App ID #: 1244

Mentor: Akella, Srinivas Email: sakella@charlotte.edu

Title: Professor

Department: Computer Science

Co-mentor: No

Community engaged research: No

Title: Autonomous Robotic Inspection and Informative Path Planning

Description: In this project, the undergraduate students will learn about state-of-the-art algorithms for autonomous robot inspection and informative path planning. The goal is to develop and implement new online approaches that incorporate sensor data. Applications include 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 Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: The students will be exposed to cutting-edge research in robotics and AI and have access to a wide variety of robots (mobile robots, drones, manipulator arms) in our active Robotics Lab. They will closely interact with graduate students. They will gain experience with ROS 2 (Robot Operating System).

Required training of 10 hours with Description: The students would work through ROS 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 ROS (Robot Operating System) 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.

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 #: 1195

Mentor: Bejger, Christopher Email: cbejger@charlotte.edu

Title: Associate Professor of Chemistry

Department: Chemistry

Co-mentor: No

Community engaged research: No

Title: Constructing Redox Active Organometallic Polymers from Artificial Metalloenzymes

Description: This main aim of this project is to prepare and characterize a series of new organometallic polymers comprising metal-sulfur cubane clusters and Janus-like N-heterocyclic carbenes (NHCs). Synthetic Fe4S4 clusters exhibit electronic, magnetic, and structural features found in native metalloenzymes. Additionally, such clusters can undergo multiple redox processes that are important for catalytic and energy storage applications. New, porous polymers made from these cluster building blocks are also expected to have enhanced stability and surface areas. Such features are useful for preparing functional materials such as supercapacitors or high surface area catalysts. Students working on this project will learn a series of organic, inorganic, and air-free synthetic techniques using glovebox and Schlenk line protocols. They will be trained in areas of molecular and material characterization including NMR, UV-vis, and IR spectroscopies, X-ray diffraction, thermogravimetric analysis, and scanning electron microscopy. Finally, students will perform electrochemical analysis on all new compounds and materials.

Accepting applications for: Either full time or part time will be considered

1 position available

Anticipated Student Learning Outcomes: Students working on this project will be fully trained to work in a synthetic chemistry lab. Specifically, students will be trained to use standard synthetic techniques, as well as air-free manipulations, including the use of the Schlenk line and glovebox. In addition, students will learn to perform analysis of new small molecules using spectroscopic techniques such as NMR, IR, UV-Vis, and mass spectrometry. Electrochemical investigations will also be performed. Thus, students will develop expertise in cyclic voltammetry and bulk electrolysis measurements. There also will be a chance for mentees working on this project to learn the basics of X-ray diffraction using single crystal and powder diffraction methods. Mentees will learn practical chemical safety and hygiene.

This project allows young chemists to learn how to design new molecules and materials. It provides the opportunity to work in a diverse laboratory setting with undergraduates, graduate students at the MS and PhD levels, and postdoctoral researchers. Participants will be trained to prepare professional research presentations and learn public speaking skills.

Required training of 2 hours with Description: Students will take chemical safety training, cryogen training, compressed gas cylinder training, and fire safety training courses.

Mentoring plan: Students will work directly with the mentor in the laboratory during training. Students will meet with the mentor daily to discuss research strategies and to analyze data. Participants will also work closely with a team of graduate students and postdoctoral researchers in the laboratory. The mentor will hold weekly group meetings. The student will be expected to present their results once during the summer during a group meeting. The mentor will help the student prepare this presentation and give feedback on the content and flow of the talk.

Applicant Requirements: Students must have completed one year of Organic Chemistry CHEM 2131 and CHEM 2132. Applicants should be willing to work with a diverse team of researchers. Students must be punctual. Synthetic chemistry is challenging. Thus, the student must be tenacious and willing to troubleshoot when initial experiments do not work.

Applicant Preferences: Students must have completed one year of Organic Chemistry CHEM 2131 and CHEM 2132. Applicants should be willing to work with a diverse team of researchers. Students must be punctual. Synthetic chemistry is challenging. Thus, the student must be tenacious and willing to troubleshoot when initial experiments do not work.

Specific Time considerations/conflicts: Our laboratory operates on a regular schedule of 9am to 5pm Monday through Friday.

App ID #: 1216

Mentor: Benjamin, Michael Email: mbenjam3@charlotte.edu

Title: Assistant Professor

Department: Engineering Technology and Construction Management

Co-mentor: No

Community engaged research: No

Title: Food Truck Safety Analysis

Description: The food truck industry has grown tremendously over the last decade. While many aspiring business owners may be interested in starting a food truck business instead of a restaurant due to lower startup costs and mobility, they may not be aware of the unique safety hazards that food trucks have (propane tanks, fire safety, customer violence, etc). Additionally, insurance coverage varies tremendously based on the type of mobile food business it is, and owners may not have the best insurance type to meet their needs in case of catastrophic loss. Finally, regulations have been slow to keep pace with food truck presence in many communities and the requirements in one area may be very different from those in a neighboring community. The purpose of the project is to gather information about the presence of safety hazards and their controls, as well as the practices used by food truck businesses.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will learn how to perform a literature review, form a scientific hypothesis, design an experiment to test that hypothesis, and analyze the data to form conclusions. They will then present their results to others during and at the end of the term.

Required training of 6 hours with Description: Depending on the project, students will be expected to complete trainings on the Responsible Conduct of Research, Human Subjects Research, and attend a training on the safety aspects of food trucks

Mentoring plan: Students will meet with the mentor once a week. If multiple students are working in the term, there may be opportunities to share results in a weekly research meeting as well.

Applicant Requirements: Competency in Microsoft Excel and Word, strong communication skills (oral and written), ability to write technical summary reports, and organize data effectively.

Must be able to manage time effectively and finish work on time.

Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

Applicant Preferences: Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

Specific Time considerations/conflicts: Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

App ID #: 1217

Mentor: Benjamin, Michael Email: mbenjam3@charlotte.edu

Title: Assistant Professor

Department: Engineering Technology and Construction Management

Co-mentor: No

Community engaged research: No

Title: Upcycling Household Waste into Useful Products

Description: With Municipal Solid Waste (MSW), several options exist to prevent materials from reaching the landfill, which has a finite capacity and lifetime. After a material is used and no longer needed, consumers may have the option of re-using the item (or making it available to others to re-use like donating to Goodwill) or recycling the item (often changing the properties of the material by heating it or breaking it into smaller parts) so that it can be reformed into a useful product. If neither option is available, the material might be incinerated to extract energy or ultimately sent to a landfill if no options are possible. A more recent concept in diverting materials from the landfill is the idea of upcycling. Upcycling is different from re-use in that re-use simply finds another user for the unaltered material (as-is), while upcycling often alters/incorporates the materials into new products that may have a life of their own. An example of this could be cutting out sections of old jeans to make a handbag or collecting a bunch of wine corks to make a cork bulletin board. Student work would involve taking clean materials that would normally go into a waste stream and converting it into new products, while documenting the time and materials needed to complete one or multiple final products, allowing for a product breakeven cost to be determined. Students may also be asked to troubleshoot when product development problems arise or provide input on new processes/products.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will learn how to perform a literature review, form a scientific hypothesis, design an experiment to test that hypothesis, and analyze the data to form conclusions. They will then present their results to others during and at the end of the term.

Required training of 6 hours with Description: Depending on the project, students will be expected to complete trainings on the Responsible Conduct of Research and Human Subjects Research. (IRB CITI Training)

Mentoring plan: Students will meet with the mentor once a week. If multiple students are working in the term, there may be opportunities to share results in a weekly research meeting as well.

Applicant Requirements: Competency in Microsoft Excel and Word, strong communication skills (oral and written), ability to write technical summary reports, and organize data effectively.

Must be able to manage time effectively and finish work on time.

Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

Applicant Preferences: Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

Specific Time considerations/conflicts: Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

App ID #: 1218

Mentor: Benjamin, Michael Email: mbenjam3@charlotte.edu

Title: Assistant Professor

Department: Engineering Technology and Construction Management

Co-mentor: No

Community engaged research: Yes

Title: Firefighter Mental Health Resources

Description: Firefighters are exposed to traumatic events on a regular basis in the course of their work that can impact their mental and emotional well-being. However, resources to address those traumatic exposures are lacking and stigma around requesting assistance for mental health is prevalent. This project will have students collect data from fire departments of different sizes, types, and locations to compare the resources available to firefighters working in those environments.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will learn how to perform a literature review, form a scientific hypothesis, design an experiment to test that hypothesis, and analyze the data to form conclusions. They will then present their results to others during and at the end of the term.

Required training of 6 hours with Description: Depending on the project, students will be expected to complete trainings on the Responsible Conduct of Research and Human Subjects Research. (IRB CITI Training)

Mentoring plan: Students will meet with the mentor once a week. If multiple students are working in the term, there may be opportunities to share results in a weekly research meeting as well.

Applicant Requirements: Competency in Microsoft Excel and Word, strong communication skills (oral and written), ability to write technical summary reports, and organize data effectively.

Must be able to manage time effectively and finish work on time.

Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

Applicant Preferences: Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

Specific Time considerations/conflicts: Work hours can be flexible (and literature reviews/writing can be done at any time), but physical lab work should be done on campus during typical work hours (M-F, 8-5) based on the number of hours the student is approved for.

App ID #: 1247

Mentor: Berez, Jaime Email: jberez@uncc.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

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. LPBF machines are still relatively new and rapidly maturing and research into novel machine characterization techniques and machine performance is required.

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: Only Full time 40 hours per week will be considered

2 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 Summer 2024) 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

Applicant Preferences:

Experience with electronics/instrumentation and mechatronics

Experience with metallography and microscopy

Proficiency in MATLAB, Python, or a similar programming language

Specific Time considerations/conflicts: Students must be available to work on-campus during normal working hours, i.e., 9am-5pm M-F.

App ID #: 1207

Mentor: Bombik, Anthony Email: abombik@charlotte.edu

Title: Assistant Professor

Department: Battery Complexity, Autonomous Vehicles and Electrification (BATT CAVE)

Co-mentor: No

Community engaged research: No

Title: How Compatible is your City for Electric Cars?

Description: Electric Vehicles are taking over the automotive market, or at least they are supposed to be. Some early estimates suggested 100% of new cars made in 2035 will be full electric. Is the infrastructure even ready for that? Is the public view of electric cars generally favorable or unfavorable? What are the challenges we must overcome to reach full market adoption? What will happen if governement tax credits go away?

There are plenty more questions surrounding the growth of EVs in this country. The main one we hope to tackle in this project is whether or not owning an electric car in your city makes sense. We will work together to develop a "Compatibility Score" based on a variety of factors, such as: the necessity of driving in a particular city, the average commuting distance, the availability of single family homes where installing chargers at home are feasible, and the local charging network distribution. We will start with grading Charlotte, and expand the algorithm to other major cities around the US.

Accepting applications for: Either full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes: Students will learn to think critically about a multifaceted engineering problem that impacts society. Students will practice classical research skills, gathering information about cities in a methodical manner. Depending on the student's background, there will be opportunities for streamlining with computer coding and mathematic algorithms. I hope that the student will gain a variety of perspectives on the fit of Electric Vehicles in the US and World market. The student will develop presentation skills to sell an audience on whether or not EVs are a good fit for their lifestyle. At the end of this experience, the student should be well prepared to make their own decision about owning an EV in the future.

Required training of 4 hours with Description: The student will need to be added to the BATT CAVE register for lab access. Although the student will not need to do any physical research with any equipment, the cubicles are located behind card 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: My goal is to introduce an undergraduate student to the lifestyle of my research group, and keep them on to research more if they enjoy it. The OUR student will attend biweekly lab meetings and present on their progress in front of the group. I make myself available for 1 on 1

support for all of my students weekdays 9-5 as long as I am not teaching, but in the past I have additionally scheduled weekly meetings with OUR students to help in their first research experience. Some of my PhD students have been known to step in and help from time to time. The research group is generally pretty friendly, and the students (ranging from undergrad to PhD) organized lab intramural teams, running groups, study groups, and social gatherings.

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. Part time summer enrollment is acceptable

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 my courses (especially Intro to EVs)

Specific Time considerations/conflicts: Only requirement is that we can find some mutually agreeable time to hold a weekly 1on1 meeting. The summer lab group meetings will be organized according to everyone's schedule and are difficult to predict. Ideally the OUR student will also attend the lab group meetings, but it is not required.

App ID #: 1255

Mentor: Bombik, Anthony Email: abombik@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering

Co-mentor: Yes

Amir Ghasemi, aghasem1@charlotte.edu, Mechanical Engineering

Community engaged research: No

Title: Electrifying and Automating a Golf Cart

Description: The BATT CAVE is working on modifying some old university golf carts to become a testbed for battery and autonomous driving research. With the help of faculty mentors Anthony Bombik and Amir Ghasemi with backgrounds in Li-ion Battery and Autonomy respectively, you will be responsible for replacing the old lead acid battery system and interfacing with the control unit of the golf cart. While one student is working on getting the electric powertrain up and running, the other student will be working on a computer controlled system which steers the car. Students will work together across both tasks with the aid of the faculty mentors to complete the autonomous golf cart project by the end of the summer and collect battery and driving data for research purposes.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will learn to think critically about a multifaceted engineering problem that impacts society. Students will practice classical research skills, gathering information about electric vehicle powertrains and autonomous measurement systems. Depending on the student's background, there will be opportunities for streamlining with computer coding and mathematic algorithms. This project will require a lot of hands-on work and skills with tools to disassemble a golf cart and re-assemble it with new components. At the end of this experience, the student should be well prepared to make their own decision about continuing research in autonomous vehicles or batteries.

Required training of 10 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. The faculty mentors will provide additional material as necessary to onboard students with respect to battery science and autonomous control theory.

Mentoring plan: Our goal is to introduce undergraduate students to the lifestyle of a research group, and keep them on to research more if they enjoy it. The OUR students will attend biweekly lab meetings and present on their progress in front of their group. I make myself available for 1 on 1 support for all of my students weekdays 9-5 as long as I am not teaching, but in the past I have additionally scheduled weekly meetings with OUR students to help in their first research

experience. Some of our PhD students have been known to step in and help from time to time. The research groups are generally pretty friendly, and the students (ranging from undergrad to PhD) organized lab intramural teams, running groups, study groups, and social gatherings.

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. Part time summer enrollment is acceptable

Previous experience working with hand tools

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: The only requirement is that we can find some mutually agreeable time to hold a weekly 1on1 meeting. The summer lab group meetings will be organized according to everyone's schedule and are difficult to predict. Ideally, the OUR student will also attend the lab group meetings, but it is not required.

App ID #: 1215

Mentor: Buchenau, Jurgen Email: jbuchena@charlotte.edu

Title: Dowd Term Chair of Capitalism Studies

Department: History

Co-mentor: No

Community engaged research: No

Title: Mexico and the Road to the North American Free Trade Agreement

Description: This project examines Mexico's long economic crisis of the 1980s and the decision to embrace a North American Free Trade Agreement (NAFTA) together with Canada and the United States. That agreement was signed in 1992 and took effect on January 1, 1944, reducing or eliminating trade barriers in North America. As the incoming Trump administration is considering new tariff barriers and other measures to protect U.S. manufacturing, it is worthwhile to understand how NAFTA came to be, and Mexico's agency in the negotiations. I am seeking students to do some of the archival work associated with the project. Students will examine the available digital documentation in the Ronald Reagan and George H.W. Bush presidential libraries. Another student could review press coverage, either just U.S. coverage or (if the student reads Spanish) Mexican media. A student proficient in Spanish could also index and evaluate the hundreds of pages of original documents that I have procured in the Mexican Foreign Ministry archive. Each student would base their own project on a sub-topic, for example, the debt crisis of 1982, the nationalization of Mexico's banks, the coming to power of President Carlos Salinas de Gortari in 1988, or the rise of a neoliberal movement within Mexico's middle classes in the mid-1980s, among many other examples. This project could interface with a senior capstone project in various disciplines.

Accepting applications for: Either full time or part time will be considered

4 positions available

Anticipated Student Learning Outcomes: --interdisciplinary and multilingual research skills; learn how to approach and study a problem from different angles

--written communication; learn how to write a persuasive essay with a research question, an evidence base, and clear argument.

--professionalism: learn how to work closely with a tenured scholar and to articulate research findings at the OUR symposium.

--a deep knowledge of how the current neoliberal capitalist global system came into being, and what challenges it has faced.

--understanding cultural, economic, and political differences between the United States and Mexico

--ability to use both quantitative and qualitative evidence for the purpose of research.

--networking for the purpose of employment or graduate school

--possibly a co-authored presentation or publication (I was just able to put together one of those for the American Historical Association, with an undergraduate student)

Required training of 0 hours with Description: Where students have no experience working with historical documents or historical literature, I will conduct a workshop on the first morning of their summer work, with follow-up conversations each week. I will also furnish students with reference guides helping students undertake their research projects and a literature search. No previous experience with historical documents or historical literature is required, and students will not need to know anything about U.S. or Mexican history before they start, other than what they have learned in K-12.

Mentoring plan: The student can expect constant mentorship from me and communication with me, usually on a daily basis. Students will work directly with me and (if there are multiple mentees) with one another, feeding of each other's strengths and working as a team. I will work directly with each student on their documentary research and their OUR presentation. I will also work with students to get their work placed at undergraduate research conferences and possibly even an undergraduate research journal. Stellar projects will put the students in a position of co-authoring a presentation and/or publication with me, as the research is expected to result in a book and several articles. I am also committed to help students succeed after the experience and will be available to write letters of recommendation for opportunities such as graduate school.

Applicant Requirements: Strong critical thinking and writing skills and ability to work independently from a computer (travel to archives is not required). Students should be self-motivated and eager to learn.

Applicant Preferences: Reading knowledge of Spanish is a plus but not required. Students in the social sciences, humanities, and economics might find this opportunity particularly attractive, but I will work with a student from any major who is eager to learn the skill set needed to read, evaluate, and synthesize historical document.

Specific Time considerations/conflicts: NA

App ID #: 1257

Mentor: Bunescu, Razvan Email: rbunescu@uncc.edu

Title: Associate Professor

Department: Computer Science

Co-mentor: No

Community engaged research: No

Title: AI Models for Recommender Systems that Elicit Surprise and Emotion

Description: The overall aim of this project is to develop AI-based recommender systems that emphasize novelty, surprise, and emotion. For example, in the domain of book recommendations, a user may seek a book that triggers (positively evaluated) surprise or certain types of effective states, such as moods and specific emotions. In the restaurant domain, the recommender system can identify restaurants that have atypical aspects, such as an origami making station in the waiting area, which could elicit positive surprise (serendipity) for clients wh oare known to enjoy paper crafts.

The students interested in participating in this project will have the opportunity to work on any of multiple project components, such as:

Obtaining and processing reviews and item data from sites such as GoodReads, Yelp, Amazon.

Drafting and implementing annotation guidelines that can be used by experts to provide various types of data annotations; setting up annotation tasks on crowd-sourcing platforms, such as Amazon Mechanical Turk (MTurk).

Developing models that classify or cluster items or reviews in these datasets.

Implementing, training, and evaluating deep learning models for recommender systems.

Implementing and evaluating formal models of surprise, serendipity, and emotion.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Depending on which part of the project the student contributes to, they will:

Develop skills for storing data in non-relational databases and accessing and visualizing it through Python and PyTorch code.

Develop and evaluate NLP and machine learning (ML) and deep learning models, using existing libraries in PyTorch or other Python-based frameworks.

The students will learn to conduct research in a collaborative setting; they will write weekly meeting reports; they will run empirical evaluations; they will write project reports and ideally contribute to the writing of a paper to be submitted for peer-review at a relevant venue.

Upon a successful completion of the project, the student will have developed skills in data processing, crowd-source annotation, machine learning (PyTorch) and language processing (LLMs) that are highly valued in academic and industry settings.

Required training of 0 hours with Description: No training or on-boarding needed (ORPI Compliance Questionnaire submitted).

Mentoring plan: We will have weekly faculty-student meetings, with weekly reports and code to be submitted on https://ccigit. charlotte.edu/.

The student will also interface with PhD students who have already done initial work on the project. The student will be expected to also attend group meetings, where they will report on their progress.

The student will contribute to the writing of a paper to be submitted for peer-review at a relevant venue.

Applicant Requirements: Student is expected to be comfortable with coding and have working knowledge of data structures and algorithms.

Student needs to be self-motivated and have a strong (technical and applied) interest in natural language processing (NLP) and machine learning (ML).

Applicant Preferences: Completion of a natural language processing course (e.g. ITCS 4101) or machine learning course (e.g. ITCS 3156) would be a significant plus.

Specific Time considerations/conflicts: No conflicts.

App ID #: 1262

Mentor: Bunescu, Razvan Email: rbunescu@uncc.edu

Title: Associate Professor

Department: Computer Science

Co-mentor: No

Community engaged research: No

Title: AI Models for Tracing of Student Knowledge and Teacher Effectiveness

Description: The overall aim of this project is two-pronged as follows:

In the first thrust, we aim to develop ML-based models that can trace and estimate the knowledge state of a student as they progress through course materials and lectures. Such knowledge tracing models can be used to predict student behaviors, such as performance on quizzes or misconceptions they inadvertently acquired, which can be very useful in implementing personalized instruction strategies, such as targeted interventions aimed at fixing misconceptions and knowledge gaps.

In the second thrust, we propose to develop AI models that process lesson plans, transcripts of teacher speech acquired from classroom instruction, and standard descriptions of common core objectives in K12 education, in order to extract activities and engagement opportunities. Models will be trained to align classroom instruction with objectives in lesson plans and common core, and to assess and improve the utilization of engagement techniques, such as offering suggestions for students opportunities to respond.

The students interested in participating in this project will have the opportunity to work on any of multiple project components, such as:

Implementing, training, and evaluating deep learning models for knowledge tracing.

Using knowledge tracing models to generate personalized instruction of simulated students.

Processing lesson plans, speech recordings of teacher instruction, and common core objective documents.

Drafting and implementing annotation guidelines that can be used by education experts to provide various types of data annotations.

Developing ML and NLP models that perform information extraction and alignment of educational activities across documents, as well as generation of candidate engagement opportunities.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will have the opportunity to:

Develop and evaluate NLP and machine learning (ML) and deep learning models, using existing libraries in PyTorch or other Python-based frameworks.

Learn to conduct research in a collaborative setting; they will write weekly meeting reports; they will run empirical evaluations; they will write project reports and ideally contribute to the writing of a paper to be submitted for peer-review at a relevant venue.

Articulate data annotation guidelines and engage in annotation exercises in order to create training examples for ML algorithms.

Experiments with state-of-the-art deep learning models, such as LLMs and graph neural networks.

Upon a successful completion of the project, the student will have developed skills in data processing and annotation, machine learning (PyTorch) and language processing (LLMs) that are highly valued in academic and industry settings.

Required training of 0 hours with Description: No training or on-boarding needed (ORPI Compliance Questionnaire submitted).

Mentoring plan: We will have weekly faculty-student meetings, with weekly reports and code to be submitted on https://ccigit. charlotte.edu/.

The student will also interface with PhD students who have already done initial work on the project. The student will be expected to also attend group meetings, where they will report on their progress.

The student will contribute to the writing of a paper to be submitted for peer-review at a relevant venue.

Applicant Requirements: Student is expected to be comfortable with coding and have working knowledge of data structures and algorithms.

Student needs to be self-motivated and have a strong (technical and applied) interest in natural language processing (NLP) and machine learning (ML).

Applicant Preferences: Completion of a natural language processing course (e.g. ITCS 4101) or machine learning course (e.g. ITCS 3156) would be a significant plus.

Specific Time considerations/conflicts: No conflicts.

App ID #: 1209

Mentor: Carter, Morgan Email: mcarte98@charlotte.edu

Title: Assistant Professor

Department: Biological Sciences

Co-mentor: No

Community engaged research: No

Title: Genetic mechanisms of novel bacterial-fungal interactions

Description: Bacteria and fungi interact wherever they are found including within the microbiomes of plants and humans, but unlike plant- and animal-associated bacteria, fungi-associated bacteria remain largely unexplored. Though most fungi can harbor bacterial symbionts, a limited number of endofungal bacteria and host systems have been investigated beyond simply noting their existence. What functional studies do exist reveal that bacterial-fungal interactions can cause changes to fungal stress tolerance, secondary metabolite production (toxins and hormones), and reproduction. The Carter Lab studies how bacteria invade and inhabit fungi as hosts, learning more about fungal cell biology, symbiosis, and bacterial host adaptation. Ultimately, our lab hopes to use bacteria to help control fungal pathogens of plants and people, which will rely on an understanding of what conditions are required for a bacterium to colonize a fungus. Undergraduates will have clearly outlined projects within larger laboratory themes directed by graduate students, working on one of three projects as best matches their interest and desired skill development: 1) developing and analyzing mutant libraries of bacteria when associated with fungi, 2) creating and using fluorescent strains to investigate competition during colonization, and 3) screening plant pathogenic fungi for symbionts and characterizing new relationships. Each of these projects will use a different proportion of microscopic techniques, basic microbial culturing, DNA methods, sequencing, computational skills, plant work, and basic biology lab skills.

Accepting applications for: Either full time or part time will be considered

3 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience with sterile technique, microbial culturing and genetic manipulation, microscopy, data processing in R, and potentially plant inoculation, as well as basic lab tasks such as media making. These are all transferrable skills to a resume for students interested in biological research as part of their career. Researchers will also participate in laboratory meetings with other members of the lab to discuss biological research topics and professional development, gaining familiarity with career paths, the process of scientific research, and intragroup communication. Student work will contribute to published papers as possible, providing additional support for pursuing research career paths should they so choose.

Required training of 4 hours with Description: All laboratory personnel must complete chemical, laboratory, and biological safety training online before starting in the laboratory in compliance with university standards and our approved biosafety protocol. Students will also be expected to read

scientific papers recommended by the professor to gain a basic understanding of their research question and methods.

