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

SSCI 587, Spatial Data Acquisition

Syllabus

Units: 4

Term - Day - Time: Fall, 2021;
Tues/Thurs 11:00-12:50 am PT

Location: Online; Zoom links available on course Blackboard

Instructor: Andrew J. Marx, Ph.D
Office: Remote
Office Hours: Monday and Wednesday 11 am-noon PT via Zoom – please contact me in advance to ensure I will be online. Also available most days and times by appointment via email.
Contact Info: marxa@usc.edu,

Library Help: Andy Rutkowski
Office: VKC 36B
Office Hours: Tue 10 am-12 pm and Thu 4:30-5:30 pm PT
Contact Info: arutkows@usc.edu, 213-740-6390
http://bit.ly/andyhangout

IT Help: Richard Tsung
Office: AHF 145D
Office Hours: By appointment
Contact Info: spatial_support@usc.edu, 213-821-4415

Course Scope and Purpose

SSCI 587: *Spatial Data Acquisition* 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 & 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 (GNSS) and Unmanned/Unoccupied Aerial Systems (UAS) 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, Eos, and Trimble 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. 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 equipment provided by the Spatial Sciences Institute and/or their own devices.

Master's Prospectus – All M.S. students in the GIST program are required to complete a thesis at the end of their studies. To help these students, and GIST Graduate Certificate students planning to transition to the GIST M.S. Program, move quickly towards the development of their thesis plans, these students apply concepts and ideas gleaned from *SSCI 581: Concepts for Spatial Thinking* and this course to prepare an abstract, extended abstract, and a preliminary prospectus for their master's thesis project. The thesis represents the capstone project for the GIST M.S. degree; additional thesis elements are interspersed throughout the required and elective courses leading to *SSCI 594a/b: Master's Thesis*. GIST Certificate students who do not intend to complete a thesis will complete alternative assignments. Students enrolled in the HSGI M.S. program are required to complete a capstone project that focuses on one or more

human security and/or geospatial intelligence challenges at the end of their studies. Similarly, these students complete on a series of assignments that work towards a project proposal.

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.

Learning Objectives

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; and
- 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 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)

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 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 path of discovery and you will find that you will learn much from your fellow classmates.

All course materials will be organized through Blackboard 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 course notes 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 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.*

Technological and Communication Requirements

The geospatial software and data required for course assignments will be accessed using computing resources provided by the Spatial Sciences Institute. ArcGIS is provided online via the SSI Server; hence, you do not need to install it on your own computer. In addition, your instructor will provide laptops with Esri, Trimble, and 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 for use whenever a presentation or meeting is scheduled.
- 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/

SSI Server and Tech Support – This course utilizes the SSI Server, which is a virtual desktop giving access to many different professional software programs. 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.

Catalina Data Hub – Students enrolled in SSCI 587 will be given access to the Catalina Data Hub https://catalinaisland-uscssi.opendata.arcgis.com), the SSI-managed open data hub, via the institutional ArcGIS Online accounts. Students should explore the open data available for Catalina Island ahead of the field component and utilize this data while on Catalina. Students can also request access to closed research groups where they can access data made available to SSI students for use during this course and for research purposes only – these data are not to be shared publicly.

Communications – Apart from the week on Catalina, course interactions will be asynchronous (not at the same time). All materials to be handed in will be submitted via Blackboard. It is each student's responsibility to stay informed about what is going on in our course. In addition to email about time-sensitive topics, any important announcements will be posted on the Announcement page in Blackboard. Be sure to check these each time you log onto Blackboard.

I will send via email through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all email sent from Blackboard or from me. Do not ignore course email until the day before assignments are due. Also, double check to be sure that email sent from the USC Blackboard account does not go into your junk mail!

While I am usually online and will probably respond to emails from students very quickly, I will endeavor to respond to all email within 36 hours of receipt, aiming for no more than 72 hours delay. In the rare case when I expect to be off-line for more than 72 hours, I will post an announcement on the Blackboard site.

Discussion and Collaborative work – On Blackboard, you will discuss your learnt concepts and theory with classmates and work with them to complete course assignments, exercises, and projects as the need arises. Through discussion and collaborative work, students can provide support to each other while working on their own assignments and sharing helpful tips.

Required Readings and Supplementary Materials

The required textbook for this course is:

- Corbin, Tripp. 2020. *Learning ArcGIS Pro 2 (2nd edition)*. Birmingham, UK: Packt Publishing. Available at: https://www.vitalsource.com/products/learning-arcgis-pro-2-tripp-corbin-v9781839219511

This textbook will be supplemented with Course Notes and a mixture of readings from academic journals, professional reports and authoritative websites.

