NYU | ROBERT F. WAGNER GRADUATE SCHOOL OF PUBLIC SERVICE

PADM-GP 4119
Data Visualization and Storytelling
Fall 2020

Instructor Information
- Sophia Rodriguez
- Email: sophiarodriguez@nyu.edu
- Website: https://sophiarodriguez.me
- Office Hours: By appointment.

Course Information
- Class Meeting Dates: 9/2 – 10/21 (Wednesdays)**No class on 9/9**
- Class Meeting Times: 6:45 – 8:25 PM
- Class Location: Zoom. See the links on the Zoom tab in the NYU Classes site.

Recitation
- Meeting Times: 8:35 – 9:35 PM after class dates
- Instructor: Brittany Muscato (bam396@nyu.edu)
- Location: Zoom. See the links on the Zoom tab in the NYU Classes site.

Course Prerequisites
- Introduction to Statistics

Course Description
In our increasingly data-reliant and data-saturated society, people who understand how to leverage data to generate insights have the power to change the world. Data visualization and storytelling is a crucial skill for policy and data analysts, communications and marketing professionals, and managers and decision-makers within nonprofits, social organizations and the government. With the advent of visualization tools that do not require coding, data storytelling in the digital age is also an attainable skillset for people with varying levels of technical ability.

This hands-on introductory course will teach students how to develop meaningful data stories that reveal visual insights accessible for relevant audiences. Students will also learn the basics of Tableau, the industry standard in data visualization tools, to make sense of and visualize publicly available data. Students will leave the course with a portfolio of data visualization projects, analog and digital, that demonstrate the application of data storytelling. This course is intended for a beginner in data visualization and storytelling. Students with extensive prior experience should consult the instructor before enrolling.

Course and Learning Objectives

By the end of the course, students should be able to:
1. Understand best practices in data visualization and storytelling to communicate accessible and meaningful insights.
2. Critique data visualizations and become better consumers of data.
3. Create meaningful data visualizations, gaining experience with the iterative process of data storytelling.
4. Gain experience with presenting data insights through visualizations.
5. Gain fundamental skills in Tableau.

Learning Assessment Table

Graded Assignment	Course Objective Covered
Participation	All
Lab Sessions	#1, #3 and #5
Data Viz Critique	#1 and #2
Analog Data Viz Project	#3 and #4
Final Viz Project	#1, #3, #4 and #5

Class Policies

This is a fast-paced, hands-on course with a lot of material condensed into seven weeks. Students should be mindful of the following expectations to ensure that they are benefitting from the sessions and achieving intended learning objectives:
- Attendance for the entire class session for all seven sessions is mandatory. Students should not register for the class if they anticipate any conflicts.
- Active engagement during the sessions is essential. Students will maximize class learning if they come prepared having completed their assigned reading and training materials and are ready to engage during the course discussions and labs.
- Deeper engagement with the content outside of the class sessions will be needed to ensure students are able to complete assignments and projects successfully. Due to the condensed nature of the course, students will need to put in additional time outside of class sessions and should plan accordingly.

Online Classroom Norms

You are expected to participate in each class with your Zoom audio and video on. Please review Wagner's Zoom in the Classroom series about classroom etiquette, participation, and more.

Students may not share the Zoom classroom recordings. The recordings are kept within the NYU Classes site and are for students enrolled in this course only.

As this semester will be held remotely, we will minimize lectures and conduct more frequent breakout groups. Therefore, it will be even more imperative to have completed readings/assignments in advance of sessions.

Course Components

Readings

This course is designed to be a largely practice-based course. Therefore, it is crucial to come prepared to class with the basic knowledge and theory needed to have interactive discussions and a hands-on lab. See Detailed Course Overview for more information for each week.

Required readings will come from noteworthy articles, blogs and book excerpts. All materials are available online via hyperlinks on this syllabus or the NYU Classes folder. Students must read assigned chapters/articles *before* coming to the respective session.

Orienting Discussions

Most course sessions will begin with a brief orienting discussion to recap best practices and lessons on data visualization and storytelling. Each discussion will build on the assigned reading material for that week and should be an opportunity to deepen knowledge and clarify questions.

