

## **SSCI 587 (35715D and 35716D), Spatial Data Acquisition**

### *Syllabus*

**Units:** 4

**Term Day Time:** Summer 2025, M and W 3:00-4:50pm  
(Classes start Wednesday 5/21)

**Location:** AHF 145A and DEN@Dornsife

**Instructor:** Laura C Loyola, PhD

**Office:** AHF B55C

**Regular Office Hours:** Wednesdays 12pm-2pm PT. Also available by appointment via email.

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**Library Help:** Andy Rutkowski

**Office:** LIPA B40-A

**Office Hours:** Thursdays 10 am-12 pm PT or by appointment

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## Course Scope and Purpose

This course provides students with the requisite knowledge and practical skills to source and evaluate data against recognized quality standards for use in GIS-based projects. It also helps students understand how to assess the quality of information output from those projects. It is a required course for the Geographic Information Science and Technology (GIST) M.S. and Graduate Certificate Programs and the Human Security and Geospatial Intelligence (HSGL) M.S. Program. We cover several topics, including:

*Data Needs and Types* – We start by focusing on the data challenge, defining data needs, fitness-for-use, and the role of conceptualization, entitiation (recognition of an entity that can be studied as a system), and quantification in scientific research and management, and an introduction to some of the ways in which spatial and attribute data can be gathered and used to serve specific needs.

*Data Capture and Estimation* – We discuss the ways various digital data, such as Volunteered Geographic Information (VGI), personal location information, street-view imagery, and others can be sourced, evaluated, and used in specific projects, as well as ways to interpolate attribute values at unsampled locations and/or times.

*Remotely Sensed Data* – We discuss the diverse ways in which data can be collected remotely using various platforms and sensors. We focus on Global Navigation Satellite Systems and Unmanned/Unoccupied Aerial Systems as valuable sources of spatial data.

*Data Quality* – We discuss data standards and how they are used to promote and/or preserve data quality. We also examine the various types and sources of error that we may encounter as a part of the data stream. We consider the various ways we can check for errors and cope with uncertainty when using GIS to help inform decisions about actions we may take in the real world.

*New Spatial Data Capture* – We explore the ways in which the Esri and Eos software ecosystems and Unmanned Aerial Systems (UAS) can be used along with field-based systems (GNSS and GPS receivers, and a variety of sensors) to support spatial data acquisition, analysis, and visualization. A variety of readings and exercises in the first half of the class will help to support a field project conducted during a one-week field trip on Catalina Island in which students design, conduct, and present the results of their own spatial data collection projects using open data, equipment provided by the Spatial Sciences Institute and/or their own devices.

*Data Integration* – We discuss and workshop the various processes through which data are prepared and integrated within a GIS. Project work builds on data acquisition throughout the term and culminates in integration and preliminary analyses.

The class sessions and assigned readings will convey the main theoretical concepts, and the assignments will give students an opportunity to internalize and apply the concepts and theory learned from readings. Some assignments, and particularly those completed on Catalina Island, require student interaction, and all will benefit from it.

## **Learning Outcomes**

On completion of this course, students should be able to:

- Describe fitness-for-purpose (i.e. use) criteria and apply them to the evaluation of geospatial data for specific applications.
- Discuss the conceptual foundations of unoccupied autonomous system (UAS)-derived imagery data.
- Describe and demonstrate the methods to collect and process UAS-derived imagery.
- Design and implement a strategy for capturing or sourcing geospatial data and any accompanying metadata.
- Assess the impact of national and international data standards on the sourcing and availability of geospatial data.
- Critically evaluate the potential impacts of data quality on spatial analysis and decision making.
- Demonstrate the ability to use one or more of the commonly utilized systems employed today for the capture of location-based data so you can acquire, organize, store, analyze, model, visualize, and share your own spatial data going forward.

Students may vary in their competency levels on these abilities. You can expect to acquire these abilities only if you honor all course policies, attend classes regularly, complete all assigned work in good faith and on time, and meet all other course expectations of you as a student.

**Prerequisite(s):** None

**Co-requisite(s):** None

**Concurrent Enrollment:** None

**Recommended Preparation:** SSCI 581: Concepts for Spatial Thinking

## **Class Conduct**

**Harassment, sexual misconduct, interpersonal violence, and stalking** are not tolerated by the university. All faculty and most staff are considered Responsible Employees by the university and must forward all information they receive about these types of situations to the Title IX Coordinator. The Title IX Coordinator is responsible for assisting students with supportive accommodations, including academic accommodations, as well as investigating these incidents if the reporting student wants an investigation. The Title IX office is also responsible for coordinating supportive measures for transgender and nonbinary students such as faculty notifications, and more. If you need supportive accommodations you may contact the Title IX Coordinator directly ([titleix@usc.edu](mailto:titleix@usc.edu) or 213-821-8298) without sharing any personal information with me. If you would like to speak with a confidential counselor, Relationship and Sexual Violence Prevention Services (RSVP) provides 24/7 confidential support for students (213-740-9355 (WELL); press 0 after hours)

**Diversity and Inclusion** – It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students’ learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful to everyone, and you are also expected to respect of others regardless of their race, ethnicity, gender identity and expressions, cultural beliefs, religion, sexual orientation, national origin, age, abilities, ideas and perspectives, or socioeconomic status. Your suggestions are encouraged and appreciated. Feel free to let me know ways to improve the effectiveness of the course for you personally or for other students.

