GIS Applications in Criminology – Crim 6332/GISc 6331
Summer 2017 Syllabus

Course Information
Time: Online, Full Summer Session
Class Location: Online

Professor Contact Information
Dr. Andrew P. Wheeler – but call me Andy!
Email: Andrew.Wheeler@utdallas.edu
Office Hours: email for an appointment

The quickest way to reach me is via email. I am frequently in my office for regular hours during the week, so feel free to stop by whenever (knock if the door is closed). Otherwise you can email to set up an appointment time.

Course Pre-requisites, Co-requisites, and/or Other Restrictions
This is a graduate level course. There are no specific prior course requirements besides being a current graduate or fast-track student. Experience in statistics and research design typical for a graduate student is expected, although no prior experience using geographic information systems is required.

Course Description

The course provides an introduction to spatial analytical techniques regularly used in the criminology and criminal justice field. The course is designed to both have analytical techniques that are used in research in academia, as well as techniques that are regularly employed in applied settings, such as crime analysis for police departments.

Student Learning Objectives/Outcomes

By the end of the course, students should have a firm grasp of:

- The basics of cartography, types of geographic data, and manipulating geographic files
- Making maps to show spatial patterns using point or areal data
- Be able to download census data and manipulate it to provide population estimates for varying geographies
- Be able to conduct univariate spatial analysis regularly undertaken by crime analysts, such as kernel density maps, and geographic offender profiling
- Fit multiple regression models that take into account spatial auto-correlation in the data

---

Required Readings

Readings for the course will be distributed via a zip file of all the readings on blackboard. Expected readings are listed in the class schedule, but I reserve the right to amend the

reading list (either require new/different readings or take off some readings) given class progression and other unforeseen circumstances.

There is no required textbook, but students who have no prior experience using GIS I would recommend Gorr & Kurland's *GIS Tutorial 1* (for ESRI's ArcMap) as an additional reference.

Software

The course will be centered on making maps and conducting various geographical manipulation, mostly using ESRI's ArcMap software. For each week students will have a tutorial on how to conduct particular data manipulations and analysis, so no prior experience using ArcMap is needed.

If you have experience in some other mapping software and would prefer to use that, (such as QGIS, or entirely conducting analysis in R) feel free. I will only be able to help with problems though mainly in ArcMap. ArcMap is generally available in various computer labs on campus. Additionally, I will provide trial licenses to students that will last through the duration of the course. Note though that ESRI's software is typically only available for Window's operating system. So if you do not have a Window's OS (or are not comfortable using a virtual machine), you may not be able to install the software on your personal computer.

Other software tools will be introduced into the course, such as CrimeStat, GeoDa, and R programs to conduct spatial regression analysis, but I will specifically provide a tutorial on how to use these tools during that particular lecture. These additional tools are all freeware.

Grading Policy

The final grade for the course will be the accumulation of assignments, two separate exams, discussion board participation, and a final project. The requirements for the final project will be further detailed in a separate handout, but the distribution of the proportion for grades will be as follows

- Assignments – [100 points, 10 assignments at 10 points each]
- Two Exams – [60 points total, 30 points for each exam]
- Software help Discussion Board Participation – [20 points]
- Final Project – [80 points]. Requirements for the project will be split into several separate components, each with their own grade. The final project and its requirements will be further described in a separate handout.

Assignments will each be graded on a 10 point scale. See the online course contents for a grading rubric for the maps.

Students are also expected to ask questions related to troubleshooting the GIS tutorials online for the discussion boards. I will provide a simple rubric, every question or answer

you provide on a forum counts for 5 points, but you can only get at max 10 points for any particular week or thread. (That is week is real time – e.g. you cannot answer 4 questions on the last day to submit comments to gain those points.) You will also be allowed to accumulate extra credit for *quality questions and quality answers* to other individuals' questions – up to a total of 20 extra credit points. I will not count duplicate questions/answers, and judging quality answers is up to my discretion. For questions I may ask you to edit your post or provide additional details, and these edits will be expected to obtain the 5 points. If you ask a question and figure it out yourself, you can answer your own question.

The exams will contain two parts. One part is a set of multiple choice (or similar) type questions. The second part is making a map equivalent to prior work you have done in the semester.

I am generally an easy grader, and you have more than 40 potential extra credit points built into my grading scheme. If you do the work you will do well in the class.

The total number of points for all of the graded material in the course is 260 points. Letter grades correspond to the total number of points is as follows:

A	230-260
B	200-229
C	170-199
D	140-169
F	Below 140

Course & Instructor Policies

Due dates for homework, final project components, exams, and online Q/A comments are listed in the *Course Information* folder. I will accept late homework (the map tutorials), but it will be automatically docked 5 points (out of a total possible of 10). Those homework assignments can be turned in late any time before the final exam is due. Homework will always require uploading a PDF to blackboard.

For components of the final project, I will not grant any credit to parts turned in late. But even if you do not turn in a project proposal or example maps I will hound you relentlessly to do that. (It is for your own benefit that I give feedback before the final project is due.)

Assignments & Academic Calendar

Below is a listing of the approximate weekly class schedule. If the content is changed anytime during the semester I will update the syllabus on Blackboard and email an announcement. I will provide a separate list with specific dates for homework assignments via blackboard.

