LIS 707: Data Visualization and Communication for Decision Making

[Syllabus date – 9/2/19]

Instructor Information

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TA Information

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Instructor Contact Policy

The best way to reach me is by my UW email. Emails received during weekdays (up to 5 pm Central Time on Fridays) should receive a response within 24 hours. Emails received during the weekends should receive a response the next business day. If you do not receive a response within the timeframes above, I'm not avoiding you - please send a reminder email.

Course Information

Prerequisites:

- LIS 603 Research and Evaluation or LIS 705 Intro to Analytics strongly recommended
- Familiarity with Microsoft Excel recommended

Credit Hours: 3

Mode: Asynchronous online course. As an online class, the course is broken into timed weekly modules. Assignments are due within the week they are assigned. Some assignments may be due on specific days within the week assigned.

How Credit Hours are Met by Course: One credit is the learning that takes place in at least 45 hours of learning activities, which include time in lectures or online class meetings with the instructor or peers, completing exams, presentations and tutorials, and doing independent reading, writing, studying, or preparation for any of these activities.

Course Description

This course will introduce students to key concepts in data visualization and communication for the purposes of decision making in organizations. Concepts include how and why visualization can be an effective tool for summarizing, analyzing and communicating about data, as well as the limitations and challenges in using data visualizations, including misrepresentation and bias. Students will receive hands-on experience with Excel and Tableau to develop visualizations and presentations as well as plan appropriate types of visualization(s) based on source data, audience, and goals.

Course Objectives

Upon completion of this course, students will be able to:

- Explain how and why visualization can be an effective tool for summarizing, analyzing and communicating about data in an organizational/managerial context
- Understand and apply best practices for communicating about data for targeted and broad audiences
- Understand and apply best practices for creating visualizations as part of a narrative to influence decision-makers
- Design and develop informative and persuasive visualizations for a policy brief using real-world data sources
- Identify and choose appropriate existing software for creating visualizations
- Understand the limitations and challenges of using data visualizations for communication and decision making purposes
- Choose appropriate visualization types based on source data, audience, and goal
- Critically analyze visualizations created by others for effectiveness and bias

Program Learning Objectives

ADM Certificate Learning Objective	Assignments in which Learning Outcome is Demonstrated
Students can formulate questions related to existing organizational goals or challenges, identify sources of data to answer those questions, and design and implement a data analysis plan to answer the questions	Discussion Forums Final Project Section Quizzes Class exercises
Students will demonstrate competency with a range of data collection and analysis techniques and tools appropriate to organizational decision making and assessment including the basics of data mining.	Discussion Forums Final Project Section Quizzes Class exercises

Students can effectively communicate the rationale for a data project and the results of their analysis across different types of media and using best practices of textual and visual communications.	Discussion Forums Visualization Makeover Section Quizzes Class exercises
Students can articulate the possible information value and the limitations of data and analytics projects including data mining projects based on understanding of data quality, data availability, metadata functionality and other data management issues.	Discussion Forums Visualization Makeover Section Quizzes Class exercises

How This Class Works

This is an asynchronous distance course, so it does not "meet" at a regular time. Work assigned for each unit must be completed within the week (a week being Thursday midnight Central Time to Thursday midnight Central Time of each week) unless otherwise directed by the individual assignment. Furthermore, each student can complete the work at a time within that week that works best for their schedule. Week units may include: asynchronous lecturers, software tutorials, student discussions, group and individual activities, synchronous meetings, and required readings.

Optional – Weekly Open Synch Sessions

On Mondays during the semester there will be an open hour for students to ask questions about the week's materials as well as discuss relevant topics for the week. Students are not required to participate in these sessions but are encouraged to take advantage of these sessions whenever possible. If you miss a synchronous session, you may watch the video of the session up to seven days after the recording.

Course Policies and Statements

Late Work Excused due to Illness or Emergency

Late work will be *excused without penalty* in the case of serious illness in self or family, bereavement and other emergencies: please contact me as soon as possible in these cases, but please look after self and family first!

Submission of Assignments

Assignments should be submitted (via the Canvas Dropbox unless otherwise noted) by 1:30 p.m. Central Time on the date they are due. Late assignments *without an accepted excuse* will be marked down 10 percentage points per 24-hour period after the due date. I will likely take longer to return late assignments, so you will not have the benefit of prompt feedback in preparing the next assignment.

Accessibility Statement

Your success in this class is important to me. If there are circumstances that may affect class performance, please let me know as soon as possible. This will enable us to work together to develop strategies for adapting

assignments to meet both your needs and course requirements. I will strive to accommodate students in a timely and confidential manner.

The McBurney Disability Resource Center (phone 608-263-2741; www.mcburney.wisc.edu) provides resources and services for students with disabilities. You will need to provide the Center with documentation of your disability order to receive their accommodation services.

Please remember that there are support services available to all students, including The Writing Center (https://writing.wisc.edu/) and Tutoring & Learning Support Resources (https://advising.wisc.edu/tutoring).

Academic Integrity

Please review the University's policy at https://conduct.students.wisc.edu/misconduct/academic-integrity/. Please do not hesitate to speak to me if you have questions.

