ANT 4852/ANG 6853
Applying GIS in Archaeological Research
Fall 2025

Instructor
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Instructor Office Hours
Tuesdays 11:30 am–12:30 pm
Wednesdays 11:30–12:30 pm

Class Meetings
Tuesday, Period 4, 10:40–11:30 am
Thursday, Periods 4–5, 10:40 am–12:35 pm
Dauer 0342

Description

Examines use of Geographic Information Systems (GIS) for management and analysis of geospatial data in anthropology, experimenting with methods and critically examining case studies. Covers both methodology (collecting data in the field, using publicly-available data; integrating and querying them in a GIS) and theory (the nature of spatial data; scales and topics of analysis). Also examines selected case studies and considers critiques that have been leveled at GIS and spatial analysis.

Anthropology is at root the study of human variation, and archaeology might be characterized as the study of human variation in the past: how much diversity of human behavior/beliefs was there at any given time and place, and how different was that from the present? Both practically and theoretically, a key component of that variation is spatial variation: for example, in human behavior, material culture, language, demographic attributes, or resources. Archaeological method and theory have to grapple with recording and analyzing spatial variation. As a result, geospatial technologies generally and Geographic Information Systems (GIS) in particular are increasingly recognized as critical tools. In this course we will examine the use of GIS for management and analysis of geospatial data in anthropological contexts, both experimenting with methods and critically examining case studies.

We will cover both methodological approaches (collecting data in the field and finding publicly-available data as well as integrating and querying it in a GIS) and theoretical implications (the nature of spatial data as well as scales and topics of analysis). We will also examine selected case studies and consider critiques that have been leveled at GIS in particular and spatial analysis in general.

The course emphasis is on working with concrete data, and software use will be an integral part of the process. We will use ArcGIS Pro, along with an introduction to free and open-source (FOSS) software, primarily QGIS (https://www.qgis.org/en/site/). Students are encouraged to work with their own data, though a pre-existing research project is by no means a prerequisite. Background in using GIS will be very helpful, but is not strictly necessary; students with no background should expect to invest significant time learning the mechanics of GIS. The course will culminate in the production of a poster presentation using GIS to address a specific research question.

Course Objectives

In completing this course, students will develop:
- Theoretical background on the applications of spatial variation, geospatial technologies, and GIS in archaeology.
- Fluency with geospatial methods, particularly the use of GIS, and a foundation from which to further self-teach.
- Familiarity with the acquisition (particularly of publicly-available data), management, and analysis of archaeological data that have a spatial component.
- Ability to produce polished products (including, but not limited to, maps) that communicate arguments based on geospatial data.

Course Structure

This course combines lectures, discussions, and lab exercises in a hybrid seminar-lab format to facilitate peer instruction and hands-on learning. The two class sessions each week will be broken into three segments. The first segment (Tuesdays) will follow a seminar format during which time a designated lead student will facilitate discussion of that week's readings. In the second segment (Thursdays), the instructor will review a new technique through lecture and demonstration, after which (time allowing) students will begin applying the new technique to solve the lab assignments, in consultation with one another and the instructor.

Participation

All students must participate in weekly discussions (10% of final grade). Participation includes attendance, active listening, and constructive contributions to discussion.

Lab Exercises

All students enrolled in the course must complete all of the assigned lab exercises (36% of final grade for graduate students, 45% for undergraduates). Lab exercises are due the Thursday after they are assigned and must be uploaded to Canvas before the start of class on the day that they are due. The specific outputs of each lab exercise will be specified with each exercise, and will include some combination of data and reflection on the utility of those data and the process of producing them. Lab exercises will generally emphasize questions, and your answers should employ methods to address questions, rather than simply demonstrating methodological

competence (and always show your work). You should strive to be clear about what procedures you have used, what the results demonstrate, and what you conclude.

