Crime Mapping and GIS for Public Safety

Spring 2009

Instructor: Dr. Joel Caplan

1. Course Information
   Class Day/Time: Tuesday, 6:00 to 8:40pm
   Location of Class: Weintraub Computer Lab (CLJ 387)
   Instructor: Joel Caplan, Ph.D.
   School of Criminal Justice
   Center for Law and Justice, Room 548
   123 Washington St., Newark, NJ 07102
   Office Hours: Tuesdays, 1:30-3:30pm
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   Email: jcaplan@newark.rutgers.edu

2. Course Description
   This workshop-style course will provide a practical introduction to the basic functionality of ArcView 9 for mapping and analyzing crime and public safety data. Participants will learn skills to make and analyze maps and will develop a solid base upon which to build further expertise in geographic information system (GIS) software.

   **Class Format:** The course will incorporate diverse learning activities including lectures, PowerPoint presentations, instructor-led skills training, and student practice sessions. Hands-on skills training will "walk" students through a series of tasks for GIS mapping and analysis. A "watch" and "follow" methodology will be employed. After watching the instructor demonstrate a technique, students will follow along in an effort to complete structured lessons.

   Classes will generally consist of two parts. **Part I** will be seminar style. Lectures or structured discussions will focus around the daily class topic. **Part II** will be hands-on skills training. Lessons will focus on using ArcGIS software to make maps and manage spatial data.
3. **Prerequisites:** This course assumes no previous experience in the use of geographic information systems (GIS). The basic ability to use a desktop computer is required.

4. **Expected Learning Outcomes/Objectives**
   1. Hands-on introduction to vector (and some raster) GIS using ArcView 9 software.
   2. Model geographic objects such as bounded areas (e.g., census tracts or service districts), specific locations (e.g., buildings or events such as crimes), and networks (e.g., streets).
   3. Learn how to collect, manage and edit spatial data (including administrative records and self-collected data) for use with GIS.
   4. Develop skills necessary for carrying out basic GIS projects and for advanced GIS coursework.
   5. Begin to develop critical thinking skills for reviewing and interpreting finished maps.

5. **Course Requirements**
   Students are to read before each class and be prepared for class discussions and assignments.

   **Attendance:** Attendance is VERY important and may count toward your final grade. You will be more successful if you attend. If an emergency arises and you must miss class, it is your responsibility to find other means to turn in your assignments on time. If absent, you are still responsible for anything assigned for the next class or classes, including obtaining any handouts given in the class you missed. It is YOUR RESPONSIBILITY to catch up.

   **Expectations:** Classroom learning is a group activity that depends upon everyone’s full participation in order to succeed. I expect students to: be prepared to begin class on time, silence or turn off and put away cell phones and other electronic devices, read and be prepared to discuss homework, submit assignments on time, and assist your classmates. You can expect that I will: be on time and prepared for every class, be available via email and appointments to answer questions and help you with homework, make every class engaging and valuable, and respect your contributions to class.

   **GIS Software and Data:** This course relies heavily on ESRI’s ArcGIS 9 software. You will be given a free trial version to install on your own personal computer, if you choose to. You may also access the software in the computer lab. Datasets will be provided as needed. Please note that datasets used in this course should not be shared or otherwise distributed to people outside of the course without permission from the instructor.

   **Blackboard:** Datasets, assignments and other information will be posted.
6. Grading

**Lab Assignments:** Labs will require you to demonstrate a combination of analytical and technical skills. There will be seven (7) lab assignments throughout the semester. They should be given to the instructor at the beginning of class on the day in which they are due. If you do not submit labs on time, you will get a zero.

Each lab assignment will be graded based upon: 1) how well you follow the specific requirements of the assignment, 2) your results, and 3) the quality of your maps. Map quality will be graded, in part, based upon your adherence to the Map Design and Layout discussion in Chapter 3 of your Coursebook. Judgments will also be made by the instructor regarding the map’s relevancy to the questions being answered or tasks at-hand.

**GIS Analysis Project:** This term project is intended to measure your applied understanding of the major skills and concepts presented in class.

**Class Presentation:** Give a PowerPoint presentation, with no more than 15 slides, of your progress/results from the GIS Analysis Project. You will have 15 minutes to present your project to the class, with 10 minutes for discussion. Be sure to include: 1) A brief background and significance of your project; 2) research questions; 3) methods/techniques used; 4) results (final or preliminary); 5) interpretation of results; and, 6) recommendations for policy/practice. (Refer to the *PowerPoint Tips* document).

The presentation is an opportunity for everyone to learn about applying GIS to unique areas of interests, and for you to get constructive feedback from the instructor and your classmates to improve your final project before submitting it.

Lab Assignments ................................................................. 50%
GIS Analysis Project ................................................................ 30%
Class Presentation ............................................................ 15%
Classroom Participation .......................................................... 5%

**Grades** represent the level of quality of a student’s performance in a course. Letter grades will be assigned as follows:

- **A**  Outstanding  90 – 100%
- **B+**  Good  85 – 89%
- **B**  Good  80 – 84%
- **C+**  Satisfactory  75 – 79%
- **C**  Satisfactory  70 – 74%
- **D**  60 – 69%
- **F**  Failing  < 60%

Any questions or issues regarding an assigned grade must be brought to the attention of the instructor before the due date of the GIS Analysis Project. Do not wait until the last minute.
7. Required Readings


Additional readings may be provided by the instructor throughout the course. Reading assignments should be completed prior to each respective class session.

