GIS FOR DESIGNERS

Virginia Tech A+D | Fall 2022 | ARCH 4304 / 5064 | 3 credits
Location: Torgersen 1040 / https://virginiatech.zoom.us/j/2981092726
Time: Thursday, 7-9:30pm
Office Hours: by appointment over Zoom

Instructor: Miranda Shugars (mshugars@vt.edu)

I. DESCRIPTION & GOALS

Maps are rhetorical tools. Designers craft compelling arguments with maps, mapping, and spatial data visualization. Maps represent vast, complex data; they can be seductive and powerfully dense. Designers use maps — not just of geography, but of social, domestic, and political context — to analyze and understand spatial problems, and argue for data-defensible solutions.

In this course, we'll cover the basics of finding and evaluating data, representing data sets in GIS, using GIS tools to dig into the meaning of data, and crafting visual arguments in the form of data maps. We'll then translate this into online, interactive maps using Mapbox and Leaflet.

This semester will focus on Roanoke, a nearby city with a history of spatial division and related ongoing issues. You'll use publicly available GIS data, building department records, and census data to explore an ongoing social inequality in the city through variables like race, density, access, income, age, health, and others. Your final project will be a scrollymap: an interactive essay with maps and images that presents your research and conclusions. This format will address the two major goals of this class: it will display the *technical skills* you've learned, and it will demonstrate your thought process as you construct a *visual argument through maps*.

As an example of the kinds of guiding questions that spatial researchers use, here's an excerpt from *A Research Agenda for Geographic Information Science,* UCGIS (2004):

- "In what ways have particular logics and visualization techniques, value systems, forms of reasoning, and ways of understanding the world been incorporated into existing GIS techniques, and in what ways do alternative forms of representation remain to be explored and incorporated?
- "How has the proliferation and dissemination of databases associated with GIS, as well as differential access to these databases, influenced the ability of different social groups to utilize this information for their own empowerment?
- "How can the knowledge, needs, desires, and hopes of non-involved social groups adequately be represented in a decision-making process, and what are the possibilities and limitations of GIS technology as a way of encoding and using such representations?"

Applications used:

- QGIS (compatible with Mac and Windows)
- OpenStreetMaps (online platform for mapping and repository of open-source geographic information)
- Leaflet (javascript library for mapping)
- Mapbox (online platform for importing and beautifying mapping data)

Skills learned:

- Identifying mappable questions
- Finding mappable data online
- Downloading and cleaning datasets for use
- Setting up mapping files
- Importing data into basemap
- Understanding map layers, styling and symbology, queries, buffers, and clipping
- Spatial data analysis
- Data visualization design
- Interactive data visualization

Concepts covered:

- maps as visual arguments
- maps as tools of power
- data fidelity and reliability
- use of maps as a social instrument

II. STRUCTURE

This course will consist of Canvas modules (lectures and supplemental videos), readings, and tutorials. Each part of the course has associated assignments (map assignments, tutorial submissions, and reading responses).

Each module consists of lecture videos (two or three, 10-20 minutes each) and additional ~5 minute relevant clips, totaling around 60 minutes. Each module has two required readings. Tutorials take around two hours to complete, and every 2-3 tutorials have a cumulative tutorial assignment. Please see the schedule below for weekly tutorial, lecture, and reading assignments. All assignments for each week are due by *Sunday at midnight* unless otherwise noted. Discussion prompts like reading responses are due before class as indicated on Canvas.

III. ASSESSMENT

Criteria

1. THOROUGH documentation, including all asked-for materials
2. CLARITY and quality of presentation
3. ON TIME assignment submission
4. THOUGHTFUL participation in class discussions

Breakdown

20% Reading responses / forum discussion (3 pts ea.)
20% Tutorial assignments (5 pts ea.)
+ Bonus (1 pt ea., max 6 pts)
60% Map assignments
- 5pts Assignment 1
- 5pts Assignment 2
- 10pts Assignment 3 (midterm)
- 30pts Assignment 4 (final)

Honor Code: refer to university honor code for academic integrity standards. While this class encourages collaboration, please be sure to indicate work (images, quotes) which are not your own. Failure to use clear citation in all of your submissions will result in points lost.

