Redistricting and the Problem of Gerrymandering

By Hadrien Nguyen
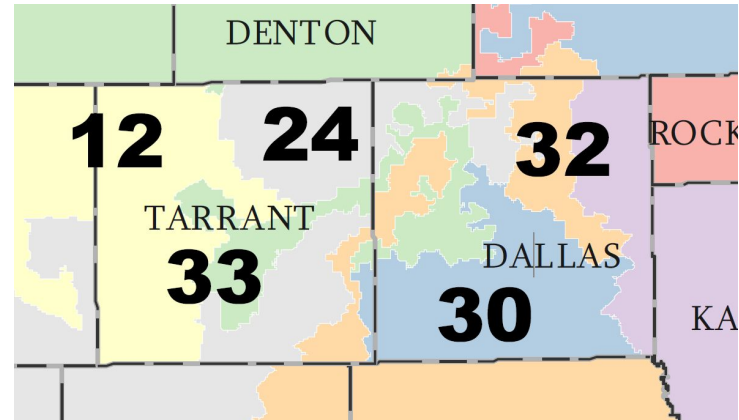
Summary of Presentation

- Redistricting
- GerryMandering
- 2 solutions

Living in a Democratic Republic and the need for redistricting
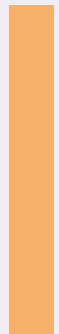
1. Every 10 years, each state redraws the boundaries of districts based on census information.
2. Goal is proportional representation in the decision-making process.

The rules
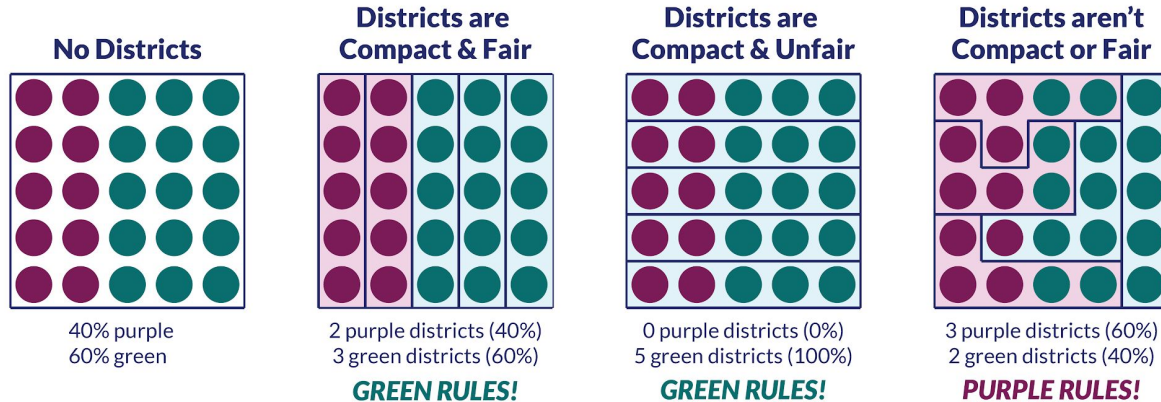
From *Political Redistricting By Computer* (1972):
- **Population Equality**
- **Compactness**
- **Contiguity**
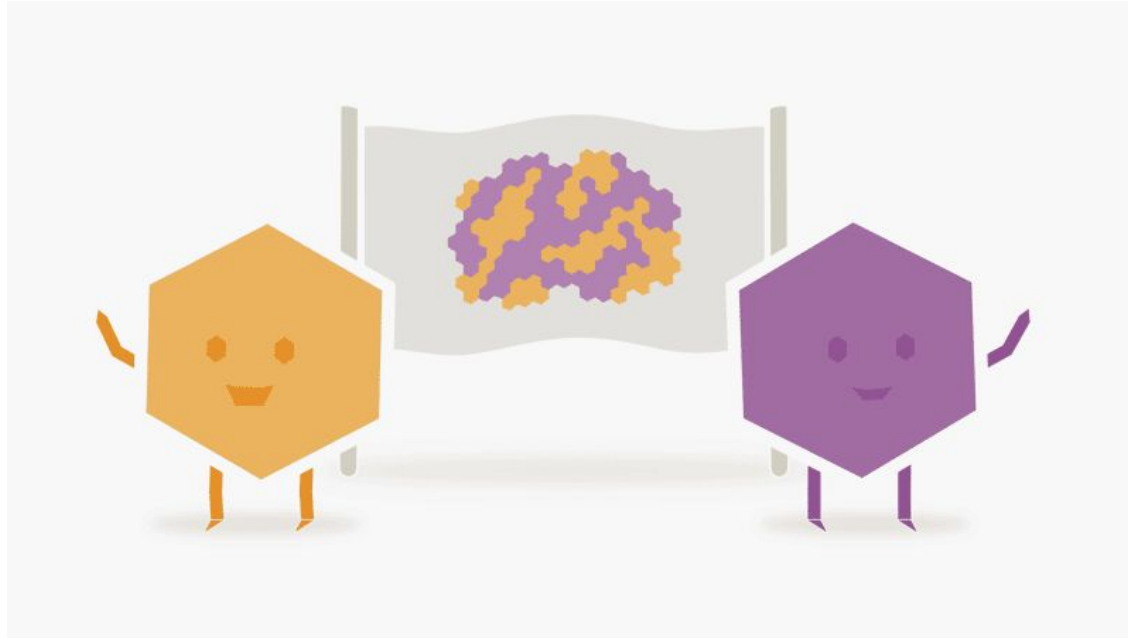- **Preservation of Existing Boundaries**

