

SSCI 579, Geospatial Intelligence Tradecraft

Syllabus

Units: 4

Term — Day — Time: Fall, 2019, Online

Location: Online

Instructor: Andrew J. Marx, Ph.D

Office: Baltimore, MD

Regular Office Hours: Tuesday and Thursday 8-9 a.m. PT via BlueJeans – 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, 202-550-4080 (Eastern),
<https://bluejeans.com/marxa>

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
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IT Help: Richard Tsung

Office: AHF 145D

Office Hours: By appointment

Contact Info: spatial_support@usc.edu, 213-821-4415

Course Scope and Purpose

This course is a required capstone for the Graduate Certificate in Geospatial Intelligence and provides students with the requisite knowledge and practical skills to inform effective decision-making in a variety of human security settings. Threats to human security come in many forms, including military operations, terrorist attacks, genocide, political violence, natural disasters, humanitarian crises, environmental risks, public health issues, and food/resource accessibility challenges. This class leverages a variety of geospatial technologies with intelligence tradecraft to develop intelligence products that support national security, disaster response, and humanitarian relief efforts. The geospatial intelligence approach is often referred to as tasking, collection, processing, exploitation, and dissemination (TCPED), and the results are used to inform and support more effective decision-making.

This is not only a required capstone course for the Geospatial Intelligence Graduate Certificate program, but it may also serve as an elective for the M.S. in Geographic Information Science and Technology (GIST) Program, the GIST Graduate Certificate Program, and Geospatial Leadership Graduate Certificate programs.

This is a graduate level course, so you should expect this class to be both academically robust and intellectually challenging. As graduate students 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 our 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 this path of discovery, and you will find that you will learn much from your fellow classmates. The challenge for us is to replicate such an academic experience within the milieu of "online learning."

All course materials will be organized through Blackboard. The main theoretical concepts will be provided through course notes and assigned readings. Hands-on practical exercises will use various software products accessible over the Internet. Assignments will give students an opportunity to internalize and apply the concepts and theory learned from readings. Some assignments require student interaction, all will benefit from it.

Learning Objectives

When you have completed this course, you will be able to:

- Describe the core geospatial intelligence needs related to surveillance, targeting, and navigation.
- Design and implement strategies for capturing or sourcing geospatial data and any accompanying metadata.

- Critically evaluate the potential impacts of data quality on spatial analysis and decision-making.
- Master the theory and protocols involved in interpreting radar, infrared, and multispectral imagery, and full motion video as well as legacy maps, digital geospatial datasets, and relatively new data sources (i.e. geo-sensor systems, social media feeds).
- Apply critical thinking, collaboration, and communication skills via course exercises and the final course project.
- Prepare and present intelligence reports tailored to a variety of the human security applications.

Prerequisite(s): None

Co-Requisite (s): None

Concurrent Enrollment: None

Recommended Preparation: SSCI 581: Concepts for Spatial Thinking

Technological Proficiency and Communication Required

We have several technologies that will facilitate our course work and our interactions, despite our dispersed locations. These include:

Blackboard – All course materials and correspondence will be posted on the course Blackboard site. As a registered student, you will find this course will show up in your available classes no later than 12:00 noon, PST on the first day of classes. It is here that the day-to-day flow of the course will be recorded.

Discussion boards – On the Blackboard site, you will post a number of discussion threads related to various course topics. These threads are very important in terms of providing support to each other while working on class exercises to share hints and helpful tips, as you would do in a classroom setting. I will check the discussion threads periodically and offer occasional comments. Please send me an email directly if you have a question or concern that requires my immediate attention.

Live meetings and presentations – You will use a browser-based service called Bluejeans to create synchronous, interactive sessions. With voice and webcam capabilities, Bluejeans can be used to share presentations and even our desktops between two or more people.

Individual meetings – Bluejeans is best for individual meetings.

SSI server and tech support – This course will utilize the SSI Servers to provide you with your own virtual desktop. If you are unable to connect to the server or experience any type of technical issues, send an email to SSI Tech Support at spatial_support@usc.edu and make sure to copy (cc) me on the email. SSI Tech Support is available Monday through Friday, 9:00 a.m. to 5:00 p.m. PST. A variety of geospatial software platforms

(ArcGIS, e-Cognition, Idrisi, etc.) are provided online via the SSI Server; hence, you do not need to install it on your own computer.

Technical Requirements - Every student must satisfy the following technology requirements: (1) a computer with a fast Internet connection; (2) a functional webcam and a microphone for use whenever a presentation or meeting is scheduled; and (3) a modern web browser.