Mentoring plan: Having directly mentored more than a dozen undergraduate students previously, I am experienced in facilitating undergraduate research in microbiology. When bringing on new students, I tailor their project goals to their professional goals so they gain skills of interest to their career paths. Students are integrated into a supportive, in-person lab environment where they will form peer connections and see models of good student research. Undergraduate summer interns work directly with a graduate student mentor (one of the three PhD students in the lab) to learn skills at the bench and on the computer, becoming more independent over the course of the experience. Our laboratory communicates regularly on the Slack platform and my laboratory handbook outlines my dedication to policies ensuring student well-being, accountability, and transparency. I typically meet with undergraduates at a set time every week to determine weekly objectives and assess progress, but am around daily for questions and troubleshooting. We have weekly group meetings where undergraduates will be expected to participate, and a summer "summit" where every group member gives a short presentation. I provide mentorship focused on the individual development of each student in the lab, tailoring advice and suggesting other opportunities that could contribute to their desired path. In my short time at UNC Charlotte, I have already mentored students through abstract writing and submission, poster development and presentations, travel scholarships for national meetings, graduate school applications, and I regularly serve as a judge for many research presentations on campus.

Applicant Requirements: Introductory biology and chemistry course sequence

Attention to detail

Perseverance

Applicant Preferences: Microbiology or Genetics courses and labs - though students are not expected to have much background in fungi

Interest in research as a career path

Interest in or experience with linux/R programming

Specific Time considerations/conflicts: Students must fulfill their weekly hours in-person in the Bioinformatics building between the hours of 9-5 on weekdays following a regular schedule that they set at the beginning of the summer with the professor and a graduate student mentor. That time window should be considered carefully when selecting any classes the student plans to enroll in, so that they can still fulfill their research hours and handle the accelerated rate of summer courses.

App ID #: 1266

Mentor: Chen, Xiang Email: xchen50@charlotte.edu

Title: Assistant Professor

Department: Department of Mechanical Engineering

Co-mentor: No

Community engaged research: No

Title: Using atomistic simulations to explore the strain effect on ion transport in battery materials

Description: As a simple concept used to characterize deformation in classical mechanics, strain engineering has emerged as a transformative means that offers exciting opportunities to tailor conductivity of materials. Batteries under operation can experience frequency change in strain. This is especially true for state-of-the-art solid-state batteries. Except for the typical strain variation during the cycles, external pressure is often required due to the weak solid-solid contact in between electrolyte and electrodes. The fundamental mechanisms of how the strain affects structural change and ion transport are far from well understood. This project aims to provide insight to this question from an atomic viewpoint, for better battery design.

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 ion transport in battery material under varied strain levels. 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 full time or part time will be considered

2 positions available

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

Required training of 6 hours with Description: Students will receive roughly 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 #: 1229

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: No

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 sources that Reyes quotes in the J. Murrey Atkins Library or through online resources. Throughout Literary Experience, Reyes quotes numerous works from the history of literature and philosophy. Sometimes, these works are easy to find; sometimes, they are quite 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: Only part time (20 hours per week) will be considered

2 positions available

Anticipated Student Learning Outcomes: The translation of Reyes's Literary Experience 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 summer.

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 Literary Experience. 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 summer, 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 – either in person or on Zoom – at least 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 will have a unique 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 my meetings. 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 mentor and mentee.

App ID #: 1198

Mentor: Deeba, Farah Email: fdeeba@charlotte.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: From Pixels to Prognosis: Using Deep Learning to Explore Placenta Pathology

Description: Project 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:

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.

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.

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.

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.

Collaboration and Communication:

Throughout the project, you will have the opportunity to collaborate with a team of students, postdocs, and faculty members. 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 full time or part time will be considered

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.

4. Communication and Presentation Skills

a. Reporting Results

Learn to document research findings through clear, structured reports that summarize methods, 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 or industry events.

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 5 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.

Customized Support: I will tailor guidance to each student's background, providing extra resources or training as needed for students new to AI, biomedical research, or programming.

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 characteristics, skills, and experiences that would make a student successful in this project:

Skills and Experiences

Technical Skills (Not required, but beneficial)

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, or Photoshop) is helpful but not mandatory.

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.

2. Skills and Experiences

a. Technical Skills (Desirable but Not Required)

Programming Knowledge: Familiarity with Python or any other programming language is beneficial but not essential. Students with an interest in coding will have opportunities to learn during the project.

Data Analysis: Basic familiarity with handling and analyzing data using tools like Excel, pandas, or NumPy is a plus.

Image Processing: Experience with tools or software for analyzing images, such as ImageJ or OpenCV, can be helpful but is not required.

b. 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.

c. 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.

3. Attitudes and Approach

a. Problem-Solving Mindset

Creative and critical thinking skills, with a willingness to explore solutions for technical challenges.

Persistence and resourcefulness when troubleshooting or learning new tools.

b. Attention to Detail

A careful and precise approach to data handling, documentation, and analysis.

Understanding the importance of accuracy and reproducibility in scientific research.

c. 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.

4. Inclusivity and Accessibility

I value diversity and inclusivity in research and 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 #: 1263

Mentor: Dreau, Didier Email: ddreau@charlotte.edu

Title: Pr.

Department: Biological Sciences

Co-mentor: No

Community engaged research: No

Title: Chemokine signaling, inflammation and cancer

Description: Cancer progression and the development of distant tumors (i.e. metastasis) is associated with cell migration of both immune and tumor cells. Gradients of signaling molecules, especially chemokines, and the expression of their receptors actively participate in the cell migration of tumor cells as well as immune cells critical to the generation of an inflammatory environment favoring tumor progression in general. Summer students will participate in the understanding of the interactions of cells and chemokines / receptors at the cell and protein levels. Specifically students will be involved in biological assays, data analysis, presentation in a collaborative environment.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: beside specific technical / research skills, students will gain experience in a research environment and hone their presentation and writing skills. The later will serve students well regardless of their future endeavors as those are critical in most careers.

Required training of 5 hours with Description: Prior to entering the lab, students will have to complete multiple online modules including biosafety modules (Ideally, this should be completed during the week before start or during the 1st week). In addition, their should contact the PI to get access to literature / background information to get a better understanding of the research their will be involved in.

Mentoring plan: A framework and specific plan will be developed (depending if part or full time) during the 1st week listing specific task/milestone. The progress will be monitored through weekly individual meeting. In addition, students will more directly work with one of the graduate students. PI will be available during lab meetings, individual meetings and on an ad-hoc basis otherwise.

The student will be expected to present / detail their results during lab meeting and to provide a full presentation toward the end of the Summer. In addition, the student will be required to present a poster (or oral) presentation at the Summer research symposium. Moreover, the student may elect to present the results at other venues with the approval of the PI.

Applicant Requirements: Ideal applicant will have a STEM background and interest in biology/cancer biology/immunology.

Applicant Preferences: Student having completed BIOL3111 (Cell biology) would be preferred.

Specific Time considerations/conflicts: For Full-time (40hrs/week generally 8-5 M_F) and part-time (20hrs/week, generally by block of 4 to 8 hrs)

App ID #: 1264

Mentor: Etzkorn, Markus Email: metzkorn@charlotte.edu

Title: Associate Professor (Chemistry)

Department: Chemistry

Co-mentor: No

Community engaged research: No

Title: Harnessing strain energy of hydrocarbons to access novel SF5-containing small molecules for potential applications in medicinal chemistry

Description: Many fluorinated drugs are well established in medicinal chemistry, displaying a desirable biological activity that is often far superior to their non-fluorinated analogs (e.g., selectivity, potency, bioavailability). There is a pressing need in the pharmaceutical community to develop new, structurally diverse types of small molecules with varying fluorination patterns to improve biological properties of existing drugs or target new biomolecules (e.g., enzymes, regulatory proteins, DNA, or RNA) that are involved in disease. Considering recent FDA approvals of novel small molecule drugs clearly supports the value of a variety of fluorinated compounds with F-, CF3-, or SF5-groups. The latter group has been described as a super-CF3-group, but unfortunately its general introduction into an organic compound is more than challenging, as no simple reagent has been available over decades. Recently, a series of publications by Pitts et al. described a novel safe and convenient method to transfer this SF5-group to one class of strained precursor compounds in a one-pot reaction.

Our group proposes to use this reagent on a variety of strained hydrocarbon precursors, such as small spirocycles, cycloalkenes or cycloalkynes to explore the reagents potential in delivering novel classes of SF5-decorated frameworks. Student participants will be involved in the preparation of the reagent, selected precursors, and the reactions toward the envisioned target compounds. They will also characterize any novel compound with contemporary analytical tools available in the Department of Chemistry. Students will have to write a daily lab report, carry out synthetic work, purify organic compounds along different techniques, gain introductory confidence with several analytical instruments, and write a comprehensive final lab report. Participation informal daily discussions and weekly group meetings are mandatory, as well as departmental safety training. Ideally, a student participant will continue this research project as an undergraduate researcher after the summer project.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: SKILLS:

- carry out standard and advanced synthetic reactions safely under supervision, and eventually with a certain level of independence

- record standard and advanced analytical data that are expected for publication of novel compounds, including data interpretation

- develop oral and written communication skills in discussing / disseminating organic chemistry research

- translate theoretical knowledge from undergraduate courses in a research laboratory setting

CONTENT:

- deepen your knowledge of synthetic organic chemistry, while expanding your understanding of organic chemistry aspects that are only discussed in a cursory manner in CHEM 2131 / CHEM 2132 (e.g., organofluorine chemistry)

- learn about applications of contemporary organofluorine chemistry to the benefit of society (i.e., medicinal chemistry, material science)

- gain theoretical knowledge of advanced analytical techniques that are required to characterize complex organic molecules

EXPERIENCE:

- hands-on experience in a synthetic lab

- work in a group environment that drives curiosity to understand organic reactions, fosters a productive and respectful work environment, and appreciates everybody for their contributions

- "Have fun" carrying out (novel) reactions and characterizing unique scaffold

Required training of 10 hours with Description: 1) departmental safety training by the department's safety officer (ca. 2 h)

2) individual group-specific safety training by the PI (ca. 2 h, but ongoing through the project)

3) discussion and mutual agreement on a learning contract, clearly stating expectation (lab work, data management, reporting), as well as how to address / solve any evolving problems (ca. 2h, but ongoing feedback through the project)

4) initial lab work under strict guidance of the PI and / or advanced (under)graduate student (SAFETY FIRST)

5) introduction to shared, departmental instrumentation (ca. 2-4 h)

Mentoring plan:

The PI considers his students apprentices who will eventually gain ownership of their own niche research project. Typically, all students will go through a thorough synthetic training along pipeline chemistry to learn about safety, standard set-ups, common purification techniques, and analytical tools, directly mentored by the PI and / or his advanced students. They should gain confidence through this training, allowing them to become more independent as thy progress with their work.

Students will receive frequent individual assistance / feedback from the PI in daily conversations, discussion in weekly group meetings, and written comments on their monthly reports, allowing them to grow professionally (science + communication)

As students mature professionally in their research project, more independence comes with an increasing level of expectation (to read references, propose reaction conditions or new transformations, suggest meaningful interpretation of obtained research data). That said, the student can always rely on the PI for guidance and support.

Pending the students intellectual and preparative contributions, the PI encourages participation in campus research undergraduate fairs, regional or national meetings, and - if applicable - writing sections of manuscripts for publication in the peer-reviewed scientific literature.

PI will always be open for scientific discussion or addressing professional concerns. The PI strives for his group members to strike a healthy balance between work and life.

Applicant Requirements: 1) CHEM 2131, CHEM 2131 L are required pre-requisite courses

2) CHEM 2132, CHEM 2132L or CHEM 2136L are advantageous

3) natural curiosity and desire to learn the ropes of synthetic organic chemistry

4) patience, as synthetic work is time-consuming

5) attention to detail, as synthetic work needs to be carried out safely and reproducibly

6) honesty: making a mistake is fine, but they must not be hidden

7) willingness to work outside of the laboratory (reading!, reading!, reading!)

8) cleanliness (in the lab), i.e., good housekeeping with your own reactions and shared lab equipment

9) team players will have an easier time <=> good communication skills will benefit your work and a positive group environment

10) organized record keeping is critical for success

11) willingness to work for several semesters with the PI, pending mutual satisfaction

Applicant Preferences: see above

Specific Time considerations/conflicts: 1) Weekly group meetings at a mutually agreeable time slot for every group member are mandatory!

2) 40h per week are required during standard business day work hours

App ID #: 1180

Mentor: Fagan, Terence Email: tjfagan@charlotte.edu

Title: Charlotte Super Fab Lab Director

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Design, Build, and Test a Portable Power Supply for a Glass Chipper

Description: Introduction

Charlotte's progression toward becoming a Fab City underscores the importance of sustainable recycling solutions for achieving a circular economy. The Innovation Barn has identified a need for distributed glass recycling technologies, such as portable power supplies for glass chippers. This project invites undergraduate researchers to take an active role in addressing this challenge, providing them with opportunities to develop innovative engineering solutions, engage with community stakeholders, and contribute meaningfully to environmental sustainability.

As a participant in the OUR Summer Program, I aim to gain hands-on research experience through designing, building, and testing a portable power supply. This initiative aligns closely with the program's emphasis on interdisciplinary research and community impact, offering a platform to connect academic inquiry with real-world applications.

Project Objectives

Develop a Portable Power Supply:

Design a reliable, energy-efficient system capable of powering a glass chipper, meeting operational and sustainability requirements.

Advance Circular Economy Goals:

Address the need for decentralized recycling technologies to promote sustainable waste management practices in Charlotte.

Promote Open-Source Development:

Ensure the project's outcomes are accessible for replication and scalability by documenting all designs, methodologies, and results comprehensively.

Support Fab City Goals:

Contribute to Charlotte's vision of a self-sustaining urban ecosystem by leveraging innovative research to solve pressing challenges.

Proposed Activities

1. Design

Student Role: Collaborate with mentors to analyze the power requirements for portable glass chippers. Research existing portable power solutions, with an emphasis on renewable energy integration, and develop preliminary CAD models.

2. Build

Student Role: Utilize advanced tools in the Charlotte Super Fab Lab to fabricate and assemble components. Integrate off-the-shelf and custom parts to create a functional prototype, fostering skills in prototyping and resource optimization.

3. Test

Student Role: Conduct systematic performance tests to evaluate reliability, efficiency, and portability. Refine the design iteratively based on test results to improve the final product's functionality.

Resources and Infrastructure

Charlotte Super Fab Lab: Access to state-of-the-art prototyping tools and expert mentorship for guidance and skill-building.

Innovation Barn: Opportunity to test prototypes in real-world scenarios and collaborate with local recycling stakeholders.

OUR Summer Research Symposium: A platform to present research findings to a wider academic and community audience, aligning with the program's emphasis on dissemination and public engagement.

Anticipated Outcomes

For Students:

Enhanced problem-solving and technical skills through hands-on research in sustainable engineering.

Strengthened collaboration abilities by working closely with mentors and peers.

Public presentation experience through participation in the OUR Summer Research Symposium.

For the Community:

A functional prototype of a portable power supply for glass chippers, contributing to Charlotte's Fab City goals.

Open-source documentation enabling scalability and adaptation of the solution for broader use.

Progress toward a circular economy by addressing a tangible need in local recycling infrastructure.

Timeline:

Phase	Activities	
Week 1–3	Build	Fabrication and assembly
Week 4–6	Test	Performance evaluation and refinement
Week 7–8	Documentation	Open-source file creation
Week 9	Presentation	Share results with stakeholders
Week 10	Conclusion	

Participation in the OUR Summer Program offers a unique opportunity to bridge academic research and community needs. By designing, building, and testing a portable power supply for a glass chipper, this project empowers me to contribute to Charlotte's circular economy goals while gaining invaluable experience in sustainable engineering and research dissemination. Through collaboration with the Super Fab Lab, Innovation Barn, and program mentors, I look forward to demonstrating how student-driven research can inspire impactful, long-lasting change.

Accepting applications for: Either full time or part time will be considered

4 positions available

Anticipated Student Learning Outcomes: 1. Skill Development

Technical Skills: Proficiency in using advanced fabrication tools like 3D printers, laser cutters, and CNC machines.

Research Skills: Expertise in experimental design, data analysis, and iterative prototyping.

Problem-Solving: Real-world application of engineering principles to address sustainability challenges.

2. Content Knowledge

Sustainability and Circular Economy: Deep understanding of how engineering supports sustainable recycling solutions.

Renewable Energy Systems: Insight into energy-efficient designs for portable power supplies.

3. Practical Experience

Collaboration with the Fab Lab Global Network connects students with international innovators.

Engagement with community partners (e.g., Innovation Barn) showcases the societal impact of their work.

Career and Educational Impact

Students will leave with a robust portfolio of technical achievements, presentation experience, and a narrative about their role in solving real-world problems. This prepares them for advanced academic opportunities, industry roles, and leadership positions.

Envisioning Their Reflections

Students will likely describe their experience as transformative, highlighting the technical skills gained, the hands-on innovation process, and the chance to contribute to a global sustainability effort. They might say, "I not only built a solution but also became part of a network dedicated to engineering a better future."

Required training of 20 hours with Description: The estimated hours of training per student for onboarding at the Super Fab Lab are broken down as follows:

Lab Orientation: 2–3 hours, including an introduction to policies, resources, and workflows.

Safety Certification: 4–6 hours, covering equipment safety, emergency protocols, and general lab practices.

Research Ethics: 2–3 hours for Responsible Conduct of Research (RCR) training.

Equipment Training: 6–8 hours, depending on the complexity of tools and the student skills in3D printers, laser cutters, CNC machines and their uses in the context of the lab.

Mentoring plan: Students will work directly with me, as well as with the staff at the Innovation Barn and the Super Fab Lab, including the Lab Manager and lab assistants. The lab assistants will provide essential training on equipment and offer ongoing project feedback, helping students refine their work and develop technical skills. This collaborative environment fosters learning from multiple perspectives, ensuring that students receive well-rounded support throughout their project.

Students can expect to meet with me once or twice a week, depending on schedules, for group discussions and informal student presentations about their progress. These meetings will allow students to present updates, discuss challenges, and receive constructive feedback. This collaborative format fosters a dynamic learning environment, where students can engage in peer learning while receiving direct mentorship and guidance on their research.

I do expect students to present their work at group meetings to encourage peer feedback and foster collaboration. Additionally, depending on the progress of the project, students may also have the opportunity to present at conferences or other public forums, offering exposure to a broader academic community.

I am committed to providing ongoing mentorship, ensuring that students receive both technical and practical support throughout their projects. Students will learn to use advanced lab equipment, including 3D printers (FDM, SLA), laser cutters, and multi-axis CNC tools, gaining hands-on

experience in modern fabrication techniques. Additionally, they will have access to the global Fab Lab network, connecting them with a community of innovators and offering opportunities for collaboration, knowledge exchange, and real-world application of their skills in a broader context.

Applicant Requirements: When selecting four students for this project, I would seek individuals with the following qualifications and characteristics:

Academic Background: Enrollment in engineering, computer science, or related fields with coursework in design, prototyping, or sustainability.

Technical Skills: Familiarity with CAD software, basic electronics, or experience with fabrication tools like 3D printers or CNC machines.

Problem-Solving Mindset: Creativity, adaptability, and a proactive approach to overcoming challenges.

Teamwork and Communication: Strong interpersonal skills for collaboration with peers and stakeholders.

Interest in Sustainability: Passion for recycling solutions, circular economy, or renewable energy systems.

Balance of Rigor and Accessibility

To avoid unnecessarily limiting the applicant pool, emphasis will be placed on a combination of relevant skills and enthusiasm for the project rather than requiring extensive prior experience.

Applicant Preferences: For this project, I seek applicants who demonstrate a strong blend of technical skills, academic preparation, and enthusiasm for hands-on innovation:

Personal Qualities:

Strong problem-solving mindset and adaptability in addressing challenges.

Effective collaboration and communication skills, especially in team settings.

Passion for hands-on research, sustainability, and contributing to innovative solutions.

Academic Preparation:

Enrollment in engineering, computer science, or related programs.

Completed coursework in CAD design, renewable energy, electric circuits, and soldering techniques.

Technical Skills:

Familiarity with tools such as 3D printers, laser cutters, and basic electronics.

A foundational understanding of sustainability principles and renewable energy integration.

Balancing Opportunity and Rigor:

I prioritize selecting students who demonstrate curiosity and a commitment to learning, ensuring inclusivity while supporting those with potential for growth and success.

Specific Time considerations/conflicts: Students will meet during daytime hours when the lab is open to collaborate on the project. Additionally, evening sessions may be arranged if applicable, depending on project needs and scheduling availability.

App ID #: 1242

Mentor: Faklaris, Cori Email: cfaklari@uncc.edu

Title: Assistant Professor

Department: Department of Software and Information Systems

Co-mentor: No

Community engaged research: No

Title: Human-Centered Solutions for Inflammatory Speech on Social Media

Description: In this project, one student will work with a Phd student and faculty to develop human-centered solutions to help distinguish speech meant to incite violence from objectionable, but likely lawful and permissible, speech. The student will become certified in Human Subjects Research and familiar with the existing research on this problem in human-AI interaction and computational social science. They will be expected to support the faculty and PhD student in literature review, design ideation, and/or prototyping. They will assist the PhD student in preparing publications.

Accepting applications for: Either full time or part time will be considered

1 position available

Anticipated Student Learning Outcomes:

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

Become familiar with the basics of designing and carrying out a research study in human-AI interaction and/or computational social science.

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 or 1:1 meeting with the student each week. Additionally, they will be invited to join my research group's Slack workspace, our Google Drive folder for tracking study materials, project team meetings, and our weekly Human-Centered Computing Lab meetings.

Applicant Requirements: We prefer students who have taken at least one course in statistics or machine learning and/or who have some knowledge about human-centered computing, design, or the social and behavioral sciences, plus a willingness to learn more about any of the above that they have not been exposed to before. Programming experience is not required, but is a plus.

Applicant Preferences: The ideal student will have some familiarity with machine learning techniques (either work-related or course-related), plus some knowledge of social or behavioral sciences.

Specific Time considerations/conflicts: We want the student to do the majority of work on-campus, either in our Woodward Hall lab or in other working spaces on the campus. The student must be available for periodic on-campus meetings, but these will be arranged with their schedule in mind.

App ID #: 1243

Mentor: Faklaris, Cori Email: cfaklari@uncc.edu

Title: Assistant Professor

Department: Department of Software and Information Systems

Co-mentor: No

Community engaged research: No

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 a PhD student on one or both of the following projects: (a) mitigating people's vulnerability to SMS text scams and misinformation, aka "smishing"; and (b) providing 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 full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes:

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

Help with recruitment, data collection, and analysis for a research study.

Become familiar with the basics of designing and building a mobile-friendly web app.

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.

Applicant Requirements: We are looking for a responsible student who has prior experience with or coursework in Human-Centered Design 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 prototyping for User Experience (UX) research and design

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 #: 1181

Mentor: Fan, Liyue Email: lfan4@charlotte.edu

Title: Assistant Professor

Department: Computer Science

Co-mentor: No

Community engaged research: No

Title: Generative AI and data privacy

Description: Large language models, diffusion models, and generative adversarial networks are examples of generative artificial intelligence (AI). They are effective at learning data distributions and can be applied widely from medicine to financial services. However, misuse of generative AI techniques may lead to harmful results. Recent research shows that adversaries may extract accurate training data by interacting with generative AI models, such as GPT2 and diffusion models. Furthermore, data generated by AI models may be abused and circulated, e.g., deepfakes, creating misinformation. This project will take a holistic approach to understanding privacy concerns in generative AI, including model memorization, data provenance, and data poisoning.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will gain deep understanding of generative AI models; obtain hands-on experience with recent approaches to inference and data poisoning attacks toward machine learning models; learn about state-of-the-art solutions for data privacy and provenance; write research manuscript and report.

Required training of 0 hours with Description: Not applicable

Mentoring plan: Dr. Fan believes in adapting her mentoring to each student to maximize their research experience and outcomes. All of our students are independent researchers. We give feedback regularly and provide support to each other when challenges arise.

Applicant Requirements:

Programming, e.g., Pytorch

Algorithms

Probabilities and statistics

Applicant Preferences:

Experience or coursework with AI/machine learning

Specific Time considerations/conflicts: Students should be available M/W/F for meetings and collaborative work.

App ID #: 1174

Mentor: Fried, Nathaniel Email: nmfried@uncc.edu

Title: Professor

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Mechanical design of a miniature endoscope prototype for laser fragmentation of kidney stones

Description: Approximately 10% of the U.S. population suffers from kidney stone disease. There are no cures for this disease. The southeastern U.S. and North Carolina suffer from the highest rates of kidney stone disease in the nation. A common minimally invasive treatment is to insert an optical fiber through the single working channel of a flexible endoscope placed inside the kidney, and to deliver pulses of laser energy to fragment the kidney stone into pieces small enough to be removed from the urinary tract. There are several limitations of this procedure. The endoscope diameters are relatively large, which makes them difficult to maneuver inside the urinary tract.

This project will explore novel approaches to reducing the diameter of several components in the endoscope, including the working channel, illumination, and detection ports. Studies will utilize Solidworks or similar software for 3D designs, 3D printing of endoscope components, mechanical stress/strain testing of novel flexible wall materials, steering cables, and optical fibers, and saline irrigation rate studies. A prototype endoscope will be assembled utilizing off-the-shelf commercial components combined with custom designed and printed parts.

Undergraduate students with a major in physics, mechanical engineering, and/or electrical engineering are needed to work on the project. No prerequisites necessary. However, any previous background with CAD/CAM, 3D printing, machine shop tools, optics, and/or mechanics, is a plus.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will gain skills in problem solving, teamwork, 3D design, printing, prototyping, as well as basic skills working with optics, mechanics, and materials.

Required training of 4 hours with Description: Only standard online training modules (e.g. safety training) required of any student working in a laboratory.

Mentoring plan: I will provide mentoring to the student on a regular daily basis. They will also interact and work closely with other graduate and undergraduate students in the laboratory. They will be encouraged to submit their results as an abstract or conference proceedings paper to a scientific conference, as well as present locally at the UNC Charlotte Undergraduate Research Conference.

