI) to perceive their surroundings, make decisions, and interact safely with people and the environment. The development and testing of these systems have generated large amounts of data from cameras, LiDAR, GPS, vehicle trajectories, system logs, and other sources. While a growing number of datasets are publicly available, much of their value remains locked away. This is because datasets are often collected independently for different research purposes and therefore differ substantially in data format, sensing modality, labeling scheme, terminology, and level of documentation. For example, one self-driving vehicle dataset may describe a scene using manually assigned labels such as "urban intersection," while another may provide only images, trajectories, or sensor data from which the same information must be inferred. These inconsistencies limit researchers' ability to understand, compare, combine, and reuse information across different datasets for downstream autonomous-system safety research. Recent advances in AI, including tools such as ChatGPT and multimodal models that can interpret images, text, and other data types, create new opportunities to unlock this value. Rather than collecting new data, this project focuses on getting more out of what already exists: by carefully designing prompts, these tools can be directed to read through raw, inconsistent, and poorly documented sources and surface the meaningful details hidden within them. Specifically, this project aims to develop an AI-assisted framework that can automatically identify key information from different self-driving vehicle datasets, generate standardized metadata, and organize them using a common description structure. The undergraduate researcher will help investigate publicly available datasets in this domain, identify useful criteria for describing them, and design prompts that apply AI tools to extract this information automatically and organize it into a standardized format for autonomous-system safety research. Through this project, the student will gain hands-on experience with real-world driving data, modern AI tools, prompt engineering, data analysis, and AI-enabled research.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience in prompt engineering, learning to design and refine prompts that guide AI tools to extract structured information from messy, real-world autonomous vehicle data. They will build technical skills in data analysis, metadata standardization, and critical evaluation of AI outputs, while also gaining domain knowledge in autonomous vehicle systems and dataset design. This experience will strengthen

students' research and problem-solving abilities in ambiguous, real-world contexts—skills highly relevant to careers in AI, data science, and robotics. Students are likely to describe this project as practical, resume-building experience applying generative AI to a genuine, unsolved research problem.

Required training of 5 hours with Description: The student will complete research ethics training (CITI) prior to onboarding. The student will also receive training in the use of generative AI tools and Python for research, as well as project-specific onboarding from the faculty mentor covering the project background, relevant datasets, research objectives, and expected research activities.

Mentoring plan: Dr. Fenglian Pan will meet with the student weekly to review progress, troubleshoot challenges, and refine research direction, with additional support available as needed via email. The student will work closely with me and my PhD student(s), who will provide guidance on related datasets and AI tools. I will help the student build technical and research skills incrementally, starting with structured tasks and progressing toward more independent contributions. The student will present their progress at group meetings, with feedback provided at each stage to support their growth as a researcher.

Applicant Requirements: The student should have a genuine passion for research in AI, autonomous systems, or data science, along with strong oral and written communication skills to document findings and present progress clearly. Familiarity with AI tools such as ChatGPT is expected.

Applicant Preferences: Students with experience in Python programming and prompt design are preferred and will receive strong consideration. Training will be provided for motivated students who are willing to learn.

Specific Time considerations/conflicts: The student must be available to meet in person for up to 1 hour for research team meetings.

App ID #: 3503

Mentor: Levens, Sara

Email: slevens@charlott.edu

Title: Associate Professor

Department: Psychological Science

Co-mentor: No

Community engaged research: No

Title: Using Positive Emotions to Promote and Sustain Healthy Behaviors: A Program of Research and Intervention Development

Description: Positive emotions play a significant role in our lives. They enrich our daily living, provide a sense of well-being, and bring meaning. Positive emotions also protect against the impacts of stress and foster resilience. Positive emotions are also the foundation of positive reinforcement learning. People want to re-experience positive emotions, so behaviors or actions that give rise to positive emotions will in consequence be more likely to be repeated. Living a healthy life can sometimes feel contrary to positive and gratifying experiences as healthy behaviors, like moderate physical activity and healthy eating require significant effort –the individual must choose to engage in a physically effortful activity, for example, over a sedentary behavior like relaxing on the couch. Its hard to do this. The vast majority of American adults are not meeting recommended physical activity guidelines. Insufficient physical activity is associated with chronic disease, physical disability and mobility issues, stress, and reduced mental well-being. Increased physical activity offers a path towards wellness and is associated with substantial mind-body health benefits and reduced mortality. Habitual physical activity has also been shown to promote positive emotions and benefit mental health. It is critical therefore to identify ways to promote healthier behavior like increased physical activity. Most people who struggle with meeting physical activity guidelines, can find engaging in physical activity challenging for a number of reasons (e.g. feeling unsure of what activities to do, or no access to a safe space to be active). In addition physical activity as a health behavior is associated with a particularly wide intention - behavior gap, in which the intention to engage in physical activity does not necessarily translate into actual engagement in physical activity. Most physical activity interventions to date have focused on planning or regulatory focused physical activity interventions to ‘close’ the intention behavior gap, but these interventions have yielded minimal success in promoting and sustaining physical activity. In my line lab, we take an alternate path and try to promote physical activity engagement through engagement of the reward pathway-- through fostering positive emotions, experiences, and associations with physical activity, that will increase the likelihood of the physical activity repeating. Broadly we seek to promote physical activity and related health behaviors by developing interventions that make engaging in those health behaviors more enjoyable and meaningful. My lab uses an integrative interdisciplinary approach that brings together the fields of exercise science, affective science, behavioral science, neuroscience, behavioral medicine, and health psychology, and methodologies such as mindfulness, guided imagery, participatory intervention development, and qualitative and quantitative research techniques. We explore avenues of physical activity engagement to promote health across the lifespan, with current efforts aimed at promoting physical activity in midlife for

healthy aging and in women undergoing menopausal transition. We apply a range of research methodologies and intervention development techniques at various developmental stages. Our goal is to develop effective, tailorable, scalable, and accessible interventions that increase physical activity engagement by increasing physical activity enjoyment. We are currently recruiting students interested in being a part of this effort to help with one or more projects underway in the lab. Current areas in which an OUR scholar can assist include 1) setting up and testing a new recumbent exercise bike for conducting physical activity experiments in the lab, 2) assisting with data collection testing a novel physical activity intervention, 3) assisting with intervention development and refinement, 4) scheduling and tracking participants, 5) assisting with focused literature reviews on physical activity interventions, physical activity engagement, measures of physical activity and related attitudes, assessing enjoyment in physical activity, physical activity across the lifespan, behavior change techniques, etc. and 6) assisting with preparing conference abstracts and manuscripts. OUR scholars will have the opportunity to select tasks and analyses from one or more of the developmental opportunities above to comprise their individual research project. OUR scholars will also have the opportunity to identify personal interests that they would like to explore in the lab and potentially incorporate those into their research project. OUR scholars will also have the opportunity to join Dr. Levens and her lab to attend either the Society of Behavioral Medicine or the Society of Affective Science national conference in April 2027 (should they wish to). Hands-on mentorship and training for all opportunities will be provided by Dr. Levens and advanced graduate students in her lab.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students will gain a wide variety of career enhancing skills during their training in the Levens Lab. Students will be a part of a thriving research lab with other undergraduate students, and masters and doctoral students. Through participation at lab meetings, working with peers and graduate students, and one-on-one professional development meetings with Dr. Levens, students will gain career and self-development experience working in a team to move lab initiatives and advance health behavior research. Dr. Levens will work with OUR scholars to develop an individualized mentoring plan to guide their training and professional development. Students will develop strong communication skills through lab discussions, idea exchanges, and presentations. Students will also have the opportunity to develop their written communication skills by contributing to literature reviews and assisting with manuscript preparation. Dr. Levens and her graduate students will also train OUR scholars in cutting-edge research methods to provide OUR scholars with methodological and technological expertise in the field of health psychology and experimental medicine. Dr. Levens engages in interdisciplinary Team Science practices by integrating diverse perspectives and dividing responsibilities to advance common goals, providing OUR scholars with extensive opportunities to strengthen teamwork skills. Through personalized training in research methods, assisting with data collection, advancing a research project, professional development exercises, and engaging in team science, students will also strengthen their leadership skills and refine their professionalism. By assisting with intervention development and refinement, synthesizing literature, and conducting literature reviews in research databases, OUR scholars will have the opportunity to engage in critical thinking and knowledge application. Students will also be guided in how to conduct research and design interventions that ensure all

people have an equal opportunity to achieve positive health outcomes. Finally, Dr. Levens will assist OUR scholars in developing and sustaining a growth orientation mindset that confers value on the process of growth and learning, and endeavor to instill a love of inquiry and research that will be beneficial in whatever career and future endeavors OUR scholars aspire to.

Required training of 3 hours with Description: All OUR scholars will be required to obtain Human Subjects CITI certification . This certification is provided by the CITI website and should take approximately 2 to 3 hours.

Mentoring plan: Dr. Levens is extremely passionate about mentorship and undergraduate research. Dr. Levens is a certified CIMER mentor (<https://cimerproject.org/>) and will develop an individualized development plan (IDP) with all OUR scholars in her lab. Dr. Levens will also provide professional development guidance incorporating CIMER materials into her mentorship practice. OUR scholars will be considered full members of Dr. Levens lab and receive weekly hands-on mentorship and training from Dr. Levens and advanced doctoral students in her lab. OUR scholars will be required to attend and participate in weekly lab meetings (the timing of which is set each semester at time that lab members are available to attend), and additional scheduled meetings (at a mutually agreed upon time) with Dr. Levens and/or her graduate students for OUR scholars to receive individualized skill based training in lab tasks and projects, such as training in how to operate the exercise bike, scheduling and tracking participants, conduct literature reviews, etc... OUR scholars will also be expected to read assigned relevant articles, participate in lab discussions and share ideas, complete training tasks in a timely manner, and occasionally present their progress and contributions at lab meetings. Dr. Levens will oversee all mentorship and training of OUR scholars and commit time and resources to their training and professional development. Dr. Levens has been training undergraduates in research for over 20 years; it is something that she deeply enjoys. At the onset of the semester Dr. Levens will meet with OUR scholars in her lab to guide them through their Individualized Development Plan (IDP). Dr. Levens will then meet with the scholar again mid-semester to review their IDP, update their goals and growth areas, and identify additional areas of training of interest to the student. At the end of the semester Dr. Levens will meet with OUR scholars to review and update their IDP in preparation for their future endeavors.

Applicant Requirements: Requirements: We are interested in students with an intrinsic interest in research and healthful living and behavior change. Students should be committed, reliable, punctual, and have good attention for detail and a good work ethic. Strong written communication skills. A sense of professionalism and ability to work directly with participants for in-person data collection. Familiarity using Microsoft Word and Excel and Google Workspace (google docs and sheets)

Applicant Preferences: Preferences: Some familiarity/interest in psychology and health literature. Ability to conduct a literature review search. Ability to follow detailed instructions and protocols. Coursework in research methods and/or data analysis. Ideally students would be interested in working in the lab for an additional semester or more after their participation in the OUR program so that they have time to more fully develop their skills and interests, and benefit from their training. Interest in careers that overlap with Lab interests, training and expertise (e.g. advanced graduate training, careers in medicine or nursing, physical therapy, mental health, etc...)

is desirable in terms of match between interest and training. Prior research experience would enable an OUR scholar to be involved in more advanced lab projects and opportunities.

Specific Time considerations/conflicts: There are no currently set meeting times.

At the end of the Spring semester OUR scholars and other lab members will identify a Fall Semester lab meeting time that fits the schedule of lab members. OUR scholars will be required to attend this weekly lab meeting.

All other required meetings will be determined in the Fall Semester at mutually available times.

App ID #: 3501

Mentor: Le, Chau

Email: cle12@uncc.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Exploring Wearable and Sensing Technologies for Construction Safety and Worker Health

Description: Construction is one of the most dangerous industries in the country, and the hazards are not only the obvious ones. Workers deal with heat, noise, fatigue, physical strain, and the constant need to notice danger in a busy environment. Wearable and sensing technology (e.g., eye trackers, physiological sensors, motion sensors, environmental monitors) can now measure a lot of what happens to a worker's body and attention during a shift. What is still difficult is using these devices consistently outside a laboratory, in the noisy, hot, moving conditions of a real job site. Our lab has recently built a collection of these devices, and this project is about getting them research-ready. This is groundwork rather than a finished study: figuring out what each device can actually measure, how to set it up consistently, how to get clean data out of it, and what kind of study it could support. It is a good fit if you like understanding how things work and are comfortable being one of the first people to try something. There are two directions you could take, and you would focus on one: Eye tracking. Wearable eye trackers record where a person looks, which is how researchers examine visual attention during hazard-recognition tasks. You would learn to set up and calibrate our eye-tracking systems, develop a consistent procedure for running a session, work out how to export and check the quality of the recordings, and review what other researchers have learned about visual attention and hazard recognition in construction. Physiological and environmental sensing. Small wearable devices can now track heart rate, electrodermal activity (a measure of sweat-gland response), skin temperature, and movement, along with the surrounding heat and noise conditions. These signals do not measure stress directly, but they are what researchers use to study stress, workload, and fatigue. You would learn to use these devices, develop procedures for collecting and organizing their data, test how well they work together, and review research on stress, fatigue, and heat exposure among construction workers. In both directions, the work involves hands-on time with equipment, careful documentation, reading research literature, and organizing and visualizing whatever data you collect. If approvals are in place, you may also help with a small number of supervised pilot data-collection sessions. Your final product would be a clear account of what these devices can and cannot do and what a future study using them should look like, which you would present at the OUR symposium. You do not need any background in sensors, electronics, or programming. Patience, curiosity, and careful record-keeping matter more here than technical experience.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience with research instrumentation: setting up and calibrating wearable and sensing devices, running a data-collection procedure consistently, exporting and checking data quality, and troubleshooting when equipment does not behave as expected. These are practical skills that transfer to any laboratory or field research setting. Students will learn what it means to make a research method reproducible. Much of this work is writing down a procedure clearly enough that someone else can follow it consistently and produce data that can be compared and evaluated; a skill that underlies all credible research and that most undergraduates never get to practice directly. Students will also develop knowledge of construction safety and worker health, including how hazards are recognized, how physical and environmental stress affect workers, and where sensing technology is and is not able to help. They will read and synthesize published research and learn to summarize a body of evidence. Each student will prepare and deliver a presentation at the OUR symposium. Because this is exploratory work, the presentation will explain what the equipment can do, what limitations were identified, and how the feasibility evidence should inform a future study. The experience builds several career-readiness competencies, including critical thinking, technology use, communication, and professionalism. A student finishing this project should be able to tell an employer or graduate program: I learned to operate research instrumentation, developed procedures that the lab now uses, and reported on what these technologies can realistically measure.

Required training of 25 hours with Description: The first three weeks will provide structured onboarding. Students will receive an orientation to the research group and their assigned device group, develop a written mentoring agreement with me, and complete any required University research-integrity or compliance training.

Each student will then receive hands-on instruction in the setup, calibration, and operation of their assigned devices, working alongside me or a Ph.D. researcher before operating equipment independently. Training will also cover data organization, documentation, reproducible research practices, and the responsible handling of equipment and research materials.

By the end of the third week, each student will receive a written description of their device group, objectives, milestones, and expected outputs so that the scope and definition of successful completion are clear.

Most of the semester's work will involve equipment characterization, procedure development, and literature synthesis and will not require the systematic collection of human-participant research data. Device setup and calibration may be practiced by members of the research team without retaining data for research purposes. If supervised pilot data-collection sessions involving human participants are undertaken later in the semester, students will complete the required human-subjects training and be added to an approved IRB protocol before participating. Pilot data collection is contingent on approval and is not required for successful completion of the project.

Mentoring plan: My commitment is that an undergraduate on my team will be a contributing member of a research group, not simply an extra pair of hands. You can expect a weekly research-team meeting that I lead, during which graduate and undergraduate researchers discuss their progress. You will be expected to attend, ask questions, and periodically present your own work to the group. You will also have individual progress check-ins with me, feedback on your work, and a

clear set of milestones so that you know where you stand. Because this project involves unfamiliar equipment, I expect the first few weeks to include more hands-on supervision than a typical research assignment. You will work directly with me or a Ph.D. researcher while learning your devices, and support will remain available between team meetings once you are working independently. I will remain responsible for the research direction, major methodological decisions, evaluation of your progress, and your overall mentoring experience. I want to be straightforward about the nature of this work: it is exploratory, and some of what you try will not work on the first attempt. That is expected and is part of what makes the results useful. You will not be judged on whether the equipment cooperates, but on how carefully you investigate, document, and report what you find. I will review drafts of your symposium poster or presentation and organize a practice session with the research group beforehand. Near the end of the semester, we will discuss what you learned, whether research is a direction you would like to pursue, and possible next steps. What I ask in return is that you come to meetings having made a genuine effort, tell us when you are stuck rather than waiting until you have fallen behind, and maintain a running record of your work so that your final presentation does not depend on reconstructing the semester from memory.

Applicant Requirements: No previous research experience, specialized coursework, or technical background is required. Applicants should bring: Careful attention to detail and patience with equipment that does not always work the first time. Reliability and consistent weekly effort. Willingness to learn unfamiliar concepts, tools, and research methods. Comfort with thorough written documentation of procedures and results.