Facilitation

All graduate students must facilitate a proportional share of the class discussions presenting case studies and reporting on lab exercises (number depending the total number of enrolled students; 10% of final grade). For undergraduates, this 10% is split between Lab Exercises and Project Prospectus.

- For case studies, the facilitator will be responsible for guiding the class in detailed discussion of that paper. Discussion should focus on how geospatial data were produced, why they were produced, and what kind of data (raster, vector, tabular, etc) were involved, what analyses/synthesis did they subsequently do, and how did they mobilize the results into an argument? Is that argument compelling? Could the results have been achieved without GIS (or at least without geospatial data)…and was it all worth it (in terms of interpretive payoff)? Where readings are not case studies but reviews or critiques, discussion should focus on identifying and assessing the key points of the argument.
- In addition to walking everyone through their solution to the assigned lab exercise, the facilitator should emphasize how the application of this particular technique solved the specific research problem at hand, as well as outlining the limitations and appropriate uses of such analysis. Relating this to your own research or adding analogous examples related to your own interests is encouraged but not required.

Term Project

All students must complete a term project (in four parts throughout the semester, combining for 44% of final grade, 45% for undergraduates). The project should address a clearly formulated question using original analyses based on the skills learned in class. Students must formulate a research question (4% of course grade for graduate students, 5% for undergraduates), identify the data and analyses needed to answer the question by (5% of course grade), and present their results at the poster session (10% of course grade). Final projects will take the form of a poster, due in the poster session at the end of the course (date TBD) and comprising 25% of your course grade. Graduate students are expected to also produce an article version of this poster (5,000 words max).

Grading and Course Requirements

A 93-100%	B+ 87-89.9	C+ 77-79.9	D+ 67-69.9	E <60
A- 90-92.9	B 83-86.9	C 73-76.9	D 63-66.9	
	B- 80-82.9	C- 70-72.9	D- 60-62.9	

https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies

	Graduate Students	Undergraduate Students
Attendance and participation	10%	10%
Nine lab exercises	36%	45%
Seminar facilitation	10%	N/A
Project prospectus	4%	5%
Project outline	5%	5%
Final project	25%	25%
Poster presentation	10%	10%

Attendance
This course is primarily a seminar; since attendance is fundamental to the learning goals, it is required. Excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation. Additional information can be found in Attendance Policies.

Assignments
Assignments in this course comprise lab exercises, project milestones, and responsibility for facilitating seminar. Lab exercises must be submitted on time (it would be unfair for some people to get to complete the lab post-discussion). Due dates for project milestones are intended to motivate you to start those projects, and are based on the need to give you feedback with sufficient time for you to react to it. As such, they can be negotiable, as long as you ask in advance. If you are scheduled to facilitate a seminar and for any reason will not be able to, please both notify the instructor as far ahead of time as possible and attempt to find another student with whom you can swap dates.

Course Texts
All readings will be posted on Canvas.

Online Resources
A Canvas Homepage can be accessed by signing in with your ID and password. This page will include digital versions of the syllabus and readings outside of the textbook. An additional webpage (https://whitschroder.github.io/gis) will include important links and lab exercises.

Required Software and Equipment
Students will need access to a PC laptop or desktop computer with at least 4 GB of RAM (2 GB RAM stick upgrades are affordable and simple to install – please check with the instructor for help). Mac users will have several options, including using UF Apps, QGIS, or a Windows installation through Boot Camp. For more complete specifications, please visit: https://pro.arcgis.com/en/pro-app/get-started/arcgis-pro-system-requirements.htm. Students should bring their laptops to class or arrange to share with another student to complete assignments. Software can also run on a Mac with the additional installation of Boot Camp: https://pro.arcgis.com/en/pro-app/get-started/run-pro-on-a-mac.htm. All software can be downloaded online. Other recommended software includes, Google Earth Pro, QGIS, Microsoft Excel, and Microsoft Word.

