IDS 707: Data Visualization and Data Storytelling

Fall 2025
Tues 10:05 am-12:05 pm
Gross 330

Teaching Team:

Instructor
Lauren Nichols
Email: Lmn7@duke.edu
Walk-in office hours: Tues 12 - 1 pm
Additional office hours: book a time using link listed for MIDS
Office: Gross 223

Teaching Assistants:

Ava Mackay-Smith
Dhinesh Ravikumar
Lauren Jenkins

What is this course about?

Even the most impressive data science projects can fail if they aren't communicated successfully. The aim of this course is the provide us with the skills we will need to successfully communicate all aspects of our work to a variety of stakeholders, whether internal or external to our organization.

In the first half of the course, we will explore the principles of effective data visualization, drawing on cognitive science, rhetoric, ethics, and design theory to understand how people perceive and interpret visual information. We will learn to critically evaluate and thoughtfully implement visualization strategies to enhance clarity, insight, and credibility in your work. We will have opportunities to exercise analytical, technical, and creative thinking skills.

The second half of the course will focus on storytelling structures, mechanisms, and strategies. We will develop techniques for crafting narratives that frame your analyses in ways that resonate with different audiences. We will examine how to structure a story around data, choose the right visuals to support that story, and adapt communication strategies for various contexts, from executive briefings to public-facing reports.

Learning Objectives

By the end of the course, students will be able to:

- Evaluate visualization's effectiveness based on the principles of effective data visualization and their intended audience and purpose
- Implement the principles of effective data visualization in your current workflows (python or R) and add annotations and make adjustments to visualizations in post-processing.
- Communicate data science methods, results, and implications to a diversity of stakeholders using effective data storytelling strategies
- Tailor presentations to communicate data science effectively to different audiences

A disclaimer

This course will likely be different from other courses you have taken at Duke. While other data science courses may focus on finding the "right" model or "best" algorithm, there usually isn't a single correct answer in data visualization. The "best" visualization is one that is accurate, but also tailored to your audience, context, and goals. For students who are used to the precision of math or computer science courses, where problems have clear right or wrong answers, the seeming subjectivity of data visualization can feel disconcerting.

Lectures will draw on principles and theory from multiple disciplines and we will spend a good deal of class time discussing how these disparate fields can be applied to your own work.

Course Communication

Important updates related to the course schedule, assignments, and other announcements will be communicated through the Canvas course site. **It is your responsibility to stay current with all course communications** to ensure you don't miss any important information.

Communication channels:

- Check the **Announcements page** regularly to stay informed of any changes.
- Attend **office hours**, either with the instructor or TAs (see office hours at top of syllabus)
- Use the **Discussions page** to ask questions about assignments or other content questions
- You can **email Lauren N.** at Lmn7@duke.edu

You can expect a **response within one business day** for questions posted on the discussions page or via email.

Lecture Recordings

All lectures will be recorded and videos will be made available after every class. These videos are meant to serve as a reference if you need to review material or if you miss a particular class. Watching class recordings is **not a replacement for attending class**. You will learn the most from attending class and actively participating in in-class exercises and discussions. Please note that 25% of your final grade will be based on in-class work (participation and quizzes).

Assignments and Grading

Course grades will be based on the following break-down:

Participation	15%
Quizzes	10%
Assignments:	75%
Problem set 1	11%
Problem set 2	12%
Problem set 3	12%
Memo Assignment	15%
Process Diagram	10%
ML Presentation	15%

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Schedule

***Updated Sep 15 – Note changes to due dates for the following deliverables:** Problem Set 3, Memo, and In-class memo presentations

This schedule is a guide to what we will be covering throughout the semester and is subject to change. Check this document and Canvas announcements regularly for the latest schedule and course materials.

Week	Event Type	Date	Topic
Week 1	Class	Tuesday Aug 26	**What makes a good figure?** Human perception; Data viz in Data Science; Taxonomy of Visualizations
Week 2	Class	Tuesday Sep 2	**Making a good figure** Tools and process; Cognitive load and making figures obvious
Week 3	**Deliverable**	Monday Sep 8	**Problem Set 1 (Due 9pm)**
	Class	Tuesday Sep 9	**Color Scales and Formatting** Color; Formatting; Text and Text Hierarchy
Week 4	Class	Tuesday Sep 16	**Quantitative Scales and Time series** Time series considerations; Quantitative scales; Visualizing Uncertainty
Week 5	**Deliverable**	Monday Sep 22	**Problem Set 2 (Due 9pm)**
	Class	Tuesday Sep 23	**Geo-Spatial data** (guest lecture - Drew Keener) Projections and coordinate systems; Rasters and Vectors; Tools and process; Special considerations for analysis and visualizations
Week 6	Class	Tuesday Sep 30	**Models, ML, and Visualization** Additional plot types; Finding the data
Week 7	***Deliverable**	***Monday Oct 6***	**Problem Set 3 (Due 9pm)**
	Class	Tuesday Oct 7	**Data Storytelling** Storytelling structures, mechanisms, & Audience
Week 8	No class	Tuesday Oct 14	
Week 9	**Class**	Tuesday Oct 21	**Slide-Deck Design** Slide design and sequencing; Power point and tool considerations
Week 10	***Deliverable** Class + ***Deliverable**	**Monday Oct 27** **Tuesday Oct 28**	**Memo (Due 9pm)** **In-Class Memo Presentations & critique**
Week 11	**Deliverable**	Monday Nov 3	**Updated Memo Resubmissions; ML Stakeholder Proposals (Due 9 pm)**
	Class	Tuesday Nov 4	**Diagrams** (Guest speaker - Eric Monson) Representing ideas, processes, and relationships; Implementation in power point
Week 12	**Deliverable**	Monday Nov 10	**Capstone Diagrams (Due 9 pm)**
	Class	Tuesday Nov 11	**In-class diagram critiques**