Applicant Preferences: The following would be helpful but are not required: Interest in construction safety, worker health, human factors, sensing technology, or wearable devices. Coursework in construction management, civil engineering technology, civil engineering, computer science, data science, psychology, exercise science, kinesiology, public health, or a related discipline. Any hands-on experience with technical equipment, electronics, or laboratory instrumentation. Basic comfort with Excel or a programming language for organizing and plotting data. Students from any major are encouraged to apply if the project interests them. Training will be tailored to each student's assigned device group and existing preparation.

Specific Time considerations/conflicts: No fixed day or time is required at the application stage. Selected students must be available for one weekly research-team meeting, which will be scheduled based on the availability of the matched students and research team. Because this project involves shared laboratory equipment, students should expect to schedule regular blocks of time in the lab (Smith 220) during normal working hours.

App ID #: 3502

Mentor: Sanders, Kristin

Email: ksande55@charlotte.edu

Title: Assistant Professor

Department: Department of Psychological Sciences

Co-mentor: No

Community engaged research: No

Title: Sleep, Memory, and Creative Problem Solving

Description: In our lab we investigate how sleep affects the way that we think about and process the world. Specifically, this project seeks to understand how sleep and other periods of wakeful rest may be a particularly beneficial period for memories to be solidified so that you remember information better, and also for memories to be reorganized in a way that facilitates forming new connections and finding creative solutions to difficult problems. As a student working on this project, you may be asked to help design new materials for an upcoming study, guide participants through behavioral tasks, transcribe participants' verbal responses, score the accuracy and quality of participants' responses to memory tests and problem-solving sessions, and/or score participants' electroencephalography (EEG) records to identify specific sleep stages or sleep features. Students will participate in a weekly lab meeting where we read and discuss research articles related to the project and share updates on the progress of ongoing data collection and analysis efforts. As part of this project, students take ownership of a piece of one of the ongoing studies or prior datasets to report on a targeted research question or finding under the guidance of Dr. Sanders.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

3 positions available

Anticipated Student Learning Outcomes: As part of this research project, students will gain hands-on experience with human subjects research. Students will advance their skills in understanding and critiquing psychological and cognitive neuroscience research, learn how to conduct research with human subjects, develop skills in administering cognitive tests to human participants, and score, analyze, interpret, and present data and results. Furthermore, students will develop and demonstrate soft skills including time management, effective communication, critical thinking, and collaboration that are relevant to many career paths. Students develop a mentorship relationship with a professor to support their career journeys and can take on a leadership role if they are part of the lab for multiple semesters.

Required training of 13 hours with Description: Students will need to complete the IRB CITI training (approximately 5 hours) to work with human subjects data. All other training will occur as part of the research experience. Typically this training requires 5-15 hours toward the beginning of the semester depending on the specific study requirements.

Mentoring plan: As a research mentor and leader of the lab group, I am committed to fostering collegiality, collaboration, and career development. I support students' growth in their research

skills through leading weekly lab group meetings where we read and discuss research articles related to the project and I use these meetings to teach skills that are relevant to all students in the group such as how to create and interpret graphs, conduct statistical analyses, and think critically about research questions and experiment results. During these group meetings we also support, celebrate, and encourage each other through challenges, disappointments, and successes. I further meet approximately weekly with students individually or in smaller project groups to provide training, guidance, and feedback on individual tasks and projects. As part of this experience, students will take ownership of a small piece of a specific research project they are working on to understand the specific research question, hypothesis, and results of their work. Students are encouraged to present this specific finding to the lab group and at a research conference.

Applicant Requirements: I am looking for students with an interest in sleep, memory, and/or creative problem solving and the research process more broadly. Students should be conscientious, reliable, curious, and engaged. Students will need to have good time management, a willingness to think critically about research processes, a collaborative spirit, and an ability to reflect on and take ownership of mistakes if they occur.

Applicant Preferences: All relevant training for this research experience will be provided by the lab. Some prior experience with a scientific research methods course (e.g. Research Methodology 1 PSYC 2391), neuroscience course (e.g. Introduction to Brain and Behavior PSYC 2113), and/or cognitive psychology course (e.g. Introduction to Cognitive Processes PSYC 2316, Psychology of Learning and Memory PSYC3131, etc.) would be helpful but is not required.

Specific Time considerations/conflicts: Students will commit to working approximately 10 hours a week. The exact hours will be determined collaboratively between Dr. Sanders and the student based on the student's availability and preferences and the needs of the project. Other meetings will be scheduled at a time that all group members can attend. This semester our primary project needs are during typical daytime hours (approximately 9am-7pm M-F). Most work will be conducted in person on campus in Colvard but some work may occasionally be completed remotely.

App ID #: 3530

Mentor: Jang, Jaeyoung

Email: jjang6@charlotte.edu

Title: Assistant Professor

Department: Public Health and Health Administration

Co-mentor: No

Community engaged research: No

Title: Women's Health in Times of Crisis: Economic Vulnerability, Health Insurance, and Access to Care

Description: Economic and social crises, such as job loss, financial hardship, loss of health insurance, or major life transitions, can create barriers to healthcare and negatively affect health. These challenges may be especially important for women because economic circumstances, employment, caregiving responsibilities, and access to healthcare can shape health in different ways across population groups. This project examines how economic vulnerability, health insurance, and public policies are related to women's healthcare access and health outcomes. Using existing national survey and administrative datasets, the research team will explore questions such as whether women experience greater barriers to healthcare during periods of economic instability, whether health insurance helps protect individuals from these effects, and whether public policies reduce health disparities among vulnerable populations. One potential area of study focuses on young adults and the Affordable Care Act provision that allows young adults to remain on a parent's health insurance plan until age 26. This policy offers an opportunity to examine whether continuous insurance coverage can serve as a safety net during periods of unemployment or financial instability and whether the benefits differ between women and men. Other related analyses may consider financial hardship, employment changes, healthcare affordability, preventive care, mental and physical health, or differences across socioeconomic groups. Undergraduate students will contribute to different stages of the research process based on their interests and level of experience. Activities may include reviewing and summarizing academic literature, researching relevant health policies, identifying and organizing variables from existing datasets, preparing descriptive statistics and visualizations, assisting with data management and analysis, interpreting findings, and helping prepare research posters, presentations, or manuscripts. Students are not expected to have prior research experience and will receive guidance and training throughout the project.

Accepting applications for: Only 75 hours over an academic semester (~5h per week)

3 positions available

Anticipated Student Learning Outcomes: Students participating in this project will gain experience with the full research process, from developing a research question to communicating findings. By the end of the experience, students are expected to: Understand how health policy, health insurance, and economic conditions can contribute to health disparities. Develop skills in locating, evaluating, and synthesizing peer-reviewed research and policy information. Gain experience working with secondary health and social science datasets. Develop basic skills in data

management, descriptive analysis, and data visualization. Learn how researchers translate broad social and health problems into measurable research questions. Strengthen their ability to critically interpret quantitative findings and distinguish statistical results from broader policy conclusions. Develop written and oral communication skills through research summaries, presentations, posters, or manuscript preparation. Gain experience collaborating as part of a research team and managing individual research responsibilities. The experience is intended to strengthen several career-readiness competencies, particularly critical thinking, communication, teamwork, technology, and career and self-development. Students should leave the project able to describe how they contributed to an empirical research project addressing an important health policy problem.

Required training of 5 hours with Description: Students will begin with an orientation to the overall research project, including the research questions, the role of health insurance and health policy, and the types of secondary data used in health services research.

Initial training will include:

- an introduction to the research question and relevant health policy context;
- guidance on conducting and documenting a scholarly literature review;
- an introduction to the selected dataset and its documentation;
- training in responsible data management and research practices;
- basic instruction in descriptive statistics and data visualization, when relevant to the student's role; and
- training in the software needed for the student's assigned tasks, such as Excel and, where appropriate, statistical software.

Students will initially complete structured tasks with examples and faculty feedback before moving toward more independent research responsibilities. Because the project is expected to rely primarily on publicly available or de-identified secondary data, extensive human-subjects training is not anticipated; students will complete any required university research-compliance training before beginning relevant activities.

Mentoring plan: My goal is to provide students with a structured but progressively independent research experience. Students will begin with clearly defined, manageable tasks and receive examples, resources, and feedback to help them understand how to complete the task and how their work contributes to the larger research project. The research team will meet regularly, generally once per week or every other week depending on the stage of the project. Meetings will be used to discuss progress, address questions, review research findings, and connect individual assignments to the broader research questions. Students will also have opportunities for individual meetings when they need additional guidance. As students gain experience, they will be encouraged to take greater ownership of a specific project component. For example, a student may become responsible for a particular area of the literature review, policy background, set of variables,

descriptive analysis, or research figure. I will provide regular feedback on students' work and help them develop both technical research skills and an understanding of the reasoning behind research decisions. I also want students to experience how research findings are communicated beyond data analysis. When appropriate, I encourage students to contribute to a research poster, presentation, conference submission, or manuscript. My mentoring approach emphasizes intellectual curiosity, reliability, collaboration, and skill development rather than expecting students to enter the project with advanced research expertise.

Applicant Requirements: Ability to communicate professionally and work collaboratively. Ability to complete assigned tasks reliably and meet agreed-upon deadlines. Willingness to read academic research and learn about health policy and quantitative research. Basic familiarity with common computer applications such as Microsoft Word and Excel. No prior research or statistical software experience is required.

Applicant Preferences: Any of the following would be helpful but are not required: Interest in women's health, public health, health policy, healthcare management, economics, or health disparities. Coursework in statistics, research methods, epidemiology, economics, public health, healthcare management, or a related field. Experience with Excel or statistical software such as Stata, R, SAS, or SPSS. Interest in quantitative data analysis or data visualization. Strong academic writing and literature-review skills. Interest in pursuing graduate education, health-related careers, policy research, or data-oriented careers.

Specific Time considerations/conflicts: No specific day or time is required at the application stage.

Students are expected to participate in a regular research team meeting, but the meeting time will be chosen based on the schedules of the students and the faculty mentor. Most individual research activities can be completed independently on a flexible schedule.

App ID #: 3504

Mentor: Gonzalez-Calderon, Carlos

Email: cgonza60@uncc.edu

Title: Assistant Professor

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Understanding Air Cargo Growth at Charlotte Airport (CLT): Commodity-Level Trade, Economic, and Land-Use Drivers

Description: Charlotte Douglas International Airport (CLT) is a major, growing air cargo hub in the Southeast. Cargo tonnage reached 224,723 tons in 2025, a 9.2% increase over the prior year, placing CLT 29th nationwide in cargo movement. This growth reflects several factors, including available infrastructure and belly-cargo capacity, CLT's extensive passenger network, e-commerce and parcel demand, and American Airlines' hub operations. However, aggregate measures such as regional GDP or total trade can mask important differences across industries and commodity groups. Different commodities respond to different economic and trade drivers and may also require different airport facilities, handling capacity, and supporting infrastructure. This undergraduate research project will examine which regional trade, economic, industry, and land-use indicators are most strongly associated with air cargo activity at CLT and whether those relationships differ across major commodity groups. Students will conduct a structured, screening-level assessment of the CLT catchment area, identifying candidate demand drivers such as industry activity, employment and business concentration, trade patterns, logistics activity, and regional development trends. The goal is not to produce an official airport forecast; instead, the project will build a transparent evidence base to support future forecasting, capacity planning, and facility-planning decisions at a commodity-specific level. Students will create a commodity-disaggregated air cargo data inventory for CLT and document a reproducible workflow for integrating information from multiple federal, state, regional, and airport-related sources. They will clean and harmonize the data, address missing values and unit inconsistencies, document assumptions, and validate across sources. The analytical work will include descriptive statistics, trend analysis, data visualization, and, when appropriate, introductory correlation or regression analyses to evaluate candidate demand determinants. Students will compare findings across commodity groups and translate the results into practical planning insights. Final products will include a documented, research-ready dataset; a set of clear figures and/or maps; a short technical summary (approximately 5-8 pages); and a poster or slide presentation for the end-of-term OUR symposium.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students participating in this project will receive a hands-on introduction to transportation and freight research using real-world air cargo, trade, economic, industry, and land-use data. They will learn how to move from a broad planning question to a

structured research process: defining candidate demand determinants, identifying appropriate data, documenting assumptions, evaluating data quality, and translating quantitative results into evidence that can inform airport planning. The project will also strengthen students' ability to communicate technical findings clearly to both specialized and general audiences. By the end of the program, students will be able to gather, clean, merge, visualize, and analyze multi-source datasets using tools such as Excel, R, Python, or equivalent software. They will use reproducible research practices, including clear folder structures, metadata, data dictionaries, structured saving or version-control practices, and a documented workflow that another researcher can follow. Students will gain practical experience with descriptive statistics, trend analysis, cross-source validation, and introductory statistical modeling concepts, including interpreting relationships without overstating causality. Students will also develop an applied understanding of air cargo systems, airport catchment areas, commodity flows, and the ways regional trade and economic development can influence freight demand. They will learn to compare patterns across commodity groups, identify data limitations and uncertainty, and explain how different industries may create different airport capacity and facility needs. Through this interdisciplinary work, students will strengthen critical thinking, analytical reasoning, teamwork, technical writing, and presentation skills relevant to graduate study and careers in transportation, logistics, airport planning, data analytics, economics, and supply chain management.

Required training of 4 hours with Description: Students will complete approximately four hours of structured onboarding and guided training at the beginning of the project. Training will introduce the fundamentals of air cargo transportation, airport catchment areas, commodity demand, and the role of regional trade and economic indicators in freight planning. Students will also review selected literature or planning reports to understand the research context and the distinction between exploratory analysis and formal forecasting. Technical training will include guided practice with the data-management and analysis tools used in the project (e.g., Excel, Python, R, and GIS when appropriate), as well as procedures for handling missing values, unit conversion, data joins, cross-source validation, and reproducible documentation. Students will set up an organized project workspace with a data dictionary, source log, and a simple "how to run" README. Students will also complete any required research-integrity or compliance training identified by UNC Charlotte.

Mentoring plan: At the beginning of the term, we will complete an onboarding that introduces the project goals, clarifies expectations, defines the research questions, and provides initial training in air cargo concepts, data management, basic statistical analysis, documentation, and responsible data handling. Students will receive a project roadmap with weekly milestones and examples of strong deliverables, such as a cleaned dataset, a data-source inventory, a trend figure, a preliminary statistical analysis, and a short methods summary. This structure will make expectations clear while showing how individual tasks contribute to the overall research question. During the semester, students will work directly with me as the primary mentor. They can expect consistent contact through a standing weekly mentoring meeting focused on progress, problem-solving, interpretation, and skill-building, plus an additional weekly work session or office-hour block for hands-on troubleshooting when needed. If two students are matched, they will operate as a small research team with complementary initial roles. For example, one student may focus on air cargo and commodity data while the other focuses on regional trade, economic,

industry, and land-use indicators. Both students will ultimately work with the integrated dataset and understand the complete analytical workflow. I will scaffold the work so students begin with clearly defined tasks and move toward greater independence as their skills develop. They will submit brief weekly progress updates, and I will provide timely, specific feedback on data quality, analytical outputs, figures, interpretation, and research communication. Students will practice presenting their work through short updates during our meetings and will be coached throughout the spring to prepare a polished poster or slide presentation for the OUR symposium. My goal is for each student to finish the experience able to explain the research question, describe the methodology and limitations, identify their individual contributions, and showcase tangible research products relevant to future internships, graduate study, or professional careers.

Applicant Requirements: I am looking for undergraduate students interested in freight transportation, air cargo, airports, logistics, or how regional economic and trade patterns shape infrastructure demand in Charlotte. Prior research experience is not required. What matters most is reliability, strong organization, attention to detail, curiosity, and a willingness to learn new tools and follow a structured research workflow. The ideal student is comfortable working with data at a basic level, communicates clearly through brief progress updates, asks questions when needed, and is open to feedback and teamwork. Familiarity with spreadsheets, introductory statistics, GIS, or basic Python/R is helpful but not required; we will provide training and support. Students can contribute meaningfully through careful data collection, documentation, quality-control checks, analysis, and technical writing. Students from a wide range of majors are encouraged to apply, including civil engineering, data science, economics, supply chain/logistics, geography/GIS, statistics, computer science, business analytics, and related fields.

Applicant Preferences: While prior research experience is not necessary, we will give preference to students who show a strong interest in transportation, logistics, airport planning, freight systems, economic development, or trade and who are motivated to learn data-driven methods. Helpful preparation includes experience with spreadsheets for data cleaning, introductory statistics or data science, GIS/mapping, or basic programming. Coursework in transportation or urban planning, economics, supply chain management, data science, geography/GIS, statistics, or computer science is a plus. Still, students from any major are welcome if they demonstrate curiosity, organization, and follow-through. We will also prefer applicants who communicate clearly, are comfortable working independently between meetings, and can commit consistently to weekly check-ins and project milestones.

Specific Time considerations/conflicts: Students must be available for a weekly mentoring meeting (approximately 60 minutes) and a weekly check-in/work session (approximately 30-60 minutes), scheduled by mutual agreement during the workweek (Monday-Friday) between 9:00 a.m. and 5:00 p.m. We will consider either a 5-hour-per-week or 10-hour-per-week commitment, and adjust the scope of individual assignments accordingly. Occasional additional availability may be requested near major project milestones and toward the end of the semester for symposium preparation and practice presentations; these sessions will be scheduled in advance and coordinated around students' academic schedules.

