DIA JumpStart

SUMMER RESEARCH PROGRAM FOR UNDERGRADUATES

USC’s Graduate Initiative for Diversity, Inclusion, and Access (DIA) aims to increase the pool of diverse PhD applicants by providing academic and financial support and professional development opportunities.

DIA JumpStart works with USC schools and programs to invite diverse candidates from outside institutions to apply for 10-week summer research opportunities in various PhD disciplines. Available opportunities range from lab-based research to mentored participation in other types of faculty projects.

PROGRAM BENEFITS

The Graduate School provides JumpStart students with a stipend and health coverage. Those who successfully complete the program will also have their application fees waived if they apply to USC PhD programs.

To complement their summer research experience, JumpStart students will participate in Graduate School-sponsored sessions on professional development and PhD funding, and an end of summer research presentation.

APPLICATIONS

Students completing their sophomore or junior year at outside institutions prior to the summer are encouraged to apply through JumpStart for available research opportunities.

Applications are evaluated by the research program, or faculty, and the Graduate School.

Applications for research positions through DIA JumpStart are available at https://websites.usc.edu/graduateschool/jumpstart

As part of the application, students will be required to submit:

- Personal statement and research interests
- Short statement on academic and professional goals
- Resume or CV
- Current transcripts (unofficial or official)
- Two (2) letters of recommendation should be submitted directly to brooksas@usc.edu before the JumpStart application deadline

FOR MORE INFORMATION

Questions about DIA JumpStart should be sent to Ashley Brooks at brooksas@usc.edu.

Additional information can also be found by visiting http://graduateschool.usc.edu/dia/
DIA JumpStart

2018 AVAILABLE RESEARCH OPPORTUNITIES

I. SUMMER UNDERGRADUATE RESEARCH FELLOWSHIP
   School of Pharmacy

II. SNAPSHOTS OF CHEMISTRY
    Dornsife College of Letters, Arts and Sciences

III. NEUROSCIENCE EXPERIENCE UNDERGRADUATE RESEARCH AND LEARNING PROGRAM
     Neuroscience Graduate Program

IV. BRAIN AND CREATIVITY INSTITUTE
    Dornsife College of Letters, Arts and Sciences

V. MUSCULOSKELETAL SONOGRAPHY & OCCUPATIONAL PERFORMANCE LABORATORY
   Chan Division of Occupational Science and Occupational Therapy

VI. ALGORITHMIC FAIRNESS
    Differential Privacy
    Viterbi School of Engineering

VII. POPULATION, HEALTH, AND PLACE
     Dornsife College of Letters, Arts and Sciences

VIII. INSTITUTIONAL RESPONSE TO TRANSIT ORIENTED DEVELOPMENT
      Price School of Public Policy
The USC School of Pharmacy’s Summer Undergraduate Research Fellowship (SURF) is geared towards increasing learning and networking opportunities for undergraduate students committed to pursuing either professional or academic research careers in pharmaceutical and translational sciences. Students will develop confidence and independence in conducting research and communicating scientific concepts under the guidance of faculty and other mentors. In addition to daily engagement in the lab, students will attend biweekly entrepreneurship/professional development seminars and participate in a workshop on the graduate school application process so as to stimulate serious consideration of graduate study. At the end of the summer, students will give an oral presentation of their research to their peers and faculty.

PROGRAM REQUIREMENTS:

- Have a strong desire to pursue a PhD in one of the disciplines offered by the USC School of Pharmacy graduate programs in the Pharmaceutical & Translational Sciences and Health Economics (https://pharmgradprograms.usc.edu/)
- Strong academic background (GPA of 3.5 or higher) in the fields related to biology, chemistry, biochemistry, microbiology, biomedical engineering, and economics
- Students should have a working knowledge of lab skills and concepts learned through college courses such as chemistry and biology

APPLICATION INSTRUCTIONS:

- When applying, please indicate three (3) faculty from USC School of Pharmacy whose research is of interest to you, you can learn more about our faculty by visiting http://pharmgradprograms.usc.edu/faculty/.
- Housing may be provided. Consideration will include a demonstrated financial need and availability. Evidence of financial need can be demonstrated by emailing your most current FAFSA package directly to Ashley Brooks at brooksas@usc.edu.
Spend 10 weeks of your summer carrying out research in residence in our Chemistry Department. We use the term “Snapshots of Chemistry” to emphasize our focus on gaining insights on key chemical features of molecular processes via visual images. Research projects will cover a broad range of topics, spanning from femtosecond time-resolved observations of transient events to synthesis of novel drugs, development of nanostructures and catalysis in energy research, biochemical and structural investigations of proteins and nucleic acids, and theoretical investigations using advanced algorithm and state-of-the-art computer graphics and multimedia capabilities.

