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

As of 7/9/2025

The USC Spatial Sciences Institute (SSI) is now accepting applications for undergraduate student researchers to work with SSI faculty on their research projects for the 2025-2026 academic year.

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 majors in Geodesign, Global Geodesign and Human Security and Geospatial Intelligence, and minors in GIS and Sustainability Science, Human Security and Geospatial Intelligence, and Spatial Studies). 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 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 in February 2026 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 USC Esri Innovation Program Student of the Year Competition and the annual United States 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

Geospatial Professional Network (formerly URISA), and the AMC SIGSPATIAL Conference. They also have co-authored published research.

To apply please provide:

- Your resume which includes your name, USC email address, cell phone number, major/minor, year in school, software and programming language competencies, and relevant course projects/skills;
- Your current STARS report (not required for a new incoming student); and
- **One** statement of interest indicating the project(s) for which you are applying. You may indicate your interest in more than one project; please indicate the priority of your preferences. If selected, you will be selected for one project only. You do not need to submit multiple statements of interest; **one** statement of interest document suffices.

Please email your complete application materials to Dr. Diana Ter-Ghazaryan, Director of Undergraduate Studies at Spatial Sciences Institute, at terghaza@usc.edu , by **5:00 p.m., Monday, July 28, 2025**. If you expect your application to be considered, do not miss this deadline.

Students selected by the faculty will be notified no later than the week of August 11-August 15, 2025, so the research teams can be organized by the start of the Fall 2025 semester.

Questions?

Please email **Dr. Diana Ter-Ghazaryan**, Director of Undergraduate Studies at Spatial Sciences Institute.

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Investigating the effect of legacy lead on educational achievements and environmental disparities near EPA superfund sites

Dr. An-Min Wu, Assistant Professor (Teaching), Spatial Sciences Institute

Paid opportunity

Project Description:

Lead is a toxic metal with serious adverse health effects, particularly for young children. Even small amounts of lead exposure can impair children's mental and physical development, leading to cognitive impairments and learning-related behavioral issues. Due to its chemical stability and physical properties, legacy lead from mining and smelting operations is likely to remain in the soils of surrounding communities, impacting the health of local residents. Despite considerable research on the health effects of lead at the community level, there is limited research for its impacts on educational outcomes in young children at a broader scale. This study aims to explore the impact of lead contamination at EPA-designated Superfund sites on children's learning outcomes. This study will investigate the relationship between proximity to Superfund sites that contain lead-related contamination and the academic performance of U.S. children. By analyzing math and reading scores from the Stanford Education Data Archive for 3rd and 4th graders, the study compares outcomes for children attending schools near unremediated sites to those living farther away during 2008-2019. This project will provide valuable insights into how environmental contamination contributes to educational disparities, particularly in those communities affected by legacy lead pollution.

The student working on this project will gain practical experience in various aspects of the research process, including conducting a literature review, organizing and cleaning datasets, and applying statistical computing techniques in GIS and in R. Additionally, students will learn spatial analysis and data visualization skills, presenting their findings through maps, meaningful diagrams and a StoryMap on the influence of Superfund site proximity on school district-level educational performance.

This project is funded by URAP 2025-2026 and is suitable for students who have spatial thinking and some training of ArcGIS that wants to gain some hands-on data experience on a research project. Ideally the student should have 1-2 GIS-related courses by the start date in Fall 2025 and have an average of GPA 3.0 or above. Priority will be given to students with majors or minors in spatial sciences (GeoDesign, Human Security and Geospatial Intelligence, GIS and Sustainability Sciences, and Spatial Studies).
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One undergraduate student will work with Professor Wu to conduct the proposed research. The student will work 8-10 hours per week during Fall 2025 and Spring 2026. Weekly meetings will be held in person with Professor Wu to discuss any updates and to receive guidance for the project.

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Using Satellite Imagery and Change Detection to Investigate Security Along the Armenian-Azerbaijani Border: Evolving Borderlands 2.0

Dr. Diana Ter-Ghazaryan, Associate Professor (Teaching), Spatial Sciences Institute

Paid opportunity

Project Description:

The Nagorno-Karabakh Conflict, one of Post-Soviet Eurasia's longest and most bitter "frozen conflicts," was reactivated in 2020, when a 44-day war broke out between Armenia and Azerbaijan over the self-declared Armenian-backed breakaway state of Nagorno-Karabakh, also known as Artsakh. This escalation, known as the 2nd Nagorno-Karabakh War, lasted from September 27 to November 10, 2020; the bitter fighting claimed thousands of lives on both Armenian and Azerbaijani sides and resulted in the hand-over of a substantial amount of territory from Armenia to Azerbaijan (including a large portion of the self-declared Armenian Nagorno-Karabakh, as well as surrounding territories occupied by Armenia after the 1st Nagorno-Karabakh War, which ended in 1994). A ceasefire was negotiated with Russia's help, but soon conditions began to disintegrate. In September 2023, after months of a brutal blockade of Nagorno-Karabakh by Azerbaijan, Azeris staged a lightning offensive and captured the territory. Within days, nearly all of the region's Armenian population (estimated at about 100,000) fled to Armenia and the self-declared republic was officially dissolved on January 1, 2024 (Global Conflict Tracker, 2025). This conflict and its abrupt end have cast a long shadow on the geopolitics in the region, and relations between Armenia and Azerbaijan haven't normalized to this day.