Social Rules

We will be working with multiple software programs in this course, and everyone will be coming into the course with varying levels of technical skill and experience. To create a more inclusive space for students of all technical skill levels, this course will adopt the Social Rules from the Recurse Center:

- No feigning surprise
- No well-actually's
- No back-seat driving
- No subtle -isms

You can read more about each rule at https://www.recurse.com/manual#sub-sec-social-rules.

And now that you've gotten this far into the syllabus, take a few minutes to send your favorite cat, dog, or other pet gif/image to yoose@wisc.edu. Once you're done, continue reading!

Technical Help: Who to Call?

- Problems with **Canvas logins** should be addressed by the DoIT help desk. Check Canvas outage notifications.
- Problems with the **VPN** should be addressed by the DoIT help desk.
- Problems with **broken links or nonfunctional videos within the class website** should be addressed to the course instructor.

Textbook and Technology

Textbooks and course readings

This course will be a mix of articles, book chapters, and online resources. Most of the readings can be access through Canvas.

There are two required textbooks:

Data Visualisation: A Handbook for Data Driven Design, **1st edition**, by Andy Kirk. Sage Publications, 2016.
NB→There is a new edition of this book coming out this fall, so please take care in ensuring that you are purchasing the **2016** version and not the 2019 version. Save yourself some money and purchase the paperback or eBook version. A physical copy will be on reserve at the iSchool library.

Storytelling With Data: A Data Visualization Guide for Business Professionals, by Cole Nussbaumer Knaflic. Wiley, 2015.
Available online through the library.

In the course reading schedule, each required textbook will be referred to as *Kirk* and *Knaflic*, respectively.

Technology
Students must have access to all applications for this course, and must have them installed by the end of Week Three. Please let the instructor or the TA know if you are having issues installing either application.

Microsoft Excel
Students have access to Microsoft Excel through Office 365. If students do not already have Excel installed on their computer, download/installation instructions can be found at
https://kb.wisc.edu/helpdesk/page.php?id=43841.

OpenRefine
OpenRefine can be downloaded and installed following the instructions at
https://github.com/OpenRefine/OpenRefine/wiki/Installation-Instructions.

Screencast software
For the Data Visualization Makeover project, students have the option to use a screencast application of their choice. For students looking for a free-to-use option, one option is the free-to-use Screencast-o-matic application - https://screencast-o-matic.com/. Screencast-o-matic does require students to create an account, and the privacy policy is at https://screencast-o-matic.com/privacy. For students who are on the Madison campus, the Computer Lab in the Information School Library have Adobe Captivate 2017 -
https://www.library.wisc.edu/ischool/services/computer-lab/.

Tableau Public
Tableau Public is a free data visualization tool that students must download to the desktop to use at
https://public.tableau.com/s/. Tableau Public requires students to supply their email address prior to installation, and the privacy policy is at https://www.tableau.com/privacy.

OPTIONAL - R

This course contains an optional module where students can explore creating data visualizations using R via Rstudio, an integrated development environment (IDE). The SSCC (Social Science Computer Cooperative) at UW-Madison provides research computing environment for who for researchers who use statistical analysis in their work. Most of the SSCC's resources can be used from any location. Rstudio is one of the resources host on Winstat, which is SSCC's Windows Remote Desktop Server cluster.

To access Rstudio, you need to complete two steps:

1. You will need to request an SSCC lab account at https://www.ssc.wisc.edu/sscc_jsp/account/lab/. The request usually take two business days and you will receive an email from CCSS helpdesk with the account activation code once approved.
2. Winstat is required to access Rstudio host remotely by SSCC. You will need to download and install Citrix Workspace on each computer you use using the instructions at https://www.ssc.wisc.edu/sscc/pubs/winstat.htm. Once you launch the Winstat session, you can use Rstudio remotely.

A note about troubleshooting visualization tools – Working with technology means dealing the rapid pace of change that technology entails: updates, software bugs, changing features, deprecated functionality, or even the discontinuation of applications or file formats (e.g. flash files no longer playing in browsers). Students are encouraged to make a good faith effort in troubleshooting technical issues, including reading documentation, technical Q&A sites such as Stack Overflow, DoIT Help Desk (for campus-owned software), and their class peers (via discussion board, private messaging, etc.), before turning to the instructor or TA for troubleshooting help.

Remember, sometimes walking away from a problem for a short while can help you solve it – read https://psychology.stackexchange.com/questions/1/how-is-it-that-taking-a-break-from-a-problem-sometimes-allows-you-to-figure-out to find out more about this psychological phenomenon. It might be also worthwhile to invest in a rubber duck - https://rubberduckdebugging.com/.

