App ID #: 1597

**Mentor:** Potochnick, Stephanie

Email: spotochn@charlotte.edu

Title: Associate Professor

**Department:** Sociology

Co-mentor: No

Community engaged research: 1597

**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 summer, we will likely be working on transcribing and coding the qualitative focus groups of Latina mothers, and conducting interviews with Latino fathers.

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 #: 1598 **Mentor:** Quinlan, Margaret

Email: mquinla1@uncc.edu Title: Professor, COMM; Director Health & Medical Humanities

**Department:** COMM

Co-mentor: No

Community engaged research: 1598

**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 the semester you will take, 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 women's challenges and opportunities 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:* Only 160 hours over an academic semester (~10h/wk)

1 *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 qualitative/rhetorical data

Excellent technical writing

Required training of 3 hours with Description: I will train the student when the project begins.

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.

Mentoring plan: Mentoring plan

The mentoring plan for the OUR Research Scholar Program involves Dr. Quinlan, who will work closely with students during the internship period. Dr. Quinlan is expected to be committed to the program, provide guidance and direction on the research project, and ensure that the scholar completes all required deliverables promptly. Regular contact with the student is necessary, and daily contact is encouraged. The mentor will also assist the scholar in writing an abstract, research report, and poster based on their summer research project and provide constructive criticism. Finally, Dr. Quinlan will inform the OUR Research Scholar Program Director of the scholar's progress and complete the program evaluation at the program's conclusion.

Applicant Requirements: Interest in gaining:

Experience working with a senior researcher.

Excellent knowledge of gathering information.

Expertise in various fields like correcting, analyzing, compiling, and interpreting data.

Multitasking ability and knowledge of clerical work.

Expertise in administrative functions.

Excellent written and oral communication skills.

Excellent administration and organization skills.

Good presentation skills.

Interest in gaining expertise in analyzing data.

Excellent technical writing skills.

Regarding courses or experiences, preference will be given to Communication Studies and Interdisciplinary Studies students with a concentration in Health & Medical Humanities and a background in Research Methods. Additionally, an interest in qualitative methods, feminist methods, and rhetorical analysis is desirable

Applicant Preferences: Preference to Communication Studies students and Interdisciplinary Studies with a concentration in Health &

Medical Humanities or other health-related field

Background in Research Methods

Interest in qualitative methods, feminist methods, rhetorical analysis

Medical Humanities or other health-related field

Some recommended or preferred characteristics, skills, courses, or experiences for the research assistant position include:

Strong attention to detail and accuracy, focused

Interested in graduate school

Health focus in your research interests

Ability to work independently and take initiative.

Strong critical thinking and analytical skills.

Interest in learning software and tools (e.g., Google Docs, Google Sheets).

Interest in experience with data collection and analysis.

Knowledge of research ethics and protocols.

Interest in experience with academic writing and formatting.

Interest in experience with qualitative research methods.

Familiarity with feminist methods and rhetorical analysis.

Interest in experience with interdisciplinary research.

Strong work ethic, good time management skills, and a willingness to learn and take on new challenges.

Specific Time considerations/conflicts: We will schedule a weekly meeting via Zoom or in person. Dr. Quinlan is available for meetings between 8-1:30, and we need to find a time that works for Dr. Quinlan and your team (if you are on a team) based on class schedules.

Sunday by 5 PM EST, students are expected to submit timesheets, updated to-do list and research journal.

App ID #: 1599 **Mentor:** White III, Richard Allen

Email: rwhit101@charlotte.du Title: Assistant Professor

**Department:** Bioinformatics and Genomics

Co-mentor: No

Community engaged research: 1599

**Title:** Elucudation of the natural evolution of hantavirus - an emerging highly pathogenic human pathogen

**Description:** The goal of this project is to model the epidemiology of hantaviruses - an emerging and dynamic threat to human health globally. Hantaviruses are members of the Bunyaviridae family. In the New World, hantaviruses occur in both North and South America. According to the CDC, New World hantaviruses have a high case fatality rate (34.5%) in the United States from 1993-2022, and currently there is no licensed vaccine or therapies. However, our understanding of transmission of these viruses among its hosts in novel environmental conditions and to humans is not well developed. This provides an excellent model system to understand the role of viral transmission in relation to climate change. We will examine the eco-evolutionary context of the spread and transmission of hantaviruses and their mammalian hosts under the pressure of a changing climate in a predictive framework. These data will provide the testbed to develop statistical models and a computational framework for predicting hantavirus outbreaks, spillover, and reassortment that can be applied beyond the hantavirus model. Our primary goal is to develop a predictive framework to examine zoonotic disease using the hantavirus-mammal system. If a highly contagious hantavirus emerged it would have catastrophic impacts on national and global security, economic stability and supply chain, and would impact human lives directly via mortality and indirectly by societal and economic instability. Thus, predictive models and forecasting using cutting edge modeling framework is our best line of defense in the prevention of pandemics. Our predictive framework will assess historical viral evolution by producing sequence data from known hantavirus-positive museum voucher specimens. The data provided will 1) include a robust database of all Orthohantaviruses; 2) provide host species abundance, distributions, richness, and viral load across the central USA; and 3) further elucidate prevalence of host and viral genotypes over the decades (1980-2023), providing the tools to link these eco-evolutionary host-hantaviral trajectories into the future using climate projections. Our models and computational infrastructure obtained will provide an 'outbreak forecast,' for hantavirus zoonosis as well as a framework for other pathogens of concern. Outbreaks of hantavirus are becoming increasingly frequent due to rapid evolution through genetic reassortment, high prevalence of host-human interaction in domestic settings, range expansion of its mammalian hosts due to climate change, and documented person to person viral transmission. Currently, as of this year there have been reports of six cases in McKinley, San Juan, and Taos Counties, NM. For example, Andes Orthohantavirus (ANDV) has evolved new modes of transmission, including three confirmed person-person transmission events, and >1,200 cases in Argentina since 1995. In the Old World, case counts are much higher. Annual cases of hemorrhagic fever with Renal Syndrome (HFRS) are >60,000-100,000 from Old World hantavirus of which 90% are reported in China, Russia, and Korea with a mortality up to 15%. In addition to posing a threat where they have historically occurred, hantaviruses also

appear to be shifting their spatial distributions as their mammalian hosts respond to changes in environmental conditions. Strategies that integrate surveillance, detection, characterization, and modeling of zoonotic events and epidemic trajectories are critically needed to prevent such futures. You will help to determine the evolutionary history of reassortment across North American hantaviruses. You will (a) reconstruct the rates of reassortment, recombination, and mutation for viromic samples from mammalian hosts collected from the 1980s to 2020s to provide a spatiotemporal eco-evolutionary baseline for hantavirus, and (b) test competing hypotheses of the drivers of viral evolution in this pathogen.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

5 *positions available*

Anticipated Student Learning Outcomes: We are looking for a talented students to help us resolve the virosphere (i.e., the totality of viruses on the planet) using molecular and computational multiomics. The RAW lab is looking for motivated individuals that are team players, willing to learn, have a interest in viruses or microbes that want to join our team. This includes any skill level for both wet-lab (microbiology, virology, at the bench) or dry-lab (data science, code building) etc.

Duties include the ability to assist, develop, design experiments and analyze results in the elucidation of viruses of microbiomes. For the Dry lab - data analysis knowledge in UNIX, R and python is extremely helpful but not required.

Specifically for this projects students engagement will emphasize content learning and skill development in Phylogenetics, coding skills, paper writing

Required training of 0 hours with Description: Training in coding, machine and deep learning, phylogenetics, and paper writing

Mentoring plan: Dr White is the primary mentor for all projects. We have a weekly lab meeting, a bimonthly journal club, and meet one on one as needed.

A team of PhD students will mentor you on what you need to have a real world research experience and it's not uncommon for students to publish their results in a peer-reviewed journal.

Honesty, critical thinking, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

If you're interested in this position. Please send me your CV. Please come discuss if this lab and project is right for you. I know you want experience but the best experience is something that will help you towards your overall career not just a line on a resume that isn't related. You can contact me via email - rwhit101@charlotte.edu.

If you are interested in viruses and host response this is the lab for you. We have a diverse and wonderful lab culture of undergrads, grads, and postdocs wanting to help you reach your career goals and solve some cool questions.

If you have questions about us. Contact us. Drop by. We are always looking for great people.

Applicant Requirements: Honesty, critical thinking, persistence, resilience, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

Applicant Preferences: Coding, phylogenetics, evolution background is helpful

Specific Time considerations/conflicts: Lab meetings on Monday and journal club every other Friday.

App ID #: 1600 **Mentor:** White III, Richard Allen

Email: rwhit101@charlotte.du Title: Assistant Professor

**Department:** Bioinformatics and Genomics

Co-mentor: No

Community engaged research: 1600

**Title:** Astrovirology - discovery of viruses within modern microbialite (001185)

**Description:** Viruses are the most numerous "biological entity" on Earth, with a ubiquitous range across every environment and an estimated global abundance of 1031 viral-like particles (VLPs). This 1031 VLP estimate (i.e., Hendrix product) accounts mainly for double-stranded DNA phage abundances. This estimation did not include the diversity of large DNA, RNA, and ssDNA viruses. Viral abundance estimates may be an underestimation as 1030 viruses are estimated to exist in the ocean alone, and global biomass estimates suggest more measurements and method developments are still needed. Modern microbial mats are ideal natural laboratories to study the viral role in carbonate precipitation and mat preservation. Fossil microbial mats date back to the Paleoarchean and may hold evidence for the origin of life. Organomineralization, or carbonate precipitation influenced/induced by biota, is a critical first step in the lithification and has two critical components: (1) a change in carbonate saturation index through the combined metabolisms of the microbial community; (2) the capacity to sequester Ca2+ ions and nucleate mineral growth. Some properties of viral capsids resemble those of EPS that bind cations. Thus, viruses may act as site for nucleation and crystal growth. Viruses may play a pivotal role in lithification of mats that is yet unresolved. Whether actively infectious (as lytic phage) or inactive (as temperate phage), viruses mediate carbonate precipitation: (i) directly as mineral nucleation site, or, (ii) indirectly, by affecting the microbial mat community, notably cyanobacteria, through altering metabolic capabilities via viral-encoded accessory metabolic genes (vAMGs), stimulating heterotrophic activity by releasing organic substrates through host lysis. This study will enhance our understanding of microbe-mineral interactions and potential preservation of microbial ecosystems, which is at the core of Exobiology research. Finding a tangible link between host-viral interactions, changing biogeochemical processes, will help to interpret mineral biosignatures, including potentially on Mars. Recent disputed findings of viral fossils in the rock record, demand a reevaluation of phage preservation. Our transdisciplinary team as NASA Exobiology funded project has studied molecular ecology and biogeochemistry of microbialites for a decade. This site harbors mat types with various degrees of organomineralization.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

5 *positions available*

Anticipated Student Learning Outcomes: Want to solve big problems?

We are looking for a talented students to help us resolve the virosphere (i.e., the totality of viruses on the planet) using molecular and computational multiomics. The RAW lab is looking for motivated individuals that are team players, willing to learn, have a interest in viruses or microbes

that want to join our team. This includes any skill level for both wet-lab (microbiology, virology, at the bench) or dry-lab (data science, code building) etc.

Wet-lab or dry-lab open slots for both to find novel viruses in the lab or on your computer from biological data.

Duties include the ability to assist, develop, design experiments and analyze results in the elucidation of viruses of microbiomes.

Potential Laboratory duties (Wet lab):

- PCR, cloning, DNA/RNA/Protein extraction, synthetic biology, CRISPR/Cas

- Phage isolation, plaque assays, Viral microscopy, Virometry

- Biogeochemistry of meta-communities

- Cultivation of microbes/viruses from diverse environments

- Next generation sequencing and LC-MS/MS

- Interpretation of results/data analysis

- Ability to document requirements and specifications

- Protocol/SOP development

- Perform instrument (Microscope/Flow Cytometer), validation, maintenance, and troubleshooting

For the Dry lab - data analysis knowledge in UNIX, R and python is extremely helpful but not required.

Required training of 3 hours with Description: A variety of techniques as listed above. Wet lab work requires CITI training and Chemical and biological safety training in person.

Mentoring plan: Dr White is the primary mentor for all projects. We have a weekly lab meeting, a bimonthly journal club, and meet one on one as needed.

A team of PhD students will mentor you on what you need to have a real world research experience and it's not uncommon for students to publish their results in a peer-reviewed journal.

Honesty, critical thinking, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

If you're interested in this position. Please send me your CV. Please come discuss if this lab and project is right for you. I know you want experience but the best experience is something that will help you towards your overall career not just a line on a resume that isn't related. You can contact me via email - rwhit101@charlotte.edu.

If you are interested in viruses and host response this is the lab for you. We have a diverse and wonderful lab culture of undergrads, grads, and postdocs wanting to help you reach your career goals and solve some cool questions.

If you have questions about us. Contact us. Drop by. We are always looking for great people.

Applicant Requirements: Honesty, critical thinking, persistence, resilience, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

Applicant Preferences: Coding, phylogenetics, evolution background is helpful

Specific Time considerations/conflicts: Lab meetings on Monday and journal club every other Friday.

App ID #: 1601

**Mentor:** White III, Richard Allen

Email: rwhit101@charlotte.edu

Title: Assistant Professor

**Department:** Bioinformatics and Genomics

Co-mentor: No

Community engaged research: 1601

**Title:** BITE (Bat Immunology Training and Education) computational immunoverse

**Description:** Bats represent 25% of all the mammals on Earth, and are elite suppressors of highly pathogenic viruses, rarely develop cancer, and have very long lifespans relative to body size. T cells are essential in the long-term suppression of viruses and cancer via the adaptive immune system leading to limited disease and long lifespan. Fundamentally, T cells arise from the bone marrow, they then migrate to thymus where they develop into naïve T cells, that circulate in peripheral tissues and blood – where they act as 'sentinels cells' (e.g., CD4 + helper, CD8+ cytotoxic) that suppress viral infection. However, after 100 years of anatomical study in bats, the role of the thymus in T cell development has not been described, nor has how T cell development occurs in the thymus or other lymphoid organ, which is the fundamental tenet of T cell immunology. This is the computational (dry-lab only) side of this grant. No wet-lab work or field work with live bats or tissues.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

5 *positions available*

Anticipated Student Learning Outcomes: We are looking for a talented students to help us resolve the virosphere (i.e., the totality of viruses on the planet) using molecular and computational multiomics. The RAW lab is looking for motivated individuals that are team players, willing to learn, have a interest in viruses or microbes that want to join our team. This includes any skill level for both wet-lab (microbiology, virology, at the bench) or dry-lab (data science, code building) etc.

Duties include the ability to assist, develop, design experiments and analyze results in the elucidation of viruses of microbiomes. For the Dry lab - data analysis knowledge in UNIX, R and python is extremely helpful but not required.

Specifically for this projects students engagement will emphasize content learning and skill development inBioinformatics relating to immunology and virology

Required training of 0 hours with Description: Training in coding, machine and deep learning, phylogenetics, and paper writing. dry lab only

Mentoring plan: Dr White is the primary mentor for all projects. We have a weekly lab meeting, a bimonthly journal club, and meet one on one as needed.

A team of PhD students will mentor you on what you need to have a real world research experience and it's not uncommon for students to publish their results in a peer-reviewed journal.

Honesty, critical thinking, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

If you're interested in this position. Please send me your CV. Please come discuss if this lab and project is right for you. I know you want experience but the best experience is something that will help you towards your overall career not just a line on a resume that isn't related. You can contact me via email - rwhit101@charlotte.edu.

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If you have questions about us. Contact us. Drop by. We are always looking for great people.

Applicant Requirements: Honesty, critical thinking, persistence, resilience, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

Applicant Preferences: Coding, phylogenetics, evolution background is helpful

Specific Time considerations/conflicts: Lab meetings on Monday and journal club every other Friday.

App ID #: 1602

**Mentor:** White III, Richard Allen

Email: rwhit101@charlotte.edu

Title: Assistant Professor

**Department:** Bioinformatics and Genomics

Co-mentor: No

Community engaged research: 1602

**Title:** Synthetic virology - phage therapy development

**Description:** Drug-resistant microbial infection (DRMI) presents a clear and present danger to humanity. The World Health Organization predicts that 10 million people globally will die in 2050 due to DRMI (Strathedee et al. 2020; White III, 2021). Worldwide at least 700,000 people die each year from DRMI (Strathedee et al. 2020; White III, 2021). Beyond its global issue, American hospitals suffer from greater than 2.8 million antibiotic resistant infections per year that results in at least 35,000 deaths (Duin and Paterson, 2020). Antibiotic resistant bacterial pathogens (ARB) that are commonly studied include Streptococcus pneumoniae, Methicillin-resistant S. aureus, Vancomycin-resistant enterococci (VRE), Clostridioides difficile, Pseudomonas aeruginosa, Acinetobacter baumannii and a variety of other sexually transmitted infections (e.g., Neisseria gonorrhoeae) which are on the CDC pathogen watch list. We are currently losing the arms race against ARB pathogens, which a few have limited treatment options, that need novel combinatorial frameworks to tackle a fundamental threat to public health. The Burkholderia cepacia complex (Bcc) contains opportunistic pathogens that pose a deadly health risk to immunocompromised patients with cystic fibrosis (CF). Large-scale use of broad-range antibiotics prescribed for lung infections has led to the evolution of antibiotic resistant strains of Burkholderia that cannot be easily treated. It is essential that we develop alternative methods to delay or circumvent the use of antibiotics to treat bacterial pathogens. Bacterial pathogens that are resistant to nearly all forms of antibiotic treatment have become a major threat to society and health. Developing alternative methods that can delay or avoid the use of antibiotics are essential to combat antibiotic resistant strains and prevent major outbreaks. The objective of this project is to significantly advance our ability to combat antibiotic resistant pathogenic strains through phage therapy. Our team has strong expertise in molecular, theoretical, and computational tools that can be used in this study involving pathogenicity, collateral resistance, and phage therapy. In this study, we will focus on opportunistic pathogens within the Burkholderia species complex including B. multivorans species that can be lethal to individuals with Cystic Fibrosis. The significance of this approach is that our developed methods and technological approaches provide an alternative method of combating antibiotic resistant pathogens that can evade traditional methods of treatment.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

5 *positions available*

Anticipated Student Learning Outcomes: We are looking for a talented students to help us resolve the virosphere (i.e., the totality of viruses on the planet) using molecular and computational multiomics. The RAW lab is looking for motivated individuals that are team players, willing to learn,

have a interest in viruses or microbes that want to join our team. This includes any skill level for both wet-lab (microbiology, virology, at the bench) or dry-lab (data science, code building) etc.

Duties include the ability to assist, develop, design experiments and analyze results in the elucidation of viruses of microbiomes. For the Dry lab - data analysis knowledge in UNIX, R and python is extremely helpful but not required.

Specifically for this projects students engagement will emphasize content learning and skill development inBioinformatics relating to immunology and virology

Required training of 0 hours with Description: Training in coding, machine and deep learning, phylogenetics, and paper writing. dry lab only

Mentoring plan: Dr White is the primary mentor for all projects. We have a weekly lab meeting, a bimonthly journal club, and meet one on one as needed.

A team of PhD students will mentor you on what you need to have a real world research experience and it's not uncommon for students to publish their results in a peer-reviewed journal.

Honesty, critical thinking, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

If you're interested in this position. Please send me your CV. Please come discuss if this lab and project is right for you. I know you want experience but the best experience is something that will help you towards your overall career not just a line on a resume that isn't related. You can contact me via email - rwhit101@charlotte.edu.

If you are interested in viruses and host response this is the lab for you. We have a diverse and wonderful lab culture of undergrads, grads, and postdocs wanting to help you reach your career goals and solve some cool questions.

If you have questions about us. Contact us. Drop by. We are always looking for great people.

Applicant Requirements: Honesty, critical thinking, persistence, resilience, and problem solving are helpful in success. This is key to successful outcomes. All knowledge is possible but you must first take that first step forward. We will help you the rest of the way.

Applicant Preferences: Coding, phylogenetics, evolution background is helpful

Specific Time considerations/conflicts: Lab meetings on Monday and journal club every other Friday.

App ID #: 1604 **Mentor:** Chen, Xiang

Email: xchen50@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1604

**Title:** Using atomistic simulations to explore the phase degradation of metal halide perovskites

**Description:** Metal halide perovskites (MHPs) represent a rapidly advancing class of materials with fascinating semiconductor properties and low cost, especially promising for photovoltaic applications. Despite these advances, the lifespan of state-of-the-art perovskite solar cells vary significantly, limited to approximately one year—considerably shorter than the 25-year lifetime of commercial silicon solar cells. It has been observed in experiments that the inorganic halide perovskite transforms from a cubic to tetragonal to orthorhombic phase, going from high to progressively lower temperatures. The low-temperature phase is rather distorted, making it prone to convert into a photoinactive phase, which is ill-suited for optoelectronic applications. This project aims to provide atomic study of the effect of microstructure on phase degradation of MHPs.

The student will participate in trainings conducted by the advisor and the graduate students. After the training, the undergraduate student will be able to use high-performance computing to conduct MD simulations. The student will use Molecular Dynamics (MD) simulations to investigate the effect of defects and microstructures on phase degradation of MHPs. Depending on the progress, the reactive force field may also be implemented to verify the classical MD results. The simulation results and the post-processing analysis provided by the student are expected to contribute as a 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 material deformation and 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 programing, 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 #: 1607 **Mentor:** Da Costa Vieira, Rafael Felipe

Email: rvieira@charlotte.edu Title: Assistant Professor

**Department:** Epidemiology and Community Health

Co-mentor: No

Community engaged research: 1607

**Title:** Ticks and tick-borne pathogens surveillance in Mecklenburg County Public Parks

**Description:** Tickborne diseases (TBDs) have been on the rise in recent decades, threatening public health. In the Northern Hemisphere, TBDs are well-known threats and represented >75% of all vector-borne disease cases reported in the USA from 2004 to 2016, with Lyme disease representing the majority of the cases (Rosenberg et al., 2018). In North Carolina, data on TBDs have been historically limited to Lyme disease and Spotted Fever Rickettsiosis, and only recently ehrlichiosis (Iyamu et al., 2024; Mokashi et al., 2024). However, other tick-borne pathogens (TBPs) and the growing number of emerging tick-borne viruses are overall understudied and rarely considered by physicians and public health professionals in differential diagnoses when evaluating tick-related febrile illnesses in humans.

Habitat degradation is a major threat to animals, promoting cascading effects on species composition and influencing vector-host-pathogen interactions (Laurance et al., 2009). On this pattern, the Charlotte metropolitan area has shown rapid urban growth and tree canopy loss, directly impacting animal and vector species composition, which may lead to an increase human exposure risk to tick bites.

Our long-term goal is to determine how the tick ecology, microbiome and TBPs shift in degraded areas and how this impacts human exposure risk. Our overall objective herein is to provide fundamental knowledge on how the ecology of ticks of public health importance respond to degradation comparing temperate and tropical climates. We also aim to detect and characterize other TBPs potentially transmitted by tick species in the Charlotte metropolitan area. Our central hypothesis is that degradation affects the distribution of animals and consequently tick species that serves as a vector for various TBPs.

Aim 1. Characterize the microbiome and TBPs ticks in the Charlotte metropolitan area. Herein, we will collect ticks in public parks in the Mecklenburg County. Here we will:

Collect and identify tick species, and establish their seasonality.

Screen questing ticks using previously validated PCR/qPCR assays and compare the occurrence of TBPs between sampled areas, considering tick stages and blood meal sources.

Map the occurrence of ticks and TBPs in sampled areas.

This research aligns with the NIH TBD research plans and will have a positive impact, as other TBPs are rarely considered in differential diagnoses when evaluating tick-related febrile illnesses. Together, data will lay the foundation for future studies on TBDs, which may have been historically neglected or even unknown in humans.

References:

Iyamu, O., Ciccone, E. J., Schulz, A., Sung, J., Abernathy, H., Alejo, A., et al. (2024). Neurological manifestations of ehrlichiosis among a cohort of patients: prevalence and clinical symptoms. BMC Infect Dis, 24(1), 701.

Laurance, W. F., Goosem, M., & Laurance, S. G. (2009). Impacts of roads and linear clearings on tropical forests. Trends Ecol Evol, 24(12), 659-669.

Rosenberg, R., Lindsey, N. P., Fischer, M., Gregory, C. J., Hinckley, A. F., Mead, P. S., et al. (2018). Vital Signs: Trends in Reported Vectorborne Disease Cases - United States and Territories, 2004-2016. MMWR Morb Mortal Wkly Rep, 67(17), 496-501.

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

3 *positions available*

Anticipated Student Learning Outcomes: Local capacity building and technical and scientific support to prepare future qualified acarologists with interdisciplinary expertise that are able to minimize tick-borne diseases (TBDs) in a sustainable manner by assisting with the prevention, diagnosis, and control TBDs and arthropod vectors is critically lacking (Vieira et al., 2024). For instance, most public health organizations have inadequate training or capacity to conduct tick surveillance and identification. Herein, students will receive comprehensive training on field sampling techniques for tick collection. Following the collection process, they will be trained in using taxonomic keys to identify ticks of public health significance found in North Carolina. Finally, students will learn how to write detailed reports and receive introductory training on mapping tick distribution and occurrence.

Required training of 2 hours with Description: I expect students to perform the following CITI training:

OSHA Bloodborne Pathogens

Shipping and Transport of Regulated Biological Materials

USDA Permits

Mentoring plan: I have a documented history of mentoring a very engaged and successful group of students from multiple backgrounds, ethnicities, and nationalities. I have already directly supervised two postdoctoral, seven Ph.D., 14 Masters, five Veterinary Residents, and several undergraduates.

In this project, I will directly lead theoretical and practical training and expeditions to the collection of ticks in the Charlotte metropolitan area. I will also provide theoretical and practical training on the identification of tick specimens. Postdoctoral and graduate students at the Zoonotic and Vector-Borne Diseases Laboratory (ZVBD Lab) will help with theoretical and practical training on DNA/RNA extraction, PCR and real-time PCR protocols for the detection of tick-borne pathogens, as well as sampling preparation for the characterization of the tick's microbiome.

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 on Tuesdays and Friday's morning. The Zoonotic and Vector-Borne Diseases Laboratory weekly meetings are either Monday OR Friday mornings.

App ID #: 1609 **Mentor:** Bossu, Sebastien

Email: sbossu@charlotte.edu Title: Assistant Professor

**Department:** Mathematics and Statistics

Co-mentor: No

Community engaged research: 1609

**Title:** New mathematical and numerical optimization methods for a class of inverse problems with applications to machine learning, financial mathematics, and engineering

**Description:** An important problem in mathematics is about approximating a potentially complicated function into a sum of simpler functions. For example, could be a complicated insurance contract payment formula that covers, say, 10 times the highest individual damage in a multi-car accident beyond a $5,000 deductible. If 3 cars were damaged for x_1 = $3,000, x_2 = $8,000, x_3 = $6,500, then the policy pays 10×8,000-5,000=30,000; but if the car damages are x_1 = $1,000, x_2 = $3,000, x_3 = $2,000$, then the policy pays nothing.

Calculating is easy, but figuring out the corresponding insurance premium is potentially difficult. Instead, we wish to approximate f as a weighted sum of single-damage contracts whose premiums are easier to calculate. Assuming at most 50 cars would be damaged, we may want to find the 50 optimal quantities of single-damage contracts that best approximate f.

In this project, we will consider the function approximation problem in the simplest input dimension d=1, i.e. we wish to approximate a given target function f(x) of a single numeric variable x using a weighted sum of n basis functions , such as polynomials, Fourier cosines, Haar wavelets, step functions, or ReLU functions. The optimal quantities of basis functions are determined to minimize approximation errors according to some metric such as MSE (mean squared error) over a relevant range of x-values. The corresponding error-minimizing problem is known in mathematics as a least-squares problem.

This project will use the linear algebra foundations of least-squares function approximation and how Gram matrices (similar to covariance matrices in statistics) play an important role in obtaining the solution. It turns out that the Gram matrix for step functions is a single-pair matrix whose inverse is tridiagonal in closed form. For ReLU basis functions, it is the sum of two single-pair matrices whose inverse can be calculated in semi-closed form.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

2 *positions available*

Anticipated Student Learning Outcomes: Develop coding and mathematical skills, including critical thinking. Learn to work professionally under supervision. Learn to communicate results in writing and possibly verbally at a presentation.