With this proposal I seek to continue and extend the work of my undergraduate research team, previously supported by the Undergraduate Research Associates Program in 2023-2024 (Evolving Borderlands 1.0). In that pilot study, I led a team of undergraduate researchers, who used satellite imagery and geospatial analysis to study the security situation along the "new" border between Armenia and Azerbaijan, and to study the material effects of the very process of "borderization" on the ground. Toal and Seferian (2022) define this term as "the process of turning a neglected but recognized line on a map into an actual demarcated border between two states," and it is applied specifically to three Armenian provinces (Gegharkunik, Vayots Dzor and Syuniq), which now share a hardening and increasingly dangerous border with Azerbaijan. The Evolving Borderlands 1.0 team concluded that the region was indeed changing rapidly, with at least 250 kilometers of new roads and 8 new settlements documented (Makmak, Abrahamian and Dubey, 2024). While the pilot team achieved a great deal and presented the results of our research at the 2024 Undergraduate Symposium for Scholarly and Creative Work,
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many unanswered questions remain. We processed mid-resolution satellite imagery with out-of-the-box spatial analysis tools, and a great next step for Evolving Borderlands 2.0 can be to process higher spatial resolution at different periods in time to allow us to detect change on a finer scale– such as shelling of buildings, destruction of cultural heritage, etc. Additional change detection analysis of forested areas can also be indicative of skirmishes and/or human movement in action. Additionally, Evolving Borderlands 2.0 intends to use deep learning in the geospatial realm to help understand migration patterns from the Artsakh region to Armenia along the Lachin Corridor in late 2023.

At the nexus of geospatial technology/imagery analysis and security studies, this project will apply computational change detection techniques to document material changes on the ground, as peace between Armenia and Azerbaijan still hangs in the balance and no formal agreement about border demarcation, or even the exact location of the border exist. Satellite imagery has been used to document wartime destruction, violations of human rights (Marx et al 2019) and, most recently, war preparations on the Russian-Ukrainian border (BBC News, 2022). In this region, satellite imagery analysis has been used to document destruction of cultural and religious monuments and other instances of erasure of cultural heritage (Caucasus Heritage Watch, 2022). Evolving Borderlands 2.0 will continue taking a broader-scale approach, using a combination of satellite imagery types and change detection techniques with an aim to understand and document the security situation on the ground.

The student researcher will play an essential role in this proposed research project by working with the faculty advisor and past researchers. The research team will engage in weekly meetings to share updates, discuss technical work, and strategize on deliverables and deadlines. SSI faculty advisor will provide technical training and trouble-shooting sessions to the undergraduate researchers on an as-needed basis throughout the project.

The undergraduate researcher will be expected to work an average of 8-10 hours per week.

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Urban Dynamics and Inequality in the Global South

Dr. Jefferey Sellers, Professor of Political Science, International Relations and Spatial Sciences

Paid opportunity

Project Description:

Work on a project that analyzes social, economic, political and spatial change in globalizing regions in Asia. This project, supported by the Provost's Undergraduate Research Associateship Program and other sources, employs a variety of geocoded data from diverse sources to analyze spatial inequality in the rapidly developing urban areas of India. Now the largest country in the world, India is undergoing a remarkably fast transition to an urban society. As the Subcontinent urbanizes, the juxtaposition of new development with rural settlement is creating dramatic disparities in the built environment between upscale development clusters and emerging slums. The project combines online real estate listing data with remote sensing images, other geospatial data and a variety of administrative, fiscal, planning, electoral and demographic data. In 2025-2026, the research will focus on a comparison of governance agendas and development outcomes among Indian high-tech regions, on analysis of urban inequality using remote sensing images and online real estate listings, and on a comparative analysis of urban growth dynamics in China, India and other regions of the Global South.

Work on the Project is supported by the Provost's Undergraduate Research Associate Program and the USC Center for International Studies.

Expectations of hours for each student can be flexible depending on the work and stage of research. A general guideline expectation will be as follows:

Each of the undergraduate researchers involved in the academic semesters will be expected to average 8-10 hours/week with much of the work carried out remotely. Work hours will vary with the project cycle throughout the academic year and in consideration of the undergraduate researcher's academic schedule.
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