

Political Science 385
Geographic Information Systems for Political Science and International Relations
1:00-4:00 PM, Mondays

Instructor: Yuri M. Zhukov, Associate Professor of Political Science, zhukov@umich.edu

- Office Hours: MW 8:30-10:00.
Signup sheet (24 hours in advance): calendly.com/zhukov-umich

Course Description: This half-course introduces Geographic Information Systems (GIS) and their applications to political science and international relations. The course's objectives are to introduce basic concepts of GIS data structures and georeferencing, introduce the basics of spatial analysis and provide hands-on experience in using GIS software to visualize and analyze political data. Specific applications will include data on elections, violence/armed conflict and urban planning. The course will meet once a week for three hours. This time will be split between a lecture and a lab exercise, where students will work with GIS software to complete an assignment.

Format: Due to Covid-19, we will be holding all class meetings remotely and synchronously, via BlueJeans (<https://bluejeans.com/361482479>). Meetings will be recorded, and made accessible through Canvas.

Grade Policy: Lab exercises (50%), final project (30%), class participation (20%).

1. **Lab exercises** (50%). There will be 5 weekly lab assignments (10% each), in which students will learn to implement basic GIS data management and analysis methods. Each exercise will begin with a demonstration of key tasks, and an overview of the assignment. Students are encouraged to work collaboratively on these exercises. The assignments will be due no later than **11:59 PM on the Friday following each lab** (e.g. Friday Oct. 30 for the Oct. 26 lab, Friday Nov. 6 for the Nov. 2 lab, etc.).
2. **Final project** (30%). Students will work in groups of 3-4 on a collaborative research project, in which they will use GIS software and data to answer a political, social or economic question. This question may be descriptive, and oriented toward map-making and visualization (e.g. "Which counties flipped from Republican to Democratic in 2018?", "Which neighborhoods are the most violent?"). The question may also be explanatory, and oriented toward the analysis of geospatial data (e.g. "Why did some counties flip from Republican to Democrat?", "Why are some neighborhoods more violent than others?"). Each group will hand in a 1-paragraph project abstract by 11:59 PM, Friday, **November 20** (worth 5% of grade), summarizing the research idea and mentioning the spatial and non-spatial data needed for its execution. Each group will prepare a 3-5 page report (excluding maps, figures and tables). These reports will be due (via Canvas) by 11:59 PM on Tuesday, **December 15** (worth 25% of grade). The report must contain three sections:
 - a) *Research Question*: what question are you asking, and why is it interesting/important?
 - b) *Data*: what kind of geospatial data did you use to answer this question, where did you find these data, what processing steps were needed to import/transform/merge the data?

c) *Preliminary results*: what did you find? (map, table or statistical graphic, with a 2-3 paragraph discussion/summary)

3. **Classroom attendance and participation** (20%). Students are expected to engage the readings fully and actively participate in all class discussions.

Software: We will use QGIS for all lab exercises. QGIS is a free, open-source, cross-platform software environment for the processing and analysis of geospatial data. It has functionality similar to ESRI's ArcGIS, but without the licensing fees. A background in GIS is helpful, but not required. Students who would like to get a head start are encouraged to download the software here (<https://www.qgis.org/>), and consult the introductory tutorial (<https://docs.qgis.org/3.4/pdf/en/QGIS-3.4-QGISTrainingManual-en.pdf>).

Students will also have the option of using the R statistical programming language for all tutorials. R is a free, cross-platform software environment for statistical computing and graphics. Students who would like to get a head start are encouraged to download the software here (<http://cran.us.r-project.org/>), and consult the introductory tutorial (<http://cran.r-project.org/doc/manuals/R-intro.pdf>). Some students may prefer the slightly more user-friendly GUI, R Studio (<http://www.rstudio.com/>). Code and data for all tutorials will be made available through the course website.

Textbooks: All required readings will be available online, through Canvas. These readings will draw from the following textbooks and resources:

- Ballas, Dimitris, Graham Clarke, Rachel S. Franklin, and Andy Newing. *GIS and the social sciences: Theory and applications*. Routledge, 2017.
- Bolstad, Paul. *GIS Fundamentals: A First Text on Geographic Information Systems*. 6th ed. XanEdu Publishing, 2019.
- Brinton, Willard. *Graphic presentation*. Brinton Associates, 1939.
- Campbell, Jonathan and Michael Shin. *Essentials of Geographic Information Systems*. Saylor Foundation: 2011.
- Rumsey, David, and Meredith Williams. *Historical maps in GIS*. David Rumsey Historical Map Collection, 2002.

Class Schedule

1. ***GIS 101*** Monday, Oct. 26
 - **Course introduction**
 - **Overview of GIS software and data structures**
Readings:
 - Ballas, et al. (2017): Ch. 1.
 - **Lab exercise: Make your first map (elections)**
2. ***Map overlays*** Monday, Nov. 2

- **Coordinate systems and projections**

Readings:

- Campbell and Shin (2011): pp. 41-50.
- Bolstad (2019): Ch. 3. [recommended]

- **Mapping basics**

Readings:

- Ballas, et al. (2017): Ch. 3.

- **Lab exercise: Plot multiple datasets on same map (violence in Afghanistan)**

3. *Spatial analysis* Monday, Nov. 9

- **Spatial queries**

Readings:

- Ballas, et al. (2017): Ch. 2.
- Campbell and Shin (2011): Ch. 6-7.

- **Lab exercise: Test a hypothesis with spatial data (NYC cycling safety)**

4. *Turning maps into data* Monday, Nov. 16

- **Geo-referencing and vectorization**

Readings:

- Affek, Andrzej. “Georeferencing of historical maps using GIS, as exemplified by the Austrian Military Surveys of Galicia.” *Geographia Polonica* 86, no. 4 (2013): 375-390.
- Rumsey and Williams (2002): Ch. 1.

- **Lab exercise: Geo-reference a map you found online (civil war in Syria)**

THANKSGIVING RECESS – NO CLASS Monday, Nov. 23

5. *Turning data into maps* Monday, Nov. 30

- **Geo-coding**

Readings:

- Goldberg, Daniel W., John P. Wilson, and Craig A. Knoblock. “From text to geographic coordinates: the current state of geocoding.” *URISA* 19, no. 1 (2007): 33-46.
- Zhukov, Yuri M., and Roya Talibova. “Stalin’s terror and the long-term political effects of mass repression.” *Journal of Peace Research* 55, no. 2 (2018): 267-283.

- **Lab exercise: Geocode a list of locations (historical lynchings in U.S.)**

6. *Putting it all together* Monday, Dec. 7

- **Building a GIS research project from the ground up.**

Readings:

- Brinton (1939): Ch. 18-29. [skim]