List of Faculty CRS Projects for 2020

Abstracts are grouped by department name.

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Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Phil Freelon: Interpreting, Celebrating, and Building Identities

Mentor Name: Dr. Emily Makas

Mentor Department: School of Architecture

Mentor College: College of Arts and Architecture

Mentor Status: Associate Professor

Project Description: A summer scholar would assist with the construction of architectural models in Summer 2020 as part of a larger project exploring the architecture of Phil Freelon. Though widely publicized, surprisingly little scholarly attention has been paid to most of Freelon’s work exploring African-American heritage and identities, with the exception of the Smithsonian National Museum of the African-American History and Culture.

This project examines that high-profile museum within the context of Freelon’s eleven other African-American-focused projects, including museums, cultural centers, and memorial parks across the United States. The research will culminate in a Fall 2020 exhibition exploring the relationship between the container and the contained, that is, connections between the forms, materials, and meanings of Freelon’s architecture and the histories and cultures exhibited within those buildings.

For the exhibition, we will supplement drawings, videos, and models borrowed from Freelon’s firm with large-scale sectional models that we produce to explore two or three of Freelon’s multi-layered façade systems, which combine formal symbolism of African and African-American culture and history with contemporary architectural design. Though primarily meant as representations of existing built work to convey information to the SoA and wider community, through the close examination and building of well-crafted, detail models of these facades, the research team will gain a deeper understanding of how they work both as architecture and as signs as well as the way they combine traditional and computational design methods.

Minimum Qualifications: Advanced architectural student with fabrication lab and model building experience.
Summer Program: The Charlotte Research Scholars

Project Title: Class Learning Unit & Class Work Group Research Findings Presentation as Interactive Learning Strategies in LBST 2301 Curriculum Development and Enactment.

Mentor Name: Dr. Honoré Missihoun

Mentor Department: Africana Studies

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Research Scholar and Lecturer

Project Description: As LBST 2102, 2201 and 2301 instructor for nine years, I have coached and mentored preceptors and communication consultants, who, from their shaky academic ground at the inception of our cooperation, have gained self-esteem and self-confidence through the challenge of preceptorship and consultancy under my advisory. Not only have they learnt to articulate their thought by interacting with their peers' work in critical thinking supported by my frequent low stakes feedback, they have also improved oral and written communication as results of our collective and interactive approach to teaching and learning in student-centered classroom environment.

I have exponentially improved Student Learning Outcomes in my LBST 2301, AFRS 3692 (W) Colloquium Writing Intensive, and other classes I teach now implementing the teaching skills I enhanced with LBST 2301 and W/O workshops offered by Summer Academy of 2018 and 2019. I have come out with Class Learning Unit (CLU) and Class Work Group Research Findings Presentation (CWGRFP), which gets students, CC, and myself engaged in collective brainstorms on texts we research, study in various groups before class, and which we debate live in class from different theoretical perspectives.

Coaching Research Scholars, I will capitalize on my CLU and CWGRFP experiences. Together with the scholars, we will refine the curricular and pedagogical objectives of CLU and CWGRFP and make them full-fledged interactive teaching and learning skills and strategies. In the process the Summer Scholar is an integrated and active contributor to the project with hands on task."

Minimum Qualifications: Actually, no specific skills are required to do well in my project. However, students with preceptor and communication consultant experiences, who have knowledge of Canvas navigation, will learn and work faster in the project.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Language and Racialization: Marshallese Children in a New Immigrant Destination

Mentor Name: Dr. Elise Berman

Mentor Department: Anthropology

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: I am currently analyzing ethnographic and linguistic data from research with Marshallese children in a new immigrant destination—a small southern city that was almost entirely white in the 1990s and but now the school system is only 35% white. I have several interviews with children, teachers, and lawyers as well as fieldnotes to analyze. I am working on analyzing this data for themes in how people perceive the Marshallese children, and how the Marshallese children experience life and school in this city. I am specifically analyzing perceptions of language, and how ideas about Marshallese children's language differ from how children actually speak with their peers. A summer scholar would transcribe interviews and any recordings of the children in English, using appropriate linguistic transcription techniques. A summer scholar would also code these transcripts as well as my fieldnotes for specific themes, and research issues of immigrant student experiences in schools, and what such issues tell us about processes of racialization and social change as tied to language and culture.

Minimum Qualifications: Experience finding sources and making annotated bibliographies, completion of at least one linguistics/anthropology course, anthropology, sociology, or linguistics major/minor preferred.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Nanomaterial-Based Biosensors for Environmental and Biomedical Applications

Mentor Name: Dr. Jun Wang

Mentor Department: Bioinformatics and Genetics

Mentor College: College of Computing and Informatics

Mentor Status: Research Professor

Project Description: My lab is located in the third floor in the bioinformatics building. My research focuses on developing nanomaterial-based optical and electrochemical biosensors for various applications. e.g., environmental and food quality monitoring, biomonitoring of exposure to toxic chemicals, and detection of biomarkers for early diagnosis of diseases. Moreover, we are developing the integration of biosensors with smartphone for onsite food safety analysis and point-of-care detection of exposure to toxic chemicals. The nanomaterials used in my lab include carbon nanotubes, gold nanoparticles, graphene, quantum dots, nanomagnetic beads, conducting polymer nanowires, etc. The summer scholars will contribute to my projects through conducting research experiments in my lab including, but not limited to, preparing sensing nanomaterials, functionalizing nanomaterials with bioreceptors such as DNA, antibodies, aptamers, optimizing experimental parameters and conditions, evaluate the analytical performance of a biosensors. The summer scholars will be closely worked with me and do experiments under my direction.

Minimum Qualifications: Majored in chemistry, biochemistry, biology, bioengineering, wet-lab research experience and skills, nanomaterial synthesis and functionalization, knowledge about biosensors, enzyme assay, immunoassays, experience in software development and application such as APP is a plus.
Summer Program: The Charlotte Research Scholars

Project Title: Gene Expression in Heat Tolerant Tomato

Mentor Name: Dr. Robert Reid

Mentor Department: Bioinformatics and Genomics

Mentor College: College of Computing and Informatics

Mentor Status: Assistant Professor

Project Description: Student will get an opportunity to hunt for genes responsible for imparting heat tolerance in tomato plant species. Working on an existing dataset from a number of different tomatoes, the student would learn a variety of bioinformatic and data mining strategies to discover potential genes that play a role in surviving high heat conditions.

Minimum Qualifications: Basic computer skills. Desire would be to have some command line scripting and/or programming experience but can train from scratch if need be.
Summer Program: The Charlotte Research Scholars

Project Title: Understanding the Role of Hsp70 in Amyotrophic Lateral Sclerosis (ALS)

Mentor Name: Dr. Andrew Truman

Mentor Department: Biological Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: Amyotrophic lateral sclerosis (ALS) is a degenerative disease that affects nerve cells in the brain. A major cause of disease symptoms is the buildup of the TDP-43 protein. Recent studies have implicated the Hsp70 molecular chaperone as a possible regulator of TDP-43. For this project, students will undertake independent research using directed evolution of the Hsp70 protein to cure cells of TDP-43 toxicity. Students will have the opportunity to use a variety of state of the art techniques (CRISPR and mass spectrometry), as well as using bacterial, yeast and cancer cell systems.

Minimum Qualifications: Students should have taken Genetics BIOL 3166.
Summer Program: The Charlotte Research Scholars

Project Title: Understanding Hsp70 Dimerization in Breast Cancer

Mentor Name: Dr. Andrew Truman

Mentor Department: Biological Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: Hsp70 is a universally conserved molecular chaperone that is required for folding of unstable proteins in cancer cells. Recent studies have suggested that Hsp70 may self-associate (dimerize), although the function of Hsp70 dimerization is not clear. For this project, we will analyze the role of Hsp70 dimerization in breast cancer. Our hope is that we can create new anticancer drugs based on inhibiting Hsp70 dimerization. The student will conduct independent research using a variety of state of the art techniques including CRISPR and mass spectrometry, as well as using bacterial, yeast and cancer cell systems.

Minimum Qualifications: Students should have taken Genetics BIOL 3166.
Summer Program: The Charlotte Research Scholars
Project Title: Symbiosis and Environmental Stress
Mentor Name: Dr. Adam Reitzel
Mentor Department: Biological Sciences
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Associate Professor

Project Description: Cooperation between organisms forms the basis for symbioses for many species on Earth. Corals and other marine invertebrates rely on symbiotic associations with algae for their growth and survival. However, the stability of these symbioses is negatively impacted by climate change resulting in "bleached" corals, which can result in collapse of coastal ecosystems. This summer research experience will provide the opportunity for a student to research questions related to how and why a marine animal host forms stable symbioses with multiple partners. The student researcher will perform laboratory and field experiments to measure the stability of symbioses in different environmental conditions. Over the summer, the student will learn and apply microscopy and gene expression techniques to understand how the symbiotic interaction changes.

Minimum Qualifications: A curiosity about biology and motivation to dive into research.
Summer Program: The Charlotte Research Scholars

Project Title: Molecular Mechanisms of Genome Stability

Mentor Name: Dr. Shan Yan

Mentor Department: Biological Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: Cells of all organisms are challenged constantly by environmental agents or spontaneous DNA decay during normal metabolism. The reactive oxygen species (ROS)-induced oxidative stress is one of the most frequent sources of DNA damage, generating approximately 10,000 oxidative DNA damage per cell per day. If left unrepaired in a timely fashion, oxidative DNA damage may compromise DNA replication and transcription programs or may be converted into potentially lethal DNA double-strand breaks (DSBs), therefore representing a serious challenge to genomic integrity. In response to oxidative DNA damage, the base excision repair (BER) pathway is activated to repair the damage, thereby maintaining genome stability (Yan, et al., 2014, Cell Mol Life Sci, 71 (20): 3951-3967, 2014). However, it remains less understood how the oxidative DNA damage is sensed and signaled for checkpoint response. AP Endonucleases including APE1 and APE2 are critical enzymes implicated in the BER pathway. Recently, graduate student Jeremy Willis and undergraduate honors students Yagin Patel and Barry Lentz from the Yan lab have demonstrated that APE2 is required for the ATR-Chk1 checkpoint signaling (Willis, et al., 2013, PNAS, 110:10592-10597, 2013). We further demonstrated that APE2 ZF-GRF domain associates with ssDNA to promote the 3'-5' end resection of oxidative DNA damage for checkpoint signaling (Wallace et al., 2017, PNAS, 114 (2): 304-309). With the ongoing projects, we plan to further investigate the molecular mechanisms of how DNA damage response is regulated in oxidative stress. We will also investigate how oxidative stress-induced genome stability leads to cancer development. The anticipated findings from this research project will help to provide new avenues for novel therapeutic strategies. Achievements of prior undergraduate students working in the Yan lab include the prestigious Barry Goldwater Scholarship and ANSWER Scholarship in 2017, and acceptance to the MD/PhD program at Duke University. More information can be found from the lab website @ https://clas-pages.uncc.edu/shan-yan/.

