

As of November 23, 2021

The USC Spatial Sciences Institute (SSI) is now accepting applications for undergraduate student researchers to work with SSI faculty on their research projects and for internships in the Spring 2022 semester.

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

Priority will be given to SSI students (Dornsife minors in GIS and Sustainability Science, Human Security and Geospatial Intelligence, and Spatial Studies, and majors in GeoDesign, Global Geodesign, and Human Security and Geospatial Intelligence). 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. Applicants must be enrolled as full-time USC students in good standing during the research semesters.

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

SSI student researchers are expected to submit their research work for presentation. Venues for presentations include such the SSI's [Los Angeles Geospatial Summit](#) on February 25, 2022 at the USC Hotel; the [USC SCymposium](#) in April on the USC campus; and the [Map Gallery of 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 2022 [USC Esri Innovation Program Student of the Year Competition](#) and the annual United State Geospatial Intelligence Foundation [GEOINT Symposium](#).

Past student researchers have presented their results at international conferences such as the [Annual Meeting of the American Association of Geographers](#), [the GIS-Pro Conference of URISA](#), and the [AMC SIGSPATIAL conference](#), and have co-authored [published research](#).

Interns with organizations associated with SSI are likewise encouraged to share the outcomes of their internships in the venues described above.

asset management is also acknowledged in various locales and for a variety of asset types^{3,4}, the ability to exploit geospatial technologies relies on geospatial data that are prepared for integration and analysis. Therefore, this research project will focus on the data wrangling that can be executed on various data prior to integration for a specific outcome.

The collaboration between the Dornsife Spatial Sciences Institute (SSI) and the Office of Sustainability (OoS) with FPM provides the necessary partnerships and access to “raw” data through which the student researcher can experience and work through data wrangling for a variety of applications.

Data wrangling, a key skill for data scientists and GIS analysts, is the process of transforming data for the “raw” form into another format that is appropriate for use and integration for a variety of purposes⁵; the goals of which are to provide accurate, actionable data in a timely manner to drive better decision-making⁶. During this process data may be aggregated or parsed, transformed into different data types or structures, and stored for later use. At the culmination of data wrangling, data quality and fitness-for-use are ensured prior to integration for analysis and modeling.

The data for this project are to be shared by FPM to SSI and OoS for research and incorporation into the USC Sustainability Map project (project co-leads the Office of Sustainability and Drs. Laura Loyola and Elisabeth Sedano of the Spatial Sciences Institute). However, the student researcher will specifically focus on data wrangling, with deliverables able to be incorporated into the Sustainability Map, as well as be utilized by FPM and OoS for resilient planning or asset management.

This research project aims to support diverse planning and management needs of USC and the OoS, while providing a student researcher the prospect of working with various USC entities and data specific to the USC campuses and surrounding areas.

Role of Undergraduate Researcher

Six specific recommended data wrangling steps⁷ are listed below, with a brief description of how the student researcher will undertake each:

- (1) Data Discovery: Since different data are structured and organized in different ways, the first step is to work with a domain expert to become familiar with the data. The student researcher will work with the FPM GIS Program Assistant to determine data structure and

³ See: Makar, C. 2016. Using GIS and asset management to understand hydrant damages and required maintenance. GIST MS Thesis. University of Southern California.

⁴ Esri. Best Practice Asset Management <https://www.esri.com/en-us/landing-page/industry/electric-and-gas/2019/asset-management-landing-page>

⁵ ODSC – Open Data Science. 2018. Top data wrangling skills required for data scientists. (September 27). <https://medium.com/@ODSC/top-data-wrangling-skills-required-for-data-scientists-8a6b7dc604a7>

⁶ As highlighted in the Goals of Data Wrangling by Altair <https://www.altair.com/what-is-data-wrangling/>

⁷ ODSC – Open Data Science. 2018. Top data wrangling skills required for data scientists. (September 27). <https://medium.com/@ODSC/top-data-wrangling-skills-required-for-data-scientists-8a6b7dc604a7>

any needs for asset management. We will also work with OoS regarding data needs for resilient planning.