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Week 13	Class	Tuesday Nov 18	**TBD** Visiting speaker or deep-dive on topic (dashboards, AI tools, other storytelling structures, Adobe Illustrator etc)
Week 14	**Deliverable**	Monday Nov 24	**Submit ML Presentation Slides & Report (Due 9 pm)**
	Class + **Deliverable**	Tuesday Nov 25	**In-class ML Presentations**
Week 15	No class	Tuesday Dec 2	Thanksgiving break & Reading Period
Week 16	**Deliverable**	Tuesday Dec 9	***(Optional) Resubmission ML Presentation Report***

Assignments

Over the course of the semester, students will complete six assignments. The first three assignments will be completed individually. The last three assignments will be completed in small groups.

Some of the assignments will also involve an in-class presentation component. The **presentation portion** of the assignment will contribute toward your assignment grade, not your participation grade. **Feedback on fellow students' presentations** will count toward participation grade.

Resubmission and late submission: Each student will receive **one token**. These tokens can be used to request either a late submission exemption OR a resubmission after grading for individual problem sets. Tokens cannot be used on group projects. To request the use of a token, please fill out this form (link).

Late submission tokens: You must request to use a token for an extension *before* the assignment due date/time. You will receive a (2 day) 48 hour extension on the deadline without incurring any late penalties (usually 5% per day).

Resubmission tokens: You may request to use a token to edit and resubmit a problem set after grading. You must request to use the token within 7 days of receiving your initial grade. You will then have an additional 7 days to edit and resubmit. Your final grade for the assignment will be the average of the grade you received on your initial submission and the grade you receive on your resubmission. For example, if you receive a 75% on your initial submission, and a 100% on your resubmission, your final grade will be 87.5%.

Quizzes

We will regularly have short in-class closed-book quizzes that will assess whether you are successfully integrating and internalizing the basic principles we are learning in class. Quizzes will take place at the start of class and cover material from the previous class(es), as well as any assigned reading or video material.

Missed quizzes cannot be made up. That said, life happens and we all need to miss class from time to time or we simply have an "off" week and don't perform as well as we might have hoped. Given this, the **lowest 2 quiz grades will be dropped**.

Participation

One of the best ways to grow your skills in data communication will be through practice and **active participation in class**. Learning data visualization principles and theories will provide the building blocks necessary for effective communication, but in order to be successful you have to practice, receive feedback, and revise. Class time will be designed to offer low-stakes opportunities to explore new approaches, take risks, and learn from your peers. This trial-and-error is essential for learning. Engaging fully in class will help you refine your ideas and improve your work *before* you are evaluated more formally via graded assignments.

Given that class-time participation is meant as an opportunity for practice and iteration, participation grades will be based on the thoughtfulness and effort of contributions, rather than on correctness.

Participation will be possible through voluntary participation, cold calling, and group contributions.

Voluntary participation: I encourage students to contribute to discussions, offer critiques, ask questions, and share insights. These contributions help create an interactive learning experience for everyone.

Cold calling: Occasionally, I will call on students to answer questions or offer insights. This is not meant to put anyone on the spot, but to make sure everyone has an opportunity to be heard, and that multiple opinions and points of view are shared.

In-Class Group Contributions: Some class sessions will involve small-group discussions or collaborative exercises. Students will be expected to share ideas, provide feedback, and/or help the group complete the exercise.

Discussion guidelines

Civility is an essential ingredient for academic discourse. Differences in beliefs, opinions, and approaches are to be expected. Active interaction with peers and your instructor is essential to success in this course, so please adhere to these guidelines:

- Respect that others' opinions and beliefs may differ from your own. If you disagree, you may critique the idea, but not the person.
- Listen carefully, be courteous and don't interrupt.
- Support your statements with evidence and a rationale.
- Try to moderate how you contribute to the discussion – if you have a lot to say, try to avoid dominating the conversation; if you are reluctant to spear up, try to find an opportunity to share your perspective.

Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Participation grading

Participation will be graded as follows (for those of you who took IDS 701, this rubric should be *suspiciously familiar*):

A range: You are fully and consistently engaged in class discussions and exercises. You both listen and contribute actively. You ask questions and provide insights that demonstrate that you are thinking carefully and deeply about the materials' relationship to other materials and ideas presented in previous classes.

