**UNDERGRADUATE RESEARCH APPRENTICESHIP PROGRAM 2016/17**

**GRADUATE MENTOR PROJECT DESCRIPTIONS**

1. ***Aseel Addawood, Informatics***. Factors influencing Attitude Formation for Controversial Topics. Controversial topics are topics that do not have strong bases of evidence that everybody can agree about. For example, topics as vaccines, encryption, immigration and many more are considered controversial. Our project seeks to understand what factors affect user opinion/attitude formation for these topics. We investigate social, psychological and source factors. We will work mainly with social media data as Facebook and twitter. It is an interdisciplinary project including information science, psychology and computer science. Suitable candidates are preferred to be from one of these departments. The researcher will help in annotating tweets and Facebook comments beside working and learning new software's that help with collecting and analyzing social media data. Programming skills are always useful, but not essential. Candidates learn a lot throughout the project. He/she will help in the development and implementation of the project. The student will have an insight into a graduate student life, attend meetings and learn communication skills. The undergraduate student will be informed on how research papers developed starting from ideas into actual research papers submitted into conferences or journals. One aim is to have a submitted paper by the end of the semester.
2. ***Ashley Long, Social Work***. The Influence of Corporate Social Responsibility (CSR) on Social Change. My research focuses on the role of business in social welfare. I intend to examine why business engages in philanthropy and what value is gained from their involvement. This research will contribute to our understanding of the social impacts of CSR and cross-sector partnerships. The research will use a mixed methods approach. In the spring of 2017, I will implement a survey with businesses in regards to their CSR activities. Most likely this survey will target two cities – I am currently working to secure the two specific geographic regions but Chicago will probably be one of them. I have also secured access to social media data to analyze CSR trends in the identified geographic regions. Further, an additional survey will be implemented with social service providers partnering with businesses. In addition to all of this quantitative data, some qualitative interviews will be conducted to validate and further explore my research questions. Based on a timeline of successfully defending a dissertation proposal yet this fall in 2016, I plan to be collecting and analyzing data during the spring of 2017. There are many aspects of this research that an undergraduate student could be incorporated into. With guidance, a student will help collect and maintain some of the quantitative data. He or she could also potentially help code interviews and summarize findings.
3. ***Jingwei Zhu, Mechanical Science & Engineering***. My dissertation project is about a new type of air conditioning/heat pump cycle, called ejector cycle, that has great potential in automotive and residential applications. I am developing several new control mechanisms/devices (simple, inexpensive, reliable) for such a cycle and also for conventional cycles so that they can achieve better performance under a wide range of working conditions. A lot of industrial partners at Air Conditioning and Refrigeration Center are following the updates of this project. The apprentice will design the parts needed for experiments using CAD tools and learn how to manufacture them in the machine shop or by using rapid-prototyping. He/she will also collect and analyze experimental data with me. If everything works out smoothly, the apprentice will also design control algorithm for the system with me. He/she can learn about how to do research before attending graduate school and have a clear idea about the current and the future of HVAC industry.
4. ***Robert Arias, Marketing – Consumer Behavior (Business Admin)***. My dissertation utilizes a multimethod approach to study how consumers construct, maintain, and enhance their experiences of belonging via consumption activities (including the purchase of a product, service, or experience). At this time, most consumer research examines how consumers react to belonging threats. I, however, focus on individuals’ conscious choices to use consumption to belong. I investigate this phenomenon in the form of two essays. I first leverage data from interviews, observations, and written narratives to develop a theoretical framework for what we term, the sense of belonging process. In my second essay, I intend to conduct a series of psychological experiments to illustrate how specific psychological dispositions may affect this process. Given my multimethod approach, an undergraduate research apprentice may participate in the research in a variety of ways. If assisting with my qualitative essay, an apprentice may choose to transcribe interviews, learn how to analyze textual data, and perhaps even conduct interviews. If the apprentice’s interests and skills align with my experimental essay, I may teach the student how to design and conduct psychological experiments and use statistical tools to analyze the quantitative data.