8. Schedule (Tentative)

**Introduction**

**Session 1 (1/20)**
Thinking Spatially
Types of GIS representations
  - Points, Lines, Polygons
Introduction to ArcGIS
  - ArcCatalog & ArcMap
  - Managing and saving files

**READING:**
- *Steinberg, pgs. 7-25*
- *Caplan, Chapter 1*

**Making Maps with Existing Data**

**Session 2 (1/27)**
Maps as Representation, Communicating with Maps
Attribute Data, viewing and querying
Querying GIS Data
  - Query by attribute; query by location
Symbology
  - Choropleth, graduated symbol, dot density, chart maps
  - Classification Methods

**READING:**
- *Steinberg, Chapter 3*
- *Caplan, Chapter 2*
Session 3 (2/3)
Map Production and Distribution
Map Design Elements, Layout
Labeling Features
Exporting Maps—PDF, JPG
  o PowerPoints, Text Documents/Reports

READING:
  • Steinberg, Chapter 4
  • Caplan, Chapter 3

LAB 1 DUE

Session 4 (2/10)
Data Cleaning and GIS Database Management
Adding XY Data
Geocoding Addresses
  o Creating XY Coordinates

READING:
  • Steinberg, Chapter 6
  • Caplan, Chapter 4

LAB 2 DUE

Managing and Editing Existing Spatial Data

Session 5 (2/17)
Converting Excel Files to .DBF
Working with Attribute Tables
  o Adding Fields
  o Editing Tables
  o Joining Tables
Calculating Values
Creating new shapfiles from existing shapefiles

READING:
  • Steinberg, pgs. 125-134
  • Caplan, Chapter 5

LAB 3 DUE
Session 6 (2/24)
Spatial Data Sources
  - Web-based online mapping
  - Secondary data, Census data
  - Government Agencies
  - Primary/Self-collected data
Acquiring and Using Base Map Layers

READING:
  - Steinberg, pgs. 134-142
  - Caplan, Chapter 6
LAB 4 DUE

Session 7 (3/3)
Map Projections
Spatial joins
Aggregating point data
Aggregation Issues
  - Edge Effects
  - Modifiable Area Unit Problem

READING:
  - Steinberg, pgs. 26-31, 142-147
  - Caplan, Chapter 7
LAB 5 DUE

Session 8 (3/10)
Digitizing/creating new shapefiles
Editing existing shapefiles
Georeferencing
  - Aerial photography
  - Raster imagery

READING:
  - Caplan, Chapter 8
LAB 6 DUE

NO CLASSES 3/16 - 3/20: SPRING BREAK
Analyzing Spatial Data

Session 9 (3/24)
Buffers
Geoprocessing
  o Clip, Union, Intersect, Merge, Dissolve, Append

READING:
  • Steinberg, pgs. 165-168
  • Caplan, Chapter 9

Session 10 (3/31)
Density ("Hot Spot") Mapping
Density Map Symbology
Calculating Odds Ratios (Location Quotients)

READING:
  • Caplan, Chapter 10

LAB 7 DUE

Session 11 (4/7)
Other GIS software, extensions and tools
Answering questions with GIS
  o Interpreting maps, explaining findings

READING:
  • Steinberg, Chapter 10
  • Caplan, Chapter 11
  • Mellow, Schlager & Caplan, "Using GIS to evaluate post-release prisoner services in Newark, New Jersey"

Student Presentations and Course Summary

Session 12 (4/14)
Session 13 (4/21)
Session 14 (4/28)

9. General School and University Information

**Academic Integrity**
As a member of the Rutgers University community you are not to engage in any academic dishonesty. You are responsible for adhering to basic academic standards of honesty and integrity as outlined in the Rutgers University Policy on Academic Integrity for Undergraduate and Graduate Students (http://cat.rutgers.edu/integrity/policy.html). Your academic work should be the result of your own individual effort, you should not allow other students to use your work, and you are required to recognize and reference any material that is not your own. Violations of the university’s policy will result in appropriate action.

**Students with Disabilities**
As stated in the Manual for Students and Coordinators of Services for Students with Disabilities (http://disabilityservices.rutgers.edu/docs/studentmanual.pdf), Rutgers University “is committed to providing equal educational opportunity for persons with disabilities in accordance with the Nondiscrimination Policy of the University and in compliance with § 504 of the Rehabilitation Act of 1973 and with Title II of the Americans with Disabilities Act of 1990.” For students with disabilities, review the manual and then contact the Student Disability Coordinator, Nelitha Wilson-Michael (nmichael@andromeda.rutgers.edu; 973-353-5300), who is located in room 352 in the Robeson Campus Center.

**Psychological and Counseling Services**
If you experience psychological or other difficulties as a result of this course, or because of other issues that may interfere with your performance in the course, please contact the university’s psychological and counseling service center (http://www.counseling.newark.rutgers.edu; 973-353-5805), which is located in Blumenthal Hall, room 101. The center offers a variety of free, confidential services to part-time and full-time students who are enrolled at Rutgers.

Please refer to http://www.newark.rutgers.edu/rscj if you want to learn about
- Accelerated Master's Program (B.S./M.A.)
- Criminal Justice National Honor Society (Alpha Phi Sigma)