Some Problems

1. Geographical proximity =/= Cultural homogeneity.
2. The overall political composition of the state can be different than the distribution of seats

=> GERRYMANDERING

No Districts

40% purple
60% green

Districts are Compact & Fair

2 purple districts (40%)
3 green districts (60%)

GREEN RULES!

Districts are Compact & Unfair

0 purple districts (0%)
5 green districts (100%)

GREEN RULES!

Districts aren't Compact or Fair

3 purple districts (60%)
2 green districts (40%)

PURPLE RULES!

Source: https://education.vpap.org/visualization/gerrymandering-simplified/
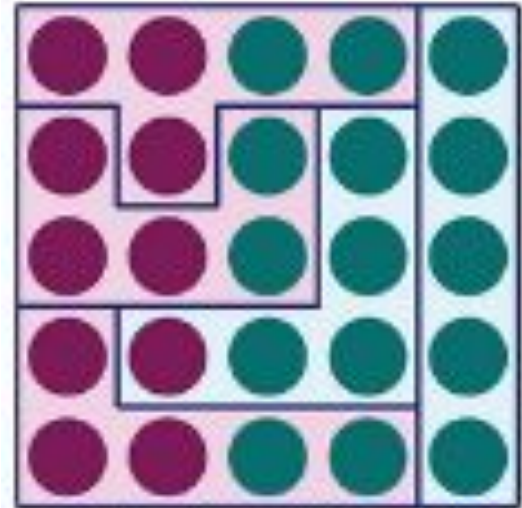
An Interactive Example

New York Times: The Gerrymandering Game

Two big gerrymandering strategies

1. Isolate the opposition => Packing
2. Achieve a majority by a small amount => Cracking

Solutions to the Redistricting Problem

Some non-game theory solutions

Use a neutral third party
- Third party is not invulnerable from partisanship or outside incentives

Require Transparency
- This is assuming that transparent gerrymandering will be punished by voters

Math-Based Redistricting
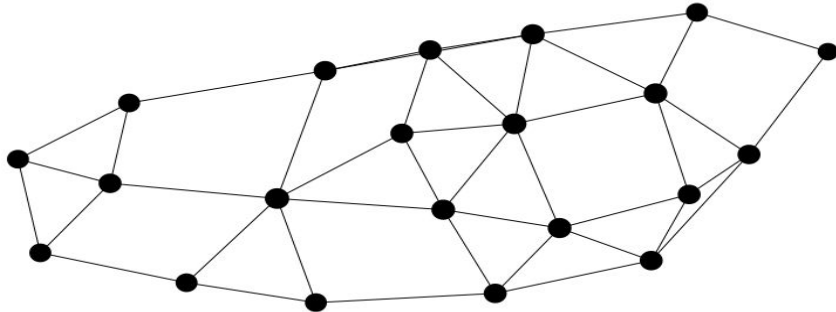
Graph G = (V,E)

Each v represents a population unit

Each e represents a polygonal boundary between population units.

