EM/SYS 622 WS

Decision Making Via Data Analysis

Spring 2024

This course provides students with a hands-on introduction to modern techniques for visualizing data and helps them develop skills to apply these techniques with corresponding problem-solving skills to inform strategic decision making. The students will gain experience in using the Python programming language as well as software packages like Gephi for data visualization.

Instructor: Amineh Zadbood, Ph.D.
Contact Information: azadbood@stevens.edu
Start/End Date: 01/22/2024 – 05/06/2024
Class times: Monday 6:30 – 9:00 pm
Class location: Online – Zoom link: https://stevens.zoom.us/j/97284975554
For more information about course access or support, contact the Technology Resource and Assistance Center (TRAC) by calling 201-216-5500.
Office hour: Thursday 8:00 – 9:00 pm (Prior appointment is required)

Course objectives:

1. Introduce the process of data manipulation, analysis, and visualization to enhance strategic decision making
2. Provide hands-on experience with utilizing data manipulation techniques and creating high-quality plots to increase understanding of the phenomena of interest and provide data-driven recommendations
3. Help develop skills in using Python programming language for data visualization
4. Improve skills in providing reports and presentations by creating interactive dashboards to communicate key insights to the audience

Assignments & grading

Participation 10%
Homework 30%
Mid-term project 30%
Final project 30%

Schedule

Week	Date	Topic	HW Release Date	HW Due Date
1	1/22/24	Introduction to data analytics & data visualization		
2	1/29/24	Introduction to Python		
3	2/5/24	Data Manipulation 1	HW 1	
	2/19/24	Presidents' Day (No Class)		
4	2/21/24	Data Manipulation 2 (Monday class schedule)		HW 1
5	2/26/24	Basic Graphs	HW 2	
6	3/4/24	Graphs with Enhancement	Mid-Term Project	HW 2
7	3/11/24	Spring Recess (No Class)		
8	3/18/24	Heatmap		Mid-Term Project
9	3/25/24	Tree Map and Time Series Plot	HW 3	
10	4/1/24	Interactive Visualization	Final Project	
11	4/8/24	Text Analysis		HW 3
12	4/15/24	Network Graphs	HW 4	
13	4/22/24	Working with Image Data		HW 4
14	4/29/24	Final Project Presentations		Final Project

Final grading rubric

Letter Grade	Range	
A	100%	to 94%
A-	< 94%	to 90%
B+	< 90%	to 87%
B	<87%	to 84%
B-	<84%	to 80%
C+	< 80%	to 77%
C	< 77%	to 70%
F	<70%	to 0%

Course materials

No textbook is required for this course. Students will be presented with slides and online tutorials. In case students are interested, the following books are recommended:

Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics
Storytelling with Data: A Data Visualization Guide for Business Professionals
Data Points: Visualization That Means Something

Homework

Assignments are **due by 11:59 pm EST on the due date listed in the course schedule**. A total of 4 homework assignments will be assigned throughout the semester.

Late submissions will be accepted up to 24 hours after the due date. However, a 50% of the maximum will be deducted from the assignment score. No assignments will be accepted after 24 hours from the due date.

An assignment file should be appended by the respective assignment number, your Last Name and First Name, such as "HW1_LastName_FirstName.pdf".
Please submit the following files:

- A working Python script ("HW1_LastName_FirstName.py") – (with comments)

- A PDF file describing the process and steps taken while manipulating data
- The dataset (raw data) used to run the script

You may learn from your classmates or others, but your submissions should indicate your independent work.

Mid-Term Project

1 mid-term project will be assigned.
Students will work individually with an assigned project and deliver a "data story" report.

Grading rubric:

- Context: Clearly defined topic that answers a specific question.
- Data Cleanliness: The extent to which the data has been manipulated to remove potential bias injection to the resulting visualizations. Identifying incomplete, incorrect, inaccurate, or irrelevant parts of the data.
- Importance: the extent to which the visualization addresses problems and facilitates decision making.
- Relevancy: Visualization contains no color, symbolism, or text that is irrelevant to the question the visualization seeks to answer.
- Aesthetic Design: Meticulous care given to colors, shape, size, background, annotation and overall design.
- Key insights communication. Clearly communicate the purpose, objective, analysis and insights and recommendations to the audience.