App ID #: 3505

Mentor: Gonzalez-Calderon, Carlos

Email: cgonza60@uncc.edu

Title: Assistant Professor

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Cleaner Freight for Charlotte: Estimating the Public Health Benefits of Reducing Truck Emissions

Description: Trucks are essential to Charlotte's economy, supplying businesses, construction sites, distribution centers, stores, and households throughout the region. At the same time, truck traffic produces air pollutants that can affect human health. The magnitude of these impacts depends not only on how many trucks are traveling, but also on the roadway type, truck activity, vehicle characteristics, and the pollutants emitted. Understanding these differences can help transportation agencies identify where strategies to reduce truck emissions may provide the greatest public-health benefits. This undergraduate research project will develop a practical, data-driven framework to estimate the air-pollution-related public-health costs of truck traffic in the Charlotte-Mecklenburg region. Rather than simply identifying locations with high truck traffic or potential exposure, the project will ask a different question: Which freight corridors generate the greatest estimated public-health damages, and where could reductions in truck emissions produce the greatest benefits? As an undergraduate researcher, you will help assemble and organize publicly available transportation and environmental datasets relevant to freight activity in Charlotte. These may include roadway networks, traffic volumes, truck traffic estimates, roadway characteristics, vehicle classification information, and emission factors. You will work with the research team to develop a reproducible, roadway-level database to estimate truck activity and emissions along major freight corridors. The project will initially focus on pollutants closely associated with transportation and public health, particularly particulate matter (PM_{2.5}) and nitrogen oxides (NO_x). Students will help estimate truck vehicle-miles traveled, apply appropriate emissions factors, and calculate screening-level emission estimates for roadway segments. They will then combine these estimates with established public-health damage factors to translate emissions into monetary measures of health impacts. This framework will allow the project to calculate indicators such as estimated annual public-health cost by roadway segment, health cost per truck-mile, and total health cost by corridor. Students will use GIS and data visualization to examine how these indicators vary across Charlotte and identify corridors where freight activity produces especially high estimated health damages. A second component of the project will evaluate simple emission-reduction scenarios. For example, students may estimate how public-health costs would change if truck emissions were reduced by 25% or 50%, or if reductions were targeted specifically to the corridors with the highest baseline health damages. The purpose is not to predict a specific future technology, but to explore how different strategies for reducing freight emissions could produce different public-health benefits. The project will culminate in a set of Charlotte Freight Health Priority Corridors—roadway segments where reducing truck emissions could potentially produce

especially large health benefits. Students will help create maps, corridor rankings, summary tables, and short fact sheets describing why particular corridors emerge as priorities. This project is designed as a practical, hands-on introduction to research at the intersection of freight transportation, air quality, public health, GIS, and data-driven transportation planning. No prior research experience is required—training and support will be provided. By the end of the project, students will have contributed to a reproducible Charlotte freight-emissions database, a GIS-based inventory of estimated truck emissions and health costs, an analysis of alternative emission-reduction scenarios, and a poster or slide presentation for the end-of-term undergraduate research symposium. The results may also provide the foundation for a future peer-reviewed study examining freight transportation and public-health impacts in the Charlotte region.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students participating in this project will gain practical, resume-ready research skills and develop an understanding of how freight transportation, vehicle emissions, and public health connect through quantitative analysis. By the end of the program, students will be able to: Translate a real-world transportation and public-health problem into research questions, data requirements, analytical methods, and specific deliverables. Work with messy, real-world transportation and environmental datasets and transform them into research-ready files through cleaning, organization, documentation, and quality-control procedures. Build a reproducible GIS and data-analysis workflow using organized folder structures, metadata, data dictionaries, and documented analytical procedures. Understand fundamental freight transportation measures, including truck traffic volumes, truck vehicle-miles traveled, vehicle classifications, and roadway characteristics. Develop an introductory understanding of vehicle emissions estimation and how transportation activity can be combined with emission factors to estimate pollutants such as PM_{2.5} and NO_x. Understand the conceptual difference between truck activity, emissions, public-health damages, and public-health benefits. Calculate screening-level indicators such as annual emissions, estimated public-health costs, health cost per truck-mile, and corridor-level health benefits. Use GIS to connect transportation data with roadway segments and create maps identifying spatial differences in freight-related emissions and health costs. Compare alternative emission-reduction scenarios and evaluate which strategies or locations could produce the greatest estimated public-health benefits. Interpret results critically, including recognizing uncertainty, modeling assumptions, data limitations, and the difference between screening-level estimates and direct measurements of human exposure or health outcomes. Produce clear, publication-quality maps, figures, and tables with appropriate legends, captions, units, and narrative framing. Communicate scientific results to both technical and nontechnical audiences through short methods summaries, progress presentations, and an end-of-term poster or slide presentation. Students will develop interdisciplinary skills relevant to graduate school, internships, and careers in transportation engineering, transportation planning, environmental engineering, public health, GIS, sustainability, environmental consulting, and data science.

Required training of 0 hours with Description: Students will begin with a structured onboarding during the first week that introduces the project goals, research questions, expectations, responsible research practices, and data-management procedures.

Students will complete a compliance check through UNC Charlotte's Office of Research Protections and Integrity (ORPI) using the required questionnaire. Based on the ORPI determination, students will complete any required training modules.

Once students satisfy compliance requirements, they will complete a short technical bootcamp covering the basic tools and concepts needed for the project. Topics will include GIS fundamentals, transportation data organization, data cleaning, reproducible workflow practices, basic freight activity measures, and introductory concepts related to transportation emissions and public-health damage estimation.

Students will establish an organized project workspace with clearly structured folders, a data dictionary, documentation of data sources, and a simple "how to run" README so they can reproduce and expand the analysis in the future.

Training will continue throughout the semester through weekly mentoring meetings and short targeted skill sessions as needed. Topics may include roadway segmentation, truck-VMT calculations, emission factors, interpretation of health-damage estimates, scenario analysis, GIS visualization, uncertainty, and scientific communication.

This project will use publicly available or aggregated transportation and environmental data. It will not use individual medical records or personal health information.

Mentoring plan: I will mentor the students through a structured research experience designed to support undergraduate researchers with different levels of previous technical and research experience. At the beginning of the semester, we will complete an onboarding that introduces the overall research question, explains the connection among truck activity, emissions, and public-health impacts, clarifies expectations, and provides initial training in the tools and workflows that students will use. Students will receive a clear project roadmap with weekly or biweekly milestones and examples of expected deliverables. Early tasks may include preparing a roadway dataset, documenting truck traffic information, calculating truck vehicle-miles traveled, or creating an initial GIS map. As the semester progresses, students will move toward emissions estimation, public-health cost calculations, scenario analysis, and interpretation of results. During the project, students will work directly with me as the primary mentor. They can expect consistent contact through a standing weekly mentoring meeting focused on progress, problem-solving, interpretation, and skill development. We may also schedule a separate weekly check-in or work session when hands-on troubleshooting is useful. If two students are selected, they will work as a small research team with complementary initial responsibilities. For example, one student may focus primarily on roadway, traffic, and truck-activity data, while the other concentrates initially on emissions, health-damage factors, and visualization. Both students will eventually work with the integrated dataset and learn how the complete analytical framework fits together. I will scaffold the project so that students begin with clearly defined tasks and gradually develop greater independence as their skills and confidence increase. Students will provide brief weekly progress updates, and I will provide timely feedback on data organization, calculations, GIS outputs, figures, interpretation, and

research communication. Students will also practice explaining their work through short informal presentations during mentoring meetings. Toward the end of the semester, I will work with them to develop and practice a polished poster or slide presentation for the undergraduate research symposium. The goal is for each student to finish the experience able to explain the research question, describe the analytical workflow, interpret the findings and limitations, identify their individual contributions, and demonstrate tangible research products that can support future internships, graduate study, or professional work.

Applicant Requirements: I am looking for undergraduate students interested in transportation, cities, environmental issues, public health, or data analysis who are excited to learn through hands-on research. Prior research experience is not required. What matters most is reliability, organization, curiosity, attention to detail, and willingness to learn new analytical tools and follow a structured workflow. The ideal student is comfortable working with data at a basic level, communicates clearly through brief progress updates, asks questions when problems arise, and is open to feedback and teamwork. Familiarity with GIS (QGIS or ArcGIS), spreadsheets, introductory statistics, Python, or R is helpful but not required. Training and support will be provided. Students from a wide range of majors are encouraged to apply, including Civil and Environmental Engineering, Data Science, Geography/GIS, Public Health, Environmental Studies, Computer Science, Statistics, and related fields. Students do not need previous experience with air-quality modeling, vehicle emissions models, or public-health cost estimation.

Applicant Preferences: While prior research experience is not necessary, we will give preference to students who demonstrate a strong interest in transportation, freight systems, cities, sustainability, environmental health, GIS, or data-driven decision-making. Helpful preparation includes any exposure to GIS/mapping, working with spreadsheets for data cleaning, introductory statistics or data science, Python/R, or transportation engineering concepts. Coursework in transportation, environmental engineering, geography/GIS, public health, statistics, data science, or computer science is helpful but not required. Students from other majors are welcome if they demonstrate curiosity, strong organization, and willingness to learn. Preference will also be given to applicants who communicate clearly, are comfortable working independently between meetings, can document their work carefully, and can commit consistently to weekly check-ins and project milestones.

Specific Time considerations/conflicts: Students must be available for a weekly mentoring meeting of approximately 60 minutes and a weekly check-in/work session of approximately 30–60 minutes. Meetings will be scheduled by mutual agreement during the workweek (Monday–Friday) between 9:00 a.m. and 5:00 p.m.

Either a 5-hour-per-week or 10-hour-per-week commitment will be considered. The scope of individual assignments and expected deliverables will be adjusted according to the student's assigned hours.

Occasional additional availability may be requested near major project milestones and toward the end of the semester for symposium preparation and practice presentations. These sessions will be scheduled in advance and coordinated around the student's academic schedule.

App ID #: 3506

Mentor: Gonzalez-Calderon, Carlos

Email: cgonza60@uncc.edu

Title: Assistant Professor

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Mapping Charlotte's Freight System: An Open-Data Inventory of Goods Movement, Facilities, and Flows

Description: Charlotte is a major transportation and logistics center where interstate highways, rail lines, Charlotte Douglas International Airport, distribution centers, industrial areas, and rapidly growing urban development interact. Goods move through the region every day, but information describing freight activity is distributed across many agencies, datasets, geographic scales, and transportation modes. As a result, it can be difficult to answer seemingly simple questions such as: Where are the region's major freight corridors and generators? What commodities move into, out of, and through the region? Which facilities connect truck, rail, and air cargo activity? And where are the most important gaps in the data needed to understand Charlotte's freight system? This undergraduate research project will build a practical, open-data inventory of goods movement in the Charlotte region. The goal is not to develop a new freight-demand model or produce an official regional forecast. Instead, the project will systematically identify, organize, compare, and visualize the best publicly available information describing freight flows, freight facilities, truck activity, commodity movements, and freight-related economic activity. The result will provide a clear baseline of what is currently known about freight movement in Charlotte and what information is still missing. As an undergraduate researcher, you will help assemble data from public transportation, economic, land-use, and freight sources. Potential datasets may include roadway networks and truck traffic counts, vehicle classification data, publicly available commodity-flow information, airport cargo statistics, rail and intermodal facilities, major industrial and logistics locations, employment and business data, and planning documents from local, regional, state, and federal agencies. Students will document each source, its geographic and temporal coverage, units, limitations, and how it can be linked with other data. A central project product will be a reproducible Charlotte Freight Data Inventory. Students will create a structured database and data dictionary describing the major freight-related datasets available for the region. The project will emphasize cross-source consistency, careful documentation, and practical data quality checks, including missing values, inconsistent geographic units, duplicate facilities, different reporting years, and differences between truck, commodity, economic, and facility datasets. Students will then use GIS and descriptive data analysis to develop an integrated picture of the freight system. The analysis may identify major truck corridors, freight-generating areas, warehouses and distribution clusters, airport and rail connections, and the regional geography of commodity and industry activity. Where appropriate, students will compare inbound, outbound, internal, and through movements or summarize the dominant commodity groups and freight-related industries represented in available datasets. An important research component will be identifying data gaps

rather than simply producing maps. Students will evaluate which freight questions existing public data can answer reliably and which it cannot. For example, some datasets may describe truck volumes but not commodities, while others may describe commodity flows at a regional scale without showing the exact routes used within Charlotte. The project will document these differences in a Freight Data Readiness Matrix that summarizes each source's strengths, limitations, spatial resolution, update frequency, and potential research uses. The final products will include an open-data freight inventory, a reproducible GIS/data workflow, maps and figures describing Charlotte's freight system, a concise technical summary of major findings and data gaps, and a poster or slide presentation for the end-of-term undergraduate research symposium. These products can serve as a foundation for future studies on freight safety, emissions and public health, urban deliveries, air cargo, commodity flows, freight demand, electrification, and transportation planning. This project is designed as a hands-on introduction to research at the intersection of freight transportation, GIS, logistics, economics, and data science. No prior research experience is required. We will provide training and support, and the work will be structured so students can make visible progress from raw data to a clear, evidence-based description of how freight moves through the Charlotte region.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Students participating in the project will gain practical, resume-ready research skills and a clearer understanding of how freight transportation systems are described using real-world data. By the end of the program, students will be able to: Translate a broad real-world question about goods movement into specific research tasks, data needs, analytical steps, and deliverables. Locate, evaluate, and document transportation, freight, economic, land-use, and facility datasets from multiple public sources. Work with messy real-world data and transform it into research-ready files through cleaning, organization, unit harmonization, and quality-control checks. Build a reproducible data workflow using organized folder structures, metadata, data dictionaries, and clear documentation so the work can be repeated and expanded. Develop fundamental freight-system measures and concepts, including truck volumes, freight corridors, commodity flows, freight generators, logistics facilities, and multimodal connections. Use GIS to map and analyze roadway freight activity, industrial and logistics facilities, airport and rail connections, and other spatial features of the freight system. Apply descriptive statistics and data visualization to summarize freight activity, commodity patterns, industries, facilities, and geographic concentrations. Compare information across datasets with different years, geographic scales, definitions, and levels of detail, and explain why those differences matter. Assess data quality and research readiness by identifying what existing public data can answer reliably and where important information gaps remain. Develop a systems-level understanding of how highway, rail, air cargo, logistics facilities, land use, and regional economic activity interact in goods movement. Produce clear, publication-quality maps, figures, tables, and concise technical writing for both specialized and general audiences. Present research findings and limitations confidently in an end-of-term poster or slide presentation. The experience will prepare students for graduate study, internships, and careers in transportation engineering, transportation planning, logistics and supply chain, GIS, economic development, data science, and related fields.

Required training of 2 hours with Description: Students will begin with a structured onboarding during the first week covering project goals, expectations, responsible research practices, data management, and research integrity. Students will complete a compliance check through UNC Charlotte's Office of Research Protections and Integrity (ORPI) using the required questionnaire and will complete any additional modules identified by ORPI.

Once students satisfy compliance requirements, they will complete a short technical bootcamp focused on the tools and concepts needed for the project. Training will introduce freight-system terminology, public data discovery, GIS basics, spreadsheet/data-cleaning practices, descriptive statistics, documentation, and reproducible research workflows. Students will also learn how to evaluate a dataset's units, spatial coverage, temporal coverage, metadata, limitations, and compatibility with other sources.

Students will establish an organized project workspace that includes clearly structured folders, a data inventory, a data dictionary, source documentation, and a simple "how to run" README. Training will continue throughout the semester through weekly mentoring meetings and short, targeted skill sessions as needed, including GIS mapping, data joining, facility classification, freight-flow interpretation, visualization, and communicating uncertainty and data gaps.

Mentoring plan: I will mentor the students through a structured, supportive research experience designed for undergraduate researchers with different levels of prior technical experience. At the beginning of the semester, we will complete an onboarding that introduces the research question, explains the major components of a regional freight system, clarifies expectations, and provides initial training in the tools and workflows used in the project. Students will receive a clear project roadmap with weekly or biweekly milestones and examples of expected deliverables, such as a documented data source, a cleaned dataset, a facility layer, a draft map, a freight flow summary, or a short methods note. Early tasks will focus on collecting and documenting individual data sources. As skills develop, students will move toward integrating datasets, interpreting freight patterns, identifying gaps, and preparing the final Charlotte freight-system profile. During the semester, students will work directly with me as the primary mentor. They can expect consistent contact through a standing weekly mentoring meeting focused on progress, problem-solving, interpretation, and skill development. We may also schedule a separate weekly check-in or work session when hands-on troubleshooting is useful. If two students are selected, they will work as a small research team with complementary initial roles. For example, one student may focus first on roadway, truck-traffic, and commodity-flow data. In contrast, the other focuses on freight facilities, land use, airport/rail connections, and economic or industry data. Both students will participate in the integrated analysis so that each understands how the full freight system fits together. I will scaffold the work so students begin with clearly defined tasks and progressively take greater responsibility for data decisions and interpretation. Students will provide brief weekly progress updates, and I will provide timely, specific feedback on data organization, maps, tables, analytical outputs, and research communication. Students will also practice presenting short updates during meetings and will be coached throughout the semester to prepare a polished poster or slide presentation for the OUR symposium. The goal is for each student to finish the experience able to explain what freight data are available for Charlotte, how different datasets can and cannot be combined, what major freight patterns emerge from the evidence, what important information remains missing, and how their individual contributions support future research and planning.