## **Course Structure**

As a graduate level course, you should expect this class to be both academically robust and intellectually challenging. As a graduate student, you are expected to engage with the information you are learning and to explore the heady cauldron of ideas, opinions, and analyses that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in the reading materials and with one another. As in any graduate level class, the instructor’s role is that of a guide who keeps you on a path of discovery and you will find that you will learn much from your fellow classmates. The main theoretical concepts will be provided through class presentations and assigned readings, and at times recorded video presentations. Hands-on practical exercises will use various software products accessible over the Internet. Assignments will give you an opportunity to internalize and apply the concepts and theory learned from readings.

*Workload* – This is a four credit, one semester graduate level course. Students should expect to spend 10-15 hours per week to complete the work in this class. Please note that in addition to the weekly workload, there is a required weeklong field excursion to the Philip K. Wrigley Marine Science Center on Catalina Island. There is a required room and board fee for the Catalina trip of approximately \$450 that is supplemental to the regular tuition cost.

*Catalina Field Excursion* – This course incorporates a one-week field excursion to the [Wrigley Institute for the Environment and Sustainability \(WIES\)](#) [Wrigley Marine Science Center \(WMSC\)](#) on Catalina Island. Specifics will be provided by your instructor as to dates of this required component of the course. Students travel together to Catalina early Monday morning of the weeklong excursion and return together on Sunday afternoon via the Miss Christi at the San Pedro port. While all reservations and bookings are made by SSI, more information on visiting WMSC can be found [here](#) for your preparations and planning.

## **Course Content Distribution and Synchronous Session Recordings Policies**

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on

the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study is prohibited. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which has been distributed to students or in any way has been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

## Technology and Communication Requirements

ArcGIS is provided online via the SSI Server; hence, you do not need to install it on your own computer. In addition, we will provide laptops with image processing software and a variety of GPS and related data capture devices for the Catalina field component. At their home workspaces, every student must have the following technology requirements:

- A computer with a fast Internet connection.
- A functional webcam and a microphone.
- An up-to-date web browser to access the SSI server.

If a student does not have access to any of these, please speak with the instructors at the start of the semester. And see the USC ITS Student Toolkit here:

<https://keep-teaching.usc.edu/students/student-toolkit/>

A limited number of computers with all the necessary software is available in the SSI Suite (AHF B55) during regular business hours, Monday through Friday 9 am to 5 pm. To reserve a computer, please use this link: <https://calendly.com/usc-ssi/the-ssi-suite-ahf-b55-student-computers-1>. These computers are available to any student in an SSCI or GSEC course and can be used as a resource if you experience difficulties in accessing the SSI server or using the GIS software on your personal computer

*Brightspace* – This course will utilize the Brightspace learning management system which allows students to access course content, upload assignments, and participate in discussion forums, among other learning experiences. The Brightspace platform provides flexibility in the learning experience where students can participate in the course residentially or remotely, synchronously (meeting together at the same time) or asynchronously (accessing videos and course content outside of class).

*SSI Server and Tech Support* – This course utilizes the SSI Server which is a virtual desktop giving access to many different professional software. If you are unable to connect to the server or experience any type of technical issues, send an email using your USC account to SSI Tech Support at [spatial\\_support@usc.edu](mailto:spatial_support@usc.edu), making sure to copy (cc) me on the email.

*Communications* – All assignments disseminated and all materials to be handed in will be submitted via Brightspace. The instructor will also create and monitor discussion forums

through which students can discuss issues and assignments as needed. Students should read all email sent from Brightspace or from course instructor as soon as possible. Also, students who do not regularly use their USC email accounts should double-check to be sure that mail sent from both the Brightspace accounts and the instructor's account (noted above) to your USC account is forwarded to an address used regularly and does not go into junk mail. The instructor will endeavor to respond to all email within 24 hours of receipt, aiming for no more than 72 hours delay. In the rare case that an instructor is off-line for an extended period of time, an announcement will be posted to the class Brightspace site. Due to the synchronous and asynchronous nature of this course, it is each student's responsibility to stay informed and connected with others in our course. In addition to email, students are expected to login to Brightspace regularly to check for announcements.

