

The United States of Gerrymandering

A Primer on Gerrymandering, Fair Districting, and its Impacts on Representation

CS171 Final Project Process Book

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12.11.17 – Final Project

Roles

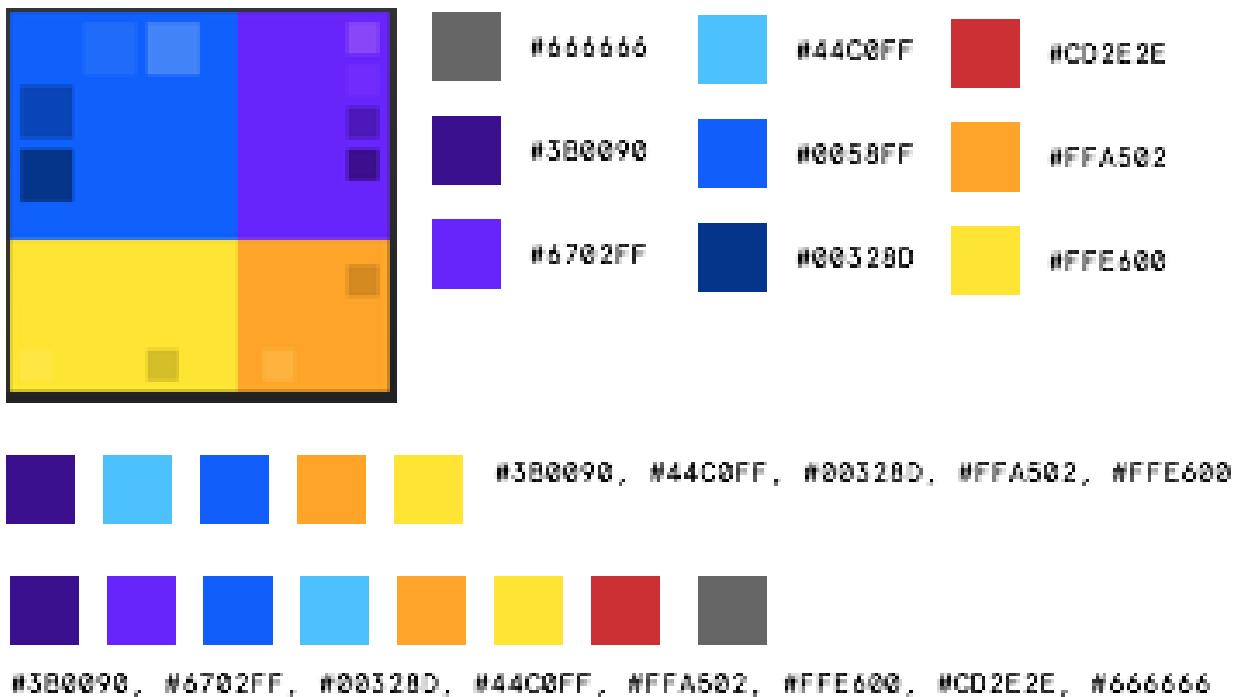
- Recording: Jenny W.
- Submission: Kiran
- Review: Jenny F.

Final Deliverables

- Code/Data/Process Book: <https://github.com/kiranw/CS171-gerrymandering>
- Link to project website: <gerrymandering.herokuapp.com>
- Project screencast (2 min max): <https://youtu.be/4xJGsNxc448>

Color Reference

- **5 color:** ['#3B0090', '#44C0FF', '#00328D', '#FFA502', '#FFE600']
- **7 color (purple to red):** ['#3B0090', '#6702FF', '#00328D', '#44C0FF', '#FFE600', '#FFA502', '#CD2E2E'];
- **7 color (red to purple):** ['#CD2E2E', '#FFA502', '#FFE600', '#44C0FF', '#00328D', '#6702FF', '#3B0090']
- **9 color:** ['#3B0090', '#6702FF', '#00328D', '#44C0FF', '#FFA502', '#FFE600', '#CD2E2E', '#666666']



Progress + Changes

- Core visualizations are completed, with all functionalities and data present
- Scripts used to generate efficiency gap calculations
- Deployment to website: gerrymandering.herokuapp.com
- Basic storytelling & content polishing and edits
- Adding cracking/packing visualization
- Added more interaction elements in each visualization
 - Update transitions between different states of redistricting in 2nd pane
 - Upgraded interaction in timeline visualization with auto-expansion and collapse in sections
- Updated reference section