Final Group Project

1 final project will be assigned.

Students will work in groups on their chosen project and create a "data story" report to present. Each group has about 15 minutes for their presentation, and every team member must speak about a portion of the project. All the teams will evaluate each other's work through written notes in a Google Doc file and will receive points for doing so.
Please form groups of three or four members. In special cases, students who prefer to work individually and cannot attend the final session may submit a

poster instead. Please inform me if you are unable to participate in the group presentations.

The final project aims to capture the knowledge and skills learned throughout the semester. It evaluates the students' approach when creating visualizations that support the decision-making process.

Grading rubric:

- ❖ All of the criteria evaluated at during the mid-term project, plus:
- ❖ Evidence: Data comes from multiple highly reputable sources; data is supplemented with references to relevant scholarship; methodology behind how the data was collected is explained.
- ❖ Layout: design multi-chart static poster or interactive dashboard.
- ❖ Key insights communication. Clearly communicate the purpose, objective, analysis and insights and recommendations to the audience.

Technology requirements

Required Software:

- Python - https://www.python.org/downloads/
- Jupyter Notebook
- Gephi - Download Gephi software

Instructor's online hours: For questions, please contact me via this email address: azadbood@stevens.edu. I will generally respond within 24 hours. Please do not hesitate to ask any questions or any clarifications that you may need. Furthermore, to discuss questions related to weekly assignments that need more explanations, I will hold office hours for a virtual meeting, Thursdays 8:00 – 9:00 pm, and a prior appointment is required.

Academic integrity

GRADUATE STUDENT CODE OF ACADEMIC INTEGRITY

All Stevens graduate students promise to be fully truthful and avoid dishonesty, fraud, misrepresentation, and deceit of any type in relation to their academic work. A student's submission of work for academic credit indicates that the work is the student's own. All outside assistance must be acknowledged. Any student who violates this code or who knowingly assists another student in violating this code shall be subject to discipline.

All graduate students are bound to the Graduate Student Code of Academic Integrity by enrollment in graduate coursework at Stevens. It is the responsibility of each graduate student to understand and adhere to the Graduate Student Code of Academic Integrity. More information including types of violations, the process for handling perceived violations, and types of sanctions can be found at www.stevens.edu/provost/graduate-academics.

Learning accommodations

Stevens Institute of Technology is dedicated to providing appropriate accommodations to students with documented disabilities. The Office of Disability Services (ODS) works with undergraduate and graduate students with learning disabilities, attention deficit-hyperactivity disorders, physical disabilities, sensory impairments, psychiatric disorders, and other such disabilities to help students achieve their academic and personal potential. They facilitate equal access to the educational programs and opportunities offered at Stevens and coordinate reasonable accommodations for eligible students. These services are designed to encourage independence and self-advocacy with support from the ODS staff. The ODS staff will facilitate the provision of accommodations on a case-by-case basis.

For more information about Disability Services and the process to receive accommodations, visit https://www.stevens.edu/office-disability-services. If you have any questions please contact: Phillip Gehman, the Director of Disability Services Coordinator at Stevens Institute of Technology at pgehman@stevens.edu or by phone 201-216-3748.

Emergency information

In the event of an urgent or emergent concern about the safety of yourself or someone else in the Stevens community, please immediately call the Stevens Campus Police at 201-216-5105 or on their emergency line at 201-216-3911. These

phone lines are staffed 24/7, year-round. For students who do not reside near the campus and require emergency support, please contact your local emergency response providers at 911 or via your local police precinct. Other 24/7 national resources for students dealing with mental health crises include the National Suicide Prevention Lifeline (1-800-273-8255) and the Crisis Text Line (text “Home” to 741-741). If you are concerned about the wellbeing of another Stevens student, and the matter is not urgent or time sensitive, please email the CARE Team at care@stevens.edu A member of the CARE Team will respond to your concern as soon as possible.