

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 <u>Los Angeles Geospatial Summit</u> on Friday, February 24, 2023 at the USC Hotel; the <u>USC Provost's Undergraduate Symposium for Scholarly and Creative Work</u> held in April on the USC campus; and the <u>Map Gallery of the Esri User</u> Conference held in July in San Diego. Students also are encouraged to submit their work to appropriate student research competitions, such as the 2022 <u>USC Esri Innovation Program Student of the Year Competition</u> and the annual United State Geospatial Intelligence Foundation GEOINT Symposium.

Past student researchers have presented their results at international conferences such as the <u>Annual Meeting of the American Association of Geographers</u>, <u>the GIS-Pro Conference of URISA</u>, and the <u>AMC SIGSPATIAL conference</u>, and have co-authored <u>published research</u>.

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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., Friday, August 5, 2002.

Students selected by the faculty will be notified by the week of August 15 - 19, 2022, so the research teams can be organized by the start of the Fall 2022 semester.

Questions?

Please email Susan Kamei or Monica Pan, Spatial Sciences Institute Academic Programs Director.

USC Urban Trees Initiative Phase Three: Geospatial Analysis for the City and County of Los Angeles

John P. Wilson, Ph.D., Professor of Sociology and Spatial Sciences, and Beau MacDonald, GIS Project Administrator

Project Description

USC Spatial Sciences Institute (SSI) interdisciplinary teams encourage undergraduate and graduate student researchers to collaborate with faculty and staff to conduct actionable applied research, often with public agencies as clients. For the past two years, SSI student teams have been essential to our Urban Trees Initiative, a partnership between various City of Los Angeles agencies and five USC entities, working with community organizations and civic leaders in neighborhoods near the USC Health Sciences and USC University Park Campuses to optimize the health and quality of life benefits envisioned by planned expansion of our urban forest.

Our focus is a scientific and holistic data-driven approach to help guide the growth of our urban forest; to promote health, sustainability and resilience; adapt to a changing climate; improve the environment and biodiversity; and support our neighbors. Potential benefits from enhanced more-equitable tree canopy distribution as they may relate to heat-mitigation, carbon storage, water quality, or reduction of particulate matter pollution; and providing input on scenarios for new green infrastructure are other research interests. Urban forests provide ecological and environmental services that strongly contribute to enhanced human well-being and advance

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

informs the selection of LA urban tree species and their optimal planting configurations along streets, within parks, on school grounds, and on private property.

Expectations include: regular and in-person collaboration with the student research team; participation in twice-weekly meetings; creation of maps, charts, and baseline analyses for twice-monthly presentations to our larger research team; contributions to one or more publications at the conclusion of this research; and creation of posters or presentations for the 2023 SSI Geospatial Summit, USC Undergraduate Research Symposium, and the Esri User Conference.

We are recruiting interested students with a variety of skill levels, including M.S. Spatial Data Science and M.S. Spatial Economics and Data Analysis students. Students from various undergraduate majors including Geodesign may find this opportunity intriguing. We request a statement that describes your knowledge, skills, abilities, and specific interests.

Building and Expanding the SSI ArcGIS 'USC GeoHealth Hub'

John P. Wilson, Ph.D., Professor of Sociology and Spatial Sciences, and Beau MacDonald, GIS Project Administrator

Project Description

USC Spatial Sciences Institute (SSI) interdisciplinary teams encourage undergraduate student researchers to collaborate with faculty and staff to conduct actionable applied research, often with other USC entities as clients. Two years ago, a three-student SSI team launched the successful USC GeoHealth Hub application: https://usc-geohealth-hub-uscssi.hub.arcgis.com. Their effort leveraged an open-data platform to create an interactive website to host a variety of spatial and non-spatial data to allow a broad audience to participate in health research, access diverse health-related data, encourage healthy lifestyles, and connect population, health, and place. Students were engaged in site design, UX/UI, data gathering, creation, visualization, and quality control, and consulted with ArcGIS Hub developers and education specialists at geospatial software and services provider Esri, and met with US EPA EnviroAtlas scientists.

Student teams made multiple highly focused presentations critical to securing research funding and support from our GeoHealth Hub partners, including five Centers and Institutes associated with USC's Keck School of Medicine (KSOM): The Southern California Clinical and Translational Science Institute, Southern California Environmental Health Sciences Center, USC Norris Cancer Hospital, USC Tobacco Center of Regulatory Science, and the USC Institute for Addiction Science. These entities provide funding as well as guidance on which resources to feature in the GeoHealth Hub. We are expanding the Hub to serve the new Community Health Equity Solutions (CHES) team and their community partners, and are excited to plan multiple enhancements in

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.

Expectations include: regular and in-person collaboration with the student research team; participation in weekly meetings; contributions to one or more publications at the conclusion of this research; and creation of posters or presentations for the 2023 SSI Geospatial Summit, USC Undergraduate Research Symposium, and the Esri User Conference. Academic recognition for our Hub teams has included an interdisciplinary first prize at the USC USC Undergraduate Symposium for Scholarly & Creative Work in each of the past two years.

We are recruiting interested students with a variety of skill levels, including M.S. Spatial Data Science and M.S. Spatial Economics and Data Analysis students. Students from various undergraduate majors including Geodesign may find this opportunity intriguing. We request a statement that describes your knowledge, skills, abilities and specific interests.

