

## **Naumova, Elena N.**

### **Short Course Description:**

This course provides students with tools and techniques to analyze and critique current forms of data visualizations in both public media and research literature. We instruct students on how to create high quality graphical displays with a keen understanding of the challenges of presenting complex information to various audiences. Using research data, students build a portfolio of graphical displays and descriptions intended for both scientific journals and popular media. This course also emphasizes effective data communication, including clear, comprehensive, and effective descriptions of graphical displays for various scientific and general audiences. This course is part of an NSF-funded study and will incorporate essential research components, including consenting, pre- and post- surveys, and pre- and post- assessment exercises (IRB-approved).

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# Syllabus

## Tufts University, Friedman School of Nutrition Science and Policy

### NUTR 393 – Data Visualization and Effective Communication

Spring 2022

**Instructors:** Elena N. Naumova, PhD, Professor ([Elena.Naumova@tufts.edu](mailto:Elena.Naumova@tufts.edu))

Corby Kummer, Senior Lecturer ([Corby.Kummer@tufts.edu](mailto:Corby.Kummer@tufts.edu))

**Teaching Assistants:** Ryan Simpson, PhD Candidate ([Ryan.Simpson@tufts.edu](mailto:Ryan.Simpson@tufts.edu))

Emily Sanchez, MS, PhD Student ([Emily.Sanchez@tufts.edu](mailto:Emily.Sanchez@tufts.edu))

**Class Meetings:** Mondays, 4:00 – 6:00pm

**Office Hours:** Wednesdays, 4:00 – 5:00pm

Zoom ID\* (Recurring Meeting):

<https://tufts.zoom.us/j/98883377369?pwd=RW1LRlBHUmVNUVZ4WUFmbVZaQ1FuZz09>

Phone ID (Direct Call In): +16465588656,,98883377369#

**Practicum:** Wednesdays, 5:00 – 6:00pm

Zoom ID\* (Recurring Meeting):

<https://tufts.zoom.us/j/93221610281?pwd=bVZvL0h2SnE1dzlNZjZGYW1wekloUT09>

Phone ID (Direct Call In): +16465588656,,93221610281#

\* Please note that Zoom links have been scheduled to begin and end 30 minutes before and after class meetings. Students are required to join Zoom 5-minutes before the times specified above.

**Graduate Credits:** 3 Semester Hour Units (SHUs) – former 1 credit

**Prerequisites:** No prerequisites required. The course has been designed to allow students to participate from diverse backgrounds. We encourage some working knowledge of data analytics and visualizations software and encourage the use of Excel, Stata, R, or Tableau.

**Course Description:** This course provides students with tools and techniques to analyze and critique current forms of data visualizations in public media and research literature. Students learn to construct high quality graphical displays with a keen understanding of the challenges of presenting complex information to various audiences. Students will build a portfolio of graphical displays and descriptions intended for scientific journals and popular media. Research data will be typical for nutrition sciences and sufficient to conduct analyses using standard statistical software. Course assignments and feedback will train students to communicate their findings clearly and concisely. Emphasis will be placed on developing a conceptual understanding of data visualizations and building effective communications for describing these graphical displays.

**Pre-Course Expectations:** Students should attempt to identify datasets relevant to their specific interests prior to the course. The instructors and teaching assistants will approve the dataset's suitability. If students cannot identify an appropriate dataset, please use our [compiled dataset repository](#), which can be found in Module 0 on Canvas.

## Course Objectives:

### a. Outcomes Addressed by the Course:

- Understand the impact of data visualizations in public media and research literature on science, medicine, and public policy.
- Learn how to construct high-quality graphical displays with a keen understanding of the challenges of presenting complex information to various audiences.
- Learn to value teamwork and to be a good team player.
- Learn to value ethical aspects of data visualization and science communication.

### b. Specific Outcomes of Instruction:

- Articulate and exemplify the basic rules of constructing data visuals, including evidence, efficiency, emphasis and ethics.
- Identify challenges and key details of data visualization techniques and analyze the quality of graphical presentations in the popular press and academic journals
- Articulate the perspectives, language, and terminology of methodological and statistical problems associated with a research question or hypothesis
- Integrate findings from other lines of research in interpreting and drawing inferences from evidence-based research to derive meaningful conclusions
- Integrate data and information from basic, clinical, environmental, social, and population sciences to prepare data for visualization
- Produce high-quality tables, graphs, and visuals using mainstream software

**Course Feedback:** Our course provides weekly feedback to students, both individually and collectively, in a variety of formats. Feedback addresses technical aspects of visualizations as well as the structure, content, and emphasis of student written briefs, figure legends, and brief titles. Please expect the following forms of feedback

- a) General Summaries: we will begin Monday Synchronous Discussion sessions with feedback on student barriers and challenges from the prior week's written assignment submission. We will also take examples of submitted visuals and comment on pros and cons during class. Feedback applies to all students even if your visual is not selected.
- b) Written Feedback: written feedback from course instructors and teaching assistants will be given for select assignments only. Feedback will be returned within 1 week of the assignment. Assignment feedback is spaced quarterly throughout the semester.
- c) Practicum Feedback: each Wednesday Practicum session will provide general and personalized feedback on assignment briefs and written work. We will take examples of submitted briefs and comment on pros and cons during class. Feedback applies to all students even if your visual is not selected.
- d) Instructor/TA Office Hours: sessions are first come, first served. Office hours will occur Wednesday before the Practicum. These sessions are for answering specific student questions. We encourage students to join as your peers' questions may reflect your own questions or challenges. You may schedule private meetings by appointment - please include all instructors and teaching assistants on your email.
- e) Student-to-Student: your thoughts and critiques as a science communicator and researcher are valued as an extension of course instructors and teaching assistants. We have designed in-class discussion sessions and peer feedback assignments to provide feedback to your classmates. You are graded by the quality not quantity of feedback.

**Accommodation of Disabilities:** Tufts University is committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability, please contact the Friedman School Assistant Dean of Student Affairs at 617-636-6719 to arrange reasonable and appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

**Diversity Statement:** Students will have many opportunities to discuss ethical dimensions of data analytics and explore challenging issues. This course aims to increase understanding of different perspectives via structured and unstructured discussions and encourage students to provide constructive critical assessment and feedback on feedback. Such conversations may not always be easy and require trust, practice, patience, courage and imagination. The ground rule for the class is to have due regard for the feelings, wishes, rights, or traditions of others and to respect each other’s’ backgrounds, experiences, and positions, as we deepen our understandings of multiple perspectives striving to acquire, develop, and communicate research findings to the best of our knowledge.

**Academic Conduct:** Each student is responsible for upholding the highest standards of academic integrity, as specified in the [Friedman School’s Policies and Procedures manual](#) and [Tufts University policies](#). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment to dismissal from the school.

**Course Organization:** This course follows a 12-module design with ~6 hours of asynchronous instruction (readings, lectures, assignments, data management, coding, and analysis) and ~3 hours of synchronous instruction (discussions, practicum). Each week, you will complete one asynchronous lecture, one synchronous discussion, and one synchronous practicum. Students must watch asynchronous lectures prior to Monday classes as well as complete peer feedback posts and reading assignments. Within synchronous discussions, students will partake in group exercises and practicum activities. Students will be asked to complete written assignments by Friday each week. Time requirements (with explanations) outlined below will differ by student and weekly assignment for completion.