Labs and Recitations

Most course sessions will include an experiential lab session. Students will also have an opportunity to hone their Tableau skills during a hands-on recitation immediately following each course session. To ensure successful lab/recitation participation, students are required to:

- Complete Lab pre-work *before* class. See Detailed Course Overview for the lab components before class.
- Fully charge their laptop to ensure they can actively participate.
- Ensure they have downloaded a Tableau Desktop license on their laptop (students are eligible for a free one-year license).
- Ensure they have Microsoft Excel on their laptop.
- Download the lab materials for during class (see Detailed Course Overview for more information).

Assignments

Assignments are formative, intended to help students understand data viz tools and best practices. They consist of completion of lab-related deliverable, writing a data viz critique blog, and storyboarding the final project. Details on each assignment will be provided in the previous class session.

Projects

Unlike the formative assignments, projects are intended to assess mastery over data viz content and skills. Evaluation information can be found under Assessment Assignments and Evaluation. Projects will be uploaded via the blog tool on NYU Classes.

(1) Analog Data Viz Project

Students will create and present an analog "data postcard" by collecting and hand drawing data they collect over the course of several days/a week (see the Dear Data project for more information/ideas). This project is intended to reinforce the importance of communicating data insights effectively and creatively irrespective of the medium/tool. As students will not be using Tableau, students should be especially mindful about visualization execution (i.e., best practices on chart types, color schemes, legends, so on). You will still be expected to submit your data analysis in Excel in addition to your analog data viz.

(2) Individual Final Project

All students must create a data story using Tableau that demonstrates their data visualization and storytelling skills through the course. While students are given free rein on content and execution, all data stories must contain three visualizations using Tableau Story Points. Data stories must also serve one of two goals: to help the intended audience make data-driven decisions or to convey meaningful impact information to an intended audience. An accompanying blog post should briefly contextualize the data story and explain how it achieves one of the two intended goals. Students will learn more about the final project during Week 4.

To ensure that students are on track with their final project, the following completion deliverables will be enforced:

- October 7: Finalize final project topic and data set; bring storyboard idea (we will do a storyboarding workshop during the class session).
- October 14: Come to class with a rough Tableau workbook of your final project (there will be an opportunity to ask questions during class).

Assessment Assignments and Evaluation

Participation (15%):

Students are required to attend all class sessions and come prepared for and actively participate in class. All students will begin with the full 15 points. If students miss class or are unprepared for a class session, a maximum of 3 points will be deducted each session. Given the remote nature of this semester, active participation will include asking/answering questions during the session (including in chat) as well as contributing to discussion in breakout groups. Please contact the instructor if any issues arise during the semester.

Participation in recitation sessions is strongly encouraged and will help students develop their Tableau skills, but will not be counted toward your Participation grade. However, hands-on exercises in recitations 2 and 4 count toward Tableau lab assignments and should be completed/submitted in NYU Classes, regardless of recitation attendance.

Homework Assignments (30%):

Assignments will be split into three components:

- Tableau lab worksheets/workbooks (10%) – Graded on a 100-point scale based on completion

- Data viz critique blog post (15%) -- Graded on a 100-point scale based on completeness and demonstrated understanding (see rubric on page 6).

- Final project storyboard (5%) – Graded on a 100-point scale based on completion

All homework assignments should be submitted via NYU Classes by the beginning of class on specified due date. Late assignments will have 10 points deducted for every day it is late (even if submitted same day but after class, 10 points will be deducted).

Analog Data Viz Project (25%):

The project will be evaluated on two components: completion of the project, including a presentation during class (10%), and the analog data viz (90%). The project data viz evaluation rubric can be found on pages 6-7. The presentation should explain the data story in a compelling, clear and effective manner (pass/fail component based on completion). Be sure to share your data file in addition to the viz.

Students will have 5 minutes to present their data story to the class (no slides). Make sure to share details on your process in addition to the image of your analog data viz during your presentation.

Final Project (30%):

The final project will be evaluated on two components: the data viz (90%) and the orienting blog post and presentation (10%). The data viz evaluation rubric can be found on pages 6-7. The blog post should explain the data story in a compelling, clear and effective manner (pass/fail component based on completion). Detailed instructions will be provided in NYU Classes.