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

- Bolstad, P. V., P. Gessler, and T. M. Lillesand. 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.
- Couclelis, H. 2020. Conceptual Models of Error and Uncertainty. *The Geographic Information Science & Technology Body of Knowledge* .(1st Quarter 2021 Edition), John P. Wilson (Ed.). DOI: 10.22224/gistbok/2021.1.3
- De Blasio, G., Quesada-Arencibia, A., García, C.R., Molina-Gil, J.M. and Caballero-Gil, C., 2017. Study on an indoor positioning system for harsh environments based on Wi-Fi and bluetooth low energy. *Sensors*. *17*(6), p.1299.
- de Smith, M.J., M. F. Goodchild, and P.A. Longley. 2020. Geospatial Analysis 6th Edition. Available at: https://spatialanalysisonline.com/HTML/index.html
- Dubayah, R.O. and J.B. Drake. 2000. Lidar remote sensing for forestry. *Journal of Forestry*. 98(6), pp.44-46.
- Eitzel, M.V., J.L. Cappadonna, C. Santos-Lang, R.E. Duerr, A. Virapongse, S.E. West, C. Kyba, A. Bowser, C.B. Cooper, A. Sforzi, and A.N. Metcalfe. 2017. Citizen science terminology matters: Exploring key terms. *Citizen science: Theory and practice*. 2(1).
- Fisher, P., A. Comber, and R. Wadsworth. 2010. What's in a name? Semantics, standards, and data quality. In *Spatial Data Quality: From Process to Decisions*, edited by R. Devillers and H. Goodchild. 43-59. Boca Raton, FL: CRC Press.
- Fraiberger, S.P., P. Astudillo, L. Candeago, A. Chunet, N.K. Jones, M.F. Khan, B. Lepri, N.L. Gracia, L. Lucchini, E. Massaro, and A. Montfort. 2020. Uncovering socioeconomic gaps in mobility reduction during the COVID-19 pandemic using location data. *arXiv preprint* arXiv: 2006.15195.
- Frank, A. U. 2010. Scale is introduced in spatial datasets by observation processes. In *Spatial Data Quality: From Process to Decisions,* edited by. R. Devillers and H. Goodchild. 17-30. Boca Raton, FL, CRC Press.
- Frank, S. A. 2011. Measurement scale in maximum entropy models of species abundance. *Journal of Evolutionary Biology*. 24: 485-496.
- Gao, S. and S. Prasad. 2016. Employing spatial analysis in indoor positioning and tracking using wi-fi access points. In *Proceedings of the Eighth ACM SIGSPATIAL International Workshop on Indoor Spatial Awareness.* (Oct): pp. 27-34.
- Goldberg, D.W., J.P. Wilson, and C.A. Knoblock. 2007. From text to geographic coordinates: the current state of geocoding. *URISA-WASHINGTON DC.* 19(1), p.33.
- Golmohammadi, J., Y. Xie, J. Gupta, M. Farhadloo, Y. Li, J. Cai, S. Detor, A. Roh, and S. Shekhar. 2020. An introduction to spatial data mining. *The Geographic Information*

Science & Technology Body of Knowledge. (4th Quarter 2020 Edition), edited by. John P. Wilson.

- Goodchild, M. F. 2000. Communicating the Results of Accuracy Assessment: Metadata, Digital Libraries, and Assessing Fitness for Use. In *Quantifying Spatial Uncertainty in Natural Resources: Theory and Applications for GIS and Remote Sensing.* Edited by T.M. Mowrer and R.G. Congalton. 3-15. Chelsea, MI: Ann Arbor Press.
- Goodchild, M. F. 2011. Scale in GIS: An overview. *Geomorphology.* 130: 5-9.
- Greenwood, F. 2015. How to make maps with drones. In *Drones and Aerial Observation: New Technology for Property Rights, Human Rights, and Global Development, A Primer*. edited by K. Kakaes. 35-47. Washington, DC: New America.
- Hutchinson, M. F. 1989. A new procedure for gridding elevation and stream line data with automatic removal of spurious pits. *Journal of Hydrology.* 106: 211-232.
- Jankowska, M. M., J. Schipperijn, and J. Kerr. 2015. A framework for using GPS data in physical activity and sedentary behavior studies. *Exercise and Sport Sciences Reviews.* 43 no.1: 48-56.
- Johnson, C. E., and C. C. Barton. 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., C. T. DellaValle, A. R. Flory, A. Nordan, J. A. Hoppin, J. N. Hofmann, …, and M. H Ward. 2014. Accuracy of residential geocoding in the Agricultural Health Study. *International Journal of Health Geographics.* 13: 37.
- Kassie, D., A. Roudot, N. Dessay, J.-L. Piermay, G. Salem, and F. Fournet. 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.
- 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), pp.86-106.
- Lippitt, C. D. 2020. Georeferencing and georectification. *The Geographic Information Science & Technology Body of Knowledge* (3rd Quarter 2020 Edition), edited by John P. Wilson. DOI:10.22224/gistbok/2020.3.3(link is external).
- Mahdianpari, M., J.E. Granger, F. Mohammadimanesh, S. Warren, T. Puestow, B. Salehi, and B. Brisco. 2020. 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*. p.111676.
- Murrieta-Flores, P., A. Baron, I.N. Gregory, A. Hardie, P. Rayson. 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.