Applicant Requirements: I am looking for a curious, hard working, and friendly student who can work independently as well as with others in a team. Previous experience with Solidworks or similar software, CAD/CAM, machine shop, mechanics, and/or optics is a plus.

Applicant Preferences: A student with a major in physics, mechanical engineering, or electrical engineering, with previous experience using CAD/CAM software, 3D printing, machine shop, mechanics, and/or optics skills.

Specific Time considerations/conflicts: Normal business hours, Mon-Fri, 9 am - 5 pm.

App ID #: 1178

Mentor: Fried, Nathaniel Email: nmfried@uncc.edu

Title: Professor

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Design of transparent surgical device tips

Description: Approximately 80% of the 15 million laparoscopic surgeries performed globally each year involve the use of energy-based devices, such as electrosurgical or ultrasonic instruments, to replace scalpels and sutures for expediated hemostatic sealing of soft vascular tissues. These devices have limitations, including undesirable collateral damage due to electrical current spread in tissues, and high temperatures on the metallic device tips. Our laboratory is developing an alternative, optical-based approach, using infrared lasers to thermally seal and bisect vascular tissues, with less collateral damage. One added advantage is that the device itself can be made transparent, to provide an improved field-of-view for the surgeon.

This project will involve the design, construction, and preliminary testing of a prototype, transparent laparoscopic instrument for laser based sealing of tissues.

Undergraduate students with a major in physics, mechanical engineering, and/or electrical engineering are needed to work on the project. Previous experience is not required, but a background in CAD/CAM, 3D printing, machine shop, fiber optics, optics, mechanics, and/or materials is a plus.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will gain experience with CAD software (e.g. Solidworks), 3D printing of biocompatible resin components, optical materials (e.g. quartz and sapphire), fiber optics, optics, and lasers. Opportunities to present include submission of abstracts or conference proceedings papers at local and national conferences as well as the UNC-Charlotte Undergraduate Research Conference.

Required training of 6 hours with Description: The student will be required to complete online laboratory safety training modules.

Mentoring plan: I plan to meet with students on a daily basis. to provide guidance and feedback. In addition, students will interact with other graduate and undergraduate students in the laboratory on a more regular basis as well.

Applicant Requirements: No prior qualifications are necessary. However, preference will be given to students with a background in physics, mechanical engineering, or electrical engineering. Previous experience with CAD/CAM software, 3D printing, mechanics, materials, machine shop,

optics, fiber optics, and/or lasers in a plus. Students should be willing to work hard both independently and as part of a team.

Applicant Preferences: Students with background in physics, mechanical engineering, or electrical engineering will be given preference. Student with prior experience with CAD/CAM, 3D printing, machine shop, materials, mechanics, optics, fiber optics, and/or lasers will be given preference.

Specific Time considerations/conflicts: Normal business hours, Mon-Fri, 9 am - 5 pm.

App ID #: 1261

Mentor: Gartlan, Scott Email: scott.gartlan@charlotte.edu

Title: Executive Director

Department: Charlotte Teachers Institute

Co-mentor: No

Community engaged research: No

Title: What do teachers value? Examining teacher professional development experiences with curriculum development and place-based field trips in the context of teacher efficacy

Description: There are a number of research projects that undergraduate and graduate students have done in the past that are related to this year's research projects. Students are invited to analyze teachers' end of program questionnaire data, including both open-ended and closed-ended questions, examine teacher efficacy data to determine a pattern in teachers' confidence from the beginning of the program to the end of the program, documenting experiences from the annual Civil Rights trip to Montgomery, AL, Birmingham, AL, and Atlanta, GA, and interviewing teachers about their roles in curriculum development and teaching in the classroom. Students will gain experience in qualitative and quantitative research methods, program evaluation design, and research writing. In addition, students will have the opportunity to meet practicing classroom teachers in the field and discuss their roles to gain insights into what makes a successful teacher.

Accepting applications for: Either full time or part time will be considered

3 positions available

Anticipated Student Learning Outcomes: Students will develop research skills on specific data collecting tools, including Qualtrics, Excel, and NVivo. They will gain direct experience in developing interview protocols, administering those protocols to practicing classroom teachers, and analyzing the results to determine patterns and themes. Students will develop an Institutional Review Board proposal and interact with the Research Office to submit, revise and resubmit the proposal for approval. Students will walk away with a deeper understanding of how program evaluation methods and principles can be used to determine the value of a particular program, not limited to education, but in all areas of inquiry. Of course, a finished research poster, at minimum, and possbility a research article submitted to a publication.

Required training of 5 hours with Description: Students will be given the opportunity to take the human subjects training required by IRB proposals. They will get a tutorial on research software and data collection tools, and will have access to key articles describing the main content and methods used in these research projects.

Mentoring plan: I have mentored dozens of students through this summer research program over the years. My philosophy is to engage the students in aspects of these research projects that they see most valuable for them. If they are more inclined to qualitative research, then I can support that. If they are more inclined to quantiative research, then I can support that too. If students are

particularly interested in international education, etc., then I can identify a project scope that includes an international focus, including different languages.

After we identify their main interests, we can narrow down a research focus that best serves the student. Then we will frame the goals of the project, identify target deadlines in order to meet the summer program requirements, and set a project management spreadsheet to help stay organized. I scaffold the experience so that there is a lot of support initially, then less so as the student feels comforable to take on independent work. I utilize in-person and video conferencing to meet the needs of the student. I want the student to create a research project that they are proud of, present that to others, learn more about the content of the particular research project, and feel more confident about the research enterprise after completing the summer research experience.

Applicant Requirements: Students should be focused, independent thinkers and workers, collaborative, and curious. I value patience and a positive attitude. I value working with students who are interested in learning more about the research process.

Students don't need to have research experience. It could certainly help to have an introduction research course, in theory or practice, but this is not required. While this work focused on education research, specifically teacher professional development, the skills and techniques used apply to research in all social sciences.

I very much value the teaching and learning process while at the same time have high expectations for a successful project with a polished research product. The main product will be a research poster that will reflect the learning and results of the experience.

Applicant Preferences: This question appears to be the same as above. I'd refer you to the above response.

Specific Time considerations/conflicts: I am flexible with the schedule. I expect regular check-ins, weekly research team meetings, and participation in the end of program research symposium at the end of the summer term

App ID #: 1199

Mentor: Ge, Eva Email: ege@uncc.edu

Title: Assistant Professor

Department: Chemistry

Co-mentor: No

Community engaged research: No

Title: Preparation and characterization of copper-binding proteins

Description: Copper is a nutrient essential for life. Maintenance of copper balance within cells is key to preserving healthy biological function, with dysregulation of metal-related pathways leading to the development of disease states such as cancer and neurodegeneration. The Ge Group studies how the proteins in our cells acquire, use, and transport metal ions including copper, and how chemical modifications of these proteins affect their structure and function. Undergraduate summer researchers will contribute to the preparation and characterization of copper-binding proteins by performing peptide synthesis, protein expression, and peptide/protein purification.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will gain hands-on experience with Fmoc-solid phase peptide synthesis, HPLC purification, LC-MS analysis, sterile technique, bacterial culture, protein expression and purification, as well as basic lab tasks such as preparing media and buffers. Students will also participate in lab meetings to discuss both literature and research topics to gain a better understanding of the process of scientific research.

Required training of 3 hours with Description: All lab members must complete chemical, laboratory, and biosafety training online prior to starting in the laboratory in compliance with university standards. Students will also be expected to read scientific papers and protocols recommended by the PI to gain a basic understanding of their research question and methods.

Mentoring plan: I have previously mentored numerous undergraduate, Masters, and PhD students. Undergraduate students will be paired directly with a graduate student mentor for day-to-day operations, but will also be integrated into a greater supportive lab environment where they will form peer connections and see models of good student research. In addition to in-person training by myself or overseen by a senior lab member, communication will be facilitated by Slack and email.

Applicant Requirements: Introductory biology and chemistry course sequence.

Applicant Preferences: Students who have completed two semesters of organic chemistry and biochemistry courses and labs will be prioritized. Also, the ability to work independently and in a team setting, interest in research as a career path.

Specific Time considerations/conflicts: Students should plan to conduct their research in Burson Hall between the hours of 9 am – 5 pm on weekdays following a regular schedule set at the beginning of the summer with the professor.

App ID #: 1268

Mentor: Gokmen, Sabri Email: sgokmen@charlotte.edu

Title: Assistant Professor

Department: Architecture

Co-mentor: No

Community engaged research: No

Title: Prompt-to-Geometry: Exploring Large Language Models for Generative Python Scripting in Architectural Design

Description: The Prompt-to-Geometry project explores the intersection of architecture and artificial intelligence by leveraging Large Language Models (LLMs) to automate and enhance computational design workflows. The goal is to create a dataset that links natural language prompts to Python scripts, enabling users to generate complex 3D forms within the Rhinoceros environment through the Grasshopper plug-in. This research investigates the applicability of LLMs for generative coding in architecture, testing their ability to interpret design intentions, translate them into executable code, and produce geometries that align with the user's vision. By developing a prototype plug-in, the project will provide a proof of concept that showcases how AI can democratize access to scripting and computational design.

Undergraduate students will contribute by building the dataset of prompts and corresponding Python scripts, testing and debugging the generated code, and iteratively refining the system's accuracy and usability. Students will also participate in evaluating the prototype's potential as a tool for architectural education, including developing workflows and use cases for design studios and computational seminars. The outcomes of this project are twofold: first, a research article highlighting the opportunities and challenges of integrating LLMs into architectural scripting; second, a deployable prototype that can be used as an educational tool to introduce students to generative coding and computational design. This project offers a unique opportunity to engage with cutting-edge AI technologies and contribute to the future of architectural education and practice.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students participating in this research project will gain hands-on experience at the forefront of computational design and artificial intelligence, acquiring valuable skills in Python scripting, data structuring, and the use of Grasshopper for parametric modeling. They will deepen their understanding of the integration between AI and architecture, learning how Large Language Models (LLMs) can be applied to automate and enhance design workflows. Through collaborative problem-solving and prototype development, students will strengthen their critical thinking, coding, and technical communication abilities. They will also gain insight into the research process, including data collection, testing, and refining innovative tools, and will have the opportunity to contribute to a publishable research article. These experiences will

prepare students for advanced academic or professional roles in computational design, or technology-driven creative fields. After completing this project, students will be able to confidently articulate how they contributed to cutting-edge research, developed tools for architectural education, and expanded their expertise in emerging technologies, making them competitive candidates in a rapidly evolving creative industries.

Required training of 20 hours with Description: The training process for student participants will begin with an introduction to the project goals, methodologies, and tools. Students will receive foundational training in Python scripting, with a focus on its application in the Grasshopper plug-in for Rhinoceros. This will include tutorials on parametric modeling, data structures, and debugging workflows. They will also be introduced to Large Language Models (LLMs) and how these models generate Python code based on natural language prompts. Students will learn about dataset development, including how to curate and structure prompt-script pairs for testing and refinement.

To ensure a smooth onboarding process, students will engage in hands-on workshops and guided exercises that simulate the project's tasks, such as generating and testing scripts for 3D geometry. Regular one-on-one mentoring sessions will provide feedback and address questions, while collaborative discussions will help them understand the broader implications of their work. By the end of the training, students will be equipped with the technical and conceptual skills needed to actively contribute to the project and apply their learning in research and design contexts.

Mentoring plan:

I will mentor students to bridge the gap between architectural scripting and artificial intelligence, focusing on developing practical programming skills and applying them to architectural design. For many, this may be their first experience integrating AI into design workflows, so I will provide foundational guidance in Python programming, particularly within the Grasshopper plug-in for Rhinoceros. While prior experience with Large Language Models (LLMs) is helpful, it is not required, as students will have access to resources and external guidance to support their contributions.

Students will explore AI tools like OpenAI's API to learn how LLMs generate Python scripts for geometry creation. They will receive guidance on curating prompts, building datasets, and testing scripts within Grasshopper, while also refining workflows for the prototype tool. Regular one-on-one and team meetings will provide feedback, address challenges, and collaboratively improve the tool’s usability. Students will also gain opportunities to present their work in discussions, workshops, or academic settings, with additional support from the Machine Learning group in the Computer Science department. As the project progresses, students may co-author research publications or conference presentations, gaining confidence in AI-driven architectural scripting and a strong foundation for careers in computational design.

Applicant Requirements: A good candidate for this project is someone with a strong passion for computer graphics, artificial intelligence (AI), and design, coupled with a curiosity to explore how these areas intersect in computational workflows. While prior experience with Large Language Models (LLMs), JSON, or APIs would be helpful, it is not required; a willingness to learn and experiment with these tools is equally valuable. Students should have basic proficiency in Python programming, as this will be the primary language used for scripting and tool development in the project. Relevant coursework that would provide a strong foundation includes ITCS 3120

(Introduction to Interactive Computer Graphics), ITCS 3153 (Introduction to Artificial Intelligence), ITCS 3156 (Introduction to Machine Learning), ITCS 4101 (Introduction to Natural Language Processing), ITCS 4123 (Visualization and Visual Communication), and ITCS 4124 (Advanced 3D Computer Graphics).

Applicant Preferences: We are seeking student applicants who are enthusiastic about exploring the intersection of artificial intelligence, computational design, and architectural scripting. While basic Python programming skills are preferred, the most important qualities are curiosity, creativity, and a willingness to learn. Prior experience with Rhinoceros, Grasshopper, Large Language Models (LLMs), JSON, or APIs is not required but is considered a plus. Students who are detail-oriented, self-driven, and collaborative will excel in this research environment. Familiarity with tools such as GitHub for version control or an interest in learning these technologies will be helpful. This project is ideal for students passionate about bridging creative and technical domains and eager to contribute to developing innovative tools that could transform architectural design and education.

Specific Time considerations/conflicts: There are no strict time requirements for this project, as the work can largely be done flexibly. However, students must be available for a weekly team meeting, which will be scheduled based on group availability, to discuss progress, address challenges, and plan next steps. Additionally, students should set aside time for periodic one-on-one check-ins, which will be arranged flexibly to accommodate individual schedules. Active communication and timely participation in these meetings are essential for success in the project.

App ID #: 1269

Mentor: Gokmen, Sabri Email: sgokmen@charlotte.edu

Title: Assistant Professor

Department: Architecture

Co-mentor: No

Community engaged research: No

Title: Morphological Analysis of French Gothic Cathedral Apses through Computational Growth Algorithms

Description: This research seeks to investigate the morphological evolution of medieval Gothic cathedral apses in France through an innovative computational approach. Integrating architectural history with graph-based recursive growth models, the project will delve into the geometric principles, radial symmetries, and structural innovations that define Gothic apses, with a focus on their development during the Early to High Gothic period. By bridging historical analysis with digital methodologies, this research aims to uncover the underlying generative rules and organizational logic employed by medieval builders, contributing to a deeper understanding of Gothic architectural systems.

The study will focus on 24 carefully selected historical case studies, using parametric modeling tools such as Rhinoceros and Grasshopper to visualize and test hypotheses about the recursive growth mechanisms that shaped Gothic apses. Through computational analysis, the project will identify patterns and algorithms that explain the radial expansion, symmetry, and differentiation of chapels and ambulatories.

The outcomes will include the development of generative algorithms that replicate historical construction principles, offering practical applications for contemporary design. Additionally, the research will culminate in the dissemination of findings through a scholarly research article, an in-depth analysis of historical precedents, and visualizations that demonstrate the recursive and geometric logic of Gothic apses. These contributions will not only advance the study of architectural history but also serve as an educational resource and a source of inspiration for future computational design practices and research on architectural morphology.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students involved in this project will:

- Acquire expertise in architectural history, specifically Gothic morphology.
- Develop proficiency in computational design tools like Grasshopper and Python scripting.
- Gain experience in graph-based modeling and recursive algorithm development.
- Learn to bridge historical research and computational methodologies.

Contribute to a research paper or conference presentation on computational morphology in Gothic architecture

Beyond technical skills, students will build critical thinking, problem-solving, and collaborative research abilities as they work through the project's analytical and creative challenges. They will participate in team discussions, contribute to the development of generative algorithms, and co-author research articles or conference presentations, gaining firsthand experience in academic dissemination. This experience will prepare them for advanced studies or careers in computational design or research-intensive fields where historical and technical expertise intersect.

Required training of 10 hours with Description: The training process will emphasize hands-on workshops and guided exercises in computational tools and historical analysis. Topics include:

Fundamentals of Python scripting and parametric modeling.

Historical architectural plan analysis.

Recursive algorithms and radial symmetry in design.

Communication and presentation skills for research dissemination.

Mentoring plan: Students will receive a comprehensive introduction to project goals, methodologies, and tools, beginning with Gothic architecture's historical and geometric principles. Training sessions will cover:

Python scripting for parametric modeling in Grasshopper.

Techniques for graph-based analysis and recursive growth modeling.

Methods for collecting and analyzing historical plan drawings.

Weekly team meetings will provide opportunities for progress updates, feedback, and collaborative problem-solving. Students will also participate in workshops, individual mentoring sessions, and opportunities to present findings in academic settings. The anticipated result of the project is the development of a research article that will be published in an international peer-reviewed journal along with custom parametric modeling scripts that can evaluate symmetry and morphology of historical precedents.

Applicant Requirements: We are seeking students who are passionate about exploring the intersection of architectural history, computational design, and digital technologies. Ideal candidates should have a strong interest in understanding Gothic architecture and its historical significance while being eager to apply computational tools to analyze and visualize architectural morphology. Basic proficiency in Python programming and familiarity with parametric design software, such as Grasshopper and Rhinoceros, are desired, but not mandatory. Prior completion of Computational Methods and / or Computational Practice courses is encouraged. A willingness to learn, experiment, and engage with interdisciplinary methods is essential, as the project will integrate historical research with computational workflows. Students with coursework or experience in architectural history (ARCH 4201 and ARCH 4202), computational design (ARCH 4604 and ARCH 4605), or related fields will have a solid foundation for this project, but curiosity and creativity are the most valuable attributes.

Applicant Preferences: Applicants should be detail-oriented, self-motivated, and collaborative, as the project will involve team discussions, iterative problem-solving, and the production of research outputs. Effective communication skills and the ability to articulate ideas clearly will be critical for collaborative sessions and presenting findings. Prior experience with advanced parametric modeling and scripting tools such Grasshopper and Python, it is not required, as training and mentorship will provide the necessary guidance. This project is an excellent opportunity for students eager to develop technical, analytical, and critical thinking skills while contributing to innovative research in architectural design and historical analysis.

Specific Time considerations/conflicts: Students must be available for a weekly team meeting, which will be scheduled based on group availability, to discuss progress, address challenges, and plan next steps. Additionally, students should set aside time for periodic one-on-one check-ins, which will be arranged flexibly to accommodate individual schedules. Active communication and timely participation in these meetings are essential for success in the project.

App ID #: 1260

Mentor: Grant, Lynnora Email: lgrant19@charlotte.edu

Title: Assistant Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

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 full time or part time will be considered

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.

Skills that can be developed through participating in this opportunity include:

CAD

Experimental Research Methods

Ceramic Manufacturing Processes

Material Characterization

Presentation

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: I am open to students who have limited lab experience - I have previously trained three students who had no laboratory research experience and I enjoyed watching them grow in confidence and ability in working in the lab. 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: Same as above: I am open to students who have limited lab experience - I have previously trained three students who had no laboratory research experience and I enjoyed watching them grow in confidence and ability in working in the lab. 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.

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 #: 1206

Mentor: Grymes, Jay Email: jagrymes@charlotte.edu

Title: Professor

Department: Music

Co-mentor: No

Community engaged research: No

Title: Rediscovering Neglected Voices: Renaissance and Baroque Composers from Historically Marginalized Backgrounds

Description: Classical music repertoire has long been dominated by white male composers whose works have been prioritized by white male music teachers and the white male authors of music history textbooks. There has been a concerted effort to diversify the Classical music canon in recent years, but these initiatives have largely focused on music from the "Common Practice Period" between 1650 and 1900, when the majority of the works in the standard repertoire were composed. The works of composers from historically marginalized backgrounds who lived during the Renaissance (15th and 16th centuries) and Baroque (17th century and the first half of the 18th) periods remain overlooked in the study of music history.

A number of early women and other early composers from underrepresented backgrounds are so neglected that they do not even have pages on Wikipedia. The few entries that do exist tend to only have brief biographies, omitting the lists of publications, recordings, and performance videos that are essential to appreciating the musical contributions of a composer's works. This project will seek to remedy that by identifying public-domain scores of compositions by Renaissance and Baroque composers from underrepresented backgrounds on websites such as the Petrucci Music Library (www.imslp.org) and ChoralWiki (www.cpdl.org), as well as recordings of those works on YouTube. The researchers will make those open-access scores and recordings available to the global Classical music community by linking them to each composer's Wikipedia page. The researchers will also identify composers from marginalized backgrounds who do not have Wikipedia pages and create entries for them that include biographical information as well as links to scores, recordings, and performances of their works.

Accepting applications for: Either full time or part time will be considered

3 positions available

Anticipated Student Learning Outcomes: Project Management: The student will learn to organize and manage a multi-faceted research project, balancing tasks such as source collection, writing, editing, and community engagement.

Collaboration and Communication: The student will enhance their teamwork and communication skills through collaborative research, writing, and online content curation.

Research Skills: The student will develop proficiency in locating and assessing primary and secondary sources, including biographical information, public-domain music scores, and online recordings.

Digital Literacy: The student will gain experience in using online platforms such as Wikipedia, YouTube, IMSLP, and ChoralWiki to disseminate information and connect global audiences with overlooked composers and their works.

Content Creation: The student will acquire skills in drafting, editing, and publishing Wikipedia entries, ensuring they meet standards for accuracy, neutrality, and citation.

Ethical Research Practices: The student will cultivate an understanding of ethical research practices, including proper attribution of sources and the respectful representation of historically marginalized figures.

Public Scholarship: The student will learn how to effectively share research findings with a broad audience, bridging the gap between academic musicology and public engagement.

Required training of 0 hours with Description: This research project will require no on-boarding training.

Mentoring plan: To ensure each student's success in this research project, I will facilitate a structured and supportive environment that prioritizes their scholarly, professional, and personal development. Working directly with the students, I will establish clear expectations; engage in regular communication; provide hands-on training in locating, analyzing, and organizing public-domain music scores and recordings; and offer tutorials on creating and editing Wikipedia entries, adhering to the platform's standards, and writing for a general audience. I will meet with the students individually and as a team, at least weekly but more often if needed, to address challenges, provide encouragement, and incorporate their input into the project's direction.

The students will share the results of their research with the global community by contributing to existing Wikipedia pages and, when necessary, creating entirely new pages. If a student expresses interest in further exploring a specific composer, I will encourage and mentor them in presenting their research at conferences such as the State of North Carolina Undergraduate Research and Creativity Symposium.

Applicant Requirements: Familiarity with Google drive and Google sheets; websites such as Wikipedia, the Petrucci Music Library, and ChoralWiki; and music databases such as Grove Music Online and the Naxos Music Library.

Applicant Preferences: The ideal applicant will possess basic skills in information literacy in music, including locating and using authoritative internet sources, and will have experience in combining historical and musical analysis to place a composer and their compositions within appropriate historical, cultural, and stylistic contexts.

Specific Time considerations/conflicts: None. I am happy to work around each student's schedule.

App ID #: 1197

Mentor: Hammelman, Colleen Email: chammelm@charlotte.edu

Title: Associate Professor

Department: Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: No

Title: Placemaking narratives in food halls

Description: Increasingly, new food halls (such as Optimist Hall, Camp North End and 7th St Public Market in Charlotte) are popping up in cities worldwide to cultivate local food businesses, provide dynamic consumption opportunities, and re-use historic industrial sites. The stories food halls tell about themselves often attach meaning to their specific spaces and provide insights on both the history and the future aspirations of food systems and cities. This new project seeks to examine these place-making narratives used in creating and marketing food halls to better understand how they are contributing to building contemporary cities. The student researcher for this project will support with compiling information about existing food halls throughout the United States and reviewing existing literature about food halls.

Accepting applications for: Either full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes: Students will gain experience in conducting literature reviews and obtaining and communicating secondary research. These foundations will be used by the faculty member in grant proposals and thus the students may also have an opportunity to learn skills in proposal development. Finally, the student would be supported in presenting about the content in food systems and urban geography obtained through this research.

Required training of 0 hours with Description: Students would receive training in completing literature reviews and how to identify and organize secondary research. This is a new project, so there is not yet an opportunity for primary data collection and analysis (although I hope that will become available in the future!).

Mentoring plan: I complete an Individual Development Plan with all student researchers that outlines their learning objectives, the research tasks expected, and steps toward accomplishing both. This is developed at the start of a project and reviewed regularly. I would expect to meet with the student at least every other week and to otherwise keep up regular communication via email. In each meeting we will discuss not only the research tasks completed, but how they fit within the larger research project and any relevant topics and resources that promote the student's professional development.

Applicant Requirements: An interest in food systems and experience reading academic journal articles. Curiosity and willingness to dig deep to find needed information. Strong written communication skills.

Applicant Preferences: Experience with conducting literature reviews, discourse course analysis, and/or storytelling. Experience in geography and/or food systems research would be a plus but is not required.

Specific Time considerations/conflicts: The student will need to be available to meet during normal operating hours at least once every other week. Otherwise, the faculty and student will work together to determine a schedule of independent work that aligns with the student's class and activity schedule.

App ID #: 1210

Mentor: Heberlig, Eric Email: esheberl@uncc.edu

Title: Professor

Department: Political Science and Public Administration

Co-mentor: No

Community engaged research: No

Title: Presidential Nominating Convention Protests

Description: During both parties 2024 Presidential Nominating Conventions, a team of university scholars and students surveyed demonstrators in Milwaukee (the Republican National Convention) and Chicago (the Democratic National Convention). We asked about their political attitudes and experiences, their motivations for protesting, and their perceptions of the opportunities and barriers to influence of their demonstrations. Over 800 surveys were collected.