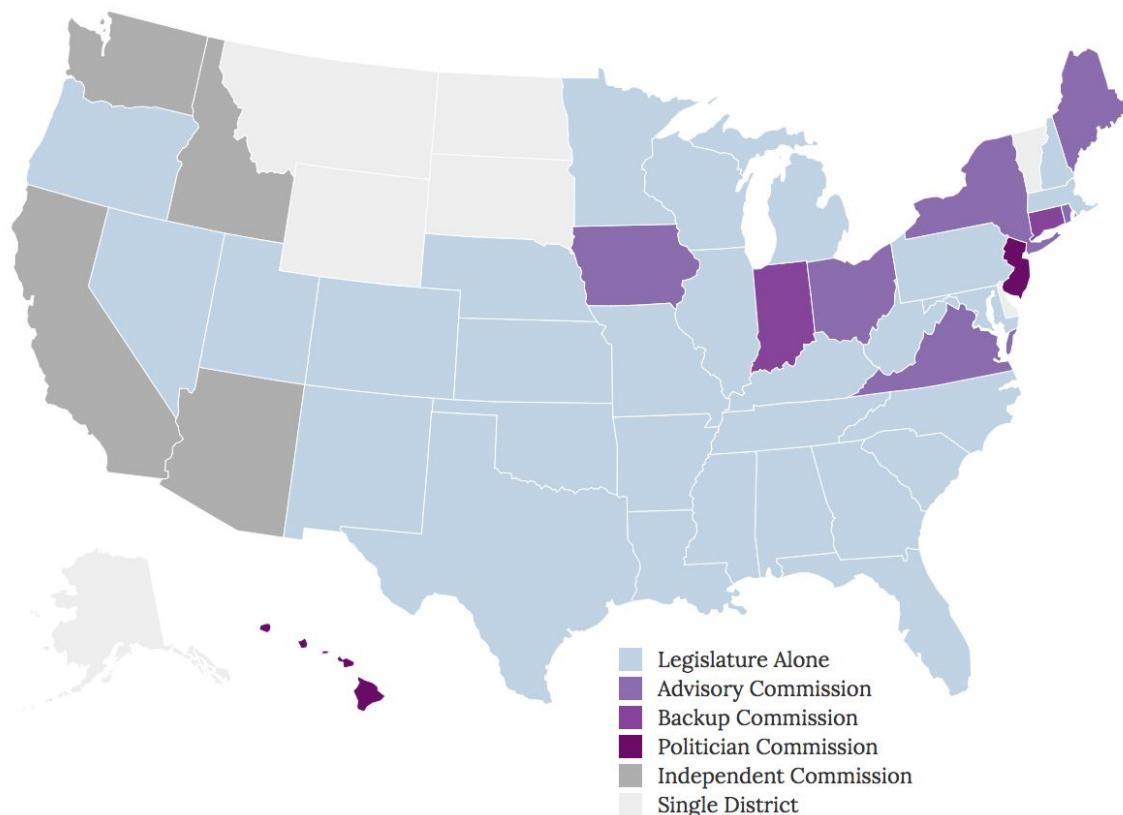
11.27.17 – Prototype Week #2

Roles

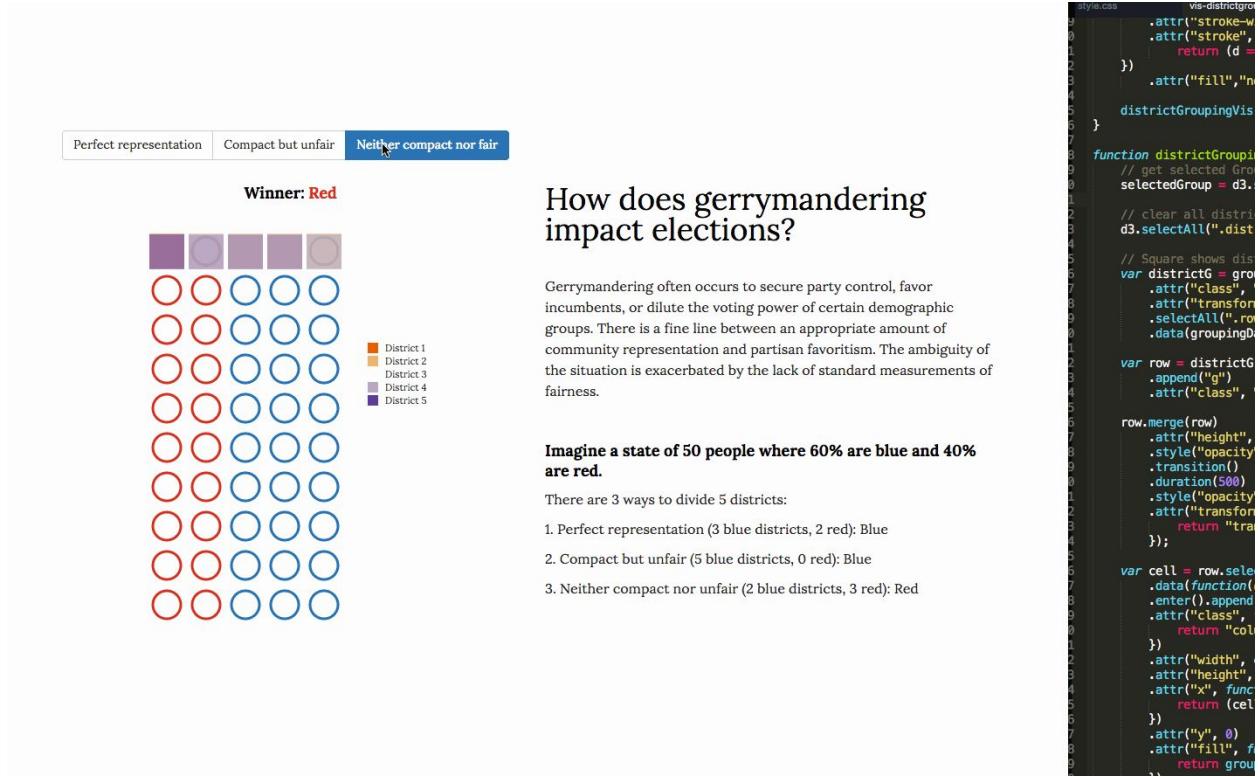
- Recording: Jenny F.
- Submission: Jenny W.
- Review: Kiran

Progress

- Core visualizations are mostly completed, with all functionalities and data present
- Scripts used to generate efficiency gap calculations
- [Link to Webpage content](#)
- Basic storytelling & content that is presented in order
- Adding in Who Draws the Districts chloropleth



- District grouping animation completed (ideally to be keyed to x/y coordinate transition)



To-dos before Final Submission

- Add in increased animation and interaction
- Make existing charts more visually appealing
- Finalizing layout
- Adding scroll jacking and other website elements such as thin content/navigation bar on top
- Style: adding gradient backgrounds, color scheme considerations
- Formalizing the call to action in the storytelling
- Add thicker white borders to the choropleths
- Highlight Gill v Whitford throughout the website
- “P” on policy & automatic drop down
- Call to action: 3 columns with icons and click to expand the descriptions

Peer Feedback

CS 171 Project Presentations
(Give the completed form to the team you gave feedback on. They will have to scan it in and attach it to their final submission.)

Your Names: Christine Zhang, Kevin Huang, Jesse Zhang
Your E-mail: christinezhang@college, khuang1@college, jessezhang@college

Name of group you evaluated: The United States of Gerrymandering

What is good about the group's visualization?
The project provides a lot of information that smoothly segways into each other. The visualizations are sufficiently complex to demonstrate a rigorous knowledge of javascript and D3.

What could be improved?
- Axes meanings are unclear, there should be some explanation for the reader.
