

As of July 19, 2022

The USC Spatial Sciences Institute (SSI) is now accepting applications for M.S. Spatial Data Science and M.S. Spatial Economics and Data Analysis student researchers to work with SSI faculty on their research projects for the 2022-2023 academic year.

We seek USC M.S. Spatial Data Science (SPDS) and M.S. Spatial Economics and Data Analysis (SEDA) 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.

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 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.**

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 Friday, February 24, 2023 at the USC Hotel; the [USC Provost's Undergraduate Symposium for Scholarly and Creative Work](#) held 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](#).

To apply

Please provide:

sustainable development goals. Urban forestry is a transdisciplinary field with economic, environmental, and social impacts that affect everyone in a community, and which operate at range of spatial and temporal scales.

We plan to expand our research scope substantially with additional County of Los Angeles and private organization partners, while continuing our rewarding work with the City of Los Angeles, where our team includes LA's Chief Forest Officer, experts from StreetsLA, LADOT, and other City agencies. SSI's John Wilson leads USC collaborators that include the USC Dornsife Public Exchange and Department of Earth Sciences, the USC School of Architecture, USC University Relations, and others. Please see "90,000 Trees for Los Angeles" <https://spatial.usc.edu/ssis-john-wilson-leads-the-usc-urban-trees-initiative/> and "Creating an Urban Forest in LA's Eastside" <https://news.usc.edu/180753/usc-los-angeles-urban-forest-initiative-trees-eastside/> on the SSI website and the USC Urban Trees Initiative webpage <https://publicexchange.usc.edu/urban-trees-initiative/> for additional information and our Phase One report "Maximizing the benefits of increased urban canopy on the Eastside of Los Angeles."

Role of student researchers and criteria for selection

Students have made high-level presentations to various groups, including to USC President Folt; earned prizes recognizing the impact of their research at the USC Undergraduate Symposium for Scholarly & Creative Work in both 2021 and 2022; regularly share their work in meetings with our partners; and participate in community engagement and planning meetings, listening and learning from neighborhood stakeholders, and contributing to a more-detailed understanding of the urban forest. We are launching student-written ArcGIS StoryMap suite to explain our research to the community at large, to supplement forthcoming reports and journal articles.

To characterize existing conditions and guide the creation of scenarios that combine scientific analyses with needs and priorities of residents, SSI students created and mapped a diverse array of geospatial data about built and natural environments, diversity, and socio-economic status; researched environmental justice issues; modeled neighborhood pedestrian flows from schools and transit stops; refined methods to create and validate tree inventory data, and integrate data from multiple sources; created 3D models of trees and buildings to quantify existing shade and model heat-mitigation impacts; and worked with USC partners to build and deploy air quality sensors to test the effects of different tree species and configurations. We intend to expand all these efforts; for example, to assess and deploy various deep-learning algorithms to derive more-comprehensive data from remotely-sensed imagery and LiDAR, and to develop more-efficient methods to assess existing conditions and develop criteria for larger research study areas.

GIS experience and an appreciation for data science will be required to support our public and private partners. Students will enhance their geospatial analysis, cartography, and programming skills, and applicants should have completed a suite of academic coursework that allows them to work proficiently with ArcGIS Pro, ArcGIS Online, and other relevant software. Student research assistants will learn to support field experiments to collect air pollution and related data as it

preparation for an NCI-funded conference hosted by SSI and the Norris Cancer Center, taking place in January 2023.

Our technology uses Esri's ArcGIS Hub Premium software that is part of USC's Esri site license administered by SSI. The ArcGIS Hub platform provides tools to share open data, create websites, and organize data, tools, and people around initiatives (e.g., student outreach, sustainability and progress on SDGs; clinical trials and cohort studies). Configurable apps to encourage and support engagement include surveys and crowdsourcing, place explorers, interactive stories and infographics. Apps, maps, StoryMaps, dashboards, and charts allow us to share data and stories in intuitive ways and show progress and accountability. Esri provides strong support, appreciates our product feedback, and continually improves Hub architecture and the ability to collaborate.