Required Readings and Supplementary Materials

Textbooks – There are five required texts for this course. Some are available online and some are available from the USC Bookstore or online outlets such as Amazon. We encourage you to acquire or purchase these books quickly since you will need these materials from the opening day of class.

- Lowenthal, M.M. 2017. *Intelligence: From Secrets to Policy* (7th Edition). Washington, DC: CQ Press.
- Heuer, R.J. 1999. *Psychology of Intelligence Analysis*. Washington, DC: Center for the Study of Intelligence. (available at <https://www.cia.gov/library/center-for-the-study-of-intelligence/csi-publications/books-and-monographs/psychology-of-intelligence-analysis/PsychofIntelNew.pdf>).
- NGA (National Geospatial-Intelligence Agency, Office of Geospatial-Intelligence Management). 2018. *National System for Geospatial Intelligence: Geospatial Intelligence (GEOINT) Basic Doctrine*. NGA Publication No. 1-0. Washington, DC: National Geospatial-Intelligence Agency Publication. (available at <https://www.nga.mil/ProductsServices/Pages/GEOINT-Basic-Doctrine-Publication.aspx>).
- NRC (National Research Council). 2007. *Successful Response Starts with a Map: Improving Geospatial Support for Disaster Management*. Washington, DC: National Academies Press.
- Tuathail, G.O., Dalby, S., and Routledge, P. 2003. *The Geopolitics Reader* (2nd Edition). London: Routledge. (available at https://www.researchgate.net/publication/249470493_The_Geopolitics_Reader_2nd_edition).

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

Readings – The following book chapters and journal articles will be posted to Blackboard under Course Documents:

- Wheaton, K.J. and Chido, D.E. 2006. "Structured analysis of competing hypotheses: Improving a tested intelligence methodology." *Competitive Intelligence Magazine* 9(6): 12-15.

- Medina, R.M. and Hepner, G.F. 2011. "Advancing the understanding of sociospatial dependencies in terrorist networks." *Transactions in GIS* 15: 577-597.
- Klein, G., Moon, B., and Hoffman, R. 2006. "Making sense of sensemaking: 1, Alternative perspectives." *IEEE Intelligent Systems* 21(4): 70-73.
- Corson, M.W. and Palka, E.J. 2004. "Geotechnology, the US military, and war." In Bruun, S.D., Cutter, S.L., and Harrington, J.W. (eds.) *Geography and Technology*. Dordrecht, The Netherlands: Kluwer. pp 401-427.
- Palka, E.J., Galgano, F.A., and Corson, M.W. 2006. "Operation Iraqi Freedom: A military geographic perspective." *Geographical Review* 95: 373-399.
- Medina, R.M., Siebeneck, L.K., and Hepner, G.F. 2011. "A geographic information systems (GIS) analysis of spatiotemporal patterns of terrorist incidents in Iraq 2004-2009." *Studies in Conflict and Terrorism* 34: 862-882.
- Stefanidis, A., Crooks, A., and Radzikowski, J. 2013a. "Harvesting ambient geospatial information from social media feeds." *GeoJournal* 78: 319-338.
- Crooks, A., Croitoru, A., Stefanidis, A., and Radzikowski, J. 2013. #Earthquake: Twitter as a Distributed Sensor System, *Transactions in GIS*, 17(1): 124-147.
- Stefanidis, A., Cotnoir, A., Croitoru, A., Crooks, A., Rice, M., and Radzikowski, J. 2013b. "Demarcating new boundaries: Mapping virtual polycentric communities through social media content." *Cartography and Geographic Information Science* 40: 116-129.
- Treverton, G. and Gabbard, B. 2008. "Assessing the Tradecraft of Intelligence Analysis," RAND (National Security Research Division).
- Croitoru, A., Crooks, A., Radzikowski, J., and Stefanidis, A. 2013. "GeoSocial Gauge: A system prototype for knowledge discovery from social media." *International Journal of Geographical Information Science* 27: 2483-2508.

Description and Assessment of Assignments

Your grade in this course will be determined on the basis of several different assessment tools:

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 which will be provided to you. Unless you opt out, your resume will be included in the Spatial Sciences 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 Assignments – 5 worth a total of 10 points. These will focus on the theory portion of the course as presented in the weekly readings. Their objective is to help you evaluate

and integrate the information you have acquired from the course readings. Some of these will involve discussions and collaborative work and some will be individual efforts. The first reading assignment is required and following this assignment, you are free to choose any four of the nine subsequent assignments, but you must complete and submit them for grading in the weeks specified at the end of this syllabus. If you complete more than the four mentioned, I will grade all of them and then count the highest four grades.