- I think the visualizations are hard to understand at first glance, but this might just be because there wasn't much time to present.

Is the message clear? What is the message?
The project is trying to get users to understand the process of gerrymandering and let the user determine for themselves whether they think it is fair.

CS 171 Project Presentations
(Give the completed form to the team you gave feedback on. They will have to scan it in and attach it to their final submission.)

Your Names: Jiaobao Li, Mayying Wu, Clic
Your E-mail: stephlijiaobao@gmail.com

Name of group you evaluated: Gerrymandering, Environment Planet

What is good about the group's visualization?
GM: very strong visualizations of each one.
Nice node chart.
TP: nice interaction vs.

What could be improved?
put the surface divisions first, we saw more to help understand the issue.

Is the message clear? What is the message?
Maybe explain with an example.

11.13.17 – Prototype Week #1

Roles

- Recording: Kiran
- Submission: Jenny F.
- Review: Jenny W.

Progress

- Generating Skeleton
- Data wrangling
- Drafting Choropleth
- We have been keeping our code updated on Git and communicating over the weekend about ways we are associating data with each other
- Current year is currently set to 2014 but next step is to implement slider. Filter function will filter based on selected year
- Demographic charts to be placed: Race, Income, Education levels for selected district
- Haven't gotten the enter/exit pattern to work for the bars charts so bars will just cover up each other. Also, sometimes the bar charts don't load it has something to do with async data loading
- Tooltips implemented on choropleth
- Demographic information barcharts on choropleth implemented

Structure

Our code is split up into two main containers - one for the timeline, one for the map visualization. All files pertaining to each are prefixed by the chart they correspond to.