<i>Course Material</i>	<i>Estimated Time Weekly</i>	<i>Description</i>
Readings and Reading Posts	60 Minutes	Students will be asked to complete 1-3 weekly readings and review these readings via Canvas posts prior to Monday synchronous discussions. Instructors will use reading scores to refine course material for the subsequent week.
Asynchronous Lectures	60 Minutes	Lectures will be pre-recorded for independent viewing and posted on Canvas at least 1 week in advance. We expect students to watch lectures prior to Monday class discussions.
Synchronous Discussions	120 Minutes	Synchronous discussion sessions every Monday will be used to facilitate team-based and collaborative in-class activities. Students will provide peer feedback on partners’ visuals,

		discuss the effectiveness of the visual's communications, critique written briefs, and outline improvements for revision.
Practicum	60 Minutes	Office Hours will immediately precede Practicum sessions. Practicums are designed for students to discuss questions and concerns regarding written pieces describing graphical displays. These sessions will be working sessions that offer content-based feedback from both course instructors and peers within the classroom focused on similar datasets or topic areas. Sessions will take place Wednesdays, which allows time for asking questions after synchronous discussions but before written assignment submission on Fridays.
Written Assignments	200 Minutes	Students will complete weekly written assignments that incrementally build towards completion of the midterm and final projects. Assignments include creating a new visualization, revising previous visual submissions, and writing briefs discussing the importance of visualizations.
Away-From-Screen Time	40 Minutes	We have incorporated time for students to detach from online work. This involves walking, yoga, biking, or any form of activity away from the computer. Students are asked to think about research tasks and reflect on project progress during this time!

**Assessment and Grading:** Please see the course grade assessment breakdown below.

<i>Assessment</i>	<i>Grade Value</i>	<i>Description</i>
Final Data Visualization Project	30%	Project topics should be unique and approved by the instructor(s). <b>The final report is expected to be a portfolio of graphical displays of research data.</b> Students will summarize their data analyses to create an infographic, structure-based, or processed-based visual. The visual will be supplemented with a detailed description of findings intended for a technical, scientific audience and for a general, public media audience. Visuals must be on a topic of the student's interests.
Midterm Presentation	30%	In preparation of the final presentation, students will complete a midterm presentation that <b>follows a similar structure as the final project.</b> Students will present one-, two-, and multi-dimensional visualizations that graph various aspects of data. Students are expected to provide structured critique to team group members.
Weekly Assignments	30%	<b>There will be 10 short 2-part assignments given throughout the course.</b> Part 1 will require students to create and describe a graphical representation. Part 2 will require students to revise and resubmit their visual and descriptions as well as critique their peers' works. Students will present and discuss works in class.
Group Activities	10%	Students are expected to work in groups of three throughout the semester. During class, students will participate in activities as a <b>PI, Collaborator, and Reviewer</b> to provide self-assessment and peer-assessment of their course assignments.

**Assignment Submission Instructions:** All homework assignments are posted on Friday one week before submission. The following policies will be strictly enforced on assignments.

<i>Submission Time*</i>	<i>Points Possible</i>	<i>Description</i>
On-Time Bonus Questions	10%	Bonus questions are listed at the end of each assignment and can be answered briefly.
On-Time Written Assignment	90%	On-time submission is equivalent to 90% of available points. Students can achieve full marks only if completing bonus questions also.
≤24 Hours Late	70%	Assignments received <24hrs after deadline will be penalized by a 20% grade reduction.
>25-48 Hours Late	50%	Assignments submitted 24-48hrs after deadline will be penalized by a 50% grade reduction.
>48 Hours Late	0%	Late submission will not be accepted or graded if late by >48 hours.

\* *Students who are unable to complete an assignment on time for any reason should notify the instructor(s) and teaching assistant(s) by email prior to the deadline, with a brief explanation for why the extension is needed.*

**3D Role Play:** As part of the course design, each student will be trained in the following three roles: Principal Investigator, Collaborator, and Reviewer. To fulfill these roles, we will divide the class into groups of 3 students to allow for peer review and feedback on course assignments. Students will partake in each role, which are described in detail below.

<i>Role</i>	<i>Assignment Expectation</i>
Principal Investigator (PI)	Students are expected to create and execute their own data analysis plan. Weekly written assignments have been developed to help assist in research ideation, management, and execution throughout the semester. We encourage students to report their barriers and challenges faced when completing their assignments.
Collaborator or Co- Principal Investigator (Co-PI)	As a Co-PI, students are expected to review the barriers and challenges of their PI's submitted homework assignment prior to Monday classes. At the beginning of each class, students will discuss potential solutions to the PI's challenges. The class will then discuss solutions to all students' barriers and challenges together.
Reviewer	As a Reviewer, students are expected to comment on their Collaborators' submitted homework assignment during Wednesday Practicum sessions. Reviewers will provide comments directly in class or on the Discussion forum, e-Portfolios, or posted rubrics throughout the semester.

**Texts and Materials:** All materials will be made available on the Tufts Canvas site. A brief description of the material and assignment submission sites are provided below.

<i>Materials</i>	<i>Description and Location</i>
Learning Objectives	For each module, the instructor has outlined a set of learning objectives that reflect the aims and goals addressed in all materials for that week. Objectives and assignments are outlined at <a href="#">Canvas &gt; Modules</a> .
Module Assignment	Students will submit written assignments for each Module, which answers on the objectives for each week. Written assignments are posted at <a href="#">Canvas &gt; Files &gt; Assignments</a> and should be submitted to <a href="#">Canvas &gt; Assignments &gt; Written Assignments</a> using Word document templates by the due date and time.
Peer Feedback	Students will provide peer feedback to one another throughout the semester. Visuals and passages of weekly assignments will be copied and pasted into online Google Forms posted in weekly modules or <a href="#">student personal webpages for ePortfolios found here</a> .
Reading List	Readings selected by instructor(s) are posted at <a href="#">Canvas &gt; Files &gt; Readings</a> . Additional recommended readings are provided in asynchronous lectures.
Reading Assignment	For each required reading, students will answer the following questions and submit their answers at <a href="#">Canvas &gt; Assignments &gt; Reading Assignments</a> : <ul style="list-style-type: none"> <li>• Paper Title</li> <li>• Rate the relevance of the paper for your research (0-low; 1-medium; 2-high)</li> <li>• Rate your comprehension of this paper (0-low; 1-medium; 2-high)</li> <li>• State the time taken to complete the reading (in minutes)</li> <li>• Summarize the most valuable lesson from this reading (1-3 sentences)</li> <li>• Explain how this material applies to your own research (1-3 sentences)</li> </ul>
Asynchronous Lecture	Pre-recorded lectures for asynchronous viewing by students should be viewed prior to Monday discussions. Lectures are posted at <a href="#">Canvas &gt; Files &gt; Recording</a> .
Away-From-Screen Time Reflection	Students will be posed questions during asynchronous lectures for their own personal reflection. This should be done independently while disconnecting from computer-based activities and no submissions are required.
Synchronous Discussion	Synchronous materials will be dedicated to small group activities. These discussion sessions will include activities for students to receive feedback. All activities and discussion slides are posted at <a href="#">Canvas &gt; Files &gt; Lectures</a> . Students will report group discussion notes, findings, and feedback using Google document templates found at <a href="#">Canvas &gt; Pages</a> .
Practicum	Practicum synchronous discussions will be dedicated to refining technical skills, exploring additional resources, and conducting team-based activities. All resources and practicum slides are posted at <a href="#">Canvas &gt; Files &gt; Lectures</a> . Students will report group discussion notes, findings, and feedback using Google document templates found at <a href="#">Canvas &gt; Pages</a> .