IV. SCHEDULE

PART 1: WHAT IS GIS? (5 wks [1-5])

Wk 1: 08.25: Introduction

Wk 2: 09.01
Modules/Readings/Tutorials
- **Module 1: Introduction**
- Readings:
  - *"The Cartography of W. E. B. Du Bois's Color Line" (Wilson, 2018)*
  - *"Reveal Submits Testimony to Congress" (Reveal and Glantz, 2020)*
- Tutorial 1: QGIS 1 Appalachian city map

Assignments
- Reading response 1 due before class

Wk 3: 09.08
Modules/Readings/Tutorials
- **Module 2: Maps as Power**
- Reading:
  - *"Maps, Knowledge, and Power" (Harley, 1988)*
  - *"Cartography and Decolonization" Decolonizing the Map (Craib, 2017)*
- Tutorial 2: QGIS 2 Appalachian city topo

Assignments
- Reading response 2 due before class
- **Map Assignment 1** due Sunday 09.11

Wk 4: 09.15
Modules/Readings/Tutorials
- **Module 3: What is GIS (and why should I care)?**
- Readings:
  - *"Human-Scaled Visualizations and Society", The Sage Handbook of GIS and Society (Ballas and Dorling, 2011)*
  - *"Geography's Nature and Perspectives", Geography: Why It Matters (Murphy, 2018)*
- Tutorial 3: QGIS 3 Roanoke parcel data

Assignments
- Reading response 3 due before class
- **Tutorial 1, 2, & 3 Assignment** due Sunday 09.18

Wk 5: 09.22
Modules/Readings/Tutorials
- **Module 4: GIS Industry Today**
- Readings:
  - *"The Economics of Maps" (Nagaraj and Stern, 2020)*
  - *"Mapping the digital empire: Google Earth and the process of postmodern cartography" (Farman, 2010)*
  - (optional) *"How to Do Things with Space: Expanded Architecture and Nongovernmental Politics: An Interview with Laura Kurgan" (McKee, 2012)*

- Tutorial 4: QGIS 4 VA census data

Assignments

- Reading response 4 due before class
- **Map Assignment 2** due Sunday 09.25

PART 2: MAP IMAGE-MAKING (3 wks [6-8])

Wk 6: 09.29

Modules/Readings/Tutorials

- **Module 5: Beautiful maps and charts**
- Reading:
  - *"Color Plates", Raw Data is an Oxymoron (Rosenberg et al. ,2013)*
  - *"Fundamental Principles of Analytical Design", Beautiful Evidence (Tufte, 2006)*
- Tutorial 5: QGIS 5 ACS data

Assignments

- Reading response 5 due before class

Wk 7: 10.06 - no class

Modules/Readings/Tutorials

- **Module 6: Truth and data fidelity**
- Reading:
  - *"A Place for Stories" (Cronon, 1992)*
  - *"Viral Visualizations: How Coronavirus Skeptics Use Orthodox Data Practices to Promote Unorthodox Science Online" (Lee et al., 2021) or http://vis.mit.edu/covid-story/*
- Tutorial 6: QGIS 6 proximity analysis and extraction

Assignments

- Reading response 6 due before class
- **Tutorial 4, 5, & 6 Assignment** due Sunday 10.09

Wk 8: 10.13

Modules/Readings/Tutorials

- **Module 7: Storytelling with maps (psychogeography, community mapping, scrollytelling)**
- Reading:
  - *Appendix A: Some References to Orientation*, from The Image of the City *(Lynch, 1960)*
  - *The Agency of Mapping: Speculation, Critique, and Invention (Corner, 1999)*
  - (optional) *Introduction to a Critique of Urban Geography (Guy Debord)*
- Tutorial 7: Intro to Mapbox

Assignments

- Reading response 7 due before class

PART 3: CODING (5 wks [9-13])