*Discussion forums* – On the Brightspace site, I will post a series of discussion threads relevant to various sections of the course. Discussions provide a key means for student-to-student discussion and collaboration. Here students can provide support to each other while working on your assignments, sharing hints and helpful tips, as you would in a classroom setting. Please post your questions about assignments there, as you would ask them publicly in the classroom. I monitor the discussion threads and offer comments when necessary, but more importantly, consider the discussion board a key way to connect with your classmates and share your discoveries.

## **Required Readings and Supplementary Materials**

Readings – The following journal articles will be posted to Brightspace under the Course Readings:

- Acheson, E., Volpi, M., and Purves, R.S. 2020. Machine learning for cross-gazetteer matching of natural features. *International Journal of Geographical Information Science*, 34(4), 708-734.
- Alvarez Leon, L.F. and Quinn, S. 2019. The value of crowd-sourced street-level imagery: Examining the shifting property regimes of OpenStreetCam and Mapillary. *GeoJournal*, 84, 395-414.
- Arietta, S.M., Efros, A.A., Ramamoorthi, R., and Agrawala, M. 2014. City forensics: Using visual elements to predict non-visual city attributes. *IEEE Transactions on Visualization and Computer Graphics*, 20(12), 2624-2633.
- Barrington-Leigh, C. and Millard-Ball, A. 2017. The world's user-generated road map is more than 80% complete. *PloS ONE*, 12(8), e0180698.
- Bolstad, P.V., Gessler, P., and Lillesand, T.M. 1990. Positional uncertainty in manually digitized map data. *International Journal of Geographic Information Systems*, 4, 399-412.
- Chrisman, N.R. 1984. The role of quality information in the long-term functioning of a geographic information system. *Cartographica*, 21, 79-87.
- Chrisman, N.R. 2017. Calculating in a round planet. *International Journal of Geographical Information Science*, 31, 637-657.

- Couclelis, H. 2021. Conceptual models of error and uncertainty. In J.P. Wilson (Ed.), *The geographic information science and technology body of knowledge* (1st Quarter 2021 ed.), <https://doi.org/10.22224/gistbok/2021.1.3>
- Delmelle, E. 2009. Spatial sampling. In A.S. Fotheringham, P.A. Rogerson (Eds.), *The SAGE handbook of spatial analysis* (pp. 165-186). SAGE Publications.
- Dubayah, R.O. and Drake, J.B. 2000. Lidar remote sensing for forestry. *Journal of Forestry*, 98(6), 44-46.
- Dwyer, J.L., Roy, D.P., Sauer, B., Jenkerson, C.B., Zhang, H.K., and Lymburner, L. 2018. Analysis ready data: Enabling analysis of the Landsat archive. *Remote Sensing*, 10(9), 1363.
- Eitzel, M.V., Cappadonna, J.L., Santos-Lang, C., et al. 2017. Citizen science terminology matters: Exploring key terms. *Citizen Science: Theory and Practice*, 2(1), 1.
- El-Sheimy, N. and Li, Y. 2021. Indoor navigation: State of the art and future trends. *Satellite Navigation*, 2, 7.
- Fisher, P., Comber, A., and Wadsworth, R. 2010. What's in a name? Semantics, standards, and data quality. In R. Devillers, H. Goodchild (Eds.), *Spatial data quality: From process to decisions* (pp. 43-59). CRC Press.
- Fisher, P. and Wood, J. 1998. What is a mountain? Or the Englishman who went up a Boolean geographical concept but realised it was fuzzy. *Geography*, 83(3), 247-256
- Fisher, P., Wood, J., and Cheng, T. 2004. Where Is Helvellyn? Fuzziness of multi-scale landscape morphometry. *Transactions of the Institute of British Geographers*, 29(1), 106-128.
- Frank, A. U. 2010. Scale is introduced in spatial datasets by observation processes. In R. Devillers & H Goodchild (Eds.), *Spatial data quality: From process to decisions* (pp. 17-30). Boca Raton, FL, CRC Press.
- Goodchild, M.F. 2000. Communicating the results of accuracy assessment: Metadata, digital libraries, and assessing fitness for use. In T.M. Mowrer, R.G. Congalton (Eds.), *Quantifying spatial uncertainty in natural resources: Theory and applications for GIS and remote sensing* (pp. 3-15). Ann Arbor Press.
- Goodchild, M.F. 2011. Scale in GIS: An overview. *Geomorphology*, 130, 5-9.
- Goodchild, M.F. 2018. Reimagining the history of GIS. *Annals of GIS*, 24(1), 1-8.
- Grantham, H.S., Duncan, A., Evans, T.D., et al. 2020. Anthropogenic modification of forests means only 40% of remaining forests have high ecosystem integrity. *Nature Communications*, 11, 5978.
- Jankowska, M. M., Schipperijn, J., and Kerr, J. 2015. A framework for using GPS data in physical activity and sedentary behavior studies. *Exercise and Sport Sciences Reviews*, 43(1), 48-56.
- Jestico, B., Nelson, T., and Winters, M. 2016. Mapping ridership using crowdsourced cycling data. *Journal of Transport Geography*, 52, 90-97.