Applicant Requirements: I am looking for undergraduate students who are genuinely interested in transportation, logistics, cities, economic development, GIS, or data analysis and excited to learn through hands-on research. Prior research experience is not required. What matters most is reliability, strong organization, curiosity, attention to detail, and willingness to learn new tools and follow a structured workflow. The ideal student is comfortable working with data at a basic level, can communicate clearly through brief progress updates, asks questions when problems arise, and is open to feedback and teamwork. Familiarity with spreadsheets, GIS (QGIS or ArcGIS), introductory statistics, Python, or R is helpful but not necessary. Students can contribute meaningfully through data collection, careful documentation, mapping, data cleaning, and clear technical writing. Training and support will be provided. Students from a wide range of majors are encouraged to apply, including Civil and Environmental Engineering, Data Science, Geography/GIS, Economics, Supply Chain or Logistics, Computer Science, Statistics, Urban Planning, and related fields.

Applicant Preferences: While prior research experience is not necessary, we will give preference to students who demonstrate strong interest in freight transportation, logistics, transportation planning, GIS, economic development, or data-driven decision-making. Helpful preparation includes experience working with spreadsheets for data cleaning, GIS/mapping, introductory statistics or data science, Python/R, or transportation and logistics coursework. Coursework in transportation, geography/GIS, economics, supply chain, data science, statistics, computer science, or urban planning is a plus. Still, students from any major are welcome if they demonstrate curiosity, organization, and follow-through. Preference will also be given to applicants who communicate clearly, are comfortable working independently between meetings, document their work carefully, and can commit consistently to weekly check-ins and project milestones.

Specific Time considerations/conflicts: Students must be available for a weekly mentoring meeting of approximately 60 minutes and a weekly check-in/work session of approximately 30–60 minutes. Meetings will be scheduled by mutual agreement during the workweek (Monday–Friday) between 9:00 a.m. and 5:00 p.m.

Either a 5-hour-per-week or 10-hour-per-week commitment will be considered. The scope of individual tasks and expected deliverables will be adjusted according to the student's assigned hours.

Occasional additional availability may be requested near major project milestones and toward the end of the semester for symposium preparation and practice presentations. These sessions will be scheduled in advance and coordinated around the students' academic schedules.

App ID #: 3507

Mentor: Gaitas, Angelo

Email: agaitas@charlotte.edu

Title: Associate Professor

Department: ECE

Co-mentor: Yes

Dr. Irene C. Turnbull, Research Assistant Professor at UNC Charlotte, imayortu@charlotte.edu, ECE

Community engaged research: No

Title: Miniaturized Wearable Temperature Sensor: Electronics, PCB Design, and Sensor Testing

Description: Our laboratory is developing very small temperature-sensing systems for biomedical and biological applications. The long-term goal is to create miniature sensors that can continuously measure temperature while being small enough to operate on or near biological tissue. A major challenge is fitting the sensor, electronics, power source, data storage, and connections into a very small package while still obtaining accurate and stable temperature measurements. Printed circuit boards, including flexible and rigid-flex PCBs, provide a promising way to integrate these components into a compact device. Undergraduate researchers will contribute directly to the development and testing of these miniature thermal-sensing systems. Depending on their interests, background, and the stage of the project, students may participate in activities such as: assembling and testing miniature temperature-sensor and PCB prototypes; programming microcontrollers and data-logging electronics; evaluating thermocouples and other temperature sensors; designing or modifying PCB layouts; developing simple computer programs for collecting and analyzing temperature data; calibrating sensors against known temperature references; measuring electrical noise, accuracy, response time, battery life, and long-term stability; developing packaging and attachment approaches for wearable sensors; performing benchtop experiments using tissue-mimicking materials or commercially obtained ex vivo tissue; analyzing experimental results and helping determine how the next device should be improved. Students will therefore participate in an authentic engineering research cycle: identify a problem, build or modify a prototype, test it, analyze the results, and use those results to improve the next design. The project is intentionally broad so that students with interests in electrical engineering, computer engineering, biomedical engineering, mechanical engineering, sensors, embedded systems, or experimental research can contribute. No previous experience with biomedical sensors is required. Students will be trained in the techniques necessary for their particular part of the project.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: By the end of the research experience, students should be able to describe how a miniature sensing system moves from an engineering idea to an experimentally tested prototype. Students are expected to gain experience in several of the following areas depending on their role: temperature sensors, thermocouples, and electronic

instrumentation;PCB and embedded-system development;microcontroller programming and data acquisition;experimental design and quantitative measurements;calibration, signal noise, accuracy, repeatability, and uncertainty;prototype assembly and troubleshooting;analysis and visualization of experimental data;technical documentation and maintaining a research notebook;scientific communication and presentation of research results.Students will also develop experience working on an open-ended problem for which the answer is not known in advance. They will learn how researchers respond when an experiment or prototype does not work as expected, how to identify possible causes, and how to design the next experiment.The experience should provide students with concrete examples of engineering design, experimentation, teamwork, problem solving, and communication that they can discuss when applying for graduate school, internships, research positions, or engineering jobs.Students will prepare and present their work at the OUR symposium at the end of the semester.

Required training of 5 hours with Description: Students will begin with an orientation to the laboratory, the overall research problem, laboratory safety, research documentation, and the temperature-sensing platform.

Initial training will include:

required university and laboratory safety training;

safe use of basic electronic and laboratory equipment;

introduction to the existing temperature-sensor and PCB prototypes;

basic operation of relevant measurement equipment;

data-recording and laboratory-notebook practices;

project-specific training in programming, electronics, PCB tools, sensor calibration, or experimental testing.

The first several experiments will be performed with direct supervision. Students will progressively work more independently as they demonstrate competency with the equipment and procedures.

The undergraduate project can be completed using electronics, benchtop experiments, tissue phantoms, and other non-animal testing. Students will not perform live-animal experiments unless separate institutional approvals are in place and the student has completed all required training and authorization.

Mentoring plan: My goal is for an undergraduate researcher to become an active participant in the research rather than simply perform a series of assigned laboratory tasks.At the beginning of the semester, I will work with each student to define a manageable project within the broader temperature-sensor program. We will identify a specific question or engineering objective that the student can make meaningful progress on during the semester.I will meet with the student regularly, generally at least once each week, to review results, discuss problems, and determine the next steps. Students will also work directly with members of my research group and will have opportunities to participate in laboratory discussions and group meetings.Early in the project, I expect to provide relatively detailed guidance. As students become familiar with the research, I will

encourage them to propose experiments, troubleshoot problems, interpret unexpected results, and make decisions about what should be tested next. Students will maintain organized records of their work and will receive feedback on experimental methods, data analysis, figures, and scientific writing. Toward the end of the semester, I will work with them on presenting their research clearly to both technical and general audiences and preparing their OUR symposium presentation. When a student's contribution is substantial and becomes part of publishable research, I also encourage appropriate recognition through conference presentations and/or authorship on resulting publications.

Applicant Requirements: No specialized research experience is required. Applicants should have: an interest in engineering, sensors, electronics, biomedical technology, or experimental research; willingness to learn laboratory and engineering techniques; ability to work carefully and document results; enough schedule flexibility to participate consistently throughout the semester. Helpful but not required experience includes any of the following: introductory circuits or electronics; programming in Python, MATLAB, C/C++, Arduino, or similar environments; PCB design or CAD; microcontrollers or embedded systems; instrumentation or sensors; soldering or electronic assembly; data analysis; biomedical engineering; MEMS or microfabrication. Students from Electrical Engineering, Computer Engineering, Mechanical Engineering, Biomedical Engineering, Computer Science, Physics, or related disciplines are encouraged to apply.

Applicant Preferences: I am looking primarily for students who are curious, dependable, willing to learn, and interested in building and testing real devices. Students do not need to arrive with extensive research experience. I would rather work with a student who asks questions, documents their work carefully, and is willing to troubleshoot a difficult problem than require a highly specialized background before they begin. Because the project includes several possible directions, students can contribute according to their strengths. A student interested in circuits or PCB design may focus more heavily on electronics. A student interested in programming may work on embedded software and data analysis. A student interested in biomedical engineering or experimental research may concentrate on sensor calibration, packaging, and testing.

Specific Time considerations/conflicts: None

App ID #: 3508

Mentor: Gaitas, Angelo

Email: agaitas@charlotte.edu

Title: Associate Professor

Department: ECE

Co-mentor: Yes

Dr. Irene C. Turnbull, Research Assistant Professor at UNC Charlotte, imayortu@charlotte.edu, ECE

Community engaged research: No

Title: Microscale Heating and Thermal Measurements in Cells and Oocytes Using 3-Omega Sensors

Description: Temperature plays an important role in cellular metabolism, development, signaling, and function, yet measuring very small temperature changes in individual cells remains technically difficult. Our laboratory develops miniature thermal sensors and microheaters that can both generate and measure very small changes in temperature. One approach uses the 3-omega technique, an electrical method in which a microscale heater is used both to generate heat and to characterize thermal properties. Undergraduate researchers will help develop and test microscale heaters and thermal sensors and explore how these devices can be used with biological samples such as cultured cells and oocytes. Depending on the student's interests, background, and the stage of the project, activities may include: electrically characterizing microscale heaters and temperature sensors; performing 3-omega measurements and analyzing electrical signals; calibrating microheaters and determining the relationship between applied electrical power and temperature; measuring heating and cooling rates and thermal response times; designing experiments to determine how heat spreads through liquids, substrates, and biological samples; using microscopes and positioning systems to bring thermal probes close to individual cells or oocytes; testing whether carefully controlled localized heating influences cellular behavior; collecting and analyzing temperature, voltage, current, microscopy, or biological-response data; improving experimental fixtures, electronics, software, and measurement protocols. Students may initially work with well-controlled test samples before progressing to biological experiments. This project brings together electrical engineering, microsystems, thermal physics, instrumentation, and cell biology. It is particularly well suited for students who would like to understand how engineering devices can be used to investigate fundamental biological questions.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: Students participating in this project will learn how microscale engineering tools can be used to investigate biological systems. Depending on their assignment, students are expected to gain experience with: electrical characterization of sensors and microheaters; the fundamentals of the 3-omega thermal measurement method; temperature calibration and heat-transfer measurements; oscilloscopes, function generators, lock-in

techniques, or related instrumentation; microscopy and microscale positioning; experimental design and controls; biological sample handling where appropriate; analysis and visualization of quantitative data; troubleshooting complex experiments; scientific documentation and presentation. Students will also learn how to distinguish a real physical or biological effect from measurement artifacts, electrical noise, environmental drift, or experimental variability. By the end of the semester, students should be able to explain the scientific question they worked on, describe the measurement system, analyze their own experimental data, and communicate their results in a research presentation. Students will prepare and present their work at the OUR symposium.

Required training of 5 hours with Description: Students will receive an introduction to the research question, laboratory safety, thermal sensors, microheaters, and the measurement system.

Initial training may include:

required university and laboratory safety training;

basic electrical measurement techniques;

operation of microscopes and positioning systems;

introduction to microheater and sensor devices;

calibration procedures;

data acquisition and analysis;

appropriate biological laboratory training if the student's project involves cells or oocytes.

Students will first perform measurements with direct supervision and will gradually progress toward independent experiments.

Any work involving biological materials will follow the applicable university approvals, laboratory procedures, and training requirements.

Mentoring plan: At the beginning of the semester, I will work with each student to define a specific research question that can be addressed within the broader microscale thermal-measurement project. Students will meet with me regularly, generally at least weekly, to review data, discuss experimental problems, and decide what should be tested next. They will also interact with graduate researchers and other members of the laboratory. I want students to understand why they are performing an experiment rather than simply following a protocol. As their experience increases, they will be encouraged to suggest modifications, identify possible sources of error, design control experiments, and interpret unexpected results. Students will maintain research records and receive feedback on experimental design, data analysis, figures, and scientific presentation. Substantial student contributions may lead to continued research, conference presentations, and authorship on publications when appropriate.

Applicant Requirements: Required Skills, Courses, or Experiences No specialized research experience is required. Applicants should have: interest in experimental research; willingness to learn electrical and/or biological laboratory techniques; careful laboratory habits; ability to document and analyze results; consistent availability during the semester.

Applicant Preferences: I am looking for students who are curious about how physical measurements can be applied to biological systems. Persistence is particularly valuable for this project because measurements at small scales require careful experimentation and troubleshooting. Students should be willing to learn unfamiliar techniques and work carefully with sensitive devices and experimental samples. Recommended or Preferred Characteristics, Skills, Courses, or Experiences Helpful but not required backgrounds include: circuits or electronics; physics or heat transfer; MEMS or microfabrication; biomedical engineering; instrumentation; MATLAB or Python; microscopy; cell biology or biological laboratory experience; signal processing. Students from Electrical Engineering, Computer Engineering, Mechanical Engineering, Biomedical Engineering, Physics, Biology, or related disciplines are welcome.

Specific Time considerations/conflicts: None

App ID #: 3509

Mentor: Gaitas, Angelo

Email: agaitas@charlotte.edu

Title: Associate Professor

Department: ECE

Co-mentor: Yes

Dr. Irene C. Turnbull, Research Assistant Professor at UNC Charlotte, imayortu@charlotte.edu, ECE

Community engaged research: No

Title: Automated Patch Clamp and Cellular Force Measurement: Developing Next-Generation Biomedical Instrumentation

Description: Patch clamping is one of the most important techniques for studying the electrical behavior of individual cells. It allows researchers to measure extremely small electrical currents flowing through the cell membrane. Traditional patch clamping, however, requires considerable skill and is difficult to perform rapidly on large numbers of cells. Our laboratory is developing a new approach that combines patch-clamp electrophysiology with microscale force sensing, atomic force microscopy concepts, microfabricated probes, imaging, and automation. One long-term objective is to develop an instrument capable of locating an individual cell, positioning a probe, forming an electrical connection with the cell, recording its electrical activity, and measuring cellular mechanical properties with substantially more automation than conventional approaches. The project is supported through an NIH translational biomedical-technology program. Undergraduate researchers will have an opportunity to contribute to the technical development while also learning how biomedical technologies move from laboratory research toward practical use. Depending on the student's background and the stage of the project, undergraduate activities may include: testing microfabricated patch-clamp or force-sensing probes; characterizing probe geometry, electrical properties, mechanical response, and reliability; helping develop fixtures and holders for reproducible probe mounting; testing automated positioning and imaging approaches; developing image-processing or computer-vision methods for locating cells and probes; helping develop software for automated motion, measurement, and data collection; performing benchtop electrical and mechanical tests; assisting with cellular experiments after appropriate training; comparing measurements obtained using new devices with conventional techniques; analyzing electrophysiological, force, displacement, or imaging data; documenting failure modes and contributing to redesign of the system. Because this is a translational NIH-supported project, students may also be exposed to the broader process of biomedical technology development, including defining user needs, evaluating potential applications, discussing commercialization and clinical or pharmaceutical research requirements, and understanding how feedback from potential users influences engineering design. When appropriate and permitted by the associated program, students may participate in or observe NIH-associated training, technical-development meetings, customer-discovery discussions, and other translational activities connected to the project.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students will gain experience with the development of a sophisticated biomedical research instrument and will see how multiple engineering disciplines must work together to solve a biological measurement problem. Depending on their particular project, students may develop skills in: biomedical instrumentation; electrophysiology and the principles of patch clamping; microscale force and displacement measurement; MEMS and microfabricated devices; microscopy and imaging; automation and motion control; image processing and computer vision; electrical measurement and low-noise experimentation; programming and data acquisition; experimental validation and comparison with reference methods; quantitative data analysis; scientific documentation and communication. Students will also learn about translational research and how technical requirements are shaped by researchers, potential users, and eventual applications. They will gain experience discussing questions such as: Does the technology solve an important problem? How reliable does it have to be? How fast does it need to operate? What would make another laboratory adopt it? By the end of the semester, students should be able to explain both the technical problem they worked on and how their work contributes to the larger biomedical technology. Students will prepare and present their research at the OUR symposium.

Required training of 5 hours with Description: Students will begin with an introduction to the overall NIH-supported project, the biological measurement problem, and the engineering system being developed.

Training may include:

required university and laboratory safety training;

introduction to patch-clamp electrophysiology;

microscopy and positioning systems;

electrical measurement and low-noise instrumentation;

operation of force-sensing or microfabricated probes;

software, automation, or image-analysis tools relevant to the student's project;

data documentation and research-record practices;

cell-culture and biological laboratory procedures when applicable.

Students will initially work on benchtop systems and controlled experiments under supervision before progressing to more complex experiments.

Mentoring plan: Students will be assigned a defined technical question that contributes to the larger NIH-supported project while remaining achievable within an undergraduate research semester. I will meet with students regularly, generally at least once each week, to discuss experimental results, troubleshoot problems, and establish the next objectives. Students will also work with graduate researchers and other members of the project team. Where useful, they will attend research meetings so they can understand how their individual contribution fits into the

larger system. An important part of this project is learning how research moves toward a usable technology. I therefore want students to see both the laboratory science and the engineering decision-making behind the project. As students gain experience, I will expect them to take increasing ownership of their portion of the work, propose experiments, analyze failures, and recommend design changes. Students will receive guidance on research documentation, data analysis, figure preparation, presentation, and professional communication. Students making substantial intellectual or experimental contributions will be encouraged to continue the work beyond the OUR term and will receive appropriate recognition in presentations and publications.