5. ***Stephanie Brown, Institute of Communications Research (Media & Communications)***. My dissertation project centers on gender in stand-up comedy and the ways that stand-up both as a job and a subculture can be used as a case study to better understand gender discrimination, sexual harassment, and cultural gatekeeping more broadly. More specifically, my project theorizes the ways in which stand-up is culturally, industrially, and socially constructed discursively through things like critics’ reviews and media representations and materially through behavioral norms, economic gatekeeping, and more insidiously, sexual harassment and gender discrimination. One section of the dissertation will be grounded in interviews with women performing stand-up comedy, both amateur and professional. I am specifically interested in having an undergraduate apprentice assist with the interview process: identifying and contacting potential interview subjects, printing and keeping track of informed consent forms, crafting interview questions, being present for and helping to conduct the interviews, and transcribing and analyzing the interview answers. Additionally, I will walk them through the IRB approval process, interviewing and ethnography as methodologies within the humanities, the recording and archiving of interview files, and analyzing qualitative data.
6. ***Joshua Gibson, Entomology***. My dissertation research involves using trap-jaw ants as a model system for understanding the role of biomechanics on shaping and directing the evolution of power amplification mechanisms in animals. Trap-jaw ants have mouthparts akin to bear traps, which they use to incapacitate and capture prey. These trap-jaw mechanisms, through the use of biological springs, levers and latches, allow them to slowly store elastic energy within their head capsules and subsequently release this energy at near instantaneous speeds. The mandible strikes of trap-jaw ants are some of the fastest movements known from the animal kingdom, with some ants possessing mandible strikes that reach maximum velocities upwards of 160 miles per hour! Remarkably, trap-jaw mechanisms appear to have evolved independently as many as eight times within the ant family. An undergraduate mentee will assist in recording and analyzing videos of high speed ant mandible strikes, dissecting and weighing components of trap-jaw mechanisms in different groups of ants, analyzing microCT scans of ant heads to examine internal morphology, and designing and conducting experiments to examine the behavioral implications of possessing power amplifying mandibles. Possible ant groups used in these projects include the genera Strumigenys, Plectroctena, and Odontomachus. Initial work will be strictly supervised and directly related to dissertation research, but students will be encouraged to think creatively and design possible experiments for independent projects as the semester progresses.
7. ***Mary Pietrowicz, Computer Science***. My project explores vocal expression in speech from an interdisciplinary perspective, which incorporates techniques from speech and signal processing, machine learning, human-computer interfaces, and linguistics. I am exploring the perception, analysis, and automated detection of emotion and voice quality (such as roughness, breathiness, creakiness, etc.), and am uncovering relationships between the two. Discoveries from this research may be useful in 1) enhancing voice/speech recognition techniques, 2) improving research methods for exploring human expression, 3) developing diagnostic and monitoring systems for physical and mental health, 4) improving security systems, 5) improving automated voice systems, 6) improving search capability, and even 7) creating interactive art installations and immersive, embodied user experiences. An apprentice could work with me on with a variety of tasks, which would depend on background and interest, such as running studies in voice perception, curating portions of oral history accounts, developing machine learning/signal processing software to recognize elements of emotion and voice quality, designing experiments and automating them, and porting and releasing software analytics packages. By the end of the semester, the experience will provide an exposure to research (helpful for graduate school), immersion in interdisciplinary work, and the opportunity to learn and apply software analytic techniques (useful in either industry or grad school).
8. ***Tyler Refsland, Program in Ecology, Evolution & Conservation Biology***. My dissertation investigates the effect of fire disturbance on forest resilience to drought stress. Current projects include (1) an observational study investigating differences in the drought response of burned and unburned adult oaks as recorded in historical tree rings, and (2) a meta-analysis of fire-driven changes to both forest community composition and species traits relevant to drought tolerance. A student will have the opportunity to gain lab-specific skills in dendrology by measuring, photographing and extracting alpha-cellulose from archived tree rings, in addition to analytical skills working with ‘big data’ and the coordinated use of reference manager (Endnote), relational database (Microsoft Access) and statistical software (R Studio).
