# Gerrymandering

Redistricting the Congressional Map of New Jersey

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This project involves redistricting the 2022 Congressional map for New Jersey to create a distinct map that uses gerrymandering techniques to provide an advantage to a particular party, community, or region. This modified map applies various algorithms and functions to manipulate district boundaries to an 'unfair' effect while remaining inconspicuous. The algorithm used in this assignment maintains that each district's population falls within ±10% of the ideal district size (total state population divided by number of districts), and therefore ensures a **balanced population** regardless of other manipulations.

Goals

Our team aimed to create the appearance of a 'fair map' by focusing on achieving **competitiveness**. However, **minority representation**, **proportionality,** and **compactness** was neglected and diminished as compared to the 2022 Congressional. What resulted was overall different outcomes for **population balance**, **contiguity**, and **compactness** between the two maps.

Bigger is better, for the ratings above.
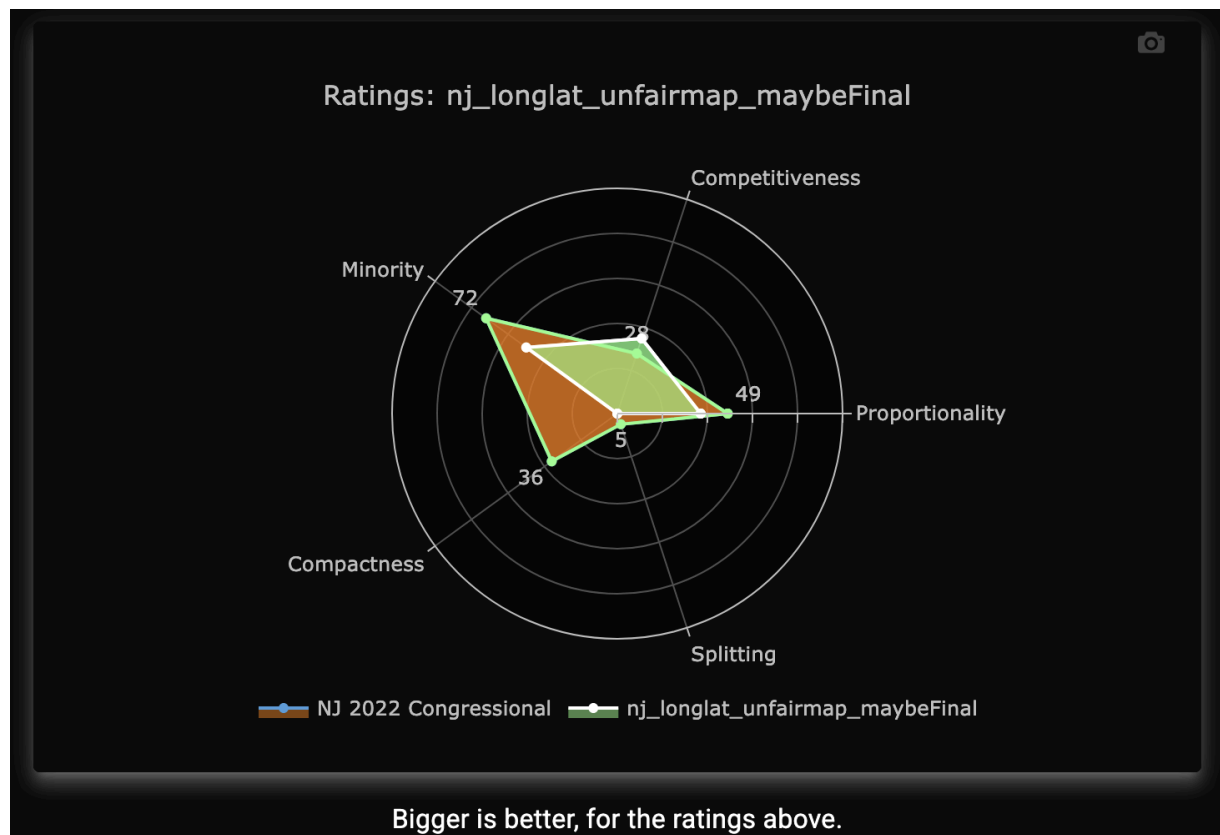
Map Name	Proportionality	Competitive	Minority	Compactness	Splitting
Current – nj_longlat_unfairmap_maybeFinal	37	35	50	0	0
Compared – NJ 2022 Congressional	49	28	72	36	5

Comparison of Metrics:

1. **Proportionality**

Proportionality refers to how closely the share of seats won by a political party in an election matches the share of the vote that party received across the state. A map is **more proportional** when the distribution of seats reflects the statewide vote more accurately.

- ○ **Original (NJ 2022 Congressional)**: 49

- ○ **Redistricted (Unfair)**: 37

The unfair redistricted map scores lower in proportionality, meaning that it does a worse job of reflecting the actual population distribution in each district. This implies a less fair representation of the state's demographics, and therefore less balanced political representation.

Original Map: Typically, the original map will have relatively balanced proportionality, meaning that districts will roughly represent the population proportions of political parties or communities.

Unfair Map: The map has reduced proportionality.

2. **Competitiveness**:

Competitiveness measures how likely it is that elections in a map's districts will be closely contested between parties—where neither party has a guaranteed win. A more competitive map encourages voter engagement and fairer outcomes. The **competitiveness metric** represents the **percentage of districts** that fall into a competitive range, based on **probability distributions** of partisan vote share.

