

# GEOG432 & 732: Applied Spatial Econometrics

Fall 2017

Tuesdays 3:30pm - 6:00pm, LeFrak Hall 1171

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**Office Hours:** Tuesdays 2:00-3:15 pm, or by appointment

## Course description and learning outcomes

This course will provide an introduction to modern econometric techniques in general and spatial econometrics in particular. It is designed for senior and graduate students of the geographical sciences department who may have relatively limited background in statistics, mathematics, and econometrics but are keen to learn this ‘difficult’ subject. This course will use the popular open source statistical computer language R. Its focus is on using statistical computing to produce analytical reports for real-world applications, research papers, and dissertations. Its aim is to enable students to develop the application of statistics to the study of economic geography, to understand how these techniques can help them comprehend the complex reality concerned and endow them with a fascination for spatial econometric methods. Through lectures, group work, and hands-on computer sessions, the class will enable students to explain when and why to use spatial econometrics and demonstrate how to apply spatial econometric methods. The class will help students develop ability to estimate and interpret spatial econometric models for analyzing socioeconomic relationships and human-environment interactions. The class will enable students to use spatial econometric tools in R effectively.

You will need to **bring your own laptop** to be able to run the statistical tests, regressions, and applications during class.

## Textbooks & Key References

- (1) Wooldridge, Jeffrey M. 2013. *Introductory Econometrics: A Modern Approach*, 5th Edition. South-Western Cengage Learning, USA. Its e-book is freely downloadable. Chapters 1-4, 6, 13 and 14.
- (2) Ward, Michael D. and Gleditsch, Kristian Skrede. 2008. *Quantitative Applications in the Social Sciences: Spatial Regression Models*. SAGE Publications Inc. A pre-published version of this book (2007), entitled *An Introduction to Spatial Regression Models in the Social Sciences*, can be downloaded at [http://dces.wisc.edu/wp-content/uploads/sites/30/2013/08/W4\\_W7\\_WardGleditsch.pdf](http://dces.wisc.edu/wp-content/uploads/sites/30/2013/08/W4_W7_WardGleditsch.pdf).
- (3) Arbia, Giuseppe. 2014. *A Primer for Spatial Econometrics: With Applications in R*. New York: Palgrave Macmillan. E-book downloadable from UMD Library website.
- (4) Millo, G. and Piras, G. 2012. sglm: Spatial Panel Data Models in R. *Journal of Statistical Software*, 47(1), 1-38. URL <http://www.jstatsoft.org/v47/i01/>.
- (5) De Micheaux, P. L, Drouilhet, R. and Liquet, B. 2013. *The R Software: Fundamentals of Programming and Statistical Analysis*. New York: Springer.
- (6) Sun, L, E Hong and T Li. 2010. “Incorporating Technology Diffusion, Factor Mobility and Structural Change into cross-region Growth Regression: An application to China”, *Journal of Regional Science*, 50 (3): 734–755.

**Prerequisites:** GEOG 306 or similar course which provides exposure to basic statistics and regression analysis (e.g. OLS). Please see me if you have any concerns about your statistical background.

## Assessment

A major component of the assessment will consist of homework assignments in which students will use R to perform various statistical and econometric analyses. The exact number of homework assignments depends on the topics we cover and how quickly we cover them. A tentative estimation is about 10. Homework reports are due one week after the homework is assigned unless specified differently. Submission should be made via the ELMS.

A second component is a project paper that utilizes spatial econometric techniques to analyze a real-world issue. Students will be responsible for choosing an appropriate topic, performing the appropriate spatial econometric analyses, and presenting the results in standard academic paper format (e.g. [http://www.elsevier.com/wps/find/journaldescription.cws\\_home/503305/authorinstructions](http://www.elsevier.com/wps/find/journaldescription.cws_home/503305/authorinstructions)). A typical structure of the project paper should include the following:

- Introduction (Background/context, objective, and significance)
- Data and methods (study area, data sets, methods)
- Results
- Discussions and conclusion
- References

The homework assignments will comprise 60% of a student's final course grade. Homework should be submitted in two flavors, coding and interpretation. Homework assignments will be graded on the base of correctness and completeness. The final research paper worth 40% of the course grade.

For the homework assignments, there will be no distinction in marking standard between the graduate and undergraduate students. For the project paper, graduate students are required to apply spatial panel data modeling techniques, whereas undergraduate students may employ spatial cross-section data modeling techniques.

## Grading

$\leq 59 = F$

60 – 63 = D-

64 – 66 = D

67 – 69 = D+

70 – 73 = C-

74 – 76 = C

77 – 79 = C+

80 – 83 = B-

84 – 86 = B

87 – 89 = B+

90 – 93 = A-

94 – 96 = A

97 – 100 = A+

You are bound by the Honor Code for all course assignments and exams.