Required training of 1 hours with Description: Standard onboarding process

Mentoring plan: The student(s) will work directly under my supervision with weekly meetings.

Applicant Requirements: This project would typically be suitable for math/stats majors and could also earn credit as senior project or honors project. Exceptionally qualified candidates from other disciplines will be considered. In addition to excellent coding and mathematical skills, candidates must be diligent, disciplined, motivated, and available.

Applicant Preferences: Calculus II, Matrices & linear algebra, Coding in C++/Python. Knowledge of optimization algorithms is a plus.

Specific Time considerations/conflicts: Weekly meeting, typically Wednesday afternoon. Some meetings may take place over Zoom.

App ID #: 1614

**Mentor:** Buchenau, Jurgen

Email: jbuchena@charlotte.edu

Title: Dowd Term Chair of Capitalism Studies

**Department:** History/Capitalism Studies

Co-mentor: No

Community engaged research: 1614

**Title:** The United States and Mexico in the Neoliberal Era

**Description:** This project mentors undergraduate student research on U.S.-Mexican relations (including the history of immigration) in the neoliberal era, with special emphasis on the presidencies of Jimmy Carter (1977-1981), Ronald Reagan (1981-1989), and George H.W. Bush (1989-1993). Students will read both scholarly literature and primary sources (eyewitness documents), usually from the U.S. perspective but, depending on Spanish language skills, the Mexican perspective as well.

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

2 *positions available*

Anticipated Student Learning Outcomes: --foster digital literacy

--distinguish valid information from disinformation, and facts from opinions

--research one aspect of recent history in depth and with help from an expert mentor

--develop critical thinking and writing skills

--build teamwork with the mentor and possibly another undergraduate student

--develop empathy for other cultures and perspectives

Required training of 0 hours with Description: First of all, no research with human or biological subjects is required, so there are no approvals to be secured in advance.

Training consists of teaching students to work with historical documents (mostly online) and historical literature--works written by other historians. The mentor will develop the student's critical thinking and writing skills and their ability to read longer non-fiction accounts of historical content.

Mentoring plan: The student will work directly with me and communicate at least three times per week; often via email or Zoom, but occasionally in person. If there are multiple students, we will have group meetings every two to three weeks. I expect to mentor students so they can present their research at an undergraduate research conference or the Spring 2026 Graduate History Forum (which accepts undergraduate presentations and takes place on campus).

With regard to past OUR students, I have taken a strong proactive role in mentoring them for success in the future, including helping them with capstone projects in their major and/or writing recommendations for graduate school and/or serving as a reference for employment.

Applicant Requirements: I am looking for a student with strong intercultural interests and well-developed critical thinking and writing skills. Earlier exposure to methods in the humanities and social sciences is required (at least completion of most of the theme courses and/or CTCM 2530, or the equivalent in AP/IB or transfer courses). The applicant should be intellectually curious, an avid reader, and willing to spend time trying to find information that requires more than a simple web browsing operation.

Applicant Preferences: This project will usually be most suitable for advanced undergraduate students, but I will consider strong applications from sophomores. A major or interest in the social sciences, humanities, economics, or international business is a plus, as is competency in Spanish.

Specific Time considerations/conflicts: none

App ID #: 1615 **Mentor:** Peterson, Nicole

Email: npeters8@uncc.edu Title: Associate professor

**Department:** Anthropology

Co-mentor: No

Community engaged research: 1615

**Title:** Improving health outcomes for Black women in Mecklenburg County

**Description:** In collaborating with the Madie Maddox Smith Women's Health Equity Institute (WHEI, https://ncwomenshealthequityinstitute.org/), we will be collecting and analyzing qualitative data analysis to examine: (1) impacts of (not having) support on the wellbeing of Black women in Charlotte, (2) the forms of support that would have the most impact on these women, and (3) the barriers to these forms of support. In North Carolina, Black Women are more likely than white non-Hispanic women to die from cancer (21.2 vs 19.3%), diabetes (5.1 vs 2.3%), or nephritis, nephrotic syndrome and nephrosis (3.8 vs 1.8%) (NCSCHS nd). In addition, Black women report experiences of discrimination during healthcare encounters that include dismissed concerns, decreased empathy, and lack of awareness of the impact of racism on health (Wright, McFarlane, and Francis 2022; Janevic et al. 2020; Hardeman, Medina, and Kozhimannil 2016). Given the increased health risks and discrimination among Black women, the proposed research project will examine what kinds of programmatic support might help decrease these impacts on Black women and their health.

We have determined through previous conversations with Black women Leaders and research that there are unmet needs around understanding and accessing the available resources. In particular, while there is heterogeneity in their experiences, our research documented many women experiencing challenges related to the Superwoman complex, secrecy norms that prevent sharing challenges particularly around mental health, and problems communicating with medical professionals due to racism and cultural norms. The listening sessions also revealed the value of spaces like group discussions for overcoming challenges around secrecy and norms, and that efforts that build trust and relationships, and increase the visibility of a variety of providers can help address some of the health disparities.

The OUR student would work with WHEI leadership and the faculty mentor (who is part of the WHEI leadership team) to conduct and analyze interviews, participate in WHEI efforts, and present on findings to WHEI and potentially other partners. We expect to conduct 20 interviews that will last about 60-90 minutes, and be conducted via zoom or phone, or in a room on a UNC Charlotte campus. Researchers will correct Zoom transcriptions of the interviews, removing any identifying information. Transcripts will be coded using nVivo with codes developed from the questions above and those that emerge during coding. This is a continuation of research from Spring 2024, so some interviews from that period may be analyzed.

Results will be compiled into a presentation for the WHEI and participants wishing to learn about these, and will be shared on the WHEI website, with policymakers involved with WHEI and others,

to inform the WHEI Summer Institute in 2026 and other activities. A research paper will also be published.

References

Hardeman, Rachel R., Eduardo M. Medina, and Katy B. Kozhimannil. 2016 Structural Racism and Supporting Black Lives — The Role of Health Professionals. New England Journal of Medicine 375(22): 2113–2115.

Janevic, Teresa, Naissa Piverger, Omara Afzal, and Elizabeth A. Howell. 2020 "Just Because You Have Ears Doesn't Mean You Can Hear"—Perception of Racial-Ethnic Discrimination During Childbirth. Ethnicity & Disease 30(4): 533–542.

North Carolina State Center for Health Statistics (NCSCHS). Nd. Leading Causes of Death in North Carolina, 2019. https://schs.dph.ncdhhs.gov/interactive/query/lcd/lcd.cfm

Wright, Kallia O., Soroya Julian McFarlane, and Diane B. Francis. 2022 When Race and Agency Collide: Examining Pregnant Black Women's Experiences in Healthcare. Journal of Applied Communication Research 50(3). Routledge: 291–308.

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

2 *positions available*

Anticipated Student Learning Outcomes: Students will gain expertise in qualitative research, including interviews, coding, and analysis. Students will also learn about research ethics and confidentiality.

Students will have an opportunity to improve their skills in writing about research for the general public and policymakers. The student may also be involved in writing an academic paper, depending on their interests.

Students may also learn how to use ArcGIS (the project includes a map using this software), nVivo, and/or Wordpress, depending on their interests.

Working in a team with community members and other students will also mean students will learn strategies for working collaboratively and with community members.

Finally, students will gain knowledge about health disparities and how these are experienced by Black women in Mecklenburg County, as well as some of the efforts intended to reduce these disparities.

Required training of 10 hours with Description: Before working on the project, students will complete the CITI training for human subjects research, as well as methodological training in interviews and data analysis offered by the team. Students will also read project documents, including papers and theses, as well as related literature around health disparities.

Mentoring plan: What students can expect as they work with Dr. Peterson:

Students in my projects learn how to engage with community members to design and implement research projects that not only prepare them to be good practitioners of anthropology, but also ask

them to grapple with important ethical and intellectual questions around applying social science with integrity and respect.

Helping students gain expertise in research and community engagement is also reinforced through my mentorship efforts, which aim to help students learn through experiences while recognizing the unique backgrounds, skills, and challenges that each student brings to class or research. For me, this often means meeting students where they are, and helping them develop new skills. I provide some flexibility for assignments and support as needed, and provide support or opportunities for leadership, where appropriate. I mentor students in a way that helps them both to address personal challenges and to plan for a future with meaningful and fulfilling careers.

I do this by setting up weekly meetings, though students can ask to meet whenever this would be useful, in person or via zoom. I prefer emails, but know some field issues require more immediate contact through texts or calls. Students, if comfortable, can present to the team or general public. I have worked with several students who needed to gain confidence to do this, but also respect students who are not ready to do this.

Applicant Requirements: Applicants should have some coursework in social sciences (sociology, geography, anthropology, etc), and an interest in working with community partners. They should have the ability to talk with someone they do not know, about topics that may be uncomfortable or emotional. Applicants should have the ability to travel around the Charlotte area in a car or on public transit to attend events.

Applicant Preferences: Experience with interviews or similar data collection is a benefit, as is experience working on community engaged research projects.

Specific Time considerations/conflicts: Schedules will be set in consultation with the student(s)

App ID #: 1617 **Mentor:** Faklaris, Cori

Email: cfaklari@charlotte.edu Title: Assistant Professor

**Department:** Software and Information Systems

Co-mentor: No

Community engaged research: 1617

**Title:** Improving Users' Experiences with Security and Privacy Tasks on Mobile Devices

**Description:** Our Security and Privacy Experiences (SPEX) group wants to assist mobile phone users with dealing with their security and privacy concerns directly on their device. The selected student will work with the faculty Principal Investigator and/or a PhD student on one or both of the following projects: (a) conducting a literature review on educational interventions for mitigating people's vulnerability to SMS text scams and misinformation, aka "smishing"; and (b) user testing of an AI-assisted question-answering and community for mobile users dealing with security and privacy concerns. The student will become certified in Human Subjects Research and familiar with the existing relevant cybersecurity and usability research for the project. They will help with tasks such as reviewing published literature on the subject, brainstorming ideas, recruiting and scheduling participants for an interview study, cleaning up transcripts, and analyzing collected data. They also may be asked to help refine a prototype mobile-friendly web app.

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

2 *positions available*

Anticipated Student Learning Outcomes:

Understand how to conduct a literature review and to summarize prior work.

Understand how to test a new mobile app product or service and to summarize findings.

Required training of 10 hours with Description: CITI certification in Social-Behavioral Research (if not already certified, time will be allotted to gain the cert)

Mentoring plan: We will schedule a 2:1 or 1:1 meeting weekly. The student will be added to our Slack workspace, Google Drive, and invited to our weekly Human-Centered Computing Lab meetings. In between meetings, the student will be expected to conduct work, ask questions, keep us updated, and prepare slides or notes on work in progress for us to review for feedback.

Applicant Requirements: We are looking for a responsible student who has prior experience with or coursework in Human-Centered Design, Human-Centered AI and/or usability or social-behavioral research, or who has coursework or prior experience in design, human-centered computing, web development, psychology, communication, sociology, or other social or behavioral sciences.

Applicant Preferences: - Someone with experience with basics of web development (HTML/CSS.JS)

- Someone with experience in conducting User Experience (UX) research and analysis

Specific Time considerations/conflicts: We expect the student to work the majority of time on campus. We want to see them in our Woodward Hall lab space, but they can also move around during the day as long as they are close by to our building. The student is required to attend some on-campus meetings, but these will be scheduled around their needs.

App ID #: 1618 **Mentor:** Faklaris, Cori

Email: cfaklari@charlotte.edu Title: Assistant Professor

**Department:** Software and Information Systems

Co-mentor: No

Community engaged research: 1618

**Title:** AI and Social Technologies to Aid Educational Migrants from the Global South

**Description:** In this project, a student will work collaboratively on an AI-driven social computing app to address the security and privacy needs among educational migrants from the Global South. The student will identify ways to help people in this important and understudied group to navigate cross-border policies and deal with scams. They will become certified in Human Subjects Research and familiar with the existing relevant human-AI interaction and usability research for the project. It is likely that the student will get hands-on training and experience in conducting a user study on such an app. This will involve recruiting and scheduling participants, taking notes and moderating test sessions, and analyzing the collected interview and survey data. They will assist the PhD student in preparing publications.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

1 *positions available*

Anticipated Student Learning Outcomes:

Become familiar with the basics of testing a Minimum Viable Product app for research.

Understand the processes of data collection and analysis for human-centered computing research.

Summarize work in progress in a way that elicits helpful feedback.

Required training of 10 hours with Description: - CITI certification for Social-Behavioral Research (hours will be dedicated to this if the student is not already certified).

Mentoring plan: We will hold either a 2:1 weekly with the mentor and Phd student or 1:1 meeting with the PhD student on the project each week, with mentor meetings twice a month. Additionally, they will be invited to join our group Slack workspace, our Google Drive folder for tracking study materials, and our weekly Human-Centered Computing Lab meetings. The student will be expected to complete tasks between meetings and ask questions of the mentor and other research students in the group. The student will participate in-person with the Phd student in user testing sessions, so that they learn by observation and by doing how to conduct such research for a professional objective.

Applicant Requirements: We prefer students who have taken Human-Centered Design, Human-Centered AI, and/or who have some knowledge about human-centered computing, design, or the social and behavioral sciences, plus a willingness to learn more about computing. Programming experience is not required.

Applicant Preferences: The ideal student will have some experience of user research for Human-AI interaction (either work-related or course-related), plus some knowledge of social or behavioral sciences.

Specific Time considerations/conflicts: The student must be available for periodic on-campus meetings, but these will be arranged with their schedule in mind. The student must participate in some (not all) user testing sessions, which may take place on weekends or at night to accommodate participant schedules.

App ID #: 1621 **Mentor:** Cross, Donald

Email: dcross8@charlotte.edu Title: Assistant Professor of Translation

**Department:** Department of Languages, Cultures and Translation

Co-mentor: No

Community engaged research: 1621

**Title:** Translation Project: "Literary Experience" by Alfonso Reyes

**Description:** For this project, the OUR Scholars will help with manuscript preparations for the publication of an English translation of Alfonso Reyes's La experiencia literaria ("Literary Experience"). Although this book is very important for literary criticism and theory, it remains largely unknown in the English-speaking world because it has never been translated. The OUR Scholars will thus have a chance to help introduce an important book to the anglophone audiences throughout the world. In fact, very few of Reyes's works have been translated into English. So, by helping with this project, the OUR Scholars will also be helping to introduce this important Mexican philosopher and critic to the world. This translation project is student-driven. I am working on the translation itself with a group of graduate students and advanced undergraduate students in the Department of Languages, Cultures and Translation. The OUR Scholars will have five principal tasks:

1. Help track down Reyes's sources in the J. Murrey Atkins Library or through online resources. Throughout La experiencia literaria, Reyes quotes numerous works from the history of literature and philosophy. Sometimes, these works are easy to find; sometimes, they are obscure and not widely available. Reyes often provides the author's name and a title, but he rarely provides information about the publisher. The majority of the OUR Scholars' task will consist in finding these sources to complete the bibliography for the book translation.

2. Once the OUR Scholars have located a source, they will help check the accuracy of Reyes's quotation. Are Reyes's quotations correct? Does he misquote? Reyes often quotes from memory, so it is important that the translation keep a record of any moments in which his quotations depart from the material that he is quoting.

3. Help search for English translations of the material that Reyes quotes. At times, Reyes quotes works in English, but the majority of his quotations are in Spanish, and a few are in French. The OUR Scholars will help determine if there are English translations of the different works that Reyes quotes. If an English translation does exist, the OUR Scholars will attempt to find and transcribe the passages that Reyes quotes in the English translation.

4. Proofread translation drafts.

5. Research secondary sources about Alfonso Reyes. By compiling interesting articles or books about Reyes's life and work, the OUR Scholars will help the translation team develop a better grasp of scholarship on Reyes's work. This background information will also help ensure a more accurate translation of Reyes into English.

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

2 *positions available*

Anticipated Student Learning Outcomes: The translation of Reyes's book will eventually be published with a university press. Generally speaking, university presses are the most rigorous and the most prestigious. The OUR Scholars names will appear in the published book in acknowledgement of work they that they do throughout the semester.

The OUR Scholars will also be able to add their role as an assistant researcher in the translation project to their CV or résumés. Very few students at the undergraduate level – or even at the graduate level – have the opportunity to work on the publication of an academic book. This experience will be a wonderful advantage when applying for jobs or for a graduate program.

In addition to these professional considerations, the OUR Scholars will also develop invaluable research skills. These skills include but are not limited to:

1. Retracing references to original sources. While this skill might seem relatively straightforward, it lies at the heart of research in the humanities, and it is all the more important in today's age of the internet and misinformation. This sort of source work also develops a sort of critical thinking since it requires decisions concerning which references need to be retraced to their sources. References can take many forms (quotations, paraphrases, allusions, etc.), and not all of them need to be retraced. In the case of this translation project, some of these sources can be hundreds or even thousands of years old.

2. Navigating the industry of academic publishing. Even if the OUR Scholars do not intend to pursue a career with a relation to the publishing industry, the experience of helping with the publication of an academic book is highly valued in all sectors. The very fact that the OUR Scholars participates in the publication of a academic book will serve future employers as proof of the quality of the Assistant's work ethic.

3. Developing an awareness of translation studies. Since the work carried out by the OUR Scholars assist in the publication of a book translation, they will gain firsthand experience of the vital role research plays in the practice of translation. They will also gain professional experience working with multilingual documents.

4. Identifying genres and trends in Latin American and world literature. Reyes has an encyclopedic knowledge of the history of Latin American literature, and he draws on numerous examples in his discussion of literature in La experiencia literaria. As the OUR Scholars retrace his references, we will also discuss his understanding of literary genres and movements.

Required training of 3 hours with Description: No formal training required. At the beginning of the semester, I will meet with the OUR Scholars students to discuss the project, define expectations, and provide any materials necessary to get started. I will ensure the OUR Scholars are familiar with the various resources necessary to complete their tasks easily and successfully. In addition, I will arrange for them to meet with a librarian who can offer them further assistance as they begin their research.

Mentoring plan: The OUR Scholars and I will meet once a week in order to discuss progress. If issues arise that need immediate attention, we will schedule supplementary meetings. I also encourage OUR Scholars to keep in contact with me regularly by email as their research progresses.

In addition, OUR Scholars might have the opportunity to work with the graduate students involved in this translation project. OUR Scholars will be working with translations drafted by graduate students, so we will keep in contact with the initial translators about their work.

OUR Scholars will also be invited to any meetings I have related to the project. These meetings might take place with graduate students working on the project or with the university press where the work will be published. These meetings will give OUR Scholars hands-on experience of both graduate studies and the publishing industry.

If the OUR Scholars wish to prepare any academic work on their experience, such as a conference paper, we will dedicate a portion of our regular meetings to talking about ways in which to transform their experience into a formal project. I will also help find a suitable conference at which they might present their work.

Finally, we will regularly discuss ways in which to narrativize and market their experience as an OUR Scholar. Having worked closely with the OUR Scholars, I will be in a good position to offer help for job applications or graduate school applications.

Applicant Requirements: While the OUR Scholars will not undertake any actual translation, their research will be part of a translation project, and many of the sources will be in Spanish. So, competency in Spanish is preferred.

In addition, the OUR Scholars should be self-motivated. I will meet with the OUR Scholars regularly, but much of the work will be carried out independently. At the same time, the OUR Scholars should be vocal about their needs and the difficulties they encounter. They should not hesitate to reach out to me whenever an issue arises concerning tasks, deadlines, meetings, or any other aspect of this project.

Applicant Preferences: The OUR Scholars will preferably have some interest in literature, Latin American culture, or Hispanic culture more broadly. Undergraduate students majoring or minoring in Spanish are a natural fit, but the position is open to anyone who meets the requirements listed above.

Specific Time considerations/conflicts: There are no fixed meetings for this project. Meetings will be arranged on days and times that cater to the availability of both mentee and mentor.

App ID #: 1622

**Mentor:** Dorodchi, Mohsen

Email: Mohsen.Dorodchi@charlotte.edu

Title: Teaching Professor

**Department:** Computer Science

Co-mentor: No

Community engaged research: 1622

**Title:** Using LLM's to help with efficient Teaching and Learning

**Description:** LLM's are available in different ways through web interfaces with subscription and/or school support to students and instructors. Teachers hope to utilize LLM's to provide more diverse and aligned materials to students while students would use LLM's for their day to day tasks. In such situation, it is very important to create proper tools that help out both the teachers and students towards the notion of learning. For example, critical thinking and creativity can be promoted by using LLM's in many different ways. This research is the continuation of existing research which leverages LLM's in providing insights to instructors as well as directions and feedback to students. Current tools that have been developed include "Student Reflection and Feedback Analysis" and "Quiz Generator", as well as "Student Reflection Feedback Generator".

Students coming on board for this project, will be exposed to a spectrum of existing projects and eventually, let them select what they like to do.The candidate need to know foundations of machine learning, be familiar with python programming and python packages and libraries and is willing to conduct research with the team of graduate and undergraduate students on different forms of small tool creation for teachers and students that will be integrated together into a larger toolset.

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

3 *positions available*

Anticipated Student Learning Outcomes: 1. Explain how Deep Learning algorithms work.

2. List different well-known transformers used primarily for text processing.

3. Explain how LLM's are built based on notion of "Attention".

4. Communicate and work efficiently in diverse research groups efficiently.

5. Accomplish tasks based on given schedule by due dates and deadlines utilizing day-to-day task identification/accomplishments.

6. Documenting and presenting the findings properly.

Required training of 5 hours with Description: CITI training is required upon onboarding. Literature review, reading papers, and being able to present the literature findings related to current research are reviewed and practiced.

Mentoring plan: 1. Communication Model: individual weekly progress report as well as team task accomplishments as well as mandatory either weekly one-on-one or group progress meeting.

2. It is expected to present your work at least 4 times throughout the duration of the research including , literature, approach, findings, and overall discussion.

3. Students are expected to be in the Text Analytics Lab and work with the research team.

Applicant Requirements: Please clearly identify your python skills and include whether or not you have prior major projects done with Python and any of the AI, Machine learning, and NLP packages. Also, familiarity with Github as source control (not just storage) is very essential. Desire to learn and interact with graduate students is also a critical part of this project. Basic familiarity with Machine Learning Models, LLM's, and prompt engineering is required.

Applicant Preferences: Strong desire to conduct research and prior exposure to research

Any of the AI/ML/NLP courses

Specific Time considerations/conflicts: Team and lab meetings are normally Wednesdays between 11:30 am to 1:30 pm.

App ID #: 1623 **Mentor:** Li, Yao

Email: yli129@charlotte.edu Title: Assistant Professor

**Department:** Earth, Environmental, and Geographical Sciences

Co-mentor: No

Community engaged research: 1623

**Title:** Developing an Integrated Geospatial Deep Learning Framework to Identify Potential Human-Vector Contact Zones for Malaria Transmission in Southern Africa

**Description:** Malaria remains a critical global health issue, affecting millions of people each year. Our project focuses on using remote sensing data and deep learning techniques to identify areas where humans are most likely to come into contact with malaria-carrying mosquitoes. By accurately mapping these zones, we can contribute to more effective malaria prevention and control strategies.

The undergraduate research assistant's responsibilities will include:

Acquire high-resolution satellite images from sources like Sentinel-1, Sentinel-2, and other platforms. This data is essential for analyzing land cover, human settlements, and environmental factors that influence malaria transmission.

Organize and preprocess large datasets to prepare them for analysis. This may involve tasks like cleaning data, correcting for atmospheric interference, and merging datasets from different sources.

Utilize Python scripts to process and analyze the remote sensing data. The student will work with libraries such as GDAL, Rasterio, and possibly machine learning frameworks like PyTorch.

Work closely with graduate students, and faculty members. The student will have the opportunity to contribute ideas, ask questions, and learn from experienced researchers in the fields of public health, geospatial analysis, and artificial intelligence.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

1 *positions available*

Anticipated Student Learning Outcomes:

Gain hands-on experience with Geographic Information Systems (GIS) and remote sensing technologies, learning how to extract meaningful information from satellite images.

Enhance the student's programming skills, particularly in Python, and learn how to handle large datasets efficiently.

Understand how technology, data science, and public health intersect. The student will see firsthand how data-driven approaches can address complex global health challenges.

Develop skills in documenting student's work, preparing reports, and possibly co-authoring research papers or presenting findings at conferences.

Required training of 2 hours with Description: GIS training;

Python and deep learning.

Mentoring plan:

The student will work closely with a dedicated mentor and have regular check-ins with the faculty to guide the development. Expect weekly one-on-one meetings for progress discussions and open communication for any questions or challenges.

The student will receive hands-on training in remote sensing, GIS, and Python programming tailored to learning objectives.

The student will have opportunities to present the work at team meetings and potentially at conferences or in research publications. We provide constructive feedback and goal setting to foster the student's professional development and career guidance.

We offer flexible scheduling to accommodate the student's coursework and commitments, supporting a healthy work-life balance.

We will provide all necessary resources, software, and learning materials to perform the student's duties effectively. The student will be encouraged to think independently and creatively, with a strong emphasis on ethical conduct and data integrity.

Applicant Requirements: Basic Python programming skills and an interest in data science; eagerness to learn; no prior experience in remote sensing or GIS necessary.

Applicant Preferences: Remote Sensing and GIS Knowledge; Python programming skills

Specific Time considerations/conflicts: No

App ID #: 1624 **Mentor:** Wakeman, Shawnee

Email: slwakema@uncc.edu Title: Clinical Professor

**Department:** SPCD

Co-mentor: Yes

Holly Johnson, hjohns76@charlotte.edu, SPCD; Cato College of Ed

Community engaged research: 1624

**Title:** Project getOTR

**Description:** The current project targets developing Artificial Intelligence (AI) using a language learning model (LLM) to identify opportunities to respond (OTR) in lesson plans and audio transcripts. There is a preponderance of research regarding the benefits of effective class-wide instructional practices to establish classroom environments that promote positive outcomes across domains (i.e., academics and behavior) and student populations (e.g., Van Camp et al., 2020). Practices that increase active student engagement have been shown to be one of the critical components in producing overall positive outcomes for all students (Franklin & Harrington, 2019) including (a) increases in students' on-task behaviors, academic performance, and demonstration of desired behaviors and (b) decreases in demonstrations of challenging behaviors (e.g., Common et al., 2020; MacSuga-Gage & Simonsen, 2015; Menzies et al., 2017). One of the most efficient and effective methods for improving student engagement is by providing all students with frequent and varied opportunities to respond (OTR).

Despite the well documented benefits of delivering increased rates of varied OTR, teachers' naturally occurring delivery rates still fall well below that of recommended rates to improve student outcomes (Scott, 2021). Teachers often receive limited training or instructional support in OTR (Simonsen et al., 2010), which impacts teachers' self-efficacy of implementation. Given the inadequate amount of preparation and training many teachers receive, there is an urgent need for teachers to engage in high-quality professional development (PD) and continued coaching support (Mitchell et al., 2017). While research suggests coaching models with 30 or more hours of direct support following an initial PD are needed to produce significant desired changes in teacher behavior and delivery of effective practices (Grasely-Boy et al., 2019; Yoon et al., 2007), programs with this kind of extensive time and resource commitment may be difficult for a majority of schools to implement and sustain (Gage et al., 2018; Grasley-Boy et al., 2019). Therefore, there is an urgent need to develop and implement a more efficient and effective way for teachers, and those who support them, to collect and analyze data associated with their delivery of OTR. Once available, this data could then be used to efficiently inform and guide decision making related to teachers' delivery of OTR.

This project targets how to support educational professionals in efficiently and effectively capturing accurate measures of their delivery rates of OTR (Project getOTR). The goal is the accurate identification of OTR in both lesson plans and audio transcripts from videos. We will work as a team to code existing plans and transcripts for four types of OTRs and align our human coding to the coding completed by AI to accurately capture teachers' delivery of OTR. The undergraduate in this

project would be trained to identify the four types of OTRs, come to consensus with the coding with the faculty members, and as part of the data analysis, work with the team to support the alignment of coding with the AI. This is a cyclical process that will be repeated with new plans and transcripts to hone both the human coding and the LLM to be more intuitive. Students will work independently after training and established reliability. Weekly meetings will occur with faculty. Students familiar with instruction and teacher delivery are preferred.

