USC Dornsife
Dana and David Dornsife
College of Letters, Arts and Sciences
Spatial Sciences Institute

As of November 14, 2019

Spatial Sciences Institute (USC Spatial) is now accepting applications for undergraduate student researchers to work with USC Spatial faculty on their research projects for the **Spring 2020 semester**.

We are looking for students who have excellent academic records, show interest in participating in cutting-edge research projects at USC Spatial, and are eager to take advantage of the opportunity to work directly with faculty on their research projects.

Priority will be given to USC Dornsife GIS and Sustainability Science minors, Spatial Studies minors, Human Security and Geospatial Intelligence minors, and GeoDesign majors. However, applications from all majors, minors, and academic programs throughout the University are encouraged. Students of all class standing (including incoming freshmen or transfer students) are welcome to apply.

The projects generally are structured for an average of 5 – 10 hours/week. **Accepted students will work out their specific work schedules for the semester with the supervising faculty or staff member and will be expected to honor the weekly time commitment for the duration of the semester.**

Where noted for certain projects, the research opportunities are contingent upon the student applying for Dornsife SOAR funding and being awarded that funding for Spring 2020. In all other projects, a research stipend is provided.

USC Spatial student researchers are expected to submit their research work for presentation. Venues for presentations include such the Esri Geodesign Summit held in January in Redlands; the Spatial Science Institute's LA Geospatial Summit on February 28, 2020 at the USC Hotel; the USC Undergraduate Symposium for Scholarly and Creative Work held in April on the USC campus; and the Esri User Conference held in July in San Diego. Students also are encouraged to submit their work to appropriate student research competitions, such as the 2020 USC Esri Developer Center Student of the Year Competition and the United State Geospatial Intelligence Foundation 2020 GEOINT Symposium.

Past student researchers have presented their results at international conferences such as the American Association of Geographers annual meeting, the SIGSPATIAL conference, and the GEOINT Symposium, and have co-authored published research.

To apply

Please provide:

- A resume which includes your name, contact information, major/minor, year in school, software and programming language competencies, and relevant course projects/skills;
- A current STARS report (not required for a new incoming student); and
- A statement of interest indicating the project(s) for which you are applying. You may apply for more than one project; please indicate the priority of your preferences. If selected, you will be selected for one project only.

Please email your complete application materials to Susan Kamei, Spatial Sciences Institute Managing Director, at kamei@usc.edu, by **5:00 p.m., Tuesday, November 26, 2019**.

Students selected by the faculty will be notified by mid-August so the research teams can be organized by the start of the Fall 2019 semester.

Questions?

Please email Susan Kamei or call her at (213) 740-1375, or email Ken Watson, Spatial Sciences Institute Academic Programs Director, or call him at (213) 740-8298.

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Dr. John P. Wilson, Professor of Sociology and Spatial Sciences
"Developing a Routing System for Non-Traditional Addresses in Los Angeles County"

This is a new project with openings for two undergraduate student researchers. These student researchers will work under the direction of Dr. Wilson, the Geographic Information Officer of Los Angeles County, and the Director of Applied Intelligence for Accenture's Health & Public Service – West division in formulating and delivering project milestones.

If selected for this project, students must be prepared to submit an application for Dornsife SOAR funding for the Spring 2020 semester by Thursday, December 5, 2019.

Project Objective:

Develop an addressing system for locations within the Los Angeles County trail system that can be used to locate issues and efficiently route responders to the correct location via multi-model transport (e.g., routing along the road network to the optimal access point, and continuing along the trail network).

Background:

The County of Los Angeles has more than 550 miles of public access trails, which play a vital role in facilitating the outdoor recreation that contributes to the health and well-being of LA County residents. LA County's homeless community sometimes uses these same public spaces (parklands, open space, river trails and wild landscapes) causing concerns amongst various public safety agencies.

Therefore, several County agencies need to identify, map, access and provide services at these non-traditional addresses. For example, should medical emergencies, fires or fire risk, sanitation, or another social service be required at an encampment, or to serve a recreational user, multiple agencies have a vested interest in identifying and routing to these locations. Providing non-traditional addressing for these known location along county trails could foster increased support services, and the ability to respond to emergencies sooner for all LA County residents.

The potential project area includes "The Emerald Necklace" a 17-mile-long loop of bicycle, equestrian and walking trails connecting the San Gabriel River, the Rio Hondo, and the Whittier Narrows region of parks and the local Nature Center. Another option would be to address an area in the Santa Monica Mountains.

Related articles:

Convergence of Homelessness and Open Space Challenges: Santa Monica Mountains Conservancy Forum

How L.A. Plans to Address Intersecting Issues of Homelessness and Open Space

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Dr. Robert O. Vos, Assistant Professor (Teaching) of Spatial Sciences

"Locations of Licensed and Unlicensed Cannabis Retailers in California: A Threat to Health Equity?"

This project has an opening for one undergraduate student researcher with Intermediate to advanced skills with processing and analyzing data in ArcGIS Pro.

Project Description:

The project is investigating the influence of proximity to cannabis retail facilities on adolescent cannabis use.