Discussion Forums – 4 worth total of 8 points. These will focus on varying combinations of theory and practice and anticipate that you will contribute to and participate in a series of discussion threads and blogs at designated times throughout the semester.

Exercises – 5 worth a total of 40 points. In order to demonstrate that you understand the basic concepts and skills learned in the class, you will complete five exercises that will follow the key components of a typical geospatial intelligence workflow (TCPED – tasking, collection, processing, exploitation and dissemination). In these assignments, you will be required to integrate key concepts and ideas and take some independent thought.

Final Project – 1 worth a total of 40 points. The final project will afford you the opportunity to work in small teams and demonstrate your ability to identify and rapidly investigate a real-world problem using the coursework you have completed thus far. Working in small teams, you will all make extensive use of geospatial data sources and analysis tools and will be required to define possible scenarios, identify key challenges, explore possible solutions, and deliver a preferred and an effective solution for an important human security need or challenge in your final project. These projects will dominate the second half of the semester and the outputs will include four distinct but interrelated products. The first is a proposal describing what you will do and why it is important (5 points), the second is a brief report summarizing the data sources and types that will be deployed along with an assessment of strengths and weaknesses (10 points), the third is a presentation describing your findings (5 points), and the last component is a final report summarizing the problem at hand, the geospatial data that was used, the analysis that was performed, and whether or not, and if so, what spatial intelligence can be gathered from the results (20 points). The layout and contents of these various components will be tailored to the threat at hand. These human security threats could easily include one or more of the following – military operations, terrorist attacks, genocide, political violence, natural disasters, humanitarian crises, environmental risks, public health issues, and food/resource accessibility challenges – and the various tasks and products would be tailored to the subset chosen for each final project.

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 below summarizes the SSCI 579 course assignments and their point distribution:

Assignment	Points	Total	% of Grade
Weekly Assignments			
Discussion forums	4 @ 2 pts each	8	8
Exercises	5 @ 8 pts each	40	40
Reading assignments	5 @ 2 pts each	10	10
Resume assignment	1 @ pts 2	2	2
Team Project Components			
Proposal	1 @ 5 pts	5	5
Data report	1 @ 10 pts	10	10
Presentation	1 @ 5 pts	5	5
Final report	1 @ 20 pts	20	20
TOTAL		100	100

And finally, it is important to note from the outset that: (1) you are expected to complete/upload all assignments at the time detailed; (2) late postings and assignments will be docked one grade and no grade will be given for postings or assignments turned in more than one week late; and (3) no written work will be accepted for grading after 5:00 p.m. PT on the last day of classes. Any exceptions to these rules for meeting deadlines are only made by me in coordination with individual students. An example of an exception would be a student's illness or injury that reasonably prohibits course involvement/participation.

Assignment Submission Policy - Assignments will be submitted for grading via Blackboard using the due dates specified in the Course Schedule below.

Additional Policies

Communications – This is a distance learning course, so most of our interactions will be asynchronous (not at the same time). All materials to be handed in will be submitted via the Blackboard Assessment link. I will also create multiple Blackboard discussion forums throughout the semester that we will use for the aforementioned assignments and so we can discuss issues and comments on the course assignments, exercises, and projects as the need arises.

In addition, I will send via e-mail through Blackboard any notices that are time sensitive. Please be sure that you read as soon as possible all e-mail sent from Blackboard or from me. Check now to make sure that mail sent from both the USC Blackboard accounts and my official email (s.fleming@usc.edu) does not go into your junk mail!

While I am usually online and will probably respond to e-mails from students relatively quickly, I will endeavor to respond to all e-mail within 24 hours of receipt, aiming for no more than 48 hours delay. In the rare case when I expect to be offline for more than 60 hours, I will post an announcement on the Blackboard site.

That said, it is each student's responsibility to stay informed about what is going on in our course. In addition to e-mail 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.

Workload – This is a four credit, one semester course. Students should expect to spend 12-15 hours per week completing the work in this course.