**Classroom Conduct:** Students are expected to attend each synchronous class. Students are expected to devote their full attention to virtual discussions without distractions during the course period. Students are also expected to read all assigned materials and review all asynchronous materials before class. When participating in any course activities online using Zoom, the following code of conduct is expected from all students:

<i>Activity/Event</i>	<i>Conduct</i>
Participating During Zoom	When speaking, please ensure your video is on and audio unmuted. If not speaking, keep video on and mute audio to minimize background noise. All Zoom session information is posted at <a href="#">Canvas &gt; Zoom</a> .
Attendance	The content of the course is unique. The schedule is dense. Missing more than 1 class per semester usually results in substantial under-performance.
Time Zone Differences	Synchronous materials will be performed according to Eastern Standard Time (EST). Please notify instructors if you are residing in a different time zone. Accommodations will be made as needed.
Zoom Session Recordings	All Zoom sessions will be recorded and posted at <a href="#">Canvas &gt; Zoom</a> . If you do not wish to be recorded, you are permitted to leave your video off or change your name to hide your identity.
Poor Internet Connection	In the event of poor internet connection or power outage, please email the instructor and teaching assistants. Students are expected to call directly into Zoom using the phone-in number for the remainder of class.
In-Class Participation	For in-class and practicum participation during synchronous discussions, student groups will be required to assign a timekeeper to ensure equal participation, a scribe for writing group results, and a reporter to present results to the class. Students should rotate assignments each class.

**Course Schedule:** Subject to change at the instructor(s) discretion.

<i>Week of</i>	<i>Module</i>	<i>Assignment Description</i>
Jan. 17	0. Welcome. Introduction to SOLSTICE. No Class.	Review our <a href="#">SOLSTICE Information website</a> . Complete IRB Consent form and <a href="#">entry survey</a> . Identify your dataset to use throughout the course. If having none, find one using our <a href="#">SOLSTICE dataset repository</a> .
Jan. 24	1. Basic Concepts in Data Visualizations	<b>Assignment 1.</b> Find a graph or visual from public media or scientific literature that reflects your academic interests. Submit the visual to canvas along with your answers to prompted questions.
Jan. 31	2. Steps of Graph Construction	<b>Assignment 2.</b> (1) Select two visuals and describe the conveyed information, intended audience, and its purpose. (2) Begin preparing your dataset for a simple one-dimensional graph using preferred software.
Feb. 07	3. Visualizing Univariate Data: 1-Dimensional Plots	<b>Assignment 3.</b> Produce a 1-dimensional plot. Write an abstract (~150 words) describing the visual intended for a general audience. <i>Group Feedback: Mon Feb. 14</i> <i>Instructor/TA Feedback: Wed. Feb. 16</i>
Feb. 14	4. Visualizing Multivariate Data: 2-Dimensional Plots	<b>Assignment 4.</b> Produce a 2-dimensional plot. Write an abstract (~150 words for general audience) and a visual brief (~300 words for technical audience). <i>Group Feedback: Thu. Feb. 24</i>
Feb. 24 (Thurs.)	5. Visualizing Multivariate Data: Multidimensional Plots	<b>Assignment 5.</b> Revise visuals, abstracts, and briefs from Assignments 3 and 4. Use instructor and peer feedback. Explain modifications made and why. <i>Peer Feedback: Mon. Feb. 28</i>
Feb. 28	6. <a href="#">Class Replaced by TND\$ Conference (Mar. 3-5)</a>	<b>Assignment 6.</b> Produce a multidimensional plot. Write a 150-word abstract, 450-word visual brief, and supplementary materials to describe your visual. <i>Group Feedback: Mon Mar. 07</i> <i>Instructor/TA Feedback: Wed. Mar. 09</i>
Mar. 07	7. Infographics	<b>Midterm.</b> Prepare mid-term presentation (6 slides), recording (3 minutes), and visual data brief using the Midterm Rubric and Visual Data Brief Template. <b>Note: assignment is due on 11 March 2022 at 11:59pm - <a href="#">This assignment is graded.</a></b>
Mar. 14	<a href="#">Midterm Presentations</a>	<b>Assignment 7.</b> Produce an infographic. Write a 150-word abstract, 450-word visual brief, and supplementary materials to describe your visual. <i>Group Feedback: Mon Mar. 28</i> <i>Instructor/TA Feedback: Wed. Mar. 28</i>
Mar. 21	No Class	Spring Recess
Mar. 28	8. Process-Based Visuals	<b>Assignment 8.</b> Revise your visual, abstract, and brief from Assignment 7. Use instructor and peer feedback. Explain modifications made and why. <i>Peer Feedback: Mon. Apr. 04</i>
Apr. 04	9. Structure-Based Visuals	<b>Assignment 9.</b> Produce a process- or structure-based visual. Write a 150-word abstract, 450-word visual brief, and supplementary materials. <i>Group Feedback: Mon. Apr. 11</i> <i>Instructor/TA Feedback: Wed. Apr. 13</i>
Apr. 11	10. Visualization and Perception	<b>Assignment 10.</b> Revise your visual, abstract, and brief from Assignment 9. Use instructor and peer feedback. Explain modifications made and why.
Apr. 18	Presentation Working Week (Practicum Wed. Apr. 20)	Patriot's Day Observed – University Holiday
Apr. 25	<a href="#">Final Presentations Rnd. 1*</a>	<b>Due: 22 April 2022 at 11:59pm - <a href="#">This assignment is graded.</a></b>
May 02	<a href="#">Final Presentations Rnd. 2*</a>	<b>Due: 29 April 2022 at 11:59pm - <a href="#">This assignment is graded.</a></b>
	<a href="#">Final Submission</a>	<b>Due: 06 May 2022 at 11:59pm - <a href="#">This assignment is graded.</a></b>

\* Please note that Midterm and Final Presentations are to be submitted **before** they are presented to allow enough time for Peer Review prior to in-class presentation.

## Course Topics, Learning Objectives and Assignments

The schedule and material are subject to modification at the instructor's discretion.

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### MODULE 0: Welcome. Introduction to SOLSTICE.

<i>Learning Objectives for This Module</i>	
	<ol style="list-style-type: none"> <li>1. Introduce teaching faculty and their professional experiences</li> <li>2. Describe motivations for the course content and structure</li> <li>3. Course scheduling and expected conference attendance</li> <li>4. Review NSF SOLSTICE grant aims and requirements</li> </ol>

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will inform students of the motivations for the course content and structure, the NSF grant aims, and NSF grant requirements.	
Away-From-Screen Time Reflection	Begin identifying one or many datasets that you intend to analyze throughout the semester. The dataset should be on a topic within a discipline of interest and expertise to you in nutrition or public health.	19 Jan. By 5:00pm
Reading List	<ol style="list-style-type: none"> <li>1. NUTR-0393 Data Visualizations and Effective Communications syllabus</li> <li>2. Nutrition and Public Health Dataset Repository</li> </ol>	
Reading Assignment	Review our <a href="#">SOLSTICE Information website</a> and <a href="#">grant overview</a> . Complete the <a href="#">entry survey with consent form</a> to help instructors understand your background knowledge and skills in data analysis and visualizations.	19 Jan. By 5:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	None	
In-Class Participation	None	
Practicum	Class introductions and welcome address.	
Practicum Participation	Review SOLSTICE grant information and complete entry survey if not done already.	19 Jan. By 5:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	Complete the <a href="#">entry survey with consent form</a> .	19 Jan. By 5:00pm
Peer Feedback	None	

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**MODULE 1: Basic Concepts in Data Visualizations.**

