Once in a Decade Opportunity to Address Gerrymandering

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Somersille Math Education Services

Outline

I. The problem: Gerrymandering

II. The New Metric: Geography and Election Outcome (GEO) metric to measure gerrymandering

Marion Campisi, Thomas Ratliff, SS, Ellen Veomett

III. “Out of the box ideas”

Other (Better?) Voting Methods that don’t involve districting

Voting Rights Lawsuit Example

Problem: Extreme Gerrymandering
Opportunity:

May 2021: Census results released

13 states gained or lost a seat

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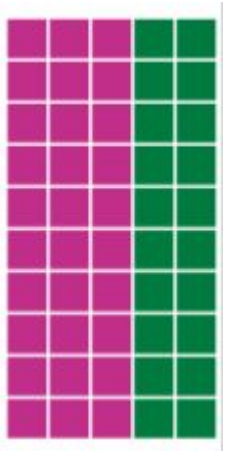
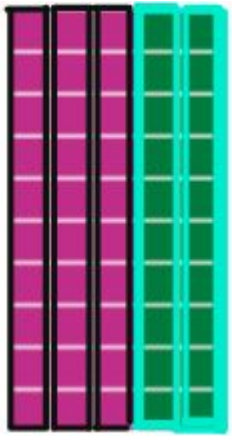
Districting



50 voters to be divided into 5 districts of 10 people each

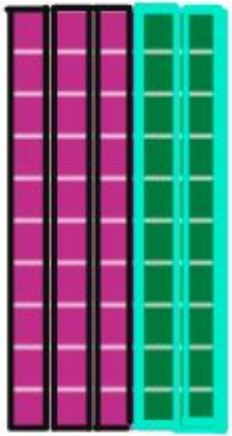
Proportional Maps



3 pink districts

2 green districts

Proportional Maps



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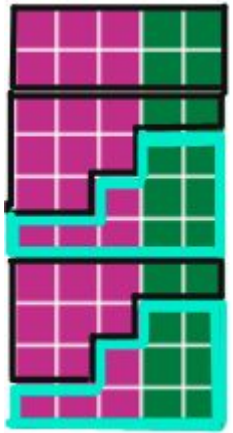

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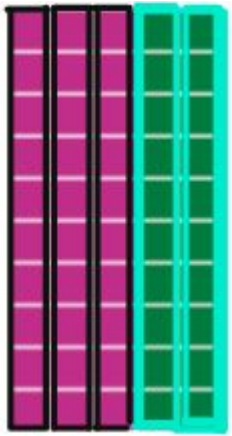
Proportional Maps*



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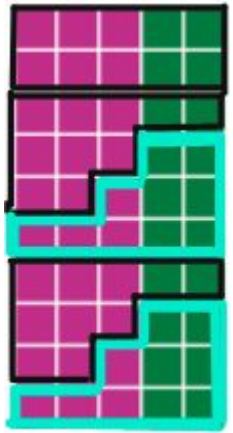

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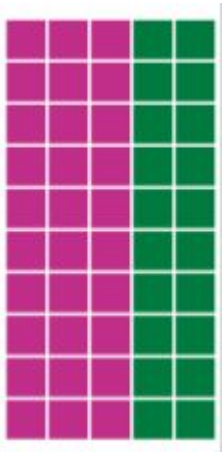
*There's no rule that maps need to be proportional

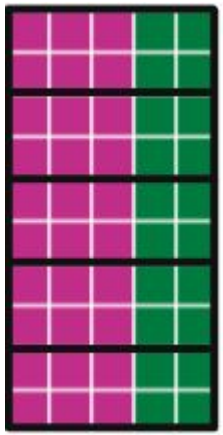
Just Equal Population

Non Proportional Maps



Non Proportional Maps

Cracking



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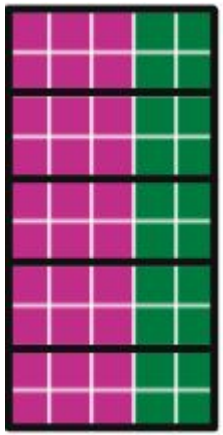
Pink wins all

Non Proportional Maps

Cracking



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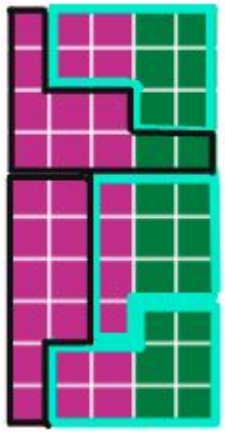

Packing and Cracking

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3 green

Green wins majority

History: 1812 Gov Elbridge Gerry

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*Gerrymander

Is it Illegal?

In the 20th century and afterwards, federal courts have deemed extreme cases of gerrymandering to be unconstitutional but have struggled with how to define the types of gerrymandering

Is this Illegal?

Voting Rights Act 1965 “prohibits racial discrimination in voting”.

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Amendments 1970

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Preventing 2 types of discrimination

Vote Denial: Bans voting qualifications or prerequisites to vote based on color.

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Amendments 1970, 1975, 1982, 1992, 2006

Preventing 2 types of discrimination

Vote Denial: Bans voting qualifications or prerequisites to vote based on color.

Vote Dilution: Dilute the effectiveness of one’s vote. Prevent racial minorities from electing their preferred candidates.