DATA VIZ CRITIQUE GRADING RUBRIC

CRITERIA *Students are expected to:*	0 points	15 points	30 points	50 points	60 points	70 points
Complete all parts of the Data Viz Critique Assignment (select an appropriate data story, submit the written critique by the due date, come prepared to present their critique).	Student does *not* complete the Data Viz Critique Assignment as assigned.	Student completes *some* parts of the assignment.	Student completes all parts of the assignment in a timely manner.			
Submit a written critique that demonstrates a clear understanding of the Trifecta framework (must be three to five paragraphs). Include at least one or two elements that may be missing from the data story. Explain how you would improve the data story (be specific).	Student does *not* submit a written critique.			Student completes *some* aspects of the written critique. Student demonstrates *a developing* understanding of the Trifecta framework. Student does *not* include any missing elements. Student does *not* include how they would improve the data story.	Student completes all aspects of the written critique. Student demonstrates *moderate* understanding of the Trifecta framework. Student includes *some* missing elements. Student includes mention of how they would improve the data story but does *not* specify.	Student completes all aspects of the written critique. Student demonstrates *a superior and thorough* understanding of the Trifecta framework. Student includes one to two missing elements. Student includes specific examples of how they would improve the data story.

DATA VIZ PROJECTS GRADING RUBRIC
NOTE: Instructor reserves the right to grade in increments of 5 points when needed (e.g., a student is between 10-20 points in a given category)

CRITERIA *Students are expected to:*	0 points	5 points	10 points	20 points	30 points
Complete all parts of the Data Viz Project (data collection and/or analysis, submission of a data viz/data story by the due date, project presentation in class, and for the final project, a blog post)	Student does *not* complete the Data Viz Project as assigned.	Student completes *some* parts of the project.	Student completes all parts of the project in a timely manner.		

Follow basic visualization rules and best practices to demonstrate applied learning (e.g., suitable chart type, proper axes and labels, visual cues like headers, directions, color choice, etc)	Student does *not* submit a data visual/story.		Student demonstrates a *developing* understanding of data visualization best practices. Data viz fundamentals (e.g., suitable chart type, proper axes and labels, visual cues like headers, directions, color choice, etc) have not been followed.	Student demonstrates a *moderate* understanding of data visualization best practices. *Some* data viz fundamentals (e.g., suitable chart type, proper axes and labels, visual cues like headers, directions, color choice, etc) have been followed but there is room for improvement.	Student demonstrates a *superior and thorough* understanding of data visualization best practices. Data viz fundamentals (e.g., suitable chart type, proper axes and labels, visual cues like headers, directions, color choice, etc) have been followed to convey a meaningful visual story.
Create a visualization that is clean, clear, concise, captivating (Shaffer 4 C's) and shows attention to detail and design	Student does *not* submit a data visual/story.		Multiple aspects of the 4Cs are *missing*, or have not been well addressed in the visualization. Visualization appears *sloppy* and may be difficult to understand as a coherent whole. Multiple issues with spelling, font consistency, positioning, or other distracting characteristics.	Aspects of the 4Cs are apparent; opportunity exists for *further* enhancement. Visualization shows thought and planning, and most aspects work in harmony. May exhibit *minor issues* with spelling, alignment, or sizing mismatched with importance.	The 4Cs are *well* represented; the visualization is clear, clean, concise, and captivating. Fonts choices are conscious and consistent, proper grammar and spelling is used, and choice of position, size, and emphasis integrate elements into a *visually appealing* and engaging whole.
Demonstrate a clear POV that allows the user to conduct the intended analysis	Student does *not* submit a data visual/story.		The visualization suggests some possibilities, but does *not lead to clarity* of understanding or action *Difficult* to understand how interpret the data and how it applies to the thesis of the analysis.	There is a clear message or story conveyed, but the action or conclusion that should be drawn is *less clear* *Study* is required to interpret the data and how it applies to the thesis of the analysis.	The visualization is *targeted* to the audience, the POV is *evident*, and the conclusion or action is *clear* The visualization facilitates *quick* cognition and leading to a fact-based conclusion or assertion.

Letter Grades

Letter grades for the entire course will be assigned as follows:

Letter Grade	Points	NYU Classes Scale (out of 100)
A	4.0 points	95 – 100
A-	3.7 points	90 – 94
B+	3.3 points	87 – 89
B	3.0 points	83 – 86
B-	2.7 points	80 – 82
C+	2.3 points	77 – 79
C	2.0 points	73 – 76
C-	1.7 points	70 – 72
F	0.0 points	

Student grades will be assigned according to the following criteria:

- (A) Excellent: Exceptional work for a graduate student. Work at this level is unusually thorough, well-reasoned, creative, methodologically sophisticated, and well written. Work is of exceptional, professional quality.