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

1 *positions available*

Anticipated Student Learning Outcomes: The undergraduate student will participate in coding lesson plans and transcriptions for the four types of OTRs.

The undergraduate student will participate with faculty in data analysis and alignment using data generated by AI and human coding.

The undergraduate student may draft sections within a manuscript outline in regards to the study.

Required training of 15 hours with Description: The student would begin by completing CITI training if not already complete. The student would also be trained to code lesson plans and audio transcripts for OTRs as well as reviewing data between human and AI coding. If a manuscript is written, the student will also be provided support for writing.

Mentoring plan: The faculty will support the student by: (a) training the student for each task; (b) meeting weekly with the student to discuss progress, questions, and next steps for each task; (c) providing space on campus to work and access to any documents (via Google Drive space) and software needed to complete the work. Both faculty will make themselves available and engage with the student. We will create a timeline for the semester with the student to lay out the task milestones and activities the first week the student is in place.

Applicant Requirements: The student must be organized and pay attention to detail in narrative data. The ability to both complete work autonomously once task assignments are understood and work collaboratively with faculty to establish clean reliable data and results is a must.

Applicant Preferences: As the qualitative data is based in the field of education and the coding will be sensitive to education concepts, an education student- major or minor- in a teacher licensure program is preferred.

Specific Time considerations/conflicts: The student must be available one day a week to meet with the research team. The day and time would be mutually agreed upon.

App ID #: 1626 **Mentor:** Subramanian, Kalpathi

Email: krs@charlotte.edu Title: Associate Professor

**Department:** Computer Science

Co-mentor: No

Community engaged research: 1626

**Title:** Real World Programming Assignments using BRIDGES

**Description:** This project will contribute to an ongoing effort to build new and highly engaging real-world programming assignments spanning introductory courses (CS1, CS2, Data Structures, Algorithm Analysis) in computer science. The goal is to build assignments that clearly illustrate the relevance and potential of computing to incoming majors in computer science, spanning current problems/topics in social, cultural, scientific, entertainment, games and other domains. The undergraduate student will work on building new assignments using external data sources, such as WikiData (https://www.wikidata.org/wiki/Wikidata:Main_Page). The student will have the opportunity to explore new datasets (that sparks his/her interests) and work in a highly creative and flexible environment. The student will work as part of a research group with other undergraduate and graduate students and participate in weekly meetings for reviews and feedback. Benefits to the OUR scholar include gaining valuable training in software design, testing, documentation and working on challenging projects, and contributing to an assignment repository used across multiple academic institutions in the United States.

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

1 *positions available*

Anticipated Student Learning Outcomes:

Work as part of a research group, learning from other project participants

Effectively communicate and bring up issues during regular meetings

Become a stronger programmer across multiple languages

Prepare and present a poster at the end of the project period.

Required training of 20 hours with Description: Students should have prior programming background and will require an initial period to learn the tools used in BRIDGES. Extensive documentation and tutorials are already available to assist this process, as well as the availability of the mentors.

Mentoring plan:

Students will participate in weekly research group meetings to get feedback on their progress.

A chat group channel on Discord will be available for communication outside of weekly meetings.

We hope to have additional students working on similar projects for help and collaboration, that the OUR student can take advantage of.

An additional faculty member will be part of the research group for assistance.

Applicant Requirements: The undergraduate student should preferably have Junior standing and must have satisfactorily completed relevant coursework in the first two years in Computer Science. Some knowledge of server side programming, Javascript, web technologies (HTML, CSS) and databases will be helpful. More important, the student should be motivated to learn new languages, technologies and tools, complete tasks on time and be ready work and actively participate with other members of the research group.

Applicant Preferences: The undergraduate student should preferably have Junior standing and must have satisfactorily completed relevant coursework in the first two years in Computer Science. Some knowledge of server side programming, Javascript, web technologies (HTML, CSS) and databases will be helpful. More important, the student should be motivated to learn new languages, technologies and tools, complete tasks on time and be ready work and actively participate with other members of the research group.

Specific Time considerations/conflicts: None

App ID #: 1627 **Mentor:** Subramanian, Kalpathi

Email: krs@charlotte.edu Title: Associate Professor

**Department:** Computer Science

Co-mentor: Yes

Erik Saule, esaule@charlotte.edu, Computer Science

Community engaged research: 1627

**Title:** Near Automatic Creation of Interactive Learning Modules for Early CS Courses.

**Description:** This project is targeted at building highly engaging and complete learning modules for CS education that can be used in early CS courses (in-person or remote). The goal is to build learning modules that can be easily adapted and customized by CS instructors to cater to their own student populations. Pedagogically, this mode of learning will be a combination of mastery based learning as well as engaging students with real-world relevance to routine CS content. The built modules would accommodate the ability to cater to students with varying skill levels. It will consist of a number or modalities in its implementation (lecture materials, assessments, multimedia segments) that typically constitute a course module with specified learning outcomes.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

2 *positions available*

Anticipated Student Learning Outcomes:

Work as part of a research group, learning from other project participants

Effectively communicate and bring up issues during regular meetings

Become a stronger programmer across multiple languages

Prepare and present a poster at the end of the project period.

Required training of 20 hours with Description: Students should have strong programming background and will require an initial period to learn the tools used as part of the project. Prior work on the project will be helpful in getting students upto speed.

Mentoring plan:

Students will participate in weekly research group meetings to get feedback on their progress.

A chat group channel on Discord will be available for communication outside of weekly meetings.

We hope to have additional students working on similar projects for help and collaboration, that the OUR students can take advantage of.

An additional faculty member will be part of the research group for assistance.

Applicant Requirements: The undergraduate student should preferably have Junior standing and must have satisfactorily completed relevant coursework in the first two years in Computer Science. Must be a strong programmer and ready to work and solve problems on their own. Knowledge of Python and high level programming languages is a plus. Additional experience with animation languages can be helpful, as the tools will be used to create animations.

Applicant Preferences: As detailed above.

Specific Time considerations/conflicts: None

App ID #: 1629 **Mentor:** Tipton, Roger

Email: rtipton2@uncc.edu Title: Research Associate Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1629

**Title:** Using Data Science to Predict Microplastics Transport in Oceans

**Description:** Project Overview: Welcome to the UNCC Undergraduate Student Research Program! This exciting project focuses on understanding the movement of microplastics in our freshwater systems and oceans. Microplastics are tiny plastic particles that pose significant environmental threats. By analyzing a comprehensive dataset on microplastics, you'll use data analysis fundamentals to predict how these particles travel through water bodies.

Project Goals:

Analyze Microplastics Data: Dive into a dataset containing information on microplastics found in various freshwater and ocean locations.

Predict Transport Patterns: Use data analysis techniques to model and predict the transport of microplastics in the ocean.

Contribute to Environmental Solutions: Your findings could help develop strategies to mitigate the impact of microplastics on marine ecosystems.

Student Contributions: As an undergraduate student, you'll play a crucial role in this research project. Here are some of the key duties you'll be involved in:

Data Cleaning and Preparation: You'll start by cleaning and organizing the dataset to ensure it's ready for analysis. This involves handling missing values, normalizing data, and performing initial exploratory analysis.

Data Analysis: Using statistical and computational tools, you'll analyze the dataset to identify patterns and trends in microplastics distribution.

Model Development: You'll develop predictive models to simulate the transport of microplastics in different water bodies. This might involve using machine learning algorithms or other data analysis techniques.

Visualization: Create visualizations to represent your findings clearly and effectively. This could include graphs, maps, and other visual aids to help communicate your results.

Collaboration: Work closely with fellow students and faculty mentors, sharing insights and collaborating on different aspects of the project.

Reporting: Document your methods, findings, and conclusions in a clear and concise manner. This will be essential for presenting your work at conferences or in academic publications.

Why Join This Project?

Hands-On Experience: Gain practical experience in data analysis and environmental science.

Mentorship: Work under the guidance of experienced faculty members who will support your learning and research.

Impactful Research: Contribute to a project that addresses a critical environmental issue, helping to protect our oceans and freshwater systems.

Skill Development: Enhance your skills in data analysis, modeling, and scientific communication, which are valuable for your future career.

Join us in this meaningful research project and make a difference in understanding and mitigating the impact of microplastics on our planet!

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

2 *positions available*

Anticipated Student Learning Outcomes: Participating in this research project offers numerous benefits for students, enhancing their education, training, and career prospects. Here are some key advantages:

Educational Benefits:

Deepened Knowledge: Students will gain a thorough understanding of microplastics, their environmental impact, and the scientific methods used to study them.

Data Analysis Skills: Through hands-on experience, students will learn how to clean, analyze, and interpret complex datasets, a crucial skill in many scientific and technical fields.

Interdisciplinary Learning: The project combines elements of environmental science, data science, and computational modeling, providing a well-rounded educational experience.

Training Benefits:

Technical Proficiency: Students will become proficient in using statistical software, programming languages (such as Python or R), and data visualization tools.

Research Methodology: They'll learn how to design experiments, develop hypotheses, and conduct rigorous scientific research.

Problem-Solving: The project will enhance their ability to tackle complex problems, think critically, and develop innovative solutions.

Career Benefits:

Resume Building: Participation in this project will be a standout addition to their resumes, showcasing their ability to handle real-world data and contribute to meaningful research.

Networking: Students will have the opportunity to collaborate with faculty mentors and peers, building a network that can support their future career endeavors.

Presentation Skills: They'll gain experience in presenting their findings, whether through written reports, presentations, or at conferences, which is valuable for any career path.

Envisioning Students' Reflections: After participating in this project, students might say:

"Participating in the microplastics research project was a game-changer for me. I learned so much about data analysis and environmental science, and it really opened my eyes to the impact of microplastics on our planet."

"The hands-on experience I gained was invaluable. I now feel confident using data analysis tools and techniques, and I know these skills will be crucial in my future career."

"Working with my peers and mentors was incredibly rewarding. I built strong connections and learned the importance of collaboration in scientific research."

"Presenting our findings at a conference was a highlight for me. It was a great opportunity to share our work and get feedback from experts in the field."

Overall, this project will provide students with a rich, multifaceted learning experience that prepares them for future academic and professional success.

Required training of 1 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 Using Data Science to Predict Microplastics Transport in Oceans, 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.

Hands-On Training and Resources: I will ensure that students receive thorough training in laboratory techniques and the use of specialized equipment necessary for nanocellulose fiber extraction. They will have access to all required resources and materials, and I will be available to assist with any technical issues that arise.

Professional Development Opportunities: Students will be encouraged to present their research findings at group meetings and, if appropriate, at academic conferences. This will help

them develop their presentation skills and gain confidence in communicating their research. I will provide guidance on preparing effective presentations and offer constructive feedback.

Commitment to Student Success: I am dedicated to creating an inclusive and supportive environment where students feel valued and empowered to succeed. This includes helping students set realistic goals, providing continuous feedback, and celebrating their achievements. I will also facilitate connections with industry professionals and academic contacts to support their career development.

Networking and Career Support: I will help students build a professional network by introducing them to industry experts and academic mentors. This networking will be invaluable for their future career paths, providing insights and opportunities for internships, job placements, or further academic pursuits.

By fostering a collaborative, supportive, and resource-rich environment, I aim to help students not only succeed in this research project but also develop the skills and confidence they need to excel in their future careers.

Applicant Requirements: Here are the key qualifications and characteristics we seek in an applicant:

Skills:

Basic Data Analysis: Familiarity with data analysis techniques and tools (e.g., Excel, Python, R) is beneficial but not mandatory. We provide training to build these skills.

Communication: Strong written and verbal communication skills to document findings and present results.

Technical Aptitude: Comfort with using software and technology for data analysis and visualization.

Courses:

Environmental Science: Courses in environmental science, ecology, or related fields provide a good foundation for understanding the project's context.

Statistics or Data Science: Courses in statistics, data science, or related fields are helpful for data analysis tasks.

Computer Science: Basic programming courses can be advantageous for developing and implementing models.

Experience:

Research Projects: Previous experience with research projects, whether in a classroom setting or through internships, is a plus but not required.

Lab Work: Experience in laboratory settings, particularly in environmental science or related fields, can be beneficial.

Team Projects: Participation in team-based projects or activities that demonstrate collaboration and teamwork skills.

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 sustainability. Here are the key qualifications and characteristics we seek in an applicant:

1. Passion for Sustainability and Innovation:

Interest in Green Technologies: A genuine interest in sustainable materials and a desire to make a positive environmental impact.

Curiosity and Creativity: A strong desire to learn and explore new concepts, especially in environmental science and data analysis..

5. Personal Characteristics:

Motivation and Initiative: Self-motivated with a strong work ethic and the ability to take initiative in driving the project forward.

Attention to Detail: Meticulous and detail-oriented, ensuring accuracy in experiments and data recording.

Adaptability: Flexibility to adapt to new challenges and learn new techniques as the project evolves.

6. Communication and Collaboration:

Team Player: Ability to work effectively in a collaborative team environment, sharing insights and supporting peers.

Effective Communication: Strong verbal and written communication skills to present findings clearly and concisely.

7. Commitment to Learning:

Willingness to Learn: Open to learning new skills and techniques, and receptive to feedback from mentors and peers.

Professionalism: Demonstrates professionalism in conduct, including punctuality, reliability, and adherence to safety protocols.

8. Enthusiasm for Research:

Curiosity-Driven: A natural curiosity and enthusiasm for scientific research and discovery.

Goal-Oriented: Focused on achieving research goals and contributing to the overall success of the project.

Specific Time considerations/conflicts: None

App ID #: 1630 **Mentor:** Tipton, Roger

Email: rbtipton2@uncc.edu Title: Research Associate Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1630

**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.

Why Join?

Hands-On Experience: Gain practical experience in cutting-edge research and laboratory techniques.

Interdisciplinary Learning: Work at the intersection of materials science, chemistry, and environmental engineering.

Professional Development: Enhance your research skills, critical thinking, and problem-solving abilities.

This project is an excellent opportunity to contribute to sustainable technology and make a real impact on the future of materials science. Join us and be part of the innovation!

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

2 *positions available*

Anticipated Student Learning Outcomes: Participating in the nanocellulose fiber extraction research project offers students a multitude of benefits that span their education, training, and career development. Through this hands-on experience, students will acquire practical skills in advanced laboratory techniques, such as chemical treatments, fiber extraction, and material testing. These skills are essential for any scientific research and will provide a solid foundation for their future endeavors.

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.

Envisioning Students' Reflections: After participating in this project, students might say:

"This project was a game-changer for me. I learned so much about sustainable materials and got to work with some amazing people. It really opened my eyes to the possibilities in materials science."

"The hands-on experience I gained was invaluable. I feel much more confident in the lab now, and I know these skills will be crucial for my future career."

"Collaborating with a team on such an innovative project was incredibly rewarding. It taught me the importance of communication and teamwork in research."

“Presenting our findings at a conference was a highlight. It was nerve-wracking but also exhilarating, and it definitely improved my public speaking skills.”

“This project has definitely made me more passionate about sustainability and green technologies. I can’t wait to see where this field goes next!”

Required training of 1 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.

Hands-On Training and Resources: I will ensure that students receive thorough training in laboratory techniques and the use of specialized equipment necessary for nanocellulose fiber extraction. They will have access to all required resources and materials, and I will be available to assist with any technical issues that arise.

Professional Development Opportunities: Students will be encouraged to present their research findings at group meetings and, if appropriate, at academic conferences. This will help them develop their presentation skills and gain confidence in communicating their research. I will provide guidance on preparing effective presentations and offer constructive feedback.

Commitment to Student Success: I am dedicated to creating an inclusive and supportive environment where students feel valued and empowered to succeed. This includes helping students set realistic goals, providing continuous feedback, and celebrating their achievements. I will also facilitate connections with industry professionals and academic contacts to support their career development.

Networking and Career Support: I will help students build a professional network by introducing them to industry experts and academic mentors. This networking will be invaluable for their future career paths, providing insights and opportunities for internships, job placements, or further academic pursuits.

By fostering a collaborative, supportive, and resource-rich environment, I aim to help students not only succeed in this research project but also develop the skills and confidence they need to excel in their future careers.

Applicant Requirements: The key qualifications and characteristics we seek in an applicant:

1. Relevant Coursework:

Science and Engineering Background: Completion of foundational courses in chemistry, materials science, environmental science, or related fields.

Laboratory Experience: Prior coursework that includes lab components, providing basic lab skills and familiarity with scientific equipment.

2. Technical Skills:

Basic Lab Techniques: Proficiency in basic laboratory techniques, such as pipetting, measuring, and using common lab equipment.

Data Analysis: Familiarity with data analysis methods and software, such as Excel, MATLAB, or similar tools.

3. Research and Analytical Skills:

Literature Review: Ability to conduct thorough literature reviews, summarize findings, and identify gaps in existing research.

Critical Thinking: Strong analytical skills to interpret data, troubleshoot experiments, and draw meaningful conclusions.

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:

1. Passion for Sustainability and Innovation:

Interest in Green Technologies: A genuine interest in sustainable materials and a desire to make a positive environmental impact.

Curiosity and Creativity: An inquisitive mindset and the ability to think creatively to solve complex problems.

5. Personal Characteristics:

Motivation and Initiative: Self-motivated with a strong work ethic and the ability to take initiative in driving the project forward.

Attention to Detail: Meticulous and detail-oriented, ensuring accuracy in experiments and data recording.

Adaptability: Flexibility to adapt to new challenges and learn new techniques as the project evolves.

6. Communication and Collaboration:

Team Player: Ability to work effectively in a collaborative team environment, sharing insights and supporting peers.

Effective Communication: Strong verbal and written communication skills to present findings clearly and concisely.

7. Commitment to Learning:

Willingness to Learn: Open to learning new skills and techniques, and receptive to feedback from mentors and peers.

Professionalism: Demonstrates professionalism in conduct, including punctuality, reliability, and adherence to safety protocols.

8. Enthusiasm for Research:

Curiosity-Driven: A natural curiosity and enthusiasm for scientific research and discovery.

Goal-Oriented: Focused on achieving research goals and contributing to the overall success of the project.

Specific Time considerations/conflicts: None

App ID #: 1631 **Mentor:** Tipton, Roger

Email: rbtipton2@uncc.edu Title: Research Associate Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1631

**Title:** Wearable Flexible Sensors for Performance Management

**Description:** Overview: Join the innovative research team at the University of North Carolina at Charlotte (UNCC) and be part of a groundbreaking project developing wearable flexible sensors to monitor and evaluate the performance of workers and athletes. These sensors are designed to provide real-time data on physical activity, helping to optimize performance, prevent injuries, and enhance overall well-being.

Project Goals:

Design and develop flexible, wearable sensors that can accurately monitor various physiological parameters.

Test and validate the sensors' performance in real-world scenarios with both workers and athletes.

Analyze the collected data to provide actionable insights for improving performance and safety.

Student Contributions: As an undergraduate researcher, you will play a vital role in this project. Your contributions will include:

Literature Review: Conducting comprehensive reviews of existing research to understand current technologies and identify areas for improvement.

Sensor Design: Assisting in the design and development of flexible sensors, including selecting materials and optimizing sensor configurations.

Prototyping and Testing: Building prototypes of the sensors and conducting tests to evaluate their performance and reliability.

Data Collection and Analysis: Collecting data from the sensors during trials with workers and athletes, and analyzing the data to assess sensor accuracy and effectiveness.

Documentation and Reporting: Documenting your findings and preparing reports and presentations to share with the research team and broader academic community.

Why Join?

Hands-On Experience: Gain practical experience in cutting-edge research and technology development.

Interdisciplinary Learning: Work at the intersection of materials science, electronics, and biomechanics.

Professional Development: Enhance your research skills, critical thinking, and problem-solving abilities.

Networking Opportunities: Collaborate with faculty, graduate students, and industry professionals.

This project is an excellent opportunity to contribute to the development of innovative wearable technology and make a real impact on the fields of occupational health and sports science. Join us and be part of the future of performance monitoring!

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

2 *positions available*

Anticipated Student Learning Outcomes: Participating in the wearable flexible sensors research project offers students a multitude of benefits that span their education, training, and career development. Through this hands-on experience, students will acquire practical skills in advanced sensor design, prototyping, and testing. They will gain proficiency in using cutting-edge technology and tools, which are essential for any scientific research and engineering career.

Educationally, students will deepen their understanding of interdisciplinary fields such as materials science, electronics, and biomechanics. They will learn how to conduct thorough literature reviews, design experiments, and analyze data, providing a solid foundation in research methodology. 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 developing innovative wearable technology will also appeal to employers and academic programs dedicated to health and sports sciences, positioning students as forward-thinking candidates in their future endeavors.

Envisioning Students' Reflections: After participating in this project, students might say:

"This project was transformative for my academic and professional growth, providing me with invaluable hands-on research experience."

"I gained practical skills and built confidence through direct involvement in cutting-edge sensor design and testing."

"Working on a project with real-world applications inspired me and reinforced my commitment to improving occupational health and sports performance."

"The interdisciplinary nature of the research broadened my knowledge and significantly shaped my educational journey."

"Participating in this project was a pivotal experience that opened doors for future career opportunities and solidified my career aspirations."

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 wearable flexible sensors for performance monitoring, 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.

Hands-On Training and Resources:

I will ensure that students receive thorough training in laboratory techniques and the use of specialized equipment necessary for sensor development. They will have access to all required resources and materials, and I will be available to assist with any technical issues that arise.

Professional Development Opportunities:

Students will be encouraged to present their research findings at group meetings and, if appropriate, at academic conferences. This will help them develop their presentation skills and gain confidence in communicating their research. I will provide guidance on preparing effective presentations and offer constructive feedback.

Commitment to Student Success:

I am dedicated to creating an inclusive and supportive environment where students feel valued and empowered to succeed. This includes helping students set realistic goals, providing continuous feedback, and celebrating their achievements. I will also facilitate connections with industry professionals and academic contacts to support their career development.

Networking and Career Support:

I will help students build a professional network by introducing them to industry experts and academic mentors. This networking will be invaluable for their future career paths, providing insights and opportunities for internships, job placements, or further academic pursuits.

By fostering a collaborative, supportive, and resource-rich environment, I aim to help students not only succeed in this research project but also develop the skills and confidence they need to excel in their future careers.

Applicant Requirements: Here are the key qualifications and characteristics I value:

1. Relevant Coursework:

Science and Engineering Background: Completion of foundational courses in chemistry, materials science, environmental science, or related fields.

Laboratory Experience: Prior coursework that includes lab components, providing basic lab skills and familiarity with scientific equipment.

2. Technical Skills:

Basic Lab Techniques: Proficiency in basic laboratory techniques, such as pipetting, measuring, and using common lab equipment.

Data Analysis: Familiarity with data analysis methods and software, such as Excel, MATLAB, or similar tools.

3. Research and Analytical Skills:

Literature Review: Ability to conduct thorough literature reviews, summarize findings, and identify gaps in existing research.

Critical Thinking: Strong analytical skills to interpret data, troubleshoot experiments, and draw meaningful conclusions.

We believe that with the right attitude and foundational skills, any dedicated student can succeed and make meaningful contributions to our team.

Applicant Preferences: When selecting student applicants for the wearable flexible sensors research project, I am looking for individuals who demonstrate a strong passion for scientific research and a commitment to innovation. Here are the key qualifications and characteristics I value:

1. Passion for Performance and Innovation:

Interest in Performance Technologies: A genuine interest in wearable technology, materials science, and performance monitoring. Students should be eager to learn and explore new concepts.

Curiosity and Creativity: An inquisitive mindset and the ability to think creatively to solve complex problems.

2. Personal Characteristics:

Motivation and Initiative: Self-motivated with a strong work ethic and the ability to take initiative in driving the project forward.

Attention to Detail: Meticulous and detail-oriented, ensuring accuracy in experiments and data recording.

Adaptability: Flexibility to adapt to new challenges and learn new techniques as the project evolves.

3. Communication and Collaboration:

Team Player: Ability to work effectively in a collaborative team environment, sharing insights and supporting peers.

Effective Communication: Strong verbal and written communication skills to present findings clearly and concisely.

4. Commitment to Learning:

Willingness to Learn: Open to learning new skills and techniques, and receptive to feedback from mentors and peers.

Professionalism: Demonstrates professionalism in conduct, including punctuality, reliability, and adherence to safety protocols.

5. Enthusiasm for Research:

Curiosity-Driven: A natural curiosity and enthusiasm for scientific research and discovery.

Goal-Oriented: Focused on achieving research goals and contributing to the overall success of the project.

Specific Time considerations/conflicts: None

App ID #: 1632 **Mentor:** Zhang, Ran

Email: rzhang8@charlotte.edu Title: Assistant Professor

**Department:** Electrical and Computer Engineering

Co-mentor: No

Community engaged research: 1632

**Title:** Towards an autonomous and distributed multi-drone platform powered by Artificial Intelligence

**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 building customized drones from scratch, programming drones both virtually in realistic simulations and practically in real drones with on-board intelligence and advanced sensors, design machine learning and reinforcement learning algorithms for distributed multi-drone management in concrete task scenarios, and document the achievements for possible research publications.

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

2 *positions available*

Anticipated Student Learning Outcomes: 1. Grasp the skills of building drones from scratch

2. Learn how to program in a realistic drone simulator integrating Gazebo, lower-level drone flight controller and RViz.

3. Learn to design machine learning and reinforcement learning algorithms for concrete practical tasks

4. Learn how to program the drones in ROS and Python and upload onto the real drones for reallife 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: 1. The mentor will hold weekly meetings with the mentees to discuss the accomplishments and tasks to be done.

2. The mentee will get trained on the project via working with existing undergraduate research assistants. The training includes how to build a drone from scratch, 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.

3. The mentees will design distributed algorithms under the guidance of the mentor

4. 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: 1. Have considerable amount of microcontroller (Arduino UNO, raspberry Pi, Intel NUC, or Nvidia Jetson) programming experiences.

2. Be familiar with Python programming

Applicant Preferences: 1. Have considerable amount of microcontroller (Arduino UNO, raspberry Pi, Intel NUC, or Nvidia Jetson) programming experiences.

2. Be familiar with Python programming

Specific Time considerations/conflicts: N/A

App ID #: 1639 **Mentor:** Smith, Michael

Email: mssmith1@charlotte.edu Title: Assistant Professor

**Department:** Engineering Technology and Construction Management

Co-mentor: No

Community engaged research: 1639

**Title:** Development of Marine Energy Technologies to Enhance Device Reliability

**Description:** Marine energy (ME) focuses on harnessing kinetic energy in the world's oceans to generate electricity. For example, point-absorber wave energy converters (WECs) harvest incoming wave-energy in marine environments. In recent years, there has been much interest and advances in ME technologies to support Powering the Blue Economy (PBE) applications. However, much work is still needed to develop, optimize, and test such marine energy systems (e.g., improve resilience, increase efficiency, reduce costs, etc.). To address these challenges, this project focuses on device / component design, process modeling, simulation, prototype fabrication, and testing of marine renewable energy devices to enhance reliability and performance. For example, the design goals are focused on reducing expenses, reducing hardware costs, increasing device resilience, and minimizing energy losses, all of which must be addressed in order to advance the marine energy industry.

Dr. Michael Smith is seeking to mentor promising undergraduate researchers on this interdisciplinary project to help address the critical problems that the marine energy industry is facing (e.g., damaged marine energy system components, etc.). This project focuses on developing and enhancing the design of marine energy devices (e.g., WECs) to enhance reliability and performance. The student's duties will include gathering and sorting relevant peer reviewed literature on the topic, collecting and analyzing data, mechanical/electrical component design, creating applicable physics-based models for analysis, prototype fabrication, conducting experimental tests, writing summaries of their work, and collaboration with the research team through regular meetings, as directed.

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

2 *positions available*

Anticipated Student Learning Outcomes: Anticipated student learning outcomes include critical thinking, teamwork, communication, and technology skills to advance the research area. The student's duties will include gathering and sorting relevant peer reviewed literature on the topic, collecting and analyzing data, mechanical/electrical component design, creating applicable physics-based models for analysis, prototype fabrication, conducting experimental tests, writing summaries of their work, and collaboration with the research team through regular meetings, as directed.