We seek a student to participate in data analysis. Qualified students should have taken a research methods class (for example, POLS 2220) and have experience with data management programs (SPSS, STATA, R, or similar statistics packages), The student will have opportunities to explore research questions that interest them as well as assisting with the data analysis activities of the principal researchers. Research questions could include analyzing how demographic characteristics (race, gender, social class, etc.), political attitudes (party identification, ideological extremism, support for political violence, political efficacy, attitudes towards the police, etc.), motivations for protest (policy, social, economic), and/or perceptions of their audience (convention delegates, politicians, traditional or new media, public opinion, etc.) affect their attitudes about effectiveness of the protests. They could also analyze differences between demonstrators at the RNC vs. the DNC, differences between more experienced and less experienced demonstrators, differences between demonstrators with different policy priorities (Gaza vs. abortion, etc.) and so on.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will gain experience working with developing literature reviews, developing research questions and hypotheses, data management and statical analysis, and communicating our findings in professional venues (such as conferences and social science journal publications). The experience will enhance a student's critical thinking, data analysis, teamwork, and communication capabilities. This experience would be valuable for students considering going to graduate school. As these are the skills that graduate schools look for (in part, because these are the skills students will be using in graduate school for their own research and as graduate assistants to faculty members), participation will enhance a student's resume for graduate school applications.

Required training of 0 hours with Description: Qualified students should have taken a research methods class (for example, POLS 2220) and have experience with data management programs

(SPSS, STATA, R, or similar statistics packages). Only a basic knowledge of these is expected; I will train students in the relevant data analysis procedures as the research unfolds. The specific skills they need will depend on the types of research questions they find interesting and worthy of exploration.

Mentoring plan: Students would work with me and with the two other principals for the project--Michael Haney of the University of Glasgow and Benji Gumrukcu of Rutgers University. I would meet with the student at least week to plan analyses, review findings, etc. I would seek funding for them to participate in presentations of the results at political science conferences. I expect to write letters of recommendation on their behalf.

Applicant Requirements: Qualified students should have taken a research methods class (for example, POLS 2220) and have experience with data management programs (SPSS, STATA, R, or similar statistics packages). Students must be well-organized and self-motivated to complete tasks in a timely manner.

Applicant Preferences: It would be a plus to have some background in social or political engagement or mobilization (including classes on political parties, elections, social movements, and/or interest groups, etc.) but is definitely not required.

Specific Time considerations/conflicts: None. We'll arrange this during the summer. I teach online during the summer so my schedule to meet with them is flexible.

App ID #: 1256

Mentor: Hoover, Fushcia Email: fhoover3@charlotte.edu

Title: Assistant Professor

Department: Earth, Environmental and Geographical Sciences

Co-mentor: Yes

Nicole Roberts, nbarclay@charlotte.edu, Engineering Technology and Construction Management

Community engaged research: No

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 full time or part time will be considered

1 position available

<u>Anticipated Student Learning Outcomes:</u>

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: IRB CITI certification will be required and initial reading and summary work to assess reading and writing comprehension will be part of the on-boarding process. Training on reading and review of peer-reviewed articles will be provided if needed.

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, a PhD RA, and will be required to attend Dr. Hoover's bi-weekly research group meetings. There is additional mentoring and professional development that student(s) may receive through students and a postdoc across both faculty research groups.

Presenting at the OUR conference is expected, as well as maintaining and providing weekly updates through written and/or oral communication methods.

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. Ideally, they will also have prior technical and literature review writing experience, and be comfortable working independently and in teams. Ideally, they will also have prior technical and literature review writing experience, and be comfortable working independently and in teams.

Specific Time considerations/conflicts: Students will meet for a one hour 1-1 meeting, and a 90min research team meeting every other week. Field site visits will also occur during the 10a-5p workday for which the student should also be available.

App ID #: 1254

Mentor: Hoover, Fushcia Email: fhoover3@charlotte.edu

Title: Assistant Professor

Department: Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: No

Title: Environmental Planning through Black Feminist Ecologies Theory

Description: Environmental planning practices to remedy environmental concerns across spatial and social inequities fail, particularly as it relates to climate change. Instead, investments can lead to displacement, and community driven solutions are not integrated into actual decision-making practices. Many Black people, particularly womyn and femmes have historically been at the forefront of identifying the palpable relationship between race, place and the environment, while pushing forward solutions through activism, organizing, and coalition building. In shifting towards holistic environmental planning processes and ecological restoration, Black Feminist Ecology theory is one potential tool we can use. Research partners will assist with literature reviews, database creation, and data cleaning of interviews transcripts.

Subject areas: urban planning, environmental justice, black feminist ecologies, environmental attitudes and perspectives

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes:

Students will gain substantial knowledge about concepts and practices in environmental planning practices, environmental justice histories and activism, and the emerging theory of Black Feminist Ecology.

Skills that student(s) will develop include interview/transcript cleaning and coding, critical analysis of articles in a literature review, research methods in an interdisciplinary setting, and carrying out work in a small team setting. This experience will benefit any student interested in pursuing research, planning, community engagement or participation, and introduce the student to an array of environmental organizations across the state.

Required training of 15 hours with Description: IRB CITI Training

Initial reading and summary work to assess reading and writing comprehension

Mentoring plan: Students who join the project will complete a mentoring compact and development plan with the Dr. Hoover. This will cover their expectations and goals for participating on the project, as well as Dr. Hoover's expectations around work outputs, meetings, and mentoring. Student(s) on the project will meet weekly with Dr. Hoover, and if available, are encouraged to

attend the monthly research group meetings. There is additional mentoring and professional development that student(s) may receive through a postdoc, and other graduate students in the research group.

Applicant Requirements: Students should have strong writing and reading skills, proficiency with Microsoft word and excel, experience searching for literature using Google Scholar or other peer-reviewed search engines. Ideally, they will also have prior technical and literature review writing experience, and be comfortable working independently and in teams.

Applicant Preferences: Students with experience in or having taking courses in the social sciences (e.g. ethnography, qualitative sociology, public health), human geography, geospatial analyses, or related fields to environmental studies, Africana studies or the Global Studies program are strongly encouraged to apply. A strong sense of maturity and professionalism to handling sensitive data is also desired. Dr. Hoover also encourages dialogue among the team as the project progresses, so a genuine interest in the subject matter is important.

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, and an additional 90 min bi-weekly research group meeting.

App ID #: 1221

Mentor: Hutchens, Thomas Email: tchutche@charlotte.edu

Title: Research Assistant Professor

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Plasma Etching of Non-linear Optical Crystals

Description: Non-linear optical crystals are used for many laser applications like industrial laser cutting and even laser fusion. These crystals require anti-reflection treatments on the surfaces. A new method for anti-reflection is by plasma etching nano-sized patterns on the surface. This project means to study the plasma etching effects on Lithium Triborate crystals. The student will prepare crystals and load them into plasma etcher for processing with various chemistries in the cleanroom. The physical and chemical surface properties will be measured with scanning electron microscope and x-ray diffraction. The goal will be to find the optimal plasma chemistry and settings for successfully and selectively etching the crystal surface.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Student's will gain cleanroom and metrology experience. Data collection from various instruments will need to be analyzed and combined into figures for reporting.

Students will also develop teamwork skills by working with lab group, hone presentation skills to share updates at weekly meetings to move progress forward on projects

Required training of 20 hours with Description: Cleanroom orientation and safety training, followed by training on the individual instruments: plasma etcher, confocal microscope, spectrometers, scanning electron microscope.

Mentoring plan: The professor will be present daily for training and guidance. Weekly group meetings will occur with opportunities to assist with other student's and projects. Reporting and data could lead to conference publications.

Applicant Requirements: Student's with good PC skills, data organization, and note taking for operating procedures are required. Good communication, attendance, and eagerness.

Applicant Preferences: Chemistry majors are a plus, but not required. Other majors could include: physics, engineering, or related disciplines.

Specific Time considerations/conflicts: Normal working hours. Any meeting times will be set for convenience.

App ID #: 1222

Mentor: Hutchens, Thomas Email: tchutche@charlotte.edu

Title: Research Assistant Professor

Department: Physics & Optical Science

Co-mentor: Yes

Ishwar Aggarwal, iaggarwa@charlotte.edu, Physics & Optical Science

Community engaged research: No

Title: Laser Damage Testing of Optical Materials

Description: Optical materials and coatings suffer from damage at high laser energies. Controlled testing with various types of lasers is important for comparing materials and coatings. This project will be to set up, align, and test samples with high energy lasers. There are continuous and pulsed lasers and standardized and statistical procedures for each type. Damaged samples will be analyzed by scanning electron microscope and other metrology tools. Results will guide the development of high damage threshold optical coatings.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Student's will gain laser safety, alignment, and operation experience. Data collection from various instruments will need to be analyzed and combined into figures for reporting.

Students will also develop teamwork skills by working with lab group, hone presentation skills to share updates at weekly meetings to move progress forward on projects

Required training of 10 hours with Description: Laser safety and operation training. Some troubleshooting of laser systems may be required. Training on the individual metrology instruments: confocal microscope, scanning electron microscope.

Mentoring plan: The professor will be present daily for training and guidance. Weekly group meetings will occur with opportunities to assist with other students and projects. Reporting and data could lead to conference publications.

Applicant Requirements: US Citizenship or permanent residency required (Labs will contain some DoD restricted equipment or samples). Student's with good PC skills, data organization, and note taking for operating procedures are required. Good communication, attendance, and eagerness. High power lasers are dangerous, so no horse play and adhering to safety procedures is required.

Applicant Preferences: Preferred majors could include: physics, engineering, computer science or related disciplines.

Specific Time considerations/conflicts: Normal working hours. Any meeting times will be set for convenience.

App ID #: 1237

Mentor: Jacobs, Donald Email: djacobs1@charlotte.edu

Title: Professor of Physics

Department: Department of Physics and Optical Science

Co-mentor: No

Community engaged research: Yes

Title: Simulating Quantum Measurements and Open Systems with a Modified Schrödinger Equation

Description: Recent experiments have revealed that an electron transitioning between atomic states can be influenced mid-transition, contradicting the traditional view that quantum state collapse is instantaneous. While this transition occurs on the timescale of hundredths of a femtosecond—previously unresolvable—modern experiments show that quantum jumps are dynamic, not instantaneous. The Schrödinger equation, a foundational equation in quantum mechanics, predicts continuous evolution, yet it does not explain how abrupt state changes occur during measurements—a core aspect of the "measurement problem."

To address this, quantum theory has evolved to include models of open quantum systems, where quantum objects like atoms or quantum dots interact with their environments. These models often rely on statistical methods that introduce randomness to the system but still fall short of describing dynamic state collapse under measurement. A unified approach is missing—one that directly models collapse as a time-dependent process influenced by external interactions.

The Jacobs Research Group has developed a Modified Schrödinger Equation (MSE) to simulate open quantum systems and quantum measurements. This model focuses on quantum dots coupled with plasmons in gold nanoparticles inside optical cavities, systems where light-matter interactions can trigger quantum excitations. This project invites undergraduate researchers to explore this system by running simulations and comparing the results with experimental data.

Students will analyze how varying system parameters—such as external driving fields, photon populations in the cavity, and dissipation/dephasing rates—affect the system's behavior (e.g., overdamped, underdamped, or critically damped responses). They will also review relevant literature and help compile experimental data to validate the model.

No advanced knowledge of quantum mechanics or complex mathematics is required. However, an interest in material science, atomic/molecular quantum chemistry, and bridging theoretical models with experimental findings is essential. This hands-on research opportunity will provide exposure to cutting-edge concepts in quantum physics and experience with computational modeling in physics and chemistry.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: Through this research experience, the student will develop essential skills required for scientific inquiry and critical thinking. They will learn how to effectively search and analyze scientific literature to understand current research trends and identify relevant experimental data. A strong focus will be placed on understanding the mathematical model governing the system, particularly the role and impact of its parameters on predicting complex dynamics.

The student will gain experience in connecting theoretical models to real-world experimental setups—an essential skill in research. Although this project is computational and theoretical, interpreting experimental results and validating models against experimental data will be central to the work. The student will also learn that scientific progress often involves refining models or recognizing when a model fails, fostering adaptability and resilience in research.

Attention to detail, analytical thinking, and problem-solving will be emphasized throughout the project. This experience will build the student's confidence in applying theoretical concepts to practical problems, preparing them for future opportunities in research, including potential presentations and publications beyond the requirements from this summer program.

Required training of 6 hours with Description: The on-boarding process will begin with one-on-one sessions where the student (or possibly two students) will learn how to run the existing simulation program and gain a clear understanding of the modified Schrödinger equation and its key parameters. The student will be guided through interpreting how these parameters influence system dynamics. Additionally, they will be assigned a few foundational research papers to build context for the project. Before the research starts, some low level general reading will be assigned (5 hours of reading). As the project progresses, the student will receive mentoring on how to present their findings in group meetings and how to record, and communicate scientific results effectively.

Mentoring plan: As a mentor, my primary goal is to create an environment where the student can grow into an independent and creative researcher. I dedicate approximately two hours per day to one-on-one meetings (or small groups like two students together) involving discussions, totaling around 10 hours per week. During this time, the student will present their progress, and we will engage in in-depth discussions about their results—analyzing what worked, what didn't, and how to move forward. I provide direct feedback, offer suggestions on new directions to explore, and guide the student in refining their approach. While I give structure and support, I also emphasize the importance of independent problem-solving and creativity, encouraging students to move beyond the mindset of seeking "right" or "wrong" answers and instead focus on understanding, adapting, and innovating.

The student will work closely not only with me but also with a PhD student in my group who is actively engaged in this project. Additionally, they will participate in two group meetings each week: one with my research group and another collaborative meeting with a chemistry professor's group. These meetings provide valuable opportunities for the student to present their work, receive constructive feedback, and engage with peers across disciplines.

I strongly encourage students to share their research beyond the lab by attending and presenting at conferences when appropriate. I am committed to helping students build their CVs with meaningful research experiences and professional development opportunities. Career guidance is also a

consistent part of my mentorship, where I offer insights into various career paths in physics, chemistry, and related fields.

Ultimately, success in this experience is not defined by achieving a perfect result but by developing the ability to think critically, adapt to challenges, and contribute original ideas. I emphasize the philosophy of being adaptable and resilient in research, often quoting Bruce Lee: “Be water.” This mindset helps students understand that scientific discovery requires flexibility and persistence. I also remind them, “If research were easy and always worked on the first try, we would call it search.” My commitment is to guide the student in navigating uncertainty, embracing challenges, and growing into a confident researcher capable of making meaningful contributions.

Applicant Requirements: The student must have access to a powerful laptop, such as a high-end or gaming laptop, to run simulations and related software. If the student does not have one, arrangements may be made through the university. Please note that my lab cannot provide a laptop.

Additionally, while there are no strict academic requirements, it is expected that the student has a strong background in physics, chemistry, mathematics, or engineering. Familiarity with certain topics is preferred but not mandatory for this project.

Applicant Preferences: Preferred Background and Skills: While there are no strict prerequisites for this project, certain skills and knowledge will greatly benefit the student’s experience and success. Programming Experience: Familiarity with MATLAB is highly recommended, as the primary computational work will involve running and potentially modifying existing MATLAB code. Even though the core program is developed, it may require adjustments or enhancements throughout the project. In addition, the results of the simulations will have to be analyzed and plotted using computational tools within MATLAB that will likely require writing scripts. Mathematical Background: A strong foundation in higher-level mathematics will be advantageous. Topics such as linear algebra, vector calculus, probability theory, statistics, and stochastic processes are particularly relevant and will appear throughout the research. Physics Knowledge: Prior coursework in modern physics, classical mechanics (particularly advanced topics), thermodynamics and statistical mechanics, and electromagnetism would provide helpful context. However, these concepts can also be learned progressively during the research experience.

Most importantly, a motivated and curious student with a willingness to learn and engage deeply with new material will thrive in this project.

Specific Time considerations/conflicts: If the student can be on campus Monday through Friday between 9am to 5pm, then all other times are flexible. Since this is a computational project, there are no special times to use equipment or to have lab assignment time.

App ID #: 1250

Mentor: Jacobs, Donald Email: djacobs1@charlotte.edu

Title: Professor of Physics

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Advancing Coarse-Grained Simulations and Generative Models for Peptide Design Through Entropy and Hydration Shell Dynamics

Description: In recent years, there has been growing interest in designing peptides as therapeutic drugs. The Jacobs Research Group, known as the BioMolecular Physics Group (BMPG), is exploring peptide design to disrupt specific protein-protein interactions linked to cancer and antimicrobial resistance. Peptides offer tunable properties and, in principle, can be engineered to bind targeted protein binding sites. However, challenges remain: peptides may also bind unintended sites, potentially causing side effects, and their binding affinity is often low. Consequently, the pharmaceutical industry seeks more precise methods to predict peptide binding specificity and affinity. Evolutionary and generative models based on machine learning and AI methods have been developed for this purpose. However, their predictions are not yet reliable due to the complex physics and chemistry of peptide interactions. Traditional molecular docking methods also struggle to accurately predict binding for flexible molecules like peptides. The core issue lies in the absence of a robust thermodynamic model. To address this, BMPG is leveraging prior work on protein stability that models enthalpy-entropy compensation through a distance constraint model. A new focus is on developing entropy-based molecular dynamics models to improve peptide docking predictions, with the broader goal of constructing physics-constrained generative models.

This summer project will investigate how the properties of water in the first and second hydration shells influence peptide binding in various peptide-protein complexes. Experimental peptide-protein structures will be sourced from the Protein Data Bank. Using standard molecular dynamics software (OpenMM), the spatial and temporal properties of water surrounding the binding interfaces will be analyzed. Additionally, non-binding "decoy" peptides will be docked at the same sites to compare how water structuring differs between successful and unsuccessful binding events. Identifying patterns in water behavior could reveal signals that distinguish effective binders from non-binders, providing insights for physics-informed machine learning models.

Additionally, the BMPG team is developing a generalized coarse-grained implicit water force field to model these subtle water-mediated interactions. This project will also help benchmark the performance of this coarse-grained model, with broader applications in protein formulation. While it is well-established that water plays a critical role in protein stability and molecular binding, a unified mechanistic understanding remains elusive. The many-body nature of water-mediated interactions complicates decomposition into simpler interactions—a challenge recognized since the 1930s. This project adopts a pragmatic, geometry-based coarse-grained modeling approach to account for these collective effects by incorporating enthalpy-entropy compensation through

distance constraints. As an exploratory project, undergraduate students have a unique opportunity to investigate the role of water in peptide binding and to contribute to ongoing model development that integrates physics-constrained generative models.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: Through this research experience, the student will develop critical skills essential for scientific inquiry and problem-solving. They will learn how to effectively build a database by identifying relevant experimental data and gain hands-on experience running molecular dynamics simulations on a high-performance computer. The student will explore the connection between thermodynamic models of emergent system properties and their underlying microscopic causes. Additionally, they will engage with machine learning concepts—both in identifying key physical features and in developing generative models that incorporate entropic effects.

This project will highlight the importance of refining models or recognizing when a model fails, fostering adaptability and resilience in research. Given the evolving nature of the model, the student will appreciate that all theories originate from creatively interpreting empirical phenomena. Throughout the project, attention to detail, analytical thinking, and problem-solving will be emphasized. This experience will build the confidence of the student in applying theoretical models to practical problems, preparing them for future research opportunities, including potential presentations and publications.

Required training of 5 hours with Description: The on-boarding process will begin with one-on-one sessions where the student (or possibly two students) will learn how to run the existing simulation pipeline and to learn about the format of the structural data on protein-peptide complexes. A few graduate students will be available to help the undergraduate student navigate through the simulation process, the data collection process and the analysis process. Additionally, they will be assigned a few foundational research papers to build context for the project. As the project progresses, the student will receive mentoring on how to present their findings in group meetings and how to record, and communicate scientific results effectively.

Mentoring plan: As a mentor, my primary goal is to create an environment where the student can grow into an independent and creative researcher. I dedicate approximately two hours per day to one-on-one meetings (or small groups like two students together) involving discussions, totaling around 10 hours per week. During this time, the student will present their progress, and we will engage in in-depth discussions about their results—analyzing what worked, what didn't, and how to move forward. I provide direct feedback, offer suggestions on new directions to explore, and guide the student in refining their approach. While I give structure and support, I also emphasize the importance of independent problem-solving and creativity, encouraging students to move beyond the mindset of seeking "right" or "wrong" answers and instead focus on understanding, adapting, and innovating.

The student will work closely not only with me but also with a few graduate students. Since there are multiple facets to this project, it is expected that one specific graduate student will be assigned

to work closely with the student. However, this project is at the intersection of a few on-going projects, making this a truly team effort. Additionally, students will participate in one group meeting per week focused on computational biology. These meetings provide valuable opportunities for the student to present their work, receive constructive feedback, and engage with peers across disciplines.

I strongly encourage students to share their research beyond the lab by attending and presenting at conferences when appropriate. I am committed to helping students build their CVs with meaningful research experiences and professional development opportunities. Career guidance is also a consistent part of my mentorship, where I offer insights into various career paths in physics, chemistry, and related fields.

Ultimately, success in this experience is not defined by achieving a perfect result but by developing the ability to think critically, adapt to challenges, and contribute original ideas. I emphasize the philosophy of being adaptable and resilient in research, often quoting Bruce Lee: "Be water." This mindset helps students understand that scientific discovery requires flexibility and persistence. I also remind them, "If research were easy and always worked on the first try, we would call it search." My commitment is to guide the student in navigating uncertainty, embracing challenges, and growing into a confident researcher capable of making meaningful contributions.

Applicant Requirements: The student must have access to a laptop for data analysis and to remotely access the high-performance computer for running simulations. Please note that my lab cannot provide a laptop. Due to the steep learning curve associated with the interdisciplinary nature of the project, the student is expected to have intermediate to advanced proficiency in at least one programming language, such as Java, MATLAB, Python, C++, or C. Python will be the primary language used in this project. While there are no strict academic requirements, a strong background in physics and chemistry is expected.

Applicant Preferences: In addition to intermediate or advanced programming skills, the following knowledge and experience will greatly enhance the student's success in this project:

Programming Experience: Proficiency in the Linux operating system and programming in Python is highly desirable before starting the project. Familiarity with Python-based machine learning tools would be especially beneficial.

Mathematical Background: A solid understanding of geometry, algebra, calculus (I, II, and III), discrete mathematics (particularly graph theory), and statistics or probability theory will be valuable for engaging in the modeling aspects of the project.

Physics/Chemistry Knowledge: Prior coursework in thermodynamics—whether from physics or chemistry—would provide helpful context. However, these concepts can also be learned progressively throughout the research experience.

Specific Time considerations/conflicts: If a student can be on campus between 9am to 5pm during the week, it will aways be possible to arrange meetings. This is a computational project, and no special constraints in time or location is present.

App ID #: 1232

Mentor: Janies, Daniel Email: djanies@charlotte.edu

Title: Carol Grotnes Belk Distinguished Professor of Bioinformatics and Genomics

Department: Center for Computational Intelligence to Predict Health and Environmental Risks; Department of Bioinformatics and Genomics

Co-mentor: No

Community engaged research: No

Title: bioinformatics and genomics as applied to animal and viral evolution

Description: In these projects, the students will work on cross-functional teams in bioinformatics and genomics as applied to animal and viral evolution. The work will entail coding, data wrangling, results parsing, and preparation of materials for presentations. The students will join meetings with the advisor and team members. In the meetings we shall discuss research aims, strategies to achieve these aims, and how to solve problems. The students will learn from the advisor and others who have developed valuable expertise to transfer to the student.

Animal evolution projets will involve genomics and computational biology as applied to echinoderm phylogeny, regeneration, and the breadth of mutable collagenous tissues.

Examples of the work are here:

https://www.sciencedirect.com/science/article/abs/pii/S1055790317301653?via%3Dihub

https://bmcgenomics.biomedcentral.com/articles/10.1186/s12864-024-10926-7

Viral evolution projects will involve genomics and computational biology as applied to

assessment of the immune evasion of viral variants and the zoonotic emergence of viral

pathogens.

Examples of the work are here:

https://onlinelibrary.wiley.com/doi/10.1111/cla.12454

https://www.frontiersin.org/journals/virology/articles/10.3389/fviro.2024.1419276/full

These papers have important contributions from Undergraduate researchers.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: The anticipated outcomes will be enhanced experience in coding, data wrangling, results parsing, preparation of materials for presentations.

The students will learn how to prepare and present at meetings to move projects along.

Required training of 5 hours with Description: The students will only handle digital data of non-regulated organisms (e.g. invertebrate animals and microorganisms).

Mentoring plan: In the cipher center we have a team science environment. The students will learn from each other as well as mentors. The expertise shared will be biological as well as computational. The expectation that students present at team meetings as well as in OUR events.

Applicant Requirements: The students should know how to manage ascii based data sets in computational environments such as the command line interface and excel. The students should know how to use basic bioinformatics tools such as genbank, blast, and mafft. The students should be able to write a read me file that explains the steps they took in the analyses such that datasets can be handed off to other researchers with provenance information.

Applicant Preferences: The students need a curious attitude and the ability to work around problems. The students need good listening skills to accept mentoring advice.

Specific Time considerations/conflicts: We expect that the students make scheduled meetings. These will be done by calendar invites and emails.

App ID #: 1220

Mentor: Johnson, Holly Email: hjohns@uncc.edu

Title: Clinical Assistant Professor

Department: Special Education and Child Development

Co-mentor: No

Community engaged research: No

Title: School-based coaching: A systematic literature review

Description: Many teachers enter the field of education with little (if any) training in classroom management (Begney & Martens, 2006) and continue to experience difficulties in this area while attempting to balance instructional and managerial demands (Simonsen et al., 2014). Thus, there is a need to provide educational agencies with access to efficient, effective, and research supported training designed to develop and improve teachers' existing classroom management skills (Simonsen et al., 2014). Given that in-service training alone has been found to be insufficient in supporting teachers' use of newly acquired classroom management practices (Wood et al., 2016), research suggests the use of coaching as a vital means to improving outcomes associated with the implementation of effective classroom management practices (Simonsen et al., 2020). Although a considerable amount of research has examined the effects of coaching on the implementation of various evidence-based classroom management practices, there has yet to be a comprehensive review of these findings. Therefore, this systematic literature review seeks to answer the following research questions.