Grade Scale & descriptions:

Letter grade	Points	Description
A	94 - 100	Outstanding achievement. Student performance demonstrates full command of course materials and evinces a high degree of originality and/or creativity that far surpasses course expectations.
AB	88 - 93	Very good achievement. Student performance demonstrates thorough knowledge of course materials and exceeds course expectations by completing all requirements in a superior manner.
B	82 - 87	Good work. Student performance meets designated course expectations, demonstrates understanding of the course materials, and performs at an acceptable level.
BC	77 - 81	Marginal work. Student performance demonstrates incomplete understanding of course materials.
C	72 - 76	Unsatisfactory work and inadequate understanding of course materials. Course work at this level triggers probationary status unless balanced by an A earned in another course during the same semester.
D	65-72	Very unsatisfactory work
F	<=64	Failing work

Assignments/Assessment

Assessment Schedule and Assessment

Assignment	Due by	Percentage of Final Grade
Participation in Online Discussion Forums (minimum 10 weekly discussions)	Every class week	10%
Class exercises	Multiple weeks	10% total
Section Quizzes	Weeks 4, 8, 11, 15	20% total
Visualization Makeover	Week 10	15%
Interim assignments for final project	Weeks 4, 8, 11	10% total
Final Project – Policy Brief	Week 15	35%
	Total Percentage	**100%**

NB - There will be no extra credit opportunities in this course.

Brief Assignment Descriptions

Full instructions and rubrics for each assignment will be posted in Canvas.

Class Exercises

Students will be required to complete short exercises to practice visualization skills.

Section Quizzes

At the end of each section, there will be a multiple-choice quiz that covers the main discussions and readings in each section.

Participation in Online Discussion Forums

Students will be required to participate in weekly forum discussions based on the topics covered in the class that week. Students can choose which weeks they participate in as long as they participate in at least ten weekly discussions at the end of the course.

Visualization Makeover Presentation

Students will find and select a data visualization from an external source and improve the visualization using the skills and techniques learned in class. When the source data may not be available for recreating the visualization, a polished illustration of the improved visualization is an option. Students will record a five-minute online presentation presenting their makeover, covering the following:

- The source of the original visualization (organization, where the visualization was used, data source), and what it was trying to convey (and who it was trying to convey to)
- The main issues with the original visualization
- What improvements were made to address the main issues

Final Project

There will be no final exam, only the final project. The final project will be a policy brief with, at minimum, three different types of data visualizations.

From The Writing Center of North Carolina at Chapel Hill[1], a policy brief is:

"… a concise summary of information that can help readers understand, and likely make decisions about, government policies. Policy briefs may give objective summaries of relevant research, suggest possible policy options, or go even further and argue for particular courses of action."

This project's focus is writing policy briefs for decision-makers that influence library, archive, or museum (LAM) operations. These briefs can cover a variety of topics, including but not limited to organizational policy, budget allocation, or services/programs offered by the organization. The decision-makers can also vary, depending on the situation: LAM administration, board members, government officials, university/college officials, school superintendents, etc.

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[1] https://writingcenter.unc.edu/policy-briefs/

Students can use a data source of their choosing with approval of the instructor. Here are some resources for library and civic open data for students looking for possible data sets:

- Library open data sets
    - NYPL - https://data.cityofnewyork.us/browse?Dataset-Information_Agency=New+York+Public+Library+%28NYPL%29
    - Seattle PL - https://data.seattle.gov/browse?q=seattle+public+library
    - Toronto PL - https://opendata.tpl.ca/
    - Chapel Hill PL - https://www.chapelhillopendata.org/explore/?sort=modified&q=library&refine.keyword=Library
- IMLS data - http://data.imls.gov/
- Civic open data sets
    - Madison, WI - http://data-cityofmadison.opendata.arcgis.com/
    - Seattle, WA - https://data.seattle.gov/
    - http://us-city.census.okfn.org/ has a list of cities with existing open data sets. Clicking on the location name links will lead you (eventually) to the data portal for that city.

The final project will have interim assignments throughout the semester to ensure students are on track with the assignment, including:

1. a proposal about the topic of the brief, including data source and targeted audience,
2. draft brief narrative, and
3. draft visualizations.

Course Schedule

NB – schedule is subject to change.

Section One – Data, Visualized

Week 1: 9/5 – 9/11

<u>Topic</u>

Welcome! Introduction to Data Visualization

<u>Students will learn about…</u>

- Course expectations
- What data visualization is, in a nutshell
- Why data visualization is important with regard to communicating data and making organizational decisions (analysis)
- Common uses of data visualization

<u>Activity</u>

- Discussion forum

<u>Required Reading</u>

- Knaflic, Chapter 1: The Importance of Context
- Kirk, Chapter 1: Defining Data Visualisation
- Preface and Introduction in *The Truthful Art: Data, Charts, and Maps for Communication* by Alberto Cairo. New Riders, 2016.

<u>Optional Reading</u>

- "Study: Charts change hearts and minds better than words do," by Christopher Ingraham. Washington Post, 15 June 2018. Available at https://www.washingtonpost.com/news/wonk/wp/2018/06/15/study-charts-change-hearts-and-minds-better-than-words-do/?noredirect=on&utm_term=.f2ea76517c0e.