Academic Integrity
Please be familiar with the University of Florida's Student Honor Code:
https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code

Special Accommodations
The process for requesting special accommodations is described at
(https://disability.ufl.edu/get-started), including registering with the Disability Resource Center
in Reid Hall and requesting an accommodation letter to be presented to the instructor.

Online Course Evaluation
Students are expected to provide professional and respectful feedback on the quality of
instruction in this course by completing course evaluations online via GatorEvals. Guidance on
how to give feedback in a professional and respectful manner is available at
https://gatorevals.aa.ufl.edu/students. Students will be notified when the evaluation period opens
and can complete evaluations through the email they receive from GatorEvals, in their Canvas
course menu under GatorEvals, or via https://ufl.bluera.com/ufl. Summaries of course evaluation
results are available to students at https://gatorevals.aa.ufl.edu/public-results.

Campus Resources
U Matter, We Care: If you or a friend is in distress, please contact umatter@ufl.edu or (352) 392-
1575 so that a team member can reach out to the student.

Counseling and Wellness Center: https://counseling.ufl.edu/, (352) 392- 1575.

Sexual Assault Recovery Services (SARS) Student Health Care Center, (352) 392-1161.

University Police Department, (352) 392-1111 (or 9-1-1 for emergencies).
http://www.police.ufl.edu

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
http://teachingcenter.ufl.edu

Writing Studio, 302 Tigert Hall, (352) 846-1138. Help brainstorming, formatting, and writing
papers. http://writing.ufl.edu/writing-studio

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf

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Course Schedule (Subject to Change)

	Facilitate Seminar
	Lab Exercise Due
	Other Assignment Due

Date	Topic	Assignments/Readings
Week 1 August 21	Course introduction What is GIS? Let's make a map!	
Week 2 August 26	Thinking Spatially	Install software Aldenderfer 1996 Goodchild 1996 Kvamme 2017 McCoy Interview on ArchaeoTech podcast
August 28		**Lab 1: Create a Map Due**
Week 3 September 2	Why GIS?	Gregory 2005 Orengo 2015 Verhagen 2018 Wheatley and Gillings 2002, Ch. 2
September 4	Vector data Georeferencing Digitizing GPS data, projections	Lab 2 assigned
Week 4 September 9	Data Types and Acquisition	Luo et al. 2019 McKinnon et al. 2016 Petrie et al. 2018
September 11	Joins and relates Summarizing data	**Lab 2 Due** Lab 3 assigned

Week 5 September 16	Gathering and Incorporating Field Data	Welham et al. 2015 McCoy and Ladefoged 2009 Bogacki et al. 2010
September 18	Project discussion	**Project Prospectus Due**
Week 6 September 23	Surface Models	Wheatley and Gillings 2002, Ch. 5, 9 Katsianis 2004
September 25	Raster data Spatial analyst Map algebra Cell statistics	**Lab 3 Due** Lab 4 assigned
Week 7 September 30	Spatial and zonal analyses	Wheatley and Gillings 2002, Ch. 6 Williams et al. 1990
October 2	Terrain analysis Density and interpolation Zonal statistics Focal statistics	**Lab 4 Due** Lab 5 assigned
Week 8 October 7	Viewsheds and distance modelling	Doyle et al. 2012 Llobera 2007 Marsh and Schreiber 2015
October 9	Euclidean distance Viewshed analysis	**Lab 5 Due** Lab 6 assigned
Week 9 October 14	Hydrology	Bruins et al. 2019 DiNapoli 2019 Garcia-Molsosa et al. 2023 Holguín and Sternberg 2018
October 16	Hydrological modelling	**Lab 6 Due** Lab 7 assigned