9. ***Fatemeh Ostadhossein, Bioengineering***. My Ph.D. thesis involves developing novel nanoparticles for biomedical and therapeutic applications. In this project, we are introducing strategies to design, synthesize and characterize new nanoparticles which can be used for bio imaging and drug delivery purposes. Specifically, in one of the researches we are addressing one of the most perplexing obstacles in the field of cancer therapy i.e. the tumor resistant cancer stem cells via novel nanomedicine approach. We uniquely bring chemical, bio-physical and engineering methodologies to this project. In another project, we are developing nanoparticles for imaging and treating the periodontal diseases. On the other hand, other researches include the development novel dual imaging modality nanoparticles, the development of new nanoparticle probes for fluorescence imaging and many other open opportunities in the field of nanoparticles for the biomedical applications. In these projects the undergrad apprentice will be able to learn the nanoparticle synthesis and the characterization techniques such as Dynamic light scattering, UV- Vis spectroscopy, ultrasonication, and some off the lab techniques conducted at MRL and RAL. Also, the other aspect of the research highly concerns with biology and the apprentice is expected to learn cell handling such as passaging the cells, counting and plating the cells and is also expected to carry out assays with the cancer cell lines such as MTT assay. It should be noted that getting used to the biology part is highly demanding and will require longer time than other methods. The apprentice is potentially expected to work with non-pathogenic bacteria, too, at some part of the projects. This includes handling and growing bacteria which is easier than handling the human cell lines. In addition, since the lab is physically located in Carle biomedical research center, the mentee is required to take special training and orientation to obtain Carle badge.
10. ***Thornton Miller, Musicology***. My dissertation project focuses on Anglo-Soviet cultural exchange in the field of classical music between the mid-1950s and mid-1970s in order to uncover the agency of professional musicians who navigated the differences between two very different political, ideological, economic, and legal systems. This research considers the personal and professional relationships between key British and Soviet musicians, as well as relationships forged between British and Soviet governmental and commercial institutions involved in international cultural exchange. The methodology of my work is primarily historical and requires the collection and study of archival evidence. The primary goal of the mentorship project will be to reorganize the archival materials I gathered in England and, if the mentee is able to read Russian, in Russia. The material should be organized for easy access and to provide as complete citation information as possible. Also, we would draft summaries and timelines for these files, in order to improve their organization and ease of access. These skills are essential for a researcher to manage one’s own personal archives.
11. ***Rai Pronoy, Geography***. My dissertation research investigates whether the seasonal migration of landless laborers in villages to cities and other productive rural areas engenders changes in class, caste, and gender relations in the home villages of the laborers. I study these changes in the dryland villages of rural western India. Broadly, I seek to understand whether migrants who move back and forth between villages and cities bring to their home villages newer forms of negotiations around labor, expectations of social conduct with the rural elite, and changes to culturally determined roles of rural women and men. The empirical information required to answer the research questions in my dissertation project is in the form of in-depth interviews, focus group discussions, memos from participant observation, and archival materials. Since late spring 2016, I have been making significant progress with analyzing the information collected by me and I welcome the opportunity to work with a research assistant in spring 2017 on the data. I will train, assist with, and eventually have the undergraduate student independently (1) conduct systematic multidisciplinary literature review on intra-rural labor migration in developing countries and the role of intermediaries in facilitating this migration; (2) code transcribed interviews and discussions on a qualitative data analysis software called NVivo 11 for Windows; and (3) conduct analysis of archival materials. The student will have a chance to get acquainted with “data” in the social sciences; learn qualitative social research methods; and be informed about social issues in the global South and therefore, potentially, apply and secure national and internationally competitive scholarships to study and research in South Asia or other places abroad.
12. ***Raquel Escobar, History***. My dissertation examines the concept of the “Indian problem” in the twentieth century as a transnational phenomenon across the Americas (strong focus on the U.S., and Mexico). During the early twentieth century the concept of the “Indian problem” was the belief that indigenous communities were hurdles to national development and the creation of a unified citizenry. This concept became a common entry point for transnational governmental, academic, and legal engagement across the Western Hemisphere. My dissertation examines how this political moment enabled the creation of a Pan American organization that was focused on solving the “Indian Problem” of the Western Hemisphere. Focusing on this Pan American organization my dissertation covers the political moment that led up to its creation, underlying motivations for U.S. involvement, local and national reaction to the institute and its projects, as well as the broader implications this moment had on international Indian policy. For this project, the undergraduate student might have responsibilities that include Historical newspaper research via microfilm and digital archives, archival research at the UIUC Rare Books and Manuscript Library, and potentially transcription and translation of correspondence (depending on language skills). Reading proficiency in Spanish would be beneficial, but not required.
