GIS Advanced Spatial Analysis

Sp-15-GIS-0102-01-Advanced GIS

Spring 2015

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OFFICE HOURS: two hour before class in the GIS Lab

OPTIONAL TEXTBOOKS (Strongly recommended):
Mitchell, 2001, "*The ESRI Guide to GIS Analysis, Volume 1: Geographic Patterns and Relationships*,"
   Environmental Systems Research Institute, Inc., Redland California, 190 p. ISBN: 9781879102064
REQUIRED TEXTBOOKS:
Mitchell, 2005, "The ESRI Guide to GIS Analysis: Volume 2: Spatial Measurements & Statistics,"
   Environmental Systems Research Institute, Inc., Redland California, 252 p. ISBN: 9781589481169

Allen, 2013, "GIS Tutorial 2: Spatial Analysis Workbook Edition 3" (arcgis10.1) ESRI Press, Redlands
   California, 408 p. ISBN: 9781589483378

SUPPLEMENTARY MATERIALS:

ArcGIS desktop software and tutorial materials are included in the Esri Workbook.

ESRI Virtual Campus Courses:

referencing data to real-world locations
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2554
getting started with the geodatabase
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2026
exploring spatial patterns in your data
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&CourseID=2052
performing spatial interpolation
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2128
using raster data for site selection
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2132
regression analysis
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2583
basics of python
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2114

CASE STUDY READINGS:

All Case studies are saved to a zip file in the Course Materials on Trunk. In some cases URLs will be
provided so that other links can be explored.

COURSE CONTENT:

This course focuses on advanced quantitative approaches to spatial analysis. Students will investigate
quantitative methods, the use of statistical analysis in problem solving, and applications of quantitative
methods and spatial analysis and examples. Case studies will be used to illustrate skills covered in the

workbook. These skills include: Data gathering , database manipulation, spatial overlay analysis, cartography principals, spatial modeling tools and heuristic problem solving. An understanding of geographic information systems is helpful but not required, as is a basic understanding of computers, as well as experience with PC-based operating systems and network-related procedures.

COURSE OBJECTIVES:

1) Students will have the opportunity to develop a solid understanding of the concepts, principles, approaches, and techniques associated with the development, management, and analysis of GIS data.
2) Students will have the opportunity to learn how to use software documentation to add to their knowledge and learn new techniques for spatial data analysis.
3) Students will have the opportunity to become familiar with various approaches used for advanced spatial analysis.
4) Students will have the opportunity to develop applied methods of conducting a spatial data compilation project, including defining the database, writing a research proposal, completing an analysis, and presenting the results in both written and oral form.

COURSE METHODOLOGY:

Lectures will be provided in MS Powerpoint format available in Trunk. Online training class will be used to supplement the workbook exercises.

Students will be expected to complete and submit all assignments and tests by the due dates. There will be readings and exercises each week. Case studies will be presented by students and the instructor for discussion during the lecture periods. Details will be provided in class.

A final project will be required. More details on the project will be provided at the beginning of the class. Submissions will include a MS Word document and/or Adobe PDF, a verbal presentation before the class and a poster for display.

The average student will require a minimum of 4 hours per week to complete the readings and assignments. This time may vary depending on how quickly you work through the step-by-step tutorials and the independent exercises.

Grades will be assigned based upon you total accumulated points in the class, as well as your class participation. Points will be assigned as follows:

Attendance and Participation	15%
Weekly Exercises	20%
Case Study	10%
Final Project	55%

The course grading scale will be as follows:

100	A+	82 – 80	B-
99 – 93	A	79 – 77	C+
92 – 90	A-	76 – 73	C
89 – 87	B+	72 – 70	C-
86 – 83	B	69 – 0	F

CLASS SCHEDULE: Note: Readings are in the **Resources** folder in Trunk

WEEK 1   1/15
       Lecture: Course Overview; Data & Formats; Penn St. Videos
       Assignments: Mitchell- Ch. 1& 2: INTRODUCING GIS ANALYSIS & MAPPING
           WHERE THINGS ARE;
           Workbook- Ex. 1: MAPPING WHERE THINGS ARE
       Design Experiment: - Do the five parts listed in the assignment.
           Remember that this is meant to be fun and spark creativity and observation
       Readings: 1. City of Boston, Department of Neighborhood and Development. 2010.
           Foreclosure Trends.
           http://www.cityofboston.gov/Images_Documents/RealEstateTrends_2010_tcm3-24316.pdf (and in Trunk)
           2. ESRI. 2010. Coachella Valley Mosquito and Vector Control District: Field
           Technicians Works Smarter – Data Access Increases Efficiency. Case Study
           Series. http://www.esri.com/library/casestudies/coachella-valley.pdf (and in
           Trunk)
       Virtual Class:
       http://video.esri.com/watch/903/spatial-statistics-best-practices
       http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2031

WEEK 2   1/22
       Lecture: Mitchell- Ch. 3; Ch. 4
       Assignments: ; Review Class Materials &
           Workbook Ex 2: MAPPING THE MOST AND THE LEAST;
               - Ex. 3: MAPPING DENSITY
       Virtual Class: Referencing data to real-world locations
       http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2554
       and   http://blogs.esri.com/Dev/blogs/geoprocessing/archive/2010/07/13/Spatial-Statistics-Resources.aspx

