**Weekly Topics and Assignments**

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| **Week** | **Topic** | **Required Reading and Assignment** |
| **1** | What Is Data Visualization? What Is R?  Learning outcomes—students will be able to   * Differentiate between information visualization and other prominent forms of visualization * Describe the two main purposes of information visualization: exploration and communication * Describe the seven basic steps of visualization * Describe the important features of the RStudio IDE * Create variables in R * Create simple single-variable plots in R, such as pie and bar charts and histograms * Iteratively build up increasingly complex plots * Use R’s Help system to look up the available parameters for plotting functions * Construct file name strings * Open data files | **Week 1 Lab—Asynchronous**: R and basic plots. Follow along with the video and turn in the plots and script.  **Week 1 Lab—Live Code-Along**: RStudio environment and loading data.  **Sign up for advanced topic presentations.**  **Readings**:   * Visualize This: Chapter 1 * Visualize This: Chapter 2 (Read only from page 22 through 27. Skip the rest of the chapter.) * Ben Fry, *Visualizing data: Accessibility score*, Chapter 1, The Seven Stages of Data Visualization. * Wiley and Pace, *Beginning R: An introduction to statistical programming*, Chapters 1 and 3.   **Quiz Week 1**: **(10 points)**. Covers readings, lectures, and labs. |
| **2** | **Data and R**  Learning outcomes—students will be able to   * List sources of freely available data * Describe the process of data exploration * Identify context markers in visualization * Differentiate between common data types * Use R functions to explore and clean data * Use R to retype, subset, and filter data * Use R to aggregate and group data * Create rough data exploration plots * Describe ways to make comparisons with visualizations * Describe ways to identify and show relationships in data * Differentiate between single- and multidimension plots | **Week 2 Lab—Asynchronous:**  Exploring data in R.  **Sign up for advanced topic presentations.**  **Readings:**   * Wiley and Pace, *Beginning R: An introduction to statistical programming*, Chapters 2 and 4 (PDFs). * Data Points: Chapter 1. * Data Points: See Chapter 4, section on Distributions, pp. 189–199. * Visualize This: Chapter 4. |

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| **Week** | **Topic** | **Required Reading and Assignment** |
|  | * Make simple multidimensional plots in R * Identify the appropriate plot type for a given set of data * Identify questions that might be answered with the data | * Visualize This: Chapter 3 is optional.   **Week 2 Homework**: **(5 points)** See details below.  **Quiz Week 2: (10 points)**. Covers readings, lectures, and labs. |
| **3** | **Graphic Design Principles: Color**  **Learning outcomes—students will be able to**   * Describe the use of contrasting and harmonious color in visualization * Describe how hue, saturation, and value combine to make a color * Use online tools to choose and create color schemes * Use R’s color setting and transformation functions * Use color to provide visual cues in visualizations * Identify elements of a visual artifact that make it compelling * Interpret the meaning(s) of a data visualization * Use Illustrator to make simple modifications to R plots * Add context elements to a data visualization * Explain the difference between raster and vector graphics | **Week 3 Lab:** Working with color in R, Adobe Illustrator introduction, adding images to plots.  **Readings**:  Data Points: Chapters 2 and 3. Data Points: Chapter 4 (For now,  skip pages 165–176; we’ll cover that later.)  Few: Chapter 3.  **Week 3 Homework: (5 points)**  See details below. |