In our summer program, you will work one-on-one in a lab with a faculty advisor and graduate student mentor. We will have weekly seminars on scientific topics as well as graduate school applications and scientific ethics. Included will also be tours of local research facility such as the Loker Hydrocarbon Research Institute and other social activities. The summer will end with a poster session, where you will display your summer research and discuss it with Chemistry faculty and graduate students.

APPLICATION INSTRUCTIONS
When applying, please indicate a research preference:
Alternative Energy, Chemical Physics, Chemical Biology, Drug Discovery, Inorganic, Organic, Materials/Polymers, Nanoscience, Physical, Theoretical
Established by the USC Neuroscience Graduate Program (NGP), the USC Neuroscience Experience Undergraduate Research and Learning Program (USC-NEURAL) is devoted to providing outstanding research experiences and professional development opportunities for underrepresented minority undergraduates who have a strong interest in pursuing an advanced degree in the neurosciences.

Neuroscience is naturally interdisciplinary. We welcome undergraduates who major in a variety of fields, including various fields of biology, biochemistry, chemistry, computer science, economics engineering, genetics, mathematics, neuroscience, and psychology.

The program has a goal of partnering NGP training faculty members with a visiting NEURAL scholar, spending approximately 90% of their time in a laboratory research setting performing original research. A goal of the program is to provide a roadmap for the scholar to learn about a specific area of neuroscience, read original literature, perform experiments and learn analytical strategies. In addition to first-hand experience working in a lab, the program fosters interactions with current NGP graduate students and other faculty to learn about advanced training in the neurosciences more generally, and to discover outstanding opportunities for career development in academics, business, education and teaching, and public policy. Regular discussion groups tackle issues of ethical conduct in research, data replicability in the biomedical sciences, the art of producing a competitive graduate school application, personal interview and written statement strategies, and specific professional opportunities beyond the PhD.
The JumpStart student will conduct research in the laboratory of Dr. Lisa Aziz-Zadeh.

Our lab uses neuroimaging techniques to explore sensory-motor skills, and their potential involvement in processing emotions, empathy, and social communication in Autism Spectrum Disorder and Developmental Coordination Disorder. The DIA scholar will be involved in a study funded by the NIH R01 mechanism on autism and dyspraxia where he or she will learn all aspects involved in conducting a brain imaging study. This will be a full immersion into Lisa Aziz-Zadeh’s laboratory at the Brain and Creativity Institute.

Specifically, this student will administer a mentalizing task to a pediatric population, and learn the skills necessary for professional interactions with children in clinical and typical populations. This task would require management and monitoring in the RedCap database for numerous participants and their assessment data. The student would also transcribe the task responses and score them using a coding protocol provided by the lab. This work will allow for direct contact with post-doctoral researchers, graduate students, and the Principal Investigator. The student would attend weekly lab meetings, and lectures and talks at the Brain and Creativity Institute around the topics of neuroscience and psychology. This will allow exposure to the type of work involved in getting a PhD and the research field.
The MSOP Lab aims to evaluate holistic approaches to enhance evaluation, prevention and rehabilitation for work-related and upper-extremity musculoskeletal disorders. Current projects include identifying injury risk factors and developing preventive interventions, developing screening and early detection techniques using sonographic imaging, and examining mind-body interventions (e.g., mindfulness, guided imagery) for hand therapy. The JumpStart student would be exposed to all projects, but most intimately involved a project funded by the CDC/NIOSH. This project includes: 1) examining connections between occupational performance and injury by analyzing tasks and ergonomics through coding of videos of dental hygienists working with patients; and 2) analyzing, measuring, and interpreting differences in various musculoskeletal tissues and structures of the forearm and wrist (e.g., median nerve, tendons) and evaluating dynamic movements of these structures on sonographic images and video clips.