Required training of 10 hours with Description: Students will be on-boarded through a combination of training activities to quickly equip students with the skills needed to contribute to the project. There will be an initial kick-off meeting to orient the students to the project (e.g., meet the team

members, identify the goals/objectives, specify the tasks, etc.). Then, students will work through guided training exercises (e.g., instructional videos, literature review, example representative learning activities/tasks, etc.) to help equip the students with the needed skills to perform the associated tasks. As the project progresses, additional skills/tools will be introduced (with the necessary training/instruction) for the project tasks, as applicable.

Mentoring plan: Mentoring on the project will include regular (e.g., weekly) meetings to discuss the project tasks, feedback on the research work, and action items. Students get the opportunity to practice their professional communication skills with weekly presentations based on the aforementioned aspects.

Applicant Requirements: Students with good academic records and related research interests are encouraged to apply. The student must be competent in Microsoft Excel, have strong communication skills (oral and written), and demonstrate keen data organization skills.

Applicant Preferences: Additionally, students with proficiency in machine design (mechanical / electrical devices) and software applications such as Mathcad, MATLAB/Simulink, and SolidWorks (or similar CAD application) are desired and will be strongly considered. Training can be provided to students who are willing to learn.

Specific Time considerations/conflicts: We will have regular weekly meetings that are scheduled based on the team's availability during the period of performance for the project.

App ID #: 1640

**Mentor:** Astratov, Vasily

Email: astratov@charlotte.edu

Title: Professor

**Department:** Physics and Optical Science

Co-mentor: No

Community engaged research: 1640

**Title:** Superresolution cellphone-based microscopy enhanced by microoptics, AI and machine learning

**Description:** Our group developed a novel way of building portable and lightweight microscopes based on the integration of ordinary cellphones with specially designed ball lenses placed in contact with biomedical specimens or nanoscale structures [1]. Such pocket-size microscopes can be taken to remote locations, and they can replace conventional microscopes in many applications such as analysis of the bacterial contamination of water, histology, and teledermatology. This project is devoted to improving resolution and quality of imaging by such miniaturized microscopes. This project involves a strong collaboration between two undergraduate students working as a team with the graduate student and with the faculty advisor.

The undergraduate students will be able to contribute to this project in several ways:

Participate in developing experimental setups with a novel way of illumination investigated samples. It will involve experimentation with lasers, light emitting diodes, waveguides, biomedical samples, ball lenses, and cellphones.

Quantify resolution of various objects: microstructures, histological samples obtained from the Carolina Biological Supply company, and fluorescent nanospheres.

Apply advanced computational methods for enhancing resolution and quality of imaging such as Richardson-Lucy deconvolution method.

Participate in discussions and propose ideas about using AI and machine learning in image processing aimed at achieving AI-guided superresolution imaging.

[1] B. Jin, A. R. Jean, A. V. Maslov, V. N. Astratov, Ball Lens-Assisted Cellphone Imaging with Submicron Resolution, Laser & Photonics Rev. 17, 2300146 (2023).

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

2 *positions available*

Anticipated Student Learning Outcomes: This project is for two students. One student will be more involved in the optical characterization work based on tasks (i) and (ii). Another student will be more involved in the image processing activities based on tasks (iii) and (iv).

Students involved in the development of optical characterization tasks (i-ii) will get the following benefits: ability to set up optical experiments; first-hand knowledge of sources of light and optical

components such as lasers, light emitting diodes, waveguides; expert-type knowledge of optical microscopy useful for developing careers in industry and academia.

Students participating in image processing activities (iii-iv) will have first-hand experience with the deconvolution methods based on using measured point-spread function. They will also learn new ideas about using AI and machine learning for superresolution imaging applications.

This project will develop team working skills. Both undergraduate students will enjoy collaborative research atmosphere and carry out knowledge about rules of team working including mutual responsibilities, helping each other with solving complicated tasks, habit of learning things from the more experienced team members such as a graduate student, regular reporting the results at the group meetings, and freedom of expressing ideas.

Required training of 8 hours with Description: During the first week in the lab, students will complete safety training, required by the UNC Charlotte Biosafety Committee and the Office of Environmental Health and Safety. During this period, we will discuss details of the research project, we will set up a schedule when students come to the lab. Students will be introduced to the organization of the lab, lab rules, laser safety rules, location of the clean room. If necessary, they will receive training at some equipment installed in the clean room. Academic Integrity and principles of the Responsible Conduct of Research will be discussed starting from the beginning of the research experience.

Mentoring plan: During the first week in the lab, students will complete safety training, required by the UNC Charlotte Biosafety Committee and the Office of Environmental Health and Safety. During this period, we will discuss details of the research project, we will set up a schedule when students come to the lab. Students will be introduced to the organization of the lab, lab rules, laser safety rules, location of the clean room. If necessary, they will receive training at some equipment installed in the clean room. Academic Integrity and principles of the Responsible Conduct of Research will be discussed starting from the beginning of the research experience. This discussion will continue through the duration of the research experience. After completion of the required training, students will start participating in the optical characterization and image processing activities. We will set up a regular one-on-one meeting. We typically have two group meetings weekly and at least one of them is expected to be attended by the undergraduate students where they will present a brief report. I encourage students' attendance of the departmental Physics seminar and relevant seminars at the Departments of Chemistry and Biology. At the end of the semester, they will send me a written report about their experiences and results. They will also make presentations about their experiences and results at the undergraduate conference.

Applicant Requirements: This project does not have strict requirements, but it has preferences described in the corresponding section below.

Applicant Preferences: A student involved in optical characterization is ideally a student majoring in physics or engineering (electrical or mechanical) with a strong interest in real physical implementation of ideas, proof-of-the-concept demonstrations, hardware development, building setups, ideally, with some experience in microscopy or any kind of optics. Experience with the undergraduate physics or engineering laboratory courses is desirable. Any previous experience with optics and/or microscopes is highly desirable but not required.

I expect that a student involved in image processing activities is ideally a student majoring in physics, engineering or computer science with a strong interest in applications of AI and machine learning to imaging technologies. Very good computer skills are desirable. Any previous experience with developing codes, software, especially working with files representing optical images is highly desirable but not required. An interest in applications of AI and machine learning in imaging is desirable.

Specific Time considerations/conflicts: Students should be available for one of the weekly group meetings. The day/time can be discussed to accommodate schedules of all participants including a graduate student. A brief progress report is expected at the meeting of each undergraduate student.

App ID #: 1642 **Mentor:** Dinar, Mahmoud

Email: mdinar@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering & Engineering Science

Co-mentor: No

Community engaged research: 1642

**Title:** Designing and Fabricating Shape Morphing Structures as Tree Search Solutions to a Sliding Puzzle Game

**Description:** We can evaluate how a structure performs mechanically for different load conditions such as bending and tension (when a component is pulled apart). In fact, we have created a dataset of thousands of structures with different shapes. The shapes were created by finding all possible combinations of filling an 8x8 grid of square cells with the condition that there had to be at least one square on each of the left and right boundaries, and any two neighboring squares had to have a shared edge. We computed the stiffness of each structure for different loads. We know that structures with the same mass but different shapes perform better under different loads. The main objective of this research is to find the fewest number of moves that transform one shape to another similarly to how in a sliding puzzle game one can rearrange the structure by sliding one square at a time. The second objective is to 3D print example solutions to demonstrate the effectiveness of the shape morphing mechanism. For a computer science student, the puzzle solving problem should remind you of tree search algorithms. For a mechanical engineering student, computing stiffness for different load conditions should remind you of mechanics of materials and the Finite Element Method.

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

2 *positions available*

Anticipated Student Learning Outcomes: - learning about running Python code on local Jupyter Notebooks and High Performance Computing servers

- learning about foundational computer science problems and algorithms for tree division, tree search

- learning about automatically designing varying shapes and conducting FEA

- learning about considerations for 3D printing structures with moving components in assembled state

You will be able to claim that you have participated in a state-of-the-art project of designing mechanical shape morphing metamaterials, and have gained practical skills in testing algorithms locally and running it on an HPC cluster, similar to how complex computational design problems are solved.

Required training of 2 hours with Description: Familiarizing the student with the data we have created, including Python libraries for visualizing the data.

Introducing tree search algorithm implementations on Python.

Designing assemblies with moving components for 3D printing.

Mentoring plan: In the first two weeks, I will introduce you to the problem and its scope and what my team has accomplished so far.

In week 2, you will learn about the details of how the dataset was automatically created from my postdoc.

In week 3, my graduate student working on the broader problem will introduce you to the puzzle solving approach done so far

In weeks 4 - 8, the CS student will learn how to create and use tree search algorithms like Breadth-first; the ME student will learn about designing for additive manufacturing, especially for moving assemblies, printed in assembled state.

In weeks 9 - 12, you are anticipated to show the results of your efforts.

In weeks 13 - 5, you will participate in writing a report or potentially a paper led by my student and postdoc.

I will have a bi-weekly one-on-one meeting with you to answer any questions about the objective of the research, methods we use, and how to demonstrate successful outcomes, including on your resume and future job applications if needed.

Applicant Requirements: For the CS student:

- Familiarity with data structures and algorithms

- Familiarity with Python

- Basic familiarity with Git and optionally VS Code

For the ME student:

- Familiarity with mechanics of materials

- Familiarity with one CAD software of your choice

- Basic familiarity with 3D printing (you should know advantages of 3D printing and understand concepts like support structures and minimum clearance)

Applicant Preferences: CS student:

- prior experience with deploying Python or C++ code on an HPC cluster

- GPU programming

- Familiarity with computational geometry problems

ME student:

- prior experience with 3D printing moving mechanisms

- prior experience with optimizing structural design

- prior experience with FEA tools like Abaqus

Specific Time considerations/conflicts: Bi-weekly one hour in-person meeting TBD.

App ID #: 1696 **Mentor:** Diab, Kefaya

Email: kdiab@charlotte.edu Title: Assistant Professor

**Department:** Writing, Rhetoric, and Digital Studies

Co-mentor: No

Community engaged research: 1696

**Title:** Palestinian Narratives of the Diaspora

**Description:** In the Spring of 2025, 2 students and I filmed interviews with three community members in Charlotte and Greensboro NC, to narrate their narratives about their Palestinian identities in the diaspora. The interviewees told us what it meant to them to be Palestinians away from their homeland, and how they developed and maintained their Palestinian identity while living outside Palestine.

During the Fall of 2025, I'd like to work with one student on watching the filmed footage and video-editing it into a series of short films that combine the various individual narratives on one website. Also, I might identify new community members to narrate their stories and include in the documentary film series, and therefore the student research assistant will be involved in filming these interviews.

Through hands-on activities, observations, and online tutorials the student will learn about basics of filming and video-editing , which are essential tools of digital research that they are likely to use in their future careers.

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

1 *positions available*

Anticipated Student Learning Outcomes: The student will learn, develop, and practice filmmaking and video-editing skills that are essential to their further academic education and future careers. Digital making skills are currently highly needed in the workplace. So students who have digital filmmaking experience will have competitive skills upon graduation.

Required training of 10 hours with Description: I will provide training to students in filmmaking and video-editing using Adobe Premier video-editing software as well as other free video-editing software. However, students need to be able to work independently and self-learn more advanced principles of filmmaking and video editing through many online sources, some of which I will aggregate for them.

Mentoring plan: I will mentor the student research assistant throughout the whole process of documentary filmmaking to include the pre-production, production, and post-production stages. The process of documentary filmmaking includes:

Preparing for the interviews by coming up with interview question

Reading, annotating, and discussing with me secondary resources about documentary fimmaking theory and practice

Assisting me with filming interviews

Watching old and new footage and identifying key clips to include in the short documentaries

Learn video-editing by observing me video-editing footage, and learning from online tutorials and other sources

Practice web-design and online publishing to circulate the short documentary series to reach out its targeted audiences

Applicant Requirements: I am looking for a student research assistant who has the following qualification:

Self-learner who takes initiative to learn beyond what I have to offer them

Patient with technology and willing to learn and practice filmmaking, and troubleshoot video-editing with and without my assistance

Has interest in documentary filmmaking

Organized and responds well to deadlines

Critical and creative thinker

Good writing skills

Applicant Preferences:

Preferably (but not necessarily) bilingual and fluent in both Arabic and English as some of the documentary film series interviewees might speak Arabic during the filmed interviews

Having a filmmaking and video-editing experience is a plus, but not necessary as I will train the student to do that work

Specific Time considerations/conflicts: My schedule is flexible in the fall of 2025. I will construct a work schedule that works with the student and my schedule.

App ID #: 1645 **Mentor:** Sarkar, Kaustavi

Email: ksarkar@charlotte.edu Title: Assistant Professor

**Department:** Dance

Co-mentor: No

Community engaged research: 1645

**Title:** South Asian Dance Intersections

**Description:** South Asian Dance Intersections is a peer-reviewed journal focusing on dances of South Asia and its diaspora. This journal is looking for a research intern who will help in the production of the fourth issue of this journal, the Call for Proposals for which is titled "Pedagogies of Crossing." In addition, the research scholar will be responsible for the production of a special issue that will focus on the conference proceeds of 2023 and 2024 online Odissi Odyssey Research Seminars. The project will entail learning and applying careful reading, copy-editing, and assisting in writing the "Editorial Prologue" for the two issues. The job will involve a mix of administrative, editorial, and content management tasks. But, it will also involve grant-writing skills as the journal is looking to target grants in the National Endowment for the Humanities for digital publications. The student will be responsible for three broad areas of activity.

1. Editorial Assistance

2. Organization and Support

3. Grant Writing and Research

The student will be responsible for proofreading manuscripts, writing summaries for the journal website, formatting content according to house style guidelines, managing post double-blind peer-review correspondence with authors, editors, and designers, and writing grants to target regional and national councils on humanities that focus on the development of discourse in the arts.

The student will need strong writing and editing skills, excellent time management for handling multiple and often competing deadlines, research skills, and communication skills as the work would entail working with different teams.

Working as an Editorial Assistant comes with several benefits, especially in a career in publishing, journalism, or media. You gain firsthand knowledge of the publishing or editorial process. It is a creative learning experience and a huge boost to your resume. You immediately broaden your network of professionals and gain visibility amongst industry professionals. You sharpen your writing, editing, research, and organizational skills. This role is often a stepping stone to positions like Associate Editor, Senior Editor, or Editor-in-Chief. You collaborate with editors, writers, designers, and publishers, which helps expand your professional network. You get to proofread, fact-check, and even contribute to publications. Most importantly, you get exposed to new ideas and diverse projects, especially in the field of academic research. You gain flexibility and a variety of career options, often with flexible work arrangements. Writing, editing, and research skills can be applied across a range of fields and experiences. This job helps students engage with meaningful content and an excellent launchpad for careers in journalism, publishing, and media. The

experience you gain is invaluable for long-term career growth in the publishing world. If passionate about content and storytelling, this will be an exciting and rewarding journey.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

1 *positions available*

Anticipated Student Learning Outcomes:

Student Learning Outcomes for the Research Internship at South Asian Dance Intersections:

Through this research internship, students will:

1. Develop Advanced Editorial Skills – Gain experience in proofreading, copy-editing, and formatting scholarly manuscripts according to academic publishing standards.

2. Enhance Research and Analytical Abilities – Learn to conduct in-depth literature reviews, fact-check sources, and summarize key arguments from peer-reviewed articles and conference proceedings.

3. Improve Academic and Professional Writing – Assist in writing the "Editorial Prologue" for journal issues, refining skills in scholarly and editorial writing.

4. Gain Practical Experience in Peer-Review Management – Understand the double-blind peer-review process, including managing correspondence with authors, editors, and reviewers.

5. Strengthen Organizational and Project Management Skills – Handle multiple editorial tasks, track deadlines, and coordinate with diverse teams, balancing competing priorities in a fast-paced publishing environment.

6. Learn Grant Writing Strategies – Develop skills in identifying funding opportunities, writing grant proposals, and targeting regional and national humanities councils for financial support.

7. Expand Digital Publishing and Content Management Knowledge – Gain familiarity with online academic publishing platforms, website content updates, and digital formatting in scholarly publishing.

8. Increase Cross-Cultural and Interdisciplinary Awareness – Engage with South Asian dance studies, diasporic performance practices, and arts-based humanities research, fostering a global and interdisciplinary perspective.

9. Build Strong Communication and Networking Skills – Work closely with editors, authors, designers, and scholars, developing professional relationships within the publishing and academic communities.

10. Prepare for Careers in Publishing, Journalism, and Academia – Acquire transferable skills applicable to editorial roles, research positions, grant writing, and arts administration, serving as a stepping stone to careers in media, academia, and cultural organizations.

Required training of 2 hours with Description: Key Benefits of This Onboarding Process lie in Smooth transition into editorial, research, and grant-writing responsibilities, a Structured learning

path with both  mentorship and independent tasks, Tangible skills development in editing, research, and publishing, and Career-building opportunities through networking and portfolio creation. A structured onboarding process ensures that the research intern quickly adapts to their role and responsibilities. Below is a step-by-step outline:

1. Pre-Onboarding

Welcome Email & Documents

- Receive a welcome email outlining key details (start date, expectations, and resources).

- Review and sign any necessary agreements or NDAs (if applicable).

Introduction to the Journal & Role

- Receive background reading materials on South Asian Dance Intersections, past issues, and the Call for Proposals ("Pedagogies of Crossing").

- Overview of the journal's mission, editorial standards, and peer-review process.

Technology & Access Setup

- Gain access to journal-related platforms, shared drives, style guides, and content management systems (CMS).

- Set up an official email for communication.

2. Orientation & Training (First Week)

Welcome Meeting with the Editorial Team

- Introduction to editors, designers, and fellow team members

- Discuss the structure of the fourth issue and the special issue based on Odissi Odyssey Research Seminars.

Editorial Training & Workflow Overview

- Training on proofreading, copy-editing, formatting manuscripts, and house style guidelines.

- Walkthrough of how to manage double-blind peer-review correspondence.

- Learning how to summarize articles for the journal website.

Grant Writing Introduction

- Overview of grant funding opportunities (e.g., National Endowment for the Humanities, North Carolina Humanities Council).

- Basics of writing grant proposals and identifying potential funding sources.

3. Hands-On Training & Mentorship (Second to Fourth Weeks/ First Month)**

Supervised Task Assignments

- Begin working on small proofreading and editing tasks with feedback from mentor.

- Draft initial summaries for journal content and refine writing skills.

Check-in Meetings & Feedback

- Weekly or biweekly meetings with mentor to track progress.

- Adjust workflow and receive constructive feedback on editorial work.

Grant Proposal Writing Practice

- Assist in drafting grant application sections with guidance from mentors.

4. Independent Work & Ongoing Support (Months 2–3)

Increased Responsibility & Autonomy

- Take on more complex editorial tasks, including working directly with authors.

- Lead aspects of content management and digital publishing.

Cross-Team Collaboration

- Work with graphic designers on layout and formatting.

- Coordinate with authors and peer reviewers for revisions.

- Finalize at least one grant proposal for submission.

- Identify future funding opportunities for the journal.

Mentoring plan: Mentoring Plan for the Research Internship at South Asian Dance Intersections

A structured mentoring plan ensures the research intern receives guidance, professional development, and opportunities for independent growth. This plan includes regular check-ins, skill-building sessions, and networking opportunities to help the intern excel in editorial work, research, and grant writing.

Mentorship Goals

By the end of the internship, the intern will:

Develop advanced editorial and research skills in academic publishing.

Gain hands-on experience with peer-review management and grant writing.

Build confidence in writing, communication, and project management.

Establish connections with scholars, editors, and publishing professionals.

Create a portfolio of editorial work and grant-writing samples.

Mentorship Structure

Initial Training & Guided Learning: Provide foundational training in editing, research, peer-review, and grant writing

Weeks 1-3

Onboarding & Goal Setting

- One-on-one meeting with  mentor to set personalized learning objectives

- Overview of journal operations, peer-review process, and publishing guidelines

Editorial Skills Development

- Shadow editors to learn copy-editing, formatting, and proofreading techniques.

- Receive editing assignments with detailed feedback.

Research & Peer Review Management

- Training on summarizing research articles for the journal website.

- Observe and assist with peer-review correspondence

Introduction to Grant Writing

- Overview of grant funding sources (e.g., National Endowment for the Humanities)

- First drafting exercise for a grant proposal, with mentor feedback.

Weeks 4-6

Phase 2: Hands-On Work with Structured Feedback

- Gain independent project responsibilities with regular check-ins.

- Review work progress, address challenges, and refine skills.

- Discuss best practices for academic editing, research writing, and grant applications.

Peer-Review Management & Author Correspondence

- Take lead responsibility in coordinating post-review revisions

- Receive feedback on professional communication strategies

Editorial Writing & Research Tasks

- Assist in writing and refining the "Editorial Prologue" for journal issues.

- Conduct independent research to support editorial projects.

Grant Proposal Development

- Work on a real grant proposal draft incorporating mentor feedback.

- Learn strategies for writing compelling funding applications

Networking & Professional Development

- Mentor introduces intern to publishing professionals and researchers

- Attend at least one industry webinar, conference, or editorial meeting

- Organize the launch of the fourth and the special issue with the conference proceedings

Measuring Mentorship Success

Feedback Forms – Intern and mentor exchange feedback at the midway point and end of the internship.

Final Presentation – Intern presents key learnings and achievements to the editorial team meetings after the launch of the respective issues.

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By following this structured mentorship plan, the intern will leave with:

A strong portfolio of editorial and grant-writing work

Professional connections in publishing and academia

Confidence in managing editorial tasks, peer reviews, and research projects

A clear pathway for future careers in publishing, media, or academic research

Applicant Requirements: For the Research Internship at South Asian Dance Intersections, we are looking for a motivated, detail-oriented, and intellectually curious student who is eager to engage in the fields of South Asian dance studies, academic publishing, and humanities research. This role requires a strong foundation in writing, editing, research, and organizational skills, as well as an ability to work both independently and collaboratively.

While prior experience in editorial work or grant writing is a plus, we are most interested in students who demonstrate a passion for research, critical thinking, and effective communication. The ideal candidate is someone who enjoys working with scholarly texts, analyzing academic discourse, and engaging with the intersections of dance, culture, and the humanities.

Qualifications & Desired Skills

We recognize that students come from diverse academic backgrounds and experiences, so we welcome applicants who possess a combination of the following key skills and attributes:

Strong Writing and Editing Abilities

Ability to write and edit clearly, concisely, and analytically, particularly in an academic or professional setting

Familiarity with proofreading, copy-editing, and formatting documents according to a style guide (MLA preferred).

Capacity to summarize complex research articles into accessible, engaging content for a general audience.

Research and Critical Thinking Skills

Experience conducting academic research, literature reviews, or textual analysis in the humanities or social sciences.

Strong attention to detail and accuracy when fact-checking and synthesizing information.

Familiarity with scholarly databases (JSTOR, Project MUSE, Google Scholar) and library research methods.

Interest in South Asian Dance, Performance Studies, or Cultural Humanities

While a formal dance background is not required, applicants should have an interest in South Asian dance, diaspora studies, or interdisciplinary humanities research

Familiarity with concepts in performance theory or cultural studies is a plus.

Willingness to engage with academic discussions on dance pedagogy, digital humanities, and artistic research

Organizational and Project Management Skills

Ability to track multiple deadlines, manage editorial correspondence, and organize digital files efficiently.

Experience handling administrative tasks, such as scheduling, coordinating with multiple teams, or maintaining project documentation.

A proactive approach to problem-solving and an ability to adapt to new editorial or research tasks

Communication and Collaboration Skills

Comfort with professional email communication when corresponding with authors, editors, and peer reviewers.

Ability to provide and receive constructive editorial feedback in a collaborative environment.

Interest in working closely with a small, dynamic editorial team and contributing to a peer-reviewed journal's production process.

Digital Literacy and Technical Proficiency

Basic familiarity with Microsoft Word (track changes), Google Docs, and reference management tools (Zotero, EndNote, or Mendeley).

Comfort with content management systems (CMS) or online publishing platforms is a plus.

An openness to learning new digital tools for academic publishing and grant writing

Interest or Experience in Grant Writing (Preferred but Not Required)

Some exposure to grant writing, fundraising, or non-profit work is helpful but not necessary.

Willingness to learn about grant application processes, funding opportunities, and proposal development for humanities research.

Relevant Coursework & Experiences

While we do not require applicants to come from a specific major, students with coursework in the following fields will likely find this internship particularly enriching:

Humanities Disciplines – English, Comparative Literature, History, Philosophy, Religious Studies, or Cultural Studies.

Social Sciences – Anthropology, Sociology, or Communication Studies, especially with a focus on performance, diaspora, or cultural theory.

Dance & Performance Studies – Students studying dance history, ethnography, choreography, or arts criticism are strongly encouraged to apply.

Journalism, Publishing, or Media Studies – Those with experience in editorial work, content management, or digital humanities will find this internship valuable.

Public Humanities & Grant Writing – Students with experience in funding applications, arts administration, or academic outreach are also encouraged to apply.

Additionally, students who have written academic papers, blog posts, or articles for student-run journals, newspapers, or online platforms, edited peer-reviewed publications, literary magazines, or newsletters, conducted independent research projects, thesis work, or archival studies, and assisted professors with research assistance, bibliographies, or conference planning are strongly encouraged to highlight these experiences in their applications.

We welcome applicants who:

Have an interest in academic publishing and humanities research

Are curious about South Asian dance, diaspora studies, or cultural intersections

Enjoy editing, writing, and collaborating in a professional environment

Are looking to develop valuable skills in publishing, grant writing, and research

Want to gain **hands-on experience in a peer-reviewed journal setting

This internship is an excellent opportunity for students considering careers in:

Academic Publishing (Editorial Assistant, Research Editor, Journal Management)

Journalism & Writing (Cultural Critic, Arts Journalist, Research Writer)

Dance & Performance Studies (Arts Administrator, Dance Scholar, Curator)

Academia & Research (PhD Programs, Humanities Fellowships, Research Institutes)

Nonprofit & Grant Writing (Humanities Grants, Arts Administration, Cultural Funding)

Applicant Preferences: For the Research Internship at South Asian Dance Intersections, we are looking for a motivated, detail-oriented, and intellectually curious student who is eager to engage in the fields of South Asian dance studies, academic publishing, and humanities research. This role requires a strong foundation in writing, editing, research, and organizational skills, as well as an ability to work both independently and collaboratively.

While prior experience in editorial work or grant writing is a plus, we are most interested in students who demonstrate a passion for research, critical thinking, and effective communication. The ideal candidate is someone who enjoys working with scholarly texts, analyzing academic discourse, and engaging with the intersections of dance, culture, and the humanities.

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Familiarity with proofreading, copy-editing, and formatting documents according to a style guide (MLA preferred).

Capacity to summarize complex research articles into accessible, engaging content for a general audience.

Research and Critical Thinking Skills

Experience conducting academic research, literature reviews, or textual analysis in the humanities or social sciences.

Strong attention to detail and accuracy when fact-checking and synthesizing information.

Familiarity with scholarly databases (JSTOR, Project MUSE, Google Scholar) and library research methods.

Interest in South Asian Dance, Performance Studies, or Cultural Humanities

While a formal dance background is not required, applicants should have an interest in South Asian dance, diaspora studies, or interdisciplinary humanities research

Familiarity with concepts in performance theory or cultural studies is a plus.

Willingness to engage with academic discussions on dance pedagogy, digital humanities, and artistic research

Organizational and Project Management Skills

Ability to track multiple deadlines, manage editorial correspondence, and organize digital files efficiently.

Experience handling administrative tasks, such as scheduling, coordinating with multiple teams, or maintaining project documentation.

A proactive approach to problem-solving and an ability to adapt to new editorial or research tasks

Communication and Collaboration Skills

Comfort with professional email communication when corresponding with authors, editors, and peer reviewers.

Ability to provide and receive constructive editorial feedback in a collaborative environment.

Interest in working closely with a small, dynamic editorial team and contributing to a peer-reviewed journal's production process.

Digital Literacy and Technical Proficiency

Basic familiarity with Microsoft Word (track changes), Google Docs, and reference management tools (Zotero, EndNote, or Mendeley).

Comfort with content management systems (CMS) or online publishing platforms is a plus.

An openness to learning new digital tools for academic publishing and grant writing

Interest or Experience in Grant Writing (Preferred but Not Required)

Some exposure to grant writing, fundraising, or non-profit work is helpful but not necessary.