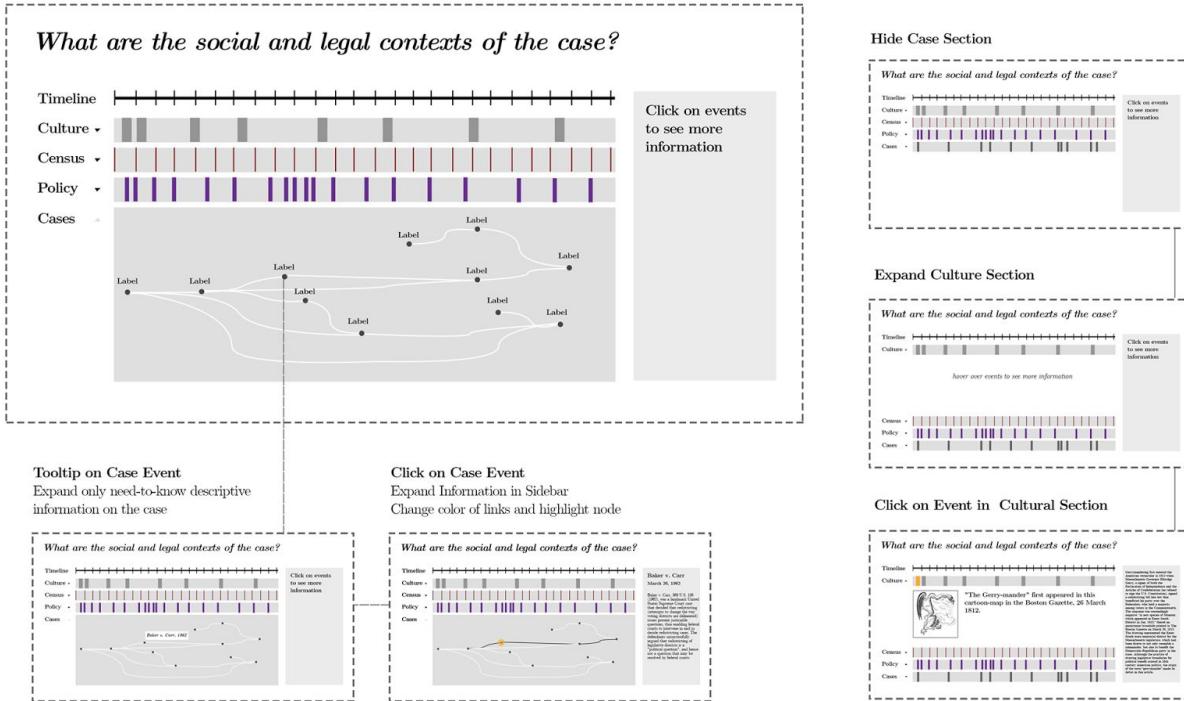
We also followed the general framework of having data, img, css, js directories to store relevant information in them.

Rough Webpage Design

Containers exist for the components we see occurring, currently with lorem ipsum data. The style still needs to be updated but we will work on that once the general structure is properly set.

Innovative View Design & Interaction Storyboard

We submitted sketches of the view and potential interactions it would have. The sketch is attached below.



11.6.17 – Project Plan

Timeline

- 11/6: Project Plan
 - Identify Datasets
 - Sketch user flows and develop a strong idea of precedents and documentation for examples
 - Learn about the issue and the papers we'd like to visualize
 - Understand the mechanics of the test
 - Initial meeting with project mentor
- 11/13: Project prototype V1
 - Have each visualization implemented (low fidelity) - have placeholders for missing media but assign space for it
 - Identify styling themes so the rest of the implementation has a baseline to operate on
 - Finalize all data
- 11/27: Project prototype V2
 - Implement proposed functionality
 - Finalize text content
- 12/11: Project Due
 - Polish visualizations
 - Make all elements cohesive
 - Add niceties (parallax, scroll controlling, type effects, etc)

Section Presentation Slides (11.8.17)

https://docs.google.com/presentation/d/1SO03KLPG3jeyeoKlaaMO9IuncoWkUFvdal33xhTmzr4/edit#slide=id.g2844349064_0_25