- (2) Structuring: Entails organizing the data. This will be done based on the needs defined in the first step and in conjunction with the SSI and OoS.
- (3) Cleaning: Includes, but is not limited to, ensuring data are uniformly formatted (for example all dates and addresses associated with the data are formatted in the same way), missing data are acquired or interpolated, geolocations of all data are accurate, etc. This step is likely to be the most time-consuming and all transformations of data will be closely documented to be included in the metadata.
- (4) Enriching: For geospatial data this may include geocoding locations that are provided as addresses once the initial cleaning of the data is done.
- (5) Validating: Assures data consistency through the use of spatial data quality parameters and further examining data features and attributes in the context of the proposed uses of resilient planning and asset management.
- (6) Publishing: This last step will be use case dependent. Any data wrangling done via ArcGIS specifically will be documented and recorded in a ModelBuilder for future iterations with decision notations, data wrangling done outside of a GIS will also be fully documented, and all data and metadata will be packaged for use in various projects.

While the above steps deal with tasks, weekly meetings will be sure to address larger issues of data wrangling for planning and asset management, including policy issues related to resilient planning and best practices of asset management including real-world modeling and visualization and analytics.

Process and Criteria for Selecting Student Researcher

For this project, key attributes sought include:

- Interest in resilient planning or asset management;
- Interest in data wrangling and data integration;
- Understanding of data structures and fitness-for-use; and
- Ability to think of data needs spatially and temporally.

Oversight and Supervision of Student Researchers

I will closely supervise the student researcher and will hold weekly meetings with the student. Google Sheets containing project data information and to-do lists with task status will be utilized to maintain up-to-date information on the project. The student researcher will maintain a weekly time sheet, with tasks completed. Weekly meetings will be used to plan tasks for the coming week, review the prior week's task status, and address any data related questions and issues. The student will have access to the technical resources of the Spatial Sciences Institute, including access to the SSI Virtual Machine and all associated software.

Integrative and Group Activities

The undergraduate researcher will have several opportunities to collaborate with the Office of Sustainability and Facilities Planning Management. The student researcher will meet weekly with

- Use spatial analysis to understand the epidemiology and variation of social determinant of health factors with pediatric critical care patients
- Use spatial analysis to understand the epidemiology and variation of social determinant of health factors with pediatric anesthesia patients
- Create maps to visualize patients in the electronic health record that receive care at a children's hospital.

The research that each student will contribute to will be critically important to expanding our knowledge of the spatial dynamics that influence health care and health care delivery. Under the direction of Dr. Jonathan Tan, the student involved in the above research endeavors in the Spring 2022 has the possibility of continuing work through the summer of 2022.

Role of the Undergraduate Researchers

As Undergraduate Research Associates, each student will be expected to work both independently and collaboratively with the rest of the supervising faculty member's research team.

Some of the responsibilities that students can expect include:

- Fill out the appropriate paperwork and standard clearances to work with patient electronic health records
- Conduct accurate geocoding of patient records
- Spatially link US Census Data and Environmental Health Data with patient clinical data.
- Create 2D/3D maps and analyze socioeconomic and environmental factors in the context of clinical care.
- Present research updates in our interdisciplinary team meetings.
- Contribute their experience, education and problem-solving skills in individual and group collaborative research planning sessions with the goal of improving pediatric health care delivery.
- Improving their analytical skills, problem solving skills and communication skills as they build a portfolio of work for future endeavors.
- Collaborate on poster presentations and on a manuscript for publication.
- Present research at local and national scientific conferences.

Expectations of hours for each student can be flexible depending on the work and stage of research. For the undergraduate researcher involved in the academic semesters, each of the undergraduate researchers will be expected to average 8-10 hours/week with some of the work carried out remotely.

Criteria for Selecting Student Researchers

Student researchers will be selected on the basis of having important skills that are necessary for the project. Familiarity and experience with statistics, geographic information systems and spatial analysis will be important. Some content knowledge or interest in learning about public

Internship with the Southern California Association of Governments (SCAG) Planning Division

As a metropolitan planning organization—the largest in the nation—Southern California Association of Governments (SCAG) is responsible for developing long-range transportation plans and a Sustainable Communities Strategy for a vast and varied region, which includes the counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. The centerpiece of that planning work is Connect SoCal, our 2020-2045 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The Plan charts a path toward a more mobile, sustainable, and prosperous region by making key connections: between transportation networks, between planning strategies and between the people whose collaboration can make plans a reality.

