IST719 Information Visualization Spring 2019

School of Information Studies
Syracuse University

1. Course Description

This course will introduce students to skills and techniques related to information visualization. In this skills-based course, students will be introduced to the R programming language, Adobe Illustrator, simple data cleaning techniques, simple design concepts and the ethics of visualizing data. The focus is on developing static data visualizations to visually explore and communicate findings using data from a variety of sources. Conceptual themes will be presented alongside technical aspects of data visualization.

1.1. Course Structure

During the asynchronous section, you will have a chance to practice and apply you knowledge via an assignment that is due before the next asynchronous session. Beyond the homework, there will also be a large project that is part of this course. This project will allow you to apply what you have learnt within the class to a real-world data problem. You will work within a team for this project, and select a real-world dataset. Your team's task is to understand the domain and the data available to determine how to best provide insight and wisdom from all the data that might be available, specifically an information visualization.

Synchronous sessions will be lab oriented with hands-on examples. Topics will relate to weekly scheduled subject material. Participation is recommended.

This class will provide many opportunities to learn about data visualization through hands-on experimentation with tools, design concepts, and real-world datasets.

Course material will be delivered as:

- Assigned readings introducing concepts and techniques
- Online group discussions focusing on assigned readings and real world examples of data visualizations
- Skill-based learning modules introducing graphic design principles, features of the R programming environment and features of Adobe Illustrator
- Instructor and Student presentations (recorded videos)
- Critiques of student work

Creating effective visualizations requires both programming *and* design skills. This semester, we will be using the R programming environment combined with Adobe Illustrator to introduce basic concepts of representing large data sets in a visual format

1.2. Learning Objectives

- Use R to do basic data cleaning and preparation on a wide range of data sets
    - Includes using functions to summarize and compare fields
    - Find missing values
    - Subset or filter data
    - Retype data into correct format

- Identify stories in data sets through exploration
    - Use R to create appropriate rough plots to identify distributions and relationships in the data
    - Use data sub setting and filtering to narrow in on questions of interest
- Create rich visual artefacts that communicate data stories
    - Identify the optimal type of visualization to minimize viewer cognitive overload and maximize image interpretability
    - Enhance viewer cognition through context cues
    - Use basic design principles to enhance viewer receptivity and convey meaning
    - Use Adobe Illustrator to combine R data visualizations, design elements and
    - context cues into a single artifact
- Critically assess visualizations
    - Interpret and analyze the meanings of data visualizations
    - Identify appropriate audience
    - Bring an ethics based perspective to development and interpretation of visualizations

1.3. At the end of the course students will be able to

- Identify and define user needs related to visual representation
- Interpret and analyze the meanings of data visualizations and information graphics
- Design and create meaningful data visualizations
- Understand many of the ethical and social issues related to the visualization of data

1.4. What does it take to succeed in this course

- An interest and passion in data science
- Independence, initiative, patience. curiosity
- Willingness to work with code, design, data

2. Texbooks:

Visualize This: The FlowingData Guide to Design, Visualization, and Statistics
By Nathan Yau. Wiley Publishing, 2011.

Data Points: Visualization That Means Something
By Nathan Yau. Wiley Publishing, 2013.

ggplot2
By Hadley Wickham, Springer, 2009/2016

An Introduction to Data Science (Optional)
By Jeff Saltz, Jeff Stanton.

ADDITIONAL READING

Additional and supplemental readings in the LMS as electronic documents for downloading and printing will be provided. Students are expected to read the assigned materials for discussions and coursework.

3. Contributions to Grade

The work for this class will involve the following:

- **HW/Exercise** (30%) are designed for you to practice the necessary skills in carrying out data processing, analysis, and management tasks. There are 9 HW/Exercises'.
- **Class Discussion** (10%) includes contributing to class Discussion Board.
- **Quiz(s)** (10%) is designed to evaluate your mastery of concepts, methods, and tools in data analysis and Visualization. Average of quizzes will be weighted by 10%
- **Advanced Topic Research and Presentation (20%) -**
- **Final Project** (30%): For the final project you work on a dataset provided, transform the data as needed, and provide a written analysis with visualizations (group of 4-7 students). Students will be assigned into a group. The grade is comprised of:
    - 27% final submission
    - 3% for the project updates (1% for each of the 3 project updates submitted)

4. Grading Policy

- Each assigned work will be graded on the scale as specified for the component, which will be summed at the end of the semester.
- Grade levels follow the scales below:

Highest	Lowest	Letter
100.00 %	93.00 %	A
92.99 %	90.00 %	A-
89.99 %	87.00 %	B+
86.99 %	83.00 %	B
82.99 %	80.00 %	B-
79.99 %	77.00 %	C+
76.99 %	73.00 %	C
72.99 %	70.00 %	C-
69.99%	0.00 %	F

- It is unethical to allow some students additional opportunities, such as extra credit assignments, without allowing the same options to all students.
- Students who wish to dispute a grade may resubmit the assignment for regrading with a one-page statement of explanation of why the paper should be regraded. If the student resubmits, the assignment will be regraded, which means the grade may go up, down, or stay the same. Except for extraordinary circumstances, no appeal for an individual assignment or project will be considered later than two weeks after the assignment was graded.