As a rule, points will be deducted from assignments turned in late at a rate of 5 points per day. No homework will be accepted past one week after the due date. No homework will be accepted via email.

General guidelines for written assignments are outlined below, and expectations for each assignment will be clearly stated at the time the assignments are given.

### **Lectures**

This course meets once a week as a lecture. During lecture, students are expected to take notes, listen and participate when appropriate. Intolerable activity includes (but is not limited to): cell-phone use, laptop use aside from note taking/following/running models and applications, sleeping, and newspaper/magazine reading.

### **Attendance**

Attendance is mandatory. You are expected to take an active part in all class exercises. For the purposes of this course, attendance means arrive to discussion at the proper time, participate when asked, and not leave until class is dismissed. The philosophy of this course is based on learning by doing, so be prepared to participate, learn, and think.

However, in the event that a class must be missed due to an illness, the policy in this class is as follows:

1. For every medically necessary absence from class, a reasonable effort should be made to notify me in advance of the class. When returning to class, students must bring a note identifying the date of and reason for the absence, and acknowledging that the information in the note is accurate.
2. If a student is absent more than 1 time, he/she is required to bring documentation signed by a health care professional.
3. If a student is absent on days when tests are scheduled he/she is required to notify me in advance, and upon returning to class, bring documentation of the illness, signed by a health care professional.

For more information on the UMD attendance policies, see <http://faculty.umd.edu/teach/attendance.html>.

Students who are absent due to religious observances are responsible for notifying me of projected absences within **the first two weeks** of the semester.

### **Notification of Disability**

Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Disability Resource Center as soon as possible to request an official letter outlining authorized accommodations. Students should then present said letter to the instructor NO LATER than Feb 5, 2014.

### **Sexual and Racial Harassment**

It is the policy of the University of the Maryland that sexual harassment and racial harassment of students, staff and applicants for admission to the University are prohibited. For further details see the UMD student handbook.

### **Academic Integrity**

Academic dishonesty is a serious offence that can result in suspension or expulsion from the University of Maryland. Please refer to the following website to determine how the University of Maryland defines plagiarism and academic dishonesty -- <http://www.testudo.umd.edu/soc/dishonesty.html>. All assignments must be cited properly, especially when using direct quotations, paraphrasing, or using ideas that are not your own and come from another author (Including websites!!!!).

### **Disruptive Students**

Students are expected to treat each other with respect. Disruptive behavior of any kind will not be tolerated. Students who are unable to show civility with one another, the teaching assistants, or myself will be subject to being referred to the Office of Student Conduct or to Campus Police. You are expected to adhere to the Code of Student Conduct.

**Guidelines for written assignments:** You have a number of written assignments for this course. Specific expectations and materials for each assignment will be discussed in class. However, these are the guidelines to follow:

- Submit assignments plus calculations (data-sheet and R code) electronically using ELMS. Assignment will not be graded until the associated calculations are received.
- The assignment has to be submitted at the specified day and time. A 5 % penalty will be given for each day that the assignment is late.
- A cover sheet for each assignment should be included which contains your name, date, assignment and title.
- Follow the guidelines for each assignment’s word length.
- Assignments will be graded on the following criteria: content, presentation, organization, clarity, and grammar and will be handed out and specified for each assignment.
- Must include proper and consistent citation.

### Course Outline & Schedule

Week/Date	Topics	Key Reading
08/29	The Nature of Econometrics and Economic Data	Chap 1 of textbook (1)
09/05	Introduction to R	
09/12	The Simple Regression Model	Chap 2 of (1); Chap 1 of (2)
09/19	Multiple Regression Analysis I: Estimation	Chap 3 of (1); Chap 1 of (2)
09/26	Multiple Regression Analysis II: Inference	Chap 4 of (1); Chap 1 of (2)
10/03	Spatial Dependence, Measuring Spatial Association & Correlation	Chap 1 of (3); Chap 2 of (2)
10/10	Spatially Lagged Dependent Variables and Spatially Lagged Model	Chap 2 of (3); Chap 3 of (2)
10/17	Spatial Error Model	Chap 3 of (3); Chap 3 of (2)
10/24	Pooling Cross Sections across Time: Simple Panel Data Methods	Chap 13 of (1)
10/31	Fixed-effect versus Random Effects in Panel Data Estimation	Chap 14 of (1)
11/07	Spatial Lag Model of Panel Data	(4); Section 4.3 of (2)
11/14	Spatial Error Model of Panel Data	(4); Section 4.3 of (2)
11/21	(Thanksgiving holiday, no lecture)	
11/28	Cross-regional growth regression: The case of China	(6)
12/05	Final review	