Wk 9: 10.20 - no class

- Tutorial 8: Intro to Mapbox Interactive

Wk 10: 10.27 - *NOTE: change in schedule*

Modules/Readings/Tutorials

- **Student Presentations (Midterm)**

Assignments

- **Map Assignment 3** due Sunday 10.30

Wk 11: 11.03
Modules/Readings/Tutorials
- **Lecture: Alicia Cavanaugh**
- Reading:
- Tutorial 9: Scrollytelling Template pt 1

Assignments due Sunday 11.06
- **Tutorial 7&8 Assignment**

Wk 12: 11.10
Modules/Readings/Tutorials
- **Lecture: Guest 2**
- Reading:
- Tutorial 10: Scrollytelling Template pt 2

Assignments due Sunday 11.13
- **Tutorial 9 & 10 Assignment**

Wk 13: 11.17
Modules/Readings/Tutorials
- **Lecture: workshop / questions for final**

Wk 14: 11.24 - no class (Thanksgiving Break)

Wk 15: 12.01 - final presentations
- **Student Presentations (Final - Map Assignment 4 pt 1)**

Assignments due Sunday 12.04
- **Map Assignment 4 pt 2**

V. RESOURCES

1. QGIS
   - QGIS training manual: https://docs.qgis.org/3.16/en/docs/training_manual/
   - A gentle introduction to QGIS: https://docs.qgis.org/3.16/en/docs/gentle_gis_introduction/
   - QGIS tips and tutorials: https://www.qgistutorials.com/en/index.html
   - Methods in Spatial Research (GSAPP) tutorials: https://github.com/CenterForSpatialResearch/methods-in-spatial-research-sp2020/tree/master/tutorials
   - Conflict Urbanism (GSAPP) tutorials: https://github.com/michellejm/ConflictUrbanism-InfraPolitics/tree/master/Tutorials
   - Points Unknown tutorials: https://pointsunknown.nyc/tutorial_list/
   - A lot of great additional ways of visualizing census data can be found here: https://spatialthoughts.com/2021/03/15/gis-in-urban-and-regional-planning/
   - Brendan Harmon, GIS for Designers: https://baharmon.github.io/gis-for-designers

2. Leaflet and Mapbox
   - Mapbox tutorials: https://docs.mapbox.com/help/tutorials/
   - Leaflet tutorials: https://leafletjs.com/examples.html
   - Conflict Urbanism (GSAPP course) tutorials: https://github.com/michellejm/ConflictUrbanism-InfraPolitics/tree/master/Tutorials
   - Axis Maps tutorials: https://www.axismaps.com/blog

3. Data visualization
    - NYT's Data Journalism training drive: https://drive.google.com/drive/u/0/folders/1ZS57_40tWuIB7tV4APVMmTZ-5PXDwX9w
    - Visualizing Data resources: https://www.visualisingdata.com/resources/
    - Information is Beautiful website: https://informationisbeautiful.net/
    - Earth climate visualization: https://earth.nullschool.net/
    - Gapminder world health chart: https://www.gapminder.org/tools/#$chart-type=bubbles&url=v1
    - Chart of Universal Commercial History (Playfair)
    - History of world conquest (Rand MacNally 1931)
    - Overlapping map projections: https://observablehq.com/@mkfreeman/overlapping-projections