5. Schedule (draft) - This is a is subject to change (draft)

Date	Readings**	Topics+	Lab*	Homework/Quiz *
Week 0	The Beauty of Data Visualization, David McCandless, TEDTalk, (Youtube). Link available in course overview	Language of the Eye		Install R Install R Studio
Week 1	Visualize This: Chap 1 Visualize This: Chap 2 Visualizing Data, Fry: Chap 1 (pdf)	What is Visualization		HW 1: Scraping Data Quiz 1
Week 2	Visualize This: Chap 3 Visualize This: Chap 4 Data Points: Chap 1	Data and R		HW 2: : Basic Visualizations
Week 3	Data Points: Chap 2 Data Points: Chap 3 Visualize This: Chap 4 (Illustrator) Now You See It, Few: Chap 3 (pdf)	Asking Questions Telling Stories		HW 3: Refining Charts with Illustrator Quiz 2
Week 4	Data Points: Chap 4	Graphic Design Principles - I		Project Update 1 HW 4: Visually Describe a Dataset
Week 5	Visualize This: Chap 5 Visualize This: Chap 6 Now You See It, Few: Chap 4 (pdf)	Graphic Design Principles - II		HW 5: Quiz 3
Week 6	ggplot2 – Chap 2 Getting Started ggplot2 – Chap 3 Toolbox ggplot2 – Chap 4 Grammar	ggplot2 Basics I		Project Update 2 HW 6: ggplot2 Basics I Quiz 4: TBD
Week 7	ggplot2 – Chap 5 Layer by Layer ggplot2 – Chap 6 Axis & Legends ggplot2 – Chap 7 Positioning	ggplot2 Basics II		HW 7: ggplot Basics II Quiz 5: TBD
Week 8	ggplot2 – Chap 11 Modeling	Modeling for Visualization		HW 8: Exploring relationships Advanced Topic
Week 9	Data Science: Chap 19	Interactivity in R Plotting: Shiny		Project Update 3 HW 9: Build A Shiny App
Week 10	Visualize This: Chap 8 Data Points: Chap 4, Visualizing Spatial Data	Advanced Topics Spatial Relationships		Final Project Poster
Week 11	Virtual Poster Presentation			Final Project Poster

*HW/Exercises, Assignments must be submitted by midnight on the night prior to the start of the next asynchronous class.

*Labs – synchronous component, recommended

**Readings should be complete per weekly schedule

General Requirement for Assignment Submissions

Assignments must be professionally prepared with computer applications. Unless otherwise stated, assignments must be submitted electronically to the LMS. No hand-written assignments will be accepted. An assignment must be in one document when it is submitted to the LMS. If you have additional supporting materials that are in physical forms or hard copies (e.g., business forms or some images), you must scan them into JPG or TIFF format and embed them into your MS Word or PDF document. If you use MS Word to prepare your assignments, use Times New Roman style with 12-pt font, 1.5 line spacing, and 1 inch margin around.

You must submit all assignments to the LMS on the deadline specified for each assignment.

HW assignments are due prior to the start of the next synchronous class. Late HW assignments will receive a 0 (no credit). If your final project is late, **I will deduct 10% of the original grade for the first day of lateness plus 15% for every subsequent day.** You will not receive full credit for topics/assignments presented in an unprofessional manner. Professionalism includes the proper use of grammar, punctuation, and limiting spelling mistakes. Professionalism also means adhering to given instructions. Failure to adhere to the assignment instructions will result in a reduction of the grade. If English is not your first language set up an appointment with the writing program so they can help you improve your writing.

Respect and Disruption

It is expected that we all treat people's contributions and differences of opinion with respect. There are certain actions that can be disruptive not only to your own learning experience but to everybody else's as well. Examples include talking to neighbors during class, arriving late, cell phone ringing during class, text messaging, falling asleep, reading newspapers or magazines, lack of civility and respect in comments made, etc. Your repeated disruption will reduce your final grade. In extreme cases, you can be asked to leave the class and even excluded from the course.

6. University and School Policies

Academic Integrity

The academic community of Syracuse University and of the School of Information Studies requires the highest standards of professional ethics and personal integrity from all members of the community. Violations of these standards are violations of a mutual obligation characterized by trust, honesty, and personal honor. As a community, we commit ourselves to standards of academic conduct, impose sanctions against those who violate these standards, and keep appropriate records of violations. The academic integrity statement can be found at: http://supolicies.syr.edu/ethics/acad_integrity.htm.

Faith-based Observances

Syracuse University recognizes the diverse faith traditions represented among its campus community and supports the rights of faculty, staff, and students to observe according to these. This link http://supolicies.syr.edu/studs/religious_observance.htm provides a description of SU's religious observance policy. Under this policy, students are provided an opportunity to make up examination, study, or work requirements that may be missed due to religious observance *provided they notify the university and their instructors before the end of the second week of classes.* Students will have access to an online notification system for this purpose on MySlice during the first two weeks of the semester. The make up of an activity affected by a religious observance will be scheduled to be completed within a week of the missed deadline in agreement with the instructor.

Disabilities

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located in Room 309 of 804 University Avenue, or call (315) 443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Ownership of Student Work

This course may use course participation and documents created by students for educational purposes. In compliance with the Federal Family Educational Rights and Privacy Act, works in all media produced by students as part of their course participation at Syracuse University may be used for educational purposes, provided that the course syllabus makes clear that such use may occur. It is understood that registration for and continued enrollment in a course where such use of student works is announced constitutes permission by the student. After such a course has been completed, any further use of student works will meet one of the following conditions: (1) the work will be rendered anonymous through the removal of all personal identification of the work's creator/originator(s); or (2) the creator/originator(s)' written permission will be secured. As generally accepted practice, honors theses, graduate theses, graduate research projects,

dissertations, or other exit projects submitted in partial fulfillment of degree requirements are placed in the library, University Archives, or academic departments for public reference.