<i>Learning Objectives for This Module</i>	
1. List the key concepts of data visualization. 2. Describe the principles of graphical presentation. 3. Describe the role of principal investigator and reviewer.	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will discuss the importance of mastering technical and communication skills related to developing and discussing data visualizations. Students will be advised on why and how effective explanations of results and methods are important as science communicators and policy influencers.	
Away-From-Screen Time Reflection	Begin thinking about a dataset that you intend to analyze throughout the semester. Reflect on how complicated your data are, what you need to do to examine them, and what relationships you want to show with your data.	24 Jan. By 4:00pm
Reading List	Ellison, A. M. 1993. Exploratory data analysis and graphic display. S. M.Scheiner and J.Gurevitch, editors. Design and analysis of ecological experiments. Chapman & Hall, New York.	
Reading Assignment	<a href="#">Reading 1</a> . Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	24 Jan. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Discussing how statistical graphics can help to convey complex ideas 2. Describing statistical graphics that can help to explain sophisticated statistical models to intended audience 3. Explaining how statistical graphics can aid research discovery	
In-Class Participation	<a href="#">Link</a> . Report 2-3 keywords or key phrases summarizing your disciplinary interest, technical/management skills, and personality traits. Discuss and report elements of cooperative learning activities.	24 Jan. 5:00-6:00pm
Practicum	1. Define your assigned principle in your own words. 2. Discuss your definitions as a group. Revise accordingly. 3. Assess the flaws of your group’s visual with respect to the 4 E’s.	
Practicum Participation	<a href="#">Link</a> . Define and evaluate the four principles of effective data visualizations. Discuss with your partners the flaws in example visuals according to these principles.	26 Jan. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<a href="#">Assignment 1</a> . Find a graph or a visual from public media or scientific literature that, in your opinion, reflects your academic interests. Submit the visual to canvas along with your answers to prompted questions.	28 Jan. By 11:59pm
Peer Feedback	Please post the visual and text to <a href="#">here</a> . Rank your partners' visuals according to the grading scheme provided <a href="#">here</a> .	31 Jan. By 4:00pm

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**MODULE 2:** Steps of Graph Construction.

<i>Learning Objectives for This Module</i>	
1. Use the steps of graph construction to read and create graphs. 2. Identify common problems of data visualization. 3. Identify best practices of data visualization.	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through the process of developing data visualizations. This includes preliminary stages with rough sketches and outlines to more polished and refined stages that communicate complex relationships.	
Away-From-Screen Time Reflection	Look at your driver's license or any other ID and find examples of continuous, discrete, categorical, interval, and binary data. Think about how you might use the information to examine a specific research question.	31 Jan. By 4:00pm
Reading List	Chapter 4: Exploratory Data Analysis	
Reading Assignment	<a href="#">Reading 2</a> . Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	31 Jan. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Describing key graphical attributes to consider including key elements, axes labeling, marker features, and coloring schemes 2. Discussing different types of data and the visualizations that are best at explaining relationships for that data 3. Reviewing common problems and challenges when developing graphics	
In-Class Participation	<a href="#">Link</a> . Recall all visuals submitted by your group partners from Assignment 1 <a href="#">here</a> and your corresponding feedback. Discuss your feedback and the properties of each visual that justifies your rating scheme.	31 Jan. 5:00-6:00pm
Practicum	1. Develop 1-2 SMART (Specific, Measurable, Achievable, Relevant, Timely) goals you which to accomplish this semester 2. Discuss your goals with your group partners	
Practicum Participation	<a href="#">Link</a> . Define and discuss SMART goals.	02 Feb. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<a href="#">Assignment 2</a> . (1) Select two visuals from public media or scientific literature. Describe the conveyed information, define the intended audience, and answer prompted questions. (2) Begin preparing your dataset for a simple one-dimensional graph using preferred software.	04 Feb. By 11:59pm
Peer Feedback	Please post your visuals and text to <a href="#">here</a> . Be mindful of entering the good and bad visuals in their corresponding slides. Review and rate your partners' visuals with respect to the 4 E's (Evidence, Efficiency, Emphasis, and Ethics) <a href="#">here</a> .	07 Feb. By 4:00pm

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**MODULE 3: Visualizing Univariate Data: 1-Dimensional Plots**

<i>Learning Objectives for This Module</i>	
1.	List the types of charts used to visualize univariate data.
2.	Describe the properties and purpose of univariate data visualization.
3.	Interpret and assess the quality of univariate graphical representations.

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through generating univariate data analyses with emphasis on the types of visuals one can produce, the benefits and limitations of those visualizations, and key properties to consider for making your visual more complex.	
Away-From-Screen Time Reflection	Review your submitted visuals. Think about what is the purpose of your graphs, what do your graphs emphasize, how do your graphs connect with your interests, and how would you rank their visual appeal.	07 Feb. By 4:00pm
Reading List	He, K., & Meeden, G. (1997). Selecting the number of bins in a histogram: A decision theoretic approach. Journal of Statistical Planning and Inference, 61(49). <a href="https://doi.org/https://doi.org/10.1016/S0378-3758(96)00142-5">https://doi.org/https://doi.org/10.1016/S0378-3758(96)00142-5</a>	
Reading Assignment	<b>Reading 3.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	07 Feb. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	<ol style="list-style-type: none"> <li>1. Describing graph attributes, such as scales and styles, for 1-dimensional plots such as bar plots, histograms, or density plots</li> <li>2. Discussing how to arrange and prepare data for the creation of one-dimensional graphics</li> <li>3. Reviewing different dimensions of figures including active and descriptive axes for main and supporting messages</li> </ol>	
In-Class Participation	<b>Link.</b> Recall all visuals submitted by your group partners from Assignment 2 <a href="#">here</a> and your corresponding feedback. Discuss your feedback and the properties of each visual that enhances or detracts its visual appeal.	07 Feb. 5:00-6:00pm
Practicum	<ol style="list-style-type: none"> <li>1. Demonstrate how to use student’s personal webpages</li> <li>2. Separate into breakout rooms according to preferred software</li> <li>3. Discuss how visualization properties can enhance clarity of visual</li> </ol>	
Practicum Participation	This technical feedback workshop will give time for students to ask questions about how to code data visualizations in the statistical software they are using throughout the semester.	9 Feb. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 3.</b> Produce a 1-dimensional graph. Provide a clear title, keywords, main messages, and a ~150-word abstract intended for a general audience (popular media).	11 Feb. By 11:59pm
Peer Feedback	Please post your visual and abstract to your personal website ( <a href="#">full list here</a> ). Comment on your partner’s initial submission with respect to the 4 E’s of Effective Data Visualization (Evidence, Efficiency, Emphasis, and Ethics) using the template provided.	14 Feb. By 4:00pm

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**MODULE 4: Visualizing Multivariate Data: 2-Dimensional Plots**

<i>Learning Objectives for This Module</i>		
1. List the types of charts used to visualize bivariate data. 2. Describe the properties and purpose of bivariate data visualization. 3. Interpret and assess quality of bivariate graphical representations.		

