SOC128: Geographic Information Systems and Sociological Geography

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Course Objectives

The course provides students with the opportunity to attain beginner to intermediate level competence with Quantum GIS (an open source equivalent to the industry standard ESRI GIS product) along with experience applying GIS to one or more fields of interest. In addition to hands-on skills, the course also introduces students to cartography, spatial data analysis, data visualization, and the use of images to communicate. Along the way, students will have the opportunity to learn some real geography, a bit of math and physics, a little bit of computer science, and to develop deeper expertise in specific areas if so motivated.

Books

- Monmonier, Mark. 1993. *Mapping It Out: Expository Cartography for the Humanities and Social Sciences*. Chicago: University of Chicago Press.
- Monmonier, Mark. 1996. *How to Lie with Maps* (2nd Edition). Chicago: University of Chicago Press.

Learning Goals

To pass this course you must be able to

1) Demonstrate knowledge of GIS, cartography, and computers vocabulary and concepts
2) Demonstrate cartographic knowledge of the world, the US, California, and Oakland
3) Use a map. Read a map. Interpret a map. Assess the quality of a map and make suggestions for improvement
4) Find and obtain and manipulate geographic data and maps
5) Use four map products to produce a requested map (including obtaining and preparing data). Make maps that use point, line, and polygon data
6) Use maps to tell a data story.

Demonstrate knowledge of GIS, cartography, and computers vocabulary and concepts

1) scale, resolution, simplification/abstraction, representation
2) point, line, area, volume
3) types of maps: topographic, thematic, schematic, choropleth, isopleth, political, mental maps, Digital Elevation Model (DEM), Political Map, Physical Map,

Topographic Map, Climate Map, Economic or Resource Map, Road Map, Thematic Map, star charts, nautical charts, bathymetric chart, aeronautical chart, cadastral map, plat, isochrone map, topological map

4) important maps: Sanborn, London Underground, Peters Projection, Booth map of London poverty (1885), Snow's cholera map (1854)
5) Longitude, latitude, parallels, meridians
6) Projections: cylindrical, conical, azimuthal; conformal, equal-area; shape, area, distance, direction; datum, false northing/easting
7) Visual variables: color, intensity, texture, size, contrast, hierarchy,
8) 1+1=3: optical illusions, texture vibration, unintended information
9) graphical elements of a map: border, legend, scalebar, north arrow, author, date, projection, coordinates, data source, data date, title, body of map
10) Information transformations: Data collection, Selection, Classification, Simplification, Exaggeration, Symbolization, Use of map
11) triangulated irregular network (TIN), interpolation, heat maps,
12) https://www.e-education.psu.edu/geog486/l6_p6.html (https://www.e-education.psu.edu/geog486/home.html)

Demonstrate cartographic knowledge of the world, the US, California, and Oakland

Find and Obtain Geographic Data and Maps

1) Oakland data sources and maps
2) California data sources and maps
3) US Census data and maps
4) Open Street Map
5) Google maps/earth, etc.

Use a map. Read a map. Interpret a map. Assess the quality of a map and make suggestions for improvement

1) Find one's way using a map.
2) Orienting a map.
3) Translate thematic map into alternative qualitative and quantitative descriptions

Use four map products to produce a requested map (including obtaining and preparing data). Make maps that use point, line, and polygon data

1) Make a map using any tool, export, embed in a web page, send in an email
2) Contribute to OpenStreetMap
3) Make a thematic map using QGIS
4) Make a thematic map using Leaflet and Javascript

Use maps to tell a data story.

1) In a Word document, a PowerPoint presentation, a video, a poster.
2) Write around maps.
3) Be honest with a map.
4) Move back and forth between other kinds of data visualization and a map.

Week 0: Thursday August 29

Class *Introduction to the course. GIS in five minutes. Why map? How to lie with maps. Introduction to Field Papers. Course website. The syllabus. Grading. First Assignment. How to learn from the web.*

- Instructor Notes
- Demo OSM and FP
- Hand out FP atlas pages of Mills campus
- Slides (draft)

Homework

- View What is GIS "tutorial"*
- Do Field Papers Exercise*
- Fill out course survey
- Read
    - ESRI. Introduction-to-GIS (~1200)*
    - ESRI. How Maps Convey Geographic Information (~600)*
    - OSM. Beginner's Guide to OpenStreetMap (Especially the pages under the sections "Collect Data," "Editing Maps," and "Editing Data."

Quiz Did You Understand?

