SSCI 587, Spatial Data Acquisition

Syllabus

Units: 4

Term—Day—Time: Summer, 2023, Tuesdays and Thursdays, 3:00 to 4:50 p.m.

Location: AHF 145A and DEN@Dornsife

Instructor: Dr. John P. Wilson
Office: AHF B55F
Office Hours: Mondays, 3-4 p.m. and Fridays, 4-5 p.m. PDT, and by appointment at other times. I am always available asynchronously via email. I am also available for synchronous chats via audio or video on most days and times *by prior arrangement* via email. Just get in touch!

Contact Info: jpwilson@usc.edu**,** 213-740-1908 (office).

Library Help: Andy Rutkowski
Office: VKC 36B
Office Hours: Thursdays, 10 a.m. to 12 p.m.
Contact Info: arutkows@usc.edu, see contact page on Blackboard for Zoom room

IT Help: Myron Medalla
Office: AHF 56B
Office Hours: By appointment
Contact Info: spatial_support@usc.edu, 213-740-4415

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 all thee tracks in the Geographic Information Science and Technology (GIST) M.S. and Graduate Certificate Programs and the Human Security and Geospatial Intelligence (HSGI) M.S. Program. We cover several topics, including:

Data Needs and Types—We start by focusing on the data challenge, defining data needs, and the role of conceptualization, entitation (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 various ways digital data 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. We focus on Global Navigation Satellite Systems, Unoccupied Aerial Systems, and both satellite and oblique imagery as valuable sources of spatial data.

Data Quality—We discuss data standards and how they are used to promote 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 can be used along with field-based systems (GNSS and GPS receivers, unoccupied autonomous systems and a variety of sensors) to support spatial data acquisition, analysis, and visualization. Many of the readings and exercises in the first half of the class will help to support the field projects conducted during the one-week field excursion on Catalina Island in which students design, conduct, and present the results of their own spatial data collection projects using equipment provided by the Spatial Sciences Institute and their own devices.

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

Written Communication Skills—Since successful spatial scientists and geospatial intelligence specialists need cutting-edge spatial skills as well as effective communication competence to prosper in today's rapidly evolving world, faculty members from the USC Writing Program coach students on their writing skills in selected assignments during this course.

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.

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 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).

COVID-19 policy—Students are expected to comply with all aspects of USC's COVID-19 policy including, but not limited to, vaccination, indoor mask mandate, and daily TrojanCheck. Failure to do so may result in removal from the class and referral to Student Judicial Affairs and Community Standards. Students are recommended to keep safe physical distancing, whenever possible, to prevent any possible transmission. Please contact your instructor if you have any safety concerns.

Diversity and Inclusion—It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that student's 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 others, regardless of their race, ethnicity, gender, identity and expressions, cultural beliefs, religion, sexual orientation, national origin, age, abilities, ideas and perspectives, or socio-economic status. Your suggestions are encouraged and appreciated. Feel free to let me know ways to improve the efficacy of this course for you personally and 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, opinion, and analysis that describe our collective effort to thoroughly interrogate the subject at hand. Learning arises from active engagement with the knowledge found in the class sessions, the reading materials, and with discussions among one another. As in any graduate level class, the instructor's role is that of a guide who keeps you on path of discovery and you will find that you will learn much from your fellow classmates. All course materials will be organized through the D2L learning management system and will generally unfold on a weekly basis, with the week's material posted at the start of the week. 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. Some of these assignments require student interaction; all will benefit from it.

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. Note: There is a required room

and board fee for the Catalina trip of approximately $360 that is supplemental to the regular tuition cost.

Technology and Communication Requirements

ArcGIS is provided online via the GIST 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://keepteaching.usc.edu/students/student-toolkit/

Desire2Learn—This course will utilize the Desire2Learn (D2L) learning management system which allows students to access course content, upload assignments, participate in discussion forms, among other learning experiences. D2L 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, making sure to copy (cc) me on the email.

Communications—All assignments given and all student deliverables will be submitted via D2L. 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 D2L or from the course instructor as soon as possible. In addition, students who do not regularly use their USC email accounts should double-check to be sure that mail sent from both the D2L and instructor's account (noted above) to your USC account is forwarded to an address used regularly and does not languish in your junk mail folder. 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 periodof time, an announcement will be posted to the class D2L 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 expectedto login to D2L regularly to check for announcements.