Minimum Qualifications: Biol 2130 (or equivalent course) C or above. Laboratory skills such as SDS-PAGE, immunoblotting analysis, recombinant protein expression and purification are preferred but not required.
Summer Program: The Charlotte Research Scholars

Project Title: Adaptations to Life in the Estuary: Tide-Associated Rhythms

Mentor Name: Dr. Paola Lopez-Duarte
Mentor Department: Biological Sciences
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Assistant Professor

Project Description: In estuaries, environmental conditions change constantly over the tidal cycle. Fish and invertebrate species that live in estuaries have adapted to these daily fluctuations, which include changes in salinity and temperature. One of these adaptations is an internal, tidal timekeeper (circatidal clock) that is used to track the tidal cycle and prepare for changing conditions. The overall goal of this project is to understand the mechanisms that underlie circatidal clocks. We use a particularly charismatic group of crustaceans in the Ocypodidae family commonly known as fiddler crabs, as a model system. In coastal marshes, fiddler crabs play important roles as ecosystem engineers and as bioindicators of estuarine health in tropical, subtropical, and temperate regions around the world.

Students working on this project will have the opportunity to do field work in coastal marshes, maintain crab adults and larvae in the laboratory, observe and track animal behaviors, learn molecular techniques to measure the expression of clock genes, and work with computational tools to evaluate different types of data.

Minimum Qualifications: Students who have completed Ecology/Field Ecology and Cell Biology courses are encouraged to apply. Knowledge of aquarium care, microscope use, and image analysis software is desired. Training on different field and laboratory protocols, use of instruments, and image analysis software will be provided in the first weeks of the program.
Summer Program: The Charlotte Research Scholars

Project Title: Understanding the Yeast Endomembrane System

Mentor Name: Dr. Richard Chi

Mentor Department: Biological Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: The endosomal system is a highly dynamic and interconnected network of organelles that serves as the focal point for the internalization of cargo at the plasma membrane (Elkin, Lakoduk, & Schmid, 2016). It receives proteins and lipids in the form of small vesicles via the endocytic pathway and these vesicles can undergo homotypic fusion to generate the endosome. The endosome matures by gradually acidifying the fluid within the endosomal lumen, which promotes the dissociation of internalized ligands such as nutrients from their receptors, and promotes molecular sorting reactions that either serve to target molecules into the lysosomal degradation pathway, or export proteins from the endosome and deliver them to other organelles for re-use. Defects in receptor-mediated endocytosis and endosome sorting results in loss of cellular homeostasis and can lead to a multitude of human diseases such as Alzheimer’s, Parkinson’s, cardiovascular disease and cancer (Huotari & Helenius, 2011; Schreij, Fon, & McPherson, 2016). Therefore, understanding the basic mechanisms of the endomembrane system is vital to the future treatments of many human diseases. Studies in cultured mammalian cells have provided a description of the temporal and morphological features of the endocytic pathway, but studies in budding yeast, Saccharomyces cerevisiae, have led the way for identifying components of the endomembrane trafficking machinery and analysis of the mechanisms of their functions (Chi, Harrison, & Burd, 2015). My lab is currently studying a newly identified protein involved in membrane trafficking and autophagy. This summer student researcher will conduct experiments to reveal its precise molecular mechanism(s) of action.

Minimum Qualifications: BIO3111.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Using Oncolytic Viruses to Treat Cancer

Mentor Name: Dr. Valery Grdzelishvili

Mentor Department: Biological Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: Pancreatic cancers, about 95% of which are pancreatic ductal adenocarcinomas (PDAC), have the worst prognosis of all cancers and will soon be the second leading cause of cancer-related deaths in the United States. Current treatment regimens clearly fail to benefit patient survival. Oncolytic virotherapy is a relatively new anticancer approach that utilizes replication-competent viruses to specifically infect and kill tumor cells. Our studies focus on vesicular stomatitis virus (VSV) as a treatment for PDAC. VSV is a promising OV, and several phase I clinical trial using VSV against different cancers are in progress. Our recent studies demonstrated that VSV is effective against the majority of clinically relevant PDAC cell lines tested, both in vitro and in vivo; however, some PDAC cell lines were resistant to virus-mediated oncolysis. These results suggest a need for better “armed” OVs to enhance OV efficacy. Our preliminary studies generated several novel recombinant VSVs expressing human genes, which have anti-tumor and pro-apoptotic properties. The proposed experiments will test these novel viruses against a panel of human PDAC cells in vitro. The student will use several cell biology, molecular biology and virology assays to examine abilities of viruses to infect, replicate in, express foreign, and kill cancer cells. We hypothesize that these new viruses will have a significantly increased anticancer efficacies compared to the parental VSV strain. Summer Scholars will directly participate in this project by conducting and analyzing experiments using well-established protocols in Virology, Cell Biology and Cancer Biology. Summer Scholars will be trained and closely supervised by Dr. Grdzelishvili, interact and collaborate with other lab members, and participate in the writing research papers based on the obtained research data.

Minimum Qualifications: General knowledge of laboratory techniques, equipment and terminology. Basic knowledge of Virology and previous lab experience working with viruses is strongly preferred.
Summer Program: The Charlotte Research Scholars

Project Title: Inflammation and Breast Cancer Progression

Mentor Name: Dr. Didier Dreau

Mentor Department: Biological Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: Breast cancer is a multi-factorial deadly disease and the role of local inflammation in cancer progression is being recognized. The proposed project will investigate aspect of local inflammation and the role of specific molecules and cells involved. Specifically, the Summer student(s) will learn about experimental design and develop hands-on experiments using cell and molecular techniques. Students will contribute to the generation of new research data furthering our understanding of breast cancer and of new potential therapeutic approach to prevent breast cancer progression.

Minimum Qualifications: Ideally, student(s) will have completed courses including general biology courses. Students with interests in cell biology, immunology, oncology would be well suited for the position.
Summer Program: The Charlotte Research Scholars

Project Title: Complex Glycan Biosynthesis in Bacterial Pathogens

Mentor Name: Dr. Jerry Troutman

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: Bacterial surface polysaccharides play central roles in a wide range of biology, and could serve as targets for novel anti-microbial agents, pathogen sensors, vaccine antigens or other important therapeutics. All of these applications require robust methods to produce these materials that can be easily adapted from one type of polysaccharide to another. One important way to go about doing this is to exploit the natural pathways that are associated with the formation of these materials to build them either enzymatically or engineer a living system to do it. Both of these options require more effective tools for the analysis of bacterial polysaccharide biosynthesis and a better understanding of these natural pathways than is currently available. The Troutman research group focuses on the development of new methods and tools for the production and analysis of complex polysaccharide biosynthesis in vitro and in cells. In the long-term the tools generated will provide new platforms for the development of both glycan-based and glycan-targeting therapeutics designed to combat the emerging threat of antibiotic resistant microorganisms.

Minimum Qualifications: CHEM 1251/1252 CHEM 2131/2132.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Silver Complexes with Aromatic Bis(chalcogenone) Ligands

Mentor Name: Dr. Daniel Rabinovich

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: We have recently investigated the reactivity of silver(I) towards a variety of monodentate N-heterocyclic thione (NHT) and selone (NHSe) ligands, and we have found that such compounds exhibit strong anticancer activity. A variety of steric and electronic effects are being studied in order to develop useful structure-activity relationships, and these include the effect of the donor atom (sulfur vs. selenium) and the ring size (five- vs. six- vs. seven-membered rings). We now propose to extend this chemistry to bidentate thione and selone ligands derived from ortho-xylene. More specifically, the project involves the preparation of compounds with 1:2 or 2:3 stoichiometries, the complete characterization of which will be based on elemental analysis, multinuclear nuclear magnetic resonance (NMR) spectroscopy and, whenever possible, single-crystal X-ray diffraction. The CRS participant student will gain valuable experience in organic and inorganic syntheses and first-hand experience with the common methods used to handle air- or moisture-sensitive compounds, including glovebox and vacuum line techniques.

Minimum Qualifications: Two semesters of General Chemistry (CHEM 1251/1252), including their laboratories, are required; one semester of Organic Chemistry (CHEM 2131) and its laboratory is desirable.
2020 Summer Research Experience
Faculty Mentor Research Project Submission

Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Silicon Complexes for Organic Electronic Devices

Mentor Name: Dr. Tom Schmedake

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: The goal of this project is to synthesize silicon based materials for organic electronic devices. The summer scholar will (1) synthesize new material, (2) characterize the material using NMR, UV-vis, and fluorescence spectroscopy, and (3) incorporate the material into a functioning organic light emitting diode (OLED).

Minimum Qualifications: Student should have completed CHEM 2131 and CHEM 2131 L.
Summer Program: The Charlotte Research Scholars

Project Title: Soluble Superatoms for Redox Flow Batteries

Mentor Name: Dr. Christopher Bejger

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: The main goal of this project is to use synthetic molecular clusters comprised of Earth-abundant elements as the charge storage species in redox flow batteries (RFBs). RFBs are rechargeable systems in which electroactive molecules dissolved in a solution flow through an electrochemical cell that converts chemical energy directly into electricity. Higher energy density RFBs that use less expensive and more abundant charge storage species are needed in order to meet the Department of Energy (DOE) cost target for grid-storage. We aim to develop a RFB in which highly soluble nanometer sized molecular clusters, that we call "superatoms", act as the redox couples in both the anolyte and catholyte solutions. Superatom electrolytes may lead to more efficient RFBs at a lower cost owing to the abundance of their constituent atoms and their tunable size, solubility, and redox properties. Using literature protocols we will synthesize a library of superatoms and study their electrochemical stability. Synthetic modifications will then be made to enhance the solubility and redox potentials of superatoms deemed electrochemically stable. Finally, lab-scale RFBs will be fabricated.