What are the effects of school-based coaching interventions on teachers' implementation fidelity of group-based instructional practices?

What are the effects of teachers' delivery of group-based instructional practices with support of school-based coaching on student outcomes?

What are the essential components/features of effective school-based coaching interventions with improved teacher implementation fidelity and/or student outcomes?

Student contributions to this project would but are not limited to (a) conducting abstract and full-text reviews while applying inclusion and exclusion criteria to determine appropriate studies for review, (b) assessing risk of bias in included studies, (c) extracting data, (d) analyzing and synthesizing findings, and (e) helping to report and disseminate results.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: As an active member of the research team, scholars participating in this project will benefit by gaining and enhancing a number of valuable skills and expanding their understanding of effective teacher training practices. During this project, scholars will receive ongoing mentorship in conducting, analyzing, synthesizing, and disseminating results from a systematic literature review. This type of research is designed to reduce bias, organize

knowledge, draw conclusions on what collective evidence shows, and help move the field forward in addressing current gaps in the literature or existing barriers to knowledge and understanding. Therefore, having experience in conducting this type of research would allow a scholar to develop a well-rounded set of practical skills that could make them more competitive in future employment endeavors. These include critical thinking, research, communication, time management, and problem-solving, all of which are highly valued by employers in nearly every field. The process of going through this rigorous research approach can help scholars become more confident in handling complex tasks, making data-driven decisions, and presenting information clearly—skills that are valuable in any profession.

Required training of 4 hours with Description: To participate in this research, scholars would need to complete, if they have not already done so, the online Collaborative Institutional Training Initiative (CITI) training program which provides a conceptual framework for ethically working with human subjects while conducting research. Additionally, the scholar would receive training and support in using PRISMA procedures to conduct a systematic literature search and be trained on how to apply data collection procedures to identified data sources.

After joining the research team, the scholar would need to meet with the designated point of contact to discuss project goals, get familiar with procedures regarding data collection and the platform used for documenting and storing data, and allow the scholar to ask and receive answers to any questions they may have. To provide additional mentoring opportunities, the research team will meet at minimum one time weekly to discuss progress related to project goals, identify necessary action items, evaluate inter-rater reliability related to specific data sources, and provide behavior specific feedback on the completion of assigned tasks.

Mentoring plan: During this project, scholars can anticipate engaging in regularly scheduled weekly research team meetings where the team will discuss project goals, progress made in relation to these goals, required action items, reliability of data collected, and provide behavior specific feedback on completed assignments. In addition to weekly meetings, faculty will make themselves available and engage with the student. To help maintain sufficient progress on this project, the research team will (a) provide a space on campus for the scholar to work, (b) collectively develop task milestones and activities during the first week of the project, (c) use meeting minutes to document details such as required action items and anticipated dates of completion, and (d) work from a collaborative platform (i.e., Google Drive) so that all members of the team have ongoing access to materials. Furthermore, while participating in this study, scholars will receive training in both conducting research with human subjects (i.e., CITI training) and data collection procedures. As a result of their efforts in active research and data collection, scholars can expect to participate in the various processes associated with disseminating findings from this systematic literature review which include but are not limited to manuscript development and submission, conference presentations, and poster sessions.

Applicant Requirements: The research team seeks to work with a collaborative scholar that is organized and timely in the completion of their tasks. The team would also like a colleague who has the ability to complete work autonomously after it is confirmed that tasks are understood and understands the importance of working collaboratively to establish clean reliable data and results.

While an honors scholar in education would be preferred due to the nature of the content being coded, any scholar could participate after successfully completing sufficient training.

Applicant Preferences: An honors student in education is preferred due to the coding of content but any student could participate with sufficient training.

Specific Time considerations/conflicts: The research team will determine a mutually agreed upon weekly meeting time of approximately 1 hour. Additionally, ongoing meetings with faculty for training as well as verification of data procedures may be necessary.

App ID #: 1240

Mentor: Kitten, Alicia Email: alicia.stewart@charlotte.edu

Title: Assistant Professor

Department: Department of Reading and Elementary Education

Co-mentor: Yes

Paola Pilonieta, ppilonie@charlotte.edu, Department of Reading and Elementary Education in the Cato College of Education

Community engaged research: No

Title: Exploring the Impact of Teacher Professional Development Targeting Elementary Literacy instruction on Teacher Self-Efficacy, Knowledge, and Practice: A Systematic Review

Description: We are currently conducting a systematic review of the literature in an effort to locate and synthesize all studies involving teacher professional development that targets literacy instruction and teacher outcomes, such as teacher self-efficacy, knowledge, and practice. Our goal is to identify previous research on this particular topic so we can highlight what is already known and what areas may need additional research. We seek an undergraduate researcher who can help us locate studies on our topic by sorting through abstracts on a Google Sheet to determine if they meet our inclusion criteria. In addition, we seek support in coding articles that do meet inclusion criteria. Coding entails pulling specific information from articles and entering that information into a codesheet/Google Sheet. We also need support identifying previous literature reviews that have already been done on this topic. This will involve accessing the university library databases to search for electronic journal articles. Last, we also seek support in summarizing previous literature reviews on this topic (e.g., annotated bibliography).

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will benefit from this experience in the following ways:

1) They will be active members of a research team, which will provide them opportunities to meet regularly with faculty and other team members in order to discuss project needs. This experience will provide them with an opportunity to experience a consistent professional setting in the field of education in which they are expected to activity participate and contribute.

2) They will be engaging with journal articles in the field of education, which can better inform them on the literature surrounding professional development and teacher outcomes. Information gained during their time on the project will deepen their understanding of this topic, which they can take with them as they enter the field as educators in the future, helping to bridge the gap between research and practice.

3) They will have an opportunity to locate and summarize previous literature reviews conducted on the topic of teacher professional development and teacher outcomes, which requires academic

writing. This skill can be used in all professional settings, and it will also support students in completing graduate coursework if they choose to seek an advanced degree.

Required training of 0 hours with Description: On-boarding will require students to engage in a brief training about 'how' to sort abstracts. Then, they will need to establish interrater reliability with other sorts before independent sorting begins. This same process will take place when coding included articles (brief training and establishing interrater reliability). We are not working with any human subjects, so IRB is not required.

Mentoring plan: In order to set students up for success, we will work closely with them to ensure they understand project tasks (i.e., trainings and ongoing communication via email and weekly team. meetings). In addition to trainings provided before each task, we will communicate readily with them to ensure all their questions are met throughout the process (email and Zoom communication will be welcomed in order to clarify tasks). We will meet weekly as a research team to discuss tasks and project progress. We will establish clear deadlines and discuss progress toward those deadlines each week to ensure all team members stay on track. Students will present preliminary findings at the summer symposium, and we, as mentors, will work closely with them to ensure they draft presentation materials ahead of time so we can provide feedback and support. In addition, we will help them prepare for the presentation by having them practice their brief and concise summary of the project (i.e., elevator speech) with us before they present at the symposium.

Applicant Requirements: We seek student applicants who have background knowledge in the elementary education, specifically in the area of literacy. We also seek student applicants who are available to attend weekly meetings, who have a general understanding of how to use Google Sheets, and those who feel confident accessing content within research articles and communicating that content verbally and in writing.

Applicant Preferences: In addition to the requirements shared above, we also seek student applicants who communicate readily via email and in person. We encourage students to ask questions when they need clarification.

Specific Time considerations/conflicts: We will meet weekly as a research team; however, we have not identified the day/time for that meeting yet. We can work directly with student researchers to identify a day/time that works well for the entire team.

App ID #: 1225

Mentor: Kolano, Lan Email: Lan.Kolano@Charlotte.edu

Title: Professor and Department Chair

Department: Middle, Secondary, and K12 Education

Co-mentor: No

Community engaged research: No

Title: Supporting immigrant children in Charlotte through innovative community based programming

Description: ourBRIDGE for Kids is a local community non-profit organization that supports immigrant children in Charlotte. During the academic year and through different summer programs, ourBridge serves approximately 200+ immigrant and newly arrived refugee children from around the world. The organization is committed to developing children's English acquisition, supporting their socio-emotional well-being, and the awareness and appreciation of diversity. Students will become a member of the program evaluation team and support the Principal Investigator (PI) in examining their program model to evaluate its effectiveness and documenting the impact ourBridge has on the local immigrant community. In this project, the scholar will help the team document the ways in which the program supports the growth and development of newly arrived immigrants in Charlotte in the third year of the program evaluation.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: This opportunity would support the growth and development of undergraduate researchers. Scholars will: (1) learn about and engage meaningfully with a powerful community organization that serves immigrant children in Charlotte, (2) assist in the data collection process, and (3) assist in the analysis of interview data using different qualitative software (ie. NVIVO). Scholars will be able to identify an area of research related to the education of immigrant children to explore with the support of a senior faculty member and a team of graduate research assistants.

Required training of 5 hours with Description: Students will need to complete the CITI (Collaborative Institutional Training Initiative) for UNC Charlotte to be added as a member of the evaluation team. Additionally, students will need to attend an onboarding meeting with the evaluation team and complete the ourBRIDGE volunteer orientation developed by the organization.

Mentoring plan: As a faculty mentor, I intend on establishing clear expectations for the scholar about his/her work schedule and responsibilities. My plan is to meet weekly with the student to establish specific tasks for completion. I also intend on treating the student as a member of our evaluation team by making the research process explicit and creating a timeline of milestones for completion. I would include the student in all evaluation team meetings to expose him/her to the full research process, even if they are only working on a specific part of it. I would incorporate routine checks for understanding by asking him/her to send a weekly email update and we would

discuss what they learned and address any obstacles they encountered. Lastly, I would assist the scholar in choosing a part of the research they find most interesting and support them in writing an abstract, research report, and develop a poster based on their summer research project by providing constructive criticism.

Applicant Requirements: Students should have an understanding the fundamentals of research, have strong interest in supporting immigrant children and their families, and have experience volunteering or working in the community

Applicant Preferences: Preference will be given to scholars who are self motivated and are committed to service to the community. Students who are proficient in another language or have experience learning additional languages (beyond what's required in general education) are encouraged to apply.

Specific Time considerations/conflicts: Students must be available on site at the organization (5-6 hours/day) or at the university research office during the summer programming hours

App ID #: 1194

Mentor: Ma, Lin Email: l.ma@charlotte.edu

Title: assistant professor

Department: MEES

Co-mentor: No

Community engaged research: No

Title: next generation battery technology for e-boat

Description: We are seeking innovative students to join a groundbreaking project focused on developing next-generation battery technology tailored for electric boats (e-boats). This project aims to enhance the energy density, safety, and longevity of batteries, addressing the unique challenges posed by marine environments. You will be involved in researching and developing advanced materials and battery architectures, conducting performance tests, and optimizing energy solutions to support the transition towards sustainable maritime transport. Join us to push the boundaries of battery science and contribute to a more sustainable future in marine technology.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Upon completion of this project, students will gain a comprehensive understanding of advanced battery technologies, particularly in the context of marine applications. They will develop skills in material science, electrochemical engineering, and system integration, learning to design, test, and optimize batteries for e-boats. Students will also enhance their abilities in data analysis, problem-solving, and innovation, understanding how to navigate the complexities of safety, efficiency, and environmental impact in battery design. This experience will equip them with the knowledge to contribute effectively to the field of sustainable energy solutions in transportation.

Required training of 6 hours with Description: The training and onboarding process for students joining the Next Generation Battery Technology for E-Boat project includes an initial orientation where students will be introduced to the project's goals, methodologies, and safety protocols. They will undergo specialized workshops on electrochemistry, material science, and battery testing techniques. Students will also receive hands-on training in our labs, learning to operate and maintain advanced equipment used for battery fabrication and analysis. Regular meetings with project mentors will facilitate ongoing learning, ensuring students are up-to-date with the latest research techniques and can effectively contribute to the project's objectives. This comprehensive approach ensures students are well-prepared to engage in meaningful research from the start

Mentoring plan: In this project, students will be mentored by a team led by experienced researchers, to ensure a supportive and growth-oriented environment. You can expect weekly one-on-one meetings with me for personalized guidance, where we'll review progress, set goals, and address any challenges. Additionally, you'll collaborate directly with our lab technicians and fellow

researchers, engaging in daily discussions to foster a collaborative learning atmosphere. We'll encourage you to present your findings during our bi-weekly group meetings, which will help develop your presentation skills and receive constructive feedback. This structured mentorship aims to not only advance your technical expertise but also enhance your professional development through regular feedback, skill-building workshops, and opportunities to contribute to publications and patent applications.

Applicant Requirements: We are seeking motivated undergraduate or graduate students with a solid foundation in chemistry, materials science, or electrical engineering. Ideal candidates should have a keen interest in battery technology, particularly for marine applications, and possess hands-on lab experience, preferably with electrochemical testing or material synthesis.

Applicant Preferences: Preferably, applicants should have some experience or coursework in electrochemistry, battery technology, or related fields.

Specific Time considerations/conflicts: N/A

App ID #: 1251

Mentor: Martins do Outeiro, Jose Email: jc.outeiro@charlotte.edu

Title: Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

Title: Immersive Digital Twin of a Robot-Assisted Finishing System for Metal Additive Manufactured Components

Description: Immersive Digital Twin (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. These technologies blur the line between the physical and virtual worlds, often making experiences more engaging and realistic. IDT of manufacturing processes is a promising teaching approach driving innovation in manufacturing education.

This project aims to developed and deploy a Digital Twin of a Robot-Assisted Finishing System for Metal Additive Manufactured (MAM) Components to enhance surface finishing. The students would contribute to developed and deploy this Digital Twin, which include the following tasks:

1) Learn about manufacturing processes and digital technologies relevant for the project through literature review and active training.

2) Develop a digital CAD model of the Robot-Assisted Finishing System.

3) Create a VR/MR experience of the Robot-Assisted Finishing System using the CAD model.

4) Collect the data from the real Robot-Assisted Finishing System and integrate it in VR/MR experiences.

5) Visualize the Digital Twin in VR/MR using headsets and tablets.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: By the end of this participation, students should:

1. General knowledge on finishing methods for metal additive manufactured (MAM) parts.
2. Gain experience in programming collaborative robots.
3. Develop skills in implementing sensors in manufacturing processes.

4. Acquire foundational knowledge and some experience on data analytics.

5. Gain hands-on experience in creating mixed/virtual reality (MR/VR) experiences.

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, including finishing methods of MAM parts, digital twins and VR/MR.

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, trouble shooting. They will receive guidance in formulating research questions, developing digital twins and mixed/virtual reality experiences for manufacturing, and implementing them through teamwork and collaboration.

Applicant Requirements: This is a multidisciplinary project requiring skills in different engineering concentrations. For this reason, it is recommended but not mandatory to have two students from different engineering disciplines, including but not limited to Mechanical, Electrical and Computer Science. Required skills:

1) 3D CAD modeling, and/or

2) programming, including but not limited to Python or C++.

Applicant Preferences: The student should be self-motivated, eager to learn.

1. Familiarity with sensor technologies.

2. Familiarity with manufacturing processes and technology.

3. Experience with Unity or Unreal game engines.

Specific Time considerations/conflicts: The student should work in the lab as required and be available to meet with faculty members and PhD/Master students as needed.

App ID #: 1192

Mentor: Mathews, Jay Email: jmathe24@uncc.edu

Title: Associate Professor

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Measuring properties of Ge and GeSn epitaxial materials for photonic devices

Description: Germanium (Ge) and germanium-tin (GeSn) alloys are materials that are of interest for use in photonic devices that are compatible and integrable with silicon (Si). These materials can be grown directly on Si, and they are compatible with complementary metal-oxide-semiconductor (CMOS) processing used for fabrication of Si microelectronics. Due to its optical properties, Si cannot be used for detection of light at wavelengths longer than 1200 nm, and it does not have the right band structure for making a laser. Ge and GeSn have been demonstrated to work at wavelengths of 2000 nm and beyond, and both materials have been used to demonstrate lasing on a Si chip. This project involves measuring the optical and structural properties of Ge and GeSn films grown on Si by our collaborators at institutions such as Air Force Research Laboratory, University of Arkansas, or Australia National University.

Photoluminescence (PL) spectroscopy is a technique that involves shining laser light on the material and then looking at the spectrum of light that is produced by band edge luminescence in the material. The spectrum and intensity of the PL is dependent on many material properties, including the defects in the material. The student will perform PL measurements on samples that were grown by different growth techniques or have been subjected to different types of thermal processing. The student may also perform other types of optical measurements such as reflection/transmission or spectroscopic ellipsometry, as well as structural characterization techniques such as scanning electron microscopy or atomic force microscopy.

The student will gain knowledge of crystalline semiconductor materials and their properties, and they will learn experimental techniques for materials characterization as well as soft skills like written and oral communication. These skills will be directly transferrable to other research or to industry, helping prepare them for their future career as a scientist or engineer. They will work directly with graduate students, one postdoctoral researcher, and the primary investigator Dr. Jay Mathews. This work may lead to publication in a peer-reviewed journal and/or a conference presentation.

Physics majors or dual-degree with Physics as one major are preferred, but students from other disciplines will be considered.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: The student will gain knowledge of crystalline semiconductor materials and their properties, and they will learn experimental techniques for materials characterization as well as soft skills like written and oral communication. These skills will be directly transferrable to other research or to industry, helping prepare them for their future career as a scientist or engineer. They will work directly with graduate students, one postdoctoral researcher, and the primary investigator Dr. Jay Mathews. This work may lead to publication in a peer-reviewed journal and/or a conference presentation.

Required training of 10 hours with Description: Students must complete online safety training for lab safety, lasers, and chemical storage. Students working in the cleanroom will undergo additional training from cleanroom staff.

Mentoring plan: The student will work directly with other undergraduate students, graduate students, one postdoctoral researcher, and the primary investigator Dr. Jay Mathews. The student will be expected to give presentations at weekly or biweekly group meetings, and Dr. Mathews will meet with them regularly one-on-one for additional mentoring. Dr. Mathews has had multiple trainings in mentoring students and has mentored 22 undergraduate students in the past. He is committed to helping students navigate the next steps of their career, and he is always available for advice after the student leaves the group.

Applicant Requirements: The student should have an interest in semiconductor materials, electronics, optics, and photonic devices such as lasers and photodetectors.

Applicant Preferences: A rising junior or senior Physics major or dual-degree with Physics as one major is preferred. The most important characteristics are enthusiasm, work ethic, and a willingness to learn new things.

Specific Time considerations/conflicts: The work schedule is relatively flexible, and group meetings are scheduled with everyone's individual restrictions in mind.

App ID #: 1193

Mentor: Miller, Jimmie Email: jamiller@uncc.edu

Title: Chief Engineer

Department: Center for Precision Metrology

Co-mentor: No

Community engaged research: No

Title: Computer Interfacing of electronic (LAN & USB) sensors

Description: The purpose of this research is to create a computer program which is capable of time-based synchronized reading information from digital electronic sensors. The software/language is up to the student. A graphical User interface for selection of timing variables and time-permitting post-acquisition statistical analysis is also desired. Also, time-permitting, some basic data collection on an Ultra-precision Measuring Machine will be accomplished. The student is encouraged to use all available (legal) sources for code creation. This project is considered a seed project for future research in machine/accelerated intelligence.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: The student will learn the practical aspects of data collection for machine learning. Most student course work only involves the creation of programs which already have data associated. This project involves the gathering of real-time physically related data through sensor systems. A greater understanding of the operation of a mechanical system having multiple axes of motion will be obtained.

Required training of 3 hours with Description: The student will be given instructed in the operation of the sensors to be interfaced via hands-on and manual based resources. The student will also be given instruction in the G-code based operation of a machine.

Mentoring plan: After training, I plan to be available whenever the student needs to discuss any aspect of the project. I have an open door policy and will interact with the student toward the most beneficial layout for a user interface. We will also discuss data archiving scenarios and meta-data requirements.

Applicant Requirements: The project requires an applicant who has software skills which can be honed by self-learning and determination. Someone who can think beyond the borders and requirements which are given to them directly.

Applicant Preferences: The only qualification is the ability to (learn to) create code that interfaces through the peripheral ports of a computer.

Specific Time considerations/conflicts: Work may take place anytime but at least one hour between 9-5 on weekdays for interaction and progress assessment.

App ID #: 1259

Mentor: Moglen, Glenn Email: gmoglen@charlotte.edu

Title: Professor and Chair

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Exploring Hydrologic Design in the Face of Climate Change

Description: Hydrologic designs are typically based on planning for specific rainfall events, such as the 100-year storm. The National Oceanic and Atmospheric Administration (NOAA) provides precipitation frequency estimates for the entire United States using historical data, a resource known as NOAA Atlas 14. Recently, NOAA has introduced a pilot product, NOAA Atlas 15, which builds on Atlas 14 by incorporating projections of future rainfall events influenced by climate change.

This study focuses on utilizing NOAA Atlas 14 and 15 in the context of rainfall-runoff modeling. A key innovation of this research lies in addressing a widely debated parameter in the most commonly used rainfall-runoff modeling tool in the United States. Specifically, the study will examine how storm magnitude and duration affect the selection of this critical parameter.

The findings from this research will provide valuable insights into how hydrologic design practices may evolve in response to climate change, geographic variability, and differing perceptions of risk. This work has the potential to significantly influence future engineering approaches to managing stormwater and mitigating flood risks.

In this study, the student will work with GIS and rainfall-runoff software to perform hydrologic modeling and spatial analyses. This work will be done in collaboration with, and under supervision from, the project mentor. The student will meet frequently with the project mentor, compile results, prepare presentation-quality maps, and create draft writing materials in preparation of a journal manuscript.

Accepting applications for: Either full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes:

Student will grow research skills that build upon ideas already learned formally in the classroom.

Student will develop skills manipulating and visualizing data in a GIS environment.

Student will work on communication skills verbally, visually, and in written form.

Student will be exposed to the scholarly research process and develop skills that will be useful at the graduate level.

Required training of 0 hours with Description: There is no need for specific training required for compliance. The mentor will provide hands-on training in the use of all relevant software.

Mentoring plan: Student will meet with the project mentor at least 1-2 times per week, but will work independently outside of those meetings. The project mentor will be available beyond these meetings as needed depending on the needs of the student possible difficulties encountered during the research. Frequency of interaction will be highest at the outset of the research when the student will be navigating the need to develop competencies in both the scholarly content of the work and the software needed to examine the questions being asked.

Applicant Requirements: Students should have an understanding of fluid mechanics, hydrology, and statistical methods relating to hydrologic risk.

Applicant Preferences: Desirable skills include familiarity with rainfall-runoff computer models and GIS software. Fluency and programming skills (any computer language) is also desirable.

Specific Time considerations/conflicts: N/A

App ID #: 1241

Mentor: Montanaro, Erika Email: emontana@charlotte.edu

Title: Associate Professor

Department: Psychological Science

Co-mentor: No

Community engaged research: Yes

Title: Sex while sipping: Norms and outcomes of bystander intervention for alcohol-involved sexual behaviors

Description: This project will take a health promotion and prevention perspective to understand college student norms surrounding alcohol and sexual behaviors. A survey will collect input from college students to understand their experiences in alcohol-involved sexual situations, and their willingness to help in concerning or risky situations. We will analyze this data collected to develop vignettes, or short stories, depicting students' common alcohol-involved sexual experiences. These vignettes will be used in a second study: an experiment to see if there are differences in the way students respond to these various situations. This research will involve understanding narratives, synthesizing different perspectives, and telling our own stories from the data. We will develop visually pleasing images/figures and a report from this data.

An undergraduate student will participate in data cleaning, analysis, and report development that depicts findings around college student norms surrounding alcohol use and sexual behaviors. For those interested in sexual health promotion, sexual violence prevention, qualitative (narrative) research and storytelling, and gaining a better sense of the research process, this would be a great opportunity.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will be able to learn about how to: analyze non-numerical data, tell a compelling story based on data, develop figures that convey research findings, use health promotion and prevention frameworks for research and practice, manage project timelines, and use research to inform or recommend improvements to existing interventions and programs.

Required training of 3 hours with Description: The student will receive training at the beginning that describes the purpose and goals of the project, the recruitment and data collection process, and the process of 'content analysis' and 'thematic analysis' in qualitative research. This is a great opportunity for students to learn an analysis technique that does not revolve solely around numbers! The student will be able to work with the mentor and graduate student weekly. There is flexibility in this opportunity for both on campus meetings and working in environments that allow the student maximal efficiency.

Mentoring plan: After understanding the student's professional development goals, they will be able to work directly with the mentor and graduate student on their professional development goals weekly. We will set an agenda for the summer with weekly lab topics. These can include CV/resume development, applying for graduate school, applying for jobs, choosing a graduate program/career, different research strategies and techniques, and even self-care in academia. The student will be able to work closely with the graduate student and learn more about graduate school life.

Weekly lab meetings will be structured as: 1) Check ins and updates/get to know each other, 2) Descriptions of the research process and next steps, 3) Professional development discussion/workgroup, and 4) Questions and closing.

Weekly meetings with the graduate student will be structured as: 1) Check ins and

question/answer, 2) research workgroup/working time synchronously with time for the student to ask questions, clarify confusions, or address concerns, and 3) professional development discussions from the graduate student perspective.

If the student is interested in attending a conference and presenting, we can work with the graduate student to identify a relevant conference to submit our work.

Applicant Requirements: Students that have taken research methods I and II are preferred; however, if students have only taken research methods I they are still encouraged to apply. Students must have taken a research methods course and have a basic understanding of research and the research process. Students do not need extensive research experience.

Applicant Preferences: Students that have taken research methods I and II are preferred; however, if students have only taken research methods I they are still encouraged to apply.

Students who can communicate in an effective and timely manner, meet project timelines, and are interested and/or passionate about storytelling, writing, image and figure making, and making sense of different stories/narratives are encouraged to apply.

Specific Time considerations/conflicts: We are flexible and can determine meeting times with the student.