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through generating bivariate data analyses with emphasis on the types of visuals one can produce, the benefits and limitations of those visualizations, and key properties to consider for making your visual more complex.	
Away-From-Screen Time Reflection	Reviewing your 1-dimensional plot, what was the purpose of the graph you prepared, what did it emphasize, how did you use color schemes and why, and how can you make graph simpler or more complex.	14 Feb. By 4:00pm
Reading List	Chui KKH, et al. 2011. Visual analytics for epidemiologists: Understanding the interactions between age, time, and disease with multi-panel graphs. PLoS ONE. Feb; 6(2): e14683. <a href="https://doi.org/10.1371/journal.pone.0014683">https://doi.org/10.1371/journal.pone.0014683</a>	
Reading Assignment	<b>Reading 4.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	14 Feb. By 4:00pm

<i>Assignment</i>	<i>During Class This Week (PRACTICUM AND DISCUSSION FLIPPED THIS WEEK)</i>	<i>Due Date</i>
Synchronous Discussion	1. Describing the underlying aims of two-dimensional figures, specifically displaying the relationship between two variables in a compact form 2. Discussing different types of comparison plots and techniques for introducing added complexity by modifying feature schemes, colors, etc. 3. Reviewing rules for public discussion and critique among class groups	
In-Class Participation	In your class groups, please discuss the feedback provided to your peers' visuals from Assignment 3. For your partner, discuss ways of improving visualizations to better address the 4 E's of data visualizations. For other group members, provide your initial reactions to visuals presented, where your attention turns when seeing the visual for the first time, and ways of improving the visual appeal.	14 Feb. 5:00-6:00pm
Practicum	1. Explain the main message of your 1-dimensional graphic 2. Present revisions made or that you intend to make 3. Think critically about the clarity, comprehension, ethics, and audience perspective portrayed by the visual and descriptions under revision	
Practicum Participation	This content-based feedback workshop will give time for students to briefly discuss revisions to their visuals before submission of the weekly assignment.	16 Feb. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 4.</b> Produce a 2-dimensional graph. Provide a ~150-word abstract for a general audience and a ~300-word visual brief for a scientific audience.	18 Feb. By 11:59pm
Peer Feedback	Please post your visual and text responses to your personal website ( <a href="#">full list here</a> ). Comment on your partner's initial submission with respect to the 4 E's of Effective Data Visualization (Evidence, Efficiency, Emphasis, and Ethics) using the template provided.	21 Feb. By 4:00pm

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**MODULE 5: Visualizing Multivariate Data: Multidimensional Plots**

<i>Learning Objectives for This Module</i>	
1. List the types of charts used to visualize multivariate data. 2. Describe the properties and purpose of multivariate data visualization. 3. Interpret and assess quality of multivariate graphical representations.	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through generating multivariate data analyses with emphasis on the types of visuals one can produce, the benefits and limitations of those visualizations, and key properties to consider for making your visual more complex.	
Away-From-Screen Time Reflection	Perform a self-reflection. Give yourself a grade for your visuals and your peer feedback critiques to partners. Review and restate your short-term and long-term class goals.	21 Feb. By 4:00pm
Reading List	Castronovo, D. et al. 2009. Visualization of spatio-temporal disease patterns with dynamic maps. Environmental Health. Dec 30; 8:61. <a href="https://doi.org/10.1186/1476-069X-8-61">https://doi.org/10.1186/1476-069X-8-61</a>	
Reading Assignment	<b>Reading 5.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	21 Feb. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Demonstrate skills in constructing and revising graphs 2. Apply knowledge of visualization basics, including graph attributes and key elements, in constructing high quality, more complex graphs 3. Describing common problems in creating multidimensional, multivariate data visualizations	
In-Class Participation	<b>Link.</b> Take a few minutes to brainstorm what you intend to create for your multivariate data visualization. Consider the significance/objectives, data/methods, results, and conclusions. Discuss your ideas with team members.	24 Feb. 5:00-6:00pm
Practicum	1. Review barriers and challenges in creating 1- and 2-dimensional graphs 2. Separate into breakout rooms to discuss revisions for this week's assignment 3. Discuss how to improve written elements of policy briefs	
Practicum Participation	This content-based feedback workshop will give time for students to briefly discuss revisions to their visuals before submission of the weekly assignment.	23 Feb. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 5.</b> Revise your 1-dimensional plot with abstract (HW3) and 2-dimensional plot with abstract and brief (HW4). Explain modifications you made and why.	25 Feb. By 11:59pm
Peer Feedback	Please post your revised visual and text responses for both assignments to your personal website ( <a href="#">full list here</a> ). Comment on questions outlined on barriers, challenges, and your revision experience on your webpage.	28 Feb. By 4:00pm

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**MODULE 6: TND5 Conference Attendance (sessions from March 03-05, 2022).**

<i>Learning Objectives for This Module</i>	
1. Learn technical skills in R software for creating data visualizations and modifying their visual properties 2. Discuss techniques for effectively communicating data scientific and general audiences 3. Discuss techniques for effectively communicating research in oral conference meetings and for public media, news articles, and publication manuscripts	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	You are expected to attend the following workshops: <ul style="list-style-type: none"> <li>• <b>Thursday 03 Mar. 2022, 3:00-4:00pm</b>, <i>Leveraging Nutrition Data for Secondary Analyses</i>. Zoom link for the session <a href="#">here</a>.</li> <li>• <b>Friday 04 Mar. 2022, 12:00-1:00pm</b>, <i>Keynote Address with Nathaniel Newlands</i>. Zoom link for the session <a href="#">here</a>.</li> <li>• <b>Friday 04 Mar. 2022, 2:00-3:00pm</b>, <i>Visualizing Complexity: The Importance of Dynamic Maps</i>. Zoom link for the session <a href="#">here</a>.</li> <li>• <b>Friday 04 Mar. 2022, 5:00-6:00pm</b>, <i>Nutrition Epidemiology and Data Science Career Talks</i>. Zoom link for the session <a href="#">here</a>.</li> <li>• <b>Saturday 05 Mar. 2022, 1:00-2:00pm</b>, <i>Networking Strategies to Leave School Employed</i>. Zoom link for the session <a href="#">here</a>.</li> </ul>	
Away-From-Screen Time Reflection	Please review the other course workshop sessions offered at the conference. <b>You must register for the conference – <a href="#">please use this link</a>.</b>	28 Feb. By 4:00pm
Reading List	1. Andrienko, G., & Andrienko, N. Geospatial Visual Analytics Tutorial. <a href="http://www.peer.eu/fileadmin/user_upload/opportunities/metier/course4/c4_visual_analytics_geospatial.pdf">http://www.peer.eu/fileadmin/user_upload/opportunities/metier/course4/c4_visual_analytics_geospatial.pdf</a> 2. Wainer, H., & Spence, I. (2005). Graphical Presentation of Longitudinal Data. Encyclopedia of Statistics in Behavioral Science.	
Reading Assignment	<b>Reading 6.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	28 Feb. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	None	
In-Class Participation	None	
Practicum	None	
Practicum Participation	None	

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 6.</b> Produce a multidimensional graph. Write a ~150-word abstract, ~450-word visual brief, and supplementary materials to describe your visual.	04 Mar. By 11:59pm
Peer Feedback	Please post your visual and text responses to your personal website ( <a href="#">full list here</a> ). Comment on your partner’s initial submission with respect to the 4 E’s of Effective Data Visualization (Evidence, Efficiency, Emphasis, and Ethics) using the template provided.	07 Mar. By 4:00pm

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**MODULE 7 (Pre-Midterm):** Infographics.

