Geographic Information Systems for Archaeologists (116.573)
Syllabus—Spring 2019

Room 5-119
Tuesdays, 10:00am-1:00pm

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Office Hours: Tuesdays 1-3
Appointments welcome

This course will offer you a practical introduction to Geographic Information Systems (GIS) using QGIS software (https://www.qgis.org/en/site/). This is a free, open-access GIS program that is becoming increasingly functional and used by the archaeological community. Each week, we will have a brief lecture on GIS theory and general principles, which will be followed by a lab practicum. The labs are very self-directed, but I will be available throughout the class period to help you finish your lab.

You will have a final project in the class in which you will use the skills you are developing in GIS to make a map that can be analyzed using basic analytical tools. You will use your own data to complete your final project, and so at the end of the class, you will have something you can use for your thesis.

There is one textbook for the class:
Connolly, James and Mark Lake
2006 *Geographical Information Systems in Archaeology.* Cambridge: Cambridge University Press. (ISBN 978-0-521-79744-3)

You can purchase the book here: https://www.amazon.com/Geographical-Information-Systems-Archaeology-Cambridge-ebook/dp/B00INYG4OG/ref=sr_1_1?ie=UTF8&qid=1547533355&sr=8-1&keywords=Geographical+Information+Systems+in+Archaeology.

Unfortunately, the book is quite old, but it is still a good reference manual for you to have and will help you with your final project. You will get more out of the class if you keep up with the readings and ask questions in class about them. Nothing is more boring than listening to a professor lecture out of a textbook. I reserve the right to quiz you on the readings if I think that you are not keeping up with them. I will ask you frequent questions in class about the readings.

In addition, I have written a customized GIS training manual for this class from which all of the class exercises and assignments will be drawn. There is a training set of data and a "real" data set drawn from a database of radiocarbon dates from the Korean peninsula.

Weekly assignments. Each week, you will need to complete a lab assignment that is in the back of each chapter of the training manual. There are 11 units. There are five computers in the GIS classroom, and you will use the same computer every week so that I can grade your assignments from those locations. Each assignment will be uploaded to the eTL. I have given very explicit instructions on how to complete each assignment. I deduct points when my instructions are not followed precisely. *Each assignment is due on the Monday following class at 9:00 am.*

NOTE: There are five computers in the lab, so the first five people to sign up for the class have priority for accessing them. No one is allowed to share a desktop computer for the class. If you are more than the fifth person to sign up for the class, you are free to use your own laptop computer to complete the assignments. QGIS is free and open-access and you can maintain the files in any language you choose. (I will only be able to assist you if you maintain them in English.)

Final project. Your final project will be to construct a project from your own research materials* that involves all of the following elements: (1) you must digitize a map of some sort, (2) you must make at least three different types of shapefiles (point, line and polygon), and (3) you must produce some sort of spatial analysis comparing features on a landscape (for example: buffer, predictive, kernel density, make a model of some sort). I am flexible about the topic and analyses you perform, but you need to talk to me about it. Finally, you must write a 4-5 page paper (**single space, text**) that discusses the purpose of your project, the process that you used to construct your GIS database, potential sources of errors, and what you hope to accomplish with this project (project goals). What is the outcome of your analysis? What does the analysis tell you about the spatial and/or temporal distribution of sites in your study area?

* If you do not have data from which to write your own paper, please talk to me and we can design a paper using the Radiocarbon Group's dataset, which may lead to a co-authorship for you on a research paper.

Grading: Weekly assignments (25 assignments and perhaps quizzes, 50%); Final project (50%)

Class outline:
Week 1 (March 5): Class Introduction. You will need to have read Conolly (2016 "Geographical Information Systems and Landscape Archaeology")
- DISCUSSION: What is GIS?
- We will review the syllabus and ensure that everyone has access to the reading material for the class.
- Assignment: *GIS Training Manual* Assignment 1: QGIS interface and coordinate systems (**DUE Monday, March 11 @ 9am**)
- Read Conolly & Lake (2006) Ch. 1 & 2

Week 2 (March 12): Spatial Data and Cartography
- DISCUSSION: Logic and variables involved in making maps
- Assignment: *GIS Training Manual* Assignment 2: Making a map
- Read Conolly & Lake (2006) Ch. 3

Week 3 (March 19): GIS in Archaeology
- DISCUSSION: How and why do we use GIS?
- Assignment: *GIS Training Manual* Assignment 3: Creating a landscape model
- Read Conolly & Lake (2006) Ch. 4

Week 4 (March 26): Geodatabases
- DISCUSSION: DBMS, hierarchy models, network models
- Assignment: *GIS Training Manual* Assignment 4: Creating a geodatabase
- Read Conolly & Lake (2006) Ch. 5

Week 5 (April 2): Spatial Data Acquisition

- DISCUSSION: Primary data, secondary data, digitizing data
- Assignment: *GIS Training Manual* Assignment 5: Digitizing maps (**DUE Monday, April 15 @ 9am**)
- Read Conolly & Lake (2006) Ch. 6

Week 6 (April 9): *No class—The digitizing project is so large that you will require extra time to complete it. I will be available in the lab to help you progress on this project on* **April 7** *during class time. This will be the make-up class for the April 9 class.*

Week 7 (April 16): Surface Models
- DISCUSSION: Kriging, interpolation and making a DEM
- Assignment: *GIS Training Manual* Assignment 6: Kriging
- Read Conolly & Lake (2006) Ch. 7

Week 8 (April 23): Data Analysis
- DISCUSSION: Statistical analyses and data classification
- Assignment: *GIS Training Manual* Assignment 7: Basic stats analysis
- Read Conolly & Lake (2006) Ch. 8

Week 9 (April 30): Spatial Analysis
- DISCUSSION: Regression, correlation, clusters, and predictive modeling
- Assignment: *GIS Training Manual* Assignment 8: Clustering and correlation
- Read Conolly & Lake (2006) Ch. 9

Week 10 (May 7): Map Algebra, Surface Derivatives and Spatial Processes
- DISCUSSION: Point and spatial operations
- Assignment: *GIS Training Manual* Assignment 9: Map algebra
- Read Conolly & Lake (2006) Ch. 10

Week 11 (May 14): Regions: Territories, Catchments and Viewsheds
- DISCUSSION: What is a "region" and how do we use them in archaeology?
- Assignment: *GIS Training Manual* Assignment 10: Making regions
- Read Conolly & Lake (2006) Ch. 11

Week 12 (May 21): Routes: Networks, Cost Paths and Hydrology
- DISCUSSION: What is a "network" and how do we use them in archaeology?
- Assignment: *GIS Training Manual* Assignment 11: Catchments
- Read Conolly & Lake (2006) Ch. 12

Week 13 (May 28): Maps and Digital Cartography
- DISCUSSION: How to make a good map
- Assignment: Have a map digitized and shapefiles made by June 4 (upload zip file of shapefiles to eTL).
- Read Conolly & Lake (2006) Ch. 13

Week 14 (June 4): Maintaining Spatial Data
- DISCUSSION: Metastandards, metadata
- Assignment: Continue working on your final project. Have spatial analysis completed by June 7.

Week 15 (**DUE June 10 @ 9:00 am**): FINAL PROJECT DUE (paper + maps submitted to me as a pdf file and leave the digital versions submitted on the shared folder).