Week1: Tuesday September 3

Class *Open Street Maps. Working in the field.*

- Instructor Notes
- Technical Notes: Image files, clients and servers, QR Codes (Slides)

Lab 1 *Dropbox; Scanning; Screenshots; Field Papers; editing Mills campus in OSM.*

- Instructor Notes
- Product: JPG and PDF of FieldPapers map; OSM UserId (link to list of edits); five OSM edits;

Homework

- Read Ferguson, K. 2010 Everything is a Remix*
- Read Wikipedia. Open Source*, especially sections on "Economic Analysis"* and "Society and Culture"* and "Peer Production"*
- Read Creative Commons. "about Creative Commons"* and watch the 3 minute video.
- View Stodden, V. 2011. "Transparency in Scientific Discovery: Innovation and Knowledge Dissemination"* (Open Science Summit Keynote 2011) (34:15)

Week 1: Thursday September 5

Class *Open source; open science; peer production; crowd sourcing; creative commons; mix culture; ethics and intellectual property; innovation.*

- Instructor Notes
- Slides (draft)

Quiz *on open source concepts*

Homework

- Oakland Geo Reading

Week 2: Tuesday September 10

Class *More OSM*

- Instructor Notes
- Slides (draft)

Before Lab

- Read over OSM wiki on neighborhoods

Lab 2 *OSM Fieldwork (tentative: Oakland Neighborhoods)*

- Instructor Notes
- Instructions
- Product: TBA

Quiz *OSM and FieldPapers*

Homework

- Soc128. The Elements of a Map
- ESRI. GIS is based on layers (~450)*
- ESRI. Key aspects of GIS (~550)*
- ESRI. Three fundamental representations of geographic information layers (~700)*
- GIGIS. Pp. 9-21 "Vector Data"

Week 2: Thursday September 12

Class *GIS Basics; Points, lines, polygons. Vectors. Data. Layers. Maps. Scales. Projections. Legends.*

- Instructor Notes
- Slides (draft)

Quiz *GIS Basics.*

Homework *: Basics*

- QGIS. "About QGIS" here* and here*
- (SKIM) Various. "Installing QGIS"*

Homework *: What QGIS Looks Like*

- (read) DeGroot @ KDMC. "QGIS Playing with the Interface I"*
- Berman, Lex. 2011. QGIS 1 - Intro to the User Interface* (3:37) @ Harvard CGA.
- Berman, Lex. 2011. QGIS 2 - Pan and zoom controls* (4:50) @ Harvard CGA

Homework *: Doing Stuff*

- (read) DeGroot @ KDMC. "Getting Started with QGIS"*
- Berman, Lex. 2011. QGIS 3 - LAYER ORDER* (3:11) @ Harvard CGA
- Watch Berman, Lex. 2011. QGIS 12 - Edit New Vector Layer* (5:35) and QGIS 13 - Editing Vector Layers* (5:27). NOTE: Berman videos are a little dry….

Quiz *Preliminaries*

Week 3: Tuesday September 17

Class *Everything you need to know about QGIS*

- Instructor Notes
- Slides (draft)

Lab 3 *Starting out with QGIS*

- Instructions
- Product: TBA

Homework

- Try to install QGIS on whatever machine you will do most of your work on. Post queries about problems encountered.

Week 3: Thursday September 19

Class *Troubleshoot installations. Walk through next several tutorials.*

- Instructor Notes
- Slides (draft)

Homework

- Read articles on your choice of 4 districts, neighborhoods, or historic places on OaklandWiki (be sure to glance at OaklandWiki Geographers too. Log them in your work record.
- Read the Documentation I
- Read/Do DeGroot @ KDMCQGIS. "Join Data to a Map and "Set a Color Range Based on Data
- Make ten maps and save as PDF or PNG in your "porfolio"

Looking Ahead

- Watch Berman, Lex. 2011. QGIS 10 - JOINS (6:48)
- Look over "Oakland Data QGIS Exercise" and "Oakland Data Color Range Based on Data"

Week 4: Tuesday September 24

Class *How the Hands-on Stuff Works: Theory of Joins and Thematic Mapping*

- Instructor Notes
- Slides (draft)

Lab 4 *QGIS 2: Data Joins and Thematic Mapping*

- Instructions
- Product: TBA

Quiz *Thematic Mapping I*

Homework

- View Berman, Lex. 2011. QGIS 4 - Identify & Select (7:23) and QGIS 5 - Attribute Query (4:17) and QGIS 7 - IMPORT X,Y Points from CSV (3:53)
- Do DeGroot @ KDMC. "QGIS Add Roads" and "QGIS Add Points"

Week 4: Thursday September 26

Class *Spatial relations; Data relations; Attribute Tables; Query languages; Computed fields.*

- Slides (draft)

Homework

- Intermediate Attribute Table Manipulation

Week 5: Tuesday October 1

Class *Thematic Maps Continued: Lab Exercises Anticipated*

- Notes
- Slides (draft)