4. Maps / Storymaps
    - MapMania maps of the year: http://bl.ocks.org/mapsmania/raw/90a698d0feda36203648b0932c6c26f6/?raw=true
    - This Is Not an Atlas: https://notanatlas.org/#atlas-maps
    - Lapham Quarterly's maps: https://www.laphamsquarterly.org/archive/maps
    - David Rumsey map collection: https://www.davidrumsey.com/luna/servlet/view/search;JSESSIONID=53e3937e-7bda-4339-a374-46b9229f950f?q=subject%3D%22data+visualization%22+LIMIT%3ARUMSEY%7E8%7E1&sort=Pub_List_No_InitialSort%2CPub_Date%2CPub_List_No%2CSeries_No&pgs=50&res=1
    - Fuck Yeah Cartography (tumblr): https://fuckyeahcartography.tumblr.com/
    - World population density map: https://luminocity3d.org/WorldPopDen/#3/11.87/76.46
    - River Run map: https://river-runner.samlearner.com/
    - LIDAR story map: https://wadnr.maps.arcgis.com/apps/Cascade/index.html?appid=36b4887370d141fcbb35392f996c82d9
    - Human footprint story map: https://storymaps.arcgis.com/stories/2f289f1a06ba4f2d95b3fbf3133c50f9
    - NYT Easter Island story map: https://www.nytimes.com/interactive/2018/03/14/climate/easter-island-erosion.html
    - ArcGIS story map gallery: https://storymaps-classic.arcgis.com/en/gallery/#s=0
    - Redlining impacts story map: https://storymaps.arcgis.com/stories/0f58d49c566b486482b3e64e9e5f7ac9?adumkts=product
    - Beautiful maps (variety of older and newer): https://mapsdesign.tumblr.com/
    - COVID funeral pyres in India: https://graphics.reuters.com/HEALTH-INDIA/CORONAVIRUS-DEATHS/qzjvqrqaqpx/index.html
    - Fivethirtyeight on redlining: https://projects.fivethirtyeight.com/redlining/
    - Interactive geological map: https://macrostrat.org/map/#/z=1.5/x=16/y=23/bedrock/lines/

5. Organizations applying mapping and data visualization
    - Anti-Eviction Mapping Project: https://antievictionmap.com/
    - Center 4 Spatial Research: https://c4sr.columbia.edu/
    - NYT's The Upshot: https://www.nytimes.com/section/upshot
    - Truth and Beauty (blog): https://truth-and-beauty.net/
    - NASA Earth Observatory: https://earthobservatory.nasa.gov/
    - Stamen (design company): https://stamen.com/work/here-xyz/
    - Fathom (design company): https://fathom.info/projects/
    - Smell Walks: https://sensorymaps.com/projects/
    - Info We Trust (design company): https://infowetrust.com/
    - Reuter's Graphics: https://graphics.reuters.com/
    - 80 Data Visualization Maps (Carto): https://carto.com/blog/eighty-data-visualizations-examples-using-location-data-maps/

6. BIBLIOGRAPHY

- Textbooks and Guides
    - Sage Handbook of GIS and Society (2011)
    - GIS Fundamentals (Bolstad)
    - Principles of GIS (Burrough et al)
    - Qualitative GIS: A Mixed Methods (Approach Sarah Elwood & Meghan Cope, eds., 2009)
- Map Design
    - Designing Better Maps (Brewer)
    - Beautiful Evidence (Edward Tufte)
    - The Visual Display of Quantitative Information (Edward Tufte)
    - Cartography (Kenneth Field)
    - Journal: Cartographica (canada)
- Theory (spatial / data)
    - A Social History of Truth (Shapin)
    - Theory and Reality (Godfrey-Smith)
    - The Image of the City (Lynch)
    - Culture and Society (Johnson, ed.)
    - A History of Data Visualization (Friendly)
    - All Data Are Local (Loukissas)
    - "Raw Data" Is an Oxymoron
    - Learning from Las Vegas (Venturi, Scott Brown, and Izenour, 1972)
- Theory (mapping)
    - Geography: Why It Matters (Murphy)
    - Close Up at a Distance (Laura Kurgan, 2013)
    - Rethinking the Power of Maps (Denis Woods & John Fels, 2010)
    - **Mapping Society (Laura Vaughan, 2018)**
    - Rethinking Maps: New Frontiers in Cartographic Theory (ed. Dodge et. al., 2009)

7. GIS DATA SOURCES
    - IPUMS (detailed census data, historic GIS data, health data, international data, and much more)
    - NOAA (broad-scale weather, climate, and atmospheric data)
    - HealthWatch (city-level heat data)
    - Mapping Inequality (redlining data and shapefiles)
    - Natural Earth (global country boundaries, oceans, lakes, etc)

8. ROANOKE RESEARCH
    - "Street by Street, Block by Block: How Urban Renewal Uprooted Black Roanoke," by Mary Bishop. The Roanoke Times, 1995
    - Root Shock: How Tearing Up City Neighborhoods Hurts America, And What We Can Do About It, Mindy Thompson Fullilove, MD. New Village Press, 2004