- Johnson, C. E., and Barton, C. C. 2004. Where in the world are my field plots? Using GPS effectively in environmental field studies. *Frontiers in Ecology and the Environment*, 2, 475-482.
- Jones, R. R., DellaValle, C. T., Flory, A. R., et al. 2014. Accuracy of residential geocoding in the Agricultural Health Study. *International Journal of Health Geographics*, 13, 37.
- Kassie, D., Roudot, A., N. Dessay, N., et al. 2017. Development of a spatial sampling protocol using GIS to measure health disparities in Bobo-Dioulasso, Burkina Faso, a medium-sized African city. *International Journal of Health Geographics*, 16, 14.
- Kunhoth, J., Karkar, A., Al-Maadeed, S., et al. 2020. Indoor positioning and wayfinding systems: A survey. *Human-centric Computing and Information Sciences*, 10, 18.
- Larkin, A., Gu, X., Chen, L., et al. 2021. Predicting perceptions of the built environment using GIS, satellite and street view image approaches. *Landscape and Urban Planning*, 216, 104257.
- Lee, J. 2009. GIS-based geocoding methods for area-based addresses and 3D addresses in urban areas. *Environment and Planning B: Planning and Design*, 36(1), 86-106.
- Liang, Y., Gao, S., Cai, Y., et al. 2020. Calibrating the dynamic Huff model for business analysis using location big data. *Transactions in GIS*, 24, 681-703.
- Lippitt, C. D. 2020. Georeferencing and georectification. In J. P. Wilson (Ed.), *The Geographic information science and technology body of knowledge* (3rd Quarter 2020 ed.), <https://doi.org/10.22224/gistbok/2020.3.3>
- Mahdianpari, M., Granger, J. E., Mohmmadimanesh, F., et al. 2021. Smart solutions for smart cities: Urban wetland mapping using very high resolution satellite imagery and airborne LiDAR data in the City of St. John's, NL, Canada. *Journal of Environmental Management*, 280, 111676.
- Minghini, M. and Frassinelli, F. 2019. OpenStreetMap history for intrinsic quality assessment: Is OSM up-to-date? *Open Geospatial Data, Software and Standards*, 4, 9. [P3]
- Murrieta-Flores, P., Baron, A., Gregory, I. N., Hardie, A., and Rayson P. 2015. Automatically analyzing large texts in a GIS environment: The Registrar General's reports and cholera in the 19th Century. *Transactions in GIS*, 19(2), 296-320.
- Pasquarella, V. J., Holden, C. E., Kaufman, L., and Woodcock, C. E. 2016. From imagery to ecology: Leveraging time series of all available Landsat observations to map and monitor ecosystem state and dynamics. *Remote Sensing in Ecology and Conservation*, 2, 152-170.
- Pôças, I., Gonçalves, J., Marcos, B., et al. 2014. Evaluating the fitness for use of spatial data sets to promote quality in ecological assessment and monitoring. *International Journal for Geographical Information Science*, 28(11), 2356-2371.
- Porter, C., Atkinson, P., and Gregory, I. N. 2015. Geographical text analysis: A new approach to understanding nineteenth-century mortality. *Health and Place*, 36, 25-34.
- Priestnall, G., Jaafar, J., and Duncan, A. 2000. Extracting urban features from LiDAR digital surface models. *Computers, Environment and Urban Systems*. 24(2), 65-78.