Minimum Qualifications: Qualified applicants will have successfully completed General Chemistry (1251 and 1252) and Organic Chemistry (CH 2131 and CH 2132) with corresponding laboratory courses.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Hybrid Nanomaterials for Gene Delivery

Mentor Name: Dr. Juan Vivero-Escoto

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: Gene therapy currently represents a significant portion of new pharmaceuticals to alleviate a wide variety of diseases, including viral infections, cancer and autoimmune disorders. However, the gene therapeutic potential is frequently hampered by various biological barriers. In order to take full advantage of this potential, it is necessary to develop effective and safe delivery systems to carry the DNA or siRNA biomolecules. The main goal of this project is to develop novel silica-based nanoparticles (SNs) as an efficient platform for gene delivery. The participation of the undergraduate student on this project will be focused on the synthesis, functionalization and characterization of silica-based nanoparticles that will be used to deliver DNA/siRNA. A Ph.D. student in my group has developed and optimized an efficient method to synthesize SNs. The undergraduate student will learn the synthesis of silica-based materials and the structural characterization of nanoparticles using a wide variety of methods such as dynamic light scattering, thermogravimetric analysis and scanning electron microscopy. In addition, the student will carry out organic reactions to functionalize the exterior surface of SNs with different functional groups. A variety of analytical techniques will be used to characterize the organic groups such as NMR and FT-IR. Finally, the student will be involved in testing the loading and delivery of DNA/siRNA material both in solution and in vitro settings.

Minimum Qualifications: The undergraduate student working in this project needs to have completed CHEM 2131 with a grade of B or above.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Photochemistry of Thiazolothiazole Voltage Sensing Dyes

Mentor Name: Dr. Michael G. Walter

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: This project is directed towards examining the photophysical properties (absorption and fluorescence emission/excitation spectra) of several newly synthesized thiazolothiazole (TTz) dye systems. Students working on this project will model structures using a computational software package (Spartan). This project will initially focus on optimizing the geometry of the thiazolothiazole materials using molecular mechanics followed by higher-level density functional theory calculations. The student working on this project will prepare solutions of TTz molecules and examine their steady-state absorption / fluorescence spectra to elucidate the charge transfer states of the dyes. The donor-acceptor properties of the charge-separated states will be determined using pump-probe picosecond time scale transient absorption spectroscopy. Students working on this project will also be exposed to some organic synthetic chemical transformations, small molecule characterization techniques, and dye sensing properties.

Minimum Qualifications: Skills obtained from 1 yr. general chemistry, 0.5 yr. organic chemistry.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Determination of Crystal and Molecular Structures by X-ray Methods

Mentor Name: Dr. Daniel S. Jones

Mentor Department: Chemistry

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: The technique of single-crystal X-ray crystallography is used to determine the detailed molecular structure of chemical compounds. Because this is a completely general method, it can be applied to almost any compound of chemical interest which can be crystallized, and is thus an important tool in many different areas of research. The determination of a substance's structure by X-ray methods involves several steps, including 1) preparation of suitable crystals for study, 2) preliminary X-ray investigation for the determination of crystal quality and lattice type, 3) collection of high accuracy intensity data on an automated X-ray diffractometer, and 4) reduction and analysis of the data utilizing high-speed computers. The Research Scholar will be involved in all of these aspects of structure determination.

Minimum Qualifications: An introductory chemistry course; one semester of calculus; one semester of physics – all with a grade of "B" or better.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Motion Planning for Multiple Robots

Mentor Name: Dr. Srinivas Akella

Mentor Department: Computer Science

Mentor College: College of Computing and Informatics

Mentor Status: Motion Planning for Multiple Robots

Project Description: In this project, the undergraduate researcher will be learning about current state-of-the-art methods for multiple-robot motion planning and collision avoidance. This will be done through an extensive literature survey, followed by development and implementation of suitable approaches. The focus will be on developing efficient algorithms for decentralized multi-robot systems. Additionally, the student will help in setting up quadcopter drones and wheeled mobile robots for experiments in the Robotics Laboratory in the Computer Science Department. A proficiency in C++/Python is preferred.

Minimum Qualifications: A proficiency in C++/Python is preferred.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Integrating 3D LIDAR with RGB Cameras to Create Color Point Clouds

Mentor Name: Dr. Srinivas Akella

Mentor Department: Computer Science

Mentor College: College of Computing and Informatics

Mentor Status: Full Professor

Project Description: A 3D LIDAR is a surveying tool that measures distance to a target by using laser light. It helps create a 3D point cloud of the environment surrounding the camera. These LIDARs can measure reflectance of an object, but fail to capture color. In this project, we will use a 360 degree 3D LIDAR coupled with four RGB cameras pointed in 4 horizontal directions to create a 3D point cloud that has color information along with it. Such a software tool would be immensely helpful in robotics, autonomous driving, and computer vision applications. A Velodyne LIDAR sensor mounted on a mobile robot will be used to perform experiments in the Robotics Laboratory in the Computer Science Department. This work would require knowledge of image processing and a good understanding of linear algebra. A proficiency in C++/Python along with its standard libraries is preferred.

Minimum Qualifications: This work would require knowledge of image processing and a good understanding of linear algebra. A proficiency in C++/Python along with its standard libraries is preferred.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Simulating 3D Buildings for Indoor/Outdoor Robot Planning

Mentor Name: Dr. Srinivas Akella

Mentor Department: Computer Science

Mentor College: College of Computing and Informatics

Mentor Status: Full Professor

Project Description: Many robotics applications require thorough testing in simulation environments before actual robots are used. Gazebo is a popular simulator that helps rapidly test algorithms, design robot software, and train AI systems. The research task is to build 3 to 4 Gazebo environments for robots to move in. Built Gazebo environments are quite popular and would be useful to ongoing research in the Robotics Lab at UNC Charlotte and the broader robotics research community at other academic institutions and research labs. This project requires a knowledge of Python/C++. Prior exposure to Robotics and/or Computer Graphics would be helpful. It requires no prior knowledge of the Gazebo simulator (http://gazebosim.org).

Minimum Qualifications: This project requires a knowledge of Python/C++. Prior exposure to Robotics and/or Computer Graphics would be helpful.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Using Game-based VR Environments for Education

Mentor Name: Dr. Julio C. Bahamon

Mentor Department: Computer Science

Mentor College: College of Computing and Informatics

Mentor Status: Assistant Professor

Project Description: The research project focuses on the use of game-based VR technologies to develop innovative methods for education and knowledge transfer. This work is part of a field called serious games. We will be using the Unity 3D game engine and VR devices such as the Oculus Rift and the HTC Vive headsets for the user interface. We may also explore the use of the Rokoko motion capture suit to create customized avatar animations.

Minimum Qualifications: Students must have taken ITCS 4230 and ITCS 4231. Must also be proficient in the use of C# and be comfortable learning how to use a new API with minimal supervision and/or assistance. Students must be highly proficient in the use of the Unity 3D game engine.
2020 Summer Research Experience
Faculty Mentor Research Project Submission

Summer Program: The Charlotte Research Scholars
Project Title: Word Graphs for Reflection Groups
Mentor Name: Dr. Angela Berardinelli
Mentor Department: Computer Science
Mentor College: College of Computing and Informatics
Mentor Status: Senior Lecturer

Project Description: This summer project is meant to build a computing framework to support research questions in pure mathematics. Student participant(s) would help build the classes for representing the word graphs of reflection groups. Then participants would write and test functions that implement algorithms of interest that need to be performed on the graphs to support investigation of combinatorial research questions.

Minimum Qualifications: No previous research experience is necessary. The ideal student candidates will have already earned credit for MATH 2164, ITSC 2214, and ITSC 2175. Previous exposure to / experience with Python is a plus, but is not necessary.
Summer Program: The Charlotte Research Scholars
Project Title: AI + IoT for Learning Analysis
Mentor Name: Dr. Mohsen Dorodchi
Mentor Department: Computer Science
Mentor College: College of Computing and Informatics
Mentor Status: Full Teaching Professor

Project Description: IoT devices can provide large amount of data from different sources and AI can provide machine learning methods to solve complex problems related to such data. In this research, the data is collected by IoT devices indicating the level of activeness. Machine learning uses the collected data to further discover knowledge about the learners collaborative learning correlation to the level of engagement. The level of engagement is determined for different context and scenarios.

Minimum Qualifications: Fluent in programming.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Building Engaging Real-World Assignments for Improved Retention of Computer Science Majors

Mentor Names: Dr. Kalpathi Subramanian and Dr. Erik Saule

Mentor Department: Computer Science

Mentor College: College of Computing and Informatics

Mentor Status: Associate Professor

Project Description: This project will contribute to an ongoing effort to build new highly engaging real-world programming assignments spanning introductory courses in computer science at the freshmen and sophomore levels. 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 and other domains. The undergraduate student will work on building new assignments using online data sources, such as WikiData (https://www.wikidata.org/wiki/Wikidata:Main_Page) in building the needed infrastructure on the server and client side for importing external data to make it easily accessible to students in introductory courses. New web technologies will also be explored to make assignments portable and useful across different programming languages, platforms, course levels, and student skills/background.

Minimum Qualifications: The undergraduate student should preferably have Junior standing and must have satisfactorily completed the courses in the first two years in Computer Science. Some knowledge of server side programming, JavaScript and databases is preferable. More importantly, student should be strongly motivated to learn new languages, technologies and tools, complete tasks on time and be ready work with other members of the research group.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Recommendation, Analysis, and Visualization of Course Material

Mentor Name: Dr. Erik Saule

Mentor Department: Computer Science

Mentor College: College of Computing and Informatics

Mentor Status: Associate Professor

Project Description: The CS materials project curates a repository of course materials to use in early computer science course. The materials are classified against curriculum standards such as the one proposed by the ACM and IEEE. The goal of the project is make the repository as useful as possible by deploying tools adequate for user to explore, be recommended, and understand the materials that are available in the repository.

This particular project consists in proposing and writing tools to recommend users materials that would be useful to them. Recommending material as a list is unlikely to be easy to understand, so it will be necessary to expose to the user why materials were recommended to them, and to organize the recommendation in ways that can easily be understood. We are expecting that the deployed algorithm will be variants of classic data mining, big data algorithms that operate on tree like structures.

Minimum Qualifications: Being able to program in any reasonably common programming language (C++, Java, Python, or JavaScript). Understanding of classic data structures (Trees and Graphs) is necessary. Some web programming would be preferable, but not required. Some knowledge of data mining algorithms would be preferable but not required.
Summer Program: The Charlotte Research Scholars
Project Title: Deep Reinforcement Learning Debugger
Mentor Name: Dr. Minwoo Lee
Mentor Department: Computer Science
Mentor College: College of Computing and Informatics
Mentor Status: Assistant Professor

Project Description: The project develops a software that is capable of debugging deep learning algorithms (specifically, reinforcement learning). The project team designs, develops, and evaluates software modules and debugging interface. The participant is expected to implement small functionalities in the debugging software.

Minimum Qualifications: Solid programming skills and computer science background (i.e., object oriented programming, Git). Familiar to interface design and programming (in python or java). Some background or knowledge on machine learning will be a plus.
Summer Program: The Charlotte Research Scholars
Project Title: The Life and Crimes of Richard Ramirez
Mentor Name: Dr. Charisse T.M. Coston
Mentor Department: Criminal Justice and Criminology
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Associate Professor

Project Description: The student would conduct library research on the nature, scope, victims, perpetrators and crimes scenes related to serial murder. Then, research the case of serial killer, Richard Ramirez. After the material will be gathered, the similarities and differences in the case compared to the literature will be explored and the question of lessons learned will be explored. A poster will be generated and presented at our annual conference: The American Society of Criminology.