Week 10 October 21	Cost distance	McCoy et al. 2011 Richards-Risetto et al. 2014 Van Leusen et al. 2002
October 23	Cost distance Least cost analysis Corridor mapping	**Lab 7 Due** Lab 8 assigned
Week 11 October 28	Cartography and Presentation	Dent 1998 Lock and Harris 2002 Howland et al. 2020
October 30	Introduction to automation, Modelbuilder	**Lab 8 Due** Lab 9 assigned
Week 12 November 4	Critiques of GIS	Palmer & Daly 2006 Wheatley 2014 Flexner 2009 Lock & Pouncett 2017
November 6		**Lab 9 Due**
Week 13 November 11	**Holiday**	
November 13	Project outline discussion	**Project Outline Due**
Week 14 November 18	Participatory Methods	Alvarez Larrain & McCall 2018 Heckenberger 2009 Smith 2020
November 20	Unrealized potential of GIS? Work on poster project in class	Church et al. 1999 Gaffney et al. 1996
Week 15 November 24–28	**Thanksgiving Holiday**	
Week 16 December 2	Work on poster project in class	

December 4–5	**Reading Days**	
TBD	**Poster Presentation**	**Poster Due and Poster Presentation**

Course Bibliography

Aldenderfer, Mark S 1996 Introduction. In Anthropology, Space, and Geographic Information Systems, edited by Mark S Aldenderfer, and Herbert D G Maschner, pp. 3–18. Oxford University Press, New York.

Álvarez Larrain, Alina, and Michael K McCall 2019 Participatory mapping and participatory GIS for historical and archaeological landscape studies: a critical review. Journal of Archaeological Method and Theory 26: 643–678.

Barceló, Juan A, and Maria Pallares 1996 A critique of GIS in archaeology. From visual seduction to spatial analysis. Archeologia e Calcolatori 7: 313–326.

Barceló, Joan A, and Maria Pallarés 1998 Beyond GIS: The archaeology of social spaces. Archeologia e Calcolatori 9: 47–80.

Bogacki, Miron, Giersz, Miłosz, Przadka-Giersz, Patrycja, Malkowski, Wiesław, and Misiewicz, Krzysztof 2010 GPS RTK Mapping, Kite Aerial Photogrammetry, Geo-physical Survey and GIS Based Analysis of Surface Artifact Distribution at the pre-Hispanic site of the Castillo de Huarmey, North Coast of Peru. In Remote Sensing for Science, Education, and Natural and Cultural Heritage, edited by Rainier Reuter, pp. 1–10. EARSeL

Bruins, Hendrik J., Hodaya Bithan-Guedj, Tal Svoray 2019 GIS-based hydrological modelling to assess runoff yields in ancient-agricultural terraced wadi fields (central Negev desert). Journal of Arid Environments 166, pp. 91-107,

Church, Tim, R. Joe Brandon, and Galen R. Burgett. 1999 GIS Applications in Archaeology: Method in Search of Theory. In Wescott, Konnie L, and R Joe Brandon, eds. Practical Applications of GIS for Archaeologists. Taylor and Francis, London. pp. 135-155

Dent, Borden D. 1998 Map Design. In Thematic Map Design, edited by Borden Dent, J. Torguson, and T. Hodler, McGraw-Hill, New York.

DiNapoli, Robert J, Carl P Lipo, Tanya Brosnan, Terry L Hunt, Sean Hixon, Alex E Morrison, and Matthew Becker 2019 Rapa Nui (Easter Island) monument (ahu) locations explained by freshwater sources. PLoS ONE 14: e0210409–27.

Doyle, James, Thomas Garrison, and Stephen D. Houston 2012 Watchful Realms: Integrating GIS Analysis and Political History in the Southern Maya Lowlands. *Antiquity* 86(333):792-807.

Flexner, James 2009 Where is Reflexive Map-Making in Archaeological Research? Towards a Place-Based Approach. Archaeological Review from Cambridge 24: 7–21.

Gaffney, Vincent, Stancic, Zoran, and Watson, Helen 1996 Moving from Catchments to Cognition: Tentative Steps Toward a Larger Archaeological Context for GIS. In Anthropology, Space, and Geographic Information Systems, pp. 1–13.