Applicant Requirements: No specialized research experience is required. Applicants should have: an interest in engineering or biomedical research; willingness to learn new laboratory or computational techniques; ability to work carefully with delicate equipment; willingness to maintain organized research records; consistent availability throughout the semester.

Applicant Preferences: I am looking for students who enjoy building, testing, programming, experimenting, and solving problems that do not have predetermined answers. No prior patch-clamp experience is expected. The strongest applicants will be curious, dependable, comfortable asking questions, willing to troubleshoot, and interested in seeing how engineering can be applied directly to biomedical research. Recommended or Preferred Characteristics, Skills, Courses, or Experiences Any of the following would be useful but are not required: circuits and electronics; programming in Python, MATLAB, C/C++, or similar languages; robotics or automation; computer vision or image processing; control systems; MEMS or microfabrication; instrumentation; microscopy; biomedical engineering; cell biology; electrophysiology. Students from Electrical Engineering, Computer Engineering, Mechanical Engineering, Biomedical Engineering, Computer Science, Physics, Biology, or related disciplines are encouraged to apply.

Specific Time considerations/conflicts: None

App ID #: 3511

Mentor: Sun, Mei

Email: msun8@charlotte.edu

Title: Associate professor

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: developing passive sampling devices to quantify "forever chemicals" (PFAS) in environmental water

Description: PFAS are a group of organic contaminants toxic to humans and ecosystems. PFAS are widely used in many products, such as nonstick cookware and firefighting foams, and end up everywhere in our environment. Passive sampling is a technique that concentrates PFAS in the environment onto a sampling device for later quantification. Our research team has synthesized the key component of the device (a PFAS receiving phase) in previous studies. Now we will test the performance of the whole device for capturing PFAS from simulated environmental water.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: •Hands-On Experience: Work closely with our experienced research team, gaining practical skills in research laboratories and environmental monitoring. • Cutting-Edge Research: Contribute to groundbreaking studies on emerging contaminants, addressing real-world environmental challenges and shaping future solutions. • Methodology to explore new areas: Learn how to get started in unfamiliar territory by finding relevant information, reading literature, making testable hypotheses, implementing a realistic work plan, critically thinking about results, and effectively communicating ideas with others. • Professional Development: Brighten your resume with enhanced problem-solving, data analysis, and teamwork skills, preparing you for a successful career.

Required training of 10 hours with Description: The student will first receive lab safety training and then learn basic protocols for conducting experiments, using instruments, and collecting data.

Mentoring plan: I and other members of my research team will teach the student the skills needed to conduct this project and, in general, how to do research in a wet lab. The students will also learn how to analyze the results, draw conclusions, and represent the research findings. I will meet with the student weekly to keep up with progress, answer questions, provide feedback, and finalize action plans. The student can expect timely communication, support resources, and opportunities for authorship if they produce high-quality results suitable for conference presentations or scientific papers.

Applicant Requirements: • Enthusiasm for water quality and curiosity about emerging contaminants. • Strong attention to detail and ability to quickly learn new techniques. • Ability to

work effectively both independently and as part of a team. • Prior coursework in environmental science/engineering and chemistry

Applicant Preferences: Good at time management and communication, interest and background knowledge in chemistry.

Specific Time considerations/conflicts: N/A

App ID #: 3512

Mentor: Eppes, Missy

Email: meppes@charlotte.edu

Title: Professor of Earth Sciences

Department: EEGS

Co-mentor: Yes

Dr. Yao Li, yao.li@charlotte.edu, EEGS

Community engaged research: No

Title: Why are those leaves so red!?! Using Remote Sensing and Geospatial Analysis to investigate Leaf Anthocyanin Synthesis

Description: Background. Tourism around Fall Leaf colors produces \$30 billion in annual revenue for local economies across 24 eastern states!! While it is well-understood how the yellow and orange colors come about - as leaves die off - the occurrence of Anthocyanins that are responsible for the vivid reds in fall leaves is widely debated in Biology. Anthocyanins are energetically expensive pigments produced during senescence (autumn die-off). It has long been a mystery as to why a tree would expend energy to make them! Past work has focused on the physiology of the plants themselves, with very little investigation between the production of those red colors and the landscapes that the trees are growing in. This project will test crucially needed links between Anthocyanins and landscapes! Our prior work. Our past preliminary work remarkably suggests that the landscape is very important, and that anthocyanin presence may correlate with nutrient stress. It therefore may be modulated by environmental variables such as soil chemistry and geomorphic position (on a floodplain, on a hillslope, etc). Previous field-based research has demonstrated links between anthocyanin content and geomorphic features such as slope, soil development (rubification), and landform stability. Why now? However, and importantly, no large-scale study has leveraged the amazing modern geospatial and remote sensing tools we now have to quantify these patterns across entire landscapes. This project builds on past work by Eppes to explore the relationship between landscape topography and anthocyanin production (the pigment that makes leaves red) in deciduous trees during autumn, using remote sensing technology to map and analyze patterns of red coloration across varied terrain and the work of Dr. Li to manipulate and model GIS data. How we will do it. The student(s) will use remote sensing imagery (e.g., multispectral drone, aerial, or satellite data) to index anthocyanin-rich foliage by isolating red spectral signatures during peak autumn coloration. These color indices will be spatially analyzed against topographic variables such as slope, aspect, elevation, and surficial geology using GIS software (ArcGIS/QGIS). Depending on student interest, lab work and field work could be acquired to validate the measurements, and/or statistical modeling could be employed to evaluate the strength of these correlations and determine whether landscape stability or nutrient availability inferred from topography plays a significant role in foliar anthocyanin expression.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Research and Analytical Skills Hands-on experience with remote sensing image processing, including classification and spectral analysis (e.g., isolating anthocyanin-associated red spectral signatures). Deepened understanding of landscape ecology, geomorphology, and their intersection with plant physiological responses - or if you are purely an IT person, experience in applying your skills to these fields. Experience applying statistical and spatial modeling to real-world environmental datasets. Geospatial and Technical Expertise Advanced training in GIS software (ArcGIS, QGIS) and digital elevation model (DEM) analysis for extracting topographic features (slope, aspect, curvature). Exposure to multispectral satellite or drone imagery, including data acquisition, pre-processing, and analysis. Opportunities to develop scripts or workflows in Python or R to automate and analyze spatial data. Academic and Professional Development Close mentorship on research design, data interpretation, and scientific communication. Potential for co-authorship on a peer-reviewed publication and/or conference presentation. Real-World Impact Contribute to an emerging body of research on climate-resilient landscape ecology and forest response to environmental stressors. Help uncover novel patterns linking vegetation physiology to landform evolution, with potential implications for conservation and land management. Potential for Student Publication/Presentation: High. This project builds upon novel hypotheses linking landscape processes with plant physiological expression and offers potential for co-authorship on a peer-reviewed journal article and presentation at conferences such as AGU or the Southeastern Division of the AAG.

Required training of 0 hours with Description: No formal training required. Student will be trained in our current workflow for using the remote sensing data to extract an Anthocyanin Index. Student will be instructed and given background on the project overall. There will be some reading to catch up on different concepts.

Mentoring plan: This is truly a multidisciplinary project - biology, Earth sciences, GIS and Remote sensing. The student will be closely mentored by both Dr. Eppes and Dr. Li (for GIS) as well as by Dr. Jiaming Lu - who has her PhD in remote sensing. We all maintain an 'open door' policy, where we are always available to help and answer questions. We will start off with regular meetings to develop a research plan. Then, in addition to open door, students can also meet with Dr. Yang and/or Dr. Eppes as required or preferred by the student. Ex: weekly meetings, bi-monthly, etc. We want the student(s) to feel confident to work independently, but also to know their limitations and to reach out for help when needed, rather than struggling and not making any progress.

Applicant Requirements: Sound Experience in Geographic Information Systems (GIS) - ArcGIS Pro Sound Experience with Remote Sensing techniques (e.g., NDVI, image classification, spectral indices) Interest and curiosity about plant ecology, biogeography, soils and/or landscapes!

Applicant Preferences: Experience/coursework with Remote Sensing and ArcGIS highly desirable; Experience/coursework with spatial statistics, LiDAR, and Python scripting in GIS preferred. Experience or ability to work independently (through coursework or other opportunities)

Specific Time considerations/conflicts: none

App ID #: 3513

Mentor: Faklaris, Cori

Email: cfaklari@uncc.edu

Title: Assistant Professor

Department: Human-Centered Computing and Education

Co-mentor: No

Community engaged research: No

Title: Mobile Scam Resilience and Cybersecurity Microlearning

Description: The selected student will help lay the foundation for a research project on helping people recognize and resist text-message scams (smishing) through short, mobile-friendly learning experiences. The primary responsibilities of this position will be conducting literature reviews and supporting idea generation. The student will identify, read, and summarize academic research related to phishing and smishing, cybersecurity awareness training, mobile learning, microlearning, behavioral science, trust and decision making, scam victimization, and human-centered security. They will help organize findings, identify research gaps, create annotated bibliographies, and prepare research summaries that inform the development of future grant proposals, research studies, and publications. The student will also participate in brainstorming and concept development activities, helping the research team design and refine innovative mobile learning interventions such as microgames, security tips, scam explanations, and simulated scam experiences. This role is ideal for a student interested in learning how academic research is conducted and how ideas move from literature reviews to funded research projects. No prior cybersecurity experience is required. We are looking for someone who is curious, organized, a strong reader and writer, and excited about exploring how technology, psychology, education, and human behavior can be combined to improve cybersecurity and reduce online scam victimization.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Upon completion, the student will have developed skills in academic literature review, interdisciplinary research synthesis, idea generation, technical and scholarly writing, and the development of research proposals in the areas of cybersecurity, human-centered computing, and learning technologies.

Required training of 0 hours with Description: None.

Mentoring plan: The student will work closely with the existing research team and receive regular guidance throughout the project. Weekly meetings will be used to discuss progress, answer questions, and plan upcoming tasks. Early in the project, the student will learn how to find academic articles, read research papers, summarize key findings, and organize information from multiple sources. As the student gains experience, they will take on more independent responsibilities, such as conducting literature reviews, identifying research gaps, and helping develop ideas for future studies. The student will participate in group meetings where they can share findings, ask questions, and learn how research projects are developed from initial ideas

through grant proposals and study design. The mentor will provide ongoing feedback on writing, critical thinking, organization, and professional communication. Students will also have opportunities to learn about graduate school, research careers, and interdisciplinary research. By the end of the experience, the student will have gained practical skills in literature review, research synthesis, academic writing, idea development, and working as part of a research team.

Applicant Requirements: No prior cybersecurity experience is required. The most important qualifications are curiosity, strong reading and writing skills, attention to detail, and an interest in learning how academic research is conducted.

Applicant Preferences: Coursework in human-computer interaction, design, computer science, psychology, education, sociology, or related topics is preferred.

Specific Time considerations/conflicts: Must be able to meet for 1 hour each week with the mentor and take part in occasional lab meetings. Independent work is required, but we can find space for a small working area in our lab.

App ID #: 3515

Mentor: Faklaris, Cori

Email: cfaklari@uncc.edu

Title: Assistant Professor

Department: Human-Centered Computing and Education

Co-mentor: No

Community engaged research: No

Title: Mobile Scam Intervention and Android App Research

Description: The selected student will help with an ongoing research study that uses an Android app to understand how people respond to scam text messages and test new ways to help them avoid scams. The student will work with the research team to help test the app, assist with recruiting and communicating with study participants, organize and manage research data, and help evaluate different scam-prevention features and educational interventions. Depending on their interests, the student may also assist with surveys, interviews, usability testing, data analysis, and creating realistic scam-message scenarios for future studies. This position is ideal for someone who is interested in technology, mobile apps, psychology, cybersecurity, or user experience, and wants hands-on experience working on a real research project that aims to make smartphones safer and help protect people from online scams. No prior cybersecurity experience is required; we are looking for someone who is curious, reliable, organized, and interested in learning how research can be used to understand and improve people's security decisions.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: By the end of the experience, the student will have gained practical experience in mobile app research, participant-based studies, usability evaluation, cybersecurity research, data collection and analysis, professional communication, and interdisciplinary research teamwork, while contributing to real-world efforts to help people avoid online scams.

Required training of 15 hours with Description: IRB CITI training in Social Behavioral research, which can be done at the start of the semester. Learning about SPSS before the start is a plus.

Mentoring plan: The student will work closely with the research team and receive regular guidance throughout the project. Weekly meetings will be used to review progress, discuss challenges, and plan upcoming tasks. During the first few weeks, the student will be trained on the goals of the research project, the operation of the Android app study, ethical conduct of research with human participants, participant communication procedures, and basic data-management practices. The student will also learn how researchers evaluate mobile apps, collect participant feedback, and study human behavior related to online scams and security decisions. As the student gains experience, they will take on increasing responsibility for supporting the study, including testing app features, helping manage participant activities, organizing research data, conducting or assisting with interviews and surveys, and contributing to discussions about new intervention ideas. The

student will participate in research group meetings where they can share observations, ask questions, and learn how research projects progress from study design to data collection, analysis, publications, and future grant proposals. Throughout the project, the mentoring team will provide constructive feedback on communication, professionalism, organization, and research skills. By the end of the experience, the student will have gained practical experience conducting participant-based research, evaluating mobile technologies, analyzing user behavior, and contributing to interdisciplinary cybersecurity research focused on helping people avoid online scams.

Applicant Requirements: No prior cybersecurity experience is required. The most important qualifications are curiosity, strong reading and writing skills, attention to detail, and an interest in learning how academic research is conducted.

Applicant Preferences: Familiarity with Android software or SPSS is a plus. Coursework in human-computer interaction, design, mobile software development, psychology, education, sociology, or related topics is preferred.

Specific Time considerations/conflicts: Must be able to meet for 1 hour each week with the mentor and take part in occasional lab meetings. Independent work is required, but we can find space for a small working area in our lab. The student also must be able to arrange work times with the lead Phd student on the project for research data collection and analysis.

App ID #: 3516

Mentor: Jenkins, Mason

Email: mjenki74@charlotte.edu

Title: Clinical Associate Professor

Department: Marketing

Co-mentor: No

Community engaged research: No

Title: The Essence of Luxury: How Consumers Construct Prestige Categories

Description: In this project, we plan to examine the relationship between the psychological essentialism (a theory of how people categorize the world) and luxury branding. Experimental research both online and in person is planned to explain how and why consumers choose to value certain brands as luxury over others, and how this maps onto basic psychological processes of categorization and reasoning.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

1 positions available

Anticipated Student Learning Outcomes: Student researchers will gain experience with experimental research in marketing and consumer behavior. This includes designing studies in Qualtrics, analyzing data in SPSS, Excel, and R, and reporting results. Students will also gain expertise in conducting literature reviews in more traditional methods and also with using emerging artificial intelligence tools. This project will be beneficial to students interested in careers in market research, branding, or those interested in pursuing graduate education. Presentation of the research at student research events is encouraged.

Required training of 2 hours with Description: Students will need to complete the CITI Human Subjects training module as part of their training. Other software training will be conducted as needed as the research progresses.

Mentoring plan: Bi-weekly meetings and regular email communications are the norm, with ad hoc meetings as needed as requested by the student. Students will be working directly with the faculty researcher. Creation of mentoring expectations will be done at the beginning of the semester to establish mutual expectations.

Applicant Requirements: Successful student researchers should be proficient working on their own asynchronously with the research team. Students who are responsible, proactively identify issues, and are motivated to contribute to the project on their own are ideal candidates. Student applicants should be intellectually engaged in the topic of consumer behavior and psychology and be comfortable talking with the faculty advisor about their opinions on this topic. The research project is one that will last over multiple semesters, and thus students should be intrinsically interested in the topic of luxury branding, consumer creativity, psychological pricing, and consumer behavior as the exact nature of required tasks (data collection, study design, literature search and review) may vary over the course of the semester.

Applicant Preferences: Preferences are for students majoring in marketing, economics, psychology, or related areas.

Specific Time considerations/conflicts: N/A

App ID #: 3517

Mentor: Clinton, Sandra

Email: sclinto1@uncc.edu

Title: Associate Research Professor

Department: Earth, Environmental and Geographical Sciences

Co-mentor: Yes

David Vinson, dsvinson@uncc.edu, Earth, Environmental and Geographical Sciences

Community engaged research: No

Title: Water Quality in post-restoration, beaver-colonized urban streams

Description: Urban streams are characterized by having a flashy hydrology, high erosion rates, high nutrient concentrations and low biodiversity. Stream restoration is a common method to mitigate these urban impacts and improve overall stream health. We have been monitoring the headwaters of the Reedy Creek watershed in Reedy Creek Nature Reserve for >10 years, spanning pre to post-restoration, for hydrology, water quality, and biodiversity. As is common in restored urban streams, beavers have recently moved into a headwater tributary and built a series of dams and creating a pond and wetland complex. Beavers are native to our Piedmont region and have been expanding their numbers across NC including in urban areas. Compared to other regions of the United States, there is less information about the role of beavers in Piedmont streams and even less is understood about their impact on urban restored streams. We are monitoring the impact of beavers on the post-restoration water quality of the Reedy Creek headwaters to compare to previous pre and post-restoration data. The OUR scholar would work in the field to collect samples for water quality analysis focusing on nutrients and total suspended solids. The student will also work to analyze these samples in the laboratory and be responsible for updating the water quality database.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience in the field collection and lab processing of water quality samples; learn best practices for quality control/quality assurance of data management; be able to explain the impact of urbanization and beavers on stream water quality

Required training of 2 hours with Description: OUR Scholars will:

1. complete assigned EHS training
2. review safety practices for field work with the project mentors

Mentoring plan: The OUR Scholar will be integrated into both the Clinton and Vinson research groups that are comprised of undergraduate and graduate researchers. The OUR Scholar will meet weekly with either Dr. Clinton or Vinson to discuss progress from the previous week and set goals for the upcoming week and any problems that may have arisen during the project. The OUR Scholar will receive training on established water quality field methods, lab procedures, and database

management. Depending on the student, there are opportunities to develop this research into an honors thesis and present the results at state or national meetings.

