

# Redistricting and Gerrymandering: When is a district map “fair”?

Jeanne Clelland, University of Colorado, Boulder

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# Redistricting and Gerrymandering

For many types of elections (Congress, state legislatures, city councils, school boards, etc.), a geographic region is divided into **districts**, each of which elects one or more representatives.

Every so often, districts are redrawn to reflect changes in population, number of representatives, etc. This process is called **redistricting**.

**Gerrymandering** refers to the practice of drawing legislative districts so that one political party wins a disproportionate number of seats relative to their share of the electorate.

# Redistricting and Gerrymandering

## The original gerrymander:

In 1812, Elbridge Gerry, the governor of Massachusetts, signed a bill that redistricted Massachusetts to benefit the Democratic-Republican party. The Boston Gazette coined the term “Gerry-mander” for a salamander-shaped district in the Boston area.



# Redistricting and Gerrymandering

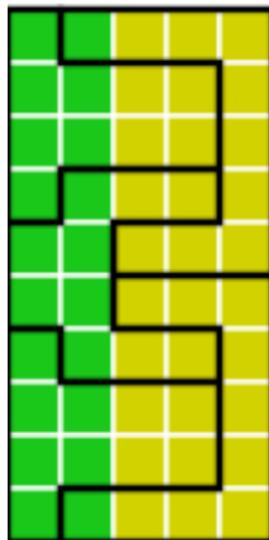
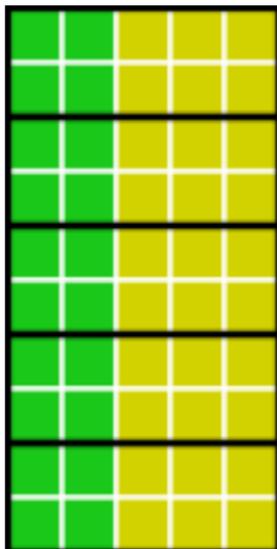
How the lines are drawn can have a big impact on the outcome of an election!



Suppose we have a map with 50 precincts, 60% yellow and 40% green, to be divided into 5 contiguous districts of 10 precincts each.

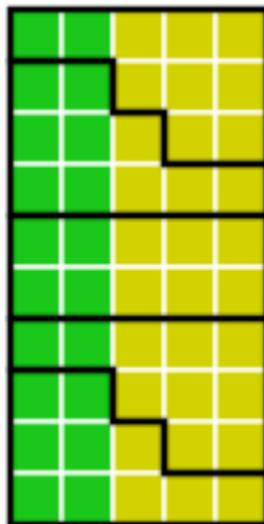
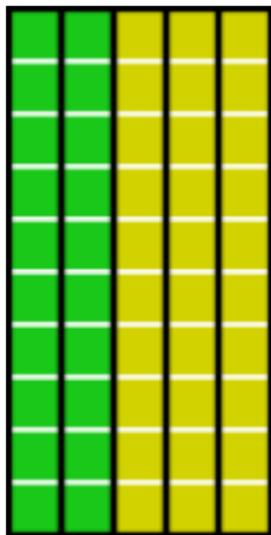
# Redistricting and Gerrymandering

We could draw the districts so that yellow wins them all,  
OR so that green wins 3 out of 5, despite having only 40% of  
the vote:



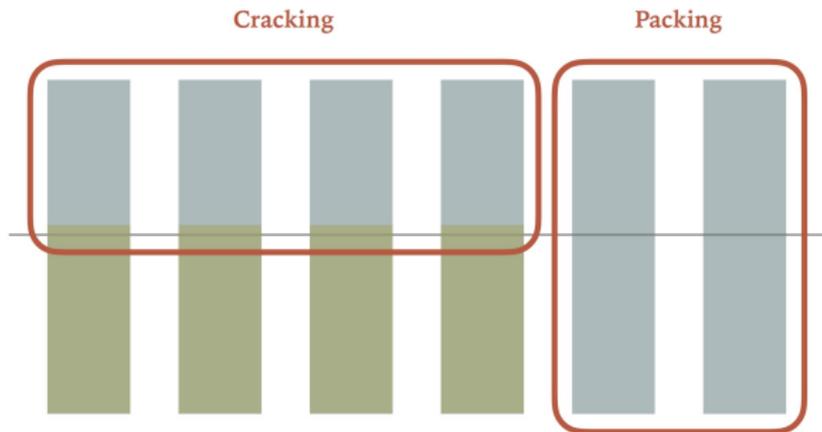
# Redistricting and Gerrymandering

On the other hand, there are multiple ways to draw districts so that the results are proportional to the vote:



# Redistricting and Gerrymandering

The primary strategies for gerrymandering are **packing** and **cracking**:



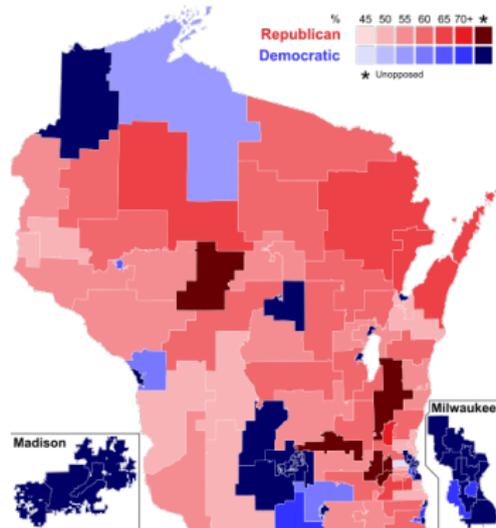
Opponents are **packed** into a few districts where they will have large majorities, and **cracked** in the remaining districts, where the party drawing the districts will have much smaller majorities.

# Redistricting and Gerrymandering

**Example: Wisconsin State Assembly election, 2018**

**Vote share:** 53% Democrat, 45% Republican, 2% Other

**Seat share:** 36 Democrat, 63 Republican

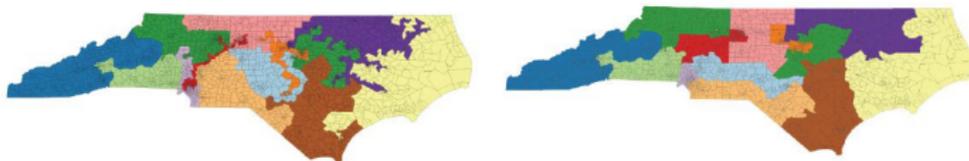


# What makes a map fair?

**Fundamental question:** Can we measure partisan bias in a manner that will satisfy courts, legislative bodies, redistricting commissions, etc.?

Some ideas that have been proposed:

- **Compactness:** Intuitively, we may think that fair districts have “nice” shapes, and strangely shaped, “ugly” districts may be a sign of gerrymandering.



## What makes a map fair?

- **Proportionality:** We might expect fair districts to result in a seat share for each party that is approximately proportional to the share of the vote that party received in the election.
- **Partisan symmetry:** Introduced by political scientists Gary King and Robert Browning in 1987; based on the principle that how one party performs with a certain vote share should be the same regardless of which party wins that vote share.
- **Efficiency gap:** Introduced by political scientists Nicholas Stephanopoulos and Eric McGhee in 2014; based on the idea of “wasted votes” and that a large gap in the percentage of votes wasted by each party may indicate gerrymandering.

# What makes a map fair?

**Problem:** Failures in all of these metrics can result from human geography rather than deliberate gerrymandering.

## **Example: Massachusetts**

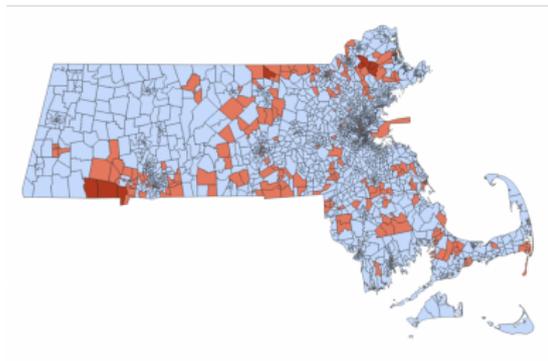
For the last three census cycles, Massachusetts has had 9 or 10 seats in the U.S. House of Representatives. Republicans consistently receive 30% - 40% of the statewide vote, but no Republican has won a Congressional seat since 1994.

Is this due to gerrymandering?

# What makes a map fair?

Moon Duchin, et. al. analyzed precinct-level partisan voting data for 13 statewide elections (Presidential and U.S. Senate) in Massachusetts between 2000 and 2016.