- NASA. 2015. *Small Spacecraft Technology State of the Art*. Moffet Field, CA: NASA Mission Design Division Ames Research Center (Ch. 1-2).
- Onsrud, H. J. 2010. Liability for spatial data quality. In *Spatial Data Quality: From Process to Decisions*, edited by R. Devillers and H. Goodchild. 3-16. Boca Raton, FL: CRC Press.
- Pasquarella, V. J., C. E. Holden, L. Kaufman, and C. E. Woodcock. 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.
- Porter, C., P. Atkinson, I.N. Gregory. 2015. Geographical text analysis: A new approach to understanding nineteenth-century mortality. *Health & Place*. 36, 25-34.
- Priestnall, G., J. Jaafar, and A. Duncan. 2000. Extracting urban features from LiDAR digital surface models. *Computers, Environment and Urban Systems*. 24(2), pp.65-78.
- Reynard, D., 2018. Five classes of geospatial data and the barriers to using them. *Geography compass*. 12(4), p.e12364.
- Robinson, L., J. P. Newell, and J. M. Marzluff. 2005. Twenty-five years of sprawl in the Seattle region: Growth management responses and implications for conservation. *Landscape and Urban Planning.* 71: 51-72.
- Shanley, L.A., A. Parker, S. Schade, and A. Bonn. 2019. Policy Perspectives on Citizen Science and Crowdsourcing. *Citizen Science: Theory and Practice*. 4(1).
- Singh, I. 2016. The future of earth observation is in small satellites. Retrieved from https://www.geospatialworld.net/article/earth-observation-small-satellites-industry/
- Smith, A. N. H., M. J. Anderson, and M. D. M. Pawley. 2017. Could ecologists be more random? Straightforward alternatives to haphazard spatial sampling. *Ecography.* 40 (no.11): 1251-1255.
- Southall, H., R. Mostern, M.L. Berman. 2011. On historical gazetteers. *International Journal of Humanities & Arts Computing*. 5(2), 127-145.
- Stockwell, S. and S. Gallo. 2017. Citizen science and wildlife conservation: lessons from 34 years of the Maine loon count. *Maine Policy Review*. 26(2), pp.25-32.
- Strominger, J., R. Anthopolos, and M. L. Miranda. 2016. Implications of construction method and spatial scale on measures of the built environment. *International Journal of Health Geographics.* 15: 15.
- Wang, J., J. Liu, D. Zhuan, L. Li, and Y. Ge. 2002. Spatial sampling design for monitoring the area of cultivated land. *International Journal of Remote Sensing.* 23 (no.2): 263-284.
- Whitehead, K., and C. H. Hugenholtz. 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.

- Zandbergen, P. A. 2008. A comparison of address point, parcel and street geocoding techniques. *Computers, Environment and Urban Systems.* 32: 214-232.
- Zhao, Q., H. Wen, Z. Lin, D. Xuan, and N. Shroff. 2020. On the accuracy of measured proximity of bluetooth-based contact tracing apps. In *International Conference on Security and Privacy in Communication Systems*. (Oct): pp. 49-60. Springer, Cham.

Description and Assessment of Assignments

Weekly Assignments

There are several different kinds of assignments with at least one due weekly. These are described in the Weekly Folders on Blackboard. Due dates are shown in the Schedule below.

Resume Assignment – 1 worth 2 points. We require all current students to post and maintain a public resume, short biography, and recent photo on our shared SSI Student Community Blackboard site. 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.

Reading Responses – 2 worth 4 points. The reading responses focus on the theory portion of the course as presented in the weekly readings. The objective is to help you evaluate and integrate the information you have acquired from the course readings. All reading responses are required.