The student researcher will conduct analysis and organizing data on accessibility of individual addresses to cannabis facilities. The workflow will be carefully explained.

The time commitment will be approximately 5-8 hours per week on average.

Funding is from the Provost's Undergraduaet Research Associate Program (URAP) and the stipend will match the experience level and time the student can devote to the project. Time will be allowed for this student to create work product at the end to demonstrate accomplishment as required for the URAP award.

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Dr. Andrew Marx, Associate Professor of the Practice of Spatial Sciences, and Dr. Parveen Parmar, Associate Professor of Clinical Preventive Medicine "Leveraging High-Cadence Data to Detect and Track Mass Migration"

This project has an opening for one research assistant who is strong at coding in Python to join the team of four other research assistants currently working on this project.

Project Description

Unexpected mass migrations continue to occur with entire towns and cities quickly fleeing sudden conflict (Myanmar village burnings 2017), natural disasters (Haitian earthquake 2010), manmade disasters (Chernobyl nuclear accident 1986) or unsafe conditions (Mexican migrant caravans 2018). Often these migrations take place in remote areas of the world where inaccessibility or unsafe conditions prevent on-the-ground observers and reporters. Additionally, information outflow is often limited or controlled by the government who is sometimes the perpetrator of the violence that individuals are fleeing. As a result, the international community struggles to react and position aid/services for large groups fleeing, having little to no warning of the migration and poor knowledge of their destination.

In response, the research proposes to leverage frequent, or high-cadence, data which directly and indirectly detects and tracks mass migrations. It will leverage two existing collaborations with private data providers: Planet.com (daily imagery of the entire Earth's surface) and Cuebiq.com (cellphone-based geolocation information). Firstly, the research will build upon ongoing work (partially supported with URAP 2018-2019 funding) to which continually monitors villages at-risk of attacks in Nigeria and Myanmar. Such attacks typically cause a mass migration from that location. Ground-reference information is provided by Human Rights Watch and Co-PI Dr. Parveen Parmar.

Secondly, the research will work through an existing collaboration with Cuebiq to provide detailed, anonymous location data on individuals in Nigeria and Myanmar. In the United States,

data are collected on 1 in 3 cellphone owners, providing their location 100 times/day to within 30 ft. A city the size Atlanta, can produce more than 1 million rows of location data/day on individual movements.

These two data streams will be brought together to monitor villages at-risk of mass migration. Specifically, it will use the Planet satellite algorithm to detect if/when different villages are attacked. It will then analyze location records to detect what percent of town residents, where they are going and when they will arrive. Typically, this is groups of individuals walking distances to the nearest international border. An early detection of an attack, coupled with knowledge of where, when and how many refugees or migrants are fleeing will significantly aid the international community in positioning aid and services.

Students will work as part of a lab, designing and implementing algorithms to harvest this massive stream of data into an alerting system that can inform the international community and ultimately reduce the suffering of those fleeing their homes.

Role of Undergraduate Researchers

The undergraduate research assistants will undertake all aspects of the research project. Under the direct supervision of Dr. Marx, they will:

- monitor smallsat imagery algorithm feed for attacks;
- create custom geospatial workflows to:
    - ~ detect when a large percent of a village's population flees and
    - ~ analyze the heading and speed of those fleeing to estimate arrival at the displaced person's or refugee camp
- implement the workflow and work with international partners in the event of a natural or manmade disaster in the study area; and
- Co-author a manuscript.

Criteria for Selecting Student Researchers

In selecting the students, the lab is looking for students with three traits:

- passion for preservation of human rights and reduction of human suffering;
- some background in Python coding in the Jupyter environment; and
- the ability to think spatially and temporally about streams of geospatial data.

Oversight and Supervision of Student Researchers

Undergraduate researchers will join Dr. Marx's Human Security and Geospatial Intelligence Lab (hsgi.usc.edu) and will operate under its current practices. Specifically, they will meet weekly (as a group) with Dr. Marx in SSI for an hour lab session where they will go over weekly progress and next steps. In the intervening period, students use a shared Google Drive folder to record

their “worklog.” In this log they write how much they worked, when and what they did. Students not abiding by the policies are removed from the lab. Students share a $8,000 computing environment housed in the lab providing data storage, processing and software necessary for the research project. It is possible to work remotely on this project.

Integrative and Group Activities

Undergraduate researchers will have several opportunities to collaborate. Students will work closely with Co-PI Dr. Parmar, as her on-the-ground expertise informs the algorithms and workflow development. They will meet weekly with other graduate and undergraduate researchers as part of the Human Security and Geospatial Intelligence Lab (hsgi.usc.edu). The lab also regularly interacts with others on campus interested in human rights work, including the Shoah Foundation and the USC Levan Institute for Humanities and Ethics (Dr. Boyd-Johnson).

Final Research Report

Students will present a poster at Spatial Science Institute’s LA Geospatial Summit in February 2020 and the USC Undergraduate Symposium for Scholarly and Creative Work in April 2020. Students will also be co-authors on a peer-reviewed journal article submitted Spring 2020.