Minimum Qualifications: A junior or rising senior, with good writing and oral communication skills.
2020 Summer Research Experience
Faculty Mentor Research Project Submission

Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Developing a VR Game with Motion Tracking

Mentor Name: Dr. Kaustavi Sarkar

Mentor Department: Dance

Mentor College: College of Arts and Architecture

Mentor Status: Assistant Professor

Project Description: This project is a part of my ongoing research in dance technology. I am trying to develop a VR gaming interface that will allow learning of dance in an intimate mode providing an aesthetic experience. I employed CRS scholar Charlotte Barrett last summer where she developed a pilot. This has led to subsequent research presentations and ongoing written publications. For 2020 summer, I want to continue developing this pilot into a functioning prototype as my collaborator Julio Bahamon from computer science are eventually applying for NEH, NSF, and NEA grants for starting work on this project late Fall 2020.

Minimum Qualifications: Computer skills: proficient in game design and development; prototype development; willing to learn new software.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Science, Women, and the Mother Tongue: Translating Knowledge for Young Readers

Mentor Name: Dr. Alan Rauch

Mentor Department: English

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: In 1699 Les aventures de Télémaque, the didactic novel by Archbishop François Fénelon was published and has been in print ever since. Fénelon’s novel was successful in England where it was the most “frequently published children’s book.” Telemachus’s guide, Mentor, is the ostensibly male figure who becomes his source of knowledge. Mentor is –of course–the goddess, Minerva in disguise and it is this female figure who imparts wisdom, strength, and fortitude. What is striking here is that it insists on the fact that Telemachus owed his true instruction to Minerva, a woman. Telemachus’s education underscored what most women knew: they had been providing intellectual content to their own offspring for generations. At home, however, women were burdened with a feminine curriculum centered on “proper” female skills. Nevertheless “permissible” subjects included foreign languages and the sciences, which opened doors on other cultures and new genres. These female “mentors” translated new and unfamiliar worlds, in travel narratives, memoirs, and in science texts to educate eager young minds. Many of these women began their careers as translators of “foreign” texts into English, but they also acted as “conceptual” translators of complex ideas in science and culture. Despite obstacles, women found outlets for “translating” their own intellect by applying themselves to genres which had been deemed “acceptable” in a cultural milieu dominated by male authorship. The three genres that are most striking and most frequent are: 1.) translation; 2.) works for children; and, 3.) travel memoirs/narratives. Taken together, they all mediate the unfamiliar in ways that render new and unfamiliar content accessible. In short, they are all “translations.”

Minimum Qualifications: Students should have an interest in archival research to explore the as yet undiscovered or at least unexamined texts by women motivated to write about science. Given the time period, late 18th to mid-nineteenth centuries, student should be historically engaged as well. If a student has language skills, say in French or German that would be useful, but not required.
Summer Program: The Charlotte Research Scholars
Project Title: Contemporary Black Poetry
Mentor Name: Dr. Malin Pereira
Mentor Department: English
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Full Professor

Project Description: African American Poetry is leading American poetry today, with black poets winning major awards and a proliferation of book publications and slam/spoken word events. How does black poetry relate to questions of identity, race, and aesthetics? This professor is working on a book project on several contemporary black poets, including Elizabeth Alexander, Rita Dove, Yusef Komunyakaa, Natasha Trethewey, Kevin Young and Wanda Coleman, among others. A Summer Scholar working on this project would read the poetry, locate and read scholarly articles and books about the poetry, and talk with the professor about it all! The student's research project (an academic paper of at least 15 pages) can be on the poet(s) of their choosing. The Summer Scholar would be encouraged to present their research at conferences and submit to an undergraduate research journal for publication.

Minimum Qualifications: 3.2 GPA: major or minor in English, Africana Studies, Education, Women's and Gender Studies or Communication Studies.
Summer Program: The Charlotte Research Scholars  
Project Title: Adding Sensor Peripherals to a ROS Enabled All-Terrain Vehicle  
Mentor Name: Dr. James Conrad  
Mentor Department: Electrical and Computer Engineering  
Mentor College: College of Engineering  
Mentor Status: Full Professor  

Project Description: Through the course of this project, the research student will be adding various sensors to the existing Honda All-Terrain Vehicle (ATV). The Robot Operating System (ROS) will be used to integrate all of the sensors together to a centralized ARM-based microcontroller. The following sensors will be added to the existing ATV:

1. LIDAR (LMS200 LIDAR sensor)  
2. GPS (To be mounted directly above the LIDAR sensor)  
3. Forward facing camera (To be mounted on the same plane as the LIDAR sensor)  

The software drivers for these sensors are already available on ROS.org. The goal of this integration is to enable the ATV to traverse an unknown environment and report time critical environment information back to the microcontroller to perform the necessary maneuvers to avoid obstacles and traverse the intended path correctly.  

Minimum Qualifications: Two or more programming courses, familiarity for the listed sensors, system design.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Developing an Instruction Manual for Building a Global Urban System in North Carolina

Mentor Name: Dr. Bill Graves

Mentor Department: Geography and Earth Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: North Carolina's dispersed urban system makes it difficult for its cities to compete for talent in the global economic system. This project will explore strategies for rescaling North Carolina's urban system to improve global visibility as well as making the state's cities more sustainable by reducing carbon outputs. Emphasis will be placed on measuring current economic conditions and assessing the costs and benefits of changes to the local infrastructure, culture and economy. The CRS scholar will be tasked with gathering data, visualization of the data and testing the feasibility of development scenarios.

Minimum Qualifications: Knowledge of Excel.
Summer Program: The Charlotte Research Scholars
Project Title: Evaluation of Tornadoes in Hurricane Dorian
Mentor Name: Dr. Casey Davenport
Mentor Department: Geography & Earth Sciences
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Assistant Professor

Project Description: Hurricane Dorian was the first major hurricane of the 2019 Atlantic hurricane season, and eventually made landfall at Cape Hatteras on September 6. However, the day before landfall, nearly two dozen tornadoes were reported in eastern North Carolina. The goal of this project is to evaluate the local environments of the supercells that spawned these tornadoes, particularly the shifts observed prior to and during the tornadogenesis phase. A Summer Scholar will help to collect the environmental profiles associated with these tornadoes, and conduct an analysis to determine common features and environmental shifts associated with tornadogenesis.

Minimum Qualifications: Student should have completed METR 3210 and METR 4105. These courses provide basic understanding and interpretation of thermodynamic diagrams (skew-Ts) and related quantities (e.g., CAPE, CIN, vertical wind shear), along with strong computer programming skills (Fortran and/or Python preferred).
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Poverty Suburbanization and the Changing Job Accessibility Landscape

Mentor Name: Dr. J. Claire Schuch

Mentor Department: Geography and Earth Sciences

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Postdoctoral Researcher

Project Description: The last decade of urbanization in America has been characterized by a reversal in the trends that gave rise to stark segregated center-city, suburban dichotomies of poverty and prosperity. This new dynamic has featured an increasing dispersion of poverty away from urban cores towards less accessible and less dense areas, as center city locations have seen a reinvestment in capital and wealth. Such a reversal challenges existing notions of how low-income residents access employment opportunities and how this accessibility shapes employment outcomes. These concerns are key to debates on the location of affordable housing, transportation, and on informing policies to decrease unemployment rates of the urban poor. This proposal contributes to our understanding of these issues in the Charlotte Metropolitan Statistical Area (MSA) through three research objectives. First, we will map accessibility from all neighborhoods to job locations in the city differentiated by wage categories, by both car and transit. This will provide insights on where gaps or mismatches exist between low-income residents and employment opportunities. Second, we will estimate how much accessibility by car and transit have contributed to changes in unemployment rates at the neighborhood level. This will guide policy makers on how much importance to place on various transportation\housing trade-offs when considering employment outcomes. Finally, we will interview residents who have relocated out of the center city to understand what challenges or opportunities exist in navigating employment options in their new locations. Together these research objectives are centered on the new opportunity landscapes that are being forged as the geography of segregation and poverty begins to shift. The mixed-methods research design gives a voice to residents in illuminating challenges that may be overlooked by quantitative mapping exercises alone, while our accessibility maps will contribute to UNCC's Urban Institute's ongoing data initiatives.

This RA position specifically focuses on the final step of the study (interviews with residents), in order to answer the research question: How do low-income residents who moved out of dense center city locations access employment? What challenges, or even opportunities, do they encounter? We classify neighborhoods based on population density to delineate the central, inner-and outer-ring suburban boundaries within the MSA.

Specifically, the assistant will help with the following:
• Transcribing interview recordings;
• Analyzing interview data;
• Writing up results;
• Presenting findings in diverse and creative ways.
Note: this study has been approved by UNC Charlotte’s Institutional Review Board (IRB). The student will obtain CITI certification in order to be added to the IRB and work with our confidential data.

Minimum Qualifications: An interest in economics, urban planning, transportation, income segregation, or related topics. Excellent written and verbal communication skills. Experience conducting qualitative research preferred. Experience with community engagement preferred. Experience summarizing and presenting information/data preferred.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Carolina in the Trenches: WWI in Our Own Backyard

Mentor Name: Dr. Heather Perry

Mentor Department: History

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: How did the First World War impact women, children and civilians in the Carolinas? What was daily life like when the US Army opened up Camp Greene, Camp Jackson, and Camp Sevier – 3 of the military training camps in the South during WWI? How did the people of North Carolina react to the deadly Spanish flu? These are some of the questions that I am trying to answer in my current research project: Carolina in the Trenches: WWI and the Re-Shaping of the American South.

I am looking for a student to help me research and piece together the experiences of civilians and soldiers stationed at Camp Greene—the US Army training camp established in Charlotte in 1917. Research includes reading through the 3 newspapers published at Camp Greene and documenting the daily activities of the soldiers and the ways they interacted with local residents. The student will focus on two aspects of life at Camp Greene: 1) soldiers' social and cultural experiences during training and 2) the impact of WWI on life in Charlotte. To do this, the CRS student will need to comb through the photograph and postcard collections found in the Carolina Room of the Charlotte Mecklenburg Library as well as the Atkins Library Special Collections. The student will also need to go through the records of the North Carolina Red Cross and YMCA so that we can compile information on how women contributed to the war effort. Finally, the student will use local and national records to help me create a database which captures and organizes the records and lives of the soldiers and POWs stationed in North Carolina from 1917-1919. Many of these materials can be accessed through the Atkins Library on-line databases, however, other materials are only available in their original format and cannot be removed from the special collections of either library. The student intern must be able to provide their own transportation to/from the Carolina Room in Uptown Charlotte and the Atkins Library Special Collections (UNCC) and should expect to spend 2 weeks researching full time at each location – in addition to the work completed using the online historical databases. The student will also need a laptop and experience using MS Word and XL.