WEEK 3   1/29
       Lecture: Ch. 5: & Raster Overview; Web Viewers (ArcGIS.com, Oliver, Tufts)
       Assignments:
           Workbook- Ex. 4: FINDING WHAT'S INSIDE
       Readings: 1. Goldsbery, Kirk; and Acmoody, Sarah (Michigan State University). 2010.
           Identifying food deserts in Lansing, Michigan. ArcUser, Fall 2010.
           http://www.esri.com/news/arcuser/1010/files/foodesert.pdf (and in Trunk)
           2. Kerski, Joseph. The Top Five Traits You Need to Succeed in a GIS Career.
           http://www.esri.com/news/arcwatch/1111/the-top-five-traits-you-need-to-succeed-in-a-gis-career.html
       Virtual Class: Getting started with the geodatabase
       http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2026
       Exploring spatial patterns in your data
       http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&CourseID=2052

WEEK 4   2/5
Lecture: Ch. 6; Ch. 7; Making Maps & Color Brewer; Tufte, Tufts Design Standards
Assignments: Mitchell- Ch. 6: FINDING WHAT'S NEARBY; Mitchell Ch 7: MAPPING
          CHANGE
          Workbook- Ex. 5: FINDING WHAT'S NEARBY,
                    Ex. 6: MAPPING CHANGE
Virtual Class: performing spatial interpolation
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2128
using raster data for site selection
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2132

Readings: 1. Tulloch, David L., Myers, James R., Hasse, John E., Parks, Peter J., and Lathrop,
          Richard G. 2003. Integrating GIS into farmland preservation policy and decision making.
          Landscape and Urban Planning 63 (2003) 33-48. (**Saved on Trunk**).
          2. Covington, Elzbieta (South Carolina Department of Health and Environmental
          Control). 2010. ArcUser, Summer 2010, P26-P29.
          http://www.esri.com/news/arcuser/0610/files/airquality.pdf
          3. Healthy GIS, Winter 2009/2010.
          http://www.esri.com/library/newsletters/healthygis/healthygis-winter2009-2010.pdf

Project Outline: Short document summarizing the scope of your project due.

WEEK 5   2/12
Lecture: Overview of Case studies in Trunk
Assignments: Find Case Study and write up short summary for presentation (can be one of
the ones in course materials or one you discover on your own).

WEEK 6   2/19 -**NO CLASS** (Monday schedule instead)

WEEK 7   2/26
Lecture: Why Use Regression Analysis?
Readings: Finding Meaningful Models (in Trunk) "FindModel.pdf"
Assignments:
          Virtual Class: regression analysis
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2583

WEEK 8   3/5
Lecture: Ch7; and Remote Sensing Overview
Assignments: Mitchell Vol 2 Ch 1& 2: GEOGRAPHIC DISTRIBUTION
          Workbook- Ex. 7: GEOGRAPHIC DISTRIBUTION
Readings: Treuhaft, Sarah. 2009. Community mapping for Health Equity Advocacy.
          PolicyLink. Organizing for Community Benefits, Los Angeles
          http://opportunityagenda.org/files/field_file/Community%20Mapping%20for%20Health
          %20Equity%20-%20Treuhaft.pdf

WEEK 9   3/12--- (**Spring Break following week**)
Lecture: Mitchell Vol 2 Ch 3:.Spatial Statistics Overview
Assignments: Mitchell Vol 2 Ch 3;
        Workbook- Ex. 8: ANALYZING PATTERNS

WEEK 10   3/26
Lecture: Mitchell Vol 2 P.147-190 (Ch.4)
Assignments: Mitchell Vol 2 P.147-190;
        Workbook- Ex. 9: IDENTIFYING CLUSTERS

WEEKS 11   4/2
Lecture: Geostatistical Extension
Assignments: Geostatistical Exercise – download from Class folder

WEEK 12   4/9
Lecture: ModelBuilder Exercise
Assignments: Mitchell Vol 2 P.135-145; Mitchell Vol 2 P.191-226
            ModelBuilder Exercise

WEEK 13   4/16
Lecture: Python Exercises
Assignments: Mitchell Vol 2 P.135-145; Mitchell Vol 2 P.191-226
Virtual Class: Basics of Python
http://training.esri.com/gateway/index.cfm?fa=catalog.webCourseDetail&courseid=2114

WEEK 14   4/23
Lecture: Discussion and demo of Lidar Data
Assignments: Project Work Time and/or Presentations

WEEK 15   4/30   **PROJECT PRESENTATIONS**

WEEK 16   5/7   **All Materials Due**

Policy on Academic Integrity for Graduate Students Read the Tufts University's policy on academic integrity for graduate and undergraduate students. **Please read this carefully!** You should pay particular attention to how to cite, quote, and paraphrase information (Part One, Chapter 4) and copyright and fair use (Part Two, Chapter 1). **If you have *any* questions, please come talk with the instructors or e-mail your questions to them. You will be held to the policies and standards set out in this document!**

Style Guidelines All written work must be produced consistent with the style guidelines of one of the two major style guides used at UEP, *The Chicago Manual of Style* or the *Publication Manual of the American Psychological Association (APA)*. Both provide clear guidance for citing and referencing other works. Such a skill is essential to avoid unintentional plagiarism. Students are strongly encouraged to purchase their own copy of either manual (the most recent editions are best, but not essential). Note, the instructor recommends the APA style and will be happy to her opinion with you!

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