- (A-) Very good: Very strong work for a graduate student. Work at this level shows signs of creativity, is thorough and well-reasoned, indicates strong understanding of appropriate methodological or analytical approaches, and meets professional standards.

- (B+) Good: Sound work for a graduate student; well-reasoned and thorough, methodologically sound. This is the graduate student grade that indicates the student has fully accomplished the basic objectives of the course.

- (B) Adequate: Competent work for a graduate student even though some weaknesses are evident. Demonstrates competency in the key course objectives but shows some indication that understanding of some important issues is less than complete. Methodological or analytical approaches used are adequate but student has not been thorough or has shown other weaknesses or limitations.

- (B-) Borderline: Weak work for a graduate student; meets the minimal expectations for a graduate student in the course. Understanding of salient issues is somewhat incomplete. Methodological or analytical work performed in the course is minimally adequate. Overall performance, if consistent in graduate courses, would not suffice to sustain graduate status in "good standing."

- (C/-/+) Deficient: Inadequate work for a graduate student; does not meet the minimal expectations for a graduate student in the course. Work is inadequately developed or flawed by numerous errors and misunderstanding of important issues. Methodological or analytical work performed is weak and fails to demonstrate knowledge or technical competence expected of graduate students.

- (F) Fail: Work fails to meet even minimal expectations for course credit for a graduate student. Performance has been consistently weak in methodology and understanding, with serious limits in many areas. Weaknesses or limits are pervasive.

Overview of the Semester

- Week 1
    - Date: September 2
    - Class topics:
        - The case for data visualization and storytelling
        - Data visualization and storytelling details and best practices
        - Introduction to Tableau (Lab Session)
    - Recitation:
        - Tableau Review
    - Deliverable: Submit completed Lab 1 Student Handout in NYU Classes <u>before</u> class start

- Week 2
    - Date: September 16
    - Topics:
        - The what, why and how of critiquing data stories
        - Introduction of analog data viz project
        - Choosing the right visuals in Tableau (Lab Session)
    - Recitation:
        - Hands-on Exercise (Using Tableau for Data Driven Decision making)
        - Review of Data Prep homework
        - Review of Tableau visuals lab session
    - Deliverable: Submit completed Data Prep homework in NYU Classes <u>before</u> class start

- Week 3
    - Date: September 23
    - Topic:
        - Data viz critiques – breakout group presentations
        - Introduction to calculated fields and dashboarding in Tableau (Lab Session)
    - Recitation:
        - Advanced maps in Tableau
        - Review of Calculated fields/dashboarding Lab Session
    - Deliverables: Upload data viz critique assignment in NYU Classes, Submit completed Hands-on Exercise from Recitation 2 in NYU Classes <u>before</u> class start

- Week 4
    - Date: September 30
    - Topics:
        - Analog project presentations
        - Introduction of final projects
        - Tableau Review/Q&A (Lab Session)
    - Recitation:
        - Hands-on Exercise (Tableau Dashboarding)
    - Deliverables: Upload analog data viz project in NYU Classes <u>before</u> class start

- Week 5
    - o Date: October 7
    - o Topics:
        - ▪ Data storytelling in real world – breakout group discussion
        - ▪ Final Projects Storyboarding Workshop (Lab Session)
    - o Recitation:
        - ▪ Final Projects Exemplars and Review of Data Sources/Data Prep
    - o Deliverable: Finalize final project topic and dataset and bring storyboard idea to class/recitation; Submit completed Hands-on Exercise from Recitation 4 in NYU Classes before class start

- Week 6
    - o Date: October 14
    - o Topics:
        - ▪ Final Projects Q&A
        - ▪ Advanced Tableau workshop and #MakeoverMonday Live Challenge (Lab Session)
    - o Recitation:
        - ▪ Open Office Hours for Tableau Questions
    - o Deliverable: Submit final project storyboard in NYU Classes, Bring final project questions to class and recitation