- Rundle, A. G., Bader, M. D. M., and Mooney S. J. (2022). Disclosure of personal identifying information in studies of neighborhood contexts and patient outcomes. *Journal of Medical Internet Research*, 24 (no.3, March).
- Scheufele, E.L., Hodor, B., Popa, Jr., G., et al. (2022). Population segmentation using a novel socio-demographic dataset. *Online Journal of Public Health Informatics*, 14, e1.
- Singleton, A.D., Pavlis, M., and Longley, P.A. (2016). The stability of geodemographic cluster assignments over an intercensal period. *Journal of Geographical Systems*, 18, 97-123.
- Singleton, A.D. and Spielman, S.E. (2014). The Past, Present, and Future of Geodemographic Research in the United States and United Kingdom. *The Professional Geographer*, 66(4), 558-567.
- Smith, A. N. H., Anderson, M. J., and Pawley, M. D. M. 2017. Could ecologists be more random? Straightforward alternatives to haphazard spatial sampling. *Ecography*, 40(11), 1251-1255.
- Smith, T., Rheinwalt, A., and Bookhagen, B. 2019. Determining the optimal grid resolution for topographic analysis on an airborne LiDAR dataset. *Earth Surface Dynamics*, 7, 475-489.
- Sola-Guirado, R.R., Castillo-Ruiz, F.J., Jiménez-Jiménez, F., et al. 2017. Olive actual “on year” yield forecast tool based on the tree canopy geometry using UAS imagery. *Sensors*, 17(8), 1743.
- Southall, H., Mostern, R., and Berman, M. L. 2011. On historical gazetteers. *International Journal of Humanities and Arts Computing*, 5(2), 127-145.
- Spielman, S.E. and Folch, D.C. 2015. Reducing uncertainty in the American Community Survey through data-driven regionalization. *PLoS ONE*, 10(2), e0115626.
- Spielman, S.E., Folch, D., and Nagle, N. 2014. Patterns and causes of uncertainty in the American Community Survey. *Applied Geography*, 46, 147-157.
- Spielman, S.E. and Singleton, A. 2015. Studying neighborhoods using uncertain data from the American Community Survey: A contextual approach. *Annals of the Association of American Geographers*, 105(5) 2015, 1003-1025.
- Stefanidis, A., Crooks, A., and Radzikowski, J. 2013. Harvesting ambient geospatial information from social media feeds. *GeoJournal*, 78, 319-338.
- Stockwell, S., and Gallo, S. 2017. Citizen science and wildlife conservation: lessons from 34 years of the Maine loon count. *Maine Policy Review*, 26(2), 25-32.
- Strominger, J., Anthopolos, R., and Miranda, M. L. 2016. Implications of construction method and spatial scale on measures of the built environment. *International Journal of Health Geographics*, 15, 15.
- Tenkanen, H., Di Minin, E., Heikinheimo, V., et al. 2017. Instagram, Flickr, or Twitter: Assessing the usability of social media data for visitor monitoring in protected areas. *Scientific Reports*, 7, 17615.

- Vergopolan, N., Chaney, N. W., Pan, M., et al. 2021. SMAP-HydroBlocks, a 30-m satellite-based soil moisture dataset for the conterminous US. *Scientific Data*, 8, 264.
- Waagen, J. 2019. New technology and archaeological practice: Improving the primary archaeological recording process in excavation by means of UAS photogrammetry. *Journal of Archaeological Science*, 101, 11-20.
- Wang, J., Liu, J., Zhuan, D., et al. 2002. Spatial sampling design for monitoring the area of cultivated land. *International Journal of Remote Sensing*, 23(2), 263-284.
- Wentz, E.A. and Shimizu, M. 2018. Measuring spatial data fitness-for-use through multiple criteria decision making. *Annals of the American Association of Geographers*, 108(4), 1150-1167.
- Whitehead, K., and Hugenholtz, C. H. 2014. Remote sensing of the environment with small unmanned aircraft systems (UASs), Part 1: A review of progress and challenges. *Journal of Unmanned Vehicle Systems*, 2, 69-85.
- Yi, L., J.P. Wilson, T.B. Mason, R. Habre, and S. Wang. 2019. Methodologies for assessing contextual exposure to the built environment in physical activity studies: A systematic review. *Health and Place*. 60 (102226).
- Yi, L., Y. Xu, S.P. Eckel, et al. 2022. Time-activity and daily mobility patterns during pregnancy and early postpartum – evidence from the MADRES cohort. *Spatial and Spatio-temporal Epidemiology*. 41 (100502).
- Zandbergen, P. A. 2008. A comparison of address point, parcel and street geocoding techniques. *Computers, Environment and Urban Systems*, 32, 214-232.
- Zhang, S., C.D. Lippett, S.M. Bogus, A.C. Loerch, and J.O. Strum. 2016. The accuracy of aerial triangulation products automatically generated from hyper-spatial resolution digital aerial photography. *Remote Sensing Letters*. 7 (2):pp.160-169.
- Zhao, Q., Wen, H., Lin, Z., et al. 2020. On the accuracy of measured proximity of bluetooth-based contact tracing apps. In N. Park, S. Kun, S. Foresti, et al. (Eds.), *Security and privacy in communication systems* (pp. 49-60). Cham, Switzerland: Springer.

The following supplemental materials will be posted to Brightspace for Project Assignments:

- Chuang, W.-C., Boone, C.G., Locke, D.H., et al. 2017. Tree canopy change and neighborhood stability: A comparative analysis of Washington, D.C. and Baltimore, MD. *Urban Forestry & Urban Greening*, 27, 363-372.
- Donovan, G.H., Gatziolis, D., Derrien, M.L., et al. 2022. Shortcomings of the normalized difference vegetation index as an exposure metric. *Nature Plants*, 8, 617-622.
- Elmes, A., Rogan, J., Williams, C., et al. 2017. Effects of urban tree canopy loss on land surface temperature magnitude and timing. *ISPRS Journal of Photogrammetry and Remote Sensing*, 128, 338-353.
- Greenwood, F. 2015. How to make maps with drones. In K. Kakaes (Ed.), *Drones and aerial observation: New technology for property rights, human rights, and global development* (pp. 35-47). New America.