Week 2: 9/12 – 9/18

<u>Topic</u>

Data visualization and humans

<u>Students will learn about…</u>

- How human perception comes into play when we create and consume data in visual format (including Gestalt principles)
- How data visualization can persuade humans, for better or for worse
- What roles bias and data quality play in creation and consumption of data visualizations

- How to evaluate visualizations for effectiveness and bias

Activity
- Discussion forum
- Class exercise – Visualization show and tell

Required Reading
- Chapter Three: The Truth Continuum in *The Truthful Art: Data, Charts, and Maps for Communication* by Alberto Cairo. New Riders, 2016.
- "Data Visualization for Human Perception" by Stephen Few in *The Encyclopedia of Human-Computer Interaction, 2nd Ed.* Available at https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/data-visualization-for-human-perception.
  - Read the first entry only – you can skim the commentary if you're interested.
- Knaflic, Chapter 3: Clutter is your enemy!
- "Infographics Lie. Here's How to Spot The B.S." by Randy Olson. Fast Company, 06 January 2014. Available at https://www.fastcompany.com/3024273/infographics-lie-heres-how-to-spot-the-bs
- "Perception in Visualization" by Christopher G. Healey. Available at https://www.csc2.ncsu.edu/faculty/healey/PP/index.html.
  - Skip the Theories of Preattentive Processing and Perception in Visualization sections.
- "How to spot a misleading graph" by Lea Gaslowitz. Available at https://www.youtube.com/watch?v=E91bGT9BjYk.

Optional Reading
- "Data & Infographics" in *Navigating Digital Information* by Crash Course. Available at https://www.youtube.com/watch?v=OiND50qfCek.
- "Data Visualization Literacy and Visualization Biases: Cases for Merging Parallel Threads" by Hamid Mansoor and Lane Harrison *in Cognitive Biases in Visualizations*, pg. 87-96. Available at https://link-springer-com.ezproxy.library.wisc.edu/chapter/10.1007%2F978-3-319-95831-6_7.
- "Black Hat Visualization" by Michael Correll and Jeffry Heer. Available at http://idl.cs.washington.edu/files/2017-BlackHatVis-DECISIVe.pdf.
- "Cognitive bias cheat sheet" by Buster Benson. Better Humans, 01 September 2016. Available at https://medium.com/better-humans/cognitive-bias-cheat-sheet-55a472476b18#.sc4fxn4im.
- Knaflic, Chapter 4: Focus your audience's attention

Week 3: 9/19 – 9/25
Topic
Preparing for data visualization – Who, What, How, Why

Students will learn about…
- How visualizations fit within the overall decision making and communication process

- Constructing business cases and goals for data visualizations
- Planning how to create visualizations for a variety of audiences
- Selecting data sets suitable for visualization, as well as prepping the data for visualization

Activity
- Discussion forum
- Class exercise – Cleaning Gratefuldata

Required Reading
- Kirk, Chapter 3: Formulating Your Brief
- Kirk, Chapter 4: Working With Data
- Knaflic, Chapter 7: Lessons in Storytelling

Optional Reading
- "Tidy Data" by Hadley Wickham. Journal of Statistical Software, v. 59, issue 10, August 2014. Available at https://www.jstatsoft.org/article/view/v059i10.
- "Telling a story and making a point" in *Fundamentals of Data Visualization* by Claus O. Wilke. O'Reilly, 2019. Available at https://serialmentor.com/dataviz/telling-a-story.html.

Resources
- OpenRefine - http://openrefine.org/
- The Quartz guide to bad data - https://github.com/Quartz/bad-data-guide
- "Top ten ways to clean your data" in Microsoft Excel Documentation. Available at https://support.office.com/en-us/article/Top-ten-ways-to-clean-your-data-2844B620-677C-47A7-AC3E-C2E157D1DB19.

Section One Quiz [Open until 9/29]

Section Two – Data Visualization Basics
Week 4: 9/26 – 10/2
Topic
Overview of Visualization Types

Students will learn about…
- Different types of visualizations
- Considerations when choosing a visualization type, including:
    o Strengths and weaknesses of different types
    o Which data types are suitable for different types of visualizations

- o   What the creator wants to convey with the data (the overall business case or goal of the visualization)
- o   How different visualization types fit (or don't fit) within the overall story or analysis

Activity
- Discussion forum
- Class exercise – Matchmaker: Data Viz Edition

Required Reading
- Knaflic, Chapter 2: Choosing an Effective Visual
- Kirk, Chapter 6: Data Representation – You do not have to read all the individual chart/graph types! Feel free to skim that section of the chapter.
- "No Humble Pie: The Origins and Usage of a Statistical Chart" by Ian Spence. Journal of Educational and Behavioral Statistics, v. 30, no. 4, Winter 2005. Available at http://www.psych.utoronto.ca/users/spence/Spence%202005.pdf.