In the coming year, we will integrate Koop Node.js web-server tools for on-the-fly transformation of geospatial data that will allow us to connect additional spatial APIs to the GeoHealth Hub. The GeoHealth Hub seeks to make research and acquisition of relevant data effective and efficient. Hub additions this past year included new and updated data sets and informative StoryMap presentations for researchers about interactive CDC geospatial tools and about the process of geocoding, and we plan for our student researchers to create several more StoryMaps in the coming year that help other researchers learn to explore different tools and datasets.

Role of student researchers and criteria for selection

In 2022–2023, our student team will continue to expand the GeoHealth Hub to support our partners and researchers in innovative and more meaningful ways; provide opportunities to develop content and share related data with collaborators and constituents including decision makers and communities we serve; and inspire action to promote healthy, resilient, sustainable behaviors. Please see examples from other organizations who are using ArcGIS Hub to communicate and share open data here: <https://hub.arcgis.com/pages/gallery>

GeoHealth Hub plans include updates to core social and environmental determinants of health; geographical expansion beyond California; deploying national-scale air quality data options; and integrating Koop JavaScript for enhanced Hub data API connections. We plan to incorporate additional maps and data visualizations including dashboards and story maps, and to implement new data sharing and collaboration protocols for KSOM partners. We expect that users will be able to access or download up-to date and longitudinal-survey data shared by thousands of organizations around the world, leveraging index and search capabilities to find and filter data.

Research applicants should have completed a suite of academic coursework that allows them to work proficiently with ArcGIS Pro, ArcGIS Online, and other relevant software. Students will learn about the ArcGIS Hub. An interest in public health issues and an appreciation for data and metadata, plus familiarity with various types of geospatial datasets, non-spatial data, metadata, and research best practices is desired.

food shortages and food outlets that closed or had limited hours, and a spike in grocery prices not seen in decades. In parallel, people lost access to school meals, restaurants, and social support networks, and faced challenges to safely and cost-effectively get food from stores and delivery services. Safe-at-home orders, social distancing strategies, and the closure of businesses, schools and community organizations are all important to stop the spread of the virus; however, these policies can also make it difficult to get food.

Our research team continues to evaluate the state of food insecurity in L.A. County and examine the impact of assistance programs. We integrate innovative data sources that reflect our food system's various features to identify dynamics in population food behaviors, food access, food security, and food distributions in L.A. County. Together, this novel integration of different data sources helps us paint a picture of the resiliency and failures of the local food system and help chart a path for long-term strategies for food.

This year we will incorporate a series of dashboard-type data visualizations and interactive applications for the County of Los Angeles. These new resources we will develop will allow L.A. County to view food insecurity-related data dynamically in space and time, and give them tools to examine food resources across the county at multiple scales, supporting the development of spatially-appropriate policies and interventions to address these challenges and the plans to achieve them. Our work will also include collection of qualitative and quantitative field data, and data aggregation at multiple levels for visualization and analysis, from service planning areas to street corridors to aggregated data tessellations. We will integrate 2D and 3D maps, widgets, spatial and non-spatial data like PDFs, tables, and spreadsheets, and geospatial data services.

Our technology for this project uses ArcGIS Experience Builder, which is part of USC's Esri site license administered by SSI. This platform allows for intensive developer customization yet empowers users to quickly transform data to interactive, responsive web apps and web pages. We examined multiple options, and concluded along with our County of Los Angeles partners that this was the preferred approach to application development; flexibility, integration, mobile optimization, and interconnection set it apart from alternatives. Student researchers will learn the building blocks of Experience Builder including pages, windows, widgets, data sources, layouts, and themes, as well as how they work together, adapt to different screen sizes, integrate with other ArcGIS products and applications, and then create the project deliverable we envision.

Role of student researchers and criteria for selection

We envision a diverse student team with contributions from Ph.D. candidates, master's students, and undergraduates. Research applicants should have completed a suite of academic coursework that allows them to work proficiently with ArcGIS Pro, ArcGIS Online, and other relevant software. Students will learn about the ArcGIS Experience Builder, but other dev experience is welcomed. An interest in public health or food insecurity issues or both and an appreciation for data and metadata, plus familiarity with various types of geospatial datasets and non-spatial data is desirable. Spatial statistics, R, and Python are useful but not required.

