HARVARD Kennedy School

DPI-852M: Advanced Data and Information Visualization

Spring 1 2021 (Jan 24 - Mar 11)

Faculty: Hong Qu	Faculty Assistant: Rosita Scarfo
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Class Days/Time: **Monday and Wednesday 1:30-2:45 PM** **HKS Littauer 130** Friday 12:00-1:15 PM (optional studio) Wexner 330	Course Assistants: Tom Shirley

Office Hours	
Faculty	**Time**
Hong Qu	TBA

Course Description

Data visualizations can inform, explain, and sway public opinion and policy decisions. For example, we rely on visual representations of dynamic trends throughout the pandemic as portrayed by charts, maps, and dashboards.

This course imparts design thinking and data ethics frameworks, along with practical data software skills, to construct and present data visually. Students work on iterative design, build, and feedback exercises to develop visual communication acumen for conveying insights uncovered by data exploration to illuminate public policy issues through visual storytelling.

Learning Objectives

- Learn quantitative reasoning and computational skills for modeling, structuring, and cleaning big data sets for visual storytelling
- Apply design thinking and design principles to produce informative data visualizations
- Develop a critical approach to compiling and organizing data narratives
- Produce compelling interactive dashboards, maps, and applications to support public policy analysis and communication

Prerequisites

DPI-851M: Data and Information Visualization or permission of instructor

Course Structure

<table>
<tr><th colspan="2">Weekly Class Sessions</th></tr>
<tr><td>Monday and Wednesday
(synchronous)</td><td>Rest of the week (asynchronous)</td></tr>
<tr><td>Class Session

75’</td><td>
<table>
<tr><td>Project work</td><td>Readings</td><td>Assignments</td></tr>
<tr><td>60' - 90'</td><td>15’ - 45’</td><td>45' - 60'</td></tr>
<tr><td colspan="3">Communicate with project clients</td></tr>
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Assignments and Projects

There will be weekly data visualization exercises to learn design and technical skills. Additionally, every student will work on a data visualization project to practice design thinking, ethical data analysis and visualization, and storytelling with social impact. Second year HKS students are welcomed and encouraged to use their PAE as their class project.

Class Attendance

Attendance is mandatory, though you may be excused for up to 1 absences if you inform the teaching team of any hardship. Attendance in the optional Friday studio sessions is highly recommended.

Participation

There will be numerous opportunities to participate in class and in digital settings to facilitate active learning and lively discussions. Every student has distinctive perspectives and questions which enrich the learning process for the entire class. Students are also encouraged to engage with the teaching team during office hours in one to one discussion. Students who volunteer as project manager for their group project will receive full credit for participation.

Grading

Attendance	10%
Participation	20%
Assignments	20%
Project	50%

Course Organization, Materials, and Access

Textbooks

Required

Cairo, A. *The Truthful Art: Data, Charts, and Maps for Communication*. (2016). New Riders.

Cairo, A. (2013). *The functional art :an introduction to information graphics and visualization* (1st edition). New Riders.

Wexler, S. (n.d.). *The Big Picture: How to Use Data Visualization to Make Better Decisions--Faster*. McGraw-Hill Education.

Recommended

Knaflic, Cole Nussbaumer, *Storytelling with Data*, 2015.

Cairo, A. (2019). How charts lie : getting smarter about visual information (First edition.). W. W. Norton & Company.

Few, Stephen. *Now You See It: Simple Visualization Techniques for Quantitative Analysis*. 1st edition. Oakland, Calif: Analytics Press, 2009.

Wexler, Steve, Shaffer, Jeffrey, & Cotgreave, Andy. (2017). The big book of dashboards. Wiley.

Yau, Nathan. *Data Points: Visualization That Means Something.* Indianapolis, IN: John Wiley & Sons, Inc, 2013.

Sleeper, Ryan. *Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master*. 1 edition. Beijing: O'Reilly Media, 2018. [Ebook]

Do No Harm Guide: Applying Equity Awareness in Data Visualization

Software

Core

- Excel
- Google Sheets
- Tableau
- Flourish
- Datawrapper
- ArcGIS
- R
    - Ggplot
- Python
    - Matplotlib

Optional

- Mapbox
- Gephi
- Observable

Academic Integrity

We expect you to adhere to the Harvard Honor Code at all times.

Students are encouraged to work together to do homework problems. What is important is a student's eventual understanding of homework problems, and not how that is achieved. The honor principle applies to homework in the following way. What a student turns in as a homework solution is to be his or her own understanding of how to do the problem. Students must state what sources they have consulted, with whom they have collaborated, and from whom they have received help. The solutions you submit must be written by you alone. Any copying (electronic or otherwise) of another person's solutions, in whole or in part, is a violation of the Honor Code.

