CSE 308, Section 2

Semester Project Discussion

Session Objectives

- Understand issues and terminology used in US congressional redistricting
- Understand top-level functionality of project system components

We will explore the project functionality in more detail in the next 1-2 class sessions
Teams

- You should form your team soon (4 members)
- Remember, you may be able to switch sections based section enrollment
- You can register a 3-member team, but I will likely add a 4th member

You register your team by sending me an email message with the names of the team members

Take time after class to talk with other students and decide on your team

Teams (to date)

- None registered yet
Project Background

- Project based on
  - Fall 2017 CSE308 – apply quantitative measures of political gerrymandering
  - Spring 2018 CSE308 – explore feasibility of automated redistricting
  - Fall 2018 CSE308 – explore feasibility of algorithms for the generation of districts based on seed precincts

- Lessons learned from previous projects
  - Focus on software design and development (less framework usage)
  - Nice integration of multiple languages (Java, Python, JavaScript)
  - Understanding of algorithms
  - Robust set of data available (but data has accuracy problems)
  - Objective function appears to capture redistricting goals and constraints
  - Many previously unexplored areas in topic

Teams can use designs and code from previous semesters – with full disclosure

Why This is an Important and Interesting Topic

- Very current
- Lots of interesting CS concepts and technologies

North Carolina’s gerrymandered map is unconstitutional, judges rule, and may have to be redrawn before midterms

By Robert Barnes
August 27 at 9:50 PM

A panel of three federal judges held Monday that North Carolina’s congressional districts were unconstitutionally gerrymandered to favor Republicans over Democrats and said it may require new districts before the November elections, possibly affecting control of the House.

The judges acknowledged that primary elections have already produced candidates for the 2018 elections but said they were reluctant to let voting take place in congressional districts that courts twice have found violate constitutional standards.

North Carolina legislators are likely to ask the Supreme Court to step in. The court tradition has not been averse to judicial review of actions that may affect an election as close to...
Overall Project Goal

- Build a robust system to
  1. integrate demographic data into election precincts
  2. formalize a graph approach
  3. generate tens (thousands?) of possible solutions for further evaluation
- evaluate various approaches to the automated generation of congressional district boundaries

“I propose that we draw the maps to give a partisan advantage to 10 Republicans and three Democrats because I do not believe it’s possible to draw a map with 11 Republicans and two Democrats.” – Chairman of NC House redistricting committee

Collective Team Goals of Spring 2019 Project

- Expand precinct data to include demographic data
- Treat precincts as nodes in a graph with smart data for edges
- Use graph partitioning algorithms for district generation
- Implement a batch solution approach for your laptop and for SBU supercomputer
- Build a user-friendly GUI that will allow the achievement of the other project goals

These are goals beyond those achieved in previous semesters
Session 2 - Project Background

Top-Level System Architecture

- GUI
- Server Logic
- Data Population
- 3-state DB

Data sources → Data Population

Does not include the supercomputer component

Project Requirements

- Some requirements will evolve over the first 6 weeks of the project
  - Top-Level system requirements provided in first 2 weeks of class
  - First system requirement update provided to you late February
  - Second system requirement update provided to you early March
- You will generate detailed requirements (use cases)

The supercomputer component with be the most likely to adjust during the semester
Session 2 – Project Background

Project – Voting District Generation Algorithms

- Develop a system that will
  - Automatically generate a state redistricting plan based on factors and algorithms variations requested by the user
  - Factors include, but are not limited to:
    - Compactness
    - Alignment with county boundaries
    - Variation limits in population
    - Political fairness
    - Preservation of some existing districts
    - Alignment with natural boundaries (e.g., highways, rivers, etc.)
    - Adherence to Voting Rights Act
  - Parameters will be a super-set of all redistricting criteria identified in your state constitution (and other sources) text search
  - Apply to congressional districts
  - Depict the results graphically in a Web interface (including a graphical comparison with existing district boundaries)

What is a Gerrymander?

- Refers to a voting district that resembles a salamander
- Named after Eldridge Gerry, 5th VP of US

![Gerrymander Image](image)

© Robert Kelly, 2017-2019
Why is Gerrymandering a Hot Topic?

- Gerrymandering is a practice intended to establish an advantage for a particular party or group by manipulating district boundaries.
- Usually features “cracking” (split opposing party voters into many districts) and “packing” (packing maximum number of opposing party voters into a handful of districts).
- Occurring in the US since 1812.
- Used aggressively in 2010, resulting in congressional dysfunction.

We address the issue of political gerrymandering.

Current Activities

- Supreme Court heard cases in 2017-2018 session.
  - Cases decided on technical grounds – no determination of constitutionality of political gerrymandering.
- Lower courts have ruled some districting unconstitutional, and ordered states to redraw the districts (with no detailed instructions).
- Other court cases in progress.
- Gradual realization that in US, representatives select their constituents, constituents do not select their representatives.
- Large number of states will redistrict following the 2020 census.
2010 Gerrymandering

- Operation Redmap (Redistricting Majority Project) - in 2010, Republican strategists succeeded in redrawing congressional districts in many states to favor their party
- States targeted based on
  - Population shifts requiring fewer or greater number of congressional districts
  - Process for redistricting in the state

http://www.redistrictingmajorityproject.com/?p=646

Example - Michigan Gerrymandering

- With a clever drawing of districts, a minority party can take control of a state congressional delegation

Michigan currently has a 7-7 split of congressional delegates
Session 2 – Project Background

How Gerrymandering Works?

- Many states are shifting to more “unfair” districting (as in rightmost figure)
- District boundaries are changed after the census if the number of representatives change
- No fixed rule for who decides the new boundaries

[Image of district boundaries]

Why is this a CSE308 Project?

- Recent concerns about the effect of gerrymandering has led to suggestions for ways to measure whether a proposed redistricting plan is “fair”
- Relatively little has been done to quantify “fair” districting
- At least 2 bills drafted in congress to reduce effects of gerrymandering
- Research efforts to measure “fairness” of gerrymandering
- Lots of existing data from multiple sources that can be aggregated
- Redistricting is a manual process controlled by political experts. The problem involves a nice combination of programming languages, architectures, algorithms, using a robust set of data from different data sources
Consequences of Current Gerrymandering

- Most congressional seats are not competitive
- Members of congress are more concerned with a primary battle than an election battle
- Republicans and Democrats represent their party's position more than the wishes of their constituents
- Extremes of each party dominate, instead of the middle

Congressional Gridlock

Recent US House Election Data

- By 2010, data became available to precisely estimate voting patterns
- Geographic Information Systems (GIS) were available by 2010 to precisely define congressional districts based on voting patterns and demographic characteristics of residents

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<th>Year</th>
<th>Republican Vote %</th>
<th>Republican Seat %</th>
<th>Democratic Vote %</th>
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<td>42.4%</td>
<td>40.9%</td>
<td>53.2%</td>
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</tbody>
</table>

Criteria for Review of House Districts

- In the past there were very limited tools and precedents to allow for legal analysis of the fairness or constitutionality of state voting districts
- Race was a primary factor
- New measures have been developed
  - University of Chicago
  - Tufts University

Assignment

- Think about the more difficult parts of your system
- Investigate Leaflet, Google Maps, geospatial capabilities of MySQL, etc.
- Discussion of requirements in next class