Week 1 - The basics of mapping

Topics:

- Introductions, go over syllabus, course set-up
- Types of geographic data – vector and raster
- Projections – transforming 3d data to 2d
- Geocoding – taking textual information and assigning it spatial coordinates

Readings:

- Keith Harries, *Mapping Crime: Principle and Practice, Chapter 1, Context and Concepts*
- Rachel Boba Santos, *Crime Analysis with Crime Mapping*, *Chapter 1, Crime Analysis and the Profession*

Week 2 - Making maps

Topics:

- choropleth maps
- point maps
- general cartographic advice

Readings:

- Jerry Ratcliffe's Top 10 Crime Mapping Tips
- Harrower & Brewer (2003) ColorBrewer.org: An online tool for selecting colour schemes for maps. *The Cartographic Journal* 40(1): 27-37.
- Buckley, Aileen (2012) Make maps people want to look at: Five primary design principles for cartography.

Week 3 - Working with census data

Topics:

- downloading the data and describing different geographies
- make choropleth maps
- areal interpolation

Readings:

- Poulsen & Kennedy (2004) Using dasymetric mapping for spatially aggregated crime data. *Journal of Quantitative Criminology* 20(3): 243-262.
- Felson & Poulsen (2003) Simple indicators of crime by time of day. *International Journal of Forecasting* 19: 595-601.
- Boggs (1965) Urban crime patterns. *American Sociological Review* 30(6): 899-908.

Week 4 - Point pattern analysis

Topics:

- Making point maps
- Centrographic statistics
- Repeat and near-repeat patterns
- Kernel density estimation

Readings:

- Sherman et al. (1989) Hot spots of predatory crime: Routine activities and the criminology of place. *Criminology* 27(1): 27-55

- Brantingham and Brantingham (1997) A theoretical model of crime hot spot generation. *Studies on Crime and Crime Prevention* 8: 7-26.
- Ratcliffe & Rengert (2008) Near-repeat patterns in Philadelphia shootings. *Security Journal* 21(1-2): 58-76.
- Levine et al. (2013) CrimeStat Version IV Documentation, Chapter 4 (Centrographic Statistics), Chapter 7 (Hot Spot Analysis of Points: I), Chapter 8 (Hot Spot Analysis of Points: I), Chapter 10 (Kernel Density Interpolation)

Week 5 - Exam 1 & project proposal due, tutorial on downloading data and geocoding

Week 6 - Exploratory Spatial Data Analysis of areal units

Topics:

- spatial weights matrix
- local and global Moran's I, LISA Maps and graphs
- Spatial lags

Readings:

- Anselin (1995) Local indicators of spatial association-LISA. *Geographical Analysis* 27(2): 93-115.
- Anselin (2005) *Exploring spatial data using GeoDa: A workbook*, Chapters 15 through 21
- Cohen & Tita (1999) Diffusion in homicide: Exploring a general method for detecting spatial diffusion processes. *Journal of Quantitative Criminology* 15(4): 423-450.

Week 7 - Spatial Regression

Topics:

- Auto-regressive and spatial error models
- Alternative models to account for spatial auto-correlation

Readings:

- Bernasco & Elffers (2010) Statistical analysis of spatial crime data. In *Handbook of Quantitative Criminology*, pgs. 699-724.
- Land & Deane (1992) On the large-sample estimation of regression models with spatial- or network-effects terms: A two-stage least squares approach. *Sociological Methodology* 22: 221-248.
- Lesage and Pace (2010) *The biggest myth in spatial econometrics*. SSRN http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1725503

Week 8 - Forecasting models for crime

Topics:

- Risk terrain modelling
- Leadings indicators
- Other models - self-exciting point processes, spatio-temporal Bayesian

Readings:

- Cohen et al. (2007) Leading indicators and spatial interactions: A crime-forecasting model for proactive police deployment. *Geographical Analysis* 39(1): 105-127.
- Johnson et al. (2012) Towards the modest predictability of daily burglary counts. *Policing* 6(2): 167-176.

- Caplan & Kennedy (2011) Risk terrain modelling: Brokering criminological theory and GIS methods for crime forecasting. *Justice Quarterly* 28(2): 360-381.

Week 9 - The Journey to Crime and Geographic Offender Profiling

Topics:

- The journey to crime tends to be short
- Geographic offender profiling – predicting the home location or the next crime location
- Crime linkage

Readings:

- Bennell et al. (2007) It's no riddle, choose the middle: The effect of number of crimes and topographical detail on police officer predictions of serial burglars' home locations. *Criminal Justice and Behavior* 34(1): 119-132.
- Porter & Reich (2012) Evaluating temporally weighted kernel density methods for predicting the next event location in a series. *Annals of GIS* 18(3): 225-240.
- Rengert (2004) The journey to crime. In *Punishment, places and perpetrators: Developments in Criminology*, pgs. 169-181.

Week 10 - Additional spatial models of crime

Topics:

- Geographically weighted regression
- Discrete choice models

Readings:

- Bernasco & Nieuwbeerta (2005) How do residential burglars select target areas? A new approach to the analysis of criminal location choice. *British Journal of Criminology* 44: 296-315.
- Graif & Sampson (2009) Spatial heterogeneity in the effects of immigration and diversity on neighborhood homicide rates. *Homicide Studies* 13(3): 242-260.

Week 11 - class projects are due and final exam

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."