Willingness to learn about grant application processes, funding opportunities, and proposal development for humanities research.

Relevant Coursework & Experiences

While we do not require applicants to come from a specific major, students with coursework in the following fields will likely find this internship particularly enriching:

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Additionally, students who have written academic papers, blog posts, or articles for student-run journals, newspapers, or online platforms, edited peer-reviewed publications, literary magazines,

or newsletters, conducted independent research projects, thesis work, or archival studies, and assisted professors with research assistance, bibliographies, or conference planning are strongly encouraged to highlight these experiences in their applications.

We welcome applicants who:

Have an interest in academic publishing and humanities research

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Enjoy editing, writing, and collaborating in a professional environment

Are looking to develop valuable skills in publishing, grant writing, and research

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This internship is an excellent opportunity for students considering careers in:

Academic Publishing (Editorial Assistant, Research Editor, Journal Management)

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Dance & Performance Studies (Arts Administrator, Dance Scholar, Curator)

Academia & Research (PhD Programs, Humanities Fellowships, Research Institutes)

Nonprofit & Grant Writing (Humanities Grants, Arts Administration, Cultural Funding)

Specific Time considerations/conflicts: I have flexible meeting times.

App ID #: 1646

**Mentor:** Smith, Megan

Email: ssmit392@charlotte.edu

Title: Assistant Teaching Professor

**Department:** Sociology

Co-mentor: No

Community engaged research: 1646

**Title:** Aging in the Correctional System: Challenges and Policy Solutions

**Description:** Aging inmates are particularly vulnerable to the harsh conditions of prison life, which can exacerbate pre-existing mental health issues and lead to new psychological problems. It is crucial to recognize their unique needs and ensure they receive appropriate care and support to maintain their mental well-being. Physical and mental health challenges exist in these environments, such as chronic illness and cognitive decline. Older inmates are more likely to suffer from chronic illnesses such as diabetes, heart disease, and arthritis. The stress and lack of proper medical care can worsen these conditions, leading to significant mental distress, including cognitive decline and dementia, which requires specialized care and support. The prison environment can be isolating, with limited opportunities for meaningful social interaction. This isolation often leads to feelings of loneliness, depression, and anxiety. Being separated from family and loved ones can further exacerbate feelings of loneliness and abandonment.

Unfortunately, inadequate mental health services in the form of limited access, stigma and neglect contribute to poor mental health outcomes and lack of help seeking. Many prisons lack adequate mental health services, leaving aging inmates without the support they need to manage their mental health issues. Additionally, prison staff may not be adequately trained to recognize and address these issues. The environmental stressors of inmate life include both violence, forms of abuse and a lack of privacy, adding to the stress and anxiety experienced by aging inmates. The lack of privacy and personal space can be particularly distressing for older inmates, who may need more quiet and restful environments.

Building on the first goal of the study which will have develop a training program for Correctional Officers (COs) at North Carolina state prisons, especially those working in the few geriatric units operating in the state. Working with data from the pilot study conducted in the summer, there are two goals. The first is to start writing manuscripts, with students as co-authors, to scholarly journals. Ideally after gathering data from the pilot study, tailored suggestions for a more comprehensive training program at more prisons will be developed to achieve some of the below policy recommendations. The second and concurrent goal is to more widely implement the training programs across the state or possibly among multiple states in the fall. In the spring, data will be analyzed and more writing on manuscripts will take place. At this juncture, we can start working on policy briefs or engaging with the with the larger community on how to help with early and compassionate release.

Suggested policy recommendations fall into four categories. Firstly, a focus on improved living conditions to ensure that prisons have age-appropriate facilities, including accessible housing and medical care. Secondly, the development of mental health programs by implementation of

comprehensive mental health programs that provide regular counseling, therapy, and support groups for aging inmates. Thirdly, training for staff to recognize and address the unique mental health needs of older inmates. And, lastly an exploration of efficacy of early release and alternatives to incarceration. Advocacy for policies that allow for the early release of non-violent, aging inmates and exploration of alternatives to incarceration, such as community-based programs is greatly needed.

Ensuring humane treatment and implementing better policies for aging prisoners is not only a moral imperative but also a practical necessity to prevent the deterioration of their mental health. By addressing their unique needs, we can create a more humane and just correctional system that respects the dignity and well-being of all inmates.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

3 *positions available*

Anticipated Student Learning Outcomes: As a student, there are a number of benefits for your participation.

Refine research skills that represent career competencies beneficial when applying for jobs or graduate school, such as critical thinking, communication, and professionalism.

The experience provides opportunities as a resume builder. The applied experience and teamwork and collaboration will allow you to be a stand out applicant in future employment interviews or in graduate school applications.

For those who have not completed their research methods or capstone/senior seminar requirements, this project can serve as a basis for your topic and will be helpful as you already have the research skills for any methods class you will take in the future.

Also, you will learn first hand that research is fun! I promise that your the year will not be dull!

The goal is for students to present the work at the end of the term and work with me to find an additional conference to present the findings at for the following semester or academic year.

Required training of 20 hours with Description: They will need to complete the CITI Training very quickly upon entrance to the program so that I can add them to an IRB application I am working on currently

Mentoring plan: My main role as a faculty member is to deliver content information and resources for your success; this research opportunity is no different. I believe in all students' ability to succeed through practice and applied experience by providing step by step activities to increase both academic skill sets and confidence. My approach to student success is also considering your experiences beyond the classroom; certain tasks within the research project are aimed at further developing career competencies such as professionalism, critical thinking, teamwork and collaboration, and leadership. Lastly, while the project benefits the group, myself included, I want to ensure that individual students have open dialogue with me to always feel supported through

conversation and resources to provide a fun experience. My commitment to you is to be present, communicative, and supportive in the ways that will help you succeed in our collaboration.

Students will work directly with me and the expectation is that there will be email communication several times during the week (M-F). When tasks are given, the expectation is that they will be completed by the due date, which will be provided with ample time to complete. I do not believe in short timelines, unless absolutely necessary, nor working on the weekends, unless work was not completed during the week. I expect students to attend all team meetings via Zoom on Mondays and at the training which will likely be one day. I do expect students to engage with me and proactively seek support when needed.

Applicant Requirements: The ideal candidate has strong and effective written and oral skills that have been learned and refined in previous coursework and in employment settings. A student with coursework in gerontology, sociology, criminal justice and/or specialties in mental health within majors and programs in CHHS are most desired. Additionally, the ideal candidate demonstrates consistency, coursework success, interest in the topic specifically (experience is ideal), and generally be proactive in seeking opportunities that lead to student success.

Applicant Preferences: I would like a team of students that possess different academic knowledge and skills as well as life experiences. I am looking for students who are dependable, energetic, enthusiastic and are genuinely interested in the topic. The goal is to make substantial progress and that will not happen without these traits. I also desire students who are humble enough to ask for help and resources when needed.

Specific Time considerations/conflicts: We will have a weekly research meeting, but this can be held over Zoom. I expect students to attend all of those meetings. They will likely be on held on Monday mornings. For trainings, the dates are TBD.

App ID #: 1647

**Mentor:** Schmutz, Vaughn

Email: vschmutz@charlotte.edu

Title: Associate Professor

**Department:** Sociology

Co-mentor: No

Community engaged research: 1647

**Title:** Assessing the social impact of the arts in Charlotte

**Description:** This project is part of a longer-term line of research that explores the variety of arts-based programs in Charlotte that aim to make some type of social impact. In particular, this project will focus on 35 artists and arts organizations that were awarded Opportunity Fund grants for the 2024-2025 fiscal year by the city of Charlotte. We have partnered with the city to provide support for evaluation research projects and we are also exploring the goals, motivations, and beliefs of the grantees about their impact on the community. Therefore, we will be examining the impact of the programs on their goals and outcomes of interest as well as assessing overall progress on the priorities of the city's Arts & Culture plan. Surveys and interviews with providers and participants of arts-based programs will be some of the data sources used in the project.

Because the specific project with the City of Charlotte and the Opportunity Fund grantees has been going since 2024, the Fall OUR Scholar for 2025 will have a unique and exciting role in helping analyze the data we have collected and create the report we will provide to the City and the grantees. This will give the student the opportunity to be a collaborator and co-author on the report and potentially subsequent academic publications that stem from our findings.

*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, particularly given that it is community-engaged and includes both basic and applied research questions. Some of the learning outcomes include:

1. Learning to communicate research findings to different audiences. Given that we will be working directly with community partners (i.e., arts-based programs in Charlotte), we will be reporting findings with practical usefulness to grantees and other stakeholders while also further academic research on the broader impacts of these activities in the community.

2. Data collection and analysis. I anticipate that students will get hands-on experience collecting survey and interview-based data. Given that we have already collected quite a bit of this type of data, the 2025 Fall Scholar will get a great deal of experience learning and practicing how to analyze 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 also join students that are being paid through our contract with the city. So, they will have the

opportunity to join our arts research team and learn how to collaborate on shared projects and potentially have co-authoring opportunities as a result.

Required training of 6 hours with Description: Students will need to complete the CITI training for human subjects research.

Other than that, I will help provide training in NVivo for qualitative analysis and will determine what quantitative training will be necessary (this will depend on the skills and software preferences of the students). The great thing is that we have students on the project that now assist with training and helping new students get up to speed on how to collect, manage, and analyze different types of data. If students are involved in conducting interviews, they will also get specific training in that as well.

Mentoring plan: As suggested above, the students will join a highly active arts research team. We have weekly team meetings, but we also have individual meetings as needed, typically every other week, to discuss individual projects. Depending on the student's personal goals and interests, they may have opportunities to collaborate on technical reports or academic papers, present at academic conferences, etc. I provide hands-on mentoring with regular check-ins.

Applicant Requirements: Willingness to work hard and work well as a team. Strong interpersonal skills and a willingness to collaborate with other students and communicate with the faculty mentor are also important skills. Attending some arts events in the community may be required as well.

Applicant Preferences: Ideally, a student will have completed a social science research methods course but this is not required. Any previous experience with data analysis (either qualitative or quantitative) is a plus, but not required. An interest in community-based arts or other types of community-engaged work is a plus, but not required.

Specific Time considerations/conflicts: N/A. We will be able to accommodate student schedules to find team meetings and participate in other events.

App ID #: 1648 **Mentor:** Balmer, Jeffrey

Email: jdbalmer@charlotte.edu Title: Associate Professor

**Department:** David R Ravin School of Architecture

Co-mentor: No

Community engaged research: 1648

**Title:** Modeling Moretti: Architectural Analysis of Mid-century Masterworks in Rome

**Description:** This research project comprises an analysis of architect Luigi Moretti's ONB Trastevere building and his 'Casa delle Armi' project, both in Rome, both completed in 1936. Drawn from the comprehensive set of design drawings (sketches and blueprints) of the buildings in the Central State Archives (ACS) in Rome and the Moretti Magnifico Archive (MMA) held at Rome's MAXXI museum, this research project involves 'forensic reconstruction' of the complex evolution of the design process of both buildings.. Aiding in this effort, I'll rely on a student research assistant to help me complete detailed digital models and drawings of Moretti's projects, enabling the first comprehensive documentation of the two projects, and to generate series of diagrams and drawings articulating and analyzing the design and subsequent modifications made to both buildings. I will work closely with the student research assistant, meeting with them weekly to provide oversight of the student's development of the digital model through joint examination of the archival drawings of the buildings.

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

2 *positions available*

Anticipated Student Learning Outcomes: There are 3 primary anticipated SLOs derived from conducting this research work:

1. Improved skill and proficiency associated with the digital modeling (primarily 'Rhinoceros') and digital drawing and diagramming (primarily the Adobe software suite) that the student will use heavily throughout the semester's work.

2. Enhanced skill and proficiency in recognizing and replicating architectural 'drawing conventions', both with respect to the 'close reading' of archival blueprints of the buildings under study, and the generation of new drawings which employ a 'professional level' of drawings reliant upon relevant drawing conventions.

3. Enhanced critical thinking, particularly with respect to the careful examination and comparison of archival documents, including blueprints, sketches, photographs and text (translations provided by myself), with the aim of developing comparative analysis and deductive reasoning, supported by an enhanced understanding of the general subject (architectural history, modernist architecture, 20th century Italian architectural and political history).

Required training of 0 hours with Description: Successful applicant will likely be drawn from full-time 3rd or 4th Year undergraduate architecture student, who will therefore possess a relevant level of proficiency in Rhinoceros digital modeling software, and the related graphic software of the

Adobe suite of applications. "On-boarding" (in terms of getting students up to speed on the background of the buildings under study) will take place during the first several weekly meetings.

Mentoring plan: Student(s) will work directly under my supervision. We will meet for 1-2 hours every week at a time that works within the students' schedule of classes and other commitments. By assisting with archival research within the discipline in which the student is enrolled (full time architectural studies), there is a direct benefit towards a greater facility with digital modeling and drawing tools, an enhanced understanding of the drawing and professional conventions of architectural drawings ('blueprints'), and enhanced critical capacity for examination and analysis of architectural drawings and models. Additionally, students will gain an enhanced historical perspective - learning in the process of the work about the history of modernist architecture, particularly Italian 20th century architecture, and the cultural and political context of these histories. Similar in nature to the high level of one-on-one contact that architecture students engage in with faculty in the design studios (more commonly referred to as 'labs' in other disciplines), the significant contact hours intrinsic to this research assistantship will provide a significant opportunity for both general and 'directed' mentorship for students intent on pursuing either a career as a professional architect, or a related academic field.

Applicant Requirements: Minimum student qualifications for this research proposal would include working knowledge of RHINO software, or similar digital modeling platform, as well as Adobe Illustrator and Photoshop. This work would be ideally suited to an undergraduate student in their 3rd or 4th year of full-time architectural studies.

Applicant Preferences: I've had great success with my OUR scholars in recent years by soliciting my colleagues who are familiar with the 'rising' 3rd and 4th year undergraduate classes here at the School of Architecture, from which my colleagues suggest students I thereafter encourage to apply to OUR. A preferred student applicant should possess an appropriate 'year-level' facility with the digital modeling (Rhino) and drawing applications used throughout the undergraduate architecture curriculum. Equally importantly, a preferred student applicant should have optimal 'time management' skills (essential to cope with the simultaneous demands of full-time enrollment in an architecture program plus a research assistantship), critical thinking skills (to ably 'connect the dots' for the work at hand), and personal responsibility (maintaining open and ongoing communication channels, keeping up with progress on assigned work.

Perhaps most importantly, the best applicants demonstrate a high degree of curiosity and enthusiasm for the work at hand. Most of the students who have conducted this work via OUR are those who subsequently enroll in the semester study program in Rome that I direct - thus, these students are motivated by the eventual visits to the buildings while they are studying in Rome.

Specific Time considerations/conflicts: No likely conflicts.

App ID #: 1649 **Mentor:** Sun, Mei

Email: msun8@charlotte.edu Title: Associate Professor

**Department:** Civil and Environmental Engineering

Co-mentor: No

Community engaged research: 1649

**Title:** Removing "forever chemicals" (PFAS) from drinking water by filtration

**Description:** PFAS are a group of organic contaminants toxic to human beings and the ecosystem. PFAS are widely used in many products like nonstick cookware and fire-fighting foams, and end up everywhere in our environment. They are very resistant to many existing treatment methods and stay in our body/the environment for years or even decades, therefore are called "forever chemicals". This project aims to improve current filtration methods to remove PFAS from our drinking water. We will use small lab setups to simulate treatment processes in water treatment plants, and optimize PFAS removal by adding different types of chemical reagents and controlling the reaction conditions.

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

1 *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 realworld

environmental challenges and shaping future solutions.

• Methodology to explore new areas: learn how to get started with an unfamiliar territory by finding relevant

information, reading literature, making testable hypothesis, implementing a realistic workplan, 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, resources for help, and opportunities for authorship if they

produce high-quality results that can be published in 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 #: 1650 **Mentor:** Sun, Mei

Email: msun8@charlotte.edu Title: Associate professor

**Department:** Civil and Environmental Engineering

Co-mentor: No

Community engaged research: 1650

**Title:** "Forever chemicals" (PFAS) in menstrual products

**Description:** PFAS are a group of organic contaminants toxic to human beings and the ecosystem. Some news reports suggest possible presence of PFAS in menstrual products, but no details are revealed on how common this issue is, which PFAS formulae are present, and at what levels PFAS are detected. The goal of this project is to examine both individual and total PFAS concentrations in a wide variety of menstrual products on the market.

*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 realworld

environmental challenges and shaping future solutions.

• Methodology to explore new areas: learn how to get started with an unfamiliar territory by finding relevant

information, reading literature, making testable hypothesis, implementing a realistic workplan, 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, resources for help, and opportunities for authorship if they produce high-quality results that can be published in conference presentations or scientific papers.

Applicant Requirements: •Enthusiasm for environemtnal issues 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 #: 1651 **Mentor:** Berez, Jaime

Email: j.berez@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1651

**Title:** Novel 3D printed instructional tools for geometric dimensioning and tolerancing

**Description:** Geometric dimensioning and tolerancing (GD&T) is a system of syntax (symbols, terminology) and semantics (rules, guidance, conditions) that is used to create rigorous engineering drawings that fully define the geometrical specifications for a component. GD&T requires strong spatial reasoning skills to comprehend the three-dimensional shapes, tolerance zones, and geometrical errors that make up the fundamentals of this complex topic. Typically, these skills are difficult to teach and learn. The objective of this research project is to develop physical demonstration tools that embody GD&T concepts and assist instructors in explaining those concepts to students. Rapid prototyping tools, such as 3D printing, will be utilized to make these demonstrators. Other objectives include the documentation of all teaching tools (CAD files, 3D printing files, accompanying explanations, etc.) in a manner that can support open-source deployment of them. Methods for assessing the effectiveness of teaching tools will also be designed. The student researcher will assist in developing these demonstrators using a variety of rapid prototyping tools in the lab. They will also be expected to help generate new ideas for related tools.

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

1 *positions available*

Anticipated Student Learning Outcomes: Students will gain experience working in a research lab setting. They will learn good project management and communication skills through weekly progress reports. They will gain experience working a variety of cutting-edge technologies including manufacturing systems, characterization instruments, and metrology equipment. They will develop skills in computer aided design, parametric modeling, mechanical design, and rapid prototyping.

Required training of 0 hours with Description: Students will receive training on an as-needed basis depending on the parameters of the project that they develop during the first stage of on-boarding. Training will include hands-on training for use of specialized equipment by the faculty member or another expert user as well as targeted instruction on the use of relevant software packages.

Mentoring plan: Students will have weekly in-person meetings with the faculty member. Further ad-hoc meetings to conduct training, assist in research tasks, etc. will also be conducted. Students will work with the faculty member to develop a "Research Expectations" plan at the beginning of the work period where milestones, deliverables, and a timeline are collaboratively developed and required assistance from the faculty member is identified. The student will also be introduced to other students in the lab in order to facilitate a collaborative work environment.

Applicant Requirements:

Interest in research-based inquiry into manufacturing and metrology

Professional work ethic and good organizational/communication skills

Second year status or higher standing (as of Fall 2025) at UNC Charlotte with a major in mechanical engineering, mechanical engineering technology, or a related area

Experience with CAD, 3D printing, rapid prototyping, machining, and similar practices

Applicant Preferences:

Experience using GD&T in industrial settings

Specific Time considerations/conflicts: General availability for in-person work during standard weekday working hours, e.g., 9-5 M-F (not including class) is required so that the student may have a weekly meeting with the adviser, attend weekly lab meetings, and schedule independent research.

App ID #: 1652 **Mentor:** Berez, Jaime

Email: j.berez@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1652

**Title:** Metrology for metal additive manufacturing machine qualification

**Description:** Metal additive manufacturing (AM) machines (also known as metal 3D printers) are complex machines with many potential performance issues that can lead to anomalies in the manufacturing process and subsequent defects in manufactured workpieces. Laser powder bed fusion (LPBF) metal AM machines require close examination in this aspect as they are increasingly being adopted for production applications which necessitate continuously monitored, repeatable, and in-control processing.

The student researcher will assess one of the following sub-systems of an LPBF machine as part of this project – (1) the carrier gas flow system (2) the optomechanical system, or (3) the recoater system. In the case of (1), the student will develop a gas flow measurement device that can map gas flow conditions over the machine build space using gas anemometry or flow visualization. In the case of (2) the student will implement a novel laser-focus measurement technique and use microscopy to perform diagnostic measurements. In the case of (3), displacement laser interferometry will be used to characterize the motion errors of the recoater system. In either project, the student will be exposed to hands-on work with modern, industrial metal 3D-printers and industrial instruments

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

1 *positions available*

Anticipated Student Learning Outcomes: Students will gain experience working in a research lab setting. They will learn good project management and communication skills through weekly progress reports. They will gain experience working a variety of cutting-edge technologies including manufacturing systems, characterization instruments, and metrology equipment. They will develop skills in analyzing experimental data with tools such as Excel and MATLAB. They will also exercise their prior knowledge in mechanical design and instrumentation and apply these skills to the project at hand.

Required training of 0 hours with Description: Students will receive training on an as-needed basis depending on the parameters of the project that they develop during the first stage of on-boarding. Training will include hands-on training for use of specialized equipment by the faculty member or another expert user as well as targeted instruction on the use of relevant software packages.

Mentoring plan: Students will have weekly in-person meetings with the faculty member. Further ad-hoc meetings to conduct training, assist in research tasks, etc. will also be conducted. Students will work with the faculty member to develop a "Research Expectations" plan at the beginning of the work period where milestones, deliverables, and a timeline are collaboratively developed and

required assistance from the faculty member is identified. The student will also be introduced to other students in the lab in order to facilitate a collaborative work environment.

Applicant Requirements:

Interest in manufacturing and research-based inquiry into manufacturing and metrology

Professional work ethic and good organizational/communication skills

Rising 3rd year or higher standing (as of Fall 2025) at UNC Charlotte with a major in mechanical engineering, mechanical engineering technology, or a related area

Experience with CAD, fabrication, machining, rapid prototyping, and similar practices

Proficiency in MATLAB, Python, or a similar programming language

Applicant Preferences:

Experience with electronics/instrumentation and mechatronics

Experience with metallography and microscopy

Specific Time considerations/conflicts: General availability for in-person work during standard weekday working hours, e.g., 9-5 M-F (not including class) is required so that the student may have a weekly meeting with the adviser, attend weekly lab meetings, and schedule independent research.

App ID #: 1653 **Mentor:** Moglen, Glenn

Email: gmoglen@charlotte.edu Title: Professor and Chair

**Department:** Civil and Environmental Engineering

Co-mentor: No

Community engaged research: 1653

**Title:** Flood Prediction in the face of Climate Change

**Description:** Are you interested in examining how floods may change as climate change progresses? This research will work with precipitation estimates derived from climate models to explore how flood behavior will change based on spatial location and climate model predictions. This is applied research in that we'll be looking at how flood predictions may impact hydrologic design of infrastructure such as bridges and culverts.

The student working on this project will obtain and organize climate data, learn and work with hydrologic models, and ultimately develop spatial- and model-dependent predictions of flood magnitudes under varying conditions and assumptions. The student will be encouraged to learn and work with a variety of computer applications ranging from Geographic Information Systems, programming tools such as Python, and hydrology specific models such as WinTR-20 and HEC-HMS to perform this investigation.

The student will mainly work independently, but with frequent meetings with the mentor to ensure any problems are overcome quickly and steady progress is made. The student's experience will be excellent preparation for possible graduate research, with learned skills in data management, statistical analysis, hydrologic modeling, and oral and written communication.

Students are encouraged to contact Glenn Moglen in advance of applying if there are questions or concerns with the proposed project.

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

1 *positions available*

Anticipated Student Learning Outcomes: Students will learn both analytical and presentation/communication skills that would be excellent preparation for a student interested in pursuing graduate study in civil and environmental engineering or in the earth sciences.

For students with a strong interest in the environment and wishing to explore climate change impacts in a substantial, quantitative context, this research should be especially fulfilling.

Potential future employment avenues opened up by this research (beyond graduate school) would be with employers in the Civil and/or Environmental areas doing drainage design, land development, and construction permitting.

Required training of 0 hours with Description: No specific training is needed.

Mentoring plan: The student will work directly with the mentor. In the initial stages of this research, frequent meetings (every few days) will be the norm to help the student learn and obtain the understanding and skills necessary to pursue the research. Once the student is further along, meetings with the mentor will become more regular (weekly), although the student can approach the mentor at any time when questions come up. I enjoy working in a hands-on way with students, but understand that students have varying needs and preferences. An independent student will do fine as long as progress is steady. As the mentor, a central concern for me is that problems encountered in the research are communicated and resolved promptly so that the student is not "stuck" for very long.

Applicant Requirements: First, and foremost, the student should be curious and interested in pressing his/herself to learn new information and analytical skills.

Second, students who are creative and critical thinkers will enjoy the greatest success in this project.

Finally, the student should be comfortable working with and manipulating large volumes of numbers - strong basic excel skills are a must.

Applicant Preferences: Desirable knowledge or skills include:

Coursework in fluid mechanics, hydrology, geology

Computer skills including programming in any language and familiarity with GIS (geographic information systems)

Specific Time considerations/conflicts: N/A

App ID #: 1655

**Mentor:** Troutman, Jay

Email: jtroutm3@charlotte.edu

Title: Professor

**Department:** Chemistry

Co-mentor: No

Community engaged research: 1655

**Title:** Bacterial glycosylation probes

**Description:** The focus of the Troutman group is on complex bacterial sugars that form on the surface of microbes and play critical roles in survival. This project aims to develop and use new molecular probes to investigate the production of these complex materials with the ultimate goal of designing materials that can disrupt their production. Undergraduate students will get hands on experience in protein isolation, high performance liquid chromatography, and enzymology.

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

3 *positions available*

Anticipated Student Learning Outcomes: Data analysis skills, literature awareness, scientific presentation and writing, protein analysis, high performance liquid chromatography, functional assay development

Required training of 3 hours with Description: CITI training in recombinant DNA technology, chemical safety, general biosafety protocols

Mentoring plan: Students will first be trained by senior graduate students in the group and present in group meetings every other week. Students will have one on one meeting with Dr. Troutman as needed.

Applicant Requirements: Completion of organic chemistry with a B or better in organic 2.

Applicant Preferences: curiosity and a desire for independent research

Specific Time considerations/conflicts: Group meetings are typically on Friday afternoons, but otherwise schedules will be developed on a week to week basis

App ID #: 1656 **Mentor:** Makas, Emily

Email: emakas@charlotte.edu Title: Associate Professor

**Department:** School of Architecture

Co-mentor: Yes

Greg Snyder, gsnyder@charlotte.edu, School of Architecture

Community engaged research: 1656

**Title:** Freelon Exhibition Animation Videos

**Description:** An undergraduate research assistant would participate in a multi-year research project and series of exhibitions exploring the architecture of the late North Carolina African American designer, Phil Freelon.

Though widely publicized, surprisingly little scholarly attention has been paid to the Freelon's work, with the exception of the Smithsonian National Museum of the African American History and Culture. Our Charlotte team has created a traveling exhibition that examines that high-profile museum within the context of other Freelon Group projects exploring African American identity. These exhibitions explore the relationship between the container and the contained, that is, connections between the forms, materials, and meanings of Freelon's architecture and the histories and cultures exhibited within the museums, cultural centers, and commemorative landscapes he designed across the United States.

Evolving iterations of the exhibition have already been shown at three venues (Gantt Center in Charlotte, the NCMA in Raleigh, FAMU in Tallahassee, and the Auburn Avenue Research Library in Atlanta) and have included drawings, videos, and photographs borrowed from Freelon's firm with well researched interpretive panels, diagrams, and 3D printed models. The exhibition is thematically organized around three key design strategies – roots, ideas, and skins - that thread through Freelon's work at different scales and types.

Tasks for the 2025-26 Academic Year focus on development of 3D animated gif videos based on prototypes to supplement existing exhibition materials.

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

3 *positions available*

Anticipated Student Learning Outcomes:

To improve understanding of the relationship between identity and the built environment.

To improve understanding of exhibition design and production.

To improve ability to conduct and organize research as well as to share research about the built environment with a public audience.

To improve ability to create three dimensional digital models and fly-through videos that diagrammatically convey information about the meaning of architecture.