Course Schedule: A Weekly Breakdown

	Topic	Readings	Deliverables/ Due Dates
Week 1 8/26	Geospatial Intelligence Context: Introduction to the intelligence community, the players and their typical roles and responsibilities.	Videos; Wheaton & Chido (2006)	Reading Assignment #1 Resume Assignment Due 9/1
Week 2 9/3* *Monday, 9/2 is university holiday	Core Needs: Role of surveillance, targeting and navigation in geospatial intelligence tradecraft.	Tuathail et al. (2003) Ch. 1-2; Medina & Hepner (2011)	Group Discussion #1 Reading Assignment #2 Due 9/11
Week 3 9/9	Role of Physical and Human Geography: Introduction to the ways in which physical and human geography can be used to situate geospatial intelligence work within an appropriate context.	Tuathail et al. (2003) Ch. 3-5; Klein et al. (2006)	Group Discussion #2 Reading Assignment #3 Due 9/15
Week 4 9/16	Geospatial Building Blocks: Introduction to the ways in which fundamental geographic information science principles and the accompanying geospatial technologies (GIS, GPS, photogrammetry, remote sensing,	Lowenthal (2017) Ch. 1-5; Corson & Palka (2004)	Group Discussion #3 Reading Assignment #4 Due 9/22

	sensor networks) have been used for intelligence problem-solving.		
Week 5 9/23	Geospatial Building Blocks (cont.): Threats to human security and the geospatial data and workflows that have been deployed to address them.	Lowenthal (2017) Ch. 6-8; Palka et al. (2006)	Group Discussion based on readings (Blog #4) Reading Assignment #5 Due 9/29
Week 6 9/30	Foundations of Geospatial Intelligence Analysis: Introduction to the information exploitation process and the ways in which standard intelligence methodologies, such as the Geospatial Intelligence Preparation of Environment (GPE) methodology and Structured Spatial Analytic Method (SGAM), can be utilized to respond to a variety of human security challenges.	Heuer (1999) Ch. 1-8; Medina et al. (2011); Treverton (2008)	Exercise #1 Reading Assignment #6 Due 10/6
Week 7 10/7	Gathering Intelligence from Legacy Geospatial Data Products: Methods and approaches for linking legacy geospatial datasets with other kinds of information to yield useful spatial intelligence (e.g. the fusion of transportation maps and train schedules to build possible travel trajectories anywhere in the world).	NRC (2007) Ch. 1-6	Exercise #2 Due 10/13
Week 8 10/14	Role of Data Mining: Methods and approaches for linking textual information to geographic locations.	NGA (2018) Ch. 1	Exercise #3 Due 10/20
Week 9 10/21	Gathering Geospatial Data from Sensors and Satellites: The ways in which the capabilities and characteristics of various satellite and sensor systems, full motion video, and unmanned aerial vehicles can be used for feature extraction and linked to specific intelligence problem-solving tasks.	NGA (2018) Ch. 2	Exercise #4 Due 11/3

Week 10 10/28	Gathering Geospatial Data from Social Media Feeds: Methods and approaches for extracting and analyzing large quantities of geosocial data from a variety of social media feeds.	NGA (2018) Ch. 3; Stefanidis et al. (2013a)	Exercise #5 Reading Assignment #7 Due 11/3
Week 11 11/4	Data Fusion, Integration, and Geovisualization: The role of data fusion, integration, and geovisualization in the creation and distribution of actionable information.	Heuer (1999) Ch. 9-13; Crooks et al. (2013)	Final Project Proposal Reading Assignment #8 Due 11/10
Week 12 11/11	Geospatial Intelligence Products and Communication: The role and character of intelligence briefs, imagery and area reports in human security applications.	Lowenthal (2017) Ch. 9-12	Final Project Data Report Due 11/17
Week 13 11/18	Geospatial Intelligence Products and Communication (cont.): The rapidly evolving number and variety of interactive and dynamic products that can be used along with threat and hazard evaluation, the preparation and presentation of predictive analytic conclusions, and the role of situational awareness and the common operating picture in human security applications.	NGA (2018) Ch. 4-5; Stefanidis et al. (2013b)	Reading Assignment #9 Final Project Preparation Due 11/24
Week 14 11/25* 11/27 - 21/1 is a university holiday	Emerging Geospatial Intelligence Technologies and Techniques: Exploration of how some of the new mobile devices and applications, virtual and augmented reality opportunities, and cartographic representations and visualization techniques might be used to acquire or extract meaning from rich and multi-dimensional datasets in a variety of human security settings.	Lowenthal (2017) Ch. 13-14; Croitoru et al. (2014)	Reading Assignment #10 Due 12/1
Week 15 12/2	Emerging Geospatial Intelligence Technologies and Techniques (cont.): Team presentations summarizing results and what was learned from the projects.	Lowenthal (2017) Ch. 15	Final Project Reports Due 12/9

Exam Week 12/11 – 12/8	Final Course Project Presentation	None	Final Project Presentation <i>Due Exam Week</i>
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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

Student Counseling Services (SCS) – (213) 740-7711 – 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

Provides 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) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and

any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support – (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation 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.

Student Support and Advocacy – (213) 821-4710

studentaffairs.usc.edu/ssu

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

Provides safety and other updates, 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.