Resources
- https://datavizproject.com/
- https://datavizcatalogue.com/
- https://www.data-to-viz.com/

Week 5: 10/3 – 10/9
Topic
Visualization UX, Accessibility, and Design

Students will learn about…
- The core tenets of user experience design (UX) and accessibility
- Why Accessibility and UX are important in creating effective data visualizations
- How to apply UX and Accessibility best practices to data visualizations, including:
    - o   Color
    - o   Layout
    - o   Annotations

Activity
- Discussion forum
- Class exercise – Universal Visualizations

Required Reading
- Knaflic, Chapter 5: Think Like a Designer

- Kirk, Chapter 9: Colour
- "The Data Visualization Checklist, 2016 Edition. Available at https://depictdatastudio.com/checklist/.
- "Chapter 6: The Big Four: Contrast, Repetition, Alignment, Proximity" in *Presentation Zen: Simple Ideas on Presentation Design and Delivery* by Garr Reynolds. 2008. Available at https://www.presentationzen.com/chapter6_spread.pdf.
- "508 Compliance & Data Visualization" by Stephanie Evergreen. 9 September 2015. Available at https://stephanieevergreen.com/508-compliance-data-visualization/.
- "accessible data viz is better data viz" by Cole Nussbaumer Knaflic. 26 June 2018. Available at http://www.storytellingwithdata.com/blog/2018/6/26/accessible-data-viz-is-better-data-viz .

Optional Reading
- Kirk, Chapter 8: Annotation
- "Digital Collections, Data Visualization, and Accessibility: What to Do? (Repost)" by Ranti Junus. Spartan Ideas, 14 March 2015. Available at https://spartanideas.msu.edu/2015/03/14/digital-collections-data-visualization-and-accessibility-what-to-do-repost/.
- "Finding the Right Color Palettes for Data Visualizations" by Samantha Zhang. Graphiq, 23 November 2015. Available at https://blog.graphiq.com/finding-the-right-color-palettes-for-data-visualizations-fcd4e707a283?gi=9b04eef59bcb.
- "Accessibility Basics: Designing for Visual Impairment" by Graeme Fulton. 3 December 2017. Available at https://webdesign.tutsplus.com/articles/accessibility-basics-designing-for-visual-impairment--cms-27634.

Resources
- http://colorsafe.co/
- http://colorbrewer2.org/#
- https://accessibility.oit.ncsu.edu/tools/color-contrast/
- https://accessibility.18f.gov/

Week 6: 10/10 – 10/16
Topic
Your first visualizations in Excel

Activity
- Discussion forum
- Practice Exercises: Charts in Excel

Students will learn about…
- Creating a data visualization in Microsoft Excel, including:
  - Exploring visualization options in Excel
  - Customizing visualization design

- How to apply data visualization best practices in Excel visualizations

Excel Tutorials
- Excel Charts & Graphs: Learn the Basics for a Quick Start. Available at https://www.youtube.com/watch?v=DAU0qqh_I-A.
- Highline Excel 2016 Class 15: Excel Charts to Visualize Data: Comprehensive Lesson 11 Chart Examples. Available at https://www.youtube.com/watch?v=xLmtGk7Ymy8.
  - There are links to parts of the video in the video description. Choose any of the chart types starting at time 8:15. I highly recommend using those links to focus on specific chart types.
- Basics of Graphing, Standard Error Bars, and Basic Stats in Excel. Available at https://www.youtube.com/watch?v=_fB09E7iTO8.
- Excel Histograms: How to Add a Normal Curve. Available at https://www.youtube.com/watch?v=iHJYWg99rPk.

Resources
- How to Build Data Visualizations in Excel. Available at http://stephanieevergreen.com/how-to/.
- Tables & Charts Excel Documentation. Available at https://support.office.com/en-us/article/tables-charts-da893558-3b39-4e50-af08-d05c50e0a8f7?ui=en-US&rs=en-US&ad=US.
- Make your Excel documents accessible to people with disabilities. Available at https://support.office.com/en-us/article/make-your-excel-documents-accessible-to-people-with-disabilities-6cc05fc5-1314-48b5-8eb3-683e49b3e593.

Week 7: 10/17 – 10/23
Topic
Choosing Software for Visualizations

Students will learn about…
- The different types of tools available to create and publish data visualizations
- Considerations for choosing the appropriate tool, including:
  - Available resources
  - Licensing, ownership, and other vendor relation considerations
  - Types of visualizations to be created
  - Dependencies and short/long term maintenance of tools
  - Skills and knowledge required to use a tool
- Creating a data visualization in Tableau Public, applying data visualization best practices

Activity
- Discussion forum
- Class Exercise – Once more, with feeling!

<u>Required Reading</u>
- "Choosing the right visualization software" in *Fundamentals of Data Visualization* by Claus O. Wilke. O'Reilly, 2019. Available at https://serialmentor.com/dataviz/choosing-visualization-software.html.

<u>Tableau Tutorials</u>
- Tableau Public Video Tutorials. Available at https://public.tableau.com/en-us/s/resources. Watch the following videos:
  - 1. Tableau Public Overview
  - 2. Connecting to Excel and Text Files
  - 11. Creating Your First Chart
  - 13. Understanding the Logic of Charts
- Reference Lines, Bands, Distributions, and Boxes. Tableau. Available at https://onlinehelp.tableau.com/current/pro/desktop/en-us/reference_lines.htm.
- Tableau Public: Tutorial – Duke University Library LibGuide. Available at https://guides.library.duke.edu/tableau/tableau_interface.
  - Work through the Interface to the Box plot sections of the tutorial.