Required training of 0 hours with Description: Interns will work with faculty and more experienced students on the project team to become familiar with the work of the Freelon Group, our exhibition design strategies and production processes, and the specific skills needed to produce diagrams, models, and gifs.

Mentoring plan: Student will meet regularly with the faculty mentor as well as with other members of the research team. Mentoring will happen formally from the faculty as well as informally by working with more experienced peers. Success is measured by engaged participation in the team, active contribution to moving the project forward, and student's own skill and knowledge growth.

Applicant Requirements: Familiarity with Rhino and other 3D animation software.

Applicant Preferences: Good research skills, familiarity with Adobe Creative Suite (especially Illustrator).

Specific Time considerations/conflicts: the schedule is flexible

App ID #: 1657 **Mentor:** Giersch, Jason

Email: jgiersch@uncc.edu Title: Associate Professor

**Department:** POLS

Co-mentor: No

Community engaged research: 1657

**Title:** Special Education and School Choice: Expanding or Shrinking Services?

**Description:** Many states have recently adopted school choice policies such as charter schools and school vouchers. While such policies provide new options for many students, do they do the same for students with special needs? Will students with cognitive, medical, or behavioral challenges find high-quality educational options in an expanding marketplace of schools? In this project, the OUR student will work with Dr. Giersch to examine the school choice policies of different states to see if they include provisions for special education and the nature of those provisions and describe the new educational opportunities that are appearing in each state. Additionally, we will investigate the work of advocacy groups representing families with special needs children to learn how they are navigating the school choice environment in different policy contexts. The end result will be a database of state-level information about special education services in schools of choice, in terms of the policies in effect, the supply of services, and the politics of special education.

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

2 *positions available*

Anticipated Student Learning Outcomes: This project exists at the intersection of political science, public policy, and education and investigates a current issue using qualitative methods. The students participating in the project will develop familiarity with navigating state government websites to identify legislation and policies related to the education of children with disabilities. Doing so will also build familiarity with the variety of special needs, from medical to behavioral to cognitive. Terms like "IEP," "504," and "SWD" will become very familiar as the scholars build a database of information about how states serve this population of children.

Required training of 3 hours with Description: Training will consist of two main areas. First, Dr. Giersch will teach the OUR scholar about special education services in k-12 public schools and school choice policies, including charter schools and school vouchers (approximately 2 hours). Next, Dr. Giersch will demonstrate how to gather, organize, and store information on each state's policies and political environment.

Mentoring plan: Dr. Giersch will meet with the scholar on a weekly basis to discuss progress and new findings. While the main goal will be to build a database of state-level data concerning special education and school choice within each of the 50 states (or at least those with the most aggressive school choice policies), it is my intent that the scholar will also prepare a case study that compares two, three, or four states in terms of contrasting approaches to serving students with special needs through school choice. Ideally, the student would submit a research proposal to either NCARE or

NCPSA (North Carolina's research associations for education and political science, respectively) in December and present at their conferences in February.

Applicant Requirements: The ideal scholar for this project would:

1) have an interest in the demand for special education services in k-12 education

2) have an interest in how public policy is made and implemented

3) be adept at navigating websites to quickly identify relevant information

4) be meticulous in storing information in databases

Applicant Preferences: The scholar must:

1) be able to work independently, efficiently, and carefully.

2) be adept at navigating websites, reading text, and identifying important details

3) pay attention to details and organize records carefully

Specific Time considerations/conflicts: Flexible, but availability sometime between 10 AM and 3 PM on either Tuesdays or Thursdays would be helpful.

App ID #: 1658 **Mentor:** Makas, Emily

Email: emakas@charlotte.edu Title: Associate Professor

**Department:** School of Architecture

Co-mentor: Yes

Marc Manack, mmanack@charlotte.edu, School of Architecture, College of Arts & Architecture

Community engaged research: 1658

**Title:** Placemaking for Post-Helene Recovery in Western North Carolina

**Description:** Faculty and students in the School of Architecture will conduct historical, mapping, and site research as well as engage with the community to propose resilient rebuilding strategies for four communities in the Hickory Nut Gorge area of Western North Carolina. Lake Lure, Chimney Rock, Bat Cave, and Gerton were all severely impacted by Hurricane Helene in 2024 and share conditions and needs but also have distinct identities and planning goals. The UNC Charlotte team will bring a holistic, interdisciplinary, systems approach to address solutions at multiple scales, including interventions for specific pilot sites, commemorative spaces to engage village histories, design-based placemaking in community centers, and a regional connective riverwalk biking and walking trail along the Broad River.

Student interns will help with background research on the communities and sites with them as well as with presentation materials for community meetings.

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

2 *positions available*

Anticipated Student Learning Outcomes:

To improve understanding of the role of multiple scales of design (site, neighborhood, region) in recreating communities in the aftermath of a natural disaster

To improve understanding of how interdisciplinary research teams work within the context of a collaborative, creative project

To improve ability to conduct and organize research as well as to share and gather information about needs and proposals related to the built environment with a public, community audience.

Required training of 0 hours with Description: Once assigned to an aspect of the research project, students will meet with faculty project mentors and their teams for orientation to their project and expected tasks. Interns will work with faculty and more experienced students to become familiar with the work in progress and methods.

Mentoring plan: Student will meet regularly with the faculty mentors as well as with other members of the research team depending on which specific task they are assigned. Success is measured by

engaged participation in the team, active contribution to moving the project forward, and student's own skill and knowledge growth.

Applicant Requirements: Design background with experience with Adobe Creative Suite and 3d modeling and rendering software such as Rhino.

Applicant Preferences: Students with research skills as well as interest in community engagement, placemaking, regional planning, and interdisciplinary collaboration.

Specific Time considerations/conflicts: meeting schedule is flexible

App ID #: 1659 **Mentor:** Eppes, Martha Cary (Missy)

Email: meppes@charlotte.edu Title: Professor of Earth Sciences

**Department:** Earth, Environmental and Geographical Sciences

Co-mentor: Yes

Faye Moser, fvisco@charlotte.edu, Earth Environmental and Geographical Sciences

Community engaged research: 1659

**Title:** Data Mining and GIS Applications to Understanding Rock Exfoliation

**Description:** Our research group explores how aspects of mechanical weathering and rock fracture processes influence the evolution of Earth's surface. This particular research project focuses on exfoliation sheets (i.e., onion skin-like slabs of rock separated from the underlying rock mass by ground-surface parallel fractures; sometimes called sheet joints found on exposed rock domes – the formation of these domes remains an inegmatic aspect of Earth Sciences.

Figure 1: Examples of exfoliation domes and sheets. Enchanted Rock, TX (L) and Half Dome, CA (R).

These unique and iconic geological landforms, characterized by dome-like shapes and exfoliating sheets, provide valuable insights into weathering, erosion, and rock deformation. Despite advancements in remote sensing, LiDAR, crowdsourced data, and GIS, these technologies have yet to be applied specifically to exfoliating rock domes, leaving a significant opportunity to use these technologies towards better understanding exfoliation domes.

Before we can learn what factors influence the exfoliation, we must first know where they are and their spatial relationships. There are a surprising number of rock domes here in the Eastern US (think South Mountain, Stone Mt, NC, 40 acre rock), but to date, no one has created a comprehenisve map of their locations!

This project seeks the assistance of a student proficient in a coding language of their choice, with a preference for those also familiar with GIS software. The student will write and use code for a "webcrawler" to access geotagged or georeferenced data from passive crowdsourcing platforms like Twitter (X), Google Maps/Earth, Instagram, Flickr, and others to find the less obvious rock domes in our region. These data (acquired by the student) will be used to populate a GIS-based map of exfoliation domes, either on a specific region, such as the Southeastern USA, or the entire country, depending on computational and time constraints. Depending on the success of the first task, an additional task could be to conduct some geospatial statistical analyses on the newly populated map in GIS. In otherwords, to start to correlate their location with other features like rock type or soils.

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

2 *positions available*

Anticipated Student Learning Outcomes: A student in this project will gain hands-on experience with GIS, coding, and crowdsourced data, tackling real-world challenges in earth sciences using computer science technologies. They'll develop interdisciplinary skills, applying technology and

data analysis to practical problems. Afterward, the student can talk about how the project deepened their understanding of GIS and coding while preparing them for future academic and professional opportunities.

Required training of 1 hours with Description: The training process for a student participating in the research will involve familiarizing them with the dataset, including its details and specific requirements. This will ensure they have a clear understanding of the data they will be working with and the expectations for the project. If the student is interested, we will also visit some field sites to verify online data observations.

Mentoring plan: We have an open door mentoring approach. To support the student's success in this research project, we will be available for questions and meetings as needed. Students can reach out to either Faye Moser or Dr. Eppes, for guidance. Meetings will be scheduled upon the student's request, ensuring they receive the support they need. There is no expectation for students to present at group meetings or conferences, allowing them to focus fully on their research and learning, but we would be happy to mentor any student through that process if they choose.

Applicant Requirements: Proficiency with coding and GIS software required. Some Earth Science knowledge and/or an enthusiasm or curiosity for Earth sciences is needed.

Applicant Preferences: Experience in data mining or machine learning for visual data a plus. Completion of at least one upper-level GIS course is preferred but not required. Familiarity with remote sensing or satellite imagery is also preferred.

Specific Time considerations/conflicts: There are no specific days or times that the student must be available. We are flexible with meeting times, accommodating the student's schedule as needed. Both remote and in-person meetings are options.

App ID #: 1663 **Mentor:** Deeba, Farah

Email: fdeeba@charlotte.edu Title: Assistant Professor

**Department:** Electrical and Computer Engineering

Co-mentor: No

Community engaged research: 1663

**Title:** From Pixels to Prognosis: Using Deep Learning to Explore Placenta Pathology

**Description:** Overview:

The placenta is one of the most fascinating and vital organs during pregnancy. It serves as the life-support system for the developing fetus, providing oxygen and nutrients while removing waste. However, complications in placental function can result in severe pregnancy outcomes such as preeclampsia, fetal growth restriction, and even stillbirth. To better understand placental health, researchers typically rely on histopathological analysis—examining tissue under a microscope. While this approach provides valuable insights, it is often subjective, time-consuming, and limited by the need for highly trained specialists. This project seeks to change that by integrating deep learning, a branch of artificial intelligence (AI), into the analysis of placental pathology. By applying AI models to histopathological images, we aim to automate the detection of abnormalities and uncover subtle patterns that may not be visible to the human eye. Ultimately, the goal is to provide a fast, non-invasive, and scalable tool that can predict pregnancy complications and improve maternal-fetal outcomes.

What You Will Do:

As an undergraduate student participating in this project, you will gain hands-on experience at the cutting edge of biomedical engineering and artificial intelligence. You'll work alongside a team of researchers and experts, learning about both the biological aspects of placental health and the technical skills needed to develop and deploy machine learning models.

Your duties will include:

1. Data Management and Preparation: Organize and preprocess histopathological images of placental tissues. Annotate regions of interest (e.g., areas of inflammation, abnormal structures) using specialized software tools. Split the dataset into training, validation, and test subsets to ensure robust model performance.

2. Deep Learning Model Development: Learn the basics of convolutional neural networks (CNNs), the primary AI architecture for image analysis. Implement and train deep learning models using open-source frameworks such as TensorFlow or PyTorch. Experiment with different architectures to optimize model performance.

3. Explainability and Biological Insights: One exciting aspect of this project is that we are not just interested in predicting the label (e.g., healthy or diseased placenta), but also understanding why the model makes certain predictions. You will work with techniques such as grad-CAM (gradient-weighted class activation mapping) to visually explain which parts of the image the model focuses

on when making its decision. This interpretability is important for ensuring the model's decisions are scientifically valid and can be trusted in clinical settings.

4. Evaluation and Reporting: Evaluate the model's accuracy, sensitivity, and specificity using quantitative metrics. Compare model outputs to expert pathologist assessments to validate its clinical relevance. Present findings through written reports or presentations to the research team.

5. Collaboration and Communication: Throughout the project, you will have the opportunity to collaborate with a team of students, postdocs, and faculty member. You'll learn how to effectively communicate your findings through presentations, reports, and discussions. At the end of the project, you'll have the opportunity to present your work to the team and potentially to a broader audience in academic or industry settings.

Who Should Join?

This project is ideal for students with an interest in artificial intelligence, machine learning, biomedical engineering, and healthcare technologies. No prior experience in deep learning is necessary, though familiarity with programming languages like Python will be beneficial. Students who are passionate about applying their skills to solve real-world health challenges, and who want to contribute to research with the potential for significant impact in pregnancy care, will thrive in this project.

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

2 *positions available*

Anticipated Student Learning Outcomes: Participation in this research project, "From Pixels to Prognosis: Using Deep Learning to Explore Placenta Pathology," will provide students with a rich, interdisciplinary experience that combines technical skills in artificial intelligence with impactful applications in biomedical research. By the end of the project, students will have gained valuable knowledge, hands-on experience, and career-enhancing skills in the following areas:

1. Technical Skills Development

a. Deep Learning Fundamentals

- Students will develop a strong foundation in deep learning techniques, focusing on convolutional neural networks (CNNs).

- They will learn to design, train, and optimize machine learning models using popular frameworks like PyTorch.

b. Biomedical Image Processing

- Gain expertise in preprocessing histopathological images, including resizing, normalization, and augmentation, which are essential steps for preparing data for AI models.

- Learn to annotate images for supervised learning tasks, understanding the importance of data quality and labeling in AI applications.

c. Model Evaluation

- Understand and apply metrics such as accuracy, precision, recall, F1 score, and area under the curve (AUC) to evaluate model performance.

- Gain experience in error analysis and model troubleshooting to refine performance.

d. Explainable AI (XAI) Techniques

- Learn to use tools like grad-CAM to interpret model predictions, which is critical for AI applications in sensitive fields like healthcare.

- Develop insights into making AI models transparent and scientifically reliable.

2. Biomedical Knowledge and Context

a. Understanding Placental Pathology

Develop a deeper understanding of the placenta's role in maternal-fetal health and the implications of placental abnormalities on pregnancy outcomes.

b. AI in Healthcare

Explore how AI is transforming healthcare by automating diagnostics, predicting outcomes, and improving the efficiency of medical research and care delivery.

3. Research Experience

a. Data Science Workflow

- Follow the complete workflow of an AI research project, from data acquisition and preprocessing to model implementation, validation, and deployment.

- Experience working with large-scale datasets, managing data pipelines, and ensuring reproducibility in experiments.

b. Collaborative Research Work as part of a multidisciplinary team that bridges fields like biomedical engineering, placenta-fetal pathology and imaging.

- Develop skills in effective communication, collaboration, and project management.

c. Problem-Solving Skills

- Tackle real-world challenges by designing innovative solutions using AI.

- Learn to iterate on experiments, adapt to setbacks, and refine methodologies based on results and insights.

- Understand how to present data visually using tools like matplotlib, seaborn, or other visualization libraries.

b. Presenting Research

- Gain experience presenting project outcomes to a broader audience, including peers, faculty, and potentially at academic conferences.

- Build confidence in explaining technical concepts and their applications in an accessible way.

5. Career Preparation

a. Technical Career Readiness

- Develop a portfolio of work, including AI models, data analyses, and research presentations, that students can showcase to prospective employers or graduate schools.

- Acquire skills that are highly sought after in fields like data science, AI, and biomedical research.

b. Research Exposure

- Gain an authentic research experience, preparing students for potential graduate studies or roles in research and development (R&D).

- Understand the interdisciplinary nature of modern scientific problems and how to navigate collaborations across fields.

c. Professional Networking

- Build connections with faculty mentors, researchers, and peers that can serve as valuable professional contacts for future opportunities.

How Students Will Talk About Their Experience: Students who participate in this project will leave with a compelling story about their involvement in cutting edge research at the intersection of AI and healthcare.

They will likely describe their experience as:

- A unique opportunity to apply deep learning to solve real-world biomedical challenges.

- A chance to contribute to research that has the potential to directly improve maternal and fetal health.

- A hands-on learning environment where they developed valuable technical and collaborative skills.

- An inspiring glimpse into how technology and healthcare can work together to transform lives.

Students may also highlight the project's relevance to their future goals, such as pursuing advanced degrees in AI, biomedical engineering, or medicine, or entering careers in AI-driven innovation. They will be able to articulate the tangible outcomes of their work, from building functional AI models to interpreting the biological significance of their findings, making their experience stand out on resumes, graduate school applications, and in professional interviews.

Required training of 2 hours with Description: - 2 hours of hands-on training of basic deep learning models (example problems

will be provided, students are expected to complete the assignment and submit the

result)

- 1 hour of training on manipulating whole slide pathology images (data and initial

MATLAB code will be provided)

- 2 hours of lit review (read suggested papers)

Mentoring plan: As a mentor, my primary goal is to create a supportive, engaging, and productive environment where undergraduate students can thrive in their research journey. I will ensure students feel empowered, valued, and equipped to succeed in both this project and their future endeavors. Below, I outline my approach to fostering student success, including mentorship, collaboration, and opportunities for professional growth:

1. Mentorship: Students will work closely with me and other members of our research team, including graduate students, postdoctoral fellows, and collaborators in related fields. I will take a proactive role in guiding students, ensuring they feel supported and confident as they tackle new challenges. What Students Can Expect From Me:

- Regular Meetings: I will hold weekly one-on-one or small group check-ins with students to review their progress, provide feedback, and address questions or concerns.

- Open-Door Policy: Students will have access to me via email, scheduled meetings, or office hours for additional support or guidance.

- Clear Expectations: I will provide students with well-defined milestones and goals for their contributions to the project, ensuring they understand their role and how it fits into the larger research context.

2. Collaborative Research: Environment Research is a collaborative process, and students will be integrated into a dynamic and interdisciplinary team. They will interact with peers, graduate students, and postdoctoral researchers who bring diverse expertise and perspectives.

Who Students Will Work With:

Graduate Students and Postdoctoral Fellows: Students will receive additional mentoring from senior lab members who can provide day-to-day guidance on technical tasks, such as coding, data analysis, and troubleshooting.

What Students Will Do:

Team Meetings: Students will participate in weekly lab or project meetings where they can present updates, ask questions, and learn from others' work.

Collaborative Problem-Solving: Students will work in pairs or small groups on specific tasks, benefiting from peer learning and shared insights.

3. Professional Development Opportunities: I am committed to helping students grow professionally by providing opportunities to develop their communication, leadership, and technical skills.

Presentations:

- Students will regularly present their work during lab meetings to develop their communication and presentation skills.

- Exceptional work will have the opportunity to be showcased at departmental research symposia, undergraduate conferences, or even national/international meetings.

Writing and Reporting:

- Students will be encouraged to contribute to research papers or reports, with guidance on structuring scientific arguments and presenting results effectively.

- For students interested in academic careers, I will provide mentorship on writing and submitting research findings to peer-reviewed journals or conference papers.

4. Intentional Learning and Skill Building

I will ensure students leave the project with a clear set of skills and experiences that contribute to their academic and career growth.

Technical Skills Development:

- Students will gain hands-on experience in deep learning, biomedical image analysis, and data science tools, with structured training modules at the beginning of the project.

- They will have access to curated resources (e.g., tutorials, research papers, and example codebases) to reinforce their learning.

Soft Skills Development:

- I will mentor students in critical thinking, problem-solving, and time management to ensure they can handle the complexities of research.

- Students will develop skills in teamwork and collaboration through group projects and discussions.

Feedback and Iteration:

- I will provide detailed feedback on students' work, helping them refine their skills and understand the reasoning behind suggested improvements.

- Regular goal-setting and reflection sessions will allow students to track their progress and adjust their approaches as needed.

5. Personal Support and Long-Term Commitment

I view my role as a mentor as extending beyond this single project. I am committed to supporting students' broader academic and career goals. Personalized Guidance: I will meet with students individually to discuss their interests and aspirations, tailoring their experience to align with their long-term goals. - For students considering graduate school or industry positions, I will provide advice on applications, resumes, and interviews.

Letters of Recommendation: Students who demonstrate dedication and growth will receive personalized, detailed letters of recommendation highlighting their contributions and skills.

Post-Project Support: After the project concludes, I will remain available to students as a mentor, offering guidance on future research opportunities or career paths.

Applicant Requirements: I am looking for undergraduate students who are enthusiastic, curious, and eager to learn in an interdisciplinary research environment. While prior experience with artificial intelligence, biomedical imaging, or programming is beneficial, it is not required—what matters most is the student's willingness to engage deeply with the project and their commitment to learning new skills. Below are the skills, and experiences that would make a student successful in this project:

Skills and Experiences

- Programming Experience: Familiarity with Python or another programming language is a plus, as the project involves working with deep learning frameworks and image processing libraries.

- Data Analysis: Basic understanding of data handling, such as organizing datasets or using tools like Excel, pandas, or NumPy.

- Image Processing: Experience with image editing, analysis, or visualization tools (e.g., ImageJ, OpenCV,3D Slicer) is helpful but not mandatory.

Relevant Courses (Helpful but Not Essential)

- Introduction to Programming or Computer Science: Basic understanding of programming concepts can help students engage more easily with technical tasks.

- Introduction to AI or Machine Learning: Familiarity with foundational concepts like neural networks or supervised learning is a plus but not mandatory.

- Biomedical or Life Sciences: Courses in biology or anatomy can provide context for understanding the significance of placental pathology.

Research or Project Experience

- Any prior involvement in research projects, class assignments, or extracurricular activities related to programming, data analysis, or healthcare innovation is a plus.

- Students without formal research experience but who are eager to learn will receive the training needed to contribute meaningfully.

Applicant Preferences: 1. Key Characteristics

a. Curiosity and Passion for Learning

- A genuine interest in understanding how artificial intelligence can solve real-world challenges in healthcare.

- Enthusiasm for tackling new topics and engaging with complex ideas, even in areas outside their prior knowledge.

b. Growth Mindset

- Willingness to step out of their comfort zone and tackle challenging problems.

- Openness to receiving constructive feedback and using it to grow and improve their skills.

c. Dedication and Responsibility

- Strong organizational skills and the ability to manage tasks effectively to meet deadlines.

- Commitment to the project and a sense of accountability for their contributions.

d. Teamwork and Communication

- Collaborative spirit and ability to work effectively in a team setting with peers, mentors, and researchers from diverse backgrounds.

- Good communication skills, including the ability to share progress, ask questions, and engage in discussions.

e. Ethical Awareness

- Awareness of the ethical responsibilities involved in research, particularly when working with sensitive biomedical data.

- Commitment to upholding integrity, transparency, and fairness in their work.

f. Inclusivity and Accessibility

I welcome applicants from all academic and personal backgrounds. What matters most is the applicant's enthusiasm for the project and willingness to invest time and effort into learning and contributing. The onboarding process and mentorship structure are designed to accommodate students with varying levels of prior experience, ensuring that every student has the resources and support they need to succeed.

Specific Time considerations/conflicts: None

App ID #: 1664

**Mentor:** Shuster, Martin

Email: martin.shuster@charlotte.edu

Title: Professor of Philosophy and Isaac Swift Distinguished Professor of Jewish Studies

**Department:** Philosophy

Co-mentor: No

Community engaged research: 1664

**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 #: 1665 **Mentor:** Grant, Lynnora

Email: lgrant19@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1665

**Title:** 3D printing technical ceramics

**Description:** The ability to form ceramics into complex shapes with tailored properties can enable technological advancements in applications requiring customized, chemically inert, and strong structures (e.g. biomedical, aerospace, and nuclear technologies). However, it is difficult to achieve a high degree of complexity through conventional ceramic processing techniques. This challenge has motivated efforts to make ceramics by additive manufacturing, where ceramic feedstock is first formed layer-by-layer into a net shape which is later post-processed to achieve the desired mechanical properties. While additive manufacturing introduces this powerful potential to form intricate near-net shaped ceramics, common issues arising during processing can lead to dimensional inaccuracy and poor mechanical strength in the final component. An undergraduate student will be able to directly contribute to addressing these issues. Some duties include: component design using CAD software, sample 3D printing, and sample characterization using microscopy techniques.

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

2 *positions available*

Anticipated Student Learning Outcomes: Students will be learning about real-world challenges (defects, distortion, and cracking during processing) which have slowed the implementation of 3D printed ceramics in commercial applications and will have the opportunity to apply concepts from materials science, metrology, and engineering courses to work toward solving these problems. Industrial applications for ceramic 3D printing are in aerospace, astronautics, energy, and biomedical sectors. Depending on the sub-project that the student and I decide on, there is an opportunity to network with my collaborators at NIST on a joint project.

Required training of 4 hours with Description: Students will be required to meet with the PI to review the protocols for specific Laboratory Safety including: waste management, safe equipment operation, and PPE required for working in this laboratory. Students will be required to take general laboratory training courses offered through EHS: https://safety.charlotte.edu/training/training-work-environment/laboratory-research-environment-training-courses/ If the project requires the student

to use special equipment outside of the PI's laboratory, the student will be put in contact with the

primary operator for training.

Mentoring plan: When mentoring undergraduate students, I ask them to have a running slide deck documenting their progress in the lab each week and things that they learned from papers and

books to supplement the lab experience. I like to meet with the student weekly to go over the slides. In the past, I have found this helpful for information retention, increasing comfortability with talking about the work and consolidating important findings, and to bolster morale when projects may seem to be at a stand still. The student will primarily work directly with me and occasionally other faculty and graduate students in the department. I plan to be available daily and would be gladly work alongside them in the lab if needed.

Applicant Requirements: Students who have had experience with robotics have had an easier time learning how to operate the 3D printers that we use. Students who have taken mechanics of materials and a materials science courses and are interested in these topics are desired. Previous experience with CAD is desired. A student willing to learn, interested in problem solving, and is driven by curiosity is desired.

Applicant Preferences: -

Specific Time considerations/conflicts: Meeting with me once a week to discuss progress. I plan to set the date and time of this meeting with the student at the beginning of the program.

App ID #: 1667 **Mentor:** Gagné, Sara

Email: sgagne@charlotte.edu Title: Chair and Associate Professor

**Department:** Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: 1667

**Title:** Salamander monitoring in urban streams

**Description:** Are you an undergraduate student looking for research and field experience? Interested in urban ecology, water quality, or herpetofauna? The Gagné lab is looking for undergraduate research assistants to assist in a project monitoring stream salamander habitat use in Mecklenburg county. Students on this project will assist in visual surveys of salamanders, dipnetting, collecting water samples, and potentially processing eDNA in stream systems in the Charlotte area. No previous experience required! Further project information provided below.

With ever growing cities, improving conservation in urban spaces is increasingly important. Amphibians are among the most vulnerable species to disruptions caused by urbanization and habitat alteration. Due to their dependance on water and permeable skin, amphibians are sensitive to changes in water quality and habitat availability, making them an important indicator species for habitat suitability. As amphibian populations are in decline globally, efforts should be made to monitor amphibians in the Charlotte area and assess what habitats can be protected or improved to improve local biodiversity. Currently, preliminary surveys have determined stream sites for herpetofauna monitoring in Mecklenburg County. Using field data and analysis in GIS and R, this project aims to collaborate with local government to improve local habitat quality and connectivity in the Charlotte area.

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

3 *positions available*

<u>Anticipated Student Learning Outcomes:</u>

Ecological field study design

Best practices for safe and effective field work in urban contexts

Expertise in visual encounter surveys and microhabitat surveys

Understanding of urban stream syndrome and its implications for biodiversity and people

Understanding of stream salamander ecology, including species identification and species importance

Best practices in field data collection

Basics of general linear modeling using AI and R

Data visualization using AI and R

Institutional Animal Care and Use Committee (IACUC) training

Interpretation of results in written format

Presentation of a poster at the URC

Co-authorship of a manuscript for publication in an ecology journal

Required training of 5 hours with Description: IACUC training

Field methods training

Mentoring plan: Both myself and a Master's student will mentor the OUR scholars. I meet weekly with students and provide specific guidance on developing research questions, methods, analysis, and ultimately interpretation of results and their presentation. The Gagné lab has extensive experience mentoring undergraduate researchers using a collaborative and supportive approach.

Applicant Requirements: A strong desire to engage in and learn about ecological field work, i.e., being outside in an urban stream. Highly organized and attention to detail, e.g., following a field protocol exactly and recording data accurately, is a must.

Applicant Preferences: Students with prior research experience are preferred, but this is not a requirement.