Feature List

- Must Have
 - NYT Aesthetic
 - 3 Basic Visualizations
 - Time Sliders
 - Explanation of context
 - Explanation of formula
- Good to Have
 - Dynamic typing effect (tell a story and make it seem as though it's being typed)

- Social Context
- Play through the years (animate time slider)
- Compare people's projections/expectations (user input?) vs reality
- Visualize how the formula works and where its components are derived from so it's more easy for people to understand
- Optional Items:
 - Scroll jacking
 - Parallax
 - Add animated components
 - Add areas for user-input to test against prior biases
 - Additional visualizations with future projects
 - Option of customizing input data to maps to see hypothetical cases as inputs to our test of fairness

Team Roles

- Rotate responsibilities for coordinator, recorder and checker weekly:
 - Kiran, Jenny F., Jenny W. in this order
- General Roles:
 - Target: All
 - Data Wrangling: Jenny W.
 - Design: Jenny F.
 - Implementation: Kiran
 - Evaluation: Jenny F.
- Each person will manage 1 visualization across all of these parts and raise issues relevant to any specific part with the person attached to that role above
 - National Voting Efficiency Map - Jenny W.
 - District-Level Visualization - Jenny F.
 - Legal and Social Context - Kiran

Background

Goals of Districting:

- Partisan fairness (reflect the population)
- Align communities of interest
- Fair representation (minority-majority) - “one person one vote” (Baker v Carr)
- Fair-fight districts (real electoral competition)
- Compactness

Requirements:

- Fairly uniform population

- Continuous and compact geography

Goals of Gerrymandering:

- “Cracking” - separating interests into different districts for vote dilution (-)
- “Packing” - overconcentrating similar interests for vote wastage (-)
- “Sweetheart gerrymandering” - favor status quo, protecting incumbents (-)
- Protecting minority interests (+)

Existing tests to determine fairness of district:

- Compactness - ratio of perimeter/area [0:1, 1 is ideal]
- Efficiency gap - measures both wasted votes and diluted votes
- Find Wasted Votes: ratio of net wasted votes/total votes cast
- Find Seat Advantage: compare to how many seats were won

Implementation Data

allCongressDataPublish.tab

<https://dataVERSE.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/CI2EPI>
<https://dataVERSE.harvard.edu/file.xhtml?fileId=3012151&version=RELEASED&version=.0>

District Data: new_allCongressDataPublish.csv

Each shape has a 4 digit ID: First two digits of the geometry id (d.id / 1000 | 0) are the state FIPS code (see us-state-names.tsv) and the last two digits are the congressional district number (d.id % 1000) within that state.

References

- <https://github.com/unitedstates/congress-legislators>
- <https://bl.ocks.org/mbostock/4657115>
- <http://bl.ocks.org/rveciana/fe6b452c853146e674dd6dd09c1cc6e3>
- <https://github.com;bradoyer/atlas-make/tree/master/us-congress>
- <https://gist.github.com/mbostock/4090846#file-us-state-names-tsv>
- <https://www.govtrack.us/data/congress-legislators/>
- <https://stackoverflow.com/questions/14565963/topojson-for-congressional-districts>
- <https://dataVERSE.harvard.edu/file.xhtml?fileId=2840580&version=RELEASED&version=.0>
- 2014.csv
- https://raw.githubusercontent.com/silicon-valley-data-science/gerrymandering-congress/master/data/114_2014_house_popular_vote.csv

11.2.17 – Detailed Project Plan

Goals

- Make the current state of gerrymandering digestible for the public, and offer a visualization to lawmakers to see its impacts on representation
- Trace legal precedents/legal references (possibly related to gerrymandering, maybe more general?) and offer social context for past US legislative action on this issue
 - Maybe trace Gill v. Whitford back a few cases, e.g.
 - Vieth v. Jubelirer
 - Davis v. Bandemer
 - Identify related and linked cases referenced from *Gill v Whitford* as a root node in case law, supreme court cases and potentially tort law
- Demonstrate the mechanics of the test itself so the math is democratized
- Demonstrate how this test applied to current districts reflects (in)equality or (un)fairness of current district lines and how the test works
 - Measures each parties' wasted votes in election, divided by total number of votes cast
 - Better than previous metric, partisan bias (calculates by shifting votes to simulate a tied election)
- Show impacts of “unfair” districting in how it impacts legal decisions made in a district, from a selected angle of metrics (*show at least #1, maybe #2-#3 pending time and ability to gather data*)
 - District demographics - race, age group, sex, income bracket, education level, winning party
 - District’s policies, e.g. healthcare funding, education funding (% public vs. private), healthcare funding
 - District’s societal impact, e.g. crime rates, graduation levels, etc
- 4) *MAYBE* -- extrapolate to show how this might cause 2018 midterms and 2020 elections to play out by party
 - Potential extension: allow for custom inputs or changing the distribution to see how it is affected by gerrymandering in our model

Tasks

- Generate a shell for our file structure in Github and share with the team (Kiran)
- Identify datasets specific to our own visualizations (All)
- Each person will take leadership over one visualization but we’ll work together on all of them
 - National Election Efficiency Map - Jenny W.