Connect SoCal is one of many projects that SCAG is responsible for—other projects, for instance, are the Regional Housing Needs Assessment (RHNA) and Environmental Justice (EJ) Analysis. There are numerous projects created to support the development of the aforementioned major projects such as SCAG Data/Map Books, Retail Land Use Studies, Local Profiles, and General Plan Data/Map Books. Geographic information system (GIS), data science, architectural design, mathematics, artificial intelligent, and urban planning backgrounds are key to make these projects successful. As such, SCAG is seeking potential resources to solve a vast array of regional planning and environmental issues (e.g. job/housing imbalance, housing affordability, emerging technologies, etc.). On the other hand, one of SCAG’s mission is to provide services to its local partners; one of which is career development for students from local universities in the region. SCAG has been successful with such service from Cal Poly Pomona (CPP), Cal State University Northridge (CSUN), University of California Los Angeles (UCLA), and University of Southern California (USC).

As part of the University Partnership Program with the USC Spatial Sciences Institute, SCAG provides GIS and technical assistance to SSI interns. Under general supervision, students will learn and perform a variety of administrative and technical duties in support of the Research and Analysis Department of Planning Division. These unpaid internship positions will primarily assist in performing spatial database management, mapping and geoprocessing, conducting research and data analysis, and providing GIS services.

Project

- *2020 Annual Land Use Data Development*
 - o Project timeline: Summer 2021 – Winter 2021
 - o Collecting parcel attributes from the County Assessor’s Offices
 - o Developing land use correspondence table between County’s and SCAG’s
 - o Reviewing and updating existing land use based on the information received from the County Assessor’s Offices

Time Commitment

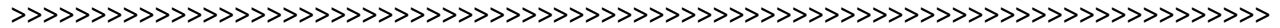
Interns are anticipated to work with the GIS two to three days a week for at least 10 hours per week. This is an unpaid internship; USC Dornsife credit is available.

Student Qualifications

Ideal candidates should understand whole systems of components workflow—from planning procedures, data geoprocessing, and land use policies to architecture geo-design, environmental impact computational assessments by using computer simulations, modeling, numerical techniques, and statistical data analysis.

Expected Outcomes

The major expected outcomes for students would be regional planning knowledge and enhancement in GIS and programming skills (e.g., Python, SAS, R, VBA, etc.). SCAG utilizes state of the art technologies and methodologies to support and develop Connect SoCal. As such, students would learn how to work professionally with SCAG staff and achieve potential skills such as collaboration, communication, presentation, and organization.



Internship with the Global TechnoPolitics Forum

The Forum is a not-for-profit 501C (3) educational institution registered in California. It is an independent, non-partisan, innovative, dynamic, and task force organization. Its mission is to shape the public debate and facilitate global coordination at the intersection of technology and geopolitics.

The Forum is growing fast, and interns are central to our efforts as we champion a path forward to a sustainable future. Our internship program offers opportunities to gain valuable work experience, explore a career path, gain an edge in the job market, develop, and refine work skills, and gain confidence. We seek interns who are committed to our mission, are talented, enthusiastic, effective communicators, entrepreneurial, collegial, and enjoy the fast pace of learning and growth. These are unpaid internships.

The mapping intern will work as part of a team to support the research process of defining, collecting, coding, and mapping the data. Data sets may include but not be limited to geography and climate; population centers; resource/commodity locations which might drive development; existing transport, communications, and industrial infrastructure; existing military bases and infrastructure; industry and infrastructure sources of financing; types of government practices

related to rule of law and digital governance; levels of economic and political partnerships in the area, etc.

International students are welcome to apply, but candidates must be authorized to work in the United States since we do not sponsor visas for interns.

Apply here:

<https://docs.google.com/document/d/1PZK0BBT6VhfsY5HTwPnMX8FUTXJP95UtvMhcMsVICtU/edit>