Reading and Research Discussions – 2 worth 4 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.

Writing Responses – 3 worth 6 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.

Data Capture and Use Assignments – 4 worth 16 points. Each student is required to complete four data capture and use assignments for this class. The “hands-on” data capture assignments require you to work through various skill development activities and data integration into the ArcGIS Pro platform. To demonstrate that you have completed the steps comprising each of these assignments, you will submit a Word document containing output such as a map and/or brief written answers.

Exercises – 3 worth 15 points. To demonstrate your understanding of the basic concepts and skills learned in the class, you will complete three exercises that will integrate key concepts and ideas and require independent thought. The final two exercises will take one of three forms depending on your student status. Students enrolled in the GIST M.S. Program and GIST Graduate Certificate students planning to transition to the GIST M.S. Program will start

work on their proposed thesis prospectus; the remainder of the GIST Graduate Certificate students will tackle a pair of exercises focused on fundamental geospatial information data capture and management challenges; and the HSGI M.S. students will start work on their proposed capstone project proposal.

Catalina Field Component or Alternate Exercise

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 – 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 – 8 points. The poster will present a summary of your project and visualization of results. The posters must be submitted for grading to Blackboard before leaving the island.

In the event fieldwork on Catalina is not permitted an alternative assignment will be provided.

Research Reports

Two research reports provide students an opportunity to integrate learning from various aspects of the course through the practice of a more in-depth assignment.

First Report – 10 points. The first report will provide you with an opportunity to describe the data capture options and challenges for a project of your choice from a list of projects spanning a variety of application domains. The first report must not exceed six single-spaced pages excluding figures, maps, tables, and references.

Second Report – 20 points. The second report will take one of three forms depending on your student status. Students enrolled in the GIST M.S. Program and GIST Graduate Certificate students planning to transition to the GIST M.S. Program (Group 1) will prepare a prospectus for a thesis project and outline some of the methods and geospatial data sources that could be used in such a project. The remainder of the GIST Graduate Certificate students (Group 2) will be afforded the opportunity to integrate all that they have learned in the semester in an investigation of data quality for one or several specific applications that your instructor will designate. The HSGI M.S. students will prepare a proposal for their capstone project. The second report (for all groups) must not exceed 10-12 single-spaced pages excluding figures, maps, tables, and references.

Grading Breakdown

Careful planning and a serious, consistent commitment will be required for you to successfully navigate the various deliverables in this and other GIST courses. The table on the next page summarizes the SSCI 587 course assignments and their point distribution:

Assignments	Number	Points	Total Points
Weekly Assignments			
Resume Assignment	1	2	2
Reading Responses	2	2	4
Reading and Research Discussions	2	2	4
Writing Responses	3	2	6
Data Capture and Use	4	4	16
Exercises	3	5	15
Catalina Island Excursion / Alternate Exercise			
First Presentation	1	5	5
Second Presentation	1	10	10
Poster	1	8	8
Research Reports			
First Report	1	10	10
Second Report	1	20	20
Totals			100

Assignment Submission Policy

Unless otherwise noted, all Assignments, Responses, Data Capture & Use Assignments, and Exercises are *due by 11:59 pm Pacific Time (PT) on Sundays*. Fieldwork components have different due dates as indicated on the Schedule below. Attention to on-time assignment submission is essential if your instructor is to meet the goal to return comments on submitted assignments before the next one is due. Sometimes this is impossible, so your instructor will post a notice on anticipated delays if needed.

Strict penalties apply for late assignments as follows:

- All assignments will be penalized 2 points for up to FOUR days late. No points will be given for submission more than FOUR days late. Note that all assignments worth 2 points will receive 0 points if submitted late.
- Additionally, no written work will be accepted for grading after 5 pm PT on the last day of classes.