- Week 7
    - o Date: October 21**No recitation but longer class time to accommodate final presentations**
        - ▪ Introduction to data viz tools beyond Tableau
        - ▪ Course key takeaways and reflections
        - ▪ Final project presentations
    - o Deliverable: Final projects due in NYU Classes

Detailed Course Overview

WEEK 1

Readings Due
1. Dykes, Brent. "Data Storytelling: The Essential Data Science Skill Everyone Needs." *Forbes.com*. March 31, 2016.
2. Ku, Wen-Yuan et al. "Online community collaborative map: A geospatial and data visualization tool for cancer data." *Medicine* 98, no. 20 (2019), e15521.
3. Shaffer, Jeffrey A. "The Shaffer 4 C's of Data Visualization." *Data + Science.* [NYU Classes]
4. Shaffer, Jeffrey A. "The Shaffer 4 C's of Data Visualization: Clean Examples." *Data + Science.* [NYU Classes]

Lab Pre-Work Assignment/Materials
- Getting Started video [25 minutes Getting Started **and** 4 minutes Tableau Interface]
- Complete the Student Handout alongside viewing this training [NYU Classes]
- Global Superstore.xlsx [NYU Classes]

Lab Materials During Class
- Same as above

Recitation
- Same as above

WEEK 2

Readings Due
1. Fung, Kaiser. "Junk Charts Trifecta Checkup: The Definitive Guide"
2. Schwabish, Jonathan. "An Economist's Guide to Visualizing Data"
3. Tufte, Edward. *The Visual Display of Quantitative Information*, "Graphical Integrity" [NYU Classes]
4. Hardin et al. (Tableau), "Which chart or graph is right for you?" [NYU Classes]
5. Visit Dear-Data.com and Dear-Data-Two.com [In preparation for selecting team project]

Lab Pre-Work Assignment/Materials
- Complete Data Prep Handout [NYU Classes]
- Data Prep – Flights.xlsx [NYU Classes]
- Managing Extracts [4 minutes]
- Data Prep with Text and Excel Files [5 minutes]
- Getting Started with Visual Analytics [6 minutes]

Lab Materials During Class
- Global Superstore.xlsx [NYU Classes]

Recitation
- Hands-On Exercise: Using Tableau for Data Driven Decision making [NYU Classes]

WEEK 3

Readings Due
- N/A

Lab Pre-Work Assignment/Materials
- [Using the Filter Shelf](#) [7 minutes]
- [Interactive Filters](#) [4 minutes]
- [Getting Started with Calculations](#) [3 minutes]
- [Calculation Syntax](#) [4 minutes]

Lab Materials During Class
- Resolved Incidents.xlsx [NYU Classes]

Recitation
- Global Superstore.xlsx [NYU Classes]

WEEK 4

Readings Due
- N/A – work on analog data viz projects!

Lab Pre-Work Assignment/Materials
- N/A – work on analog data viz projects!

Lab Materials During Class
- Review of prior materials

Recitation
- Hands-on Exercise (Tableau Dashboarding)

WEEK 5

Readings Due
1. Ryan, Lindy. "Storyboarding Frame-by-Frame" in *Visual Data Storytelling with Tableau*. Boston, MA: Pearson Education, 2018. [NYU Classes]
    - Pay particular attention to pages 176-178
2. Nussbaum, Cole. ["#SWDchallenge: sticky notes."](#) *Storytelling with Data* (blog), November 1, 2018.
3. Nussbaum, Cole. ["how i storyboard."](#) *Storytelling with Data* (blog), August 25, 2015.
4. Review these examples and come prepared to discuss your own example of data storytelling

in the real world (instructions to be given in prior class):

- UN Sustainable Development Goals (skim the PDF report and review the interactive Storymap by clicking on the individual SDG icons)
- Canva, "How nonprofits design their data reports"
- Tableau Foundation Living Annual Report
- Health Intelligence, "A global overview of the magnitude, disparities and trend of infant mortality in the world."

Lab Pre-Work Assignment/Materials

- N/A – focus on final projects!