Minimum Qualifications: Completion of at least 2 history courses at UNCC -- including HIST 2600 with a B or higher; experience using and reading online newspaper collections and databases; experience with Chicago or Turabian citation styles; excellent communication and organization skills.
2020 Summer Research Experience

Faculty Mentor Research Project Submission

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Summer Program: The Charlotte Research Scholars

Project Title: Hero to Les Misérables: Jean-Maximien Lamarque (1770-1832) and the Age of Revolutions

Mentor Name: Dr. Christine Haynes

Mentor Department: History

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: In addition to working on a related honors thesis on this period in French history, the Charlotte Research Scholar would help with primary and secondary source research for a new book project on the biography of Jean-Maximien Lamarque, who was a military officer and eventually politician in France from the 1790s until his death in 1832, which provoked the revolt that figures in the novel/musical Les Misérables (originally by Victor Hugo). For this biography, the Scholar will help me to review the secondary literature on the military campaigns of the revolutionary and Napoleonic wars in which Lamarque was involved. She will also help me to search digitized parliamentary records for his speeches in the French legislature. And she will investigate additional archival and printed sources online and via Interlibrary Loan on Lamarque’s family, publications, etc. Because I have already had her in several courses and am advising her honors thesis, I recommend Kellie Giordano for my research assistant.

Minimum Qualifications: Good research skills. Reading knowledge of French. Course background in European history, especially the French Revolution.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Statistical Analysis of Time-to-Event Data

Mentor Name: Dr. Qingning Zhou

Mentor Department: Mathematics and Statistics

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: This project will focus on the statistical analysis of time-to-event data which arise in many fields including epidemiology, biomedicine, economics, finance, psychology and social sciences. We will investigate some recent statistical approaches, such as survival tree and forest methods from machine learning, and compare them with the traditional Cox model approach through simulation studies and real data analysis. The student is expected to learn about these methods, conduct simulation studies and analyze a real dataset of interest.

Minimum Qualifications: Knowledge of probability theory and statistical inference, prior experience in R programming or other statistical software (e.g., MATLAB or Python).
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Image Compression and Linear Algebra

Mentor Name: Dr. Xingjie Helen Li

Mentor Department: Mathematics and Statistics

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: The main goal of this project is to study modern data compression techniques and design new schemes to compress various types of images such as portraits and landscapes. Meanwhile, the student will learn the basic knowledge of advance matrices theory, singular value decomposition, randomized linear algebra, fast numerical algorithms, and statistics tools of data analysis. The result of this project will be novel and expected to be published in an undergraduate research journal.

Minimum Qualifications: The student must have taken calculus I, II, linear algebra, and must have taken at least one programming course such as python or MATLAB. The student must have a minimum GPA of 3.2 in these courses.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Freeform Optics - Evolution? No Revolution!!!

Mentor Name: Dr. Konstantinos Falaggis

Mentor Department: Mechanical Engineering and Engineering Science

Mentor College: College of Engineering

Mentor Status: Assistant Professor

Project Description: Freeform Optics are expected to revolutionize an entire field of optics and will replace most of manufactured optics - ranging from reading glasses and side mirrors of cars to optical microscopes and optical components used in satellites. The challenge is that complex shaped surfaces have higher surface slopes and need to be measured with low uncertainty. This summer experience allows the selected student to gain research experience within an ongoing research project at UNCC that is funded through the Center of Freeform Optics (CEFO) https://centerfreeformoptics.org/ CEFO projects are funded by the affiliate member companies as e.g. Nikon, Facebook Reality Lab, AFRL, AOS, Ball Aerospace, OptiPro, Zeiss, and many others. The on-going CEFO research project focuses on the development of measurement systems for freeform optics, because "the most significant impediment to progress is the optical testing of these surfaces." This needs to be achieved for manufacturing environments, which is subject to temperature changes that affect the measurement accuracy. During this summer research experience, the selected student will have the opportunity to gain experience in MATLAB programming, Metrology experiments, machining of samples, and the metrology of such samples. The latter includes comparing the manufactured samples using commercially available measurement instruments at the Center of Precision Metrology (which is after NIST, the best metrology site in the US).

Minimum Qualifications: Basic MATLAB programming skills; successful completion of MEGR2156 for the work in the mechanical workshop; have a steady hand to handle optical components (mirrors and lenses).
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Program Evaluation of NASA Student Launch: Understanding the Outcomes of School and Community Experiences with UNCC STEM Outreach Program

Mentor Name: Dr. Jerry Dahlberg
Mentor Department: Mechanical Engineering
Mentor College: College of Engineering
Mentor Status: Assistant Teaching Faculty

Project Description: NASA Student Launch is a research-based, competitive, experiential exploration activity. It strives to provide relevant, cost-effective research and development of rocket propulsion systems. This project offers multiple challenges reaching a broad audience of middle and high schools, colleges, and universities across the nation. One of the many requirements of the competition is that teams must engage a minimum of 200 participants in educational, hands-on science, technology, engineering and mathematics (STEM) activities during the 8 month competition calendar. A STEM Engagement activity report is filled out and submitted after each event as well as any feedback received from the participant group. The target groups are broken down by grade level from pre-school through educators.

The UNC Charlotte Rocket team has been competing for the last ten years and has placed 2nd in the nation for two years in a row. In 2018, the team also placed second in the nation in STEM education outreach. The goal of this summer research is to conduct an analysis of the teacher surveys and outreach reports from school and community partnerships to determine what activities and programs are most valued and how to improve the outreach program.

The researcher will use this data to develop and design a survey for the university student participants to determine their thoughts on the outreach, the project, the students they interact with as well as the educators.

Minimum Qualifications: Basic understanding of survey design and data analysis of surveys. Strong writing skills preferred.
Summer Program: The Charlotte Research Scholars

Project Title: Continued Development of a Macroscopic Analog of Molecular Hydrodynamic Systems

Mentor Name: Dr. Jerry Dahlberg
Mentor Department: Mechanical Engineering
Mentor College: College of Engineering
Mentor Status: Assistant Teaching Professor

Project Description: "Confined, vibration-driven grain piles exhibit fluid-like properties, in particular, predictable, non-random flow patterns, hydrodynamic modal response to vibrational forcing, and a persistent, spatially uniform tendency toward local statistical mechanical equilibrium. Based on these similarities, our research group at UNC Charlotte has shown that vibrated grain beds can serve as directly observable, dynamically equivalent analogs for studying single-molecule-scale and collective, multi-molecule-scale dynamics in simple monatomic liquids. The proposed project seeks to further explore dynamical similarities between our analog system and molecular hydrodynamic systems by measuring the so-called dynamic structure factor. Briefly, the structure factor encapsulates and exposes the complex, simultaneous, coupled dynamic response of condensed multi-body, externally excited systems. Our goal will focus on determining how well and to what extent the structure factor in our analog system mimics that observed (by, e.g., photon and neutron-scattering) in simple monatomic liquids."

The student researcher will be responsible for reviewing relevant literature, setup and conduct experiments, perform data analysis and work as part of an active research group.

Minimum Qualifications: A basic understanding of Fluid Mechanics, experimental procedures, Microsoft Word, Excel and a desire to work in a hands on lab. The researcher will learn new skills such as technical writing using Latex and be instructed on the use of lab equipment."
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Explore the Growth Mechanism of Si-based Two-dimensional Nanostructures: Importance of the Catalysts in Chemical Vapor Deposition

Mentor Name: Dr. Haitao Zhang

Mentor Department: Mechanical Engineering and Engineering Science

Mentor College: College of Engineering

Mentor Status: Associate Professor

Project Description: Conventionally, catalysts can promote the growth of one-dimensional (1D) nanostructures by accommodating source vapor through a typical vapor–liquid–solid (VLS) process. In this study, we will explore the catalyst-assisted chemical vapor deposition of Si-based (e.g., Si₂Te₃) two-dimensional (2D) nanostructures. Preliminary results show catalysts used in our chemical vapor deposition method could induce the nanostructure growth by promoting the formation of intermediates for the final deposition, a role different from the one in the classic VLS process. The effect of different metal catalysts (e.g., Cu and Au) on the control of composition and morphology of the nanostructures will be investigated. This work will reveal the growth mechanism for controlled growth of the 2D nanostructures for future device applications.

Minimum Qualifications: Student had materials courses (e.g., MEGR 3161 or equivalent, such as solid state physics) is preferred.
2020 Summer Research Experience
Faculty Mentor Research Project Submission

Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Songs of the Ghettos and Camps: A Resource for Scholars and Performers

Mentor Name: Dr. James A. Grymes

Mentor Department: Music

Mentor College: College of Arts and Architecture

Mentor Status: Full Professor

Project Description: In 1948, songwriter, folklorist, and Holocaust survivor Shmerke Kaczeroginski (1908–1954) published Lider fun di getos un lagern [Songs of the Ghettos and Camps], a collection of 235 songs that were written and performed in Nazi ghettos and concentration camps during the Holocaust. Although Kaczerginski’s work continues to serve as the most significant primary resource for Jewish folk and popular music during the Holocaust, its Yiddish texts render it inaccessible to most scholars and performers. Transliterations of many of the songs from their original Hebrew script into Latin characters are scattered among a variety of secondary sources, as are literal and/or performance translations of those texts into English. There are also performable arrangements of Kaczerginski’s monophonic melodies, but these, too, tend to be dispersed throughout the repertoire.

With guidance from the mentor, the Charlotte Research Scholar will locate Latin transliterations and English translations of the Yiddish songs in Lider fun di getos un lagern. The student will also identify performable arrangements with accompaniments, as well as existing recordings that can serve as models for future interpretations. The result will be a resource that will provide scholars and performers all over the world access to Kaczerginski’s monumental compilation of songs from the Holocaust.

Minimum Qualifications: Knowledge of Microsoft Excel is required, as is familiarity with musical notation. Knowledge of Yiddish is not necessary.
Summer Program: The Charlotte Research Scholars
Project Title: Mechanically Tunable Terahertz Photonic Crystals
Mentor Name: Dr. Tino Hofmann
Mentor Department: Physics and Optical Science
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Assistant Professor

Project Description: In this project, a method to mechanically tune polymethacrylate-based photonic crystals for the THz spectral range will be developed and implemented. If applied perpendicular to the surface of the photonic crystal, compressive or tensile strains can result in a change of the thickness and density of the low-density layers of photonic crystals and could result in a change in the photonic bandgap of the crystal. The student will work on the design, experiment, and analysis of THz transmission spectra. The student will work together with a team of graduate students and is expected to participate in weekly group meetings. It is expected that the results of this work will be published in a peer-reviewed scientific journal. The student is expected to contribute to this publication as the main author.