<u>Resources</u>
- "DataBasic: A suite of data tools for the beginner" by Matt Carroll. January 2016. Available at https://medium.com/3-to-read/databasic-a-suite-of-data-tools-for-the-beginner-5165651e46a5#.3kz3vdald.
- http://chartmaker.visualisingdata.com/
- http://www.visualisingdata.com/resources/
- https://en.wikipedia.org/wiki/Comparison_of_JavaScript_charting_frameworks
- Other particular tools of interest:
  - D3.js - https://d3js.org/
  - R - https://www.r-project.org/
    - *Data Visualization: A practical introduction* by Kieran Healy. Princeton University Press, 2018. Available at http://socviz.co/index.html.
  - PowerBI - https://powerbi.microsoft.com/en-us/
  - Socrata - https://www.tylertech.com/products/socrata

Section Two Quiz [Open until 10/27]

Section Three – Expanding the Data Visualization Toolbox

Week 8: 10/24 – 10/30

<u>Topic</u>

Communicating about Change: Timelines and Trends

<u>Students will learn about…</u>

- How data can be visualized to show trends throughout a specific time period
- When it's appropriate to use trend/timeline visualizations as part of a larger narrative
- Which visualizations are appropriate for trends and timelines

Activity
- Discussion forum
- Class exercise – Time series and trend charts in Excel and Tableau

Required Reading
- Knaflic, Chapter 8: Pulling it All Together
- Kirk, Chapter 5: Establishing Your Editorial Thinking
- "11 Ways to Visualize Changes Over Time – A Guide." FlowingData, 7 January 2010. Available at https://flowingdata.com/2010/01/07/11-ways-to-visualize-changes-over-time-a-guide/.
  - Some of the example links are dead but can be accessed through the Wayback Machine.
- Chapter 9: Revealing Change in *The Truthful Art: Data, Charts, and Maps for Communication* by Alberto Cairo. New Riders, 2016.
- Kirk, pages 191 – 200 (the "T" section)

Optional Reading
- "Visualizing trends" in *Fundamentals of Data Visualization* by Claus O. Wilke. O'Reilly, 2019. Available at https://serialmentor.com/dataviz/visualizing-trends.html
- Are University Admissions Biased? | Simpson's Paradox Part 2. Available at https://youtu.be/E_ME4P9fQbo.

Examples
- "East before West: What Middle-Eastern thinkers discovered long before the west." Available at https://informationisbeautiful.net/visualizations/what-islamic-golden-age-thinkers-discovered-long-before-the-west/.
- "Wisconsin's dairy crisis in 6 charts" by Andrew Mollica. *Milwaukee Journal Sentinel,* 16 May 2019. Available at https://projects.jsonline.com/news/2019/5/16/wisconsins-dairy-crisis-in-6-charts.html

Week 9: 10/31 – 11/6
Topic
Interactive Visualizations

Students will learn about…
- Different ways in which a data visualization can be made interactive
- Considerations in deciding if a data visualization should be interactive or static, including:
  - Impact in broader story/narrative goals

- o   Data types appropriate for interaction
- o   UX and Accessibility
- o   Tools and publication platforms, as well as end user support
- Best practices in design and functionality in interactive visualizations

Activity

- Discussion forum
- Class exercise – Building your first interactive charts in Excel and Tableau

Required Reading

- Kirk, Chapter 7: Interactivity
- "The Eyes Have It: a Task by Data Type Taxonomy for Information Visualizations" by Ben Shneiderman. *Proceedings 1996 IEEE Symposium on Visual Languages*, 1996, pp. 336–343.
- "The death of interactive infographics?" by Dominikus Baur. March 2017. Available at https://medium.com/@dominikus/the-end-of-interactive-visualizations-52c585dcafcb.
- "In Defense of Interactive Graphs" by Gregor Aisch. March 2017. Available at https://www.vis4.net/blog/2017/03/in-defense-of-interactive-graphics/.

Optional Reading

- "User-centered design and agency in interactive data visualizations" by Sonia H. Stephens. 2015 IEEE International Professional Communication Conference (IPCC). Available at https://doi-org.ezproxy.library.wisc.edu/10.1109/IPCC.2015.7235819.
- "Why We Are Doing Fewer Interactives" by Archie Tse. Available at https://github.com/archietse/malofiej-2016/blob/master/tse-malofiej-2016-slides.pdf.

Examples

- "An alternative data-driven country map" by INTERACTA. Available at https://projects.interacta.io/country-tsne/.
- One data set, two ways of presenting the same data:
  - o   Interactive - https://informationisbeautiful.net/visualizations/worlds-biggest-data-breaches-hacks/
  - o   Static - https://digitalguardian.com/sites/default/files/biggest-data-breaches-of-all-time-slate.png
- "The Daily Routines of Famous Creative People." Podio. Available at https://podio.com/site/creative-routines.
- Listen to Wikipedia. Available at http://listen.hatnote.com/.
- "The Numbers Behind 'The Fast and the Furious'" by Mark Glassman et al. *Bloomberg*, 1 August 2019. Available at https://www.bloomberg.com/graphics/2019-fast-furious-hobbs-and-shaw/.