Lab 5 *QGIS III Queries, buffers, overlays, unions, intersections*

- Instructions
- Product: TBA

Homework

- Watch Berman, Lex. 2011. QGIS 14 - Styles & Symbolization (6:49)
- Monmonier chapter on visuals

Week 5: Thursday October 3

Class *Map Design and Graphic Communication I*

- Slides

Homework

- Layer Properties Exercise
- Cartographic Elements, etc.
- Graphic Design

Week 6: Tuesday October 8

Homework

- DeGroot @ KDMC. "QGIS Export for Print"
- Wikipedia, "Data Visualization

Class *The "Art" and the "Science" of Data Visualization with Maps I*

- Instructor Notes

Lab 6 *QGIS 4 - Making Beautiful Maps with QGIS*

- Instructions
- Product: TBA

Quiz *Maps, Graphic Design, and Communication*

Homework

- Read Chapter 3 section titled "EARTH" in GIS Commons Text (~5 pages)
- Watch this short video from the National Geographic Society and this One Minute Mapping (1:01) video from ESRI.
- Map projections of the Earth (2:48) from the PBS show "Life by the #s"
- Geography Tutor - Types of Maps and Map Projections (3:13)
- Michelle Rightler Latitude, Longitude, and Types of Map Projections (10:24) and Latitude, Longitude, and Types of Map Projections Part 2 (8:53)
- Watch Berman, Lex. 2011. QGIS 9 - Projections and CRS (5:23)

Week 6: Thursday October 10

Class *Projections and Coordinate Systems I*

- Notes, Slides

Homework

- Ujaval Gandhi Tutorial: Working with Projections in QGIS

Week 7: Tuesday October 15

Class *Projections and Coordinate Reference Systems in QGIS (2) Introduction to "Geoprocessing"*

Lab 7 *Projections and Coordinate Reference Systems*

- Instructions
- Product: TBA

Homework

- DeGroot @ KDMC. "QGIS Analysis Tools"
- Geoprocessing I Quiz

Week 7: Thursday October 17

Class *From GeoProcessing to Spatial Statistics*

Homework

- Read Wikipedia entry on Spatial Analysis
- Quiz Basic Spatial Statistics
- Read Robinson, WR 1950. "Ecological Correlations and the Behavior of Individuals." American Sociological Review, Vol 15. No 3 (Jun., 1950), 351–357.
- Read Subramanian,S V, Kelvyn Jones, Afamia Kaddour and Nancy Krieger. 2009. "Revisiting Robinson: The perils of individualistic and ecologic fallacy." Int. J. Epidemiol. (2009) 38 (2): 342-360. doi: 10.1093/ije/dyn359.

Week 8: Tuesday October 22

Class *Intro to Spatial Statistics*

- Notes, Slides

Lab 8 *Stats and Analysis*

- Instructions
- Product: NONE

Homework

- Exercise based on lab
- Read Robinson, WR 1950. "Ecological Correlations and the Behavior of Individuals." American Sociological Review, Vol 15. No 3 (Jun., 1950), 351–357

DROP DEADLINE Wednesday 23 October 5 pm

Week 8: Thursday October 24

Class *Spatial Statistics II Ecological Fallacy*

Week 9: Tuesday October 29

Class *Spatial Statistics III Heat Mapping*

Lab 9 *Stats and Analysis II*

Class *Practical Geoprocessing and Statistics.*

Week 9: Thursday October 31

Class *Introduction to Coding*
Homework

- CodeAcademy Exercises

Week 10: Tuesday November 5

Class *Coding II*
Lab 10 *Code academy; learn to code; web scraping; data cleaning.*

Week 10: Thursday November 7

Class *TBA*

Week 11: Tuesday November 12

Class *TBA*
Lab 11 *Python code academy; learn to code; web scraping; data cleaning.*

Week 11: Thursday November 14

Class *What We Don't Yet Know How to Do in GIS*
Homework

- DeGroot @ KDMC. "QGIS Simplifying a Map for Web Use"
- DeGroot @ KDMC. "QGIS Export an Interactive Map"

Week 12: Tuesday November 19

Class *Web Mapping*
Lab 12 *Web Mapping*

Week 12: Thursday November 21

Class *TBA*
Lab *TBA*

Week 13: Tuesday November 26

Lab 13 Class Project

Week 14: Tuesday December 3

Class *Wrapping Up I*
Lab 14 *Wrapping Up II*
Homework

- Read over skill and concept list for final exam. Bring questions to next class.

Week 14: Thursday December 5

Class *Careers and Next Steps and Course Summary*