- Herfort, B.S., Lautenback, J., Porto de Albuquerque, J., et al. 2021. The evolution of humanitarian mapping within the OpenStreetMap community. *Scientific Reports*, 11, 3037.
- Jeziorska, J. 2019. UAS for wetland mapping and hydrological modeling. *Remote Sensing*, 11, 1997.
- Klinkhardt, C., Woerle, T., Briem, L., et al. 2021. Using OpenStreetMap as a data source for attractiveness in travel demand models. *Transportation Research Record*, 2675(8), 294-303.
- McDonald, R.I., Biswas, T., Sachar, C., et al. 2021. The tree cover and temperature disparity in U.S. urbanized areas: Quantifying the association with income across 5,723 communities. *PLoS ONE*, 16(4), e0249715.
- Minghini, M. and Frassinelli, F. 2019. OpenStreetMap history for intrinsic quality assessment: Is OSM up-to-date? *Open Geospatial Data, Software and Standards*, 4, 9.
- Rakha, R.T. and Gorodetsky, A. 2018. Review of Unmanned Aerial System (UAS) applications in the built environment: Towards automated building inspection procedures using drones. *Automation in Construction*, 93, 252-264.
- Roman, D., Tarasova, T., and Paniagua, J. 2019. MethOSM: A methodology for computing composite indicators derived from OpenStreetMap data. *Journal of Spatial Information Science*, 19, 3-27.
- Troy, A. and Davis, S. 2016. The effects of urban forest canopy on microclimate and heat islands. USDA Forest Service. *USDA Forest Service Urban Forest Connections Webinar Series*. <https://www.vibrantcitieslab.com/resources/urban-canopy-and-heat-islands/>
- U.S. Environmental Protection Agency. 2008. *Reducing urban heat islands: Compendium of strategies* (Draft). <https://www.epa.gov/heat-islands/heat-island-compendium>
- Wolch, J., Byrne, J., and Newell, J.P. 2014. Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough.' *Landscape and Urban Planning*, 125, 234-244.
- Zhang, Y., Zhou, Q., Brovelli, M.A., et al. 2022. Assessing OSM building completeness using population data. *International Journal of Geographic Information Science*, 36(8), 1443-1446.

## Description and Assessment of Assignments

### Assignments

There are different kinds of assignments throughout the semester that build competencies in data acquisition and evaluation, as well as written communication. These are described in the Assignments module in Brightspace. Due dates are shown in the Schedule below.

**Resume Assignment – 1 worth 3 points.** In addition to the submission via Brightspace, we require all current students to post and maintain a public resume, short biography, and recent photo on our shared SSI Student Hub site on Brightspace. Please prepare your resume in the SSI template that will be provided to you. Unless you opt out, your resume

will be included in the Spatial Science Institute Graduate Programs Resume Book. This resume book is compiled annually and, along with our web presence, is used to promote our programs, and more importantly, your skills, experience, and professional aspirations. This assignment is due at the end of the term so that you can incorporate your newly gain skills.

*Projects – 3 worth 48 points.* The projects will be the major tool used to evaluate your learning in this course. These assignments will integrate key concepts and ideas and require students to complete the basic types of data acquisition and integration asked of professional spatial analysts in real-world settings through independent thought. Prompts will list helpful information, such as software tutorials, for becoming familiar with ways that concepts learned in the course are implemented in various software packages. Each project has two deliverables: a workflow diagram and a written report that describes project goals, methods, data, and results. The workflow diagram is due one week prior to the final deliverable and is workshopped in an online forum or during a synchronous class session with classmates and the instructor.

*Reading and Research Discussions – 3 worth 15 points.* These assignments call on students to identify relevant research case studies employing the methodologies and concepts we cover in class and to discuss them with the instructor and their classmates during course meetings and in online discussion forums.

*Summative Assignment – 1 worth 4 points.* A final summative written assignment to be completed during the final examination period is required. In this assignment, you will reflect on the course learning outcomes and explain how the assigned work completed during the semester address these.

### ***Catalina Field Component***

For this part of the course, you will be divided into small teams to undertake your field work together. In addition to completing the data collection project, each team will deliver two oral presentations and a poster summarizing your project and results.

*First Presentation – 5 points.* This 10-15 minute presentation will take place at the start of the week and will describe your team’s proposed research project.

*Second Presentation – 13 points.* This 15-20 minute presentation will take place at the end of the week and will summarize your team’s methodology, results and findings.

*Poster/Storymap – 12 points.* The poster or story map will present a summary of your project and visualization of results. The posters/story maps must be submitted for grading to Brightspace before leaving the island.

### **Grading Breakdown**

Careful planning and a serious, consistent commitment will be required for you to navigate the various deliverables in this course. The table below summarizes the SSCI 587 course assignments and their point distribution.