- "Wisconsin dairy farms: A portrait of loss" by Andrew Mollica. *Milwaukee Journal Sentinel,* 16 May 2019. Available at https://projects.jsonline.com/news/2019/5/16/wisconsin-dairy-farms-a-portrait-of-loss-map.html.

Week 10: 11/7 – 11/13

<u>Topic</u>

Communicating about Spatial and Relationship Data

<u>Students will learn about…</u>

- Which visualization types are appropriate for relationship, associations, and spatial data
- Considerations in showing relationships in data as well as creating spatial visualization including:
  - Impact in broader story/narrative goals
  - Appropriate data sets
  - Data quality
  - UX and Accessibility
  - Potential bias
- Best practices in design and functionality in spatial and relationship visualizations

<u>Activity</u>

- Discussion forum
- Class exercise – Maps!

<u>Required Reading</u>

- "Visualizing geospatial data" in *Fundamentals of Data Visualization* by Claus O. Wilke. O'Reilly, 2019. Available at https://serialmentor.com/dataviz/geospatial-data.html.
- "Visualizing associations among two or more quantitative variables" in *Fundamentals of Data Visualization* by Claus O. Wilke. O'Reilly, 2019. Available at https://serialmentor.com/dataviz/visualizing-associations.html.
- "What to consider when creating choropleth maps" by Lisa Charlotte Rost. 21 March 2018. Available at https://blog.datawrapper.de/choroplethmaps/.
- "When Maps Shouldn't Be Maps" by Matthew Ericson. 14 October 2011. Available at http://www.ericson.net/content/2011/10/when-maps-shouldnt-be-maps/.
- Kirk, pages 185 – 190; 201 – 209 (aka all the "R" and "S" entries in "CHRTS")

<u>Optional Reading</u>

- "Election maps are telling you big lies about small things" by Lazaro Gamio. The Washington Post, 1 November 2016. Available at https://www.washingtonpost.com/graphics/politics/2016-election/how-election-maps-lie/.
- Spurious Correlations - http://tylervigen.com/spurious-correlations

Tableau Tutorials –
- Video 5, Connecting to Spatial Files, at https://public.tableau.com/en-us/s/resources
- Build a Simple Map. Available at https://help.tableau.com/current/pro/desktop/en-us/maps_howto_simple.htm.
- Customize How Your Map Looks. Available at https://help.tableau.com/current/pro/desktop/en-us/maps_options.htm.
- Build a Scatter Plot. Available at https://help.tableau.com/current/pro/desktop/en-us/buildexamples_scatter.htm.

Examples
- "Here's How America Uses Its Land" by Dave Merrill and Lauren Leatherby. *Bloomberg,* 31 July 2018. Available at https://www.bloomberg.com/graphics/2018-us-land-use/.
- "Images of the social and economic world" by Mark Newman. 2006. Available at http://www-personal.umich.edu/~mejn/cartograms/.

Section Three Quiz [Open until 11/17]

Section Four – Data Visualization Applications and Integrations

Week 11: 11/14 – 11/20

Topic

Dashboards: What they Are and How they are Used

Students will learn about…
- Dashboard basics: what they are and how they are used in various organizations
- The role of dashboards in decision making processes in organizations as well as analyzing data "at a glance"
- Best practices in designing and creating dashboards for particular audiences and organizations
- How dashboards can be created with different data visualization tools

Activity
- Discussion forum
- Class exercise – Building your first dashboard

Required Reading
- "Best Practices for Effective Dashboards (Version 2019.1)." Tableau Desktop Help Documentation. Available at https://onlinehelp.tableau.com/current/pro/desktop/en-us/dashboards_best_practices.htm.

- "The Art and Science of Effective Dashboard Design" by Jen Underwood and Jaimie Fox. Microsoft Power BI Blog, 29 September 2015. Available at https://powerbi.microsoft.com/en-us/blog/the-art-and-science-of-effective-dashboard-design/?cdn=disable.
- "Common Pitfalls in Dashboard Design" by Stephen Few. Perceptual Edge, February 2006. Available at http://www.perceptualedge.com/articles/Whitepapers/Common_Pitfalls.pdf.
    - Read to page 15.

Optional Reading
- "Best Practices for Effective Dashboards" by Katie Poznanski-Ring and Dawit Gelan. Available at https://www.purdue.edu/datasummit/Presentations/Best_Practices_for_Effective_Dashboards.pptx.
- "Building a Scalable and Flexible Library Data Dashboard" by Nathan Mealey. Code4Lib Journal, Issue 35, 30 January 2017. Available at https://journal.code4lib.org/articles/12152.
- "Affordances and Signifiers: applying design theory to your dashboards" by Andy Cotgreave. April 2017. Available at https://gravyanecdote.com/bigbookofdashboards/affordances-and-signifiers/.