They found that, **even without requiring that districts be contiguous**, there was **no way** to build **any** district from basic units (either precincts or towns) to create a majority-Republican district.



Massachusetts' most Republican precincts 2006 (Image courtesy Moon Duchin)

# What makes a map fair?

We need a new idea!

**Key idea:** The opposite of “gerrymandering” is “**not** gerrymandering,” i.e., drawing maps without incorporating political bias.

So, one way to detect **biased** maps is to try to understand what **unbiased** maps might look like.

# Ensemble analysis

## Main idea:

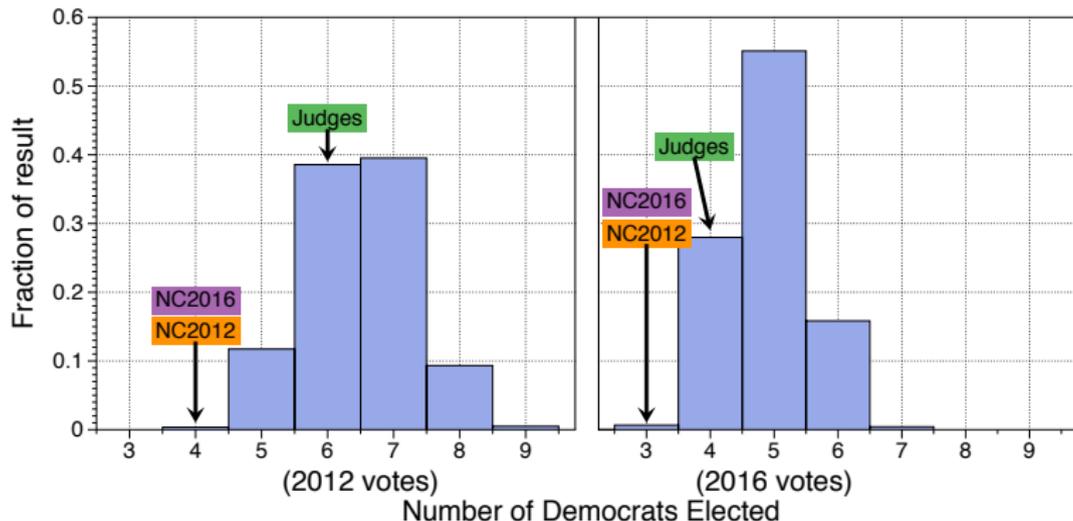
- Create a large collection of thousands—or even millions—of randomly generated valid districting plans (referred to as an “ensemble”), **using no partisan information**.
- For each plan in the ensemble, use real precinct-level voting data to determine what the outcome of an election would have been with the same voting pattern under that plan.
- Create a histogram showing the frequency of various outcomes. This creates a picture of what is **likely** for districts drawn without partisan bias, providing context for any proposed or enacted districting plan for a state.
- If a proposed districting plan is an **extreme outlier** compared to the ensemble, that represents strong evidence of partisan bias.

## Ensemble analysis in action

Dr. Jonathan Mattingly, et. al. performed a detailed ensemble analysis of Congressional districts in North Carolina to evaluate three districting plans:

- the 2012 districting plan drawn by the state legislature, and subsequently thrown out by U.S. District Court as an unlawful racial gerrymander;
- the 2016 replacement plan drawn by the state legislature, which was ruled an unconstitutional partisan gerrymander by a federal court and was the subject of *Rucho v. Common Cause*;
- a plan proposed by a bipartisan panel of retired NC judges.

# Ensemble analysis in action



Mattingly's analysis played a key role in the legal challenges to North Carolina's Congressional districting plan in *Rucho v. Common Cause* (U.S. Supreme Court) and *Common Cause v. Lewis* (Wake County Superior Court).

# Ensemble analysis for Colorado

## Who we are:



Beth Malmskog  
Colorado College



Jeanne Clelland  
CU Boulder



Flavia  
Sancier-Barbosa  
Colorado College



Daryl DeFord  
Washington State  
University

We were hired by the Colorado Independent Legislative Redistricting Commission to conduct ensemble analysis for proposed district plans for the State Senate and State House.

# Ensemble analysis for Colorado

## **Our ensembles:**

For each chamber, we created an ensemble of 2,000,000 plans with the following constraints:

- Districts must have approximately equal population, with no more than 5% deviation between the most and least populous districts in any plan.
- Districts must be contiguous and relatively compact.
- County splits should be minimized, subject to the equal population constraint.
- Counties with population less than 10,000 will never be split.
- Commission-identified COIs in NE Colorado, SW Colorado, the San Luis Valley, and the Roaring Fork Valley will never be split.