Specific Time considerations/conflicts: None

App ID #: 1668 **Mentor:** Vinson, David

Email: dsvinson@charlotte.edu Title: Associate Professor

**Department:** Department of Earth, Environmental, and Geographical Science

Co-mentor: No

Community engaged research: 1668

**Title:** Spring-stream connections within small urban and forest watersheds of the Piedmont

**Description:** The OUR-supported student will contribute to a multi-year project on the interactions between groundwater, stream water, and water quality in the Piedmont region. Project study sites include a permanently preserved forest watershed and a historically significant urban spring. Both field work and lab work are expected within this project. The OUR-supported student will make water quality measurements, collect samples, analyze water quality in the lab, analyze data, and interpret results. Expected project areas in fall 2025 include detailed examination of two springs for hydrology and water quality. The student will download sensors for water temperatures and water quality, will collect water quality samples, and will analyze water quality parameters . The lab analyses in this project will help us understand groundwater-surface water interactions, the amount of time that water resides in the watershed, and water quality. The OUR-supported student will also study the small streams supported by these springs. Finally, the OUR-supported student will cross-train with related water quality projects in the Piedmont region to gain additional experiences.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

1 *positions available*

Anticipated Student Learning Outcomes: The OUR-supported student will work collaboratively and independently to gain experience with taking field measurements of natural water (pH, temperature, dissolved oxygen) and collecting water samples according to established procedures. The OUR student will also participate in the lab analysis of water samples for water quality parameters such as ion concentrations, metal concentrations, nutrient concentrations, alkalinity, or dissolved organic carbon. The student will learn to follow established methods in the lab and to manage data collected during the project. This project will provide excellent experience for students interested in employment or graduate school in hydrology, stormwater, water quality, soils, or related fields.

Required training of 0 hours with Description: As part of the project, the student will do general lab work. General lab safety training will be provided before the student will do the in-lab portions of the project. Procedure-specific lab training will be provided for analysis procedures. Specific training will be provided for field work procedures such as downloading sensors and collecting water samples.

Mentoring plan: The project faculty advisor, Dr. David Vinson will work with the student to define goals and tasks that fit the student's interests and that build on the prior skill set (within the needs of the overall project). Students will build upon their skill set to gain confidence and experience in

lab work, field work, data collection, and interpreting results. Within the student's core block of time on the project, the OUR-supported student will have progress meetings with Vinson. The OUR-supported student will be trained by Vinson and/or the lab manager. The student will participate in a small lab group setting in which students work collaboratively toward shared goals while also developing the confidence and skills to work independently toward individual goals. At many times, the OUR-supported student will work independently or alongside other students. All students working in the group are expected to support and mentor their student peers. Other mentoring goals can be set according to the student's interests. For example, for students interested in applying to graduate school, the student's project can develop experiences to include in the student's graduate school application research statement.

Applicant Requirements: Interest in field work and/or in working a water quality analysis lab is a must. No specific experience is required; training will be provided. Applicants must be able to learn and follow established procedures and safety requirements. In addition, the student should have completed at least one semester of college-level chemistry before beginning the project. Students must also have the interest and ability to work within a team environment toward shared goals.

Applicant Preferences: Prior experience working in a laboratory setting; or previous coursework in hydrology, soils, water quality, geology, chemistry, or a related field; would be a plus.

Specific Time considerations/conflicts: The student will commit to a core block(s) of hours during weekdays to work on the project. Committing to a core block(s) of hours will be critical to the student's success. Additional flexible hours will be possible around the core committed time block(s).

App ID #: 1673 **Mentor:** Pipkin, Amanda

Email: apipkin@uncc.edu Title: Professor of History

**Department:** History

Co-mentor: No

Community engaged research: 1673

**Title:** Women Printers of Early Modern European Domestic Advice

**Description:** There are a significant number of English and Dutch women who worked publishing books during the sixteenth-century. One popular genre they published was religious advice for husbands, wives, children, and servants which circulated in a variety of forms including: instruction manuals, devotional guides, catechisms, and emblems from 1529 to 1691. Studying these women and their publications allows us to trace how the religious reformations sweeping Europe at that time transformed men's and women's religious opportunities and responsibilities.

For this project, a student will search Early English Books Online and WorldCat.org to create a database of women printers and their publications to identify who printed domestic advice, when, in which languages, and by which authors. Then, they will use GIS mapping software to visualize when and where these English and Dutch printers published their advice.

*Accepting applications for:* Only 80 hours over an academic semester (~5h per week)

1 *positions available*

Anticipated Student Learning Outcomes: Critical thinking, technology, engagement across perspectives.

Required training of 3 hours with Description: Learning how to use Worldcat and Early English Books online and GIS software.

Mentoring plan: The student will work directly with me. We will meet initially a couple times to learn how to gather the data and set up a database. Then we will meet once weekly to discuss findings and try out different GIS formats to see how to best display the data. They will not need to present at conferences or to groups, but may choose to present a poster at the Undergraduate Research Conference.

Applicant Requirements: Interest in history and capacity to sift through information to find patterns.

Applicant Preferences: Interest in history and capacity to sift through information to find patterns.

Specific Time considerations/conflicts: N/A

App ID #: 1675 **Mentor:** Clinton, Sandra

Email: sclinto1@uncc.edu Title: Research Associate Professor

**Department:** Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: 1675

**Title:** Dragonfly genetic connectivity in urban freshwater systems

**Description:** We will be sampling dragonfly nymphs from ponds & streams in Mecklenburg County. This will involve visually identifying down to species or genus level using a microscope and dichotomous key. We will also be looking at genetic connectivity, so the student will learn how to do DNA extraction, PCR, gel electrophoresis, and handle minor DNA sequence sets. This project will have a field and lab component.

*Accepting applications for:* Only 160 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 skills.

Training in using excel, GIS, and potentially R.

Training in data management and good data practices.

Required training of 3 hours with Description: UNCC 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 help the student 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 fall schedules are known. Students will need at least 1 block of4-5 hours of time for field work. The remaining hours for lab work will need 2-3 blocks of time.  All work will occur during the work week.

App ID #: 1677 **Mentor:** Clinton, Sandra

Email: sclinto1@uncc.edu Title: Research Associate Professor

**Department:** Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: 1677

**Title:** Secondary production of macroinvertebrates used as an indicator of Success for Urban Stream Restoration

**Description:** The project entails collecting samples of aquatic macroinvertebrates from different habitats in three streams around Mecklenburg County. The samples will be processed and identified in the lab, where calculations of secondary production/growth of biomass will be used to evaluate macroinvertebrate communities in the stream and the stream's overall health. Student contributions can come from helping collect samples from streams monthly and sorting and taxonomic identification of macroinvertebrates in the lab.

*Accepting applications for:* Only 160 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.

Training in using excel and potentially R.

Training in data management and good data practices.

Required training of 3 hours with Description: UNCC 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 MS student in the Clinton research group and will work with this student to collect and analyze the data. The MS student and the Dr. Clinton will help the student with skills related to data analysis and presentation. The undergraduate researcher and the MS 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 MS 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 help the student 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). An enthusiasm for freshwater science is encouraged.

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: There are no set required times, as much of the work is very flexible. The weekly meetings can be in-person or zoom for a recap of what has been done during the week and plans for the following week. However, once a month, for sampling, the OUR scholar would need to have 3+ hours available at one time. This exact day and time of the sampling are also flexible.

App ID #: 1678

**Mentor:** Hoover, Fushcia

Email: fhoover3@charlotte.edu

Title: Assistant professor of environmental planning

**Department:** Earth, environmental and geographical sciences

Co-mentor: Yes

Nicole Roberts, nbarclay@charlotte.edu, Engr tech. and construction mgmt., College of Engineering

Community engaged research: 1678

**Title:** Identifying Emerging NC Water Conservation Strategies for a Climate Change Future

**Description:** As North Carolina's population continues to grow, so too does the need for maintaining and conserving safe and reliable water sources. The sustained population growth combined with increased intensity and damage of climate change driven storms, 100° F days, and existing social and economic inequities, further strain our aquatic ecosystems, and water quality and availability, negatively impacting human health [1]. Our goal is to develop water conservation case studies for North Carolina that include management and policy approaches based on future impacts to water quality and supply due to climate change. As a part of this goal, we will highlight the State's progress toward the "One Water" approach that includes drinking water, wastewater, and stormwater management. Our proposed research asks, 1) What are the water conservation and supply needs given future climate driven changes in rainfall and flooding patterns? 2) What current and emerging strategies are stakeholders using?, and, 3) How are utilities and conservation groups working together (if at all), to establish innovative approaches to climate preparedness for water quality and supply? This proposal addresses the WRRI Focus Area 2 on Drinking Water, Wastewater and Water Infrastructure; Climate Change Impacts on Water Resources & Water Conservation and Supply Strategy.

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

2 *positions available*

Anticipated Student Learning Outcomes: This is a part of an ongoing project between Drs. Hoover and Roberts. Student researchers will support the faculty in analyses of focus group discussions carried out over the summer, and and organizing case studies.

Students will gain substantial knowledge about water conservation and supply strategies across the State of NC, and the southeast.

Students will learn about different types of environmental planning and policy documents.

Skills that student(s) will develop include literature review search techniques, use of public data portal, research design, conducting research in a team setting, and methodological analysis of articles and planning documents.

This experience will benefit any student interested in pursuing research, conservation policy and planning, community engagement or participation, and introduce the student to an array of organizations across the state.

Required training of 10 hours with Description: CITI certification, and on boarding that includes required readings and assessments of writing and reading abilities.

Mentoring plan: Students who join the project will complete a mentoring compact and development plan with the Drs. Hoover and Roberts. This will cover expectations and goals for participating on the project, as well as Dr. Hoover and Dr. Roberts's expectations around work outputs, meetings, and mentoring. Student(s) on the project will meet weekly with Drs. Hoover and Roberts, and are required to attend Dr. Hoover's monthly research group meetings. There is additional mentoring and professional development that student(s) may receive through graduate students and a postdoc in Dr. Hoover's faculty research group.

Applicant Requirements:

Strong reading comprehension, writing, and communication skills

Courses or familiarity with water systems and/or water conservation courses (volunteer experiences count)

Students should have proficiency with Microsoft Word and Excel, and strong organizational skills

Ability to take constructive direction and feedback, and incorporate that into tasks

Applicant Preferences:

Ideally, student applicants will have experience searching for peer-reviewed/scholarly articles using Google Scholar, the UNCC library or similar databases.

Prior technical and literature review writing experience

Able to work independently and in teams.

Experience building and managing websites and/or experience with social science coding software

Specific Time considerations/conflicts: Students must be available to meet for a one hour 1-1 meeting, and a 90min research team meeting every other week.

App ID #: 1681 **Mentor:** Suresh Babu, Arun Vishnu

Email: asures10@charlotte.edu Title: Teaching Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: 1681

**Title:** Gust alleviation on aircraft wings

**Description:** Airplane wings and helicopter blades encounter atmospheric gusts which can pose danger to the aircraft and its passengers. Can we adjust a flap or tab on a wing to negate the effect of a gust? If so how should we move them? This project will explore the effect of the gusts on the wing: how the air flow around the wing is affected due to the gust and how the sudden forces generated with the aim of developing strategies to counteracting the gust effects. The project will use concepts of fluid dynamics to make simple mathematical models for a wing encountering various types of gusts. An undergraduate student with some background in introductory fluid mechanics shall be able to, with the guidance of the mentor, develop an understanding of the basic aerodynamic theory of wings, and further study a wing or blade encountering a gust. The research will also involve the use of MATLAB for calculations and visualization.

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

2 *positions available*

Anticipated Student Learning Outcomes: Students will have an excellent opportunity to apply classroom knowledge to tackle an interesting and critical real-world engineering problem. The project will also further enhance their understanding of fluid mechanics and enable them to further explore the concepts of aerodynamics. Besides, the project will also be a great platform to enhance the students' problem solving and mathematical modeling skills. Finally, through the use of MATLAB, a beginner-friendly programming platform, the students will be able to develop good computer coding skills while applying it to study a research problem.

Required training of 0 hours with Description: N/A

Mentoring plan: The students will be initially guided by the mentor to develop an understanding of the relevant aerodynamic theory. The students will also be initially guided to operate some existing MATLAB programs for visualization and calculations. Through the course of the project, the student will develop theoretical models and add make small-scale modifications to the existing MATLAB programs to analyze the models. Mentoring meetings will be set up with the mentor weekly twice on a recurring basis during weekdays 9-5. The mentor will also be available to meet more often whenever needed. Smaller discussions will also be addressed through email communications .

Applicant Requirements: Background in Fluid Mechanics

Some experience in MATLAB or a similar programming language

Applicant Preferences: Strong Mathematical background (calculus, Fourier series) and Fluid dynamics fundamentals

Interest in Fluid Mechanics and Aerodynamics

Proficient in MATLAB or a similar programming language

Specific Time considerations/conflicts: N/A

App ID #: 1679 **Mentor:** Bombik, Anthony

Email: abombik@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: Yes

Youxing Chen, ychen103@charlotte.edu, Mechanical Engineering, College of Engineering

Community engaged research: 1679

**Title:** SEM Characterization of Crushed Battery Electrode Surfaces

**Description:** This project utilizes Scanning Electron Microscopy (SEM) to analyze the surface morphology and structural changes of lithium-ion battery electrodes following controlled mechanical compression. By pre-crushing the electrodes, we aim to simulate the effects of mechanical stress encountered during battery manufacturing or abuse. SEM imaging, coupled with techniques like Energy-Dispersive X-ray Spectroscopy (EDS), will reveal:

Fracture patterns and crack propagation: How the compression induces cracks and fractures in the electrode material.

Particle morphology and size distribution: Changes in the size and shape of active material particles due to crushing.

Surface area alterations: The impact of compression on the electrode's surface area, which is crucial for electrochemical performance.

Delamination and binder integrity: Observing the separation of active material from the current collector and the damage to the binder material.

Compositional changes: EDS will help to map the elements and see if there are any changes in the distribution of the elements.

This characterization will provide valuable insights into the mechanical durability of electrode materials and the potential impact of mechanical stress on battery performance and safety.

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

2 *positions available*

Anticipated Student Learning Outcomes: SEM Operation and Interpretation:

Students will gain hands-on experience operating a scanning electron microscope.

They will learn to acquire high-resolution images and interpret SEM micrographs, understanding the relationship between image features and material properties.

They will understand the principles of electron beam interaction with materials.

Sample Preparation:

Students will develop skills in preparing delicate battery electrode samples for SEM analysis, including techniques for handling and mounting samples.

Battery Materials Science:

Students will gain a deeper understanding of the structure and properties of lithium-ion battery electrode materials.

They will learn how mechanical stress affects the morphology and performance of these materials.

Data Analysis and Interpretation:

Students will learn to analyze and interpret large datasets of SEM and EDS data.

They will develop skills in quantifying features such as particle size, crack length, and elemental distribution.

Experimental Design:

Students will learn to design and execute experiments to investigate the effects of mechanical compression on battery electrodes.

Problem-Solving:

Students will develop problem-solving skills by troubleshooting issues related to sample preparation and SEM operation.

Data Correlation:

Students will learn to correlate the microstructure changes they observe with potential changes in the electrochemical performance of the battery electrodes.

Scientific Communication:

Students will learn to communicate their findings effectively through written reports and oral presentations.

Required training of 10 hours with Description: The student(s) will need to be added to the BATT CAVE register for lab access.

The student(s) will need training to operate SEM.

There may be some basic virtual training required by the university if the student has never conducted research or worked in a lab space before.

Mentoring plan: Initially, I'll provide a structured onboarding for the undergraduate, covering lab safety and project goals. The student is expected to attend weekly group meetings and present progress on a rotating basis. To ensure consistent support, a PhD student will be assigned as a peer mentor, offering shadowing opportunities. Actively, I will encourage their participation in lab social activities and highlight our research's collaborative nature. Furthermore, regular, constructive feedback and clear, achievable goals are essential. Highlighting the project's real-world impact and

engaging in career discussions will further enhance their experience. Ultimately, these strategies will cultivate a supportive environment, fostering their growth and continued research involvement.

Applicant Requirements:

Some prior lab experience (Biology, Physics, or Chemistry lab for example)

Basic computer skills (microsoft office, email)

Self starter, motivated, and can make progress independently

Student must not be planning to do an internship and this REU. There is not enough time for both.

Applicant Preferences: None of the following are necessary but would speed up the onboarding process:

College of Engineering student

Student with prior research experience

Student that is considering a long term interest in research

Student who has taken one of the mentor's courses

Specific Time considerations/conflicts: Student must find availability during regular business hours for SEM operation, and find time to meet with advisors biweekly.

App ID #: 1680 **Mentor:** Bombik, Anthony

Email: abombik@charlotte.edu Title: Assistant Professor

**Department:** Mechanical Engineering and Engineering Science

Co-mentor: Yes

Xiang Chen, xchen50@charlotte.edu, Mechanical Engineering, College of Engineering

Community engaged research: 1680

**Title:** Atomic-Electrochemical Modeling of LLZTO for Solid State Batteries

**Description:** This undergraduate research project aims to enhance the accuracy of solid-state battery simulations by integrating atomic transport modeling with electrochemical models, specifically focusing on the LLZTO (lithium lanthanum zirconium titanium oxide) ceramic electrolyte. By simulating lithium ion movement at the atomic level, we can capture nuanced transport phenomena that are often simplified or overlooked in traditional electrochemical models. This project will involve:

Developing or adapting atomic transport models: Utilizing computational tools to simulate lithium ion diffusion within the LLZTO lattice, considering factors like grain boundaries and defect structures.

Integrating these models with existing electrochemical models: Combining the atomic-level transport data with macroscale electrochemical simulations to create a more comprehensive and accurate representation of battery performance.

Validating the integrated models: Comparing simulation results with experimental data on LLZTO electrolytes, such as impedance spectroscopy and electrochemical cycling tests, to assess the accuracy and predictive power of the combined model.

Analyzing the impact of microstructural features: Investigating how grain size, porosity, and other microstructural characteristics influence lithium ion transport and overall battery performance, providing insights for optimizing LLZTO synthesis and processing. This research will contribute to the development of more reliable and efficient solid-state batteries by providing a deeper understanding of the complex interplay between atomic transport and electrochemical processes in LLZTO electrolytes.

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

2 *positions available*

Anticipated Student Learning Outcomes: This project will equip students with a robust skillset encompassing both computational and materials science domains. They will gain proficiency in computational modeling, utilizing software for atomic transport simulations and developing/adapting simulation scripts. Students will master multiscale modeling, learning to bridge atomic-level simulations with macroscale electrochemical models, and develop data analysis and visualization skills for interpreting complex datasets. Simultaneously, they will deepen their understanding of solid-state battery technology, particularly focusing on LLZTO electrolytes

and lithium ion transport mechanisms. The project will also foster critical thinking, problem-solving, and scientific communication skills, as students design computational experiments, correlate simulation results with experimental data, and effectively present their findings. Ultimately, this research provides a comprehensive learning experience, preparing students for future endeavors in computational materials science and solid-state battery research.

Required training of 5 hours with Description: The student will need to be added to the BATT CAVE register for lab access.

There may be some basic virtual training required by the university if the student has never conducted research or worked in a lab space before.

Mentoring plan: Initially, I'll provide a structured onboarding for the undergraduate, covering lab safety and project goals. The student is expected to attend weekly group meetings and present progress on a rotating basis. To ensure consistent support, a PhD student will be assigned as a peer mentor, offering shadowing opportunities. Actively, I will encourage their participation in lab social activities and highlight our research's collaborative nature. Furthermore, regular, constructive feedback and clear, achievable goals are essential. Highlighting the project's real-world impact and engaging in career discussions will further enhance their experience. Ultimately, these strategies will cultivate a supportive environment, fostering their growth and continued research involvement.

Applicant Requirements:

Some prior lab experience (Biology, Physics, or Chemistry lab for example)

Basic computer skills (microsoft office, email)

Self starter, motivated, and can make progress independently

Student must not be planning to do an internship and this REU. There is not enough time for both.

Applicant Preferences: None of the following are necessary but would speed up the onboarding process:

College of Engineering student

Student with prior research experience

Student that is considering a long term interest in research

Student who has taken one of the mentor’s courses

Specific Time considerations/conflicts: Student(s) must find time to meet with advisors on a bi-weekly basis. Mentoring will be available during regular work hours only, although the student has flexibility to work around their schedule.

App ID #: 1682 **Mentor:** Clinton, Sandra

Email: sclinto1@uncc.edu Title: Research Associate Professor

**Department:** Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: 1682

**Title:** Review of Monitoring Practices Related to Beaver Restoration Plans

**Description:** Beavers are important ecosystem engineers who modify the landscape by building dams and creating wetland habitat. These beaver ponds and wetlands provide multiple ecosystem services such as increasing: 1) water storage; 2) nutrient retention; and 2) biodiversity. An emerging restoration practice is the implementation of beaver dam analogs (BDAs) in degraded streams to improve stream structure and function. BDAs are a human-made structure that mimics a natural beaver dam and provides similar ecosystem services. While BDAs are being placed in streams across the United States, there is little information on whether these structures' function similar to natural beaver dams and provide the same water quality benefits. The overall goal of this project is to conduct a literature review on the ecosystem benefits of BDAs by evaluating: 1) the proposed restoration goals of BDA projects; 2) the monitoring data collected to meet these goals; and 3) evaluating if the monitoring data allow us to determine the success of the restoration goals.

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

1 *positions available*

Anticipated Student Learning Outcomes: Anticipated Student Learning Outcomes Include:

Students will gain experience in summarizing the science and policy related to beaver restoration and co-existence. These skills can be transferred to other fields.

Students will learn to code data from research papers into a database.

Students will learn data analysis and presentation skills.

Required training of 0 hours with Description: None are anticipated

Mentoring plan: Students who join the project will complete a mentoring compact and development plan with the Dr. Clinton. The plan covers expectations and goals for both the student and the mentor. The student will meet weekly with Dr. Clinton to review goals for the week and summarize past work. This work is part of a larger project - The North American Beaver Knowledge Network; and students will have an opportunity to meet and work with other students from multiple universities (Minnesota and Washington), non-profits (Beaver Institute), and Indigenous Tribes.

Applicant Requirements: Students should have some experience reading the scientific literature and government reports and be comfortable with using search engines (e.g. Web of Science). A knowledge of Excel is required for working with the database. The students should also be comfortable working independently and in teams.

Applicant Preferences: A strong interest in environmental science and/or policy, preferably related to freshwater ecosystems and conservation. Students with GIS courses are preferred however, this is not a requirement for the position.

Specific Time considerations/conflicts: Student(s) must have availability during the week for at least an hour between 9am-5pm for a weekly 1-hr meeting. There may be additional meetings with the broader research groups that the student should attend if available.

App ID #: 1684 **Mentor:** Roberts, Nicole

Email: nbarclay@uncc.edu Title: Assistant Professor

**Department:** Engineering Technology and Construction Management

Co-mentor: Yes

Dr. Michael Smith, mssmith1@uncc.edu, Engineering Technology and Construction Management

Community engaged research: 1684

**Title:** Artificial Intelligence/Machine Learning Model Development and Evaluation for Water Utility Applications

**Description:** Artificial Intelligence (AI) involves the use of a machine (e.g., a computer) to perform cognitive functions (e.g., perceiving, reasoning, learning, and remembering), where AI is comparable to an intellectual process or program. AI methods, such as Machine Learning (ML), have been used successfully in numerous industrial applications to produce predictive models in support of data-driven decision making (e.g., healthcare, traffic flow, cyber security, power system, speech recognition, water demand, earthquake ground motion analysis, and pipeline monitoring and prediction). However, much work is still needed to expand use of AI/ML within the water sector, since these methods are not yet well understood in this industry.

Dr. Nicole Roberts and Dr. Michael Smith are jointly seeking to mentor a promising undergraduate researcher on their project to help address the critical problems that water utilities are facing (e.g., aging water infrastructure, which brings an increased risk of flooding and road washouts to municipalities constrained by tightened budgets and time). This project focuses on developing novel data-driven ML-based models for optimizing processes, improving performance, and predicting water quality parameters and infrastructure conditions to inform long-term planning for better outcomes. The student's duties will include gathering and sorting relevant peer reviewed literature on the topic, collecting and analyzing data, creating ML-models, writing summaries of their work, and collaboration with the research team through regular meetings, as directed.

*Accepting applications for:* Only 160 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 Python as part of the research process.

Mentoring plan: We 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 must be competent in Microsoft Excel, have strong communication skills (oral and written), and demonstrate keen data organization skills.

Applicant Preferences: Students with proficiency in programming and/or software applications such as Matlab, Python, and ArcGIS 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 #: 1685 **Mentor:** Roberts, Nicole

Email: nbarclay@uncc.edu Title: Assistant Professor

**Department:** Engineering Technology and Construction Management

Co-mentor: No

Community engaged research: 1685

**Title:** Life Cycle Cost Analysis of Green Stormwater Infrastructure

**Description:** Stormwater infrastructure needs for flood control and water quality are increasing due to intensified climate impacts, aging infrastructure, and rapidly growing demand. While there is general support for an increased number of green stormwater infrastructure (GSI) measures and nature-based solutions to help address these issues, there are still uncertainties of their short-term costs, long-term costs (e.g., maintenance cost), and benefits that hinder wider adoption and implementation. Thus, there is a need to evaluate life cycle costs and benefits of GSI compared to conventional stormwater control measures (SCMs). This research project contributes to performing total value assessment of specific green stormwater infrastructure (GSI) measures using life cycle cost analysis and cost-benefit analysis approaches.

The undergraduate student will be responsible for helping with literature review, and gathering cost data for selected GSI measures, and examining the cost versus economic, environmental, and social benefits.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

1 *positions available*

Anticipated Student Learning Outcomes: The expected learning outcomes for the student(s) 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 4 hours with Description: The student will be trained to use software that calculates GSI co-benefits.

Mentoring plan: We will have regular weekly project update meetings 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 must have strong communication skills and demonstrate keen data organization skills.

Applicant Preferences: Willingness to learn, timeliness of required work, and professionalism are desired qualities in the student applicant.

Specific Time considerations/conflicts: We will agree on a time and date to meet at least once per week in person for 30 minutes to 1 hour.

App ID #: 1687

**Mentor:** Martins do Outeiro, Jose

Email: jc.outeiro@charlotte.edu

Title: Professor

**Department:** MEES

Co-mentor: No

Community engaged research: 1687

**Title:** Manufacturing Education and Training Using Immersive Digital Twins

**Description:** The education and training of manufacturing processes require students to acquire knowledge and skills in both fundamentals and technologies. Given the wide range and complexity of processes, understanding the underlying physics and gaining knowledge and hands-on experience with various technologies is challenging and time consuming, which can negatively affect students' motivation and success in learning these processes. To address this issue, Immersive Digital Twin (IDT) offers a transformative solution for teaching manufacturing processes. By creating highly interactive and visually immersive simulations of manufacturing processes, IDT enables students to acquire knowledge and skills more efficiently. IDT results from the combination of Digital Twins (DT) with Immersive Technologies (IT), also called Extended Reality (XR). DT is the creation of a digital representation of a real-world physical asset (system, process, or product), to enable management, simulation, and optimization. IT like Virtual Reality (VR) and Mixed Reality (MR) are advanced digital technologies that create or enhance a sense of presence in a simulated reality, allowing users to interact with digital environments as if they

were part of them.

The objective of this project is to create interactive IDTs for education and training of machining processes. These IDT are developed using specific software (Unity, Creo Illustrate, Vuforia Studio and Reality Composer) and hardware (Oculus Rift, Microsoft HoloLens 2 and Apple Vision Pro).

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

2 *positions available*

Anticipated Student Learning Outcomes: At the end of this project the student should: 1) be able to conduct a literature review and collect valuable information required for research, 2) have knowledge in manufacturing processes, in particular machining fundamentals and technology, 3) understanding the principles behind IoT (sensors) and its applications in manufacturing, 4) have skills on developing digital models of machines and processes, 5) have skills on visualizing these models in MR and VR using specific software (Unity, Creo Illustrate, Vuforia Studio and Reality Composer) and hardware (Oculus Rift, Microsoft HoloLens 2 and Apple Vision Pro).

Required training of 5 hours with Description: The faculty will spend time with the student educating him/her on the topics related to the project, which includes: 1) machining process fundamentals and technology, and 2) fundamentals of Immersive Technologies (Augmented and virtual realities) and their applications in manufacturing. He/she will also learn about conducting machining experiments along with collecting data from sensors implemented in the process.