Discussion forums—Discussion forums provide a key means for student-to-student discussion and collaboration that can replicate the face-to-face contact you may have experienced in traditional classrooms. Here students can provide support to each other while working on your assignments, sharing hints and helpful tips, as you would in a classroom or lab setting. Please post your questions about assignments there, as you would ask them publically 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

The required textbook for this course is:

- Bolstad, P., Manson, S. 2022. *GIS fundamentals: A first text on geographic information systems* (7th Ed.). Elder Press.

This textbook, which is also used in *SSCI 581: Concepts for Spatial Thinking,* will be supplemented with class presentations and a mix of readings from academic journals, professional reports and authoritative websites.

Supplemental Readings—The following journal articles will be posted to D2L under the Course Readings for the appropriate week:

- Acheson, E., Volpi, M., 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., 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., 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.
- Bader, M.D.M., Mooney, S.J., Rundle, A.G. 2016. Protecting personally identifiable information when using online geographic tools for public health research. *American Journal of Public Health, 106*(2), 206-208.
- Barrington-Leigh, C., 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., 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., 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., 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., Li, Y. 2021. Indoor navigation: State of the art and future trends. *Satellite Navigation, 2,* 7.

- Fisher, P., Comber, A., 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., 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., 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). CRC Press.

- Gao, S., Rao, J., Kang, Y., et al. 2020. Association of mobile phone location data indications of travel and stay-at-home mandates with COVID-19 infection rates in the US. *JAMA Network Open, 3*(9), e2020485.

- Goldberg, D.W., Wilson, J.P., Knoblock, C.A. 2007. From text to geographic coordinates: The current state of geocoding. *URISA Journal, 19*(2), 33-46.

- 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.

- Hu, Y., 2018. Geo-text data and data-driven geospatial semantics. *Geography Compass*, *12*(11), e12404.

- Jankowska, M.M., Schipperijn, J., 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., Winters, M. 2016. Mapping ridership using crowdsourced cycling data. *Journal of Transport Geography, 52*, 90-97.

- Johnson, C.E., 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., 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. *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 Qtr. 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.

- Murrieta-Flores, P., Baron, A., Gregory, I.N., et al. 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.

- Onsrud, H.J. 2010. Liability for spatial data quality. In R. DeVillers, H. Goodchild (Eds.), *Spatial data quality: From process to decisions* (pp. 3-16). CRC Press.

- Pasquarella, V.J., Holden, C.E., Kaufman, L., et al. 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.

- Porter, C., Atkinson, P., 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., Duncan, A. 2000. Extracting urban features from LiDAR digital surface models. *Computers, Environment and Urban Systems. 24*(2), 65-78.

- Reynard, D. 2018. Five classes of geospatial data and the barriers to using them. *Geography Compass, 12*(4), e12364.

- Robinson, L., Newell, J.P., Marzluff, J.M. 2005. Twenty-five years of sprawl in the Seattle region: Growth management responses and implications for conservation. *Landscape and Urban Planning, 71,* 51-72.

- Smith, A.N.H., Anderson, M.J., 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., 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., Berman, M.L. 2011. On historical gazetteers. *International Journal of Humanities and Arts Computing, 5*(2), 127-145

- Spielman, S.E., 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., Nagle, N. 2014. Patterns and causes of uncertainty in the American Community Survey. *Applied Geography, 46,* 147-157.

- Spielman, S.E., 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., Radzikowski, J. 2013. Harvesting ambient geospatial information from social media feeds. *GeoJournal, 78,* 319-338.

- Stockwell, S., 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., 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.

- Thatcher, C.A. Lukas, V., Stoker, J.M. 2020. *The 3D Elevation Program and energy for the nation: Energy infrastructure and high-quality three-dimensional elevation data* (Fact Sheet 2019-3051). U.S. Geological Survey.

- Toutin, T. 2004. Geometric processing of remote sensing images: Models, algorithms and methods. *International Journal of Remote Sensing, 25*(10), 1893-1924.

- 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.

- Whitehead, K., 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.

- Wirola, L., Laine, T.A., Syrjärinne, J. 2010. Mass-market requirements for indoor positioning and indoor navigation. *2010 International Conference on Indoor Positioning and Indoor Navigation,* Zurich, Switzerland (pp. 1-7). IEEE.

- Yi, L., Wilson, J.P., Mason, T.B., et al. 2019. Methodologies for assessing contextual exposure to the built environment in physical activity studies: A systematic review. *Health & Place, 60,* 102226.

- Yi, L., Xu, Y., Eckel, S.P., 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.

- Zandbergen, P.A. 2009. Accuracy of iPhone locations: A comparison of assisted GPS, WiFi and cellular positioning. *Transactions in GIS, 13*(s1), 5-26.