Minimum Qualifications: Solid knowledge of electrodynamics, graphing using Origin and MATLAB, scientific writing using LaTeX.
2020 Summer Research Experience
Faculty Mentor Research Project Submission

Summer Program: The Charlotte Research Scholars
Project Title: Infrared Laser Sealing and Cutting of Blood Vessels
Mentor Name: Dr. Nathaniel M. Fried
Mentor Department: Physics and Optical Science
Mentor College: College of Liberal Arts and Sciences
Mentor Status: Full Professor

Project Description: Conventional suturing of blood vessels during surgery is time consuming and skill intensive. Alternative use of ultrasound (US) and radiofrequency (RF), energy-based devices enable more rapid vessel closure and hemostasis than sutures and mechanical clips, which leave foreign objects in the body. However, US and RF devices have limitations, including thermal damage to adjacent delicate tissues (e.g. nerves). Also, the device jaws can reach excessively high temperatures and thus take a long time to cool down between applications.

The Biomedical Optics laboratory is developing an alternative method using infrared (IR) laser energy. Advantages include more rapid sealing/cutting of vessels, less thermal spread, stronger vessel seals, elimination of a deployable mechanical blade to bisect tissue seals, and lower jaw temperatures.

This project requires a Physics, Electrical Engineering, or Mechanical Engineering undergraduate summer student to assist in the design, characterization, and testing of a laser-based device for sealing and cutting blood vessels. Work will include opto-mechanical design of the device, computer simulations (optical and thermal) and experimental studies (tissue dissection, laser operation, and vessel burst pressure measurements).

Minimum Qualifications: Major in Physics, Electrical Engineering, or Mechanical Engineering. A strong work ethic, and willingness to work as a team with another graduate student in the lab. Experience with SolidWorks, Matlab, or Labview not required, but preferred. Experience with 3D printing and machine shop skills (drill, mill, lathe, etc.) not required, but preferred.
Summer Program: The Charlotte Research Scholars
Project Title: Measurements of Light-Wavefront Properties using Adaptive Optics.
Mentor Name: Dr. Menelaos K. Poutous 
Mentor Department: Physics & Optical Science 
Mentor College: College of Liberal Arts and Sciences 
Mentor Status: Assistant Professor

Project Description: Light waves passing through optical components such as lenses, prisms, apertures and windows, become aberrated. This wave distortion is due to non-uniformities in the volume or surfaces of the optics, which in turn can be measured to obtain information about the transmitting media properties. A Shack-Hartmann wavefront sensor system is to be assembled and tested by the participating Scholar. The hardware and software components are available in Prof. Poutous' laboratory, where the experiments will take place. The participating Scholar will be directed and mentored by Prof. Poutous, and he/she is expected to interact on a daily basis with the graduate student members of the group. After benchmarking the sensor system by testing a set of “control” optical components, tests will expand to components with surface modifications, previously fabricated in Prof. Poutous' laboratory. Novel results will be considered for publication in appropriate engineering journals or conferences. At a minimum, the participating Scholar will be assisted in a poster submission to the Summer Research Symposium. Applications of wavefront sensors include astronomical imaging, atmospheric turbulence mapping, biological imaging and laser beam "shaping".

Minimum Qualifications: Basic knowledge of optics. The ability (and desire) to be trained to use various optical components and instrumentation, including manual dexterity to assemble functional systems. The desire to contribute in current research on optical surfaces and their properties. The ability to adhere to Laboratory safety rules and regulations is required. Laser safety training will be included in the effort, as required by regulations. The Optical Micro-Structured Lab (OµSL) is a safe and respectful environment for all student and staff members, and as such, the participant is required to adhere to the Lab's and University's rules and regulations.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Legislating and Campaign Money in the U.S. House

Mentor Name: Dr. Eric Heberlig

Mentor Department: Political Science and Public Administration

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: I have developed a data that combines data on campaign donations from the Federal Election Commission, legislative effectiveness scores, voting records, and institutional positions of members of the House from 1996 through 2012. There are a number of analyses I’m working on and on which a student could collaborate. The main theme of the project analyzes the relationship between interest group money and legislative effectiveness. “Access-oriented” interest groups (especially corporations) have traditionally concentrated their campaign contributions on legislators with specific characteristics: members of the majority party, members serving on committees with jurisdiction over their agendas, and legislators who are more centrist ideologically. The political environment has changed substantially over the past decade, with Congress polarizing ideologically and great power being concentrated into the hands of party leaders. These changes undermine the viability of corporate Political Action Committees’ (PACs) strategies. I seek to analyze how and why their contribution strategies have adapted to the new environment. I hypothesize that contributions are increasingly oriented towards Republicans (ideologically aligned with corporations and the majority party), elected party leaders, and legislatively effective Democrats. Second, and relatedly, despite the reputation of corporate PACs being “access-oriented,” they clearly have greater policy agreement with Republicans. So we are analyzing how business PACs can target their donations strategically and selectively to certain Democrats who can help them achieve their goals while giving less enthusiastically to Democrats who could help the Democrats win majority party status. Third, we are analyzing how donors are reacting to the increased diversity of Congress, especially the increase in women and racial minorities. There is substantial evidence in psychology that people are threatened by “powerful” women, particularly in man dominated professions (like politics). Do donors evaluate and reward women (or minority) legislators’ accomplishments (legislative successes, institutional posts) in the same way they do men’s?

Minimum Qualifications: Completed POLS 2220 (or equivalent) with a B or higher. Familiarity with data management and analysis programs such as Excel and SPSS.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Race, Gender and Coverage of the 2020 Democratic Presidential Primary

Mentor Name: Dr. Mary L. Atkinson

Mentor Department: Political Science and Public Administration

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: This project will track news coverage of the candidates running for the 2020 Democratic Presidential nomination. Students will help collect a database of news articles that mention the candidates and will code these articles based on the information they contain. For instance, students will record mentions of the candidates' families, their physical appearances, and their policy proposals. We will then examine the data collected to discern whether news coverage differs based on the sex and race of the candidates.

Minimum Qualifications: Students must be fluent in English and familiar with news reporting. Experience conducting database searches (e.g. NewsBank) is helpful. Any experience with qualitative research methods and/or coding is a huge plus.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Politics of Migration

Mentor Name: Dr. Beth Elise Whitaker

Mentor Department: Political Science and Public Administration

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: Hostility toward immigrants is on the rise in many parts of the world. Scholars seeking to explain xenophobia have tended to focus on economic conditions, changing demographic patterns, and cultural factors. Relatively less attention has been given to the role of political competition in fueling anti-immigrant attitudes and generating exclusive policies. I am involved in several projects that seek to understand the influence of political factors on attitudes toward migration. One line of research involves a series of survey experiments conducted in the United States and examines factors that influence support for naturalization versus deportation of undocumented immigrants, including beneficiaries of the Deferred Action for Childhood Arrivals (DACA) program. Another line of research uses survey data from 32 African countries to examine the relationship between proximity to an international border and support for free movement. Still another line of research examines the involvement of African diaspora populations in home country politics, whether by participating in multiparty elections or sponsoring rebel groups. I would like to work with a Charlotte Research Scholar in summer 2020 on various aspects of these related projects. The scholar’s tasks could include reviewing recent literature, assisting with data collection and analysis, gaining skills in GIS to assist with analyzing geocoded data, and designing and administering survey experiments. The scholar will gain experience with different types of research methods and learn more about existing research on the politics of migration, both of which could be especially useful for someone who is working toward an honors thesis in political science.

Minimum Qualifications: Political science major or minor; preferably someone who has taken POLS 2220 and/or statistics.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Volunteer Management: Examining Motivation, Inclusion & Satisfaction

Mentor Name: Dr. Jaclyn Piatak

Mentor Department: Political Science & Public Administration

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Associate Professor

Project Description: Interested in volunteering? Motivation and management? Diversity, inclusion, and equity? The environment?

Working with an international environmental organization, this study examines: What volunteer management practices correspond to diverse, engaged, and dedicated volunteers?

A Charlotte Research Scholar would help link chapter surveys to individual volunteer surveys and help code open-ended responses from volunteers about their experience volunteering with the organization.

Findings have implications for understanding volunteers’ motivations, inclusion, and satisfaction that will help the organization better serve their volunteers and advance their mission in addition to providing broader insights into volunteer management.

Minimum Qualifications: Ability to work with Excel; SPSS or STATA skills would be a plus.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: School Choice and School Segregation

Mentor Name: Dr. Jason Giersch

Mentor Department: Political Science and Public Administration

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: Do charter schools increase segregation, and under what circumstances? The laws governing charter schools vary from one state to another, and these differences could have implications for school segregation. I have data about the distribution of socioeconomic and racial groups among students in schools in all 50 states. With my guidance, the CRS student will examine that data for patterns of segregation to see if the laws governing charters affect demographic distributions in public schools.

Minimum Qualifications: (1) Basic spreadsheet analysis in Excel, Stata, or other statistical software. (2) Basic awareness of state government in the US.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Investigating how the world "gets under our skin": Biobehavioral influences on human health and well-being

Mentor Name: Dr. Jeanette M Bennett

Mentor Department: Psychological Science

Mentor College: College of Liberal Arts & Sciences

Mentor Status: Associate Professor

Project Description: Globally, my research lab, StressWAVES, examines how our experiences "get under the skin" via stress and affects our health, both physical and mental. Although chronic stress can harm the body and mind, acute or manageable stress improves our cognitive, emotional, mental and physical functioning. We attempt to understand how acute, healthy stress becomes derailed and toxic as well as investigate innate individual differences that inhibit or reverse the negative effects of stress, whether acute like job loss or major like traumatic events. If concepts like mind-body, stress, blood pressure, trauma, resilience, depression, cortisol, are interesting to you, you should consider this opportunity. It is especially good for those who envision a career in biopsychology, health psychology, psychoneuroimmunology, clinical psychology, or a health-related field. Psychological as well as biological factors are assessed in all studies, including but not limited to handling and processing of blood or saliva, guiding participants through data collection protocols, as well as data entry, cleaning, and analysis. Over the summer, you will assist with data collection on two PhD dissertations: one examining how emotion regulation influences acute stress reactivity and the other investigating how racial discrimination and racial context of origin alters cardiovascular health. For a summer student's research project, completed data will be used and compromises of the following areas: emotions and caffeine exposure, emotional stressors/trauma and well-being, or tobacco smoking and biobehavioral effects on health.