Course Schedule

	Topic	Readings and Assignments	Due Dates
Module 1: Spatial Information			
Week 1 8/23	**Introduction to Spatial** Introduction to Class; Introduction to Spatial Data Acquisition	Chrisman (1984) Resume Assignment; Writing Response 1	Resume Assignment: 8/29 Writing Response 1: 8/29
Week 2 8/30	**Representation of Spatial Phenomena** Conceptual Data Models; Geospatial Data Inherent Issues	Goodchild (2011); Frank (2010); Strominger et al. (2016) (optional) Data Collection and Use (DCU) 1 (optional); Writing Response 2	Data Capture and Use 1: 9/5 Writing Response 2: 9/5
Week 3 9/6* *Monday, 9/6 is university holiday	**Fitness-for-use** Data Needs and Sources; Suitability of Data for a Defined Purpose	Goodchild (2000); Hutchinson (1989) Writing Response 3; Reading Response 1; Exercise 1	Exercise 1: 9/12 Writing Response 3: 9/12
Week 4 9/13	**Uncertainty and Error** Maps: topological errors, digitizing, attribute data, errors; Data Standards, Data Quality and Uncertainty	Fisher et al (2010); Bolstad et al. (1990); Helen Couclelis (2021) Data Capture and Use Assignment 2	Data Capture and Use 2: 9/19
Module 2: Spatializing Textual Data Sources			
Week 5 9/20	**Geocoding** Geocoding Process; Issues with Geocoding	Goldberg et al. (2007); Zandbergen (2008); Jones et al. (2014) Exercise 2	Exercise 2: 9/26
Week 6 9/27	**Natural Language Processing (NLP)** Spatializing data using NLP; Applications in Spatial NLP	Murrieta-Flores et al. (2015); Porter et al. (2015); Southall et al. (2011) Reading and Research Discussion 1 (RRD)	RRD 1: 10/3

Module 3: Field Practicum			
Week 7 10/4	**Catalina**	Reynard (2018); Lippitt (2020) Proposal Presentation Final Presentation Poster	First Presentation: Tuesday, 10/5 Second Presentation: Sunday, 10/10 Poster: Sunday, 10/10
Module 4: Terrestrial Data Acquisition			
Week 8 10/11 *10/14-10/15 is a university holiday	**GNSS & GPS** GNSS system and uses; Surveying, coordinates, Field data collection	Johnson & Barton (2004); Jankowska et al. (2015) Data Capture and Use Assignment 3	Data Capture and Use 3: 10/17
Week 9 10/18	**Distributed Data** Citizen Science; Personal Electronic Device Data	Eitzel et al. (2017); Fraiberger et al. (2020); Shanley et al. (2019); Stockwell and Gallo (2017) Reading and Research Discussion 2 (RRD)	RRD 2: 10/24
Module 5: Non-Terrestrial Data Acquisition			
Week 10 10/25	**Satellite Imagery** Concepts and methods of remote sensing; Principles of imagery analysis	Pasquarella et al. (2016); Robinson et al. (2005); NASA (2015), Ch. 1-2; Singh (2016) Data Capture and Use Assignment 4	Data Capture and Use Assignment 4: 10/31
Week 11 11/1	**Unoccupied Aerial Systems (UAS)** UAS platforms, sensors and products; UAS use-cases	Greenwood, Ch. 4 (2015); Whitehead & Hugenholtz (2014) Data Capture and Use Assignment 5	Data Capture and Use Assignment 5: 11/7
Module 6: Non-GNSS Data Acquisition			
Week 12 11/8	**Indoor** Connecting Non-GNSS &GNSS datasets, Indoor Geocoding Process; Mapping with Bluetooth and WiFi	De Blasio et al. (2017); Gao and Prasad (2016); Lee (2009); Zhao at al. (2020)	Reading Response 1: 11/14

Week 13 11/15	**LIDAR** Mapping the Natural Environment; Mapping the Urban Environment	Dubayah and Drake (2000); Mahdianpari et al. (2021); Priestnall et al. (2000) Report 1	Report 1: 11/21
Module 7: Using Spatial Data			
Week 14 11/22* *11/24-11/28 is a university holiday	**Spatial Sampling** Spatial Sampling Methods; Sampling Applications/Uses	de Smith et al. (2020) section 5.1.2; Smith et al. (2017); Wang et al. (2017) Exercise 3	Exercise 3: 11/28
Week 15 11/29	**Spatial Estimation** Spatial Prediction; Estimation Applications/Uses	Golmohammadi et al. (2020); Frank (2011); Kassie et al. (2017); Onsrud (2010) Reading Response 2	Reading Response 2: 12/7
Final Exam 12/8 - 12/15	Finals Week	Report 2	Report 2: 12/12

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 scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems

Counseling and Mental Health– (213) 740-9355 – 24/7 on call
engemannshc.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
www.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 of Equity and Diversity (OED) – (213) 740-5086 |Title IX Compliance – (213) 821-8298
equity.usc.edu, titleix.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 of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs – (213) 740-0776
dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention – (213) 821-4710
uscsa.usc.edu
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC – (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.

Resources for Online Students
The Course Blackboard page and the GIST Community Blackboard page 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.