Garcia-Molsosa, A., Orengo, H.A. & Petrie, C.A. 2023 Reconstructing long-term settlement histories on complex alluvial floodplains by integrating historical map analysis and remote-sensing: an archaeological analysis of the landscape of the Indus River Basin. Herit Sci 11, 141.

Goodchild, Michael F 1996 Geographic Information Systems and Spatial Analysis in the Social Sciences. In Anthropology, Space, and Geographic Information Systems, edited by Mark S Aldenderfer, and Herbert D G Maschner, pp. 241–250. Oxford University Press, New York.

Gregory, Ian N 2005 "GIS and its uses in Historical Research" In A Place in History: A Guide to Using GIS in Historical Research. 1–112.

Heckenberger, Michael J. 2009 Mapping Indigenous Histories: Collaboration, Cultural Heritage, and Conservation in the Amazon. Collaborative Anthropologies 2: 9–32.

Holguín, Leah R. and Troy Sternberg 2018 A GIS based approach to Holocene hydrology and social connectivity in the Gobi Desert, Mongolia. Archaeological Research in Asia 15, pp. 137-145.

Homburg, Jeffrey A 2005 Tips for Improving the Quality of Your Poster Presentation. The SAA Archaeological Record 22–23.

Howland, Matthew D., Brady Liss, Thomas E. Levy, and Mohammad Najjar 2020 Integrating Digital Datasets into Public Engagement through ArcGIS StoryMaps. Advances in Archaeological Practice 1–10.

Katsianis, M 2004 Stratigraphic Modelling of Multi-period Sites Using GIS: The Case of Neolithic and Early Bronze Age Knossos. pp. 1–11. BAR, Oxford.

Kosiba, Steve, and Andrew M Bauer 2012 Mapping the Political Landscape: Toward a GIS Analysis of Environmental and Social Difference. Journal of Archaeological Method and Theory 20: 61–101.

Kvamme, Kenneth L 2006 Archaeological Modeling with GIS at Scales Large and Small. Reading Historical Spatial Information from around the World Studies of Culture and Civilization Based on Geographic Information Systems Data 75–91.

Kvamme, Kenneth L 2017 Geographical Information Systems (GIS). In Encyclopedia of Geoarchaeology, edited by Allan S. Gilbert, pp. 309–313. Springer

Llobera, M. 2007 Reconstructing visual landscapes. World Archaeology, 39(1), 51–69.

Llobera, Marcus 2012 Life on a Pixel: Challenges in the Development of Digital Methods Within an "Interpretive" Landscape Archaeology Framework. Journal of Archaeological Method and Theory 19: 495–509.

van Leusen, Martijn 2002 Line-Of-Sight and Cost Surface Analysis Using GIS. In Exploring Digital Archaeological Landscapes: A Discussion of Regional Map-forming Patterns and Processes, pp. 1–23. University of Groningen, Groningen.

Lock, Gary, and Harris, Trevor 2002 Analysing change through time within a cultural landscape: conceptual and functional limitations of a GIS approach. In The development of urbanism from a global perspective, pp. 1–13. Uppsala Universitet

Lock, Gary, and John Pouncett 2017 Spatial thinking in archaeology: Is GIS the answer? Journal of Archaeological Science 1–7.

Luo, Lei, Xinyuan Wang, Huadong Guo, Rosa Lasaponara, Xin Zong, Nicola Masini, Guizhou Wang, Pilong Shi, Houcine Khatteli, Fulong Chen, Shahina Tariq, Jie Shao, Nabil Bachagha, Ruixia Yang, and Ya Yao 2019 Airborne and spaceborne remote sensing for archaeological and cultural heritage applications: A review of the century (1907–2017). Remote Sensing of Environment 232: 111280.

Marsh, Erik J, and Katherina J Schreiber 2015 Eyes of the empire: A viewshed-based exploration of Wari site-placement decisions in the Sondondo Valley, Peru. Journal of Archaeological Science: Reports 4: 54–64.