App ID #: 1213

Mentor: Moxie, Jessamyn Email: jbowlin9@uncc.edu

Title: Associate professor

Department: Epidemiology and Community Health

Co-mentor: No

Community engaged research: Yes

Title: Training LGBTQ+ young adults to be supportive when hearing about sexual violence

Description: It can be hard to know how to respond when someone tells you about experiencing violence. Sometimes the ways people respond inadvertently can add extra stress, and marginalization. As part of an ongoing federally-funded study, we will be piloting the adaptation of a training program. The training program focuses on helping young adults be more supportive when someone tells them about experiencing sexual violence, and we're adapting it for LGBTQ+ individuals. LGBTQ+ individuals face disproportionate rates of sexual violence, and often experience negative reactions when telling others about their experiences. This is the second phase of the project; in the first phase we have gathered information about the recommended changes to the program using focus groups. We will be piloting the adapted program with 20 individuals and assessing its impacts using electronic surveys. The third phase of the study will be a randomized control trial of the adapted training, which would occur after the summer of 2025. The undergraduate student would be a part of an interdisciplinary team and gain valuable experience in team science approaches. The undergraduate student would be assisting in developing the recruitment strategies, observing the training itself, data analysis of the outcomes, and making changes to the program based on the feedback.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: By the end of the summer, students will be able to:

- Explain best practices in online and in-person recruitment approaches

- Discuss the effects of social reactions to sexual violence

- Discuss research methods in program adaptation

- Analyze qualitative data using Dedoose online software

Required training of 5 hours with Description: CITI Human Subjects Basics course; Training in our research lab values and procedures; Training in qualitative analysis

Mentoring plan: The student will be working directly with me as well as our lab group (including other undergraduate students and a graduate mentor). They can expect one-on-one meetings with myself and the graduate student mentor each week, as well as full lab group meetings. The student

will be encouraged to present at meetings as appropriate - such as taking point lead on a particular aspect of the data analyses or recruitment.

Applicant Requirements: Students must have strong verbal and written communication skills, a familiarity with Google tools (e.g. Google docs, sheets, Drive), previous experience with LGBTQ+ individuals or identify within LGBTQ+ communities, an interest in team science approaches (i.e. work well with others).

Applicant Preferences: Preferred previous experiences with sexual violence prevention or LGBTQ+ population advocacy, previous qualitative research experience, presentation abilities

Specific Time considerations/conflicts: NA

App ID #: 1249

Mentor: Murtha, Timothy Email: tmurtha@charlotte.edu

Title: Professor

Department: Anthropology

Co-mentor: No

Community engaged research: No

Title: Measuring Volunteer Participation and Retention for Environmental Conservation

Description: In this project you will work alongside the Catawba Riverkeepers, to gather data on why their volunteers keep volunteering for them, and how they can increase the amount of people who continuously volunteer. Students involved will conduct focus groups, create surveys, research and analyze data, and once done they will present that data to their nonprofit, whilst recommending solutions based on their data and analysis. Study findings will ultimately contribute to the science of how best to build and retain these types of volunteer-nonprofit relationships that are often vital to the organization's success and sustainability.

Accepting applications for: Only Full time 40 hours per week will be considered

1 positions available

Anticipated Student Learning Outcomes: Students will get hands-on experience in how to create and implement an ethnographic study. For things such as interviews, surveys, and data analysis. While also practicing active communication with the non profit involved, and time management skills involving the planning and preparation for the project outline.

Required training of 5 hours with Description: They will have to have a CITI Human Subjects research training certificate or will need to complete the course. Students will need to either already know, or be open to learn about how to conduct ethnographic research. Such as focus groups, surveys, and interviews. As well as how to analyze and process the data they gather.

Mentoring plan: I will act as a mentor and advisor for how the students will conduct their projects. I will answer their questions, give advice for when they're stuck, and review their project to check for errors. We will meet regularly as a small group with other students working on similar community engaged projects as well as individually this may be weekly or biweekly. I expect the student to present their findings to the community organization as well as at the OUR research symposium and if appropriate submit a poster proposal to the Society for Applied Anthropology conference.

Applicant Requirements: Required skills: Students who can conduct interviews, use word or google docs, and use ppt presentation, or google slides.

Required Courses: Anth 2171

Experiences: With email, and microsoft and google software(Word, ppt, google doc, google slides)

Applicant Preferences: Characteristics: Strong willed, can take criticism,

Skills: Quick thinker, hard worker, good communication

Courses: Any other applied anthropology courses, or cultural anthropology courses.

Experiences: Has conducted interviews, and research before.

Specific Time considerations/conflicts: Mondays through Fridays should be spent working on the project, as for meetings whenever possible for both the student and the mentor.

App ID #: 1189

Mentor: Parvinnezhad Hokmabadi, Mohammad Email: mparvinn@charlotte.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Fabrication and Testing of Edge Emitting and Surface Emitting Semiconductor Lasers

Description: Since their invention in 1960, lasers have played pivotal roles in a wide range of applications, including spectroscopy, optical tweezing, additive manufacturing, and directed energy, among others. In many cases, these applications rely on bulky fiber or solid-state lasers. While semiconductor lasers offer a compact form factor, their performance in terms of power, linewidth, and brightness still lags those of solid-state and fiber lasers.

This project aims to engage students in advancing semiconductors or diode lasers to achieve higher power, efficiency, and brightness. The fabricated devices will include both edge-emitting and surface-emitting lasers, utilizing advanced principles based on photonic crystals, metamaterials, and supersymmetry to enhance their performance.

The primary focus of this project will be on the fabrication and testing of these devices, rather than their design and theory. However, students will also contribute to designing photolithography mask layouts and identifying suitable lithography, etching, and material deposition processes in a nano-fabrication cleanroom environment.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes:

Students will engage in cutting-edge research on fabricating and testing semiconductor lasers, gaining valuable hands-on experience in nano- and micro- fabrication skills, such as micro- and nano-lithography, dry etching, wet etching, material deposition.

The students may also be involved in making optical bench setups for testing the devices.

Students will learn about lasers characteristics and how to test them, collect data and analyze.

This comprehensive skill set will be highly beneficial for pursuing careers in optics and nan-fabrication roles, such as Laser Engineer, Optical Metrology Engineer, or Process Engineers at leading companies such as Intel, Meta, Microsoft, or in National Labs.

If successful, the findings from this project are expected to be also published and presented at conferences and in journal articles, providing students with opportunities to enhance their academic credentials and pursue graduate degrees, if interested.

Required training of 30 hours with Description: Students will begin with initial training on the concept of lasers and nano-fabrication methods, including assigned readings to help them understand the scope of the project. After getting familiar with the concept, the students will receive basic nano and micro fabrication training to make their initial laser devices under the advisor's guidance. The training will involve wafer handling, photolithography, material deposition, photomask design and probably e-beam lithography. Following this and making the first set of devices, the advisor will instruct them on sample testing, data collection, and analysis.

Mentoring plan: I and the team members will teach the principle of lasers. The students will get basic training on clean room safety protocols, and nano- and micro- fabrication skills initially by the professional staff of Physics Department clean room and then by the adviser on more details. The students will design photomasks, find and optimize the parameters involved in fabrication of devices in clean room. After the first set of devices is made, the adviser will give them training in testing the devices, collecting data and analyzing them, in his own lab. Throughout the project, I will meet with the students once a week to guide them through the project. Finally, I will advise students to prepare their results for a presentation as a poster or a talk in a conference if interested.

Applicant Requirements: Basic Electromagnetics, Chemistry, Material Science and any hands-on experience would be useful too.

Applicant Preferences: Basic Electromagnetics, Chemistry, Material Science and any hands-on experience would be useful too.

Specific Time considerations/conflicts: There will be a 1-1 or group meeting once a week. The exact dates and times will be decided later.

App ID #: 1188

Mentor: Parvinnezhad Hokmabadi, Mohammad Email: mparvinn@charlotte.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Design, Fabrication, and testing of Flat Metamaterial Lenses

Description: In recent years, new types of lenses have emerged beyond the conventional concave and convex lenses. These lenses, known as metalenses, have flat interfaces and are remarkably thin and compact. They are expected to revolutionize the future of imaging systems, phones and Augmented Reality systems in the near future. These lenses are made by designing and inscribing nanostructures onto the surface of a glass slide or silicon wafer. By carefully engineering these nanostructures, a simple glass slide can be transformed to a focusing or diverging lens or the glass slide can even bend or shape the light in unconventional ways. In this project, interested undergraduate students can participate in various stages, including design, fabrication, and testing of these devices.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes:

Students will engage in cutting-edge research on metalenses, gaining valuable experience with optical software tools such as COMSOL, RSoft, and Zemax.

They will also develop fundamental nano-fabrication skills in clean room.

Students will learn to test samples using lasers sources, spectrometers and camera, they will learn to collect data and analyze them.

This comprehensive skill set will be highly beneficial for pursuing careers in optics, such as roles as Optical Engineers, Optical System Engineers, Optical Metrology Engineer, or Process Engineers at leading companies like Intel, Meta, Microsoft, or in National Labs.

If successful, the findings from this project are expected to be also published and presented at conferences and in journal articles, providing students with opportunities to enhance their academic credentials and pursue graduate degrees, if interested.

Required training of 30 hours with Description: Students will begin with initial training on the concept of metalenses, including assigned readings to help them understand the scope of the project. After getting familiar with the concept, the students will then be trained to use software tools for designing simple metalens structures, starting with designs that are manageable for

undergraduate students. Once the initial design is complete, in the second stage, the students will receive basic nano-fabrication training to create their initial devices under the advisor's guidance. Following this and making the first device, the advisor will instruct them on testing devices, data collection, and analysis.

Mentoring plan: I and the team members will teach the undergraduate students how to design lenses using commercial software tools. After the design is done, in about or before the second month, the students will be trained on clean room safety protocols, and nano-fabrication skills initially by the professional staff of Physics Department clean room and then by the adviser on more details. Then, the adviser will give them training in testing the devices made, collecting data and analyzing them, in his own lab. Throughout the project, I will meet with the students once a week to guide them through the project. Finally, I will advise students to prepare their results for a presentation as a poster or a talk in a conference if interested.

Applicant Requirements:

Interest and motivation to learn new knowledge and create new devices

Ability to work effectively both independently and as part a team

Strong attention to detail and ability to quickly learn new techniques

Prior coursework in either electromagnetics, engineering, or chemistry

Applicant Preferences: Prior coursework in either electromagnetics, engineering, or chemistry

Specific Time considerations/conflicts: There will be a 1-1 or group meeting once a week. The exact days and time will be decided later.

App ID #: 1239

Mentor: Potochnick, Stephanie Email: spotochn@charlotte.edu

Title: Associate Professor

Department: Sociology

Co-mentor: Yes

Roger Suclupe, rsuclupe@charlotte.edu, College of Health and Human Services

Community engaged research: No

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 full time or part time will be considered

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 6 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 #: 1179

Mentor: Quinlan, Margaret Email: mquinla1@uncc.edu

Title: Professor, Communication Studies

Department: COMM

Co-mentor: No

Community engaged research: No

Title: Communicating Women's Reproductive Health

Description: OUR research experience serves as a research practicum for interested undergraduate students. You will work on a research project and/or research projects and complete specific tasks to get “hands-on experience” through the design and conduct of actual communication studies research. Your project will be structured and include:

Assisting me with my research; depending on the research project, you may be assigned to conduct/write/perform literature reviews, interviews or surveys, coding, data entry, statistical analysis, interview or focus group scheduling, focus group/interview transcription, transcribing of one-on-one interviews, sourcing articles or other related research tasks. Before 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: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Undergraduate Research Assistant: I will work with Dr. Margaret M. Quinlan, Professor, Department of Communication Studies, Interdisciplinary Studies, Health & Medical Humanities at UNC Charlotte. I will help the professor collate, execute and design research. It is competitive.

Dr. Quinlan will guide you to:

gathering information;

analyzing, compiling, and interpreting data; multitasking ability;

clerical work;

administrative functions

Core Skills we will work on developing

Excellent written and oral communication

Excellent administration

Good presentation and organization

Expert in analyzing data

Excellent technical writing

Required training of 0 hours with Description: I will train 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: 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:

1. Experience working with a senior researcher.

2. Excellent knowledge of gathering information.

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

4. Multitasking ability and knowledge of clerical work.

5. Expertise in administrative functions.

6. Excellent written and oral communication skills.

7. Excellent administration and organization skills.

8. Good presentation skills.

9. Interest in gaining expertise in analyzing data.

10. 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

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 around 8 or 9 AM EST via Zoom that works for both our schedules (usually on Mondays)

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

App ID #: 1258

Mentor: Rasanen, Ryan Email: rrasanen@charlotte.edu

Title: Assistant Professor

Department: Civil and Environmental Engineering

Co-mentor: No

Community engaged research: No

Title: Rainfall and Landslides: Building a Model to Predict Debris Flows in Western North Carolina

Description: Hurricane Helene caused widespread devastation, triggering over 2,000 landslides and severe flooding across the Carolinas, Tennessee, and Virginia. Western North Carolina was particularly hard-hit, with 104 fatalities, at least 23 directly attributed to landslides. Flooding and landslides destroyed critical infrastructure, including numerous bridges and roadways, as well as many residential homes. This catastrophic event is not isolated—since 1924, heavy rainfall events have resulted in significant flooding and landslides in this region on average every nine years.

Debris flows, the most common type of landslide in western North Carolina, are fast-moving mixtures of water, saturated soil, rock, and organic material. They are often triggered by intense rainfall and can cause rapid, destructive downslope movement. Despite their frequent occurrence and significant impact, current predictive models are limited. Many models either predict only the general locations of potential landslides and/or fail to differentiate between the various types of landslides.

This project aims to enhance the understanding and prediction of debris flows in western North Carolina. The main objectives are:

Debris Flow Collection: Compile a comprehensive dataset of debris flows in western North Carolina from the past 100 years by extracting debris flow data from various online resources [~2-3 weeks];

Geospatial Data Collection: Gather freely available regional geospatial data, including rainfall, slope of ground, geology type, etc. using online resources [~2 weeks];

Model Development: Create a preliminary predictive model for debris flows in western North Carolina using the collected datasets [~2-3 weeks].

Poster Creation: Develop poster for Research Symposium and provide feedback to student during practice presentations [~1 week].

Improved prediction of debris flows can help communities better prepare for future extreme weather events, mitigate risk, and improve the resilience of infrastructure. By participating in this project, students will conduct research that could have a profound impact on North Carolina and gain experience in data collection and model development—critical skills needed in any STEM field.

Accepting applications for: Either full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes: By participating in this project, students will gain valuable skills and experiences that will enhance their academic and professional development:

Research with Real-World Impact: Students will contribute to research that addresses an important and common hazard in North Carolina.

Data Management and Model Development: Students will gain experience in creating and managing datasets and developing predictive models, skills highly valued by future employers.

Technical Tool Proficiency: Students will learn to use industry-relevant tools, including Excel, ArcGIS, and Matlab/Python.

Enhanced Critical Thinking and Communication: Participation will improve students' analytical thinking and their ability to communicate technical findings effectively.

By the end of the project, students will be able to discuss their experience in terms of:

Contributing to impactful research on natural hazard mitigation and debris flow prediction.

Developing competencies in data science tools such as Excel, ArcGIS, and/or Matlab/Python.

Strengthening their resumes and positioning themselves for future research roles, internships, or careers in civil engineering and/or related fields.

Required training of 0 hours with Description: The student will work directly with their research advisor who will teach them the tools they need to do the project. Weekly meetings are planned and will be in person or occasionally over zoom if needed. More frequent meetings may occur as needed/desired by the student. The number of hours required for training depends on the student's experience. I expect training to occur throughout the project as questions arise, but initially there will be a couple hours introducing the project and some data science tools. No official training programs, like those needed for research related to human subjects, is needed for this project. Therefore, the "Required Training Hours" is set to 0 hours.

Mentoring plan: My goal as a mentor is to provide students with a supportive, engaging, educational, and real-world research experience that allows growth in both technical skills and professional development. Here is what students can expect from working on this project:

Regular Meetings and Guidance: Students will meet with me weekly to discuss progress, challenges, and next steps. These one-on-one meetings will aid in research productivity, goal setting, and offer personalized professional guidance.

Opportunities for Presentation and Feedback: Students will informally present their findings and/or progress during weekly meetings to improve communication skills and receive constructive feedback. Additionally, students interested in sharing their work at conferences or university symposiums will be encouraged and supported.

Skill Development through Hands-On Activities: I will provide training on data collection techniques, geospatial analysis tools, and model training and testing. Students will have access to necessary resources and software.

Commitment to Professional Growth: I will offer mentorship, discuss potential next steps in research or industry, and help students identify future opportunities that align with their interests.

I am committed to creating a positive and intellectually stimulating research experience where students are supported and challenged, ultimately leading to the development of a product to help the community. Together, we will work toward making meaningful contributions to the understanding and mitigation of debris flow hazards.

Applicant Requirements: No specific courses or prior experience are required to participate in this project. However, students with a genuine interest in natural hazards, such as rainfall-induced debris flows, are encouraged to apply. Attention to detail and a commitment to checking and verifying one's work are important qualities for success.

While prior experience with data science and landslide research is not necessary, familiarity with one or a few topics such as geotechnical engineering, geology, natural hazards, hydrogeology, remote sensing, programming, or data science would be beneficial. Additionally, experience using tools like Excel, Matlab/Python, or ArcGIS—whether from coursework, internships, or personal projects—is a plus. I am committed to helping students develop these skills and will provide guidance and resources as needed throughout the project.

Applicant Preferences: No specific courses are required to participate, but familiarity with tools like Excel, ArcGIS, or Matlab/Python is recommended. Experience from coursework or projects in geotechnical engineering, geology, earth sciences, or data science would be advantageous but is not mandatory. The key qualities sought are attention to detail and a genuine interest in the collection and prediction of debris flows.

Specific Time considerations/conflicts: Meeting times are flexible and will be in person or occasionally on zoom as needed. Regular meetings will be scheduled weekly, but can occur more frequently as needed/desired by the student.

App ID #: 1270

Mentor: Reid, Robert Email: rreid2@uncc.edu

Title: Research Assistant Professor

Department: Bioinformatics & Genomics

Co-mentor: No

Community engaged research: No

Title: Developing pan genome tools for exploring heat tolerance in tomato plants

Description: Do you want to contribute to keeping pizza affordable for years to come??? Then figuring out how to make tomatoes thrive in high conditions is a must and that is what our lab does! Based in Kannapolis, we are a Bioinformatics group studying the tomato genome through NSF grant funding.

This project entails heavy computational analysis using a high performance computing environment to develop pipelines and implement software tools. We are exploring the genes that are involved when tomato plants undergo acute heat stress

For more details:

https://phys.org/news/2024-11-hardiness-scientists-key-phase-tomato.html#google_vignette

Here is a recent blurb about our collaborators of whom we work closely with.

By studying tomato varieties that produce fruit in exceptionally hot growing seasons, biologists at Brown University identified the growth cycle phase when tomatoes are most vulnerable to extreme heat, as well as the molecular mechanisms that make the plants more heat tolerant. The discovery, detailed in a study in Current Biology, could inform a key strategy to protect the food supply in the face of climate instability, the researchers said. Agricultural productivity is particularly vulnerable to climate change, the study noted, and rising temperatures are predicted to reduce crop yields by 2.5% to 16% for every additional 1 degree Celsius of seasonal warming.

The scientists took some lessons from evolution to experiment with how best to speed up the adaptation process for varieties of tomato plants, explained study author Sorel V. Yimga Ouonkap, a research associate in molecular biology, cell biology and biochemistry at Brown. It would take a long time to wait for evolution to weed out the vulnerable tomato varieties like Heinz in favor of those that can handle extreme heat, a process that might also jeopardize the qualities that make vulnerable crops commercially desirable.

This project involves multiple side projects where we explore gene sequences. We use Bioinformatic tools to gain insight and packages in R to run statistical analyses. This is the type of work you would be doing!

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will get increased exposure to hands on command line pipeline development. They will learn to navigate SLURM and some python coding.

We will practice presenting complex data structures in a high level manner so that the student can explain their work to a broad audience.

Required training of 10 hours with Description: No human or animal training required for this role, just time to getting acquainted with the command line environment on the High performance Cluster

Mentoring plan: Each project is an independent effort with weekly updates. We employ an AGILE like environment with scrums and 2 week sprint efforts.

They will work with me directly but will also be invited to be part of our biweekly meetings with the larger tomato group, which consists of 6 universities arounds the globe.

Students will eventually present their work via zoom to our collaborators.

Applicant Requirements: Coding and command line experience preferred.

This is a computational position.

Applicant Preferences: Coding and command line experience preferred.

This is a computational position.

Specific Time considerations/conflicts: Tuesday afternoons is imperative. Mondays are strongly encouraged as well.

App ID #: 1226

Mentor: Schmutz, Vaughn Email: vschmutz@charlotte.edu

Title: Associate Professor

Department: Sociology

Co-mentor: No

Community engaged research: No

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 Summer 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 full time or part time will be considered

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 Summer 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: They 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 #: 1204

Mentor: Shuster, Martin Email: mshuste2@uncc.edu

Title: Professor of Philosophy and Isaac Swift Distinguished Professor of Jewish Studies

Department: Philosophy

Co-mentor: No

Community engaged research: No

Title: The Political Economy of Policing

Description: The Political Economy of Policing

This project is one of the projects in the 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 full time or part time will be considered

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 1 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 #: 1233

Mentor: Smith, Megan Email: Megan.Smith@charlotte.edu

Title: Assistant Teaching Professor

Department: Sociology

Co-mentor: No

Community engaged research: No

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.

The first goal of the study is to 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. To accomplish this, there will be informal interviews with prison wardens and unit managers to gain entree and ask about the current training is and where the gaps exist. Then, we will develop a training program and will ideally lead the training at one to two prisons as a pilot study. Following the aging and mental health training, we will provide surveys to all participants followed by semi structured interviews to some participants to gather information about how the trainings were received, effectiveness of training delivery, etc. This study focuses on the third policy suggestion below. 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.

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: Either full time or part time will be considered

4 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 summer 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

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 provide content information and resources for your success; this research opportunity is no different. I believe in all students' ability to succeed through practice and hands on 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, so 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 in ample time. 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: Ideally students have strong and effective written and oral skills that they have practiced in previous coursework and possibly in employment settings. A student with coursework in gerontology, sociology, criminal justice and/or specialities in mental health withing majors and programs in CHHS are most desired. Candidates should also demonstrate 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 need students who are dependable, energetic, enthusiastic and are genuinely interested in the topic. The goal is to make great progress and that will not happen without these traits. I also am looking for students who are humble enough to ask for help and resources when they need them.

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. There will also be a training day that is TBD

App ID #: 1238

Mentor: Smith, Michael Email: mssmith1@uncc.edu

Title: Assistant Professor

Department: Engineering Technology and Construction Management

Co-mentor: No

Community engaged research: Yes

Title: Design and Development of Marine Energy Systems to Improve Performance

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 full time or part time will be considered

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 #: 1201

Mentor: Subramanian, Kalpathi Email: krs@charlotte.edu

Title: Associate Professor

Department: Computer Science

Co-mentor: No

Community engaged research: Yes

Title: Title: Building Real-World Programming Assignments For Improved Engagement and Retention of Computer Science Majors

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 and other domains. The undergraduate student will work on building new assignments, project descriptions, starter code and documentation and possibly 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, learning new and current technologies, documentation and working on challenging projects, and contributing to an assignment repository used across multiple academic institutions in the United States.

Accepting applications for: Only part time (20 hours per week) will be considered

1 positions available

Anticipated Student Learning Outcomes:

Learn new software technologies

work together with other students in the group using shared software tools

Learn to build production quality software, testing

Required training of 0 hours with Description: Student will be screened based on prerequisites and should be ready to learn the tools in a short amount of time. Extensive tutorials are already built with the software for onboarding new students in the project.

Mentoring plan: Students will meet with the PIs of the project each week as part of a group meeting.

Students will also have a Discord channel to pose questions, report problems outside of the meeting times.

Applicant Requirements: Students should have completed the first 2 programming courses in CS and Data Structures at a minimum. Knowledge and. coursework on Algorithm Analysis is also a plus. Should be a competent programmer and the ability to work independently on given problems.

Applicant Preferences: As detailed above

Specific Time considerations/conflicts: We will set the time for weekly meetings taking into account the preferences of all members of the group.

App ID #: 1234

Mentor: Subramanian, Kalpathi Email: krs@charlotte.edu

Title: Associate Professor

Department: Computer Science

Co-mentor: Yes

Erik Saule, esaule@uncc.edu, Associate Professor, Computer Science, CCI

Community engaged research: No

Title: Efficient Generation of Highly Engaging Learning Modules

Description: This is a new project that will begin in 2025 and will contribute as preliminary work towards building a prototype of a system that will result in efficient generation of learning modules for CS instructors. The idea behind this project is to build complete learning modules (material concepts, demonstrations (as animations), interactive exercises and assessments) in a stramlined fashion, so that the process of creating and editing such materials is not very tedious.

As part of this project we will use the 3 Blue 1 Brown set of tools (https://www.3blue1brown.com/) to build high quality animations of algorithmic concepts for computer science instructors for their use in their courses. The OUR student will be involved in learing the tool's programming API and building example animations of a few specific algorithms. Note that this is a long-term project and this part of the project is just the beginning.

Accepting applications for: Only part time (20 hours per week) will be considered

2 positions available

Anticipated Student Learning Outcomes: - Learn new software technologies

- Work together with other students in the group using shared software

  tools

- Learn to build high quality software, testing and documentation

Required training of 10 hours with Description: Student will be screened based on prerequisites and should be ready to learn the tools in a short amount of time. With the availability of tutorials and examples (this is an open source tool) we expect a learning curve of 1-2 weeks

to get going on the project.

Mentoring plan: - Students will meet with the PIs of the project each week as part of a group meeting.

- Students will also be part of a Discord channel to pose questions and/or report problems outside of the meeting times.

- Mentors will also be available to meet with student as needed during

the week in-person or by Zoom

Applicant Requirements: Students should have completed the first 2 programming courses in CS and Data Structures at a minimum. Knowledge and. coursework on Algorithm Analysis is also a plus. Should be a competent programmer and the ability to work independently on given problems.

