

SRA 468 Visual Analytics

Spring, 2017

Class meets on Tuesdays and Thursdays 4:35pm-5:50pm in 202 IST building

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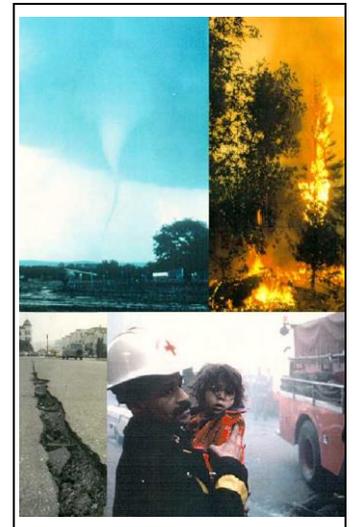
Teaching assistant: Yuhan Luo, ypl5142@psu.edu

Note: All course-related email, including messages to your instructor(s) and fellow students should be sent within Canvas, using the Inbox. Every attempt will be made for the instructor (or a substitute) to respond to email questions within 24 hours.

1. Introduction

Human society is constantly risked by extreme events such as natural disasters, terrorist attacks, and the spread of pandemics. In order to assess risks and potential damages as well as supporting effective response, decision makers must analyze and make sense of huge volume of data coming from a variety of sources (maps, images, news service reports, emails, and sensor data). Visual analytics is an emerging field of study that addresses the need for the science and tools supporting analytical reasoning and sense-making with vast amounts of data. It is a branch of information science that responds to increasing challenges of information overload in business and intelligence community.

The objective of this course is to expose students with analytical skills on handling massive, heterogeneous, and dynamic set of information. It emphasizes the integration of human judgment with computational analysis using visual representations and interaction techniques in the analytical process. Such skills are critical to those professionals working as intelligence analysts, decision makers, engineers, or emergency response teams. The course covers both theoretical concepts and practical skills in the use of visual analytic tools for solving problems. Group exercises and presentations will be important parts of the course.



The course will consist of video lectures, system demonstrations, labs, discussion forums, homework assignments, and a final (term) project. The laboratory component will introduce students to two visual analytic tools:

- (1) ArcGIS 10.3 software package from ESRI (www.esri.com); and
- (2) GeoDa spatial data analysis tool for exploratory data analysis (geodacenter.asu.edu).

These tools are used to learn the principles in visualizing, managing, and analyzing geographically referenced data for understanding risk, threats, and vulnerability. Basic knowledge in databases, spreadsheet, and elementary statistics is desirable.

2. Textbook and Resources

Required textbooks

[T1] Michael Law and Amy Collins (2015) *Getting to Know ArcGIS* (4th edition) (for ArcGIS 10.2 and 10.3), ESRI Press. (paperback). ISBN: 9781589483828. (available at amazon.com)

[T2] **Mitchell, A.**, 1999, *ESRI Guide to GIS Analysis*, v. 1, ESRI Press, ISBN 1-879102-06-4

Supplementary Readings: (Available as PDF from Canvas)

- [Reading 1](#): Thomas, J.J., Cook, K.A. 2005, **Chapter 1: Grand Challenges**. In *Illuminating the Path: The Research and Development Agenda for Visual Analytics*. (pp. 19-32) IEEE Computer Science.
- [Reading 2](#): Thomas, J.J., Cook, K.A.: *A Visual Analytics Agenda*. IEEE Computer Graphics and Applications 26(1) (2006) 10–13
- [Reading 3](#): Keim, D., Andrienko, G., Fekete, J.-D., Görg, C., Kohlhammer, J. and Melançon, G. 2008, **Chapter 7: Visual Analytics: Definition, Process, and Challenges**. In: Kerren, A., Stasko, J.T., Fekete, J.-D. and North, C. eds. *Information Visualization: Human-Centered Issues and Perspectives*, Springer, (pp.154–175)
- [Reading 4](#): Icke, I. 2009, *Visual Analytics: A Multifaceted Overview*, City University of New York, 2009.
- [Reading 5](#): Anselin, L. 2003, *An introduction to Exploratory Data Analysis using GeoDA* (Quick Tour)
- [Reading 6](#): Monmonier, M. (1997). **Chapter 2: Shaky Preparations**. In *Cartographies of danger mapping hazards in America*. (pp.15-48) Chicago, Ill.: University of Chicago Press.

Computing Resources

The College of IST provides an ESRI's ArcGIS 10 for use by students (details will be given in the second week of the class). This software is available both from IST classrooms and from the VLABS (svg.up.ist.psu.edu). Data to be used for this class can be found in \\up.ist.local\VA\. You are encouraged to create a short cut to this folder.

3. Assessment of Performance

Grades will be assessed on required activities throughout the semester. These include homework, lab reports, online quizzes, term project reports and presentations.

Course Grading Breakdown	
Grading Category	Percentage of Final Grade
Worksheets (6)	18%
Quizzes (3)	24%
Labs (3)	12%
Group Project	24%
Midterm Exams (2)	20%
Discussions	2%
TOTAL	100%

Course Grading Scale: The following are minimum cutoffs for each grade:

- 90.00% = A
- 88.00% = A-
- 85.00% = B+
- 80.00% = B
- 77.00% = B-
- 75.00% = C+
- 70.00% = C
- 60.00% = D
- less than 60.00% = F

4. Course Outline and Schedules

This schedule is tentative and subject to change throughout the semester. Please check the course website (on ANGEL) for the most up-to-date schedule. When formal lectures /lab sessions are scheduled, class attendance will be enforced by attendance survey.

