Table of Contents

Data Visualization Handbook

This my personal notes on data visualization.

Outline:

1. Introduction
    i. Data Visualization
    ii. Design Theory
        i. Color Theory
        ii. Design Thinking

All about Data Visualization

What is Data Visualization?

- A graphical representation of information and data
  - Data is raw, unorganized facts -> Information is processed data, organized such that it's useful

Why do Data Visualization?

1. Data Analysis - "making sense of data"
2. Communication
   i. Data Visualization is the fastest way to communicate data to others
   ii. Human are intensely visual creatures that even youn children can interpret bar charts
3. Warning: We must be warned that when we do data visualization, we must be honest and careful as they can also be used to lie, mislead or distort truth.

Which Data Visualization to make?

Types of Data Visualization

According to how we interact with the data visualization

1. Static
2. Interactive

According to the use of the data visualization

1. Exploratory
2. Explanatory

Interactive Data Visualization

Why do interactive Data Visualization?

- Interactive visualization empowers people to explore data for themselves.
- History: `Ben Shneiderman (in 1996) of Univ. of Maryland proposed the design pattern of “Visual Information-Seeking Mantra”: overview first, zoom and filter, then details-on demand.`

Why on the web?

- Visualizations aren't truly visual unless they are seen. (Scott Murray, *Interactive Data Visualization for the Web*. An introduction to D3 for people new to programming and web development)
- Web is the fastest way to share data visualization to the world.

History

Notes to add Source

Example

Dashboard

- STOMP Covid-19
  - Covid-19 Philippines Dashboard

Visual Essay

Interesting Visual Essays

- How Long Does it Take to (Quick) Draw a Dog?
  - a minimal interactive visualization exploring the Quickdraw dataset by Google
- An Interactive Visualization of Every Line in Hamilton
  - see how Shirley Wu explores hamilton through the dataset she manually processed 👐

Websites

Publications

- The Pudding
  - a digital publication that explains ideas debated in culture with visual essays
- New York Times Visual Stories and Graphics (2019)
  - an American newspaper based in New York City with worldwide influence and readership

Blogs

- Data Sketches
  - a 12-month collaboration between Nadieh Bremer and Shirley Wu where they document their process with creating visual essays
- R2D3
  - an experiment in expressing statistical thinking with interactive design
- Scrolling In Data Visualization
  - a really cool compilation of scrollytellingin data visualizations by Jim Vallandingham

Personal Blogs

- Amelia Watttenberger
- Nadieh Bremer
- Shirley Wu
- Jim Vallandingham

Design Theory

What is Design Theory?

- Personally, I think Design Theory is best described by this quote I read on Shillington

> "Design theory is the asking and answering of the question “Why am I designing it this way?” If you can’t answer that question at every stage of the design process, you probably need to do a bit more thinking." - Andy Lester, Shillington London teacher

Guidelines

- This part is still a Work in Progress, the following are just a rough list.

Data Storytelling

- This page is under construction

D3

What is D3

- Data-Driven Documents (name is a clever allusion of W3)
- Documents are web-based documents

What it does

- Loading data into the browser's memory
- Binding data to elements within the document, creating new elements as needed
- Transforming those elements by interpreting each element's bound datum and setting its visual properties accordingly.
- Transitioning elements between states in response to user input.

What we're working with

1. DOM (Document Object Model)
2. Html (Hypertext Markup Language) particularly the SVG element
3. CSS (Cascading Style Sheets)
4. JS (Javascript)

How do these relate with each other?

- The Document Object Model (DOM) is a cross-platform and language-independent interface that treats an XML or HTML document as a tree structure wherein each node is an object representing a part of the document (Wikipedia def). Through a process called **rendering**, the browser is able to display a webpage by parsing HTML, applying visual rules listed in the CSS, and generating DOM.

To be continued

More D3 notes found at

Visual Essay

What is a Visual Essay?

- Under construction

How to create a visual essay?