<i>Learning Objectives for This Module</i>	
1. Describe the properties and purpose of infographics. 2. Interpret and assess quality of infographics. 3. Produce infographics for selected examples.	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through generating infographics. Students will also be given more in-depth instruction on how to provide and receive constructive critiques of presented works and the value of peer review in data analyses.	
Away-From-Screen Time Reflection	Think about what is the goal of your infographic, who is your intended audience, how will you apply your data, how will you use other elements when creating your infographic.	07 Mar. By 4:00pm
Reading List	Chen, C. (2010). Information visualization. <i>Wiley Interdisciplinary Reviews: Computational Statistics</i> , 2(4), 387–403. <a href="https://doi.org/10.1002/wics.89">https://doi.org/10.1002/wics.89</a>	
Reading Assignment	<b>Reading 7.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	07 Mar. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Discussing different types of infographics and the process of their creation 2. Describing advantages, challenges, limitations, and solutions for using infographics for displaying scientific information	
In-Class Participation	In your class groups, please discuss the feedback provided to your peers' visuals from Assignment 6. For your partner, discuss ways of improving visualizations to better address the 4 E's of data visualizations. For other group members, provide your initial reactions to visuals presented, where your attention turns when seeing the visual for the first time, and ways of improving the visual appeal.	07 Mar. 5:00-6:00pm
Practicum	1. Conduct a dry-run of your midterm presentation 2. Discuss the significance/objectives, data/methods, results, conclusions 3. Solicit feedback for improvements from peers	
Practicum Participation	Students will use this time to practice student presentations and peer feedback. As per the Midterm Rubric, students will have 3 minutes to present their research with or without slides (depending on what you have completed thus far) followed by 3 minutes of peer feedback in your group.	09 Mar. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Midterm.</b> Prepare mid-term presentation (6 slides), recording (3 minutes), and visual brief using the Midterm Presentation rubric and Visual Brief template.	11 Mar. By 11:59pm
Peer Feedback	Please post your midterm presentation recording to your personal website. You are responsible for watching your partners' recordings prior to the in-class presentations on Monday. No formal responses are required but you will be expected to provide 2-3 minutes of comments in class next week.	14 Mar. By 4:00pm

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## Midterm Presentation Overview

### Learning Objectives

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- 1) Practice the basics of scientific communication, including content and delivery.
- 2) Create effective elements of research presentation including tables and graphs based on four principles of graphical presentation (evidence, efficiency, emphasis, and ethics).
- 3) Critique elements of presentations: data sources, measures of outcomes and exposures, adequacy of analysis, type of visualization, features of graphics, interpretation of results.

### Assignment Directions

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Midterm presentations will be 3 minutes maximum in length. Each slide requirement represents an aspect of what could become a conference presentation or a visual brief. Presenters will be evaluated for the clarity and cohesiveness of their presenting argument. Reviewers will evaluate presenters using the Assessment Rubric. The Reviewer will provide 2-3 minutes of comments after the presentation. **Students must submit their assignment by 11:59pm on 11 March 2022.**

### Visual Brief Guidelines

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- Your visual brief should be a revised version of your multidimensional visualization assignment. Your midterm project submission should be done using the DataViz Visual Brief Template and include the following components:
  - Title. The title should provide a unique, clear, and concise description of the manuscript message.
  - Abstract. The unstructured abstract should be informative for non-specialists, direct, and 'reader-friendly'. The abstract should capture the relevance, value, originality, and impact of the presented work in <150 words.
  - Keywords. Include up to six keywords (in alphabetical order) that describe the contents within your briefs and visualization.
  - Highlights. Include 2 brief key messages (in bullet point format), each of only 120-140 characters with spaces (~50 words), to promote your work on social media.
  - Visual. A revision of your multidimensional graph using your data source selected for the course. Statistical graphs should have clearly labeled axes and units. Visuals should be ~6.5 x 9 inches. Image resolution should be at least 300 dpi.
  - Figure Legend. The figure legend should be <100 words and consist of a brief description of the content complementing (not duplicating) the brief. Provide information to clarify the use of panels, markers, color schemes, and line types.
  - Visual Brief. Your ~450-word brief should describe the objectives, main messages, and implications of your visual. Write for a scientific, technical audience and incorporate clearly defined objectives, takeaways, and conclusions.
  - Data Source. Provide information on data sources and details if and how the data were processed in any way. Describe key elements of the methodology and all data files/data sets used to produce an illustration.
  - Author Contributions. For briefs with several authors, a short paragraph specifying their individual contributions must be provided. Authorship must be limited to those who have contributed substantially to the work reported.

- Funding Source. Authors with no funding please add: “This research received no external funding.” Check carefully that the details given are accurate and use the standard spelling of funding agency names.
- Acknowledgements. Acknowledge any support given which is not covered by the author contribution or funding sections. This may include administrative and technical support, or donations in kind (e.g., materials used for experiments).
- Conflicts of Interest. Authors with no conflicts of interest please add: “The authors declare no conflict of interest.” Otherwise, authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results.
- References. All references should be placed at the end of the file. The list of references should only include works that have been published or accepted for publication. Do not use footnotes. In-text citations should be given a unique number, assigned in the order of citation, and presented in square brackets. You may use any style just remain consistent for all citations.
- Your brief must be submitted using our DataViz Visual Brief template, the same assignment template used for the midterm presentation submission.

### **PowerPoint Presentation Guidelines**

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- Your project should have a theme and your multidimensional visualization must help tell a clear, cohesive story understood by the intended audience.
- Provide one title for your project that supports your story - be very clear about the goal of your project and the aims/message of the visual you present.
- Create a multidimensional visual - you are encouraged to revise a version from your prior submission. State how you improved the visual based on instructor and peer feedback.
- Visualization slides should consider the following
  - What is my main research question? What are my main messages?
  - How was the graph constructed? What data sources were used?
  - What should the listener do after hearing my presentation?
- Cite all data sources and software used for developing the visualizations as footnotes.

### **Preparation Resources**

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- Preparing Your Elevator Speech

### **Common Barriers and Challenges**

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- Lack of stating the importance and/or timeliness of the problem
- Lack of stating gaps in knowledge
- Lack of stating associations between main exposure and outcome variables
- Failure to answer on the proposed research hypotheses
- Ambiguity in defining key concepts, terms, variables, or model components
- Lack of stating the visualization techniques used or improvements made
- Lack of support for stated results

## Presentation Assessment Rubric

Slide	Content Included	Score	Out Of
1	<i>Introductory Slide (~15 Seconds)</i>		
	• Name and Tufts University academic concentration		1
	• Preliminary working title		1
	• Clearly stating if presentation for a general or scientific audience		2
2	<i>Introduction and Background (~30 Seconds)</i>		
	• Basic introduction of the topic		6
	• More detailed background of discipline		4
3	<i>Research Problem and Goal (~30 Seconds)</i>		
	• Problem statement for why research is needed in this area		6
	• Overarching goal of your presented visualization		8
	• Specific messages for how your visual answers on this goal		8
	• Research hypothesis for each supporting message		8
4	<i>Methodology &amp; Modeling (~60 Seconds)</i>		
	• What visualization techniques are employed?		8
	• What key dependent and independent variables are used?		6
	• Provide at least one data visualization with proper labels/legends		4
5	<i>Preliminary Results (~30 Seconds)</i>		
	• What is the impact or main takeaway of your results/visual?		6
	• What comments did you receive on your first draft of this visual?		6
	• How did you address these comments and revise your visual?		4
6	<i>Future Directions (~15 Seconds)</i>		
	• How do preliminary results influence next steps in your research?		6
	• What difficulties do you expect moving forward?		6
	<i>Overall Presentation</i>		
	• Clarity		5
	• Comprehension/Cohesiveness		5
	<b>MIDTERM PRESENTATION FINAL SCORE</b>		<b>100</b>

### As a peer reviewer, please consider the following:

- Evidence: presenter provide clear significance, knowledge gap, and public health impact for each visual and the portfolio as a whole
- Efficiency: presenter visuals are creative and effectively communicate presentation theme/message. Please note improvements made to maximize efficiency.
- Emphasis: presenter introduces visuals and provides descriptions with logical flow suitable for intended audience
- Ethics: all visuals are constructed with the understanding of potential effects on the audience in terms of truth; the graph provides trustworthy information to audience
- Response to Questions: how well the presenter responded to feedback and questions asked during presentation

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**MODULE 7 (Post-Midterm): Infographics.**

<i>Learning Objectives for This Module</i>	
1. Describe the properties and purpose of infographics. 2. Interpret and assess quality of infographics. 3. Produce infographics for selected examples.	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	None	
Away-From-Screen Time Reflection	None	
Reading List	None	
Reading Assignment	None	