## Ensemble analysis for Colorado

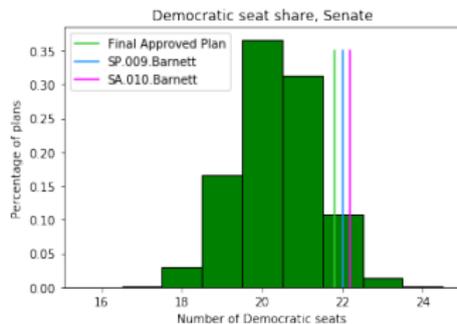
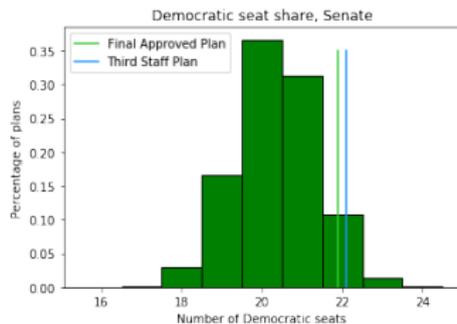
To evaluate partisan outcomes for plans in our ensembles, we used an average of Democratic/Republican vote shares from 8 statewide elections between 2016 and 2020 that were identified by the Commission.

The statewide two-party vote shares for this “composite election” were about 54% Democratic, 46% Republican.

So if the outcome were perfectly proportional, we might expect about 19 Democratic seats (out of 35) for the State Senate and about 35 Democratic seats (out of 65) for the State House.

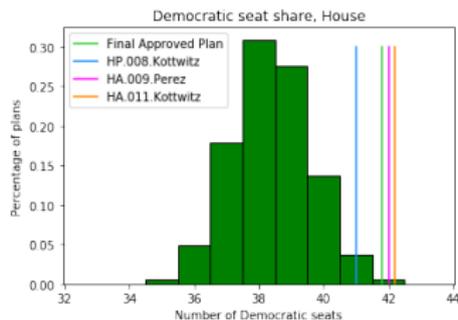
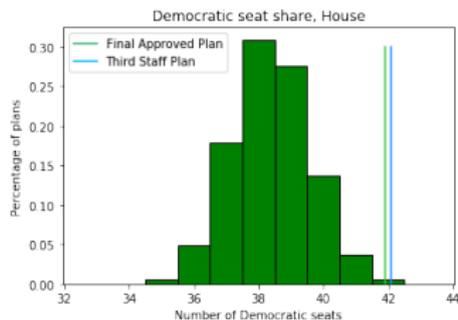
# State Senate

Ensemble results for Democratic seats, with proposed plans for comparison:



- The most common outcomes in the ensemble are 20 or 21 Democratic seats; there is a “winner’s bonus” above the proportional outcome of 19 Democratic seats.
- All the plans under final consideration produced 22 Democratic seats, which is still within the range of “reasonable” outcomes.

Ensemble results for Democratic seats, with proposed plans for comparison:



- The most common outcomes in the ensemble are 38 or 39 Democratic seats; there is a “winner’s bonus” above the proportional outcome of 35 Democratic seats.
- All the plans under final consideration produced 41 or 42 Democratic seats, which makes them **all** look like outliers compared to our ensemble.

## What's going on?

These final House plans were proposed by Commissioners of all political affiliations, and the fact that they **all** produce similar results suggests that the issue may lie with our ensemble rather than with these particular plans.

Some possibilities include:

- **Communities of interest:** Our methods are not sophisticated enough to incorporate all the information about communities of interest that the Commission may have taken into consideration when drawing districts. And especially for House districts, keeping communities whole can have a big impact on partisan outcomes.
- **Competitive districts:** The Commission's efforts to maximize the number of competitive districts may have affected partisan outcomes in neighboring districts in a way that our ensembles were not able to model effectively.

## Final thoughts

- Ensemble analysis is a powerful tool for understanding the political geography of a state and providing **context**, but it should be applied with caution; it may not tell the whole story.
- **Map-drawing is fundamentally a human endeavor;** there will never be a “perfect” map, and computers should never have the final say!