CS 450: Data Visualization Syllabus

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Course Overview

This introductory course provides a comprehensive overview of essential principles and techniques used in data visualization. Students will delve into the significance of data visualization in effective communication and decision-making. The curriculum covers foundational concepts such as design principles, color theory, and visual perception, guiding students in creating clear and informative visualizations using popular tools. Emphasis is placed on exploring various data types and visualization techniques, interactive visualization, and ethical considerations in data representation. Through hands-on projects, real-world applications, and discussions, students will gain practical skills to transform raw data into compelling visual narratives.

Prerequisite: CS 301 and CS288

Educational objectives for the course:

Upon completing the course, the student will be able to:

- Understand the key components of data visualization analysis and design.
- Recognize common pitfalls in visualization design and understand the importance of perception and cognition in visualization.
- Apply visualization techniques to analyze distributions, proportions, and relationships among multiple variables.
- Utilize optimization techniques to enhance the effectiveness of comparisons and the interpretability of patterns.
- Evaluate the quality of various visualization techniques and assess their ability to provide valuable insights.
- Build effective dashboards for storytelling with data using popular data visualization libraries.

Topics to Be Covered:

The list of topics to be covered includes the following:

- Introduction to Data Visualization
- Tools and Technologies for Data Visualization
- Frameworks for Visualization Analysis and Design
- Visualizing Distributions, Proportions, and Relationships
- Stacked Visualizations for Data Representation
- Identifying and Avoiding Common Pitfalls in Data Visualization
- Tree Visualization Techniques
- Geovisualization Methods
- Plotly and Dash

Course Resources:

- <u>Visualization Analysis and Design</u> Tamara Munzner, ISBN-13: 9781466508910, CRC Press, 2014.
- <u>Fundamentals of data visualization</u> Claus Wilke, ISBN-13: 9781492031086, O'Reilly Media, 2019.
- <u>Storytelling with data</u> Cole Nussbaumer Knaflic, ISBN-13: 9781119002253, Wiley, 2015.

 <u>D3.js in Action, Third Edition</u> – Anne-Marie Dufour, Elijah Meeks, ISBN-13: 9781617299309, Manning Publications, 2023.

Class Attendance (5% of grade):

Class attendance is mandatory. Attendance will be taken randomly, and the final score will be based on the recorded attendance. Methods of taking attendance may include participation in Canvas activities, electronically submitting in-class work, calling students by name, passing a signature list around, or any combination of these methods. This may vary from week to week. Arriving 10 minutes late to class or leaving early will count as an absence. If you are unable to attend for valid reasons, you must submit proper documentation to the dean of students. You will be excused once the reason is deemed valid. Students who miss more than three unexcused classes will have their grade reduced by one letter grade.

Assignments (20% of grade):

There will be 6 assignments in this course. The weight of each assignment will vary according to their level of difficulty. Assignments must be submitted through Canvas by the due date. Late submissions will incur a penalty of 0.5% per hour past the deadline. If it is not explicitly stated, any external modules or packages are not allowed to use that is not covered during the lecture.

Quizzes (10% of grade):

There will be weekly quizzes based on the materials covered during that week. These quizzes are designed to reinforce your understanding of the course content and help you stay engaged with the material. Quizzes will be administered using a lockdown browser to ensure academic integrity. During each quiz for the environment check, you must show the desk and there should not be any other devices or notes there.

Project (15% of grade):

There will be a project with two milestones, with each milestone serving as a step in the project's development. The specific requirements for each milestone will be covered during class discussions and made available on Canvas.

Exams (50% of grade):

There are two exams in this course: a midterm worth 20% and a cumulative final exam worth 30%. Both exams will be administered using a lockdown browser with a camera to ensure academic integrity. Please test the lockdown browser setup beforehand. You are also required to bring your ID to both exams.

Class Participation

Asking and answering questions, taking quizzes, solving problems — individually or in groups — is a regular part of class meetings. Cell phones must be turned off during class. During class time you may not play games, text, email, browse the web or engage in other activities that are not part of the class. Any violation will be reported to the dean of students office.

Course Communication

Canvas (<u>canvas.njit.edu</u>) will be used for posting lecture notes and submitting homework. Lecture-related questions will be addressed during office hours, while the TA will be your primary contact for assignment-related queries. For email communication, include the course number and section in the subject line, and allow 24-48 hours for a response.

Grade Formula						
Grade	A	B +	В	C +	С	D
Overall Course Score Cutoff	90	85	80	75	70	65

If the overall performance falls below the expected average, adjustments may be applied to determine the final letter grade.

Grade Appeals

If you believe that you deserve more credit than you have been awarded on a particular problem, you may request, at the time it is returned or within 48 hours of the grade being posted, that it be re-graded. Your entire assignment will be re-graded, which may result in points being added or subtracted.

University Code on Academic Integrity

Read the University Code on Academic Integrity (<u>njit.edu/policies/sites/policies/files/academic-integrity-code.pdf</u>). It describes infractions of academic integrity and penalties for violations, including, for the most serious violations, an XF grade in the course or expulsion. All work that you represent as your own must, in fact, be your own. Work done by others or copied from somewhere must be given proper credit.

Use of Generative AI Tools

The use of generative AI tools (such as ChatGPT, GPT-3, or similar platforms) to obtain direct answers for any courserelated work is strictly prohibited. These tools can be used for clarifying concepts, supplementing course materials, and practicing problems, but they should not replace your own work. If you use generative AI tools to learn any material that is related to a quiz or assignment, you must disclose this and provide the full transcript of your interaction. Unauthorized use of AI tools will result in disciplinary action, which may include a failing grade for the assignment or course and further consequences per the institution's academic integrity policies. For any questions about appropriate use or for help with coursework, please contact me or use available academic support resources.

I reserve the right to make small changes to this syllabus; if there is any modification, you will be informed during the semester.