Applicant Requirements: Minimum 1000-level chemistry + lab and earth sciences or related course
Comfortable working in uncomfortable weather conditions: hot, cold and sometimes wet and muddy field conditions
Car to drive to/from UNCC and Reedy Creek Park (10-15 minutes each way)
Strong interest in doing field and lab work
Independently able to work in the field

Applicant Preferences: Field methods based course
Rising junior or senior

Specific Time considerations/conflicts: Students must have free a 3 hour block (or more) to conduct field work. Field work can start early in the morning or be conducted during the day. The student must return to campus by 4 pm and may not work on weekends.

Lab work must be completed during normal business hours when other researchers are present to help support the analysis.

Readings and data analysis can be completed as best managed by the student's schedule.

App ID #: 3518

Mentor: Clinton, Sandra

Email: sclinto1@uncc.edu

Title: Associate Research Professor

Department: Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: No

Title: Dragonfly genetic connectivity in urban freshwater systems

Description: Aquatic insects are important members of both freshwater and terrestrial food webs due to their unique life history where the egg to juvenile stage occurs in the water and the mature stage occurs as winged adult. Globally, these organisms are declining due to multiple stressors including urbanization. Dragonflies are an excellent target species to better understand how urbanization impacts aquatic insects as they play an important role as a predator in both the freshwater and terrestrial system and they are sensitive to water pollution that occurs in urban systems. We are quantifying dragonfly diversity using both traditional taxonomic keys and molecular methods to better quantify the barriers to dispersal and impacts of habitat decline on their overall population structure. To address these goals we are sampling dragonfly nymphs (juveniles) from ponds and streams in Mecklenburg County. This research will involve visually identifying organisms down to species or genus level using a microscope and dichotomous key. We are also quantifying genetic connectivity, so the OUR scholar will learn how to do DNA extraction, PCR, gel electrophoresis, and handle DNA sequence sets. This project will have a field and lab component.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: Anticipated student learning outcomes: Gaining field experience in urban freshwater ecosystems. Skills using a dichotomous key and microscope. Exposure to DNA methodologies and bioinformatics methods. Training in using Excel, GIS, and potentially R. Training in data management and good data practices.

Required training of 3 hours with Description: UNC Charlotte EHS (lab safety) and CITI (field safety) training

Mentoring plan: The scholar will complete a mentor-mentee contract at the beginning of the semester that outlines the goals of everyone participating in the project. The OUR scholar will be directly advised by a PhD student in the Clinton research group and will work with this student to collect and analyze the data. The PhD student and the Dr. Clinton will help the student with skills related to data analysis and presentation. The undergraduate researcher and the PhD student will meet weekly to set goals for the week and review tasks from the previous week. The student will also meet ~1x/week with Dr. Clinton to discuss any questions related to the research and deliverables. The student (if schedules allow) will also join the Clinton research group lab meetings (2x/month). At the beginning of the semester the student will be assigned ~5 relevant journal

articles to read for background information. These articles will be reviewed with the PhD student and Dr. Clinton. OUR scholars are expected to present their research at the OUR symposium at the end of the semester. Depending on progress and interest, Dr. Clinton will work with the student to attend a local (NC) or national meeting related to their research topic.

Applicant Requirements: Students should be interested in learning traditional taxonomy and willing to work several hours on a microscope. This project will also involve a field component, and students should be comfortable working in urban streams and ponds. The research program will provide transportation and boots. The department also maintains a field closet for students who may need field clothes (these are free to students).

Applicant Preferences: Students should have completed introductory Earth Science (ESCI 1101) or introductory biology. While students who have completed an introductory environmental science or ecology course are preferred, this is not required. An enthusiasm for freshwater science and field work is encouraged. Both lab-based taxonomy and field work can be challenging and students should be willing to work through difficulties.

Specific Time considerations/conflicts: Lab meetings will be set once spring schedules are known. Students will need at least 1 block of 4-5 hours of time for field work. The remaining hours will be for lab work (2-3 hour blocks), and data analysis. Field and lab work will be conducted during business hours to ensure proper training and supervision for the student. Literature reviews and data analysis can occur outside of regular business hours.

App ID #: 3521

Mentor: Li, Xingjie

Email: xli47@uncc.edu

Title: Professor

Department: mathematics and statistics

Co-mentor: No

Community engaged research: No

Title: Recovering Efficiency Without Labels: Shuffled Regression and Optimal Transport for U.S. Airlines and Major Hubs

Description: This project analyzes how efficiently major U.S. airlines and major airport hubs operate using public data from the Bureau of Transportation Statistics (BTS) and the Federal Aviation Administration (FAA). We will start by building a baseline model that connects airline inputs—like labor, fuel, and fleet capacity—to real-world outputs like passengers carried and flight reliability. Because real-world public data is often messy and unmatched, students will learn how to use advanced data-matching techniques, such as "shuffled regression" and optimal transport, to reconstruct missing connections. Additionally, we will use Wasserstein distances or additional efficiency scores to compare flight performance distributions across different airlines and airports. Ultimately, this project gives students hands-on experience managing a complete data science pipeline, taking them all the way from raw aviation data to cutting-edge statistical analysis and meaningful real-world conclusions.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Ultimately, this project gives students hands-on experience managing a complete data science pipeline.

Required training of 0 hours with Description: Students will learn how to use advanced data-matching techniques, such as "shuffled regression" and optimal transport. Students will use concepts and application of Wasserstein distances.

Mentoring plan: Students will learn how to use AI in a reliable way, and collect the data, implement the simulation, analyze the results to provide a comprehensive report for US major air hubs' efficiency rankings. Students will meet me every week, discuss the learning objective, results from last week and subtasks for next week. Students must provide a weekly report/results to show their progress every week.

Applicant Requirements: Students must take calculus I and II, linear algebra and matrix.

Applicant Preferences: I would like to have priority for students who took advanced level math classes such as calculus III, IV; applied probability, etc. Students with some coding experience is a plus but not a necessary.

Specific Time considerations/conflicts: students must be available for in-person meetings on campus. Although zoom meeting is allowed occasionally, most of the meetings will be in-person.

App ID #: 3522

Mentor: Akella, Srinivas

Email: sakella@charlotte.edu

Title: Professor

Department: Machine Learning

Co-mentor: No

Community engaged research: No

Title: Autonomous Robotic Coverage, Inspection, and Informative Path Planning

Description: In this project, the undergraduate students will learn about state-of-the-art algorithms for autonomous robot coverage, inspection, and informative path planning. The goal is to develop and implement new online approaches that incorporate streaming sensor data. Applications include autonomous vehicles, inspection of critical infrastructure (e.g., power lines, roads), and search and rescue (e.g., after disasters). Students will work on cutting edge research in robotics and learn about optimization and machine learning algorithms and ROS (robot operating system). The research will be conducted in the Robotics Laboratory in the Machine Learning department. In addition to validation of the algorithms in simulation, there will be opportunities to implement and demonstrate the algorithms on wheeled mobile robots, autonomous surface vehicles, and drones.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: The students will learn to perform research by participating in and contributing to ongoing robotics research projects. The students will be exposed to cutting-edge research in robotics and AI at UNC Charlotte and learn to do literature surveys of related research. They will have access to a wide variety of robots (mobile robots, drones, manipulator arms) in our active Robotics Lab. They will closely interact with graduate students. They will gain experience with ROS 2 (Robot Operating System).

Required training of 20 hours with Description: The students will work through ROS 2 tutorials and read selected research papers as preparation. They will also be exposed to relevant robot software and hardware.

Mentoring plan: The faculty mentor will meet with the student on a regular basis (weekly or more frequently if needed). The student will also have the opportunity to interact with graduate student mentors involved in robotics research. They will attend research presentations and will be encouraged to present progress reports on their work. The student will receive guidance on their research and will be taught how to write research abstracts, posters, and present their research work.

Applicant Requirements: Familiarity with algorithms and data structures, and a proficiency in C++/Python is preferred. A good background in math (linear algebra, calculus) is desirable.

Familiarity with the Robot Operating System (ROS 2) or ArduPilot is a plus. Familiarity with robot electrical design is also a plus.

Applicant Preferences: Coursework in Algorithms and Data Structures (ITSC 2214), Linear Algebra (MATH 2164), and Calculus III (MATH 2241). Experience in Robotics (ITCS 4150: Mobile Robotics or ITCS 4151: Intelligent Robotics) and/or Artificial Intelligence (ITCS 3153) or equivalent courses will be a plus. Should be comfortable with programming in C++ and/or Python. Enthusiasm and willingness to take on open-ended projects.

Specific Time considerations/conflicts: Students should be prepared to come to the lab between 9 am and 5 pm on weekdays. This will enable face-to-face communication in the lab, mentoring by the mentor and graduate students, and the opportunity to attend research presentations.

App ID #: 3523

Mentor: Yarmand, Matin

Email: myarmand@charlotte.edu

Title: Assistant Professor

Department: Human-Centered Computing and Education

Co-mentor: No

Community engaged research: No

Title: First Steps Matter: Evaluating On-campus Orientation Programs

Description: On-boarding programs make new experiences feel less daunting and more exciting. Starting something new (whether a new class, project, or job) can feel quite overwhelming. These programs aim to provide necessary information, clear roadmap, and helpful tips. Think about the last time you on-boarded into a new program or job. How did you find the exercises? Did you dive in, taking notes and engaging with the process, or were you wishing for a fast-forward button to skip ahead straight to the final quiz? Looking back on your orientation experience, what would you have wished you did differently in the first couple of weeks to expedite your learning? This project aims to capture and examine these experiences and feelings at scale. Specifically, you will: read relevant literature to better understand the existing work in this space, devise an anonymized survey that gathers perceptions around orientations, distribute the survey to collect responses from the UNC Charlotte community (students, staff, and faculty), and analyze the collected data to reveal patterns. The World Economic Forum predicts that by 2028, 23% of jobs will change: 69 million new jobs will be created and 83 million existing positions will disappear. In today's dynamic labour market — supercharged by the unprecedented advances in Generative AI — effective on-boarding programs help people adapt and excel when switching jobs. Understanding current practices and perceptions is the first key step.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: If you seek graduate school — you will learn the end-to-end process of conducting survey studies, one of the most important tools in Human-Computer Interaction (HCI) and psychology research. You will learn how to craft a survey that is both engaging for the audience, and informative for the researchers, as well as how to quantitatively and qualitatively analyze the data. There will further be opportunities for engagement that can help develop your communication, writing, and presentation skills. This project prepares you for your research career, and will give you enough insight and material that you can use to prepare a strong application for graduate school. If you seek industry — the survey design and analysis components of the project closely align with many industry requirements, especially for User Experience (UX) and Data Science (DS) roles. Developing a concise and informative survey is a sought-after skill by many companies that aim to evaluate their product at mass. Data analysis is also a critical component of all companies, used to organize and make sense of information at scale. In this project, you will develop these two types of skills extensively. If you are open to both — you have the opportunity to benefit from both categories! Show up motivated with open eyes, learn and practice

these skills (that often overlap between academia and industry), and you will be able to know for sure which career path you gravitate towards.

Required training of 5 hours with Description: You will need to complete the IRB CITI training before distributing the survey. This ensures curating a survey that aligns with ethical human-subject protocols.

Mentoring plan: We will collaboratively work on a mentoring plan that works for your schedule and mine. Having worked with many undergraduate students in the past, here is what I have found to be helpful: Phase 1: Project Setup and Early Guidance Meetings: 3x per week (two short check-ins + one long co-working session) Duration: Weeks 1-3 Mentor Role: Offer close guidance on project goals, co-work to model research and design processes, help with problem scoping and solution planning Phase 2: Independent Survey Design, Distribution, and Analysis Meetings: 1x per week (one long check-in) Duration: Weeks 4-12 Mentor Role: Provide targeted feedback on the survey design process and track alignment with project goals Phase 3: Consolidation and Presentation Meetings: 2x per week (one long and one short check-ins) Duration: Weeks 13-15 Mentor Role: Advise on clear presentation strategies and provide support for integrating the work into a cohesive final outcome Besides our 1-on-1 engagement, I would also encourage you to talk to other students and faculty, and at least once, present to the HCC research group. These interactions can help you build a broader network, and especially, learn how to communicate your progress to a wider audience.

Applicant Requirements: The following skills are crucial for success in this project: Literature Review — You should be able to read academic papers from a variety of disciplines to get a better understanding of the existing work in the space, and later synthesize the information. Independence — You must be able to think and work independently, always aspiring to discuss your new ideas. I will be helping you along the way, but you will be the one driving the work according to your interest and expertise. Motivation and Curiosity — You must be motivated and curious to pursue this line of work. This interest can especially stem from your past experience when you might have experienced prior frustration with orientation programs.

Applicant Preferences: The following skills can put you on a path to success: Data Analysis — Prior experience in Data Science can be very helpful for survey analysis, such as existing familiarity with Python Pandas or R. Design — Prior design skills (e.g., user scenario and storyboarding) is a plus (Recommended course: ITIS 3130). Writing — Strong writing skills can help you transform your work into a manuscript that will publicize your work to a broad audience.

Specific Time considerations/conflicts: There is no specific day or hour for engagement in this research. We will collaboratively find times that work for both of us.

App ID #: 3524

Mentor: Yarmand, Matin

Email: myarmand@uncc.edu

Title: Assistant Professor

Department: Human-Centered Computing and Education

Co-mentor: No

Community engaged research: No

Title: Making Metaphors Work: A Usability Study of AI-Assisted Learning Tools

Description: As long as humans have existed, metaphors have been instrumental in bridging and sharing knowledge. Metaphor theories describe how humans communicate conceptual knowledge by mapping a known concept from other life experiences onto a target concept we want to convey. For example, we might find reading interdisciplinary papers to be an uphill battle. Of course, no such battle takes place; the metaphor is abstract to the target concept. But, this common idiomatic metaphor allows us to imagine the difficulty in our own experience and ascribe qualities to it (e.g., the metaphor implies the task gets more difficult over time, like going uphill). In this project, you will take an active role in advancing our existing AI-driven metaphor generation system and evaluating its usability. Your responsibilities will include preparing and refining the current system for study deployment, including implementing logging and tracking mechanisms to capture meaningful interaction data. You will help design the usability studies by developing study protocols, defining evaluation metrics, and preparing materials for participants. You will then recruit and run study sessions, guiding participants through tasks and ensuring high-quality data collection. Finally, you will analyze both system logs and participant feedback to identify usability patterns, strengths, and areas for improvement, contributing directly to research findings and system refinement. Through this project, you will develop core HCI skills spanning system preparation, usability evaluation, data analysis, and research communication. You will gain hands-on experience readying a research prototype for real-world deployment. Importantly, your contributions will extend beyond implementation: you will have the opportunity to participate in writing and refining research papers, with the potential to co-author submissions to top-tier HCI conferences. This experience positions you not only as a developer, but as a researcher capable of contributing to impactful, publishable work.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: If you are considering graduate school, this project will give you hands-on experience in preparing and evaluating interactive systems through rigorous usability research. You will design and run user studies, implement logging mechanisms, analyze both quantitative interaction data and qualitative feedback, and translate findings into system improvements. These skills are essential for success in master's and PhD programs, especially in Human-Computer Interaction (HCI). You will also work closely with faculty and research collaborators, positioning you to earn strong reference letters and build an academic network. If you are considering industry, this project closely mirrors real-world UX research and product evaluation

workflows. You will gain experience instrumenting systems for data collection, designing usability protocols, running participant sessions, and synthesizing insights to inform iterative development. These experiences prepare you for roles in UX research and product development, where evaluating and refining systems based on user data is critical. If you are open to both paths, this experience bridges research and applied system development. You will learn to move from prototype to deployment-ready system, collect and interpret rich user data, and contribute to improving AI-driven tools through evidence-based design. You will emerge with strong HCI research skills, practical evaluation experience, and the opportunity to contribute to work that may be submitted to leading HCI conferences.

Required training of 0 hours with Description: There is no on-boarding process needed for this project.

Mentoring plan: We will collaboratively work on a mentoring plan that works for your schedule and mine. Having worked with many undergraduate students in the past, here is what I have found to be helpful: Phase 1: Project Setup and Early Guidance Meetings: 3x per week (two short check-ins + one long co-working session) Duration: Weeks 1-3 Mentor Role: Offer close guidance on project goals, co-work to model research and design processes, help with problem scoping and solution planning Phase 2: Independent Design and Development Meetings: 1x per week (one long check-in) Duration: Weeks 4-12 Mentor Role: Provide targeted feedback on the usability design process, offer clues for technical obstacles, and track alignment with project goals Phase 3: Consolidation and Presentation Meetings: 2x per week (one long and one short check-ins) Duration: Weeks 13-15 Mentor Role: Advise on clear presentation strategies and provide support for integrating the work into a cohesive final outcome Besides our 1-on-1 engagement, I would also encourage you to talk to other students and faculty, and at least once, present to the HCC research group. These interactions can help you build a broader network, and especially, learn how to communicate your progress to a wider audience.