If you have any questions as to whether some action would be acceptable under the Academic Honor Code, please speak to me.

Accessibility & Accommodations for Student Learning

Harvard Kennedy School is committed to the full inclusion of students with disabilities so they can be a part of the full HKS experience.

In accordance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA), and the Americans with Disabilities Act Amendments Act (ADAAA), HKS provides accommodations, services, and support to students with documented disabilities on an individual, case-by-case basis. Please let me or the teaching team know if there is anything we can do to supp

Supporting Student Wellness

Being a student myself, I identify with the stress, pressure, and intensity of academic endeavors. In the best moments, we appreciate how Confucius said: "Isn't it a pleasure to study and practice what you have learned?" Yet, we are often deluged with material and assignments that can feel overwhelming and burdensome.

I encourage every student to practice self-care. We should communicate genuinely with classmates and the teaching team to foster a supportive class community based on mutual understanding and strive to build up our collective fortitude. Beyond the classroom, Harvard's resources for wellness can be found on this student support page.

Supporting an Inclusive Classroom

Every member of the Harvard community brings unique life experiences and perspectives into our classrooms and campus life. As schoolmates, we enrich each other's academic and social experiences by being appreciative of everyone's distinctive contributions. In this class, I hope we keep an open mind and heart towards each other, to grow together in this learning community as students, citizens, and friends in virtue as Aristotle expounded. Please speak up to express your ideas and share your personal experiences related to anything we cover in class as we journey together seeking veritas as experienced by diverse persons and

communities. Please reach out to me directly if you have ideas or concerns for enhancing our inclusive community. Additionally HKS has an excellent office of diversity, inclusion and belonging.

Harvard Library Resources

Visualization Support - Jess Cohen-Tanugi - library-viz@harvard.edu

Digital Mapping and GIS Support - maps@harvard.edu

Course Schedule

Class Meetings, Readings, and Assignments

(see the HKS Academic Calendar for dates)

Please note that the specifics of this Course Syllabus is subject to change, and you will be responsible for abiding by any such changes. All changes will be communicated to you via email, course announcement, and/or Canvas.

UNIT	**WEEK 1 Dashboards**		**Time**
Design Principles and Excel	Synchronous Class Sessions		
		Lecture 1 Building a dashboard in Tableau	75’
	Asynchronous Exercise		
		Assign 1 Dashboard design	60’
Recommended Material	Wexler, Steve, Shaffer, Jeffrey, & Cotgreave, Andy. (2017). The big book of dashboards. Wiley. Cairo, A. (2013). *The functional art :an introduction to information graphics and visualization* (1st edition). New Riders.		

UNIT	**WEEK 2 Data Modeling and Cleaning**		**Time**
Chart Types	Synchronous Class Sessions		
		Lecture 2 Wrangling data using Excel, R, and Python	75’
	Asynchronous Exercise		
		Lab 2 Data cleaning	60’

Recommended Material	Our World in Data – All Charts https://ourworldindata.org/charts Python Pandas vs. R Dplyr	Optional

UNIT	**WEEK 3 Exploratory Data Analysis**	**Time**
Storytelling with Data	Synchronous Class Sessions	
	Lecture 3 Patterns, Trends, Outliers	75’
	Asynchronous Exercise	
	Lab 3 Data Analysis	60’
Recommended Material	Yau, Nathan. *Data Points: Visualization That Means Something.* Indianapolis, IN: John Wiley & Sons, Inc, 2013.	Optional

UNIT	**WEEK 4 Human-Centered Design**	**Time**
Exploratory Data Analysis	Synchronous Class Sessions	
	Lecture 4 Personas, Scenarios, and Goals	0’
	Asynchronous Exercise	
	Lab 4 User research	60’
Recommended Material	Four User-Centered Strategies for Designing Useful Data Visualizations	Optional

UNIT	WEEK 5 Project Check-in		Time
User Centered Design	Synchronous Class Sessions		
		Lecture 5 User Centered Design	0’
	Asynchronous Exercise		
		Lab 5 Peer critique	60’
Recommended Material	Cairo, A. *The Truthful Art: Data, Charts, and Maps for Communication*. (2016). New Riders.		Optional

UNIT	WEEK 6 Humanizing Numbers and Statistics		Time
Visualizing Geospatial Data	Synchronous Class Sessions		
		Lecture 6 Empathetic Storytelling with Data	0’
	Asynchronous Exercise		
		Lab 6 Design Presentation	60’
Recommended Material	Do No Harm Guide: Applying Equity Awareness in Data Visualization Cairo, A. (2019). How charts lie : getting smarter about visual information (First edition.). W. W. Norton & Company.		Optional

UNIT	WEEK 7 Project Presentations		Time
Project Presentations	Synchronous Class Sessions		
		Lecture 7 Project presentations	75’
Recommended Material			Optional