Mentoring plan: The faculty and student will meet on a regular basis (weekly or as needed) to discuss the progression of the project, the challenges and difficulties, trouble shooting. He/She will get guidance on formulating research questions, developing AR experiences in manufacturing and testing them through teamwork and collaborative efforts.

The instructor will be lenient towards small mistakes made during the time and would make sure that the student learns from their mistakes so that they can be successful when it comes to launching their own project.

Applicant Requirements: This is a multidisciplinary project requiring skills in different engineering concentrations. For this reason, it is recommended to have at least two students from different engineering disciplines (including but not limited to Mechanical, Electrical and Computer).

1. 3D CAD modeling.

2. programming, mainly in Python and JavaScript.

Applicant Preferences: The student should be self-motivated, eager to learn.

1. Familiarity with sensor technologies.

2. Familiarity with machining technology.

Specific Time considerations/conflicts: The student must work in the lab as required and be available to meet with faculty members, PhD/Master students, and postdocs as needed.

App ID #: 1688

**Mentor:** Martins do Outeiro, Jose

Email: jc.outeiro@charlotte.edu

Title: Professor

**Department:** MEES

Co-mentor: No

Community engaged research: 1688

**Title:** An Intelligent Robot-Assisted Finishing System for Post-processing Metal Additive Manufactured Components

**Description:** This project aims to implement a hybrid finishing process for MAM components using drag finishing in order to enhance surface properties.

The students would contribute to developing an experimental setup and to conducting machining tests and characterizations. The tasks conducted by the students are:

1) Learn about machining process fundamentals and technology through literature review and active training.

2) Design and produce mechanical components for the experimental setup.

3) Learn about programming a robotic arm required for holding the workpiece during machining.

4) Conduct experimental machining tests to collect and analyze the generated forces during surface finishing.

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

2 *positions available*

Anticipated Student Learning Outcomes: Benefits for students participating in research (skills, content, experience)

At the end of this project, students should:

1) have knowledge on machining process technology.

2) have the ability to study literature and collect valuable facts required for research.

3) have experience of designing and producing mechanical components.

4) Know how to program a robotic arm.

5) have the experience of finishing workpiece surfaces.

6) have the skill of data acquisition from machining tests.

Required training of 5 hours with Description: The faculty will spend time with the student, educating him/her on the topics related to the project, which include machining process fundamentals and technology. The student will also learn about the experimental setup and its

working principles. He/she will also learn about conducting the machining process along with the data acquisition system required for the study.

Mentoring plan: The faculty and students will meet on a regular basis (weekly or as needed) to discuss the progression of the project, the challenges and difficulties, and troubleshooting. Both in the machinery and programming aspect, the student is not required to know everything beforehand. The instructor will make sure that the student learns from their mistakes so that they can be successful when it comes to launching their own project.

Applicant Requirements: This is a multidisciplinary project requiring skills in different engineering concentrations. For this reason, it is recommended to have at least two students from different engineering disciplines (including but not limited to Mechanical, Electrical and Computer). The Students are recommended (not mandatory) to have basic knowledge in:

(1) materials and manufacturing process

(2) instrumentation

(3) data acquisition

(4) programming, mainly in Python and MATLAB.

Applicant Preferences: The student should be self-motivated and eager to learn.

Specific Time considerations/conflicts: The student must work in the lab as required and be available to meet with faculty members, PhD/Master students, and postdocs as needed.

App ID #: 1690 **Mentor:** Maity, Dipankar

Email: dmaity@charlotte.edu Title: Assistant Professor

**Department:** Electrical and Computer Engineering

Co-mentor: No

Community engaged research: 1690

**Title:** Path Planning of Autonomous Robots in Uncertain Environments

**Description:** Optimal path planning for autonomous agents (robots) in uncertain environments is a challenging task; and it becomes more difficult when agents have limited onboard resources (computation power, battery, communication bandwidth). Decision making algorithms for such agents need to be memory efficient, robust, and must be compliant with the safety regulations. Such decision-making problems are actively being studied among the members of autonomous robotics research community. Therefore, for the thesis, the student will focus on finding an optimal path for a resource limited agent operating in uncertain and dynamic environments.

This research work has the potential to address decision making problems across different domains. As a prime example, consider a group of drones performing a search and rescue mission in hostile environments. Given the uncertainty of environment and distance of each drone from the point of rescue, the objective if determine which drone(s) in the group would be best carry out the rescue effort with minimum risk, and how to coordinate their motion. The research is focused on developing efficient algorithms which can find optimal paths for agents under uncertainties in dynamic environments and limited onboard computation resources. The outcome of this research work can be used for planning efficient robotic delivery systems for our campus, safe UAV operations in military applications, and all the way to reliable space navigation. The timeline of proposed thesis research project is to first develop described path planning algorithm, simulate its results in appropriate framework, and implement algorithm on suitable robot model. Finally, publish the work in conference/journals. Major contributions (during the summer) will be in:

(i) Literature survey and implementing existing algorithms

(ii) Developing a framework for risk-aware path planning methods

(iii) Conducting preliminary simulations to validate the framework and modify as needed

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

1 *positions available*

Anticipated Student Learning Outcomes: Anticipated learning outcomes from this project are critical thinking, data generation and analysis, and documentation and project reporting.

These skills with enhance the student's ability to solve challenging real-world problems through their critical thinking capability, their ability to generate data, conduct experiments and document the findings in report formats--all these are necessary for becoming successful engineers.

Required training of 25 hours with Description: The student will receive training in operating the software and hardware involved in the project. The student will be provided with documented reading materials, research papers and reports from the lab. The student is also going to be connected with MS and PhD students in the lab for additional on-boarding support.

Mentoring plan: The mentoring plan involves the following:

(1) One on one meeting

(2) Group meetings

The student and I will meet weekly at least once and discuss the project progress and any roadblocks. The mode of contact will be email and slack (the student will be added to the Lab's slack channel, giving them a semi-professional experience of communication). The student will work with me, and at time, with another MS or PhD student. The student will be expected to present in group-meetings. Current lab members provide weekly progress in group meetings, and the same will be expected from the student. Additionally, through out the semester the student will be asked to provide longer presentation (conference style). The will be also asked to present their poster in a group meeting. I will have dedicated resources and time allocated for the student's growth and success.

Applicant Requirements: The student should be adept in coding (python) and a passion for mathematics.

Applicant Preferences: Hardworking, motivated, and curious to learn new concepts and face challenges.

Specific Time considerations/conflicts: N/A

App ID #: 1689 **Mentor:** Joyee, Erina

Email: ejoyee@charlotte.edu Title: Assistant Professor

**Department:** MEES

Co-mentor: No

Community engaged research: 1689

**Title:** Integration of a Coaxial Nozzle and Fiber Feeding System for Multi-Component Direct Ink Writing (DIW) Printing

**Description:** Traditional Direct Ink Writing (DIW) printers rely on a single-material extrusion process, which limits their ability to fabricate multi-component and fiber-reinforced structures. To overcome this limitation, this project focuses on modifying a DIW system by integrating a coaxial nozzle and a fiber feeding system to enable the printing of multi-functional composite structures.

A coaxial nozzle allows the simultaneous deposition of different materials in a core-shell or multi-layered arrangement, while a fiber feeding system enables the incorporation of continuous fiber reinforcements within the printed structures. These advancements will enhance the mechanical, electrical, and functional properties of DIW-printed objects, opening new possibilities for lightweight composites, wearable electronics, biomedical scaffolds, and energy storage applications.

This research aims to design, fabricate, and integrate a coaxial nozzle and fiber feeding system into an existing DIW 3D printer and optimize its performance for printing multi-material and fiber-reinforced structures.

The students will:

Design and fabricate a coaxial nozzle system, allowing controlled co-extrusion of core-shell or layered materials.

Develop a fiber feeding mechanism, ensuring precise control over fiber placement within the printed structures.

Integrate the coaxial nozzle and fiber feeding system into an existing DIW printer.

Optimize printing parameters (flow rate, nozzle speed, fiber tension, and extrusion control) to achieve high-quality multi-component structures.

Evaluate the printed structures, analyzing mechanical properties (tensile strength, fiber-matrix adhesion) and functional characteristics using microscopy and mechanical testing.

Demonstrate the feasibility of multi-material DIW printing by fabricating functional prototypes, such as fiber-reinforced composites, conductive pathways, or gradient biomedical scaffolds.

This project will provide hands-on experience in advanced additive manufacturing, machine design, and composite material fabrication, equipping students with essential skills for cutting-edge research in multi-material 3D printing and structural reinforcement technologies.

*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:

Understand Additive Manufacturing Principles:

Gain in-depth knowledge of Direct Ink Writing (DIW) and its applications in multi-material and fiber-reinforced 3D printing.

Optimize Printing Parameters:

Investigate key factors such as extrusion rate, nozzle diameter, and material viscosity to achieve high-precision prints.

Develop techniques to control fiber alignment and distribution within printed structures.

Hands-On Experience with 3D Printing Systems:

Modify and integrate customized hardware components (coaxial nozzles, fiber feeders) into an existing DIW printer.

Troubleshoot and refine hardware-software interactions for improved process control.

Characterize and Evaluate Printed Structures:

Conduct mechanical testing (tensile, compression) to assess material strength and durability.

Use microscopy and imaging techniques to analyze print quality.

Develop Problem-Solving and Research Skills:

Apply critical thinking and engineering design principles to address challenges in DIW-based multi-material printing.

Learn to analyze experimental data and optimize design iterations based on testing results.

Explore Real-World Applications:

Understand how DIW-printed composites can be used in biomedical scaffolds, wearable electronics, energy storage devices, and structural reinforcements.

Discuss the potential of DIW technology for future research and industrial applications.

Required training of 10 hours with Description: The student training/onboarding process includes:

1. Orientation & Safety Training – Lab safety, equipment handling, and research protocols.

2. Introduction to Research – Overview of DIW printing.

3. Hands-on Equipment Training – Operating 3D printers, material preparation, and software tools.

4. Supervised Experiments – Guided practice in printing, testing, and data collection.

5. Regular Progress Meetings – Feedback sessions to track learning and improvements.

6. Independent Research – Advanced tasks, data analysis, and potential contributions to publications or presentations.

Mentoring plan: 1. Will meet with students twice 1:1 to mentor and talk about research progress.

2. Full training will be conducted by the mentor.

3. Will have regular communication personally or via online resources (email/zoom).

4. Will identify project goals with the student at the start of the term and evaluate them every 2 weeks.

5. Will identify specific tasks for the goals.

6. Will assist students in writing reports, and abstracts, and preparing poster for the annual symposium.

Applicant Requirements: Experience with motion systems, actuators, and mechanical assembly for prototype development. Proficiency in 3D modeling (Fusion 360, SolidWorks) for designing printer components.

Applicant Preferences: Prior experience in conducting lab experiments is preferred, particularly in handling materials, mechatronics, prototype development, and fluid dynamics. Strong communication skills are also desired.

Specific Time considerations/conflicts: None

App ID #: 1691 **Mentor:** Joyee, Erina

Email: ejoyee@charlotte.edu Title: Assistant Professor

**Department:** MEES

Co-mentor: No

Community engaged research: 1691

**Title:** Bio-Inspired 3D Printing of Lattice Structures for Load Bearing Scaffolds

**Description:** Nature has evolved optimized structural designs that provide exceptional mechanical strength, lightweight properties, and multi-functionality. Inspired by biological structures such as honeycombs, bamboo, tortoise shells, and seed pods, this project aims to develop bio-inspired lattice structures for load-bearing scaffolds using 3D printing and mechanical testing. Lattice structures are widely used in biomedical scaffolds, aerospace, and protective applications due to their high strength-to-weight ratio and tunable mechanical properties. However, fabricating complex, hierarchical structures with enhanced mechanical performance requires optimized design strategies and advanced additive manufacturing techniques.

This research will focus on:

Extracting bio-inspired design principles from naturally occurring geometries to improve mechanical efficiency.

3D printing optimized lattice structures using Direct Light Processing (DLP) printing with suitable materials.

Evaluating mechanical properties through compression, tensile, and impact testing to determine structural performance.

The students will:

Analyze biological structures (e.g., tortoise shells, bamboo, honeycombs) to extract key geometric patterns for scaffold design.

Develop and modify lattice designs using CAD modeling tools to optimize mechanical properties.

3D print bio-inspired scaffolds, experimenting with different unit cell geometries and material compositions.

Conduct mechanical testing, evaluating strength, deformation behavior, and energy absorption capacity of the printed models.

Compare experimental results to assess the effectiveness of different lattice architectures for biomedical and structural applications.

This project will provide hands-on experience in biomimetic design, additive manufacturing, and mechanical characterization, equipping students with essential skills in advanced materials and structural optimization.

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

1 *positions available*

Anticipated Student Learning Outcomes:

Learn how natural structures (e.g., honeycombs, trabecular bone, plant cell walls) influence mechanical performance.

Apply biomimetic concepts to optimize scaffold designs for strength, flexibility, and lightweight properties.

Operate and optimize Digital Light Processing (DLP) printers for fabricating high-resolution lattice structures.

Understand material selection, curing mechanisms, and post-processing techniques for printed scaffolds.

Use CAD software to design complex bio-inspired lattices.

Apply generative design techniques to improve scaffold efficiency and mechanical performance.

Perform mechanical testing (compression, tensile, and flexural tests) to evaluate scaffold strength.

Use microscopy and imaging techniques to assess structural accuracy and porosity.

Learn iterative design techniques to improve scaffold performance based on test results.

Develop critical thinking and teamwork skills by collaborating on real-world biofabrication challenges.

Understand how bio-inspired scaffolds can be applied in tissue engineering, regenerative medicine, and load-bearing structures.

Discuss future scaling, commercialization, and interdisciplinary research opportunities.

Required training of 10 hours with Description: 1. Orientation & Safety Training – Lab safety, equipment handling, and research protocols.

2. Introduction to Research – Overview of DLP bio printing.

3. Hands-on Equipment Training – Operating 3D printers, material preparation, and software tools.

4. Supervised Experiments – Guided practice in printing, testing, and data collection.

5. Regular Progress Meetings – Feedback sessions to track learning and improvements.

6. Independent Research – Advanced tasks, data analysis, and potential contributions to publications or presentations.

Mentoring plan: 1. Will meet with students twice 1:1 to mentor and talk about research progress.

2. Full training will be conducted by the mentor.

3. Will have regular communication personally or via online resources (email/zoom).

4. Will identify project goals with the student at the start of the term and evaluate them every 2 weeks.

5. Will identify specific tasks for the goals.

6. Will assist students in writing reports, and abstracts, and preparing poster for the annual symposium.

Applicant Requirements: Proficiency in 3D modeling (Fusion 360, Creo, SolidWorks) for designing samples.

Applicant Preferences: Prior experience in conducting lab experiments is preferred, particularly in handling materials, mechanical testing, and biomaterials, as well as a strong interest in bio-inspired design and additive manufacturing. Strong communication skills are also desired.

Specific Time considerations/conflicts: None

App ID #: 1693

**Mentor:** Xue, Hongfei

Email: hongfei.xue@charlotte.edu

Title: Assistant Professor

**Department:** Compute Science

Co-mentor: No

Community engaged research: 1693

**Title:** Human Activity Sensing and Understanding using Wireless Signals

**Description:** Our project aims to develop cutting-edge systems capable of sensing and recognizing human activities through the analysis of the physical properties of wireless signals. These systems repurpose the wireless signals typically used for communication, such as WiFi and millimeter-wave (mmWave), to enable activity sensing. Unlike traditional human sensing methods that rely on cameras and wearable sensors, our research leverages the ubiquity and non-invasiveness of wireless signals. These signals offer unique advantages, including the ability to work in environments where visual methods fail due to poor lighting or occlusions and preserve privacy more effectively.

Undergraduate students participating in this project will have the opportunity to engage in various aspects of research and development, including:

- Data Collection and Preprocessing: Assist in setting up experimental environments for data collection using WiFi and mmWave technologies. Learn to preprocess the collected signal data to prepare it for analysis.

- Model Training and Evaluation: Participate in training machine learning and deep learning models on processed datasets. Gain hands-on experience in evaluating model performance and making iterative improvements.

- Software Development: Contribute to developing the software tools and interfaces needed for data collection, model training, and activity recognition testing.

- Research Documentation: Assist in the documentation process by compiling results, conducting literature reviews, and contributing to the writing of research papers or reports.

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

2 *positions available*

Anticipated Student Learning Outcomes: Participating in the research project on human activity recognition using wireless signals offers undergraduate students a multifaceted learning experience, rich in both theoretical knowledge and practical skills. Here are the anticipated learning outcomes categorized into skills, content knowledge, and experience:

Skills:

- Technical Proficiency in Deep Learning: Students will learn to implement and optimize deep neural networks, gaining hands-on experience with PyTorch. This includes data preprocessing, model architecture design, training, and evaluation.

- Signal Processing and Analysis: Participants will develop skills in processing and analyzing wireless signals, such as WiFi and mmWave, understanding how human activities alter these signals and can be inferred from them.

- Research Methodology: Students will acquire a rigorous approach to scientific research, including hypothesis formulation, experimental design, data collection, statistical analysis, and result interpretation.

- Collaborative Software Development: Working on a project of this scale provides practical experience in collaborative software development practices, including version control with Git, code review, and continuous integration tools.

- Problem-Solving and Critical Thinking: The challenges faced during the project will hone students' problem-solving skills, requiring them to apply critical thinking to overcome obstacles and achieve project goals.

Content Knowledge:

- Human Activity Recognition (HAR) Fundamentals: Students will gain a deep understanding of the principles and state-of-the-art techniques in HAR, focusing on device-free methods using wireless signals.

- Data Privacy and Ethics: Students will learn about the ethical considerations and privacy concerns inherent in human activity recognition research, especially regarding device-free monitoring methods.

- Machine Learning and Deep Learning Theory: Participants will deepen their knowledge of machine learning and deep learning theories, understanding how these models can be applied to interpret complex signal data.

Experience:

- Real-World Application of Theoretical Knowledge: Students will apply their classroom learning in computer science and engineering to address real-world problems, bridging the gap between theory and practice.

- Interdisciplinary Collaboration: The project offers the chance to work in an interdisciplinary team, fostering collaboration skills and exposing students to different perspectives and expertise areas.

- Research Innovation: By contributing to cutting-edge research in HAR, students will experience the innovation process firsthand, including the excitement of discovery and the potential for real-world impact.

- Professional Development: Participation in this research project can significantly enhance students' resumes, providing them with a competitive edge for future academic or industry opportunities in high-tech fields.

- Publication and Presentation Skills: Students will have the opportunity to contribute to research reports and presentations, gaining valuable experience in scientific communication and the publication process.

Required training of 0 hours with Description: N/A

Mentoring plan: Short Responses:

- The student will directly work with me and one of my PhD students on the project.

- We will have weekly meetings with the students.

- Yes, the student is expected to present at the group meetings and conferences.

- I will work closely with the student to provide guidance and materials. And my PhD student will be open to the questions of the student.

My Mentoring Philosophy: My mentoring approach is built on the foundation of support, growth, and collaboration. I believe in creating an inclusive, encouraging environment that promotes curiosity, critical thinking, and innovation. My goal is to guide students through their research journey, helping them to apply theoretical knowledge to practical problems, develop new skills, and grow both personally and academically.

Success Plan

- Goal Setting: At the beginning of the program, goals will be set collaboratively with the student, aligning their interests with the project objectives.

- Skill Assessment and Development Plan: An initial assessment of the student's skills will be conducted to identify areas for development. A personalized plan will be created to address these gaps throughout the course of the project.

- Feedback and Evaluation: Constructive feedback will be provided regularly, focusing on achievements and areas for improvement. Mid-term and end-of-term evaluations will assess progress toward the set goals.

- Encouragement of Independence: While providing the necessary support, students will be encouraged to take initiative, make decisions, and lead parts of the project, fostering independence and confidence.

- Recognition of Contributions: Student contributions will be acknowledged in presentations, publications, and reports. They will also be encouraged to present their work in academic forums.

What Students Can Expect

- Regular Check-Ins: Students can expect regular meetings to discuss progress, challenges, and next steps. These sessions provide an opportunity for feedback, reflection, and adjustment of goals and strategies.

- Clear Communication: Open lines of communication are vital. Students will receive clear instructions on tasks, expectations, and timelines and are encouraged to express their thoughts, concerns, and ideas freely.

- Access to Resources: Students will be provided with the necessary resources and tools to successfully engage in the research project. This includes access to literature, software, databases, and any required hardware.

- Skill Development: Apart from project-specific skills, students will be guided in developing soft skills such as teamwork, time management, problem-solving, and scientific communication.

- Intellectual Challenge: The mentoring experience is designed to push students out of their comfort zones in a supportive way, encouraging them to tackle difficult problems, think critically, and engage deeply with the research content.

- Professional Networking: Students will be introduced to professionals in the field, including guest speakers, faculty members, and industry experts, to expand their professional network and understand the broader implications of their work.

- Ethical Guidance: Students will learn about the ethical considerations in research, ensuring they understand the importance of privacy, consent, and ethical data handling.

Applicant Requirements: - Basic Programming Knowledge: Proficiency in at least one programming language (e.g., Python, C++) is essential for coding, data analysis, and model development.

- Fundamental Mathematics: A grasp of basic mathematics, including calculus and linear algebra, to understand the algorithms and models used in the project.

- Introduction to Machine Learning: Having a basic knowledge of machine learning concepts and techniques.

- Data Analysis Skills: Experience with data processing and analysis, understanding how to clean, interpret, and derive insights from data.

- Problem-Solving Ability: Demonstrated ability to approach and solve problems systematically and creatively.

- Communication Skills: Effective written and verbal communication skills for documenting research findings and collaborating with the team.

Applicant Preferences: - Advanced Programming Skills: Proficiency in Python with libraries such as PyTorch for deep learning model development is highly desirable.

- Signal Processing Coursework: Courses or experience in signal processing, especially related to wireless signals, would be advantageous.

- Experience with Deep Learning: Prior experience or coursework involving deep learning, particularly in the context of activity recognition or related fields.

- Project Management Skills: Ability to manage time effectively and contribute to multiple aspects of the project, showing initiative and independence.

- Collaborative Experience: Experience working in teams, especially in multidisciplinary settings, demonstrating the ability to collaborate and communicate effectively with peers from different backgrounds.

- Research Methodology: Familiarity with research methods, including experimental design, literature review, and statistical analysis.

- Curiosity and Enthusiasm for Learning: A strong desire to learn new concepts, explore innovative solutions, and engage deeply with the research topic.

- Critical Thinking: The ability to critically evaluate information, challenge assumptions, and contribute original ideas to the research.

- Presentation Skills: Experience with or willingness to learn how to present research findings to both technical and non-technical audiences.

Specific Time considerations/conflicts: - Weekly Lab Meetings: It's standard for research groups to have weekly lab meetings where all members discuss their progress, challenges, and next steps. Once a week, 1-2 hours, preferably scheduled during a common free period for all team members.

- Research Team Meetings: Smaller team meetings focusing on specific aspects of the project might occur more frequently than full lab meetings. 1 hour per week, timing to be determined based on the specific subgroup members' schedules within the larger project team.

- Data Collection Sessions: For projects involving wireless signal processing, data collection is a critical component that might require all hands on deck. Variable, depending on the phase of the project.

App ID #: 1694 **Mentor:** Akella, Srinivas

Email: sakella@charlotte.edu Title: Professor

**Department:** Computer Science

Co-mentor: No

Community engaged research: 1694

**Title:** Autonomous Robotic Localization, Inspection, and Informative Path Planning

**Description:** In this project, the undergraduate students will learn about state-of-the-art algorithms for autonomous robot localization, 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 Computer Science Department. In addition to validation of the algorithms in simulation, there will be opportunities to implement and demonstrate the algorithms on quadcopter drones and wheeled mobile robots.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

2 *positions available*

Anticipated Student Learning Outcomes: In this project, the undergraduate students will learn about state-of-the-art algorithms for autonomous robot localization, 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 Computer Science Department. In addition to validation of the algorithms in simulation, there will be opportunities to implement and demonstrate the algorithms on quadcopter drones and wheeled mobile robots.

Required training of 10 hours with Description: The students will work through ROS 2 tutorials and read selected research papers as preparation.

Mentoring plan: The mentor will meet with the student on a regular basis (weekly or more frequent if needed). The student will also have the opportunity to interact with graduate students involved in robotics research. 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 Robot Operating System (ROS 2) or ArduPilot is 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) 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: Student should be prepared to come to the lab between 9am and 5pm on weekdays. This will enable face-to-face communication in the lab and also the opportunity to attend research presentations.

App ID #: 1697 **Mentor:** Ogunro, Tobi

Email: vogunro@charlotte.edu Title: Associate Professor

**Department:** Civil & Environmental Engineering

Co-mentor: No

Community engaged research: 1697

**Title:** Translating Engineered Water Repellency Research on Soil to Field Application: Accelerated In-Situ Drying

**Description:**

Significant advancements have been made in the research on engineered water repellency (EWR) to mitigate the adverse effects of high moisture content of the mechanical properties of soils. EWR primarily focuses on surface treatment of soil particles to render them non-wettable, thereby preventing water ingress and maintaining soil moisture optimal levels for enhanced material performance. Our team has successfully conducted bench-scale tests of EWR using organosilane (OS) treatment in the laboratory. However, field pilot tests have yielded mixed results, with limited success. The main challenges in translating this technology to field applications include the slow drying process of the treated soil layer and insufficient data to simulate field-relevant conditions.

To address these challenges, our team has identified the following research topics to facilitate the field applications of the technology:

Optimizing the drying agent content of organosilane-treated silty and clayey soil in the laboratory. This study involves characterizing soil index properties, mixing OS and drying agents with soil, performing compaction test, and measuring the wettability of the treated soil by assessing the contact angle of water droplets using an imaging device.

Laboratory simulation of the effectiveness of drying agents on organosilane-treated soil under field conditions. This study will explore an innovative and easily implementable method for rapidly reducing excess water in treated soils. It will investigate the drying process of instrumented O- treated soil samples amended with various drying agents (such cement and potassium polyacrylate Super Absorbent Polymer (SAP)). The samples will be subjected to different environmental conditions of humidity and temperature in an environmental chamber.

Assessing the long-term performance of organosilane-treated soil subjected to wetting solutions with high ionic concentrations. Given that brine and other products are used to de-ice roads and bridges during winter, ingress of these solutions could weaken the bonds between OS and soil surfaces. This study will examine the impact of water with varying ionic concentrations on the contact angles, the breakthrough pressure, and ponding resistance of OS treated soils.

The outcomes of these research topics will significantly contribute to the successful field application of our research in engineered water repellency of soils.

*Accepting applications for:* Only 160 hours over an academic semester (~10h/wk)

3 *positions available*

Anticipated Student Learning Outcomes: Students will learn critical thinking and effective collaboration skills. The student education, training and careers advising will be led by me. Each student will participate in the professional & career development training offered by the university during the project. The students will learn skills that are crucial for their academic and professional success, chart a well-defined professional development plan (including self-assessment, goal-setting, action plan, milestones, resources, evaluation and reflection), explore effective ways to foster teamwork, and improve communication.

Required training of 2 hours with Description: Since this research exclusively uses organosilane, a chemical that is environmentally benign and safe for handling, our team has trained several undergraduate to work with it. Consequently, student training will be limited to a one-hour online the online laboratory safety course. Additionally, students will be required to attend a one-hour in-person laboratory orientation with our environmental lab and geotechnical lab managers before gaining access to the labs.

Mentoring plan: My mentoring is developed in the context of regular meetings (weekly, standing meeting with research team every Friday) and an individual meeting prior to this group. During the team meeting students will describe their work to colleagues and assist each other with solutions to challenging research problems, explore issue- rather than discipline-based solutions, peer and faculty mentoring. Student will work directly with me but will be assist in laboratory activities by my graduate students. Students will develop multidisciplinary and leadership skills, and acquire teamwork skills.

Applicant Requirements: No specialized skills and courses or experiences required, however, students must be interested to work in a team and open to learn new skills

Applicant Preferences: Civil Engineering, Geologic, Chemistry and Engineering and Science

Specific Time considerations/conflicts: None