Assignment	Number	Points Each	Points
Resume Assignment	1	3	3
Reading and Research Discussions	3	5	15
Projects	3	16	48
Summative Assignment	1	4	4
Catalina Island Excursion			
First Presentation	1	5	5
Second Presentation	1	13	13
Poster/Storymap	1	12	12
<b>TOTALS</b>	<b>14</b>	<b>--</b>	<b>100</b>

## Grading Scale

Assignments in this and other SSCI courses, are graded on the letter grade scale where A is exemplary, B is very good, C is satisfactory, D is unsatisfactory, and F needs improvement. Final grades use the same letter grade scale with C being the minimum passing grade for credit at the graduate level. The grading scale follows:

A	> 93 points	B-	80-82 points	D+	67-69 points
A-	90-92 points	C+	77-79 points	D	63-66 points
B+	87-89 points	C	73-76 points	D-	60-62 points
B	83-86 points	C-	70-72 points	F	<60 points

## Assignment Submission Policy

Assignments must be submitted via Brightspace by the due dates specified in the Course Schedule. Attention to on-time assignment submission is essential. The instructor will aim to return feedback before the next assignment is due.

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 2 points up to four days late. No points will be given for submissions more than four days late.
- Additionally, no written work will be accepted for grading after 5 p.m. PT on the last day of classes.

## SSI Policy on the Creation of Original Work and Use of Generative AI

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. Students may not have another person or entity complete any substantive portion of an assignment or reuse work prepare for courses without obtaining written permission from the instructor(s). Developing strong competencies in research, writing, and the technical execution of geospatial technologies are foundational to SSI academic programs that are designed to prepare you for success in the workplace. Therefore, using generative AI tools –

unless explicitly specified otherwise – is strictly prohibited in this course, will be identified as plagiarism, and will be reported to the Office of Academic Integrity.

## Grading Timeline

My goal is to provide grading and feedback on each course assignment in a timely fashion. Depending on the enrollment, number of graders, and deadlines, this will be in within 2-3 weeks.

## Learning Experience Evaluations

Please note Learning Experience Evaluations for the course take place at the end of the semester and are facilitated by the University. These evaluations provide an important review of student experiences in the course.

## Schedule

Week	Topics	Assignments & Readings	Deliverables / Due Dates
<b>Module 1   Introduction and Spatial Data</b>			
<b>Week 1</b> 5/21	<b>Introduction to Course</b> Introduction to class, expectations, and data acquisition		No Deliverables
<b>Week 2</b> 5/26* *Monday, 5/26 is a university holiday	NO CLASS		
5/28	<b>Representation of Spatial Data</b> Review of various spatial data models  <b>RRD 1 and Project 1 Intro</b>	Chrisman (1984) Fisher and Wood (1998) <i>Case study:</i> Fisher et al. (2004)  Project 1 RRD 1	
<b>Week 3</b> 6/2	<b>Fitness-for-use &amp; Scale</b> A discussion of metadata and the concept of fitness-for-use; The role and importance of scale	Goodchild (2000) Pôças et al. (2014) Wentz and Shimizu (2018)  Frank (2010) Goodchild (2011) <i>Case Study:</i> Strominger et al. (2016)	
6/4	<b>Uncertainty and error</b> Sources of error, data standards, data quality and uncertainty	Couclelis (2021) Fisher et al. (2010) Bolstad et al. (1990)	RRD 1 (synchronously, in class; asynchronously, before and after class session)

Week	Topics	Assignments & Readings	Deliverables / Due Dates
<b>Week 4</b> 6/9	<b>Digital World</b> What's New in the digital World?	Chrisman (2017) Goodchild (2018)	Project 1 Workflow
<b>Module 2   Terrestrial and Non-Terrestrial Data Acquisition</b>			
6/11	<b>GNSS and Complimentary Systems</b> Global Navigation Satellite Systems, Regional Navigation Systems and complementary systems for terrestrial data acquisition  Project 1 workflow workshop - asynchronous	Jankowska et al. (2015) Yi et al. (2019) Yi et al. (2022)	
<b>Week 5</b> 6/16	<b>Surveying &amp; Field Data Collection Workshop</b> Surveying, coordinates, and field data collection; workshop of ArcGIS FieldMaps and hosted feature layers	RRD 2  Johnson and Barton (2004) Lippitt (2020)	ArcGIS FieldMaps access  Project 1 Due
6/18 Thursday, 6/19 is a university holiday	<b>Project 2 Intro</b>  <b>UAV</b> Unoccupied Aerial Systems: UAS platforms, sensors and products	Project 2  Whitehead and Hugenholtz (2014) Sola-Guirado et al. (2017) <i>Case Studies:</i> Waagen (2019)	
<b>Week 6</b> 6/23	<b>Satellite Data</b> Satellite imagery: Concepts and methods of remote sensing Demo	Dwyer et al (2018) Zhang et al. (2016) <i>Case Studies:</i> Pasquarella et al. (2016) Vergopalan et al (2021)	
6/25	<b>VGI &amp; Open Street Map</b> Citizen science, volunteered and ambient geographic information: OSM as a validated data source	Eitzel et al. (2017) <i>Case Studies:</i> Stefanidis et al. (2013) Stockwell and Gallo (2017)  Barrington-Leigh and Millard-Ball (2017)  Minghini and Frassinelli (2019)	Project 2 Workflow
<b>Week 7</b> 6/30	<b>RRD 2</b> <b>Personal Location Data</b> Mobile phones and social media clicks	Jestico et al. (2016) Tenkanen et al. (2017) Liang et al. (2020)	RRD 2 (synchronously, in class; asynchronously, before and after class session)
7/2* *Friday, 7/4 a university holiday	<b>Ground Image Acquisition</b> The benefits and utility of street view imagery such as Google Earth Imagery and others  <b>Project 2 workflow workshop</b>	Alvarez Leon & Quinn (2019) <i>Case Studies:</i> Arietta et al (2014) Larkin et al. (2021)	

