CSCI 397: Information Visualization

People have access to an increasingly staggering amount of information, and one way of processing such vast amounts of data is through visualization. This independent study will delve into the field of information visualization and understand in detail how visualization can be used to explore and explain complex data. I will learn the principles behind information visualization, how to evaluate and critically critique visualizations, and how to transform datasets into effective visualizations.

The final deliverable will be a website/blog that details what I've learned throughout the semester and serves as a resource for others who are also interested in learning about information visualization. Each week I will write a blog post about the topic for that week. Each post will include key points of the readings, my takeaways, and links to additional resources. In addition to the blog post, each week may also include additional deliverables pertaining to that week's topic, such as implementing my own visualization or analyzing existing visualizations.

Each week, the readings and deliverables will be roughly 10 hours of work, and I will meet with Iris for 1-2 hours to discuss the weekly topic.

Schedule

The listed readings are sample readings and subject to change as I continue to research and find more readings throughout the semester. I will also read corresponding sections of more comprehensive resources such as textbooks and curricula from other schools.

Week 1: Intro to Info Vis & Data

What is information visualization, and what do we use it for? How does visualization change depending on the data and intended purpose? What are the fundamentals of information visualization?

Readings

- http://socviz.co/lookatdata.html#lookatdata
- https://serialmentor.com/dataviz/index.html Part 1
- https://sites.google.com/williams.edu/hci/topics?pli=1&authuser=1 (Info Vis section from Iris's website)
- http://www.cs171.org/2015/assets/slides/01-Introduction.pdf
- http://www.cs171.org/2015/assets/slides/03-Data.pdf
- http://va.gatech.edu/courses/cs7450/schedule-2/data-items-attributes-tables-visual-primitives/
- http://va.gatech.edu/courses/cs7450/schedule-2/infovis-overview/

Week 2: Visual Perception

How is visual data perceived and processed? What should we consider as we think about how to visualize data? How can visual properties be manipulated?

Readings

- https://eagereyes.org/papers/a-pair-of-pie-chart-papers
- https://idl.cs.washington.edu/papers/crowdsourcing-graphical-perception/
- https://idl.cs.washington.edu/papers/quantitative-color/
- http://www.personal.psu.edu/cab38/ColorSch/ASApaper.html
- https://www.csc2.ncsu.edu/faculty/healey/PP/index.html
- http://va.gatech.edu/courses/cs7450/schedule-2/visual-perception/
- http://www.sci.utah.edu/~miriah/cs6964/lectures/L02-design.pdf

- https://cs.nyu.edu/courses/fall02/V22.0380-001/color_theory.htm
- The good, the bad, and the biased: five ways visualizations can mislead (and how to fix them) DA Szafir (2018)
- http://socviz.co/lookatdata.html#perception-and-data-visualization

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Week 3: Process

What is the process of turning raw information into a visualization? What do we keep in mind as we create visualizations? What guidelines can we follow in our design process? What tools are available for us to use?

Readings

- https://www.w3schools.com/graphics/canvas_intro.asp
- https://d3js.org/
- https://www.tableau.com/

Deliverable

Brainstorm and sketch several information visualizations with a sample dataset, and choose one of them to create. Document the process.

Week 4: Data In-depth

What types of data are there? How can we interact with different types of data, and how does that affect our design choices? What types of data should be visualized?

Readings

- https://courses.cs.washington.edu/courses/cse512/18sp/uwnetid/readings/models/shneiderman96eyes.pdf
- https://courses.cs.washington.edu/courses/cse512/18sp/uwnetid/readings/models/infovis_design_space.pdf
- http://links.jstor.org/sici?sici=0036-8075(19460607)3:103:2684%3C677:OTTOSO%3E2.0.CO;2-G

Deliverable

Examine the different types of visualizations associated with different data types and explain why they might be better suited for one type over another.

Week 5: Narratives

How do we design visualizations to build narratives from data? How do we effectively communicate our data and engage the audience?

Readings

- http://michaelnielsen.org/reinventing_explanation/
- http://va.gatech.edu/courses/cs7450/schedule-2/visual-analytics/
- https://serialmentor.com/dataviz/telling-a-story.html
- http://vis.stanford.edu/papers/narrative
- https://serialmentor.com/dataviz/telling-a-story.html
- Riche & Hurter, "Data Driven Storytelling"

Deliverable

Find examples of effective storytelling with data and pinpoint the qualities that make them effective.

Week 6: Accessibility

How can we increase the audience of our information visualizations? What are nonvisual ways to represent information?

Readings

- http://sarahendren.com/talks-plus-essays/
- http://interactions.acm.org/archive/view/july-august-2018/the-good-the-bad-and-the-biased
- https://scholar.google.com/citations?hl=en&user=CGb88B0AAAAJ&view_op=list_works&sortby=pubdate

Deliverable

Find visualizations and document in terms of accessibility *how* they can be improved and *why* they should be improved. Make one (or more) of them more accessible.

Week 7: Evaluation

How can we evaluate data visualizations and articulate our critiques? What heuristics can we keep in mind as we design visualizations. Which practices should we adopt and which ones should we avoid?

Readings

- http://socviz.co/lookatdata.html#what-makes-bad-figures-bad
- http://va.gatech.edu/courses/cs7450/schedule-2/evaluation/

Deliverable

Evaluate and critically critique several data visualizations. Use an evaluation to redesign a visualization.

Week 8: Textual Data

How do we think about and visualize textual data?

Readings

- http://searchuserinterfaces.com/book/sui_ch10_visualization.html
- http://www.cs171.org/2015/assets/slides/12-TextVis.pdf
- http://va.gatech.edu/courses/cs7450/schedule-2/text-and-documents/
- http://va.gatech.edu/courses/cs7450/schedule-2/text-and-documents/

Deliverable

Visualize a textual data set.

Week 9: Networks

How do we think about and visualize relational data?

Readings

- http://www.cs171.org/2015/assets/slides/11-graphs.pdf
- http://www.cs171.org/2015/assets/slides/15-graphs_part2.pdf
- http://va.gatech.edu/courses/cs7450/schedule-2/graphs-and-networks/

Deliverable

Visualize a relational data set.

Week 10: Hierarchical Data

How do we think about and visualize hierarchical data?

Readings

- http://www.aviz.fr/wiki/uploads/Teaching2014/bundles_infovis.pdf
- http://va.gatech.edu/courses/cs7450/schedule-2/hierarchies-and-trees/

Deliverable

Visualize a hierarchical data set.

Week 11: Geospatial Data

How do we think about and visualize geospatial data?

Readings

- http://www.cs171.org/2015/assets/slides/14-spatial_data.pdf
- http://www.cs171.org/2015/assets/slides/16-maps.pdf
- http://va.gatech.edu/courses/cs7450/schedule-2/geospatial/

Deliverable

Visualize a geospatial data set.

Week 12: Application

I will put everything I've learned together and work with a larger dataset, such as the WCMA one. I will document my process in visualizing it and will present the visualization at the end.