Resources
- "How to create and publish accessible dashboards with Tableau" by Kyle Gupton. 12 July 2018. Available at https://www.tableau.com/about/blog/2018/7/how-create-and-publish-accessible-dashboards-tableau-91412.
- Create and share a Dashboard with Excel and Microsoft Groups. Available at https://support.office.com/en-us/article/Create-and-share-a-Dashboard-with-Excel-and-Microsoft-Groups-ad92a34d-38d0-4fdd-b8b1-58379aae746e.

Examples
- https://library.hccs.edu/dashboard/snapshot
- https://dashboard.plano.gov/
- http://www.corkdashboard.ie/pages/index
- https://datadashboard.fda.gov/ora/cd/recalls.htm
- http://performance.sandiego.gov/

Week 12: 11/21 – 11/27
Topic
Combining Open Data and Other Data Sources in Data Visualizations

Students will learn about…
- The different types of Open Data available to the public
- Evaluate Open Data and other data sources for quality and appropriateness when considering combining data sets
- When to consider combining data sets with an external data set, including identifying possible data analysis benefits
- The pitfalls in combining data sets and how to avoid them

Activity
- Discussion forum

Required Reading
- "What is Open Data?" in the *Open Data Handbook*. Open Knowledge International. Available at http://opendatahandbook.org/guide/en/what-is-open-data/.
- "Mashups and open data in libraries" by Own Stephens. UKSG Serials, v. 24 no. 3, 9 November 2011. Available at https://serials.uksg.org/articles/10.1629/24245/.

Cautionary Tales/Examples
- Data visualization of collisions since 2006 in Seattle, WA. Available at http://seattlecollisions.timganter.io/collisions.
  - Read http://seattlecollisions.timganter.io/blog/the-data/ to get a sense of what data is being pulled in
- coredata.nyc
  - Read http://furmancenter.org/coredata/userguide/methodology to get a sense of the data linking process
- "Riding with the Stars: Passenger Privacy in the NYC Taxicab Dataset" by Jonathan Armoza. 15 September 2014. Available at https://research.neustar.biz/2014/09/15/riding-with-the-stars-passenger-privacy-in-the-nyc-taxicab-dataset/.
- "The Myth of the Criminal Immigrant" by Anna Flagg. The Marshall Project, 30 March 2018. Available at https://www.themarshallproject.org/2018/03/30/the-myth-of-the-criminal-immigrant.
  - The permalink to the article referenced in the above post is http://search.ebscohost.com.ezproxy.library.wisc.edu/login.aspx?direct=true&AuthType=ip,uid&db=sih&AN=120767543&site=ehost-live&scope=site.

Resources
- https://www.kaggle.com/
- https://toolbox.google.com/datasetsearch
- https://www.data.gov/open-gov/
- https://libguides.geneseo.edu/data

Week 13: 11/28 – 12/4 [Thanksgiving recess]

This week is for you all to take a breather during the holiday recess! Work on the final project or catch up on Optional Reading.

NB - There will be a discussion topic on the forum for those who want/need the distraction from the holiday weekend.

Week 14: 12/5 – 12/11

<u>Topic</u>

Where Do We Go From Here: Trends and Keeping Up

<u>Students will learn about…</u>

- Strategies in keeping up with data visualization trends and tools
- Current and possible future trends in data visualization

<u>Activity</u>

- Discussion forum

<u>Required Reading</u>

- Knaflic, Chapter 10: Final Thoughts
- "The Future of Data Visualization: Predictions for 2019 and Beyond" by Ann Emery. 10 January 2019. Available at https://www.linkedin.com/pulse/future-data-visualization-predictions-2019-beyond-ann-emery.
- "The 3 waves of data visualization: A brief history and predictions for the future" by Elijah Meeks. 27 February 2019. Available at https://www.tableau.com/about/blog/2019/2/three-waves-data-visualization-brief-history-and-predictions-future-100830.

<u>Case Study – Journalism and data visualization trends and issues</u>

- "Data Visualization in Scandinavian Newsrooms" by Martin Engebretsen, Helen Kennedy, and Wibke Weber. Noridcom Review, v. 39, issue 2, 2018. Available at http://dx.doi.org.ezproxy.library.wisc.edu/10.2478/nor-2018-0007.
- "To Post or Not to Post: Online Discussion of Gun Permit Mapping and the Development of Ethical Standards in Data Journalism" by David Craig, Stan Ketterer, and Mohammad Yousuf. Journalism & Mass Communication Quarterly, v. 94, issue 1, 2017. Available at https://journals.sagepub.com/doi/pdf/10.1177/1077699016684796.
- "The New York Times has a course to teach its reporters data skills, and now they've open-sourced it" by Joshua Benton. Nieman Journalism Lab. 12 June 2019. Available at https://www.niemanlab.org/2019/06/the-new-york-times-has-a-course-to-teach-its-reporters-data-skills-and-now-theyve-open-sourced-it/.

Section Four Quiz [Open until 12/15]

Week 15: 12/12 – 12/19 [Exam week]

Final Projects due. You made it to the end 😊

Acknowledgements