Minimum Qualifications:

Required
1. Entry level biology courses (e.g., BIOL 1110/1115)
2. Entry level psychology courses (e.g., PSYC 1101)
3. Willingness to work on lab protocols where biological specimens (e.g., saliva, blood, etc.) are collected
Preferred
1. Biopsychology courses (e.g., PSYC 2113) with B or better
2. Research methods course (e.g. PSYC 2101/2103) with B or better OR previous research experience
3. Experience with SPSS and proficient in Microsoft Excel/Word
4. Phlebotomy, completely not expected but advantageous
Summer Program: The Charlotte Research Scholars

Project Title: Assessing Movement-Based Interventions in Collaborative Music Improvisation

Mentor Name: Dr. Alexia Galati

Mentor Department: Psychological Science

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: This project assesses the impact of movement-based interventions on collaborative music improvisation. The project examines whether motor patterns that involve turn-taking (alternating between leading and following) in collaborating dyads subsequently promote better quality improvisation.

In the study, dyads first engage in one of three types of motor coordination. The two partners (A and B) will mirror each other’s movement with: 1. Partner A always leading the movement, 2. Partner A first leading followed by Partner B leading, or 3. No designated leader. In the next phase, dyads improvise a performance using percussion instruments. Video-processing (frame-differencing methods) and audio-processing (to obtain acoustic properties such as intensity) will be applied to recordings of these phases to obtain measures of the partner’s body movement and music production over the course of the improvisation phase. Improvisation is expected to be of lower quality, and to be motorically and acoustically less variable, when the intervention involves a solo leader compared to when it involves turn-taking.

The summer research scholar is expected to be involved in recruiting research participants and running experimental sessions, assisting with audio and video processing of the recordings, getting experience in coding for statistical analysis and in scientific presentation.

Minimum Qualifications: Research Methods courses in the student’s major (e.g., Research Methods I and II for Psychology majors); introductory Statistics or similar course; Programming experience and/or experience with audio and video processing is encouraged but not required.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Community Perceptions of Sexual Assault Prosecution and #Metoo

Mentor Name: Dr. Jennifer Langhinrichsen-Rohling

Mentor Department: Psychological Science

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Full Professor

Project Description: Are you interested in sexual violence, forensics, and psychology? In 2019, Dr. Langhinrichsen-Rohling conducted a community survey of registered voters in Mobile, Alabama. The goal of the survey was to assess perceptions of crime and safety as well how they viewed prosecution of rape and sexual assault. The sample was almost equal in terms of White (52.7%) and Black/African American (42.6%), female (67.3%) and male, married (51.9%) and unmarried voters, ranging in age from 18 to 91. The student who joins this project will be working on data cleaning, coding and analysis related to one of several aims: demographic differences in support for local and national safety and justice initiatives (i.e., #metoo, National Sexual Assault Kit Initiative); relations between familiarity with national movements and self-reports of needed evidence for local sexual assault convictions; predictors of feeling unsafe in the community. They will also conduct literature reviews and a policy analysis. An enterprising student could also choose to replicate this survey in Charlotte, NC for comparison purposes. Expected products would include development and potential presentation of findings at a national and/or international conference and inclusion in a publication of these data, as warranted.

Minimum Qualifications: Prefer a student who has successfully completed a course in research methods and/or statistics (B or better) and who is a strong writer. This experience would be ideal for someone who is committed to obtaining a graduate degree in psychology, law, or other related fields.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Sex Through Text

Mentor Name: Dr. Erika Montanaro

Mentor Department: Psychological Science

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: Smartphone use, especially text messaging, has permeated young people's lives and has allowed individuals immediate and constant access to each other. Additionally, texting has rapidly changed the way young people communicate, flirt, date, and even participate in risk behavior (e.g., substance use, sexual activity). However, remarkably little is known about the risks and benefits associated with this form of communication among young adults. For example, how might attitudes and norms communicated via text message develop over time and influence risk behavior? Innovative methods are needed to measure how young people use text messages in their romantic and sexual interactions, psychological mechanisms associated with texting, and correlates of texting to risk behavior.

The specific aims of the proposed study are:
1. To assess the feasibility of using smartphones to understand risky health behavior interactions (e.g., risky sex) in a sample of young women and their partners.
2. To describe the relationship between texting and risky health behavior. These data will help to determine the frequency of communication and patterns of interactions within relationships, and how these patterns predict risky health behaviors.

The current study offers a unique opportunity to examine a wide variety of health relationships (e.g., risky sex, depression, anxiety, substance use, eating behaviors, physical activity). Romantic relationships offer a context in which partners influence each other's behaviors. Recent work suggests that partners influence each other's alcohol use, marijuana use, eating behaviors (Cornelius, Desrosiers, & Kershaw, 2016), as well as cigarette use (Cornelius, Desrosiers, & Kershaw, 2017). These patterns are beginning to be explored via smartphone communication--over 90% of participants in a study by Bergdall et al. (2012) used text messages as a way to communicate with their partner. This suggests that research should focus on the importance of text messages in the way young people develop relationships, make health decisions within the context of those relationships, and ultimately their health behaviors.

Analyzing the content of text messages will allow researchers to assess how health information is being communicated via text message alleviating the concern of participant response bias. Smartphone use is nearly ubiquitous among young adults, and while researchers are beginning to examine the relationships between text messages and health it is still not well understood. The proposed study seeks to further understand these relationships. A Charlotte Research Scholar student would aid in data management and text analysis.
Minimum Qualifications: Completion of Research Methods in Psychology with a B or better. Experience using SPSS. Strong writing skills. Experience with literature reviews.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Improvising Health Care Outcomes Using Technology

Mentor Name: Dr. Monika Sawhney

Mentor Department: Public Health Sciences

Mentor College: College of Health and Human Services

Mentor Status: Associate Professor

Project Description: Tuberculosis (TB) a highly infectious disease most prevalent in low-middle income countries. TB can be treated more efficiently if detected in a timely manner. However, the delay caused in timely detection results in the majority of the population not being treated and cured. The student working on this project will collaborate with the current research team to explore possible technology options that can assist in timely detection and effective patient care for susceptible populations. The Summer Scholar will be responsible among other things to conduct thorough literature survey, maintain databases, and assist other team members in exploring organizations and companies working in the area of using technology for treatment of infectious diseases (especially Tuberculosis). In addition the Summer Scholar will help prepare presentations and reports summarizing research results for different array of audiences.

Minimum Qualifications: Computer skills, research skills, at least a junior standing, diligent, detail oriented, drive to learn, and work collaboratively in a team environment.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Harnessing Social Media with Mixed Methods: Gun Violence Responses in Charlotte

Mentor Name: Dr. Jessamyn Bowling

Mentor Department: Public Health Sciences

Mentor College: College of Health and Human Services

Mentor Status: Assistant Professor

Project Description: Social media is still understudied in relation to violence prevention, and this project will enhance the Charlotte Research Scholar's skills in analyzing multiple data sources using different approaches. This project will use mixed methods research to analyze Twitter data (n=226,000) in response to the April 30th mass shooting. In order to better respond to instances of gun violence, this project will compare content of tweets with official university responses and local incident reports (LiveSafe data). This collaboration is interdisciplinary, and the Charlotte Research Scholar will engage with faculty from different disciplines (public health, social work, computing and informatics, and psychology). The Scholar will assist in data preparation, data analyses, and dissemination of findings. The Scholar will gain expertise in large datasets, content analyses, requesting public records, and violence prevention.

Minimum Qualifications: Excellent writing skills. Previous experience with reading peer-reviewed/academic journal articles. Familiarity with social media (as a user or analyzer).
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Developing a Measure of Hate-Motivated Behavior

Mentor Name: Dr. Robert Cramer

Mentor Department: Public Health Sciences

Mentor College: College of Health and Human Services

Mentor Status: Associate Professor

Project Description: Hate-motivated behavior is a pressing problem for the legal, criminal justice, and health systems. This project addresses hate-motivated behavior through data drawn from a national U.S. sample (currently being collected). The central focus of the project concerns development of the Hate-Motivated Behavior Checklist, a self-report tool designed to capture frequency, types, and motivations of hate-motivated behaviors. Measures are also being collected concerning mental health, socio-political attitudes, exposure to social groups, and other factors that may contribute to the commission of hate-motivated behavior. The Summer Scholar would work with Dr. Cramer and several collaborators (scholars from other institutions and leading national organizations such as the Matthew Shepard Foundation). Depending on the student’s experience and interest, they may contribute: (1) literature review; (2) data cleaning; (3) attending collaborative meetings/calls; (4) conference abstract development, and/or; (5) research manuscript development. Dr. Cramer and his team is also invested in long-term research mentoring. As such, the student would have the chance to learn data analytics methods, interface with other UNC Charlotte scholars and graduate students, and explore the potential of graduate study.

Minimum Qualifications: Experience with library literature database searches (e.g., PubMed, PsycINFO); academic training (e.g., major/minor) in public health, psychology, criminal justice, sociology, nursing, or related discipline(s); exposure to data analytic software (e.g., SPSS); proficiency in Microsoft Office, especially Excel and PowerPoint (or related visualization capabilities); a grade of B or higher in a research methods or similar course; experience and ability for strong academic writing at the undergraduate level (as demonstrated by a writing sample).
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Examining Teachers Perceptions of and Use of Inquiry in Math

Mentor Name: Dr. Drew Polly

Mentor Department: Reading and Elementary Education

Mentor College: College of Education

Mentor Status: Full Professor

Project Description: This study is using survey and interview data from elementary school teachers to examine their perceptions of and use of inquiry wall teaching mathematics. Research Scholars will contribute by helping with data collection, data analysis, and the presentation and publication of results.

Minimum Qualifications: Comfort with Google Documents.
Summer Program: The Charlotte Research Scholars

Project Title: Anti-Racist Pedagogy in Elementary School

Mentor Name: Dr. Erin T. Miller

Mentor Department: Reading and Elementary Education

Mentor College: Cato College of Education

Mentor Status: Associate Professor

Project Description: Through a Spencer Foundation Small Grant, I will be collecting data on a three day anti-racist improvisational workshop in a 5th grade classroom in May 2020. A Summer Scholar would contribute to this project by assisting with the implementation of the workshop, data collection, data organization, and initial analysis.

