POS 4764: GIS for Political Analysis

MWF 11:30am – 12:20pm - HPH 310 - Fall 2018

Instructor: Konstantin Ash (Konstantin.Ash@ucf.edu) Office Hours: M 3-5p, F 1-3p @ HPH 311A

Course Description

The manipulation and analysis of geographic data is an increasingly important skill in both academic political science and in private and public sector employment. The goal of this class is to provide an introduction to geographic data and two computer programs used to both create, examine, alter and analyze geographic data: including ArcGIS and Google Earth Engine. Students will be introduced to ways of both creating data-sets with geographic components and extracting geographic data from existing geo-coded sources.

The course is divided into two parts: the first part will cover basic data manipulation in ArcGIS, while the second will introduce remote sensing through Google Earth Engine. No prior knowledge of any statistical or programming language or statistical analysis is required for the course and at least one week will be devoted to teaching each concept/program.

At the end of the class, there will be an inferential research component. You will be asked to gather your own geographic data and analyze it by generating maps or simple statistical models. There are deadlines throughout the course, ranging from submission and approval of the research topic to submission of the data to be used in the project in advance.

Assignments

Homework Assignments

There are seven homework assignments due throughout the semester, at the beginning of the class noted on the course schedule. Each will be non-cumulative examinations of recently taught skills. Homework assignments will be assigned 1-2 weeks before they are due. Each assignment will be worth 10% of the final class grade. Late assignments are penalized 1 point for each 12 hours of lateness. No homework assignments will be accepted 48 hours after the due date.

Research Paper

The research paper will be a way combining course content into a single project. The requirements are to 1) have a research question that can be answered through the use of geographic data, 2) gather data obtained both through standard rasters and/or shapefiles and through remote sensing using Google Earth Engine 3) create maps that illustrate some sort of relationship between at least two variables in the data.

The research paper should clearly present a research design that shows understanding of geographic data gathering, a justification of the data used in the analysis with a clear narrative about how the data was obtained, and a clear presentation of the results of the analysis. Visualizations, including maps that illustrate the findings should be included whenever possible. These visualizations should be clear and expand a reader's understanding of your subject and design. The paper will be graded on the extent to which these components are successfully executed. The paper should be approximately 10 pages of text, 12-point font, double-spaced, not including citations, title pages.

In addition to the paper, students are required to submit replication code for any work they have done on the paper in ArcGIS or Google Earth Engine, including data extraction and analysis, as a supplemental file to the paper submission.

A prospective research question for the paper and a description of relevant data to be extracted is due on Sunday, November 4 at 11:59pm. The question and data for approval must be submitted on time. Late submissions will be penalized with a one point deduction from the student's final grade. The research paper is due on **Friday, December 7, 2018 @ 11:59pm**.

Presentation

Students are required to present their research paper in the last week of class (specific date(s) to be scheduled). The paper does not need to be written, but the bulk of data-gathering and analysis should be completed by presentation time. The gap between the presentation and when the paper is due is designed so that students may receive feedback on their work and then address that feedback before the final paper is due

Plagiarism

There is a ZERO tolerance policy on plagiarism. If you are found having copied any substantial portion of your paper from other sources without having first accredited them, you will either have large amounts of points deducted from your paper grade or will fail the class altogether. Please consult the UCF Office of Student Conduct's Rules of Conduct for more information.

Required Computer Programs

The readings for the class will be posted on WebCourses. There will be three required computer programs that you must either download to your personal computer or use in the computer labs. It will make your life a lot easier to get these on your personal computer.

- **Google Earth Engine** - Google's means of analyzing geographic data through Google Earth, includes a large data-base of spatial maps from remote sensing sources. Access the explorer, which is

a drop-down menu-type program, here: https://explorer.earthengine.google.com/workspace and the Code Engine here https://code.earthengine.google.com/. You need to request access beforehand to use the code engine. It is also helpful to download Google Earth Pro for your personal computer as it handles .kml files well: https://www.google.com/earth/download/gep/agree.html.

- **ArcGIS** is our only paid app. It is available in this computer lab and the one on the third floor. There may be others on campus. I have also already contacted you about a free student version that you can place on your personal computer for one year. Please talk to me if you have not heard anything. Regrettably, ArcGIS is not available for Apple products.
- **Google Earth Pro** - Google's visualization app for desktops. Available for free download here. We will use it for file conversion only, but it is a useful hobby-mapping program.

Grade Breakdown

Research Paper – 25%
Presentation – 5%
Seven Homework Assignments – 10% each

Course Schedule and Readings

The course will take a defined structure for most weeks of the semester (unless otherwise noted below. We will begin with conceptual lectures or hands-on tutorials at the beginning of the week, generally on Mondays and Wednesdays and conclude with an open lab on the Friday of each week. The lab will be an opportunity to work on either example problems or homework assignments and to ask questions of either me or of other students. Please note that, either due to holidays or contracted schedules, some weeks will not have labs.

Week 1 (August 20-24) - Introduction, Geographic Research and its use in political science

Monday: Instructor introduction, student introduction, course introduction, syllabus review.