- Zhang, S., Lippitt, C.D., Bogus, S.M., et al. 2016. The accuracy of aerial triangulation products automatically generated from hyper-spatial resolution digital aerial photography. *Remote Sensing Letters, 7*(2), 160-169.

The following supplemental materials will be posted to D2L under the Project Assignments for the appropriate week:

- 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., 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., 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., Paniagua, J. 2019. MethOSM: A methodology for computing composite indicators derived from OpenStreetMap data. *Journal of Spatial Information Science,* 19, 3-27.

- Troy, A., 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., 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

Weekly Assignments

There are several different kinds of assignments throughout the semester that build competencies in data acquisition and evaluation, as well as problem solving and written communication. These are described under the Assignments tab in the Weekly Folders in D2L. Due dates are shown in the Schedule below.

Resume Assignment—1 worth 3 points. In addition to the submission via D2L, we require all current students to post and maintain a public resume, short biography, and recent photo on our SSI Student Community site. Please prepare your resume in the SSI template that will be provided to you, and unless you opt out, your resume will be included in the SSI 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 start of the semester but you can upload an updated resume that incorporates your newly gained skills later in the semester as well.

Writing Responses—3 worth a total of 3 points. In collaboration with the Writing Center, three instructional videos on writing will be provided. A short quiz at the end of each video will evaluate your understanding of the major points of the video.

Projects—3 worth a total of 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 asked of professional spatial analysts in real-world settings through independent thought. Prompts will list helpful information, such as 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 a total of 12 points. These RRD assignments call on students to identify relevant research case studies employing the methods 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 that you completed during the semester addressed these learning outcomes.

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 tasks, each team will deliver two oral presentations and a poster summarizing your project and the results.

First Presentation—1 worth 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—1 worth 10 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—1 worth 15 points. The poster will present a summary of your project and one or more visuals highlighting the results. The posters must be submitted for grading to D2L 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 578 course assignments and their point distribution.

Assignment	Number	Points Each	Points
Resume Assignment	1	3	3
Writing Responses	3	1	3
Reading and Research Discussions	3	4	12
Projects	3	16	48
Summative Assignment	1	4	4
Catalina Island Excursion			
First Presentation	1	5	5
Second Presentation	1	10	10
Poster	1	15	15
TOTALS	**13**	**--**	**100**

In addition, it is important to note from the outset that:

- You are expected to attend and participate in every class session and to complete and upload all assignments before the deadlines listed in the Course Schedule. The DEN model means that you may choose the modalities to best fit your own circumstances and therefore participate in each class session in one or other of three modalities—In-person and synchronous, remote and synchronous, or remote and asynchronous).

- I will deduct one letter grade for late postings and assignments up to one week, and no credit will be assigned for postings or assignments turned in more than one week late.

- No written work will be accepted for grading after 11:59 p.m. PT on the last day of classes (i.e. Friday, August 11th, 2023).

- This said, assignments should be submitted via D2L by the due dates specified in the Course Schedule below and attention to on-time submission is a key ingredient leading to success in this course. The instructor will aim to return feedback before the next assignment is due.

Course Schedule

Dates	Topics/Daily Activities	Readings	Deliverables / Due Dates
Module 1 | Spatial Data			
Week 1 5/18	Introduction to course		Resume Assignment, Monday, 11:59 p.m., 5/22
Week 2 5/23	The representation of spatial phenomena and fitness-for-use	Chrisman (1984) Fisher and Wood (1998) Reynard (2018) Goodchild (2000) *Case study:* Fisher et al. (2004)	Writing Response #1, Wednesday, 11:59 p.m., 5/24
5/25	RRD1 Discussion and Introduction to Project 1	*For Project 1:* Greenwood (2015) Rakha & Gorodetsky (2018) Jeziorska (2019)	Project #1 Workflow, Monday, 11:59 p.m., 5/29
Week 3 5/30	The role and importance of scale	Frank (2010) Goodchild (2011) *Case study:* Strominger et al. (2016)	Reading and Research Discussion #1, Wednesday, 11:59 p.m., 5/31
6/1	Sources of error, data standards, data quality and uncertainty	Bolstad et al. (1990) Fisher et al. (2010) Couclelis (2021)	
Week 4 6/6	What's new in the digital world?	Chrisman (2017) Goodchild (2018)	Project #1, Wednesday, 11:59 p.m., 6/7
Module 2 | Terrestrial and Non-Terrestrial Data Acquisition			
6/8	GNSS / GPS systems and complementary systems	Jankowska et al. (2015) Yi et al. (2019) Yi et al. (2022)	Writing Response #2, Monday, 11:59 p.m., 6/12
Week 5 6/13	RRD2 Discussion and Introduction to Project 2	*For Project 2:* U.S. Environmental Protection Agency (2008) Wolch et al. (2014) Troy + Davis (2016) Chuang et al. (2017)	