The MSOP Lab is in the Chan Division of Occupational Science & Occupational Therapy. Occupational science is an interdisciplinary field interested in understanding the activities in which humans engage on a regular basis (i.e., occupations), how occupations are linked to learning and are socially constructed, and how occupations impact health and well-being. The JumpStart student would have ample opportunity to learn about doctoral training in this academic discipline through ongoing contact with two PhD student research assistants, as well as direct mentoring with Dr. Roll, who is the Director of the PhD program in Occupational Science. The timing of participation is flexible according to student availability, but ideally would occur either May 29-Aug 3 or June 4-Aug 10.
**DIA JumpStart**

**ALGORITHMIC FAIRNESS**

**DIFFERENTIAL PRIVACY**

**VITERBI SCHOOL OF ENGINEERING**

The JumpStart student will work with Dr. Aleksandra Korolova at the Viterbi School of Engineering on one of two projects:

**AUDITING ALGORITHMIC FAIRNESS**

Data-driven algorithms and machine learning are increasingly used in systems that make decisions about and on behalf of people. As these algorithms become more common and more complex, it is crucial to understand their inherent risks, such as codifying and entrenching biases, reducing accountability, and creating new types of discrimination.

In this project, we will take a principled approach to auditing the algorithms used by a major online service provider with an eye to identifying unexpected risks. We will quantify the identified risks and factors influencing them, and research algorithmic modifications and transparency options that could help remedy them. An expected outcome of the project is a publication in a venue focused on algorithmic fairness, accountability and transparency, such as https://www.fatml.org/

**Pre-requisites:** Solid knowledge of algorithms; strong programming skills; familiarity w/ machine learning

**DIFFERENTIAL PRIVACY: FROM THEORY TO PRACTICE**

Differential privacy has emerged as the most promising approach to privacy-preserving data collection and analysis. Although recently differentially-private algorithms have been deployed by Google (https://github.com/google/rappor) and Apple, those deployments are limited in the kinds of use cases they can address.

In this project, we will address several of the barriers to making differentially private algorithms universally useful. We will develop new algorithms for differentially-private on-device machine learning while making modeling assumptions appropriate for medium-sized companies collecting data. The project will consist of algorithm design and analysis, prototype implementation, and experiments measuring performance under various assumptions. We'll aim to have the project’s findings published in a top-tier privacy or machine learning venue and adopted in practice by companies interested in providing strong privacy guarantees.

**Pre-requisites:** strong knowledge of algorithms & machine learning; familiarity with differential privacy

**APPLICATION INSTRUCTIONS:** Please indicate which project you are applying for.
The USC Ph.D. program in Population, Health, and Place is an interdisciplinary program shared among the Spatial Sciences Institute, Sociology, and Preventive Medicine. We work at the intersection of these three fields in hopes that students will emerge as leaders in public health. See more about our program here: https://spatial.usc.edu/index.php/doctoral-programs-1/

In the first 6-weeks, we propose that the fellows will audit and participate with our 8 Ph.D. students in collaborative research projects conducted through our practicum courses (SSCI 601ab). The precise collaborative projects are still being decided, but will likely include developing health indicators for metropolitan regions across California and addressing the social and spatial factors behind the opioid abuse crisis nationwide. DIA Jump start students would be expected to assist with various data processing tasks, depending on each student’s background and capability to be quickly trained (e.g., with GIS systems). The DIA students would present their own work on the collaborative projects at the end of their 10-weeks.

In the last 4-weeks of their program, the DIA students would assist Ph.D. students in researching dissertation proposals and receive academic mentoring from faculty and the Ph.D. students to support writing of research statements that they could use in applications in the future. Overall, DIA Jumpstart students would learn about the nature of interdisciplinary Ph.D.’s, how to locate and target Ph.D. programs in various field, and how to write a compelling statement of research interest.
The DIA Jumpstart student conduct research on an ongoing METRANS Transportation Center funded study at the USC Price School: Institutional Response to Transit Oriented Development in the Los Angeles Metropolitan Area: Understanding Local Differences Through the Prism of Density, Diversity, and Design. The objective of the proposed study is to examine local initiatives and institutional responses to transit developments, their evolution over the last 25 years, and the extent to which institutional responses to promote transit neighborhood idea have been implemented. Drawing on LA County’s diverse institutional, political, and socio-economic landscape, what inferences can be drawn about local governments’ response to the design and planning of transit-oriented developments (TODs), their relative success, and future outlook? Using an in-depth case study of 10 station areas, we will analyze the impacts of TOD and explore minority participation (housing, businesses, and employment) in transit neighborhoods — history, current trend, and future possibilities. Ultimately, this research will result in identifying locally driven best practices in station area development and a better understanding of institutional and policy responses and the role of community values and participation affecting land use near transit stations.

The DIA Jumpstart student will be exposed to a holistic and interdisciplinary research agenda converging on public policy issues related to the built environment, design, diversity, equity, public participation, and transportation. Price School faculty — Dr. Banerjee and Bahl — will mentor the student and s/he will work with Ph.D. and Master’s students to have an immersive and engaged learning experience.