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	In class, students will fill out a Qualtrics survey for all other students' presentations. This should be done as their recording is played. <a href="#">The Qualtrics survey can be found here.</a>	
In-Class Participation	<b>A Review of Midterm Presentation Recordings</b>	<b>14 Mar. 4:00-6:00pm</b>
Practicum	1. Discuss student experience for midterm presentations 2. Separate into breakout rooms according to preferred software 3. Discuss how to use art graphics and other properties to enhance clarity of infographic visualizations	
Practicum Participation	<b>This content-based feedback workshop will give time for students to briefly discuss revisions to their visuals before submission of the weekly assignment.</b>	<b>16 Mar. 5:00-6:00pm</b>

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 7.</b> Produce an infographic. Write a ~150-word abstract, ~450-word visual brief, and supplementary materials to describe your visual.	<b>18 Mar. By 11:59pm</b>
Peer Feedback	Please post your visual and text responses to your personal website ( <a href="#">full list here</a> ). Comment on your partner's initial submission with respect to the 4 E's of Effective Data Visualization (Evidence, Efficiency, Emphasis, and Ethics) using the template provided.	<b>28 Mar. By 4:00pm</b>

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**MODULE 8: Process-Based Visuals.**

<i>Learning Objectives for This Module</i>	
1. Describe the properties and purpose of process-based visuals including visual hazards 2. Produce visual representation of a process or concept. 3. List the challenges of visualizations with respect to perception and describe approaches to assess perception of visuals in this form	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through generating process-based visualizations. Students will also be given more in-depth instruction on how to provide and receive constructive critiques of presented works and the value of peer review in data analyses.	
Away-From-Screen Time Reflection	Draw a flow chart thinking of what you might do for your process-based. Use the drawing to better understand the structure of your visual.	28 Mar. By 4:00pm
Reading List	Aguilar Rendón, N.; Morales Zaragoza, N.; Hernández Azpeitia, J. (2016). Infographics as a tool for business agreement. En Systems & design: beyond processes and thinking. Editorial Universitat Politècnica de València. 563-574. doi:10.4995/IFDP.2015.3376. <a href="https://riunet.upv.es/handle/10251/87874">https://riunet.upv.es/handle/10251/87874</a>	
Reading Assignment	<b>Reading 8.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	28 Mar. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Discussing the purpose of process-based visualizations as compared to visualizations from data analyses 2. Describe key elements that should be considered when creating process-based visuals and steps for effective application in research 3. Explaining potential problems or limitations when using process-based visuals and their solutions	
In-Class Participation	In your class groups, please discuss the feedback provided to your peers' visuals from Assignment 7. For your partner, discuss ways of improving visualizations to better address the 4 E's of data visualizations. For other group members, provide your initial reactions to visuals presented.	28 Mar. 5:00-6:00pm
Practicum	1. Explain the main message of your graphic 2. Present revisions made or that you intend to make 3. Think critically about the clarity, comprehension, ethics, and audience perspective portrayed by the visual and descriptions under revision	
Practicum Participation	This content-based feedback workshop will give time for students to briefly discuss revisions to their visuals before submission of the weekly assignment.	30 Mar. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 8.</b> Revise your visual, abstract, and brief from Assignment 7. Use instructor and peer feedback. Explain modifications made and why.	01 Apr. By 11:59pm
Peer Feedback	Please post your revised visual and text responses to your personal website ( <a href="#">full list here</a> ). Comment on questions outlined on barriers, challenges, and your revision experience on your webpage.	04 Apr. By 4:00pm

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**MODULE 9: Structure-Based Visuals.**

<i>Learning Objectives for This Module</i>	
1. Describe the properties and purpose of structure-based visuals including visual hazards 2. Produce visual representation of a process or concept. 3. List the challenges of visualizations with respect to perception and describe approaches to assess perception of visuals in this form	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will guide students through generating structure-based visualizations. Students will also be given more in-depth instruction on how to provide and receive constructive critiques of presented works and the value of peer review in data analyses.	
Away-From-Screen Time Reflection	Draw a flow chart thinking of what you might do for your structure-based. Use the drawing to better understand the structure of your visual.	04 Apr. By 4:00pm
Reading List	Brown, R., Delectic, A., and T. Wong (2015). How to catalyze collaboration. <i>Nature</i> , 525, 315-317	
Reading Assignment	<a href="#">Reading 9</a> . Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	04 Apr. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Describing techniques for creating structure-based visuals and how they deviate from process-based visuals 2. Discussing key attributes for consideration when developing these types of visuals including hierarchy, relationship, and sequence	
In-Class Participation	<a href="#">Link</a> . Please state your short-term and long-term professional goals. State how data visualizations and communications might play a role in these professions. Comment on areas you feel confident in and areas needing additional teaching or instruction to reach your goals.	04 Apr. 5:00-6:00pm
Practicum	1. Review barriers and challenges in creating process/structure-based graphs 2. Separate into breakout rooms according to preferred software 3. Discuss how visualization properties can enhance clarity of visual	
Practicum Participation	This content-based feedback workshop will give time for students to briefly discuss revisions to their visuals before submission of the weekly assignment.	06 Apr. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<a href="#">Assignment 9</a> . Produce a process- or structure-based visual. Write a ~150-word abstract, ~450-word visual brief, and supplementary materials to describe your visual.	08 Apr. By 11:59pm
Peer Feedback	Please post your visual and text responses to your personal website ( <a href="#">full list here</a> ). Comment on your partner's initial submission with respect to the 4 E's of Effective Data Visualization (Evidence, Efficiency, Emphasis, and Ethics) using the template provided.	11 Apr. By 4:00pm

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**MODULE 10:** Visualization and Perception.

<i>Learning Objectives for This Module</i>	
1. Describe the properties and purpose of visualizing a process or conceptual mapping including the main challenges of visualizing hazards and risks. 2. Produce visual representation of a process or a concept. 3. List the challenges of visualizations with respect to perception and describe approaches to assess perception of visuals	

<i>Assignment</i>	<i>Before Arriving to Class</i>	<i>Due Date</i>
Asynchronous Lecture	This course lecture will discuss the importance of perception when generating data visualizations. This includes careful dissection of what data ethics means and diving into the importance of catering visuals to how you believe your audience will engage or understand your work.	
Away-From-Screen Time Reflection	Reflect on how you can use multi-panel plots to improve visuals you have created for the class, design visual for your final project, and create visuals for your works outside of the classroom.	11 Apr. By 4:00pm
Reading List	1. B.I.U. Dur (2012). Analysis of data visualization in daily newspapers in terms of graphic design. <i>Social and Behavioural Sciences</i> 51, 278-283. 2. D. Barbarash (2016). Representation stigma: perceptions of tools and processes for design graphics. <i>Frontiers of Architectural Research</i> , 477-488.	
Reading Assignment	<b>Reading 10.</b> Please rate all assigned readings according to the template provided in the <i>Texts and Materials</i> section outlined above.	11 Apr. By 4:00pm

<i>Assignment</i>	<i>During Class This Week</i>	<i>Due Date</i>
Synchronous Discussion	1. Describe techniques for giving and receiving feedback on data visualizations and written works 2. Respond to a peer critique and edit presented visuals.	
In-Class Participation	In your class groups, please discuss the feedback provided to your peers' visuals from Assignment 9. For your partner, discuss ways of improving visualizations to better address the 4 E's of data visualizations. For other group members, provide your initial reactions to visuals presented, where your attention turns when seeing the visual for the first time, and ways of improving the visual appeal.	11 Apr. 5:00-6:00pm
Practicum	1. Explain the main message of your graphic 2. Present revisions made or that you intend to make 3. Think critically about the clarity, comprehension, ethics, and audience perspective portrayed by the visual and descriptions under revision	
Practicum Participation	This content-based feedback workshop will give time for students to briefly present revisions made to their visuals before submission of the weekly assignment.	13 Apr. 5:00-6:00pm

<i>Assignment</i>	<i>End-of-Week Deliverables</i>	<i>Due Date</i>
Module Assignment	<b>Assignment 10.</b> Revise your visual, abstract, and brief from Assignment 9. Use instructor and peer feedback. Explain modifications made and why.	15 Apr. By 11:59pm
Peer Feedback	Please post your revised visual and text responses to your personal website ( <a href="#">full list here</a> ). Comment on questions outlined on barriers, challenges, and your revision experience on your webpage.	18 Apr. By 4:00pm

## MODULES 11 & 12: Student Presentations

### Learning Objectives

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- 1) Practice the basics of scientific communication, including content and delivery.
- 2) Create effective elements of research presentation including graphs and other visuals based on four key principles: evidence, efficiency, emphasis, and ethics.
- 3) Critique elements of presentations: data sources, measures of outcomes and exposures, adequacy of analysis, visualization chosen, features of graphics, interpretation of results.