Goal: Create k subgraphs such that

1. The population deviation between subgraphs is minimized
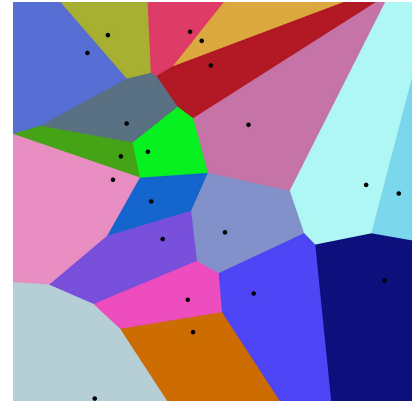2. The compactness of districts is maximized
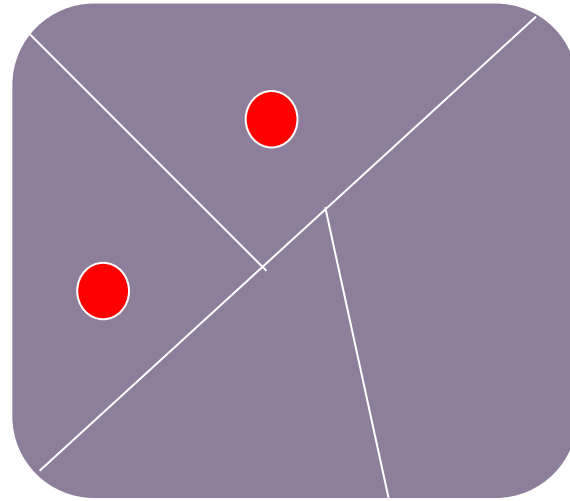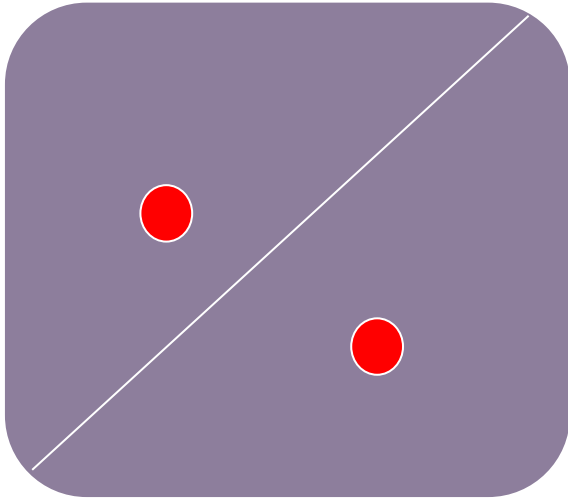
Different approaches:

Partitioning

Voronoi: Choose k centers and assign based on closest center that as not reached a population Threshold

Swapping

Use an existing plan as an input and swap boundary population units.

Automated Congressional Redistricting

I-Cut-You-Choose Algorithm

Based on the cake cutting algorithm.
1. Player 1 divides unfrozen vertices into n-k subgraphs
2. Player 2 chooses one subgraph to freeze
3. Swap places, and repeat until all vertices are partitioned

An end to electoral representation?

Deliberation, cognitive diversity, and democratic inclusiveness: an epistemic argument for the random selection of representatives

- Landemore (2012)

Some scholars have argued for lottery-based representation, an end to career politicians and a focus on cognitive diversity

Sources

Deliberation, cognitive diversity, and democratic inclusiveness: an epistemic argument for the random selection of representatives 2012 -
https://doi.org/10.1007/s11229-012-0062-6

Political redistricting by computer 1972 -
https://dl-acm-org.ezproxy.uta.edu/doi/10.1145/361532.361543

Automated Congressional Redistricting 2019 -
https://dl-acm-org.ezproxy.uta.edu/doi/epdf/10.1145/3316513

A Partisan Districting Protocol with Provably Nonpartisan Outcomes 2017 -
https://arxiv.org/abs/1710.08781