- National Voting Demographics - Jenny F.
 - Legal and Social Context - Kiran
 - Generate a design theme (something similar to NY Times/538, readable and trustworthy) (Jenny F.)
 - Evaluate work and document the process regularly (Jenny W.)

Description of Datasets

Planned Visualizations

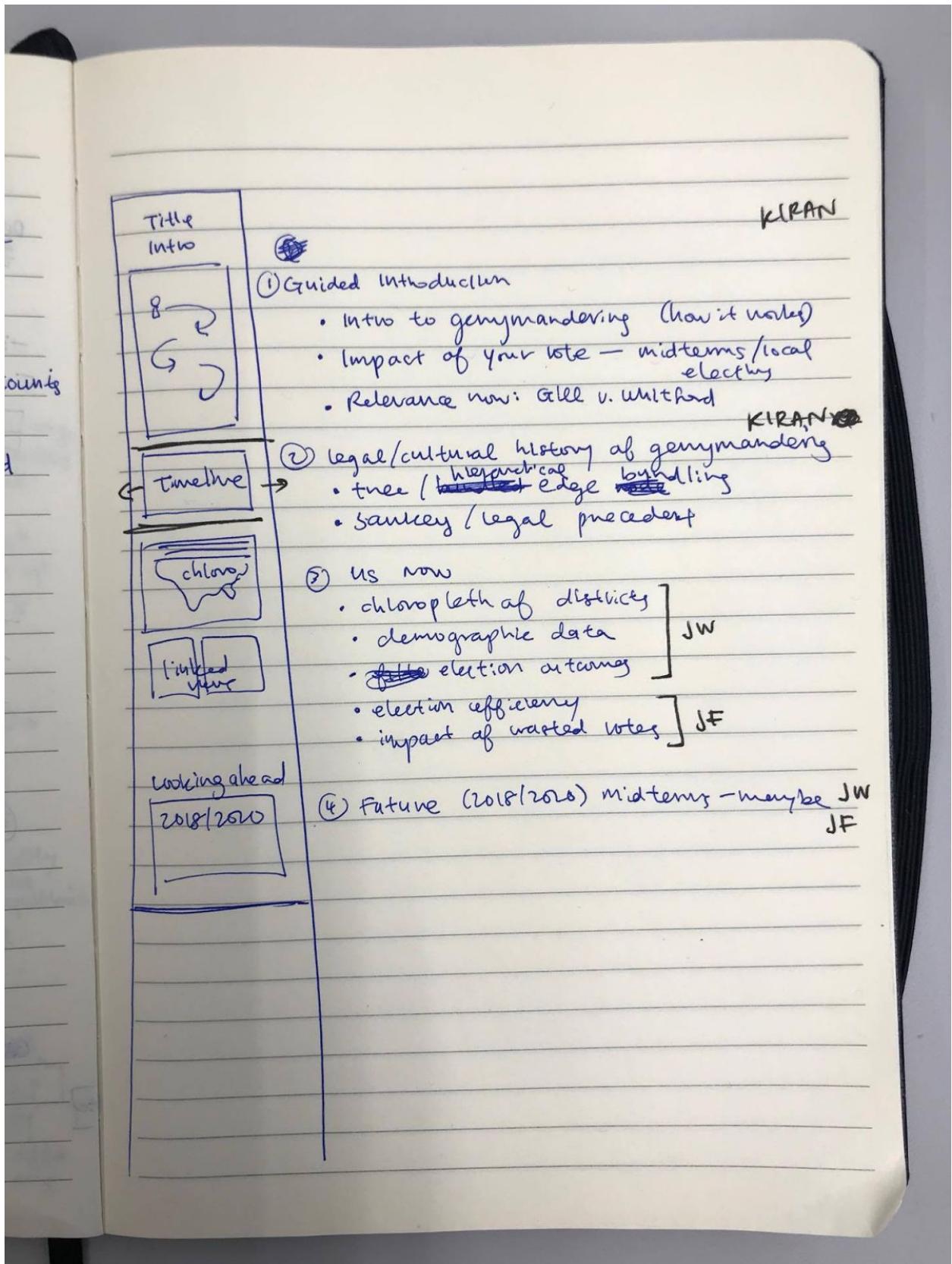
- 1) Visualize efficiency equation applied across districts (chloropleth with call-out bar graphs as tooltips/linked views)
 - Tooltip: on click/hover: show Electoral outcome/who won, % wasted votes, and the incumbent party (shaded in donkey or elephant)
 - Time slider (pick date) to show District lines and how they change over time
 - 2) Click on a specific district: show that district's demographics below
 - Incumbent party in office
 - Race, income, employment, education/graduation levels, healthcare funding (basically the effect on communities)
 - Hierarchical edge bundling?