1. Pick a dataset
2. Explore the dataset
    i. List data attributes
    ii. Ask questions and forumalate hypotheses
    iii. Explore the dataset
3. Sketch
    i. Design with a thesis in mind
4. Develop Sketch
    i. What you'll need
        i. JS Visualization library (D3.js)
        ii. A Scroller
    ii. Things to consider while developing
        i. Mobile responsiveness
        ii. Type of interaction
            i. Scroll ⭐⭐⭐
            ii. Stack ⭐⭐
                - use of static charts and images
                - less dev tim
            iii. Stepper
                - user clicks through
            iv. Swipe/tap
                - overrides default scrolling behavior and browser functionality
5. Deploy

Notes from

- Shirley Wu's Observable Notebook
- Reponsive Scrollytelling

Scrollytelling

6 Javascript libraries

1. Waypoints
2. ScrollStory
3. Scrollmagic
4. Graph-scroll
5. In-view
6. Scrollama
7. Create your own

Some Recommendations by Russell Goldenberg

- For highly customized stories you will want ScrollMagic or Waypoints.
- For the beginner you might want to check out ScrollStory, especially if you lean on jQuery.
- For the d3 lover you should explore graph-scroll.js, but be ready to accept the defaults or be ready to tinker.

Notes from

- How to implement scrollytelling with six different libraries

Tools and Resources

General Resources

- Data Storytelling
  - ⭐ Storytelling with Data: A Data Visualization Guide for Business Professionals by Cole Nussbaumer Knaflic
  - Introduction to Data Visualization & Storytelling: A Guide For The Data Scientist by Jose Berengueres, Marybeth Sandell, and Ali Fenwick

Tools

- D3
  - Book
    - ⭐ Interactive Data Visualization for the Web, 2nd Edition by Scott Murray
    - D3.js in Action, Second Edition by Elijah Meeks
    - Fullstack D3 and Data Visualization by Amelia Wattenberger
  - Tutorial
    - ⭐ Intro to D3 by Michael Menz
    - 13 hour course Free Full Tutorial Course - Freecodecamp by Curran Kelleher
  - Website (Learn by reading other people's code)
    - bl.ocks.org
    - Observable
      - notebooks built for data analysis, visualization, and exploration
- Greensock
- React
- Note: ⭐ - personally recommend

Common Tech Stacks

- D3.js + HTML + CSS
- React.js + D3.js
- React.js + D3.js + Greensock

Jobs

General Titles

- Data Visualization Engineer
- Data Journalist
- Data Analyst / Visualization Specialist

Tool specific

- Tableau Consultant
- Tableau Designer
- D3.js Developer
- PowerBI Developer

Data Visualization Engineer

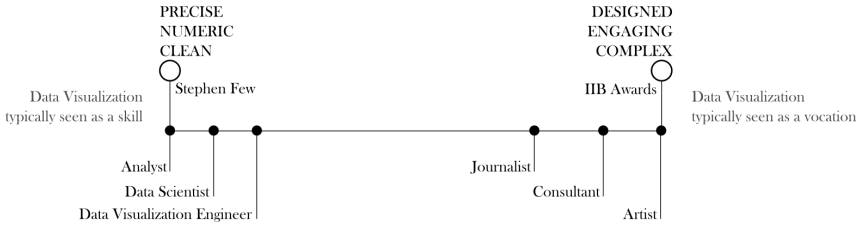
Data Visualization Engineering Skills

- Technical + Design Expertise
- solid understanding of UI development
- principles of design (graphic principles and user-centered design)
- Technical - **hack data visualization methods and reproduce any charing methdos you see**
- Theoretical - **understand the fundamental principles of visual display of information**
- Practically - **think of yourself as a designer first** (finding out what your readers first, touches on interaction design, information design, and graphic design)

Comparing a data viz role to an analyst role:

- an Analyst role focus is on the question
- a Data Viz role focus is on an audience that typically needs something more than a single report and expects views into the data that generate more than the expected insights

Role Spectrum



Source of image above

3 concerns:

1. Data visualization products are extremely conservative
2. Data visualization as a professioanl focus currently lacks clear avenues for advancement, so bright people with ambition feel forced to transition into other science or engineering roles in order to advance
3. Data visualization is underrepresented in leadership positions

Sources:

- What is a Senior Data Visualization Engineer

- If Data Visualization is So Hot, Why are People Leaving?

To read:

- Data Humanism, the Revolution will be Visualized