- ○ **Original (NJ 2022 Congressional)**: 28

- ○ **Redistricted (unfair)**: 35

The competitiveness score is much higher in the redistricted map, indicating less party dominance or less district-level electoral competition.

Original Map: The original map has districts that are relatively competitive.

Unfair Map: This gerrymandered map increases the competitiveness of the map, so multiple parties or candidates have a better chance of winning in each district.

3. **Minority Representation**:

Minority Representation evaluates how well a redistricting map provides minority communities with a meaningful chance to elect candidates of their choice.

- ○ **Original (NJ 2022 Congressional)**: 72

- ○ **Redistricted (Unfair)**: 50

The redistricted map has a significantly lower minority representation score.

Original Map: The original map scores very high on Minority Representation. It may achieve this through ensuring that minority voting power is preserved in a district or group of districts, i.g.: "opportunity districts".

Unfair Map: The unfair map scores much lower in terms of Minority Representation, but not so low as to be notably bad in it. The low score is possibly due to "cracking" minority communities (splitting them across multiple districts through redistricting).

4. **Compactness**:

Compactness measures how **geometrically tight and regularly shaped** each district is. More **compact districts** are preferred because they're easier to understand, appear less manipulated, and tend to keep communities together. The compactness of a map is relevant for ensuring that a redistricted map is inconspicuous and does not seem "obviously" gerrymandered.

- ○ **Original (NJ 2022 Congressional)**: 36

Original Map: The original map has a much higher compactness score, which indicates that its districts are more geographically and visually coherent. The lower compactness in the redistricted map can be identified in its more irregular shapes.

Unfair Map: The compactness score of the unfair map is very low due to certain goals in redistricting.

Redistricted Unfair Map
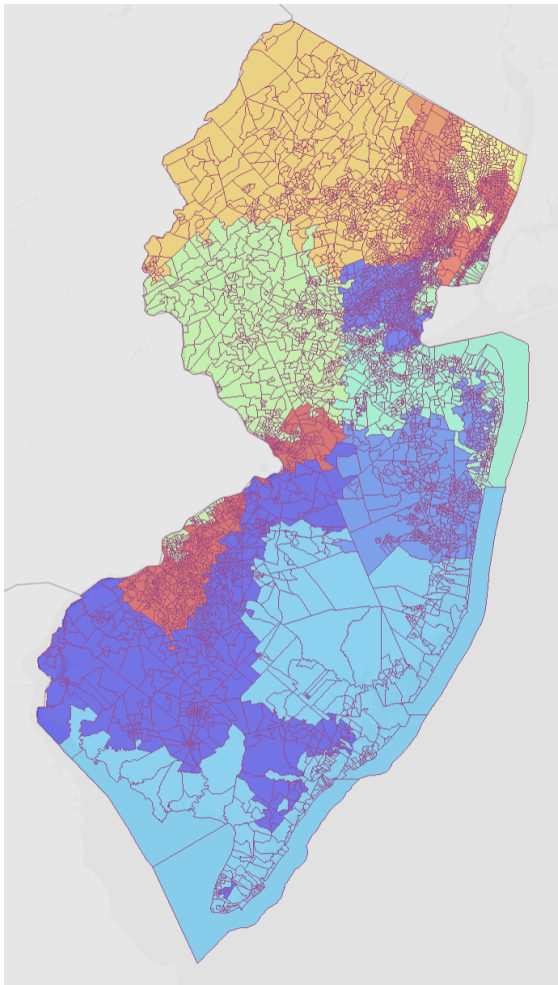
5. **Splitting**:

Splitting refers to how often political boundaries—like counties or cities—are divided across multiple congressional districts. A map with **fewer splits** better preserves community integrity and makes representation clearer and more accountable.

○ **Original (NJ 2022 Congressional)**: 5

○ **Redistricted (Unfair)**: 0

The original map has some splitting of counties or municipalities, while the redistricted map eliminates these splits entirely. This is a positive aspect of the redistricted map, as it could lead to more cohesive districts with stronger community identities.

Strengths of the Redistricted Map:

- **Contiguity & Balanced Population:** Each district's population falls within ±10% of the ideal district size. Electoral districts are physically adjacent, achieving adequate contiguity.

- **No Splitting**: Eliminating splits in the redistricted map leads to more cohesive districts that may better reflect the interests and identities of local communities.

Weaknesses of the Redistricted Map:

- **Weaker Minority Representation**: The redistricted map has a notable drop in minority representation, which could be seen as a step backward if the goal is to enhance political power for historically underrepresented groups. However, it isn't a huge drop.

- **Decreased Competitiveness**: While the change in competitiveness is minor, the slight reduction could lead to fewer competitive elections, which might lessen voter engagement and diminish political diversity in some districts.

- **Lower Compactness**: The redistricted map's lower compactness results in districts with more irregular shapes. Could increase suspicion of gerrymandering.

Conclusion

The redistricted map has notable strengths in avoiding splits, which contribute to more representative and cohesive districts. However, its lower compactness, reduced minority representation, and slightly lower competitiveness could present significant drawbacks, particularly if ensuring fair minority representation is a priority. This works well for a map that is purposefully designed to be unfair. If we had more time, we could have better disguised how the unfair map was biased against minorities and also increased its compactness. This might have involved increasing the minority representation enough to appear like it makes an impact, while instead the map will normally not end up without a predetermined result. In terms of our algorithm, we could add a minority_share weight to the map and tweak the results to get a higher score.