Applicant Requirements: The following skills are crucial for success in this project: Programming — You must have prior coding experience in full-stack development, either as part of previous classes or personal projects. You should have strong familiarity with front-end development, including HTML, CSS, JS. Strong familiarity with back-end workflows (e.g., Python Flask) is also necessary. It is also important that you are fairly familiar with project management on Github. Independence — You must be able to think and work independently, always aspiring to discuss your new ideas and explorations. I will be helping you along the way, but you will be the one driving the work according to your interest and expertise. Motivation and Curiosity — You must be motivated and curious to pursue this line of work. This interest can especially stem from your past experience when you might have shared challenges when reading interdisciplinary papers.

Applicant Preferences: The following skills can put you on a path to success: Design — Prior design skills for usability studies is a strong plus (recommended courses: ITIS 3130, ITIS 3140). Writing — Strong writing skills can help you transform your work into a manuscript that will publicize your work to a broad audience.

Specific Time considerations/conflicts: There is no specific day or hour for engagement in this research. We will collaboratively find times that work for both of us.

App ID #: 3525

Mentor: Mohammed, Shahed

Email: smoham30@uncc.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Development of a Precision Deformation Platform for OCT-Based Biomechanical Imaging

Description: Changes in tissue deformation and mechanical behavior are associated with many diseases, including cancer, fibrosis, cardiovascular and retinal diseases, making accurate measurement of microscopic tissue motion important for developing new diagnostic imaging tools. Optical coherence tomography (OCT) provides a promising tool for capturing microscopic deformation, however, validation of OCT-based biomechanical imaging remains challenging because the true deformation inside a sample is usually unknown. This project aims to develop and quantitatively evaluate a programmable deformation platform integrated with a Thorlabs optical coherence tomography (OCT) system to generate controlled microscopic motion in tissue-mimicking samples. The student will combine precision actuation, OCT imaging, MATLAB/Python programming, and displacement analysis to determine how accurately and reproducibly prescribed axial and lateral motions can be generated and recovered from OCT measurements. The resulting framework will provide experimental ground truth for validating emerging multidimensional OCT motion-tracking and biomechanical imaging methods.

Objective 1: Develop an OCT-Compatible Controlled Deformation Platform

Objective 2: Integrate Programmable Motion with OCT Image Acquisition

Objective 3: Quantitatively Validate OCT-Based Displacement Measurements

Student Deliverables: The student will deliver a working OCT-compatible deformation prototype, MATLAB/Python control and analysis code, a calibrated dataset of OCT images acquired under known displacements, quantitative accuracy and repeatability results, and a research poster/presentation summarizing the findings.

Expected Impact: Establish a reusable ground-truth platform for validating OCT-based displacement and strain measurements. Enable more rigorous development of multidimensional and vector deformation imaging methods for quantitative tissue biomechanics. Provide a foundation for future translational studies using OCT-derived mechanical biomarkers for disease detection, characterization, and monitoring.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Through this project, the student will gain hands-on experience in: Biomedical imaging and optical instrumentation Precision motion control MATLAB and/or Python programming CAD and rapid prototyping Image processing and registration Experimental design Quantitative error and statistical analysis Scientific visualization Research communication Importantly, no prior OCT or biomedical imaging experience is required. Training will be provided as part of the research experience.

Required training of 10 hours with Description: The student will complete all required UNC Charlotte research compliance and laboratory safety training before beginning hands-on work. Initial onboarding will include orientation to the laboratory, safe operation of the Thorlabs OCT system and precision actuators, basic laser/optical safety, data management and research integrity expectations, and training in MATLAB/Python-based instrument control and image analysis. The student will first observe demonstrations and complete supervised practice sessions before independently operating the equipment. Because the proposed work will initially use tissue-mimicking phantoms and does not involve human or animal subjects, no human-subject or animal-research training is anticipated unless the project scope changes.

Mentoring plan: The student will meet with the faculty mentor at least once each week to review progress, discuss experimental results, troubleshoot challenges, and establish goals for the following week. Initial activities will involve close supervision and structured training in OCT operation, motion control, laboratory safety, and data analysis. As the semester progresses, the student will assume increasing responsibility for experimental planning, data acquisition, analysis, and interpretation. Graduate researchers in the laboratory may provide additional technical guidance, while the faculty mentor will remain responsible for the overall research direction and the student's development as an independent researcher. The student will also receive mentoring in scientific literature review, research ethics, data visualization, abstract preparation, and scientific presentation.

Applicant Requirements: No prior research, OCT, or biomedical imaging experience is required. Students should have basic programming experience in MATLAB, Python, or a similar language and be comfortable with introductory engineering mathematics. Coursework in circuits, programming, signals and systems, instrumentation, controls, or image processing is helpful but not required. Experience with CAD, 3D printing, electronics, or laboratory experimentation is also beneficial. Most importantly, the student should be motivated to learn, comfortable with hands-on problem solving, and willing to work independently after appropriate training.

Applicant Preferences: The project is appropriate for undergraduate students in Electrical and Computer Engineering, Mechanical Engineering, Biomedical Engineering, Computer Science, or related disciplines. Students with an interest in one or more of the following areas are particularly encouraged to apply: MATLAB or Python programming, Robotics or mechatronics, Electronics and instrumentation, Signal or image processing, Mechanical design or 3D printing, Biomedical technology. Prior research experience is not required. Curiosity, willingness to learn, attention to detail, and interest in hands-on experimentation are more important than prior expertise.

Specific Time considerations/conflicts: There are no fixed days or times that the student must be available. Research hours can be scheduled flexibly around the student's course schedule. However, the student will be expected to attend a weekly meeting with the faculty mentor and coordinate blocks of time for hands-on OCT experiments, equipment training, and laboratory work. Consistent weekly engagement and reliable communication will be expected throughout the project.

App ID #: 3526

Mentor: Yarmand, Matin

Email: myarmand@uncc.edu

Title: Assistant Professor

Department: Human-Centered Computing and Education

Co-mentor: No

Community engaged research: No

Title: AI in the Classroom: How Students Use LLMs for Coursework

Description: When you use ChatGPT for a class, what drives that decision: your learning goals, the assignment, or what you think everyone else is doing? This project explores these questions by analyzing a rich, semester-long dataset from approximately 80 students who completed weekly surveys reflecting on their coursework. Each week, students described how they used large language models (LLMs), what benefits or challenges they experienced, how this use aligned with their goals for the class, and how they perceived their classmates' behaviors. By examining these reflections over time, this project asks: How do students use LLMs in coursework, and how much is that use influenced by goal orientation? As an undergraduate researcher on this project, you will play a central role in shaping and carrying out the study. You will start by conducting a guided literature review to understand prior research on students' goal orientations, peer perceptions, and the use of AI tools in learning. From there, you will dive into hands-on quantitative and data-science work: cleaning and organizing survey datasets, visualizing patterns in different types of responses, testing whether differences between student groups are statistically significant, and running correlation and regression analyses to explore relationships among LLM use, goals, and perceptions. You will synthesize your findings into a clear written report and visual summaries that communicate both results and implications. This project can directly influence how instructors design courses in an era of widespread AI use. By showing how different goal structures are linked to distinct patterns of LLM use, your work can inform how assignments are framed, how AI guidance is provided, and how classroom norms are set. The results are also well-positioned for submission to a premier Human-Computer Interaction (HCI) conference, offering you the opportunity to contribute to the field and potentially become a co-author on a peer-reviewed publication.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

1 positions available

Anticipated Student Learning Outcomes: If you are considering graduate school: You will gain hands-on experience with the full research pipeline, from reviewing prior literature to analyzing semester-long survey data and interpreting results. You will learn how to conduct rigorous quantitative analyses, including data visualization, statistical testing, and correlation and regression analyses; these are core skills in Human-Computer Interaction (HCI), Computer Science Education, and learning sciences research. You will also develop academic writing and communication skills through reporting results and contributing to a study that can be submitted to a top-tier research conference. This experience will prepare you for graduate-level research and strengthen your graduate school applications. If you are considering industry: The skills you develop

in this project closely align with industry roles such as User Experience (UX), Data Science, and AI product research. You will learn how to analyze real-world data at scale, identify meaningful patterns, and communicate insights through clear visualizations and reports. Understanding how users interact with AI tools, and how motivation and social context shape behavior, is increasingly valuable in industry settings where AI-enabled products are being designed, evaluated, and deployed. If you are open to both paths: This project offers a strong foundation for exploring both academic and industry careers. The research, data analysis, and communication skills you will practice are highly transferable across domains. By working on a real and impactful study, you will gain clarity on your interests and build experience that supports multiple future career directions.

Required training of 0 hours with Description: There is no on-boarding process needed for this project.

Mentoring plan: We will collaboratively establish a mentoring plan that works well with both your schedule and mine. Based on my experience mentoring undergraduate researchers, the following phased structure has proven effective for supporting learning, independence, and meaningful research outcomes over a summer program.

Phase 1: Onboarding and Research Foundations

Duration: Weeks 1-2 **Meetings:** 2-3x per week (one longer working session, one to two short check-ins) **Mentor role:** Provide close guidance on project goals, introduce the research questions and dataset, and co-work to model research practices. During this phase, I will support you in understanding the study context, relevant literature, and analysis plan, while helping you build confidence with tools, workflows, and expectations.

Phase 2: Data Analysis and Skill Development

Duration: Weeks 3-7 **Meetings:** 1-2x per week (one primary working meeting, optional short check-ins as needed) **Mentor role:** Shift toward targeted mentorship as you take increasing ownership of the project. I will provide feedback on data analysis decisions, help interpret results, suggest next analytical steps, and support problem-solving around statistical or technical challenges. This phase emphasizes independent work, iterative analysis, and skill-building in data visualization and quantitative methods.

Phase 3: Synthesis, Writing, and Presentation

Duration: Weeks 8-10 **Meetings:** 2x per week (one longer session, one short check-in) **Mentor role:** Support you in synthesizing findings into a cohesive narrative, refining visualizations, and preparing a final report or draft suitable for research dissemination. I will advise on research communication, writing clarity, and next steps toward potential conference submission. You will also be encouraged to engage with other students and faculty and to present your work at least once to the Human-Centered Computing (HCC) research group. These experiences will help you develop professional communication skills, receive broader feedback, and build a research network that extends beyond this summer program.

Applicant Requirements: The following skills are important for success in this project:

- Literature Review** — You should be able to read academic papers from a variety of disciplines to get a better understanding of the existing work in the space, and later synthesize the information.
- Data Analysis** — You should have relative familiarity with quantitative data analysis, including working with tabular data (e.g., dataframes), using tools such as Python and Pandas, and interpreting basic statistical relationships (such as correlations).
- Independence** — You must be able to think and work independently, always aspiring to discuss your new ideas. I will be helping you along the way, but you will be the one driving the work according to your interest and expertise.
- Motivation and**

Curiosity — You must be motivated and curious to pursue this line of work. This interest can especially stem from your past experience of using LLM for coursework.

Applicant Preferences: The following skills can put you on a path to success: Programming — Prior experience with data visualization using libraries like Seaborn is helpful, as well having working familiarity with correlation analysis (e.g., linear regression). Writing — Strong writing and storytelling skills can help you transform your work into a manuscript that will publicize your work to a broad audience.

Specific Time considerations/conflicts: There is no specific day or hour for engagement in this research. We will collaboratively find times that work for both of us.

App ID #: 3528

Mentor: Li, Xuyang

Email: xuyang.li@charlotte.edu

Title: Assistant Professor

Department: Albert School of Construction

Co-mentor: No

Community engaged research: No

Title: Detecting Hidden Damage in Structures with Experiments and AI

Description: Structural damage is often difficult to identify before it becomes serious. Cracks, loosened connections, and material degradation can change how a structure responds to external forces, even when the damage is not visible. By measuring these changes, engineers can better assess structural conditions and identify potential problems earlier. This project combines laboratory experiments with AI for structural damage detection. Our research team will test structural specimens equipped with sensors and collect data under different loading and damage conditions. The student will support these experiments by helping prepare test specimens, set up sensors, and collect and organize data under supervision. On the computational side, we will develop AI models that learn to identify and locate damage from the measured structural responses. Principles of mechanics will also be incorporated so that the predictions are guided by physics and are more reliable and interpretable. **Your Role:** As the undergraduate researcher, you will work with the faculty mentor and graduate researchers on both the experimental and computational parts of the project. You will assist with experimental setup and data collection, prepare and analyze sensor data, train and evaluate AI models, and create visualizations of the results. The balance between laboratory and computational work can be adjusted based on your interests and skills. No prior research experience is necessary. We are looking for a student who is curious about how structures behave, enjoys experimental or computational work, and wants hands-on experience applying AI to engineering problems.

Accepting applications for: Only 150 hours over an academic semester (~10h/wk)

2 positions available

Anticipated Student Learning Outcomes: The student will gain practical experience across the major stages of an engineering research project, from laboratory experiments and data collection to computational modeling and analysis. On the experimental side, the student will learn basic instrumentation, sensor use, data acquisition, and experimental procedures. On the computational side, the student will learn to process data, train and evaluate AI models, and create clear visualizations using scientific Python tools. Beyond technical skills, the student will develop critical thinking by analyzing results, forming hypotheses, and drawing evidence-based conclusions. They will also learn to communicate ideas across engineering, mathematics, and AI through weekly meetings and a final presentation. Ultimately, the student will develop a professional research workflow and the methodical habits needed for a future career in engineering, computing, or scientific research.

Required training of 5 hours with Description: The onboarding process will begin with required university training, including laboratory safety training needed for access to the structures laboratory. The student will then receive project specific instruction in experimental procedures, sensor use, data management, and the computational tools needed for their assigned tasks. Laboratory activities will be conducted under the supervision of the faculty mentor or a graduate researcher. Initial tasks will be completed with direct guidance before the student begins working more independently.

This project involves fundamental research in structural engineering and scientific AI, with the goal of producing results suitable for public presentation and potential publication.

Mentoring plan: The mentor's philosophy is to help the student develop from a classroom learner into a confident and increasingly independent researcher. The goal is to build technical, critical thinking, and professional skills at the intersection of engineering experiments and artificial intelligence. The student will meet with the faculty mentor for one hour each week to set goals, review progress, discuss challenges, and receive technical guidance. The student will also work closely with a PhD student who will provide guidance during laboratory activities and computational tasks. At the beginning of the project, the student will receive direct instruction and clearly defined tasks. As the student gains experience, they will take greater responsibility for analyzing results and identifying the next steps. The mentor will provide regular feedback on experimental practices, code, data analysis, figures, and presentations. The student will maintain organized research notes, share progress during meetings, and present their work at the end of the project. The mentoring environment will encourage questions, careful experimentation, and gradual development of research independence.

Applicant Requirements: 1) Completion of introductory calculus or a comparable quantitative course. 2) Interest in structural behavior, experiments, data analysis, or artificial intelligence. 3) Willingness to learn programming and laboratory procedures. Prior experience in both areas is not required. 4) Clear communication, careful work habits, and a proactive attitude toward problem solving.

Applicant Preferences: 1) Coursework in Statics, Mechanics of Materials, or Structural Analysis. 2) Some experience with Python, MATLAB, or another programming language. 3) Familiarity with linear algebra, differential equations, or numerical methods. 4) Prior exposure to machine learning, sensors, laboratory experiments.

Specific Time considerations/conflicts: Most computational work can be completed on a flexible schedule that accommodates the student's coursework. Laboratory sessions will be scheduled in advance by mutual agreement.

The student must also be available for one weekly meeting with the mentor. The specific day and time will be determined based on mutual availability.

App ID #: 3531

Mentor: McCoy Hudson, Whitney

Email: wmccoy2@uncc.edu

Title: Assistant Professor

Department: Reading and Elementary Education

Co-mentor: No

Community engaged research: Yes

Title: Dream B.I.G.: Black Girls' STEM Learning, Identity, and Opportunity

Description: Dream B.I.G. (Boosting Innovation for Girls) is a research study examining how Black girls experience science, technology, engineering, and mathematics (STEM) learning across school, community, and informal learning environments. The study is particularly interested in the people, programs, learning environments, and experiences that shape girls' STEM interests, confidence, sense of belonging, educational experiences, and future aspirations. The OUR Research Scholar will gain experience with multiple stages of the research process. Depending on the stage of the study and the student's training, responsibilities may include reviewing and organizing research literature; assisting with survey preparation and data management; preparing materials for interviews and small-group discussions; organizing participant-created artifacts and STEM pathway maps; assisting with transcript review and qualitative data organization; developing and applying qualitative codes; participating in research team discussions about emerging findings; and helping create research presentations and other research products. A major goal of the position is for the student to learn how researchers move from a research question to data collection, analysis, interpretation, and communication of findings. Rather than completing isolated research tasks, the Scholar will have opportunities to understand how their work contributes to the larger study. The student will also develop an individual area of inquiry within the broader Dream B.I.G. project that can serve as the basis for their OUR abstract and research presentation. No prior research experience is required. Students interested in elementary education, education, psychology, child and family studies, sociology, STEM education, youth development, or related fields may find this project particularly relevant.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: By the end of the research experience, the student will be able to describe the major stages of conducting an educational research study, including developing research questions, reviewing literature, collecting and managing data, analyzing evidence, interpreting findings, and communicating research to academic and non-academic audiences. The student will gain hands-on experience with mixed-methods educational research. Specific skills may include conducting targeted literature reviews; preparing and managing survey and qualitative data; working with interview transcripts, participant-created artifacts, and visual pathway maps; developing and applying qualitative codes; identifying patterns across multiple forms of data; maintaining research documentation; and using research software and data-management systems as appropriate to their assigned responsibilities. The student will also

develop experience conducting research involving children, adolescents, and community-based learning environments. Through required human-subjects training and ongoing mentorship, the student will learn about informed consent and assent, confidentiality, ethical treatment of research participants, responsible data management, and research with youth. An important learning outcome is the development of the student's ability to think and communicate as a researcher. The Scholar will participate in discussions about research design and interpretation rather than solely completing research support tasks. With faculty mentorship, the student will develop a focused question or analytic contribution within the larger Dream B.I.G. study, prepare an abstract, and create a research presentation for the Undergraduate Research Conference.