Applicant Preferences: As this work involves animation tools, students with background in computer

graphics or game design is preferable. They should have taken related

courses in these areas and will be better prepared for the project.

Specific Time considerations/conflicts: We will set the time for weekly meetings taking into account the preferences of all members of the group.

App ID #: 1230

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: No

Title: Mathematical modeling of aircraft wings encountering gusts

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 a 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 full time or part time will be considered

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: None. The project involves only mathematical modeling and computer coding.

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 Introductory Fluid Mechanics

Interest in theoretical/mathematical modeling

Beginner level experience, and interest, in MATLAB programming

Applicant Preferences: Strong Grasp of and interest in Fluid Mechanics

Background in theoretical/mathematical modeling

Proficient in MATLAB programming

Specific Time considerations/conflicts: N/A

App ID #: 1248

Mentor: Syverson, Drew Email: dsyverso@charlotte.edu

Title: Research Assistant Professor

Department: Department of Earth, Environmental and Geographical Sciences

Co-mentor: No

Community engaged research: Yes

Title: Orange Hydrogen from Low Temperature Serpentinization

Description: For the first time in a lifetime, humankind is poised to harness an entirely new energy resource. Locked up within certain iron-rich silicate rocks in the Earth's crust is a chemical reactivity sufficient to produce hydrogen upon contact with water. Iron is released from the rock via a process known as serpentinization. The hydrogen (H2) generated this way, recently termed orange hydrogen to distinguish it from other sources [1], could provide carbon-free energy at scale so large as to enable a profound energy transition. Subsurface hydrogeomechanical engineering will unlock this resource by creating and injecting water into underground fractures, initiating self-sustaining reactions to produce hydrogen from rock. Commercially viable hydrogen production, however, will require mastering the hydrogen evolution reaction at low temperature because there is no commercial path for drilling into, or creating, high-temperature subsurface environments.

Achieving efficient hydrogen production at low temperatures is the only economic technology-to-market pathway even though the rates of hydrogen production are maximized at high temperature (200–350˚C) [2, 3]. Drilling to depths this hot is expensive and risky, at the limits of advanced geothermal technology. Heating shallower formations or injecting steam has a large energy penalty and energy cost. Even considering Washington state, which has among the cheapest industrial electricity in the US, the minimum heating cost is ~ 84 ¢ / kg H2 assuming 100% of iron is liberated by serpentinization and converted into hydrogen. Because the efficiency of fracture stimulation and hydrogen generation will be less than 100%, the cost for heating alone will easily exceed the economic target of $1/kg H2 at the well head. All other costs for establishing and operating a stimulated serpentinization site will worsen this outlook.

Low temperature serpentinization and hydrogen generation would avoid the energy and economic costs of heating but presents other challenges. Mineral-fluid reactions are often slow and may remain far from thermodynamic equilibrium. Nevertheless, important laboratory studies and field systems [4 - 7] provide evidence that the key reactions can be active at temperatures below 100˚C.

In this project we seek to discover and harness chemical approaches for accelerating and sustaining low temperature serpentinization. In particular, we will perform experimental methods in the laboratory that will enhance our understanding of the chemical controls dictating the rates of the key reactions controlling the rate of hydrogen generation during serpentinization at low temperatures.

The student(s) will perform well-controlled laboratory serpentinization experiments that are designed to significantly increase hydrogen production. In particular, the generation of hydrogen

during serpentinization in natural environments is dependent on the chemistry of fluids reacting with ultramafic rock. Dissolved silica, $SiO_2(aq)$, has a fundamental control on the phase and composition of secondary minerals formed, the fate and oxidation of iron(II), and the amount of hydrogen generated during reaction between water and reactant silicate minerals. These experiments will also employ a novel 29Si isotope tracer technique to quantify the rate and amount of primary silicate mineral reaction in the experiments [8].

The student(s) will gain experience in laboratory methods, analytical instrumentation, and will learn to examine and interpret how changes in fluid chemistry will control the serpentinization reaction and the generation of hydrogen. The overall goal of this project is to optimize the generation of molecular hydrogen during the serpentinization of ultramafic rock under moderate hydrothermal conditions (~80°C). Success could enable the development of geologic hydrogen as a new carbon-free energy resource. This blossoming field of orange hydrogen has a large potential for expansion in the near future and will provide abundant opportunities in academia and industry.

References

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Ely, T., et al., Huge variation in H2 generation during seawater alteration of ultramafic rocks. Geochemistry, Geophysics, Geosystems, 2023. 24(3): p. e2022GC010658.

Mayhew, L.E., et al., Hydrogen generation from low-temperature water–rock reactions. Nature Geoscience, 2013. 6(6): p. 478-484.

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Morrill, P.L., et al., Geochemistry and geobiology of a present-day serpentinization site in California: The Cedars. Geochimica et Cosmochimica Acta, 2013. 109: p. 222-240.

McCollom, T.M., et al., Hydrogen generation and iron partitioning during experimental serpentinization of an olivine–pyroxene mixture. Geochimica et Cosmochimica Acta, 2020. 282: p. 55-75.

Syverson, D.D., et al., Nutrient Supply to Planetary Biospheres From Anoxic Weathering of Mafic Oceanic Crust. Geophysical Research Letters, 2021. 48: p. 1-8.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes:

The student(s) will learn to independently perform literature reviews

The student(s) will gain experience in laboratory methods:

Preparation of fluids and minerals used for reactants in the experiments

Design and setting up experiments

Sampling experiments and mineral product

Analytical instrumentation (all housed within the Department of Earth, Environmental, and Geographical Sciences at UNCC), such as Inductively-coupled mass spectrometry (ICP-MS), Gas chromatography (GC), pH electrodes

Examine and interpret geochemical data produced from the experiments

The student(s) will also gain independence in the laboratory environment and the ability to think critically of their experiments and outcomes of the proposed activities.

The student(s) will present and disseminate the research results at the end of the OUR term through a poster or oral presentation at the OUR symposium. There is also potential to present research results in larger conferences more focused on this particular research field.

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

Mentoring plan:

The student(s) will work directly with mentor Dr. Syverson and with a designated MS student and postdoc working on this project, such that the OUR experience is productive during the given amount of time the project is active.

The student(s) will meet with Dr. Syverson once a week with regards to progress and discussion of the literature.

Dr. Syverson will also meet with the OUR student(s) throughout each week in the laboratory to help the prepare and perform the experiments and during analysis of samples using a variety of analytical instrumentation.

Dr. Syverson will mentor the student(s) throughout the interpretation of research results.

The student(s) will produce and share research results with Dr. Syverson's research group and at the OUR symposium. Potentially, at a larger conference focused on the field of orange hydrogen.

Applicant Requirements:

Have taken general chemistry, mineralogy, and other relevant Earth science courses.

Has experience with wet-chemistry laboratory work, such as measuring pH and performing titrations.

Applicant Preferences:

Has an interest in solving Earth's on-going climate problem and is interested in going to graduate school.

The student(s) has an interest in the development of orange hydrogen as a clean-energy alternative.

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

App ID #: 1265

Mentor: Tate, Ashley Email: atate29@charlotte.edu

Title: Assistant Professor

Department: Dance

Co-mentor: No

Community engaged research: No

Title: UNC Charlotte Dance Department - 2025 Hip Hop Symposium

Description: As an Assistant Professor of Dance who also serves as an affiliate faculty member in Africana Studies and in the Center for Community, Heritage, and the Arts, I am committed to the authentic embodiment of equity and inclusion, community engagement, and the honoring of roots and culture. My research investigates how African Diasporic dance education, practice and performance function as tools for social justice. Specifically, I explore how the elements of Hip Hop and jazz contribute to the reimagining of art and civic engagement practices.

Hip Hop is one of the most important and influential movements in our world today. Beyond its musical influence, Hip Hop has made a profound impact on social work, empowering communities, advocating for social justice, and providing innovative approaches to therapy and healing. The city of Charlotte has a thriving network of dynamic Hip Hop artists, practitioners, and scholars, among them professors from our very own faculty. This event is designed to highlight and share personal narratives of some of these people who are working to address social issues that plague their communities through Hip Hop practice, performance and research. The symposium is also designed to publicly explore (through presentation and dialogue) how the core tenets and values of this culture and art form shed light on social issues, provide creative avenues for expression and healing, and empower marginalized communities. The symposium will be open to the public, with sessions taking place on both the main and Center City campuses. This type of engagement among the general public, students, academics and industry leaders is an opportunity to create dialogue, foster community, and facilitate continuing education. The core values and tenants that are inherent to hip-hop culture provides an exciting and growing intellectual movement that directly aligns with UNC Charlotte's vision to be an emerging top-tier research university driving discovery and innovation.

I am looking to mentor undergraduate students who will assist me this summer in the development and execution of a Hip Hop symposium at UNC Charlotte to be held October 17-19, 2025. The symposium is designed to build a platform to approach vital questions and raise awareness concerning hip-hop as a movement for social change and empowerment. The symposium will feature panels, performances, sessions and other events led by myself, local and national scholars, students, and community members. Due to the interdisciplinary nature of this event, I have secured commitments from colleagues across campus who research and study Hip Hop culture within the departments of Africana studies and philosophy. These research assistants will assist with administrative, research and artistic tasks. They will be involved with researching the Hip Hop dance ethnography of Charlotte, NC, and they will present at the culminating OUR symposium, as

well as the Hip Hop symposium itself. They will also organize collected information that will aid in the development of an article highlighting the process and results of the symposium and its impact on the campus community and the industry as a whole. Finally, they will assist with promotion and marketing via various channels and tools, such as COA+A website, social media, email, flyers, posters, and press releases.

I look forward to the opportunity to work alongside young scholars to advocate for the public value of arts and culture on the campus of UNC Charlotte and beyond by partnering, serving and collaborating with local and national hip-hop artists, practitioners, and scholars.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Participation in this research project will cover the following student learning outcomes:

Students will demonstrate skills in Creative Practice and Inquiry (all modes of communication, including written and oral)

Generate ideas through the following: exploration (physical, technological, and/or aural); analysis of and response to existing works of art and scholarship; and in relationship to political and social ideas and environments.

Compose ideas into communications (performed, written, oral) that are structurally, aesthetically, and intellectually sound and sensitive to diverse communities.

Express and communicate evidence, ideas, and opinions through clear and cogent writing.

Think critically, exploring generated ideas in relationship to desired aesthetic and social/cultural outcomes.

Re-enter creative and inquiry processes to deepen understanding and improve communication.

Self-reflect, exploring encounters with self, disciplines, personal practices, creative and academic work, communities, and environments.

Develop an introductory knowledge of writing for dance: self-reflection, critique, and proposal writing.

Students will demonstrate Professional & Leadership Skills

Demonstrate knowledge of diverse choreographic, musical, historical, and intellectual dance practices and "texts."

Think and work across areas of knowledge and practice.

Demonstrate the habits of self-education and lifelong learning, especially by regularly reading and attending arts events.

Strengthen self-discipline, organizational skills, and confidence.

Display abilities to work independently and in collaboration with others.

Strengthen interpersonal skills, including the capacity for problem solving, conflict resolution, and inter-generational and multi-cultural communication.

Demonstrate appropriate professional habits: be on time, work with energy and commitment, invest in personal rehearsal and reflection, display leadership skills and community-engagement by helping others.

Prepare for graduate-level study and/or jobs in dance professions through internships, independent projects, or by participating in a faculty-led research project.

Students will demonstrate Community-Building and Cultural Awareness Competencies

Demonstrate knowledge of theories that impact understandings of individuals (identity) and communities (representations).

In the last few years, a number of universities (including Harvard University and University of Southern California, both R1 research institutions) have begun to host symposiums centered around the history and impact of hip-hop culture, with particular focus on the intersection of hip-hop and social justice and commentary as it relates to music and dance. In my research, I have discovered that UNC Charlotte has not previously hosted an event of this kind. I do believe that participating students will be honored and excited to play such an integral part in the development of the first Hip Hop Symposium on campus.

Required training of 0 hours with Description: None needed.

Mentoring plan: Research assistants will contribute to research on the Hip Hop dance ethnography of Charlotte, North Carolina. They will work under my guidance to develop the artistic and technical skills necessary to carry out this research project. In the course of this research, they will develop expertise in qualitative research and learn more about embodied arts-based research methods. These skills will have broad applicability to other areas of research and will be an immense benefit to students as they establish their own agendas. Students will add to their artistic knowledge by reading and discussing literature with me and participating in seminars related to this research. I will work with students to design an individual development plan describing their research, training, and career goals as well as the approaches they will take to achieve those goals. We will review and revisit this plan on a regular basis. I will meet weekly with the assistants to discuss their progress on the project and to identify and resolve any difficulties carrying out their work. Students will be encouraged to attend asynchronous online workshops on responsible conduct of research, career opportunities, résumé writing, and interview skills. Students will improve their ability to communicate research findings by presenting and obtaining feedback on their research at regularly scheduled meetings, and they will be expected to give a poster and oral presentation at the end of summer of 2025, and present at the symposium in October 2025.

Applicant Requirements: Students must have:

Working knowledge of Microsoft Office, internet, and electronic media.

Strong organizational, oral and written communication skills

Self-motivation and a high level of responsibility to complete tasks in a timely manner and make significant progress without direct supervision.

Interest in the subject matter of the research project in question.

Applicant Preferences: Student Preferred Qualifications:

Public speaking and presentation abilities.

Successfully completed a Hip Hop-oriented course at UNC Charlotte (from any department).

Specific Time considerations/conflicts: No specific days or times, we can work through a mutually agreeable schedule.

App ID #: 1223

Mentor: Tipton, Roger Email: rtipton2@charlotte.edu

Title: Research Associate Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

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

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 full time or part time will be considered

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

Mentoring plan: To ensure students’ success in developing a process for extracting nanocellulose fibers from plant matter for biocomposite materials, I am committed to providing comprehensive support and guidance throughout their research journey. Here’s what students can expect from me during this experience:

Direct Mentorship and Regular Contact: Students will work closely with me through regular one-on-one meetings where we will discuss their progress, address challenges, and set goals. These sessions will provide personalized feedback and guidance, ensuring that students feel supported and confident in their work.

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

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 #: 1224

Mentor: Tipton, Roger Email: rtipton2@charlotte.edu

Title: Research Associate Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

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 full time or part time will be considered

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

Mentoring plan: To ensure students' success in developing a process for 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 #: 1231

Mentor: Tipton, Roger Email: rtipton2@charlotte.edu

Title: Research Associate Professor

Department: Mechanical Engineering and Engineering Science

Co-mentor: No

Community engaged research: No

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 full time or part time will be considered

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 #: 1211

Mentor: Trammell, Susan Email: srtramme@uncc.edu

Title: Professor

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Light-Assisted Drying to Enable Room Temperature Storage of Vaccine and Other Biologics

Description: Vaccination against infectious disease is one of the greatest advances of modern medicine as evidenced by the elimination of smallpox worldwide and the prevention of an estimated 2.5 million deaths per year from diphtheria, whooping cough, and measles. However, vaccines are temperature-sensitive biologics and the vast majority of vaccines must be stored between 2-8°C. Temperature excursions above or below this recommended temperature range can decrease the potency of the vaccine. As a consequence, vaccines must be stored and transported at these recommended temperatures from the point of manufacture to the point of use. This system of controlled temperature distribution is called the cold chain. Cold storage strategies are expensive and are especially burdensome in low-resource settings due to a lack of available infrastructure. As evidenced by the rollout of the COVID-19 vaccine, cold chain storage can be challenging even in countries like the US. Inadequate access to temperature-controlled delivery systems is one of the leading causes of under-vaccination globally. There is a need for new methods that can provide thermally stable vaccines that do not require refrigeration.

Light-Assisted Drying (LAD) is a new processing technique to prepare biologics such as vaccines for storage at ambient temperatures. LAD uses illumination by near-infrared laser light to assist in the formation of a protective trehalose (sugar) amorphous solid matrix. For LAD processing, a biologic is suspended in a trehalose solution that is then irradiated with a near-IR laser that selectively heats water in the sample to accelerate drying. As water is removed from the sample, an amorphous solid protective matrix is formed. The sample temperature is monitored with a thermal camera. The samples are dried to low moisture content (~2% water content by mass) and this enables storage at ambient temperatures. Samples can be quickly rehydrated when needed. LAD is broadly applicable to a variety of biologics including proteins, vaccines, and nanomedicine products. The next step in developing the LAD process is to demonstrate the ability to successfully process vaccines that currently are difficult or impossible to lyophilize (e.g. alum adjuvanted or mRNA vaccines) and require storage at refrigerated or freezing temperatures.

This project will be a hands-on experience in the laboratory. Undergraduate researchers will learn how to LAD process samples and acquire polarized light imaging to characterize the preservation matrix. Students will also assist with experiment design and data analysis. Students who successfully complete the summer program will be listed as a co-author on a conference proceedings paper.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students participating in this research project will gain valuable hands-on laboratory experience, including developing experimental design, data analysis, and technical writing skills. They will develop skills in oral presentation and teamwork, preparing them for collaborative and independent work in academic or professional settings. These experiences will enhance their ability to approach complex problems systematically and communicate findings effectively. This will provide a strong foundation for graduate school or careers in research, healthcare, or industry. Students will leave the project with practical expertise they can confidently discuss in applications, interviews, or professional settings.

Required training of 10 hours with Description: Students will need to complete Laboratory Safety Training and Laser Safety Training (online modules) before working on the project.

Mentoring plan: Students will work directly with one of my graduate students, who will provide day-to-day guidance and support in the laboratory. I will meet with the students as a group during our weekly lab meetings and will also hold individual meetings with each student at least once a week. During lab meetings, students will deliver a brief (5-10 minute) progress report, summarizing their work from the previous week and outlining goals for the upcoming week. These sessions will include reviewing data, troubleshooting experiments, and discussing strategies to achieve research objectives. Students will also be expected to present their findings at the Summer Undergraduate Research Symposium. Those who successfully complete the program are usually listed as co-authors on a conference proceedings paper. Additionally, there may be opportunities for students to continue working in the lab beyond the summer program to further develop their skills and contribute to ongoing projects.

Applicant Requirements: Applicants should have completed PHYS 2101 and 2102 with a grade of C or better to ensure they have a strong foundation in physics principles. While not required, completion of 3000-level coursework, such as PHYS 3141, would be beneficial, as it may provide additional background information relevant to the research. In addition to coursework, I value students who demonstrate curiosity, a strong work ethic, and the ability to think critically. Applicants should be reliable, motivated to learn, and able to collaborate as part of a research team. Prior laboratory experience is not required but is advantageous. Students should have an interest in developing hands-on skills and engaging in data analysis.

Applicant Preferences: While not required, completion of 3000-level coursework, such as PHYS 3141, would be beneficial, as it may provide additional background information relevant to the research. In addition to coursework, I value students who demonstrate curiosity, a strong work ethic, and the ability to think critically. Applicants should be reliable, motivated to learn, and able to collaborate as part of a research team. Prior laboratory experience is not required but is advantageous. Students should have an interest in developing hands-on skills and engaging in data analysis.

Specific Time considerations/conflicts: Students must be available during normal working hours 9 AM-5 PM to work with graduate students. They may not work in the lab alone after hours.

App ID #: 1212

Mentor: Trammell, Susan Email: srtramme@uncc.edu

Title: Professor

Department: Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Enhanced Thermal Imaging (ETI): A New Tool for Surgical Guidance

Description: Surgical procedures rely on imaging tools for pre-operative planning, intraoperative guidance, and post-surgical assessment of healing. Common techniques, such as CT, MRI, Doppler ultrasound, and angiography, are essential for surgical planning but face significant limitations during surgery. These methods often require intravenous dyes, specialized equipment, and skilled technicians to interpret the images, making them impractical for many intraoperative applications. Our lab is developing a new imaging tool to address these challenges: Enhanced Thermal Imaging (ETI). ETI is an infrared (IR) imaging technique (8-10 microns) that uses heat as a contrast agent to detect vascular structures within tissue. While the human body naturally emits thermal infrared radiation, tissues are generally at similar temperatures, making it difficult to distinguish between tissue types in standard thermal images. ETI overcomes this limitation by selectively heating blood vessels to make them visible in thermal images. Tissue is illuminated with a green LED (530 nm), and because blood absorbs green light more strongly than surrounding water-rich tissue, blood vessels heat up by approximately 0.5 °C relative to the surrounding tissue. This selective heating causes blood vessels to appear brighter in thermal images, enabling clearer visualization of vascular structures. We have successfully applied ETI to delineate the margins of solid tumors and assess the reperfusion of skin grafts after surgery. Our current work focuses on advancing this technique for minimally invasive surgical applications, with the potential to improve surgical precision and outcomes.

This project offers a hands-on laboratory experience where undergraduate researchers will learn to operate the ETI system and contribute to designing a new module for imaging through an optical fiber bundle. Participants will gain experience in experiment design, data analysis, and problem-solving. Students who successfully complete the summer program will be acknowledged for their contributions as co-authors on a conference proceedings paper.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students participating in this research project will gain valuable hands-on laboratory experience, including developing experimental design, data analysis, and technical writing skills. They will develop skills in oral presentation and teamwork, preparing them for collaborative and independent work in academic or professional settings. These experiences will enhance their ability to approach complex problems systematically and communicate findings effectively. This will provide a strong foundation for graduate school or

careers in research, healthcare, or industry. Students will leave the project with practical expertise they can confidently discuss in applications, interviews, or professional settings.

Required training of 10 hours with Description: Laboratory Safety Training and Laser Safety Training (online modules).

Mentoring plan: Students will work directly with one of my graduate students, who will provide day-to-day guidance and support in the laboratory. I will meet with the students as a group during our weekly lab meetings and will also hold individual meetings with each student at least once a week. During lab meetings, students will deliver a brief (5-10 minute) progress report, summarizing their work from the previous week and outlining goals for the upcoming week. These sessions will include reviewing data, troubleshooting experiments, and discussing strategies to achieve research objectives. Students will also be expected to present their findings at the Summer Undergraduate Research Symposium. Those who successfully complete the program are usually listed as co-authors on a conference proceedings paper. Additionally, there may be opportunities for students to continue working in the lab beyond the summer program to further develop their skills and contribute to ongoing projects.

Applicant Requirements: Applicants should have completed PHYS 2101 and 2102 with a grade of C or better to ensure they have a strong foundation in physics principles. (this is also the requirement to advance to upper level classes in engineering and physics)

Applicant Preferences: While not required, completion of 3000-level coursework, such as PHYS 3141, would be beneficial, as it may provide additional background information relevant to the research. In addition to coursework, I value students who demonstrate curiosity, a strong work ethic, and the ability to think critically. Applicants should be reliable, motivated to learn, and able to collaborate as part of a research team. Prior laboratory experience is not required but is advantageous. Students should have an interest in developing hands-on skills and engaging in data analysis.

Specific Time considerations/conflicts: Students must be available during normal working hours 9 AM-5 PM to work with graduate students. They may not work in the lab alone after hours.

App ID #: 1175

Mentor: Truman, Andrew Email: atruman1@uncc.edu

Title: Professor

Department: Biological Sciences

Co-mentor: No

Community engaged research: No

Title: Understanding protein-protein interactions in amyotrophic Lateral Sclerosis

Description: Amyotrophic lateral sclerosis (ALS) is a devastating neurodegenerative disease that affects nerve cells in the brain and spinal cord, leading to progressive muscle weakness and paralysis. More than 30 genes are strongly associated with ALS including the TAR DNA-binding protein 43 (TDP-43). Mutations in TDP-43 lead to its mislocalization from the nucleus to the cytoplasm and formation of insoluble hyper-phosphorylated and ubiquitinated aggregates. These aggregates attract molecular chaperones, ubiquitin, and proteasomal machinery, overwhelming the proteostasis system. Although interactors of TDP-43 have been identified, the nature of these complexes remains poorly defined. To characterize the direct interactions of TDP-43, we purified TDP-43 complexes from HEK293 cells that had been treated with the MS-cleavable crosslinker DSSO and submitted these to mass spectrometry analysis.The undergraduate student will work with a postdoctoral researcher to analyze all of the data from the MS experiment. They will identify new TDP-43 interactions and verify them experimentally. Techniques learned include mammalian cell culture, mass spectrometry, CRISPR and structural biology.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will learn about the ALS disease and new technologies to investigate it including mammalian cell culture, mass spectrometry, CRISPR and structural biology. Students will have the opportunity to present their findings at Truman lab meetings, the Proteostasis Group Meeting (run by Dr. Truman) and possibly at external chaperone conferences.

Required training of 1 hours with Description: Students will undergo rigorous training and onboarding mentored directly by a highly-skilled postdoctoral researcher. Dr. Truman has trained over 20 undergraduate students all whom have achieved their desired career goals that range from medical school to PhD programs.

Mentoring plan: Although the student will be directly mentored by a highly skilled postdoctoral researcher, Dr. Truman will be available to discuss their project and provide additional guidance at any time. Students are expected to present their finding at a range of venues include Truman lab meetings, the Charlotte Proteostasis Group Meetings and possibly external conferences. My group is one of the most highly funded in the university and we have 12 group members to ensure a diverse and exciting research environment.

Applicant Requirements: Students should be able to commit to the hours required by the OUR position and be majoring in biology.

Applicant Preferences: Background experience with molecular biology techniques is a bonus.

Specific Time considerations/conflicts: Students are required to attend weekly Truman lab meetings.

App ID #: 1176

Mentor: Truman, Andrew Email: atruman1@uncc.edu

Title: Structural insights into the human chaperone-RNR complex

Department: Biological Sciences

Co-mentor: No

Community engaged research: Yes

Title: Structural insights into the human chaperone-RNR complex

Description: Ribonucleotide reductase (RNR) is a critical enzyme in the synthesis of DNA bases and is a well-established therapeutic target for various diseases, including cancer. The human RNR complex consists of the R1, R2, and R2B subunits. Our previous research identified the molecular chaperones Hsp90, Hsp70, and DNAJA1 as key regulators of RNR stability and activity in both yeast and mammalian cells. Although the chaperone dependency of RNR is well-documented, the precise nature of the chaperone-RNR interaction remains unclear. In this study, we aim to elucidate the structural basis of the chaperone-RNR interaction. We have successfully expressed and purified human Hsp90, Hsp70, DNAJA1, R1, R2, and R2B proteins using multi-step fast protein liquid chromatography (FPLC). Students will work with an experience postdoctoral research on characterizing the structure of the complex. Students will be taught protein expression and purification technologies as well as crosslinking mass spectrometry (XL-MS) and cryo-electron microscopy (Cryo-EM) to resolve the complete structure of the chaperone-RNR complex. This research lays the groundwork for novel anticancer therapies targeting these interactions.