You consistently provide thoughtful and actionable feedback to your fellow students during critiques that draw on principles and materials discussed in previous classes.

If your partner or group is struggling with an exercise you help them understand the material rather than just completing the material on your own. If you are struggling with the material, you ask for help (both from the instructor, TA, and fellow students).

B range: You are engaged in class discussions and exercises. You listen and contribute regularly. You are able to answer questions about the material, but your level of engagement lacks the depth acquired from time thinking carefully and deeply about the material.

You usually provide thoughtful feedback to your fellow students during critiques, though it may not always be actionable or be fully grounded in the principles and materials discussed in previous classes.

When working in pairs or groups, you work with your partner/team when you have similar levels of understanding, but do not always insist in helping a struggling partner to understand the

material. You often ask for help when you are struggling, but other times let your partner complete the exercise. You don't attend office hours regularly when struggling.

C range. You have met the minimum requirements of participation. You participate sometimes, but not regularly. The comments, questions, and insights you offer show a basic familiarity with the materials but do not help to build a coherent or productive discussion.

During critiques you sometimes offer feedback or ask questions. Feedback demonstrates basic familiarity with course material, but is not entirely constructive.

When working in pairs or teams, you only sometimes work with your partner. When your partner is struggling, you often just do the exercise yourself. If you are struggling, you only occassionaly ask for help or attend office hours.

D range. You have not met the minimum requirement of participation. You rarely participate in class. Your questions, comments, and insights do not demonstrate any deep engagement or understanding of the material.

You rarely offer feedback or ask questions during critiques. When you do offer feedback it is not constructive or actionable, or may reflect only a cursory understanding of material we have previously covered.

When working in teams, you do not attempt to work with your team. When someone on your team is struggling, you just do the exercise yourself. If you are struggling, you do not ask for help or allow your team to complete the exercise.

Use of Generative AI Tools

Generative AI is a powerful tool that can help you code faster, create visualizations more efficiently, and support your learning. However, in this course, it is **not a substitute for your own understanding or work**. You are expected to:

1. **Be able to code basic figures from scratch** in at least one language or library (e.g., seaborn, plotnine, ggplot). This is essential for exploratory work and on-the-fly analysis. Choose a library with strong defaults and minimal boilerplate.
2. **Understand and critically evaluate** any code generated by AI.
3. **Know how to troubleshoot and adapt** when AI-generated code fails. This includes consulting official documentation or community resources (e.g., Stack Overflow).

What is allowed/not allowed:

AI Tools for Code

- You **may use** generative AI to assist with **coding** on homework assignments.
- However, **you may not directly paste assignment prompts or datasets** into AI tools to get answers.

AI Tools for Narrative/Explanatory Work

- Unless explicitly instructed otherwise, **you may not use AI to write narratives or answer conceptual questions on** assignments.
- All written reflections, explanations, and storytelling components must be **your own original work**.

Mental Health and Wellness Resources

Student mental health and wellness are of primary importance at Duke, and the university offers resources to support students in managing daily stress and self-care. Some resources are listed below:

DuWell provides Moments of Mindfulness (stress management and resilience building) and meditation programming (Koru workshop) to assist students in developing a daily emotional well-being practice. All are welcome and no experience is necessary.

If your mental health concerns and/or stressful events negatively affect your daily emotional state, academic performance, or ability to participate in your daily activities, many resources are available to help you through difficult times.

DukeReach provides comprehensive outreach services to identify and support students in managing all aspects of well-being.

Counseling & Psychological Services (CAPS) services include individual and group counseling services, psychiatric services, and workshops. To initiate services, walk-in/call-in 9:00 AM – 4:00 PM (M/W/Th/F) and 9:00 AM – 6:00 PM Tuesdays. CAPS also provides referral to off-campus resources for specialized care. Contact: (919) 660-1000

TimelyCare (formally known as Blue Devils Care) is an online platform that is convenient, confidential, and free way for Duke students to receive 24/7 mental health support through TalkNow and scheduled counseling.

Academic Accommodations

If you are a student with a disability and need accommodations for this class, it is your responsibility to register with the Student Disability Access Office (SDAO) and provide them with documentation of your disability. SDAO will work with you to determine what accommodations are appropriate for your situation. Please note that accommodations are not retroactive and disability accommodations cannot be provided until a Faculty Accommodation Letter has been given to me. Contact: sdao@duke.edu

Academic Integrity

All students must adhere to the Duke Community Standard (DCS): Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and nonacademic endeavors, and to protect and promote a culture of integrity.

To uphold the Duke Community Standard, students agree:

- I will not lie, cheat, or steal in my academic endeavors.
- I will conduct myself honorably in all my endeavors; and
- I will act if the Standard is compromised.

Regardless of course delivery format, it is the responsibility of the student to understand and follow Duke policies regarding academic integrity, (e.g., completing one's own work, following proper citations of sources, and adhering to guidance around group work, and more). Ignoring these requirements is a violation of the Duke Community Standard. Any questions and/or concerns regarding academic integrity can be directed to the Office or Student Conduct and Community Standards at conduct@duke.edu.