		Elmes et al. (2017) McDonald et al. (2021) Donovan et al. (2022)	
6/15	Surveying, coordinates, and field data collection	Johnson + Barton (2004) Lippitt (2020)	Project #2 Workflow, Monday, 11:59 p.m., 6/19
Week 6 6/20	Citizen science, volunteered and ambient geographic information	Barrington-Leigh + Millard-Ball (2017) Eitzel et al. (2017) *Case studies:* Stefanidis et al. (2013) Stockwell + Gallo (2017)	
6/22	Mobile phones and social media clicks	Zandbergen (2009) Jestico et al. (2016) Tenkanen et al. (2017) Gao et al. (2020) Liang et al. (2020)	Reading and Research Discussion #2, Monday, 11:59 p.m., 6/26
Week 7 6/27	Unoccupied Aerial Systems: Platforms, sensors, and products	Touton (2004) Whitehead & Hugenholtz (2014) Zhang et al. (2016) *Case studies:* Sola-Guirado et al. (2017) Waagen (2019) Mahdianpari et al. (2021)	Writing Response #3. Wednesday, 11:59 p.m., 6/28
6/29	Satellite image acquisition	Dwyer et al. (2018) *Case studies:* Robinson et al. (2005), Pasquarella et al. (2016) Vergopolan et al. (2021)	
Week 8 7/4	NO CLASS—July 4th Holiday		Project #2, Wednesday, 11:59 p.m., 7/5
7/6	Ground image acquisition	Alvarez Leon + Quinn (2019) *Case studies:* Arietta et al. (2014) Larkin et al. (2021)	
Module 3 | Field Practicum			
Week 9 7/10-7/16	Catalina field excursion		First Presentation, Wednesday, 9:00 a.m., 7/12 Poster Submission, Sunday, 8:45 a.m., 7/16 Second Presentation, Sunday, 9:15 a.m., 7/16
Module 4 | Administrative and Textual Data Sources			

Week	Topic	Readings	Assignments
Week 10 7/18	RRD3 Discussion and Introduction to Project 3	*For Project 3:* Minghini et al. (2019) Roman et al. (2019) Herfort et al. (2021) Klinkhardt et al. (2021) Zhang et al. (2022)	
7/20	U.S. Census and American Community Survey	Spielman et al. (2014) Spielman + Folch (2015) *Case study:* Spielman + Singleton (2015)	Project #3 Workflow, Monday, 11:59 p.m., 7/24
Week 11 7/25	The geocoding process	Goldberg et al. (2007) Zandbergen (2008) Jones et al. (2014) Bader et al. (2016)	
7/27	Spatializing data using natural language processing	Southall et al. (2011) Murrieta-Flores et al. (2015) Hu (2018) *Case studies:* Porter et al. (2015) Acheson et al. (2020)	Reading and Research Discussion #3, Monday, 11:59 p.m., 7/31
Module 5 | Non-GNSS Data Acquisition			
Week 12 8/1	Indoor mapping and positioning	Wirola et al. (2010) Kunhoth et al. (2020) El-Sheimy & Li (2021)	
8/3	LiDAR: Mapping the built and natural environments	Priestnall et al. (2000) Dubayah + Drake (2000) Smith et al. (2019) Thatcher et al. (2020)	
Module 6 | Spatial Sampling and Estimation			
Week 13 8/8	Spatial sampling	Delmelle (2009) Smith et al. (2017) *Case study:* Wang et al. (2002)	Project #3, Wednesday, 11:59 p.m., 8/9
8/10	Spatial estimation	Lee (2009) Onsrud (2010) Kassie et al. (2017) Grantham et al. (2020)	Summative Assignment, Monday, 11:59 p.m., 8/14

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of

academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on Research and Scholarship Misconduct.

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. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu

Support Systems

Counseling and Mental Health – (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline – 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) – (213) 740-5086
eeotix.usc.edu
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
usc-advocate.symplicity.com/care_report
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.usc.edu
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) 821-4710
campussupport.usc.edu
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
diversity.usc.edu
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
dps.usc.edu, emergency.usc.edu
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) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.

Office of the Ombuds – (213) 821-9556 (UPC) / (323-442-0382 (HSC), or
ombuds.usc.edu
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) 442-3340, otfp@med.usc.edu, or
chan.usc.edu/otfp
Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

Resources for Remote Students

The Course D2L and SSI Community D2L pages have many resources available for remote 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.