Week	Topics	Assignments & Readings	Deliverables / Due Dates
<b>Module 3   Catalina Field Excursion</b>			
<b>Week 8</b> 7/7	Catalina Field Excursion		First Presentation, Tuesday, 7:00 p.m. Second Presentation, Sunday, 9:00 a.m. Poster, Sunday, 9:00 a.m.
<b>Module 4   Administrative and Textual Data Sources</b>			
<b>Week 9</b> 7/14 (Esri UC)	<b>Administrative Data</b> U.S. Census , American Community Survey, and IPUMS Demo	Spielman et al. (2014) Spielman and Folch (2015) <i>Case Study:</i> <b>Spielman and Singleton (2015)</b>	Project 2 due
7/16	<b>Secondary Geodemographic Datasets</b>	Singleton and Spielman (2014) Singleton et al, (2016) <b>Scheufele et al. (2022)</b>	
<b>Week 10</b> 7/21	<b>Introduction to Project 3</b>  <b>Geocoding</b> The geocoding process and practice Demo	Project 3  Zandbergen (2008) Lee (2009) Jones et al. (2014) Rundle et al (2022)	
7/23	<b>NLP</b> Spatializing data using natural language processing	Southall et al. (2011) Murrieta-Flores et al. (2015) <i>Case Studies:</i> Acheson et al, (2020) Porter et al. (2015)	Resume Assignment
<b>Module 5   Non-GNSS Data Acquisition</b>			
<b>Week 11</b> 7/28	<b>Indoor mapping and positioning</b> How to measure and position indoor and without GNSS	Kunhoth et al. (2020) El-Sheimy & Lu (2021) <i>Case Study:</i> Zhao et al. (2020)	
7/30	<b>LiDAR</b> Mapping the built and natural environment	RRD 3  Priestnall et al. (2000) Dubayah and Drake (2000) Smith et al. (2019) Mahdianpari et al (2021)	
<b>Module 6   Spatial Sampling and Estimation</b>			
<b>Week 12</b> 8/4	<b>RRD 3</b>  <b>Spatial Sampling and Spatial Estimation</b>	Summative Assignment  Delmelle (2009) Smith et al. (2017) <i>Case Study:</i> Wang et al. (2002) Kassie et al. (2017) Grantham et al (2020)	RRD 3 (synchronously, in class; asynchronously, before and after class session



Week	Topics	Assignments & Readings	Deliverables / Due Dates
8/6	<b>Project 3 workflow workshop</b>		Project 3 Workflow
<b>Week 13</b> 8/11 Friday, 8/15 is the last day of class	<b>Data Validation and Reviewer</b>		
	<b>Closing thoughts</b>		Project #3 due; Summative Assignment due Friday, 8/15

## Statement on Academic Conduct and Support Systems

### ***Academic Integrity:***

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others (including AI generated) or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

### **Students and Disability Accommodations:**

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](http://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

### **Support Systems:**

[\*Counseling and Mental Health\*](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[\*988 Suicide and Crisis Lifeline\*](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[\*Relationship and Sexual Violence Prevention Services \(RSVP\)\*](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[\*Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)\*](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[\*Reporting Incidents of Bias or Harassment\*](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[\*The Office of Student Accessibility Services \(OSAS\)\*](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[\*USC Campus Support and Intervention\*](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

### ***Resources for Online Students***

The Course Brightspace page and the SSI Student Hub on Brightspace have many resources available for distance students enrolled in our graduate programs. In addition, all registered students can access electronic library resources through the link <https://libraries.usc.edu/>. Also, the USC Libraries have many important resources available for distance students through the link: <https://libraries.usc.edu/faculty-students/distance-learners>. These include instructional videos, remote access to university resources, and other key contact information for distance students.