13. ***Kim Drager, Integrative Biology***. My dissertation project is on the architecture of ant nests and how nest shape varies between different species and environments. I use 3-D scans of ant nest casts to model how nest shape affects soil processes such as water flow, erosion, nutrient leaching, and mineral weathering. My current work is on a common species of ant found on a hillslope in Sand Ridge State Park in Illinois. The goal is to find out how nest architecture (e.g., orientation of chambers, total volume and depth of nest) changes in various positions along the hillslope. I will then model water flow through the hillslope to determine the effect that the varying nest shapes have on hydrological and erosional processes in the soil. An undergraduate assistant will work to digitize the casts I make of the ant nests using 3-D photogrammetry. This undergraduate will also use 3-D editing software to refine and edit the 3-D models, and ultimately to create a digital reconstruction of ant nests along the hillslope to be used in the hydrological simulation.
14. ***Lisa Ortiz, Education Policy, Organization & Leadership***. The purpose of this project is to explore the ways in which Puerto Rican migrants negotiate new - and maintain previously established - spaces, places, and relationships while unveiling if their educational aspirations and desires of progress for themselves and/or their families come into fruition. Particular attention will be given to class and individual forms of capital and community cultural wealth in order to explore social mobility of an ethnoracial minoritized group in the Rural Midwest. By employing ethnographic methods such as participant observation and interviews, I focus on the perceptions of intergenerational families who engage in rural-to-rural migration to the Midwest. In addition, I juxtapose such necessary stories with narratives of news media in the island as well as examine the role of social media in maintaining ties and remapping the island, and in sharing migration stories. Given that the nature of my project relates to individuals as well as archives, an undergraduate apprentice can choose an area in which they might feel their interest is better incorporated. That is, I foresee the possibility of transcribing, potentially visiting participants, attending public meetings, or working individually with media or archival sources. More importantly, if given the opportunity, I hope to learn from my future mentee by them providing insight with regard to direction of research, theoretical interpretations, and ethical considerations.
15. ***Rekha Balachandran, Comparative Biosciences (Neurotoxicology)***. My dissertation project is aimed at elucidating how circadian disruptions affect impulsive behavior and its underlying neurochemistry. Circadian rhythms are innate rhythms that govern behavior and physiology. Disruption of these rhythms are associated with increased risk of cardiovascular and reproductive disorders, decreased immune responses, and poor cognitive abilities. Previous studies have shown the impact of circadian disruption on aspects of attention and memory, but there are few studies that examine its effect on impulsive behavior. Impulsivity is a behavior that is associated with commonly diagnosed neurobehavioral disorders like ADHD and bipolar disorders. In my dissertation, I will examine two different models of circadian disruption, working during reverse light cycle and working when exposed to light at night and the effect they have on impulsive behavior. In addition, I am examining the molecular basis for this difference in behavior between the models of circadian disruption and the controls. An undergraduate assistant will aid me in conducting both behavior testing and molecular analysis. The undergraduate will work with me on performing daily behavior testing in our lab, tissue collection and processing, and the molecular analysis after the behavior testing is completed. There are established protocols for all the experiments proposed in my dissertation proposal and within the Eubig lab. This will support the undergraduate in learning behavior testing paradigms in which our lab specializes and the molecular methods that will be used to analyze endpoints of protein and gene expression.
16. ***Qina Yan, Hydrosystems Lab, Civil and Environmental Engineering***. ***How does the glacial legacy and human legacy affect present hydrologic, geomorphologic, and Carbon-Nitrogen dynamics?*** My research aims to understand how long-term climate change since the Grate Ice Age and short-term human activities, such as tillage, channelization, commercial fertilizer, etc., impact landscape evolution and soil carbon-nitrogen dynamics. Two related projects for undergraduate apprentice include: River floodplain estimation and flood event prediction: This research aims to delineate floodplain area inside a river valley and then provide an effect way to predict the spatial flooding range in nature river; and 2. Coupling carbon dynamic and soil erosion/deposition processes to predict the Soil Organic Carbon (SOC) storage in agriculture field over the decades: Student will learn how to use measure data into simulation and predict future scenarios. An undergraduate apprentice might be incorporated into the project via collecting data from the field and lab measurements, running numerical models (i.e. Python, MATLAB or C++), plotting geospatial graphics (with ArcGIS), and even participating writing literatures for publication. The undergraduate would build a good background and intuitive on the interdisciplinary area between hydrology, geomorphology, and biogeochemistry.