- 3) Sankey tracing legal timeline/tree
 - Maybe show the year/date highlighted corresponding to above time slider
 - Attach cultural and time-related data to generate context for legal changes historically
 - Attach relevant news articles, public response, and media at the time to events in the tree

Sketches/Story

- At least 3 sketches of visualization ideas for your project (one for each visualization)
- A sketch of an interaction storyboard:
 - Hovering in 1) (tooltips)
 - Clicking on district in 1) updates 2)
- A sketch of your webpage layout/storytelling (Martini Glass Model)
 - Describe what Gerrymandering is & historical introduction
 - Make users click through to learn more about context in sequence
 - Least user control, but guided learning
 - Introduce Gill v Whitford (side story: trace legal history & trace cultural history)
 - Highlight specific areas that users should click on, and after these are selected, allow interaction on the visualization for more exploration
 - More user control, but still some guidance
 - Show impact on America today (linked-view visualizations, US chloropleth and district-level data)
 - Unrestricted exploration of data through visualization
 - Potentially: predictive part about 2018/2020 elections

Sketches and storyboard are on the next pages



10.30.17 – Proposal

Proposal Link: (Studio 5 Nathan Weds 6PM)

https://docs.google.com/forms/d/e/1FAIpQLSdyFv20McLOB34LKcXBIsmE_bLctJlv-WqJiBEb4i3cOBm73A/viewform

Abstract

Gerrymandering has had a long history of influencing the election of public officials in the US. It's now incredibly relevant as the case, *Gill v Whitford* (on Wisconsin's partisan redistricting plan) is being reviewed by the Supreme Court. Litigating this has been difficult because there is no standard test of fairness on proposed redistricting plans. We would like to visualize a recent proposal of an "efficiency gap test" that could potentially serve as a legal basis for US courts to use as a metric, and more broadly, give context to the history of gerrymandering.

We will demonstrate how this test, when applied to current districts, reflects the (in)equality or (un)fairness of current district lines, and compare that to other metrics of partisanship that already are widely in use. We also want to show the impacts of unfair redistricting over a time series of data, with granularity for district demographics, policies (e.g. support for healthcare) and social measures (e.g. crime rate, graduation levels). Our final goal is to trace the legal precedents of redistricting laws to better understand why the current laws are as they are, and to provide context. A final interesting use of this model would be a display on how a future election could play out (2018 midterms/2020 election).

Planned Visualizations

- (1) Visualize efficiency equation applied across districts (chloropleth with call-out bar graphs as tooltips and linked views)
- (2) District lines and how they change over time (incumbent party in office, education levels, racial composition, income demographics)
- (3) Time series that shows how district lines affect communities, such as through the relative impact of a resident's vote, what types of propositions are being supported by district funding, etc.
- (4) Tree to show legal precedents of redistricting

Planned datasets

- (1) District lines data: US Census Bureau (e.g. https://www.census.gov/rdo/data/congressional_district_data.html)
- (2) Election results: various state elections commissions (demographics per district)
- (3) Supreme Court Cases, Case Law and Tort Law