Minimum Qualifications: Translation skills, research skills, data organization (N’Vivo).
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: The Impact of Pediatric Multiple Sclerosis on Parents and Siblings

Mentor Name: Dr. Suzanne Boyd

Mentor Department: School of Social Work

Mentor College: College of Health and Human Services

Mentor Status: Associate Professor

Project Description: Currently, 1 million adults are diagnosed with Multiple Sclerosis in the United States. Approximately 10,000-15,000 children are diagnosed with Pediatric Multiple Sclerosis. While Disease-Modifying Therapies are being approved at a fast rate to stop the progression of MS, there is no cure available. Persons living with MS are impacted in many ways. The Summer Scholar will have the opportunity to participate in two research projects about MS: (1) The impact of Pediatric and Adult MS on sibling relationships and (2) Online Survey: Demographic profile of persons with MS in Mecklenburg County and Needed Resources/Services. Scholars will participate in finalizing an IRB application, survey development, original data collection, data analysis, and final report writing. They will have the opportunity to be a contributing co-author of a peer-reviewed manuscript depending on their interests.

Summer scholar will complete CITI training, be involved in all aspects of with 2 projects research that centers on have the opportunity to conduct an independent project. They will learn how to identify and evaluate empirical research evidence, write an Institutional Review Board application, develop project goals, methodological approach, develop and collect survey data, and basic data analysis skills, and present results to project stakeholders.

Minimum Qualifications: This project is well-suited for students who are self-directed, motivated/eager to learn and to develop both oral and written communication skills. Basic proficiency in Microsoft Word, some familiarity with Excel, overall computer skills. Scholars will be important research team members.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Using Data to Prevent Sexual Assault at UNC Charlotte

Mentor Name: Dr. Annelise Mennicke

Mentor Department: Social Work

Mentor College: College of Health and Human Services

Mentor Status: Assistant Professor

Project Description: Sexual assault and other forms of interpersonal violence are an unfortunate reality for college students, and UNC Charlotte is no exception. This project will afford an eager, engaged, and activist-oriented student the opportunity to help analyze UNC Charlotte-specific data about sexual assault that can inform prevention and intervention programs and policies. Specifically, over the past four years, I have collected data from over 8,000 undergraduate students on their experiences with sexual and interpersonal violence, attitudes and beliefs about sexual violence, and engagement in bystander behaviors. The goal of this summer project will be to longitudinally analyze the data to assess trends in victimization, utilization of resources, and promising areas for prevention and intervention. Students will assist in crafting a literature review, analyzing data, and writing a manuscript for publication. In addition, we will prepare a report that will be distributed to university administrators and campus officials.

Minimum Qualifications: Experience reading peer-reviewed/academic journal articles; strong writing skills. Preferred qualifications: knowledge of SPSS; graphic design skills; volunteer experience with sexual assault prevention or intervention programs.
Summer Program: The Charlotte Research Scholars
Project Title: Human Papillomavirus Literacy among Sexual and Gender Minority Populations
Mentor Name: Dr. Yuqi Guo
Mentor Department: School of Social Work
Mentor College: College of Health and Human Services
Mentor Status: Assistant Professor

Project Description: The proposed project aims to promote cervical cancer prevention through informing tailored interventions for sexual minority women, by collecting data on cervical cancer screening among sexual minority women. The proposed study will be an exploratory cross-sectional survey design by surveying 500 sexual minority women to understand their Pap test use behaviors. The principal investigator (PI) will modify an existing survey that the PI previously developed and used for a cancer screening study. The participants will be recruited online from Amazon Mechanical Turk (MTurk).

A summer scholar is important to this project. This project plans to complete data collection during summer from May to August. The student will work on the research project under the PI’s close supervision. The student will play an important role in the proposed research project. She/he will be accountable for helping to identify participants, recruitment effort, and data management. The student will also help the PI revise the questionnaire, conduct the survey, and collect and analyze data. After finishing the project, the student will present the results of our research nationally and internationally along with the PI. The PI and the student will also publish articles to disseminate the findings and provide more practice references and policy suggestions for other researchers and policy makers.

We truly believe that we have to collect preliminary data through this pilot study and to develop community-specific intervention strategies. We anticipate that this summer program will help the faculty and the students build up a strong mentorship. Also the preliminary data collected during summer will prepare us for continuous grant funding opportunities from the NIH/NCI, American Cancer Society, and Center of Disease Control and Prevention in the Fall semester 2020.

Minimum Qualifications: To complete the proposed research project, the students should be able to speak and read English. Also, the students need to have basic skills of using Excel to manage data.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Race, Health, and Knowledge: Addressing Custodial African American Grand-Parenting Needs

Mentor Name: Dr. Kendra Jason

Mentor Department: Sociology

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Assistant Professor

Project Description: African American custodial grandparents are often sought out by social services to provide immediate care for one or more young grandchildren, yet, grandparent caregivers receive significantly fewer services and support than non-caregivers. This is further complicated because placement with African American grandparents are often permanent. Further, African American grandparents are more likely to be plagued with issues related to poverty, chronic illnesses, as well as a lack of knowledge and trust when it comes to navigating social and medical institutions. Drawing on data derived from 22 custodial grandparents in the Piedmont area of North Carolina, our aims are to (1) understand the physical and mental health needs of African American custodial grandparents and; (2) identify what supports are needed for these grandparents to provide the best care for themselves and their grandchildren.

Research, policy and practice implications of this research include identifying social supports unique to African Americans (e.g., family, friends, distant kin, church) and determining strategies to strengthen them, which is paramount to addressing disparities in care and health for custodial grandparents.

A summer scholar would greatly contribute to this project by assisting with data collection, analysis (thematic coding and analytic memoing), creating tables and graphs, and writing collaborations.

Minimum Qualifications: Ideally student has taken a research methods course (not mandatory). Excel and Word proficiency needed. Student will be trained on qualitative methods and NVivo software.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Understanding Why Students Dropout from STEM Majors: Are there Racial/Ethnic Differences?

Mentor Name: Dr. Martha Cecilia Bottia

Mentor Department: Sociology

Mentor College: College of Liberal Arts and Sciences

Mentor Status: Research Associate Professor

Project Description: The research aims to identify important individual, school, and college level variables that are related to students' odds of dropping out from STEM (Science, Technology, Engineering, and Mathematics) majors. In addition, the study will analyze if the significant variables vary depending on students' racial/ethnic backgrounds. The scholar would help with the literature review on causes of dropping out from STEM and will conduct, under my guidance, preliminary quantitative analysis of data to test hypotheses.

Minimum Qualifications: Good writing skills, preferably some familiarity and/or interest with quantitative methods (STATA), interest in the topic.
Summer Program: The Charlotte Research Scholars

Project Title: Mental Health Informatics

Mentor Name: Dr. Albert Park

Mentor Department: Software and Information System

Mentor College: College of Computing and Informatics

Mentor Status: Assistant Professor

Project Description: Data annotation, building computational framework to extract relevant information.

Minimum Qualifications: Computational skill and coursework completed for Machine Learning or Natural Language Processing.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: Identifying the Commonalities in Upper Elementary Struggling Writers and Practice-based Professional Development for Self-regulated Strategy Development: Evaluating Changes in Teacher Instruction across Multiple Implementations

Mentor Name: Dr. Erin FitzPatrick

Mentor Department: Special Education

Mentor College: College of Education and Child Development

Mentor Status: Assistant Professor

Project Description: Two research projects are occurring and the student would be able to support either or both projects. "Identifying the Commonalities in Upper Elementary Struggling Writers" is a systematic literature review to determine how the term struggling writer has been defined in the literature across time. In that work, the student would learn to conduct a systematic literature review, create characteristic matrices, and synthesize findings for publication. A second project, "Practice-based Professional Development for Self-regulated Strategy Development: Evaluating Changes in Teacher Instruction across Multiple Implementations" is a mixed methods research study to investigate change in teacher pedagogical skills across multiple implementations of a writing intervention within the same genre. These research questions will guide the investigation: (1a) How are teachers modeling self-regulatory talk? (1b) With regard to number, duration, and quality, how did teacher modeling of self-regulatory (e.g., ideation, coping strategies, motivation) talk change across repeated implementations? (2a) How are teachers modeling essay writing? (2b) With regard to duration and quality, how did teacher modeling of essay writing change across implementations? The student researcher will support transcription of data as well as coding to answer these questions.

Minimum Qualifications: The student will need to have good writing skills. Basic Microsoft Excel skills are desired.
Summer Program: The Charlotte Research Scholars Program (CRS)

Project Title: North Carolina AIG District Plans: An Investigation of Recommended Differentiated Curriculum, Instruction, and Programming for Gifted Learners

Mentor Name: Dr. Cindy Gilson

Mentor Department: Special Education and Child Development

Mentor College: College of Education

Mentor Status: Assistant Professor

Project Description: Would you like to learn more about how to differentiate for gifted learners? Then this project is the one for you! Here is some background information. Article 98 is the North Carolina legislation that requires all school districts to identify and serve Academically or Intellectually Gifted (AIG) learners from kindergarten through grade 12. This state policy also requires that school districts submit a 3-year AIG District Plan detailing how the six standards from the 2018 NC Program Standards document will be implemented and monitored within that district. These AIG District Plans, particularly Standard 3 Differentiated Curriculum and Instruction, provide a wealth of potentially helpful strategies, tools, and resources for pre-service and in-service teachers alike to learn how to best differentiate for gifted learners. However, to date, no one has compiled a comprehensive list of these differentiated approaches across the NC school districts. Given that gifted learners spend most of their time in the mixed-ability classroom, all education majors would benefit from compilation of the information provided in these documents. This list will add to a teacher’s toolbox of strategies to be an effective teacher.

This summer project will involve the application of qualitative research analysis methods to compile and evaluate the differentiation approaches as listed in the NC AIG District Plans. These plans are publicly available through the NC Department of Public Instruction website, so we will not need to go through the IRB process. The district plans will be downloaded and compiled into a UNCC Google Drive folder or NVivo 12, which is a qualitative analysis program. Dr. Gilson and the Research Scholar will develop a codebook to then analyze each document. The differentiated approaches used by the districts will then be evaluated using quality indicators to ensure that the approaches are best practices and recommended by experts in the field of gifted education.

The findings of this study will help AIG directors and specialists better serve gifted students and support classroom teachers. It may also inform future research studies, publications, and professional development for pre- and in-service teachers.

The Charlotte Research Scholar on this project will participate in a supportive, collaborative, and intellectually stimulating mentorship experience. The Primary Investigator, Dr. Cindy Gilson, will provide the Scholar with foundational knowledge of qualitative research designs, as well as introductory skills for screening, organizing, and analyzing qualitative data. Specifically, the Scholar will contribute to the research study by coding data to identify themes that help answer the research questions. The Primary Investigator will guide the Scholar so that he/she can
successfully complete the tasks. Depending on the Scholar's interests and writing skills, there is an open opportunity to co-author a manuscript for publication. Additionally, the Scholar is welcome to identify a research question to answer based on his/her particular interest in the study.

Minimum Qualifications: Motivation to learn, an interest in research skills, and basic computer skills (ex. how to use email and Google Drive).