Mccoy, Mark D 2011 A cost surface model of volcanic glass quarrying and exchange in Hawai`i. Journal of Archaeological Science 38: 2547–2560.

Mccoy, Mark D, and Thegn N Ladefoged 2009 New Developments in the Use of Spatial Technology in Archaeology. Journal of Archaeological Research 17: 263–295.

McKinnon, Duncan P., Jason L. King, Jane E. Buikstra, Taylor H. Thornton, and Jason T. Herrmann 2016 Returning to the Kamp Mound Group (11C12): Results from Geomagnetic Survey and High-Density Topographic Mapping in Calhoun County, Illinois. Midcontinental Journal of Archaeology 41: 231–254.

Nuninger, Laure, Philip Verhagen, Frédérique Bertoncello, and Angelo Castrorao Barba 2016 Estimating "Land Use Heritage" to Model Changes in Archaeological Settlement Patterns. Landscape Archaeology Conference LAC 1–12.

Orengo, Hector 2015 Open Source GIS and Geospatial Software in Archaeology: Towards their Integration into Everyday Archaeological Practice. In Open Source Archaeology: Ethics and Practice, edited by Andrew T. Wilson, and Ben Edwards, pp. 64–82. De Gruyter

Palmer, Carol, and Daly, Patrick 2006 Jouma's Tent: Bedouin and Digital Archaeology. In Digital Archaeology: Bridging Method and Theory, edited by Thomas L Evans, and Patrick Daly, pp. 1–33. Routledge, London.

Petrie, Cameron, Hector Orengo, Adam Green, Joanna Walker, Arnau Garcia, Francesc Conesa, J. Knox, and Ravindra Singh 2018 Mapping Archaeology While Mapping an Empire: Using Historical Maps to Reconstruct Ancient Settlement Landscapes in Modern India and Pakistan. Geosciences 9: 11.

Richards-Risetto, Heather and Kristin Landau 2014 Movement as a Means of Social (Re)production: Using GIS to Measure Social Integration Across Urban Landscapes. *Journal of Archaeological Science* 41:365-375.

Smith, Cecilia 2020 Ethics and Best Practices for Mapping Archaeological Sites. Advances in Archaeological Practice 8: 162–173.

Verhagen, Philip 2018 Spatial Analysis in Archaeology: Moving into New Territories. In Natural Science in Archaeology: Digital Geoarchaeology, pp. 11–25. Springer International Publishing, Cham.

Verhagen, Philip, and Thomas G Whitley 2011 Integrating Archaeological Theory and Predictive Modeling: a Live Report from the Scene. Journal of Archaeological Method and Theory 19: 49–100.

Welham, Kate, Lawrence Shaw, Mark Dover, Harry Manley, M. Parker Pearson, Josh Pollard, Colin Richards, Julian Thomas, and Chris Tilley. 2015 Google Under-the-Earth: Seeing Beneath Stonehenge using Google Earth-a Tool for Public Engagement and the Dissemination of Archaeological Data. Internet Archaeology 40.

Wheatley, David 2014 Connecting landscapes with built environments: visibility analysis, scale and the senses. In Spatial Analysis and Social Spaces: Interdisciplinary Approaches to the Interpretation of Prehistoric and Historic Built Environments, edited by Eleftheria Paliou, Undine Lieberwirth, and Silvia Polla, pp. 115–134. De Gruyter,

Wheatley, David, and Mark Gillings 2002 Spatial Technology and Archaeology. Taylor and Francis, London.

Whitley, Thomas G. 2017 Geospatial analysis as experimental archaeology. Journal of Archaeological Science 84: 103–114.

Williams, Ishmael, Limp, W Frederick, and Briuer, Frederick L 1990 Using geographic information systems and exploratory data analysis for archaeological site classification and analysis. In Interpreting space: GIS and archaeology, edited by Kathleen M S Allen, Stanton W Green, and Ezra Zubrow, pp. 239–273. Taylor and Francis