Accepting applications for: Only Full time 40 hours per week will be considered

4 positions available

Anticipated Student Learning Outcomes: Students will work with an experience postdoctoral research on characterizing the structure of the complex. Students will be taught protein expression and purification technologies as well as crosslinking mass spectrometry (XL-MS) and cryo-electron microscopy (Cryo-EM) to resolve the complete structure of the chaperone-RNR complex. This research lays the groundwork for novel anticancer therapies targeting these interactions. Students will have the opportunity to present their findings at Truman lab meetings, the Proteostasis Group Meeting (run by Dr. Truman) and possibly at external chaperone conferences.

Required training of 1 hours with Description: Students will undergo rigorous training and onboarding mentored directly by a highly-skilled postdoctoral researcher. Dr. Truman has trained over 20 undergraduate students all whom have achieved their desired career goals that range from medical school to PhD programs. Group Meeting (run by Dr. Truman) and possibly at external chaperone conferences.

Mentoring plan: Although the student will be directly mentored by a highly skilled postdoctoral researcher, Dr. Truman will be available to discuss their project and provide additional guidance at any time. Students are expected to present their finding at a range of venues include Truman lab meetings, the Charlotte Proteostasis Group Meetings and possibly external conferences. My group

is one of the most highly funded in the university and we have 12 group members to ensure a diverse and exciting research environment

Applicant Requirements: Students should be able to commit to the hours required by the OUR position. Background experience with molecular biology techniques is a bonus.

Applicant Preferences: Background experience with molecular biology techniques is a bonus.

Specific Time considerations/conflicts: Students are required to attend weekly Truman lab meetings (TBD)

App ID #: 1177

Mentor: Truman, Andrew Email: atruman1@uncc.edu

Title: Professor

Department: Biological Sciences

Co-mentor: No

Community engaged research: No

Title: Elucidating the interplay between Hsp70 phosphorylation and TORC1 signaling in yeast

Description: The yeast Target of Rapamycin (TOR) pathway, involving TORC1 and TORC2 complexes, regulates cell growth and metabolism in response to nutrient availability. TORC1 controls protein synthesis, autophagy, and stress responses, while TORC2 regulates actin cytoskeleton organization and cell survival, crucial for cellular adaptation and homeostasis. The Hsp70 molecular chaperone binds and folds many proteins involved in signal transduction. In this study, we set out to understand the role of yeast Hsp70 phosphorylation and TOR signaling. We screened 146 yeast strains expressing mutations in Hsp70 phosphorylation sites (73 phospho-mutants and 73 phospho-mimics) for sensitivity to the well-characterized TORC1 inhibitor Rapamycin. Our phenotypic screen identified 7 phosphorylation sites crucial for the cellular response to Rapamycin. Notably, three of these sites are located in the client-binding domain, suggesting a role in regulating client interactions. Undergraduate students will work with an experienced PhD student to determine how Hsp70 regulates the TOR pathway. In particular students will be trained in mass spectrometry, western blotting, gene editing techniques and protein expression technologies.

Accepting applications for: Only Full time 40 hours per week will be considered

4 positions available

Anticipated Student Learning Outcomes: Undergraduate students will work with an experienced PhD student to determine how Hsp70 regulates the TOR pathway. In particular students will be trained in mass spectrometry, western blotting, gene editing techniques and protein expression technologies. Students will have the opportunity to present their findings at Truman lab meetings, the Proteostasis Group Meeting (run by Dr. Truman) and possibly at external chaperone conferences.

Required training of 1 hours with Description: Students will undergo rigorous training and onboarding mentored directly by a highly-skilled PhD researcher. Dr. Truman has trained over 20 undergraduate students all whom have achieved their desired career goals that range from medical school to PhD programs. Group Meeting (run by Dr. Truman) and possibly at external chaperone conferences.

Mentoring plan: Although the student will be directly mentored by a highly skilled postdoctoral researcher, Dr. Truman will be available to discuss their project and provide additional guidance at any time. Students are expected to present their finding at a range of venues include Truman lab meetings, the Charlotte Proteostasis Group Meetings and possibly external conferences. My group

is one of the most highly funded in the university and we have 12 group members to ensure a diverse and exciting research environment.

Applicant Requirements: Students should be able to commit to the hours required by the OUR position and be majoring in biology.

Applicant Preferences: Background experience with molecular biology techniques is a bonus.

Specific Time considerations/conflicts: Students are required to attend weekly Truman lab meetings (TBD)

App ID #: 1253

Mentor: Vivero-Escoto, Juan Email: jviveroe@charlotte.edu

Title: Professor

Department: Chemistry

Co-mentor: No

Community engaged research: No

Title: Light-activated nanoparticles for the elimination of bacterial biofilms

Description: The World Health Organization has declared that antibiotic resistance bacteria (ARB) is one of the top 10 global public health threats facing humanity. The use, and in some situations misuse, of antibiotics, combined with the scarcity of new therapeutics entering the antibiotic pipeline, further exacerbates this public health threat. Some bacteria's ability to form communities in a polymeric matrix, also known as biofilms, is one of the many mechanisms of resistance adopted by bacteria to evade antibiotics. Biofilm disruption via physical or chemical methods in combination with antimicrobial agents is the current strategy to treat such biofilms; however, suboptimal outcomes have been obtained when ARB is part of the biofilm. Therefore, effective methods for biofilm removal and complete elimination of ARB are urgently needed to avoid recolonization and continues infection. Nanotechnology can play a major role in overcoming some of the main issues associated with the removal of biofilms and the elimination of ARB. In this project, we will design light-activated nanoparticles to improve the removal of biofilms and killing of ARB. Our central hypothesis is that silver nanoparticles (AgNPs) functionalized with organic molecules (photosensitizers, PSs) activable by sequential light irradiation will eliminate biofilms by a) disrupting the biofilm and facilitating accumulation of nanoparticles; and b) inactivating the embedded bacteria via increased silver ions action.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: The participation of the undergraduate student on this project will be focused on the synthesis and characterization of photosensitizer molecules and silver nanoparticles.

The undergraduate student will learn the synthesis and characterization of these molecules and nanoparticles using a variety of analytical techniques such as mass spectrometry (ESI-MS), nuclear magnetic resonance (NMR), Infrared spectroscopy (FT-IR), dynamic light scattering (DLS), and UV-vis/Fluorescence spectroscopy. Moreover, the student(s) will also develop skills to characterize the photophysical properties of those compounds using absorbance and fluorescence spectroscopy. Finally, the student will be helping a graduate student in testing the properties of nanoparticles in biofilms.

The undergraduate student will learn to read the literature associated with the topic, will present her/his/their research during group meetings and will write an abstract and report at the end of summer.

The undergraduate student will participate in the Undergraduate research symposium, and (if possible) in regional conferences like NCPhotochem and SERMACS.

Required training of 3 hours with Description: The undergraduate student will receive safety training by the Chemistry Department.

The undergraduate student will receive training on the characterization techniques (ESI-MS, NMR, FT-IR, DLS, and UV-vis/Fluorescence spectroscopy) according to his/her/their progress in the research project.

Mentoring plan: Dr. Vivero-Escoto will have biweekly individual meetings with the undergraduate student. These meetings will alternate with subgroup and group meetings during the summer.

Dr. Vivero-Escoto will mentor and supervise the undergraduate student on writing (abstract, partial and final reports), oral communication (group meeting presentations) and poster presentations.

Dr. Vivero-Escoto will participate in any activity related to the OUR program during summer.

Dr. Vivero-Escoto will keep a continues communication with the OUR Summer Research Scholar Program Director.

Dr. Vivero-Escoto will be the main mentor of the undergraduate student, but most likely a graduate student will also be part of the summer research experience. The graduate student will be involved in the training of characterization techniques.

Applicant Requirements: The undergraduate student working in this project needs to have completed CHEM 2131 with a grade of B or above.

Applicant Preferences: Experience in the synthesis and characterization of organic molecules is preferred.

Specific Time considerations/conflicts: Group meetings are usually scheduled on Monday or Wednesday 1-3pm.

Individual meetings are scheduled based on students' availability.

The research in this project is hands-on; therefore, the student is expected to spend at least 75% of the time in the laboratory.

App ID #: 1228

Mentor: Wakeman, Shawnee Email: slwakema@charlotte.edu

Title: Clinical Professor

Department: SPCD

Co-mentor: Yes

Holly Johnson, hjohns76@charlotte.edu, SPCD

Community engaged research: No

Title: Project get OTR

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.

To support educational professionals in efficiently and effectively capturing accurate measures of their delivery rates of OTR, this project (Project get OTR). The goal of this summer project is part of 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 undergraduates 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 establishing reliability are established. Weekly meetings will occur with faculty. Students familiar with instruction and teacher delivery are preferred.

Accepting applications for: Only part time (20 hours per week) will be considered

2 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 summer 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 have an eye for 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: education student- major or minor in a teacher licensure program

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

App ID #: 1202

Mentor: Walter, Michael Email: Michael.Walter@charlotte.edu

Title: Professor

Department: Chemistry

Co-mentor: No

Community engaged research: Yes

Title: Photochromic Thiazolothiazole Films for Smart Window, Sensing, and Energy Applications

Description: Color-changing materials have gained much interest for applications like smart windows, displays, chemical sensors, smart packaging, energy storage, and information storage. We have developed an inexpensive hydrogel system which is electrochromic, electrofluorochromic, and photochromic, by implementing poly(vinyl alcohol)/borax polyelectrolyte and dipyridinium thiazolothiazoles. Students involved in the development of these materials will learn about synthetic organic chemistry techniques, device engineering, and electrochemistry. They will also be trained in photochemical characterization techniques to help further develop these materials performance and application.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students involved in the development of these materials will learn about synthetic organic chemistry techniques, device engineering, and electrochemistry. They will also be trained in photochemical characterization techniques to help further develop these materials performance and application.

Required training of 2 hours with Description: General chemistry lab safety training, and safety training specific for the Walter Research Group.

Mentoring plan: Students can expect to regularly interact with graduate and undergraduate researchers, and postdocs through laboratory work and weekly research meetings with Dr. Walter. Students will learn how to effectively communicate their science to the team, work collaboratively to solve chemistry and materials engineering challenges, and eventually, help lead projects and establish new research directions.

Applicant Requirements: - Self-starter, motivated to learn new hands-on laboratory techniques and instrumentation

- Interest in interdisciplinary research (chemistry, engineering, materials, energy)

- Works well on a team of undergraduate and graduate student researchers

Applicant Preferences: Minimum Qualifications: 1 yr. general chemistry and lab, some organic chemistry training

Specific Time considerations/conflicts: Research Group Meetings

App ID #: 1203

Mentor: Walter, Michael Email: Michael.Walter@charlotte.edu

Title: Professor

Department: Chemistry

Co-mentor: No

Community engaged research: No

Title: Fluorescent Biological Sensors for Imaging and Cell Membrane Voltage Sensing

Description: The long-term goal of this project is to understand how highly fluorescent thiazolothiazole molecular sensors are impacted by changing electric fields in cellular membranes. Tracking these changes offers the potential to gain a deep understanding of complex and rapidly changing cellular physiology. Fluorescent, small molecule voltage sensitive dyes (VSDs) have greatly impacted this field, however, there is still a great need to develop new dyes with enhanced long wavelength emission for imaging in thick tissues, improved photostability for long-term imaging, and improved cell membrane voltage sensitivity. In this project, we propose the continued exploration of unique and highly fluorescent thiazolo[5,4-d]thiazole molecular fluorophores. TTz dyes are the next generation of imaging tools because they exhibit high photochemical stability, are easy to prepare/modify, show fast response times, good cell membrane localization, negligible cytotoxicity, and are sensitive to cellular membrane potential. We recently developed a highly improved method to synthetically access asymmetric TTz dyes for cell membrane applications. In addition, we are leveraging new insights into the sensing mechanism of the TTz dyes to design molecular probes with even greater cell membrane potential sensitivity. We will conduct spectroscopic and electrochemical characterizations to understand the role of molecular structure on the cell membrane localization and voltage sensing. We will evaluate the cell membrane voltage sensing performance of the dyes, which will provide important feedback for further tuning of their photophysical properties.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: Students involved in the development of these materials will learn about synthetic organic chemistry techniques, molecular cell biology, and fluorescent biological imaging (microscopy). They will also be trained in photochemical characterization techniques such as fluorescence lifetimes and quantum yields.

Required training of 2 hours with Description: General chemistry lab safety training, and safety training specific for the Walter Research Group (this includes the use of various spectrometers and equipment that utilizes LED light for photochemical processing).

Mentoring plan: Students can expect to regularly interact with graduate and undergraduate researchers, and postdocs through laboratory work and weekly research meetings with Dr. Walter. Students will learn how to effectively communicate their science to the team, work collaboratively

to solve chemistry and biological imaging challenges, and eventually, help lead projects and establish new research directions.

Applicant Requirements: - Self-starter, motivated to learn new hands-on laboratory techniques and instrumentation

- Interest in interdisciplinary research (chemistry, biological materials, sensing applications, microscopy)

- Works well on a team of undergraduate and graduate student researchers

Applicant Preferences: Minimum Qualifications: 1 yr. general chemistry and lab, some organic chemistry training

Specific Time considerations/conflicts: Research Group Meetings

App ID #: 1227

Mentor: Wang, Jun Email: jwang81@charlotte.edu

Title: Professor

Department: Bioinformatics and Genomics

Co-mentor: No

Community engaged research: No

Title: Development of Biosensors for early detection of diseases and early screening of exposure to pesticides

Description: We are developing nanotechnology-based biosensors for early detection of kidney diseases and fast screening of human exposure to pesticides. These are two of important problems worldwide. We develop functional nanomaterials and use these these nanomaterials as sensing materials for detection of biomarkers of the disease and exposure. We also develop mobile health technology involving smartphone and developing mobile app for those biosensors.

the students who choose to join my group will involve the synthesis of nanomaterials, fabrication sensor devices, optimization of experiments parameters and conditions for the biosensors, and evaluate the analytical performance of biosensors. the student will work in the wetlab daily in person. They will be required to report to me once a week on the progress they made and discuss the research problems they have.

Accepting applications for: Only Full time 40 hours per week will be considered

2 positions available

Anticipated Student Learning Outcomes: Students will learn how to apply his learnt knowledge to answering research questions and solving research problems. they will also learn some analytical skills and gain experience and capability on how to conduct a research project.

Required training of 2 hours with Description: lab safety training and biosafety training

Mentoring plan: I will closely work with student and have at least one meeting a week with the student to discuss the project he conducted and provide advices for the student. Moreover, the student will work with a postdoctoral researcher or a PhD student daily and get their help. in addition, the student will present his work on group meeting weekly

Applicant Requirements: applicants have wet-lab skills, majored in chemistry, biology, or bioengineering. interested in nanotechnology and biosensor development. self-motivated, have fun with wet-lab research.

Applicant Preferences: Seniors are preferred. having courses including analytical chemistry, organic chemistry, biochemistry, biology will be helpful to quickly fit for research environment

Specific Time considerations/conflicts: the Students must attend 1 h weekly group meeting generally happens on Friday.

App ID #: 1182

Mentor: White III, Richard Allen Email: rwhit101@charlotte.edu

Title: Assistant Professor

Department: Bioinformatics and Genomics

Co-mentor: No

Community engaged research: No

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: Either full time or part time will be considered

5 positions available

Anticipated Student Learning Outcomes: 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: 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.

Applicant Requirements: None

Applicant Preferences: Coding, phylogenetics, evolution background is helpful

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

App ID #: 1183

Mentor: White III, Richard Allen Email: rwhit101@charlotte.edu

Title: Assistant Professor

Department: Bioinformatics and Genomics

Co-mentor: No

Community engaged research: No

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: Either full time or part time will be considered

5 positions available

Anticipated Student Learning Outcomes: Bioinformatics relating to immunology and virology

Required training of 0 hours with Description: This would be the dry lab part of the project. No active research with wet-lab or viewing bats in the field. This is for computational design of antibodies, phylogenetics, and primer design only.

Mentoring plan: 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.

Applicant Requirements: None. No skills required - we will train you. But, biological background is helpful.

Applicant Preferences: biological background preferred

python, R, rust, unix, machine learning very helpful.

Specific Time considerations/conflicts: Monday lab meetings and every other week journal club are required unless during class time.

App ID #: 1184

Mentor: White III, Richard Allen Email: rwhit101@charlotte.edu

Title: Assistant Professor

Department: Bioinformatics and Genomics

Co-mentor: No

Community engaged research: No

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: Either full time or part time will be considered

5 positions available

Anticipated Student Learning Outcomes: Want a career in synthetic biology or engineering? Interested in designing approaches for vaccines and detection of viruses. Skills learned include molecular biology, synthetic biology techniques, and engineering of complex microbiomes.

The 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.

We will work with you to learn strengths and interests to find the best fit for your role on the project. 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 microbes

Required training of 2 hours with Description: Coding, machine and deep learning

Wet-lab would require 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.

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.

Applicant Requirements: Requirements: honesty, curiosity, on-time, and enthusiasm. Student must be able and willing to communicate.

Applicant Preferences: Biological background is helpful. Culturing microbes and PCR helpful

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

App ID #: 1185

Mentor: White III, Richard Allen Email: rwhit101@charlotte.edu

Title: Assistant Professor

Department: Bioinformatics and Genomics

Co-mentor: No

Community engaged research: No

Title: Astrovirology - discovery of viruses within modern microbialite

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: Either full time or part time will be considered

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 4 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.

Applicant Requirements: Requirements: honesty, curiosity, on-time, and enthusiasm. Able to communicate.

Applicant Preferences: Biological background is helpful

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

App ID #: 1214

Mentor: Williams Colonnese, Madelyn Email: mcolonn1@uncc.edu

Title: Associate Professor

Department: Reading and Elementary Education

Co-mentor: No

Community engaged research: No

Title: Mathematical Writing Instructional Support

Description: The role of the OUR scholar during this project is to support the pre-assessment and post-assessment of mathematical writing instruction for elementary students in first through fifth grade at a local elementary school. The pre and post assessment would include working with students to assess the characteristics of mathematical writing and understanding of fact fluency. The student scholar would then score all of the assessments, identify trends and patterns in the data, and organize the data. The OUR scholar would also be expected to pursue their own research project during this time related to mathematical writing/mathematics instruction. The OUR scholar would work closely with the mentor throughout the program.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: The expected benefits for students would be an opportunity to contribute original research to the mathematics teaching community, develop teaching skills by analyzing an aspect of mathematics instruction closely, understand how to pre- and post-assess students, utilize rubrics to score student work, and develop an understanding as to how to notice patterns across student data. This opportunity would provide students will additional experiences to develop their skills in education and provide them an opportunity to engage in research about education.

Required training of 10 hours with Description: The students will need to complete CITI training, training on how to assess students and score student work, and deepen their understanding of mathematical writing as an instructional practice.

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

Applicant Requirements: Characteristics:

Curious to learn more about collecting and analyzing data

Some prior experience working with elementary students

Some prior experience looking at and analyzing student work

Applicant Preferences: In addition to the aspects listed in requirements I am also looking for students who are able to take initiative and interested in pursuing their own area of research.

Specific Time considerations/conflicts: Tentatively June 25 - 27 and July 16 - 18

App ID #: 1245

Mentor: Zhang, Ran Email: rzhang8@charlotte.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Visualizable Realistic Simulation for Multi-Drone Missions with Gazebo and Fly4Future Flight Controller

Description: Most of the existing simulations to demonstrate multi-drone coordinated missions are Matlab or Python based. Such simulations mostly generate performance figures and simple illustrations of the decision procedure. A vivid realistic demonstration of how the drones are moved and how the target objects are identified in the drones' view is lacking. In other words, the decision procedure is not well visualized. To obtain real-time visualized decision making procedure for multi-drone missions, this project aims to leverage on Gazebo to create realistic environments, the embedded flight controller developed Fly4future company to control the movements of the drones, and Ritz to demonstrate real-time visualizable observations from the drone sensors (e.g., camera, 3D lidar and UVDAR). The outcomes are expected to provide a simulator to help algorithm designers visualize the algorithm execution such that more insights can be obtained for further improvement.

Accepting applications for: Either full time or part time will be considered

2 positions available

Anticipated Student Learning Outcomes: 1. Learn how to use Gazebo, Fly4future flight controller and Ritz to visualize drone-related simulations

2. Learn how to integrate different apps into Gazebo for robotic control

3. Learn to design multi-drone control strategies to optimize target performance

Required training of 10 hours with Description: Training: joint operation of Gazebo, Fly4future fight controller and Ritz. Fly4future will provide at least 3 workshops to demonstrate how.

Mentoring plan: 1. Meet with the student once or twice a week to discuss progress and future plan

2. Provide professional workshop opportunities to train the student

3. Help the student explore how to design multi-drone coordination algorithms to optimize the target performance

Applicant Requirements: 1. Excel in Python programming

2. Good experiences in distributed algorithm design

3. Has relevant development and research experiences in drones

Applicant Preferences: 1. Excel in Python programming

2. Good experiences in distributed algorithm design

3. Has relevant development and research experiences in drones

Specific Time considerations/conflicts: N/A

App ID #: 1246

Mentor: Zhang, Ran Email: rzhang8@charlotte.edu

Title: Assistant Professor

Department: Electrical and Computer Engineering

Co-mentor: No

Community engaged research: No

Title: Learning-based Joint Task and Charging scheduling for Airship-Pivoted Wirelessly Charged UAV networks

Description: Wireless charging for UAV networks receives increasing attention as it minimizes human intervention and significantly prolongs the drone life time and operation radius. However, existing charging methods either suffers from safety and efficiency issues (laser charging) or requires the drones to temporaliy leave the network for charging (wireless pad charging). In this project, we propose a new paradigm for wirelessly charging drones: using airship as the airborne charging tank, providing in-air wireless charging to flying drones. The airship can carry large-weight batteries using its own buoyancy without consuming energy, and charge the drones near the mission scene, just like the on-water aircraft carrier. This project aims to verify the feasibility of the approach and develop joint task scheduling and wireless charging for the airship-pivoted drone network.

Accepting applications for: Either full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes: 1. Develop good knowledge of the technical parameters of airship, drone power consumption and wireless charging.

2. Gain experiences of joint optimization of multiple objectives.

3. Grasp design methods of learning-based controls.

Required training of 20 hours with Description: 1. Literature survey and information fusion skills

2. Classical algorithms for reinforcement learning.

Mentoring plan: 1. Meet with the student once or twice a week to discuss the progress and next-step plan.

2. Expediate the student training by providing and explaining preliminary codes for learning-based strategy design

3. Training on academic paper planning and writing

Applicant Requirements: 1. Very good Python programming skills

2. Relevant develop and research experiences with drones

Applicant Preferences: 1. ECE students

2. With development or project experiences on reinforcement learning

Specific Time considerations/conflicts: N/A

App ID #: 1267

Mentor: Zhou, You Email: yzhou33@charlotte.edu

Title: Assistant professor

Department: Department of Physics and Optical Science

Co-mentor: No

Community engaged research: No

Title: Optical Accelerator for Imaging Processing

Description: Recent progress in machine vision has enabled wide-ranging applications, including self-driving cars, industrial automation, and medical imaging. Current image processing technologies rely predominantly on electronic architecture. As model complexity and data volume grow, digital computing faces challenges related to processing speed and energy efficiency. The computational bottleneck is particularly critical in autonomous driving, augmented reality and virtual reality, where massive amounts of image data need to be processed in real time. Therefore, it is essential to develop new computing platforms that can process data rapidly with minimum energy consumption.

To address these limitations, we aim to develop optical computing, leveraging the unique properties of photons for parallel, low-power, and ultra-fast image processing. We will develop an optical computing platform to accelerate image processing, thereby improving the efficiency and throughput in modern machine vision tasks

Accepting applications for: Either full time or part time will be considered

1 positions available

Anticipated Student Learning Outcomes: The proposed research will provide a wide range of training and educational opportunities for students. These opportunities will involve training in interdisciplinary techniques, including semiconductor nanofabrication, metrology, and algorithm-driven optimization. Additionally, students will develop an awareness of current challenges and future research directions in nanotechnology and microelectronics. They will also gain practical experience by presenting their research findings at scientific meetings, such as the Summer Research Symposium. By the end of the program, students will acquire a competitive edge for pursuing advanced degrees and careers in STEM.

Required training of 5 hours with Description: The student will start with training on safety policies and protocols specific to the academic research environment, including lab safety, ethical research conduct, and equipment handling practices. Afterwards, the student will receive hands-on nanofabrication training in the cleanroom. This environment simulates the conditions used in electronic chip fabrication. The student will be trained on various nanofabrication tools, such as electron beam lithography, reactive ion etching, and thin-film deposition. Due to the interdisciplinary nature of the project, the student will also gain experience in modeling and machine learning.

Mentoring plan: With the first week of the program, I will schedule an orientation with the student to discuss the project. Together, we will outline the student's short- and long-term goals and identify the skills needed to achieve them. Throughout the program, the student will work closely with a graduate student and a postdoc. I will meet weekly with the student to discuss their progress and address any challenges they encounter. These meetings will include one hour per week dedicated to research discussions, supplemented by additional hours of informal interactions. The students are encouraged to present their progress at group meetings but not required.

Applicant Requirements: Basic programming skills; Experimental physics experience; Foundational understanding of basic physics; Willing to take initiative;

Applicant Preferences: Motivated to pursue advanced study in STEM; Perseveres through challenges; Self-motivated; Have taken optics and photonics related courses; Experience with optical instrumentation

Specific Time considerations/conflicts: Individual meetings