Outline

- Motivation
 - *Gill v. Whitford* (Wisconsin redistricting plan) is challenging Supreme Court precedent on gerrymandering
 - Previous attempts to litigate gerrymandering have failed because there's no sufficient standard metric or test for fairness of a district line
 - Recent proposal of the "efficiency gap test" could be enough of a legal test for the justices, who are interested in an idea of "partisan symmetry"
 - Any proposed redistricting plan should treat parties symmetrically in terms of conversion of votes to seats
- Goals
 - 1) Demonstrate how this test applied to current districts reflects (in)equality or (un)fairness of current district lines
 - Measures each parties' wasted votes in election, divided by total number of votes cast
 - Better than previous metric, partisan bias (calculates by shifting votes to simulate a tied election)
 - 2) Show impacts of "unfair" districting in how it impacts legal decisions made in a district, from a selected angle of metrics (*show at least #1, maybe #2-#3 pending time and ability to gather data*)
 - 1) District demographics - race, age group, sex, income bracket, education level, winning party
 - 2) District's policies, e.g. healthcare funding, education funding (% public vs. private), healthcare funding
 - 3) District's societal impact, e.g. crime rates, graduation levels, etc
 - 3) Trace legal precedents/legal references (possibly related to gerrymandering, maybe more general?)
 - Maybe trace Gill v. Whitford back a few cases, e.g.
 - Vieth v. Jubelirer
 - Davis v. Bandemer
 - Identify related and linked cases referenced from *Gill v Whitford* as a root node in case law, supreme court cases and potentially tort law
 - 4) *MAYBE* -- extrapolate to show how this might cause 2018 midterms and 2020 elections to play out by party

- Potential extension: allow for custom inputs or changing the distribution to see how it is affected by gerrymandering in our model
- **Planned Visualizations**
 - 1) Visualize efficiency equation applied across districts (chloropleth with call-out bar graphs as tool-tips/linked views)
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 - Race, income, employment, education/graduation levels, healthcare funding (basically the effect on communities)
 - Hierarchical edge bundling?
 - 3) Sankey tracing legal timeline/treemap
- **Description of datasets**
 - District lines data: US Census Bureau (e.g. https://www.census.gov/rdo/data/congressional_district_data.html)
 - Election results: various state elections commissions
 - Demographics per district
 - Supreme Court Cases, Case Law and Tort Law
 - Trace back from *Gill v Whitford* on Oyez

Visualization Inspiration

- Multiple levels of filtering on voting data:
<https://www.nytimes.com/interactive/2016/06/10/upshot/voting-habits.html>
- Basically a lot of these charts, but we just have to avoid duplicating:
<https://www.nytimes.com/interactive/2017/10/03/upshot/how-the-new-math-of-gerrymandering-works-supreme-court.html>

Pull-out quotes

- “Could you tell me what the value is to democracy from political gerrymandering? I really don’t understand” how that makes it “okay to stack the decks.” – Sotomayor ([WaPo](#))
- “If you can stack a legislature in this way, what incentive is there for a voter to exercise his vote?” Ginsburg asked. “Whether it’s a Democratic district or a Republican district . . . the result is preordained in most of the districts... What becomes of the precious right to vote?” – RBG 🔥 ([WaPo](#))

Bibliography

- Justin Levitt, Loyola Law School. "All About Redistricting." <http://redistricting.lls.edu/>
- WYNC Radio. "Who's Gerry and Why Is He So Bad at Drawing Maps?" <http://www.wnyc.org/story/whos-gerry-and-why-he-so-bad-drawing-maps/>
- <https://www.nytimes.com/interactive/2017/10/03/upshot/how-the-new-math-of-gerrymandering-works-supreme-court.html>
- <https://www.policymap.com/2017/08/solutions-to-gerrymandering/>
- <https://www.vox.com/policy-and-politics/2017/10/11/16453512/gerrymandering-prorportional-representation>
- <https://www.usnews.com/news/the-report/articles/2017-07-28/big-data-and-the-gerrymandering-of-america>
- Han, Patrick. "The Most Gerrymandered States Ranked by Efficiency Gap and Seat Advantage." Azavea. 19 July 2017. <https://www.azavea.com/blog/2017/07/19/gerrymandered-states-ranked-efficiency-gap-seat-advantage/>
- <http://svds.com/gerrymandering/>
- <https://www.policymap.com/2017/08/a-deeper-look-at-gerrymandering/>
- https://www.washingtonpost.com/news/wonk/wp/2016/01/13/this-is-actually-what-america-would-look-like-without-gerrymandering/?utm_term=.5a1926145983
- Formula background (Nicholas Stephanopoulos, Eric McGhee @ UChicago): https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2457468
- Case in question (Gill v. Whitford re: Wisconsin redistricting plan): <http://www.scotusblog.com/case-files/cases/gill-v-whitford/>
- https://www.washingtonpost.com/graphics/2017/politics/courts-law/gerrymander/?utm_term=.284ecca49642
- <https://www.brennancenter.org/sites/default/files/legal-work/How%20the%20Efficiency%20Gap%20Standard%20Works.pdf>