Required training of 10 hours with Description: The Scholar will complete a structured onboarding process before accessing research data or participating in research activities. Training will include all UNC Charlotte and ORPI requirements applicable to the student's role, including required CITI human-subjects research training and study-specific IRB training.

The student will then receive project-specific training covering the Dream B.I.G. research questions and conceptual framework; research protocols; participant confidentiality; secure data handling; research involving children and adolescents; survey and qualitative research methods; and documentation procedures.

Additional task-specific training will be provided before the student begins activities such as qualitative coding, transcript review, artifact analysis, or data management. The student will initially practice research procedures using sample or de-identified materials and receive feedback before independently completing assigned research tasks.

Mentoring plan: The OUR Research Scholar will work directly with me, Dr. Whitney N. McCoy Hudson, Principal Investigator of the Dream B.I.G. study. My goal is to provide the student with a structured research experience in which they learn not only how to complete research tasks, but also how and why researchers make decisions throughout the research process. I will provide consistent mentorship, clear expectations, opportunities for guided practice, regular feedback, and increasing independence as the student develops their research skills. At the beginning of the semester, the student and I will develop an individualized mentoring and research plan based on the goals of the Dream B.I.G. study, the student's previous experiences, and the skills they would like to develop. During the first several weeks, I will introduce the student to the study's research questions, conceptual framework, mixed-methods design, research protocols, and ethical responsibilities associated with research involving children and adolescents. We will also discuss how individual research activities—including literature reviews, surveys, interviews, participant-created artifacts, qualitative coding, and data analysis—connect to the larger research questions. The student can expect regular direct contact with me throughout the semester. We will meet at least once each week, individually and/or as part of a research team meeting, to review progress, discuss upcoming tasks, address questions, and examine what we are learning from the research. I will also be available between scheduled meetings for questions that arise as the student completes assigned research activities. At the beginning of a new task, I will provide instruction, examples, and opportunities for practice. The student will receive feedback on their work before progressing to greater independence. For example, a student learning qualitative coding may first review the codebook with me, practice coding a sample transcript, compare

coding decisions with me or another trained research team member, discuss areas of agreement and disagreement, and then begin coding study materials as appropriate. The Scholar will participate in research team discussions and will be expected to contribute ideas, questions, observations, and preliminary interpretations. As appropriate to the stage of data collection, the student may work directly with other trained members of the research team and participate in activities such as literature synthesis, survey preparation, interview preparation, transcript review, qualitative coding, artifact organization and analysis, STEM pathway-map analysis, data management, and development of research products. The student will not be expected to perform a research activity independently until they have received appropriate training and demonstrated readiness to complete that activity. I also want the Scholar to develop ownership of a small area of inquiry within the larger Dream B.I.G. study. As the semester progresses, I will help the student identify a focused research question that aligns with both the larger project and their interests. For example, the student might examine patterns related to STEM belonging, mentorship, learning environments, opportunity pathways, or participant-created STEM artifacts. We will work together to determine what data are appropriate for answering the question, develop an analytic approach, interpret findings, and consider alternative explanations for emerging patterns. This will allow the student to experience research as an intellectual process rather than solely as a set of assigned tasks. Research communication will be an intentional part of the mentoring experience. The student will periodically share their progress during research meetings and receive feedback on communicating research findings clearly to different audiences. I will work individually with the Scholar to develop the abstract and research presentation required by the Office of Undergraduate Research. This will include feedback on writing the abstract, selecting findings, developing figures or other visual representations of results when appropriate, designing the poster or presentation, and practicing the oral presentation. The Scholar will present their work at the required UNC Charlotte undergraduate research event. If the student's work develops into a contribution appropriate for additional dissemination, I will also mentor them through opportunities to contribute to conference proposals, presentations, manuscripts, or other scholarly products, with authorship or acknowledgment determined according to the nature and extent of their contribution. Professional development will also be incorporated into our meetings. I will talk with the student about how research skills translate to graduate education and careers in education, research, youth development, psychology, STEM education, and related fields. When relevant to the student's goals, I will provide guidance on identifying graduate programs, developing a curriculum vitae or résumé that communicates research experience, preparing application materials, and describing their research skills in professional settings. I will also periodically check in with the student about the mentoring experience itself, including their workload, understanding of expectations, areas in which they would like additional support, and skills they would like more opportunities to practice. These conversations will allow us to adjust responsibilities as the student develops and ensure that the experience remains both productive and educational. My commitments to the Scholar are to provide consistent access to mentorship; clearly defined expectations and deadlines; appropriate training before new responsibilities are assigned; timely and constructive feedback; opportunities to ask questions and make mistakes while learning; increasing responsibility as skills develop; substantive involvement in research discussions; and support in developing and communicating an independent scholarly contribution. In return, I will expect the student to communicate regularly, come prepared for meetings, meet agreed-upon

deadlines, maintain research records carefully, protect participant confidentiality, seek assistance when needed, and engage thoughtfully with the research process. By the end of the semester, my goal is for the Scholar to understand how their individual contributions fit within a larger research study and to leave with tangible evidence of their development as a researcher: experience working on a funded study, training in mixed-methods educational research, an individual research question or analytic contribution, an abstract, and a completed research presentation.

Applicant Requirements: Students should demonstrate curiosity about research and an interest in learning about children's educational experiences, STEM learning, or educational opportunity. The position requires reliability, professionalism, attention to detail, and the ability to follow research protocols carefully. Students should be able to communicate effectively, manage assigned responsibilities and deadlines, maintain organized records, and ask questions when research procedures are unclear. Because the project involves human-subjects research, students must be willing to complete required research ethics training, maintain participant confidentiality, follow approved data-security procedures, and handle research materials responsibly. Students should also be comfortable reading scholarly material, working collaboratively, receiving feedback, and developing new research skills. No particular major, previous research methods course, or specialized software experience is required.

Applicant Preferences: Preference may be given to students with interests in elementary education, education, child and family studies, psychology, sociology, STEM education, youth development, informal learning, or community-engaged research. Students who are particularly interested in learning qualitative or mixed-methods research, working with youth-focused research, understanding learning experiences across school and community settings, or pursuing graduate study may find the position especially beneficial. Experience working with children or adolescents, educational programs, community organizations, qualitative data, survey data, or research is welcomed but not required. Students who demonstrate curiosity, initiative, thoughtful engagement with research questions, and a willingness to learn unfamiliar research methods are especially encouraged to apply.

Specific Time considerations/conflicts: No specific day or time is required at the time of application. The Scholar must be available for a regular weekly meeting with the faculty mentor and/or research team at a mutually agreed-upon time. Some research activities involving participants may occur outside standard class hours; participation in those activities will be scheduled in advance based on the student's availability and level of training.

App ID #: 3532

Mentor: Shuster, Martin

Email: mshuste2@charlotte.edu

Title: Professor of Philosophy and Isaac Swift Distinguished Professor of Jewish Studies

Department: Philosophy

Co-mentor: No

Community engaged research: No

Title: The Political Economy of Policing

Description: This project is one of the inaugural endeavor's of the newly established Philosophy and Critical Theory Lab (<https://pages.charlotte.edu/pact/>) at UNC-Charlotte. The project will involve an inquiry into the political and economic basis of policing, especially around police misconduct settlements, police militarization, and police administration. This project will revolve around compiling data on police misconduct settlements in preparation for theoretical/philosophical analysis. Students will be involved in the first phase of data compilation. Students are expected to have (1) superior organizational skills, (2) excellent communication skills, whether via phone, in person, or in writing (e-mail and/or print), (3) facility with computers, including the GoogleDocs, GoogleDrive, and entering data into spreadsheets, and (4) tenacity (they are liable to deal with a range of bureaucratic structures).

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students will: Learn how to navigate government agencies and bureaucracies
Learn to gather quantitative and qualitative data from public sources
Practice dealing with unexpected obstacles and problem solving in response to them
Learn how to safeguard and collate data
Develop written and oral communication skills
Develop organizational skills
Develop theoretical and analytical skills related to complex issues around policing

Required training of 2 hours with Description: Students will receive training in how the lab approaches this project and will be socialized into lab culture while learning technical aspects of our work.

Mentoring plan: This is a position that has well defined goals but offers a motivated students a lot of possibility for innovation and creative thinking with regard to problems that arise when gathering data from government agencies that may be resistant to providing that data. This requires good social skills and an ability not to be flustered by recalcitrant bureaucratic agent. The student can expect to have a mentor available to answer questions but will also be performing a lot of independent work. You will work directly with Dr. Shuster. We will generally have regular meetings. We are happy to have students participate at conferences but it is not required.

Applicant Requirements: Students are expected to have (1) superior organizational skills, (2) excellent communication skills, whether via phone, in person, or in writing (e-mail and/or print), (3)

facility with computers, including the GoogleDocs, GoogleDrive, and entering data into spreadsheets, and (4) tenacity (they are liable to deal with a range of bureaucratic structures).

Applicant Preferences: Problem solving and ability to think outside of the box when possible are huge pluses.

Specific Time considerations/conflicts: n/a

App ID #: 3533

Mentor: Shuster, Martin

Email: mshuste2@charlotte.edu

Title: Professor of Philosophy and Isaac Swift Distinguished Professor of Jewish Studies

Department: Philosophy

Co-mentor: No

Community engaged research: No

Title: Violences: Building Profiles in Violence

Description: This is a new project at the Philosophy and Critical Theory Lab (<https://pages.charlotte.edu/pact/>) at UNC-Charlotte. The project aims to pursue a comparative understanding of different kinds of violence. To that end, students will be involved in researching and writing up profiles in violence around events selected by Dr. Shuster for a comparative research perspective (genocide, mass violence, ethnic cleansing, but also political violence, terrorism, etc.) Students can expect to have to (1) read scholarly materials and (2) write summaries and papers around this material geared for a public audience. Some of the materials may involve scenes of significant violence. Student work will be crucial in setting the stage for comparative theoretical inquiry in the future.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students will learn to parse and assess scholarship on violence They will learn how to synthesize scholarship for a public audience They will learn how to do comparative work across disciplines They will learn how to raise questions about violence and to deal with it in sensitive ways Develop organizational skills Develop theoretical skills related to inquiry around difficult topics

Required training of 2 hours with Description: Students will be trained in how best approach texts and how to write profiles of texts

Mentoring plan: Students will work directly with Dr. Shuster. They can expect to learn a lot about the profiles they are researching and about how best to present what they learn. They will meet with Dr. Shuster regularly (weekly or every two weeks). This project will require a commitment to reading difficult material and to writing about it in ways that could make that material available to a public audience. For motivated students interested in the topic, it will be a rewarding experience that will gain them a lot of knowledge and experience.

Applicant Requirements: Someone who has experience reading difficult texts, a good writer (so courses that hit either are a plus). Someone who can work independently on well-delineated tasks. Good written communication is essential.

Applicant Preferences: Someone who has experience writing policy, scholarship, or other related forms of writing is a plus.

Specific Time considerations/conflicts: n/a

App ID #: 3535

Mentor: Gillani, Braveheart

Email: braveheart@charlotte.edu

Title: Assistant Professor

Department: School of Social Work - College of Health and Human Services

Co-mentor: No

Community engaged research: Yes

Title: Caring for Men Who Care (and other projects)

Description: This position offers students an opportunity to join the Caring Masculinities Lab and participate in several connected research projects. The main project, Caring for Men Who Care, examines the experiences of men working in caring professions. We have completed a survey examining workplace stigma, belonging, burnout, meaning, and masculinity. We are now preparing manuscripts from those findings and beginning the second phase of the project, which focuses on interviews with men about their everyday experiences at work. Students will have tangible opportunities to: Read and code interview transcripts; Attend regular research meetings and discuss emerging findings; Compare how different participants describe care, masculinity, work, and belonging; Help create and refine a qualitative codebook; Assist with tables, literature reviews, presentations, and manuscripts; Help develop visual models of wholeness and belonging; Contribute to research on transmasculinity, identity, and community. Students will work directly with me and see how a research project moves from raw data to themes, presentations, and published manuscripts. They will have opportunities to share their interpretations, ask questions, and help decide how findings are organized and communicated. Tasks will match each student's interests and level of experience. No previous research experience is required. I am looking for students who are curious, dependable, respectful of different life experiences, and willing to learn. Training will be provided in research ethics, confidentiality, literature searching, qualitative coding, analytic writing, and research software. As students gain experience, they will take on more independent responsibilities and contribute to products they can discuss in graduate-school applications, job interviews, and professional portfolios.

Accepting applications for: Either 5 hours or 10 hours per week are acceptable

2 positions available

Anticipated Student Learning Outcomes: Students will have opportunities to: Learn how to code qualitative interviews and identify themes across participants; Develop a qualitative codebook and write analytic memos; Learn quantitative analysis; Conduct focused literature searches and summarize scholarly research; Understand how qualitative and quantitative findings can be used together; Practice ethical research, confidentiality, and secure data management; Use research software such as Dedoose, NVivo, Excel, or reference-management programs; Contribute to manuscripts, presentations, research tables, and visual models; Strengthen professional writing, teamwork, communication, critical thinking, and time-management skills; and Explore graduate education and careers in social work, public health, psychology, education, research, and related fields.

Required training of 5 hours with Description: Students will begin with an individual onboarding meeting to discuss the projects, their interests, weekly responsibilities, confidentiality, and expectations for working with research participants' information.

Before accessing study data, students will complete all applicable UNC Charlotte ORPI and IRB requirements.

Project-specific training will then include:

An overview of the Caring for Men Who Care and transmasculinity projects;

Confidentiality, secure data storage, and responsible handling of sensitive information;

Introduction to qualitative research and interview analysis;

Guided practice coding a sample transcript;

Training in Dedoose or NVivo;

Practice writing analytic memos and documenting research decisions;

Literature-search and APA citation skills; and

Expectations for professional communication and participation in research meetings.

Mentoring plan: Students will work directly with me throughout the research experience and meet with me weekly, either individually or as a small research team. We will begin with a conversation about the student's interests, strengths, career goals, and previous experience. Together, we will develop a clear work plan with specific responsibilities, learning goals, and realistic deadlines. I do not expect students to arrive with advanced research skills. I will introduce each new task, provide examples, and offer guided practice before students work independently. I will provide timely, specific feedback on coding, analytic memos, literature reviews, presentations, and other products. Each student will work toward at least one tangible product, such as an analytic memo, literature review, codebook, conceptual model, community resource, research poster, conference presentation, or manuscript contribution. I will support students in presenting at the UNC Charlotte Undergraduate Research Conference or another venue. This will include helping them develop the proposal, prepare the presentation, and practice communicating their findings. Students who make substantial intellectual contributions to presentations or manuscripts will receive appropriate recognition or authorship. We will discuss expectations for contribution and credit early in the experience. I will be in consistent contact, provide clear expectations, meaningful responsibilities, and constructive feedback. I will also help students connect their research experience to graduate school, career exploration, and professional development. My goal is for students to leave with practical research skills, tangible work they can discuss in applications and interviews, and confidence that their ideas can contribute to meaningful scholarship.

Applicant Requirements: No previous research experience or specific major is required. I am looking for students who are curious, dependable, and willing to learn. Applicants should have a genuine interest in at least one of the project's central topics: masculinity, caring professions, gender identity, transmasculinity, wholeness, or belonging. Because students may work with interviews containing personal and sensitive experiences, they must approach participants' stories

with respect, care, and openness. Students do not need to hold any particular identity, but they must be comfortable engaging thoughtfully with diverse perspectives and experiences, including those of transgender and gender-diverse people. Successful applicants should demonstrate: Reliability and follow-through; Careful attention to detail; Respect for confidentiality; Openness to feedback; Willingness to ask questions; Strong reading and basic writing skills; Ability to manage time and meet agreed-upon deadlines; Ability to work independently while communicating regularly

Applicant Preferences: Interest in masculinity, caring professions, transmasculinity, identity, wholeness, or belonging; Experience reading and summarizing scholarly articles; Familiarity with literature searches, APA style, or academic writing; Interest in qualitative interviews, survey research, or mixed-methods research; Thoughtfulness when discussing identity, inequality, vulnerability, and personal experiences; Comfort working both independently and collaboratively; Curiosity, creativity, intellectual humility, and willingness to contribute original ideas.

Specific Time considerations/conflicts: None. I am happy to work async.