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| **4** | **Graphic Design Principles: Typeface and Layout, R Plot Area Control**  **Learning outcomes students will be able to**   * Describe how typeface and layout work together to create a visual hierarchy * Describe how visual hierarchies direct viewers’ attention * Explain how lines, gutters, grids, and colors can be used to highlight visual elements * Critically assess example posters, and discuss effectiveness of design elements * Set and use different layouts in R * Set and use different kinds of fonts in R * Use Adobe Illustrator to carefully lay out text, plots, and other graphic elements of a layout * Export plots to Microsoft Word and other Microsoft products | **Week 4 Lab:** Layouts and fonts in R and details in Illustrator.  **Readings:**  Few: Chapter 4, Analytic Interaction and Navigation.  Data Points: Chapter 5, Visualizing With Clarity.  Visualize This: Chapter 4 (Illustrator parts).  Visualize This: Chapters 6, Visualizing Relationships.  **Week 4 Homework:** VT, Chapter 4, Illustrator, and Chapter 6. See detailed description below.  **Quiz Week 4: (10 points)** Covers readings, lectures, and labs.  **Note:** |
| **5** | **Working With Social Media Data: Twitter**  **Learning outcomes—students will be able to**   * Format, work with, and plot data with dates * Clean malformatted string data * Clean and parse hashtags * Use different data transformations to scale skewed data * Make word clouds * Develop complex categorical data plot, like alluvial, treemap, and river plots in R * Use example plot data as an approach to understand how to make new plot types | **Week 5 Lab:** Working with Twitter data.  **Readings:**  Visualize This: Chapter 7, Spotting Differences.  **Assignment:**  Start working on Work-in-Progress report (due Week 7). See details below. |
| **6** | **A Grammar of Graphics: ggplot2**  **Learning outcomes—students will be able to**   * Identify the building blocks of the grammar of graphics * Distinguish between aesthetics, geometry, and the other building blocks and what they do * Know the difference between setting and mapping aesthetics * Build basic and some complex plots with ggplot * Make informed decisions about when to use ggplot and when base plots or other packages are more appropriate | **Week 6 Lab:** ggplot.  **Readings:**  Mathison, The credibility of image- based research and evaluation.  Sturken, Practices of looking.  **Optional Reading**  *R graphics cookbook* (PDF).  **Assignment:**  Finish Work-in-Progress report for next week. See details below. |

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|  | * Describe R’s memory model and the implications for using ggplot with large datasets |  |
| **7** | **A Grammar of Graphics: Maps, Work-in- Progress, and Ethics Discussion**  **Learning outcomes—students will be able to**   * Use different R packages to make maps * Geocode address data * Plot points on a map * Create choropleth maps at country, state, and county level * Simple regular expressions for cleaning data * Using shape files and geoJSON for map plotting * Discuss the difference between raster map tiles and vector shapes * Give constructive feedback on layouts, colors, fonts, and other design elements * Identify ethical concerns around visualizations | **Week 7 Lab:** Maps!  **Readings:**  Data Points: Chapter 4. pp. 165–176 (spatial data).  Visualize This: Chapter 8.  **Optional Reading**  *R graphics cookbook* (PDF).  **Assignment:**  Work-in-Progress report due **(6 points)**.  Prepare for your presentations. See details below.  **In-Class Exercise:** Participate in group feedback session. |
| **8** | **Visualizing Social Networks and Advanced Topic Presentations**  **Learning outcomes—students will be able to**   * Describe key elements of a social network * Describe the concept of centrality in a network * Identify a few structural measures * Differentiate between matrix and linked list social network data * Visualize nodal attributes * Visualize network structures * Describe the meaning of a network layout * Describe advanced visualization tools used in the market place * Have knowledge of a range of additional R packages used in data cleaning and visualization not otherwise covered in class * Apply design skills learned in class to slide deck creation | **Week 8 Lab:** Social network visualization.  **Assignment:**  Prepare for your presentations Work on final poster (see rubric and instructions below).  **Quiz Week 8: (10 points) In-Class Exercise:**  Advanced topic presentations (8  points). |

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| **9** | **RGL (3-D Visualization), Animation, and Advanced Topic Presentations**  **Learning outcomes—students will be able to**   * Create simple points and lines in 3-D space * Create a 3-D social network model * Control aspects of the 3-D environment, like lighting and simple materials * Create a simple data animation in 3-D space * Create a simple scene in 3-D space * Manage R packages * Describe advanced visualization tools used in the marketplace * Have knowledge of a range of additional R packages used in data cleaning and visualization not otherwise covered in class * Apply design skills learned in class to slide deck creation | **Week 9 Lab:** Visualizing in 3-D and making animations.  **Assignment:**  Prepare for your presentations. Work on final poster. See details below.  **In-Class Exercise:**  Advanced topic presentations (8 points). |
| **10** | **Shiny: Making a Simple Interactive Dashboard in R**  **Learning outcomes—students will be able to**   * Identify the fundamental functions for a Shiny app * Discuss the general architecture of a Shiny app * Build a simple Shiny application useful as a portfolio piece. * Demonstrate knowledge of the process of creating a visual artifact * Work in a group to create a mini-poster from an unknown dataset | **Week 10 Lab:** Shiny  **Assignment:**  Work on final poster. See details below.  **In-Class Exercise:**  Viz-a-thon (2 points). |
| **11** | **Poster Day**  **Students present their posters.** | **Poster Presentations** |