Wednesday: Rationale for learning geographic data analysis. Definitions: shapefiles, rasters georeferencing. Introduction to ArcGIS.

Friday: Importing shapefiles and rasters into ArcGIS.

Week 2 (August 27-31) - Introduction to ArcGIS

Monday: Opening shapefiles. Opening rasters. Importing tabular data into ArcGIS.

Wednesday: Coordinate systems. Attribute tables. ArcCatalog.

Friday: Lab - work on Homework 1

Homework 1 Due Sunday, September 2 at 11:59pm.

Reading:

- Wilpen L. Gorr and Kristen S. Kurland. GIS Tutorial 1 Basic Workbook. ESRI Press (2010) Ch. 1

Week 3 (September 5-7) - Feature Analysis

Wednesday and Friday: Commands for manipulating features and rasters.

Reading:

- Wilpen L. Gorr and Kristen S. Kurland. GIS Tutorial 1 Basic Workbook. ESRI Press (2010) Ch. 8.

Week 4 (September 10-14) - Feature Analysis Continued

Monday and Wednesday: Commands for manipulating features and rasters continued.

Friday: Lab - work on Homework 2

Homework 2 Due Sunday, September 16 at 11:59pm.

Reading:

- Wilpen L. Gorr and Kristen S. Kurland. GIS Tutorial 1 Basic Workbook. ESRI Press (2010) Ch. 9.

Week 5 (September 17-21) - Zonal Statistics

Monday: Zonal statistics.

Wednesday: Zonal statistics continued.

Friday: Lab - implementing zonal statistics.

Reading:

- Wilpen L. Gorr and Kristen S. Kurland. GIS Tutorial 1 Basic Workbook. ESRI Press (2010) Ch. 11

Week 6 (September 24-28) - Creating Rasters and Shapefiles

Monday: Geocoding rasters from non-georeferenced image data.

Wednesday: Creating features to overlay with raster content.

Friday: Lab - work on Homework 3

Reading:

- Wilpen L. Gorr and Kristen S. Kurland. GIS Tutorial 1 Basic Workbook. ESRI Press (2010) Ch. 1

- David W. Allen and Jeffery M. Coffey. GIS Tutorial 3 Advanced Workbook. ESRI Press (2010) Ch. 4

Homework 3 Due Sunday, September 30 at 11:59pm.

Week 7 (October 1-5) - Raster Interpolation

Monday: Missing data and interpolation concepts.

Wednesday: Raster interpolation in ArcGIS.

Friday: Lab – implementing raster interpolation technique.

Reading:

- David W. Allen and Jeffery M. Coffey. GIS Tutorial 3 Advanced Workbook. ESRI Press (2010) Ch. 9

Week 8 (October 8-12) - Map Design

Monday: Designing Maps in ArcGIS.

Wednesday: Designing maps continued.

Friday: Lab - work on Homework 4

Homework 4 Due Sunday October, 14 at 11:59pm.

Week 9 (October 15-19) - Introduction to Remote Sensing

Monday: Definition of remote sensing. Key terms. Projections, bands and sensors.

Wednesday: Differentiating satellites: LOA vs. MODIS vs. Landsat.

Friday: Google Earth Engine Explorer. Lab and free exploration.

Reading:

- Lillesand, Thomas M., Ralph W. Kiefer and Jonathan W. Chipman. Remote Sensing and Image Interpretation. Hoboken, NJ: John Wiley and Sons. pp. 330-486.
- James B. Campbell and Randolph H. Wynne. Introduction to Remote Sensing. New York and London: The Guilford Press. Ch. 11.

Week 10 (October 22-26) - Google Earth Engine Explorer

Monday: Basic analysis of layers using GEEE.

Wednesday: Topography and map-making from remotely-sensed data.

Friday: Lab - Work on Homework 5

Homework 5 Due Sunday October, 28 at 11:59pm.

Week 11 (October 29- November 2) - Google Earth Engine API

Monday: Intro to Javascript

Wednesday: Extracting Layers from GEE API. Mathematical operations.

Friday: Lab - using Google Earth Engine API.

Research Paper Proposal Due Sunday November, 4 at 11:59pm.

Week 12 (November 5-9) - Google Earth Engine API Continued

Monday: Image Collections and Extraction. Reducing and masking.

Wednesday: Exporting Image data from GEE API to ArcGIS

Friday: Lab – work on Homework 6.

Homework 6 Due Sunday November, 11 at 11:59pm.

Week 13 (November 14-16) - Google Fusion Tables

Wednesday: Creating Features and introduction to Google Fusion Tables

Friday: Operations and Commands using Google Fusion Tables.

Week 14 (November 19-21) - Labs and Work on Final Homework and Papers

Monday: Open Lab for Final Paper and Homework 7.

Wednesday: Homework 7 Due at 12pm. No class.

Week 15 (November 26-30) - Labs and In-Class Presentations

Final Paper Due on Friday, December 7, 2017 @ 11:59pm