Food Systems

John P. Wilson, Ph.D., Professor of Sociology and Spatial Sciences, and Beau MacDonald, GIS Project Administrator

Project Description

A team of USC scholars in public health, psychology, health policy, data science and geographic information science, including Spatial Sciences Institute research scientists and SSI Population, Health and Place Ph.D. Program graduate students, have been working with the Los Angeles County Emergency Food Security Branch to better understand the risk factors and health consequences of food insecurity in Los Angeles County. Under the leadership of Kayla de la Haye, assistant professor in the department of population and public health sciences at the Keck School of Medicine of USC, the team has met with L.A. County experts on a weekly basis, answering difficult questions about access to food, changes to food insecurity and food assistance programs across L.A. County, as exacerbated by the pandemic, and how answers to these questions vary based on demographics and neighborhood location. Research findings have informed L.A. County's ongoing efforts to raise awareness of financial and food assistance resources for residents in need.

Please see "More LA County Residents are Hungry during the Pandemic" on the SSI website https://spatial.usc.edu/more-la-county-residents-are-hungry-during-the-pandemic/ and the "USC Food Insecurity in Los Angeles" webpage https://publicexchange.usc.edu/food-insecurity-in-la-county/ for links to multiple reports that the team has produced.

As our reports detail, the COVID-19 pandemic created a crisis in the U.S. food supply chain, made disparities in food access worse and led to widespread food insecurity and hunger, which are severe threats to population health and national security. During this crisis, it became particularly difficult for policy makers and community stakeholders to identify populations at risk for food insecurity. Waves of job and income loss during the pandemic meant some households did not have enough money to purchase food. This was coupled with failures in the food supply, such as

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.

Expectations for researchers include regular and in-person collaboration with the student research team; participation in once-or-twice-weekly meetings and regular presentations to our larger research team and partners; contributions to one or more publications at the conclusion of this research; and collaboration with other student researchers to create posters or presentations for the 2023 SSI Geospatial Summit, the Esri User Conference, and the USC Undergraduate Research Symposium if relevant.

We are recruiting interested students with a variety of skill levels, including M.S. Spatial Data Science and M.S. Spatial Economics and Data Analysis students. Students from various undergraduate majors including Geodesign may find this opportunity intriguing. We request a statement that describes your knowledge, skills, abilities and specific interests.

Health Equity

John P. Wilson, Ph.D., Professor of Sociology and Spatial Sciences, and Beau MacDonald, GIS Project Administrator

Project Description

The Southern California Center for Chronic Health Disparities in Latino Families and Children aims to reverse obesity and obesity-related chronic diseases in Latinos with culturally sensitive solutions. USC, in partnership with Children's Hospital Los Angeles, recently won a \$24.5 million NIH grant to launch a center aimed improving Latino health across Southern California, fighting obesity and related chronic diseases in Latino children and families across Southern California. This new regional center established a consortium across 10 counties, home to nearly 11 million Latinos who represent 45.2% of the population. The consortium brings together universities, hospitals and community groups; the goal is to develop and test culturally sensitive, family-based interventions to the complex mixture of early-life nutrition, environment and social factors that set kids up for risk of obesity and obesity-related chronic diseases for the rest of their lives.

Spatial Sciences Institute researchers led by Dr. John Wilson will conduct geospatial assessments and provide technical expertise in social and environmental determinants of health to support and build the research enterprise as part of the Methods and Data Sub-Core for the new Center. The project was envisioned by Michael Goran, a professor of pediatrics at the Keck School of Medicine of USC and director for diabetes and obesity at the Saban Research Institute at Children's Hospital Los Angeles (CHLA), a national leader in pediatric research. Goran, who has focused his research career on the causes and consequences of obesity, especially in Latino children, will co-lead the effort with Lourdes Baezconde-Garbanati, a tenured professor in the department of population and public health sciences at the Keck School of Medicine and an expert in community engagement. The community outreach and engagement offices at both the Southern California Clinical and Translational Science Institute and the USC Norris Comprehensive Cancer Center will play a central role in engaging various partners in Southern California in outreach to Latinos.

USC researchers seek interventions tailored to the Latino community. According to Baezconde-Garbanati, "parents are always very eager to do what they can to improve the health of their children, but interventions can't be one-size-fits-all. What's going to make these interventions easy to adopt is they are very culturally- and language-specific. They are developed with community input, and that makes all the difference." For example, the center will test new strategies such as the idea of "food prescriptions," or affordable grocery delivery accompanied by meal plans tailored to Latino culture led by a team at Kaiser Permanente, as well as parent training via telehealth on topics such as reducing sugary drinks in women and infants led by a team at the University of California, San Diego. Promotores de salud, or community health workers, will disperse the center's findings.

Role of student researchers and criteria for selection

We envision a diverse student team. Master's students and undergraduates are encouraged to apply. 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 should be detail-oriented with an interest in public health and an appreciation for data and metadata, plus enjoy working with various types of geospatial datasets and non-spatial data. Spatial statistics, R, and Python are useful skills but not required.

Expectations include: regular and in-person collaboration with the student research team; participation in weekly meetings; data-mining and associated research to support acquisition and creation of relevant datasets; development of maps, charts, and baseline analyses for regular presentations to our larger research team; contributions to one or more publications at the conclusion of this research; and creation of posters or presentations for the 2023 SSI Geospatial Summit, the Esri User Conference, and the USC Undergraduate Research Symposium if relevant.

We are recruiting interested students with a variety of skill levels, including M.S. Spatial Data Science and M.S. Spatial Economics and Data Analysis students. Students from various undergraduate majors including Geodesign may find this opportunity intriguing. We request a statement that describes your knowledge, skills, abilities and specific interests.