### Assignment Directions

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End-of-term presentations will be 5 minutes maximum in length (time limit strictly enforced). Each slide requirement represents the aspect of the presentation to be discussed. Presenters will be evaluated for the clarity and cohesiveness of their presenting argument. Your chosen infographic, process-based visual, and structure-based visual should have a central message and theme. Your submission should integrate peer and instructor feedback from prior revisions. After your recording is played in class, you will have 1-2 minutes to defend your presentation and comment on edits/modifications you might make. Reviewers will evaluate presenters using the Assessment Rubric. The Reviewer will provide 2-3 minutes of comments after the presentation. **Students must submit their assignment by Friday at 11:59pm the week before they present. Students will be allowed to revise their first submissions before submitting the final project.**

### Reviewer Feedback

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All students will be required to submit a review of every class members' presentation using a Qualtrics survey. Group members are further responsible for providing presenters 1-2 minutes of comments and questions after in-class recordings are played. Questions to consider include:

- Does background information articulate why additional research is necessary?
- What is the knowledge gap being addressed?
- What are the authors underlying goals of the study?
- Do the specific aims and objectives address elements of these goals clearly?
- How were the graphical displays used to address the proposed knowledge gap?
- What are the key messages that the visuals were intending to communicate?
- Do messages of the graphical displays effectively answer the research hypotheses?
- Were visualization techniques effectively employed to communicate the main message?
- Did presenters discuss prior improvements made to visualizations and if so, were they easily seen in the presented visuals?
- What was the main takeaway of the presentation? Do results provide a clear next step in research needing to be performed?

### Preparation Resources

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- Preparing Your Elevator Speech
- ADA-CEE Reviewer Guide

## Visual Brief Guidelines

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- Your visual brief should be a revised version of your multidimensional visualization assignment. Your midterm project submission should be done using the DataViz Visual Brief Template and include the following components:
  - Title. The title should provide a unique, clear, and concise description of the manuscript message.
  - Abstract. The unstructured abstract should be informative for non-specialists, direct, and 'reader-friendly'. The abstract should capture the relevance, value, originality, and impact of the presented work in <150 words.
  - Keywords. Include up to six keywords (in alphabetical order) that describe the contents within your briefs and visualization.
  - Highlights. Include 2 brief key messages (in bullet point format), each of only 120-140 characters with spaces (~50 words), to promote your work on social media.
  - Visual. A revision of your multidimensional graph using your data source selected for the course. Statistical graphs should have clearly labeled axes and units. Visuals should be ~6.5 x 9 inches. Image resolution should be at least 300 dpi.
  - Figure Legend. The figure legend should be <100 words and consist of a brief description of the content complementing (not duplicating) the brief. Provide information to clarify the use of panels, markers, color schemes, and line types.
  - Visual Brief. Your ~450-word brief should describe the objectives, main messages, and implications of your visual. Write for a scientific, technical audience and incorporate clearly defined objectives, takeaways, and conclusions.
  - Data Source. Provide information on data sources and details if and how the data were processed in any way. Describe key elements of the methodology and all data files/data sets used to produce an illustration.
  - Author Contributions. For briefs with several authors, a short paragraph specifying their individual contributions must be provided. Authorship must be limited to those who have contributed substantially to the work reported.
  - Funding Source. Authors with no funding please add: "This research received no external funding." Check carefully that the details given are accurate and use the standard spelling of funding agency names.
  - Acknowledgements. Acknowledge any support given which is not covered by the author contribution or funding sections. This may include administrative and technical support, or donations in kind (e.g., materials used for experiments).
  - Conflicts of Interest. Authors with no conflicts of interest please add: "The authors declare no conflict of interest." Otherwise, authors must identify and declare any personal circumstances or interest that may be perceived as inappropriately influencing the representation or interpretation of reported research results.
  - References. All references should be placed at the end of the file. The list of references should only include works that have been published or accepted for publication. Do not use footnotes. In-text citations should be given a unique number, assigned in the order of citation, and presented in square brackets. You may use any style just remain consistent for all citations.
- Your brief must be submitted using our DataViz Visual Brief template, the same assignment template used for the midterm presentation submission.

## Presentation Assessment Rubric

Slide	Content Included	Score	Out Of
1	<i>Introductory Slide (~15 Seconds)</i>		
	• Name and Tufts University academic concentration		1
	• Preliminary working title		1
	• Clearly stating if presentation for a general or scientific audience		2
2	<i>Introduction and Background (~30 Seconds)</i>		
	• Basic introduction of the topic and detailed background of discipline		6
	• Overview of presentation (please use <i>Preparing Your Elevator Speech</i> )		4
3	<i>Research Problem and Goal (~60 Seconds)</i>		
	• Problem statement for why research is needed in this area		6
	• Overarching goal of your presented visualization		8
	• Specific messages for the visualization and relationship to main goal		8
	• Research hypothesis for supporting each message		8
4	<i>Methodology &amp; Modeling (~90 Seconds)</i>		
	• What visualization techniques are employed?		8
	• What key dependent and independent variables are used?		6
	• How does visual effectively communicate the presentation theme?		4
5	<i>Preliminary Results (~75 Seconds)</i>		
	• What is the impact or main takeaway of your results/visuals?		6
	• What comments did you receive during your peer review process?		6
	• How did you address these comments and revise your visuals?		4
6	<i>Future Directions (~30 Seconds)</i>		
	• What contribution do results provide to address the knowledge gap?		6
	• What considerations should be taken for future research?		6
	<i>Overall Presentation</i>		
	• Clarity/Comprehension/Cohesiveness		2
	• Evidence of giving and receiving constructive feedback		2
	• Evidence of responding clearly to comments and questions		2
	• Evidence of producing high-quality tables, graphs, and visuals		2
	• Evidence of interdisciplinary collaboration by interacting effectively with team members from other disciplines		2
	<b>END-OF-TERM PRESENTATION FINAL SCORE</b>		<b>100</b>

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### Final Submission:

The ePortfolio of your end-of-term personal webpage should be completed. All webpages should be polished from each assignment and your final project should be submitted, which includes:

1. Recorded presentation (<5 minutes) describing infographic, process-based, or structure-based visual (and supplemental one-dimensional or two-dimensional graph)
2. PowerPoint slides (~6) used for your recorded presentation
3. One ~1000-word visual brief with an abstract for general audience and brief writing for a technical, scientific audience using the Health Data Brief Template
4. Two Reviews, one for each of your partners' presentations
5. Completion of [SOLSTICE exit survey](#) with consent form

**Submissions are due by 11:59pm EST on 06 May 2022.**