Lab Materials During Class

- Bring your final project topic, dataset and storyboard idea for session

Recitation

- Bring your final project topic, dataset and storyboard idea

WEEK 6

Readings Due

1. Few, Stephen. *Common Pitfalls in Dashboard Design*. Boise, ID: ProClarity, 2006. [NYU Classes]
2. Review #MakeoverMonday for live in-class challenge

Lab Pre-Work Assignment/Materials

- Focus on final projects! For those interested in improving their dashboard formatting, review the following course in LinkedIn Learning: Creating Interactive Dashboards in Tableau 10. Focus on following modules: Worksheet Design, Dashboard Design and Designing Interactivity

Recitation

- Bring your own Tableau workbooks and come with questions!

WEEK 7

Readings Due

1. N/A

Lab Pre-Work Assignment/Materials

- Focus on final projects! For those interested in improving their dashboard formatting, review the following course in LinkedIn Learning: Creating Interactive Dashboards in Tableau 10. Focus on following modules: Worksheet Design, Dashboard Design and Designing Interactivity

Student Resources

NYU Data Services has an entire [collection of resources on Tableau](#) as well as offers [in-person consultations](#) for NYU students. There is also a great [mini-workshop tutorial on Data Storytelling in Tableau](#) offered by Fanalytics 2018, a community event organized during Tableau Conference (download Tableau workbook and follow along). Also, NYU students have free access to [LinkedIn Learning (through NYU Home)](#) which offers a warehouse of online talks and data courses on data visualization.

There are countless blogs on data visualization online that can serve as helpful references. Here are a few to get started:
- [Tableau Public](#)
- [Storytelling with Data](#) by Cole Nussbaumer
- [FlowingData](#) by Nathan Yau
- [Information is Beautiful](#) by David McCandless
- [PolicyViz](#) (Check out the podcast) by Jonathan Schwabish
- [Junk Charts](#) by Kaiser Fung
- [The Economist](#)
- [Data Therapy](#) by Rahul Bhargava

Select data sources that can potentially be used for final project:
- [Tableau Public](#)
- [Tableau Community Forums](#)
- [Gapminder](#)
- [NYC OpenData](#)
- [U.S. Census Data](#)
- [Data.gov](#)

Supplementary Resources
- Edward Segel and Jeffrey Heer, ["Narrative Visualization: Telling Stories with Data"](#)
- Tableau Webinar, ["How to Design Engaging Data Stories in Tableau: 7 Starter Story Types"](#)
- Dashboarding Inspiration, [Everyday Dashboards](#)

NYU Classes and Course Communication

This is a living syllabus and may change throughout the semester. All changes will be communicated via announcements through NYU Classes. Students should ensure they are receiving notification emails when new announcements are posted.

Lectures slides and completed lab files will be uploaded after each class in NYU Classes under Resources → respective week.

Students should feel free to email me with any questions and expect a response within 48 hours. Students should be mindful that this is not my full-time job; responses during business hours will likely be limited.

Technology Support

Students have 24/7 support to NYU's IT services. Explore the NYU servicelink knowledgebase for troubleshooting and student guides for all NYU-supported tools (like NYU Classes, Zoom, etc). Contact askIT@nyu.edu or 1-212-998-3333 (24/7) for technology assistance, or you may contact Zoom's 24/7 technical support (this includes a chat function), or Review Zoom's support resources. Don't forget, your peers are another source of support. You could ask a friend or classmate for help or tips.

If you do not have the appropriate hardware technology nor financial resources to purchase the technology, consider applying for the NYU Emergency Relief Grant.

Academic Integrity

Academic integrity is a vital component of Wagner and NYU. All students enrolled in this class are required to read and abide by Wagner's Academic Code. All Wagner students have already read and signed the Wagner Academic Oath. Plagiarism of any form will not be tolerated and students in this class are expected to report violations to me. If any student in this class is unsure about what is expected of you and how to abide by the academic code, you should consult with me.

Henry and Lucy Moses Center for Students with Disabilities at NYU

Academic accommodations are available for students with disabilities. Please visit the Moses Center for Students with Disabilities (CSD) website and click on the Reasonable Accommodations and How to Register tab or call or email CSD at (212-998-4980 or mosescsd@nyu.edu) for information. Students who are requesting academic accommodations are strongly advised to reach out to the Moses Center as early as possible in the semester for assistance.

NYU's Calendar Policy on Religious Holidays

NYU's Calendar Policy on Religious Holidays states that members of any religious group may, without penalty, absent themselves from classes when required in compliance with their religious obligations. Please notify me in advance of religious holidays that might coincide with exams to schedule mutually acceptable alternatives.