Week 1: Introduction

L01: Overview of the course

L01: Introduce Yourself Jan 13

L01: Worksheet - Understanding Information Overload Jan 13

Week 2: Information Visualization

L02: Activities - Information visualization

L02: Worksheet - Information Visualization Jan 20

Week 3: GeoVisual Analytics

L03: Activities (Objectives, lecture slides, and readings)

L03: Lab 1 : Visualizing Geographical Data with ArcGIS Jan 27

L03: Quiz 1 (covering L01)Jan 27

Week 4: Exploratory Data Analysis

L04: Activities - Exploratory data analysis (EDA)

L04: Worksheet - Histograms, Box plot, and Scatter plot Feb 3

Week 5: Visualizing Categorical Data

L05: Activities - Mapping where things are

L05: Lab 2: Mapping Where Things Are Feb 10

L05: Quiz 2 (covering L02 and L04) Feb 10

Week 6: Visual Analysis of Quantitative Data

L06: Activities - Mapping the Most and the Least

L06: Worksheet - Mapping the most and the least Feb 17

Week 7 Review and Midterm exam

Midterm Exam I: review and practice

Midterm Exam II: exam session Feb 23

Week 8: Spatial Analysis - Finding What's Inside

L08: Activities - Finding What's Inside

L08: Worksheet - Location Queries and Attribute queries Mar 2

Week 9: Finding What's Nearby

[Log: Activities - Finding What's Nearby](#)

[Log: Worksheet - Finding What's Nearby](#) Mar 17

Week 10: Midterm II: Hands-on

[Midterm II review and Practice](#)

[Midterm II exam](#) Mar 23

Week 11: Term Project Preparation

[L11: Activities - Term project requirements](#)

[L11: Quiz 4 \(covering Lo8 and Log\)](#) Mar 30

Week 12: Term Project Proposal

[L12: Activities - Group Project](#)

[L12: Group Project Exercise 1 \(note: this requires individual submission\)](#) Apr 7

[L12: Group Project Exercise 2 . \(note: this requires individual submission\)](#) Apr 7

[Term Project Proposal](#) Apr 6

Week 13: Term Project: Analyzing World earthquake hazards and risks

[Progress report I](#) Apr 14

Week 14: Term Project: Analyzing Earthquake hazards and risks in the United States

[Progress report II](#) Apr 21

Week 15: Term Project: final report

[Draft Project Report](#) Apr 25

[Group Presentation](#) May 2

[Peer Evaluation Form](#) May 5

5. Course Policy

Class participation is required on all scheduled class meetings, and will be monitored by attendance survey. Students should devote their full attention to the classroom activities. At the discretion of the instructor, active participation of class activities may be awarded with bonus points. In case of missing classes for legitimate reasons, the instructor must be notified in advance, and a plan to make up the missing activities must be discussed with the instructor. Missing classes without acceptable reasons will be recorded as penalty grade: 1st missing class: -2%; 2nd missing class: -3%; 3rd missing class: -5%.

Policy regarding use of computer in classroom: You should keep your laptop computer closed, except when a hands-on lab is in session. Browsing unrelated web content during class time may be recorded as penalty points.

Late submission. Homework, lab reports, and term project reports must be submitted in time. Permission for late submission must be requested from the instructor before any late submission can be accepted. A penalty of up to 30% will be assessed if a submission is within 3 days after the deadline. No submissions will be accepted three days after the deadline.

6. University Policy

Students with disabilities. It is Penn State's policy not to discriminate against qualified students with documented disabilities. If you have a disability-related need for modifying your exam or test environment, notify your instructor during the first week of classes so that your needs can be accommodated. You will be asked to present documentation from the Office of Disability Services (located in 105 Boucke Building) that describes the nature of your disability and the recommended remedy. You may refer to the Nondiscrimination Policy in the Student Guide to University Policies and Rules.

Americans with Disabilities Act. The School of Information Sciences and Technology (IST) welcomes persons with disabilities to all of its classes, programs, and events. If you need accommodations, or have questions about access to buildings where IST activities are held, please contact the Dean's Office (814) 865-3528 in advance of your participation or visit. If you need assistance during a class, program, or event, please contact any member of our staff or faculty in charge.

PSU Statement on Academic Integrity. According to the University Advising Handbook: "Academic integrity is the pursuit of scholarly activity free from fraud and deception, and is the educational objective of this institution. Academic dishonesty includes, but is not limited to, cheating, plagiarism, fabrication of information or citations, facilitating acts of academic dishonesty by others, unauthorized possession of examinations, submitting work of another person, or work previously used without informing the instructor, or tampering with the academic work of other students. Any violation of academic integrity will be thoroughly investigated, and where warranted, punitive action will be taken." Students should be aware that standards for documentation and intellectual contribution may depend on the course content and method of teaching, and should consult instructors for guidance.