Thornburg v. Gingles 1986

Gingles Conditions For Voting Rights Lawsuit Claims

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Thornburg v. Gingles 1986

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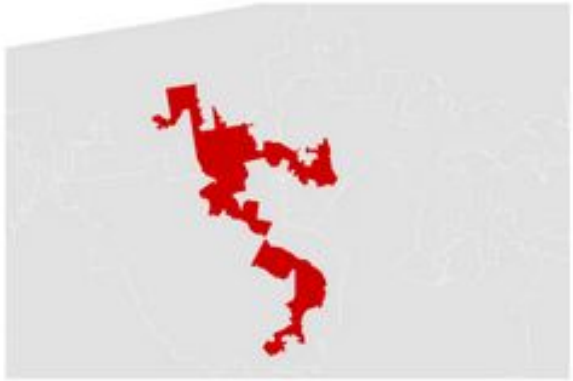
Remedy for VRA lawsuits: Draw Majority Minority Districts

“Crimes Against Geography”

North Carolina

1st District

4th District



12th District

“Crimes Against Geography”

Maryland’s 3rd District

“The Praying Mantis”

“Crimes Against Geography”

Texas

33rd District

35th District

“Upside Down Elephant”

“Crimes Against Geography”

Pennsylvania 7th District

“Goofy Kicking Donald Duck”

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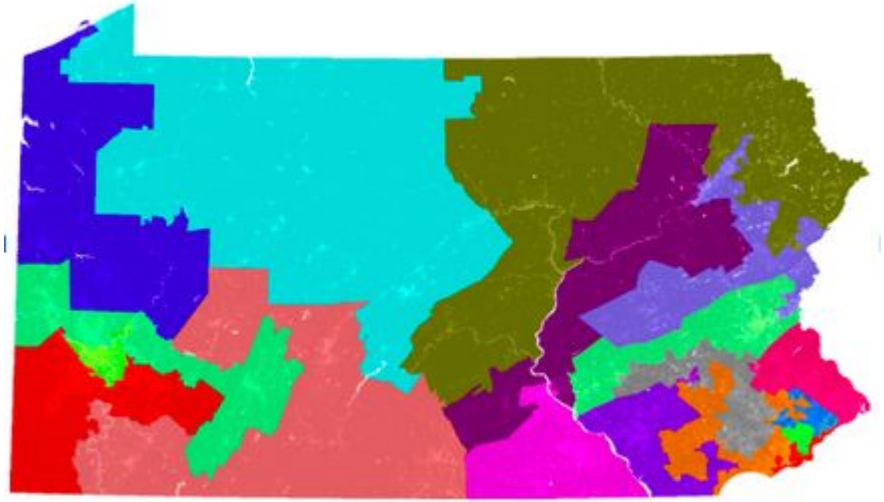


“Crimes Against Geography”

Pennsylvania 7th District

“Goofy Kicking Donald Duck”

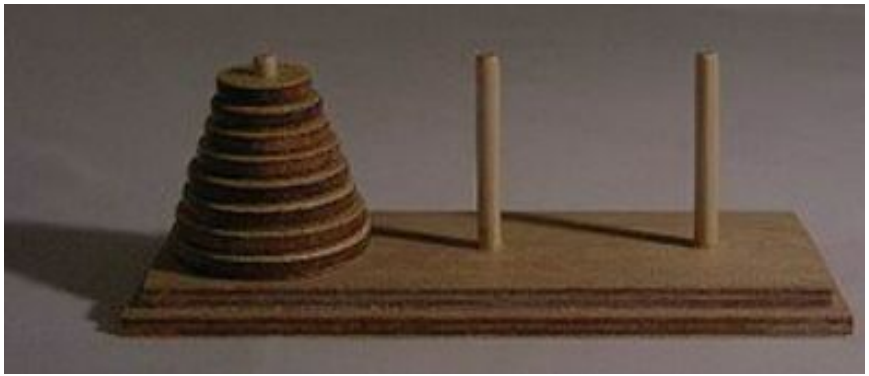
Why it’s so problematic

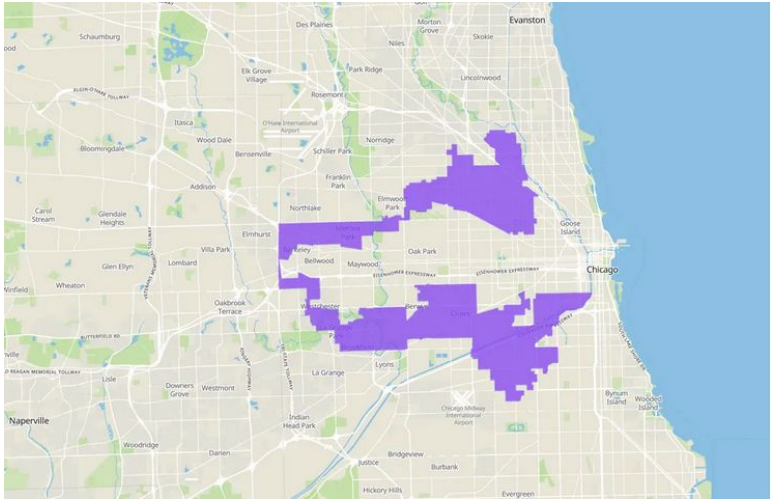
Politicians choosing their voters

Vs.

Voters choosing their elected officials

Why I Got Involved In Redistricting





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4) Turns out fair is a subjective notion. It's an over-constrained problem

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Needed team building, coalitions, allies. Community members, Politicians, Lawyers and lawmakers, Social Scientists, as well as Mathematicians...

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All types of mathematicians

Bring your brand of math to the problem

Opportunity:

Measuring Gerrymandering

Currently Popular Metrics

Map Data (Compactness)

Election Data

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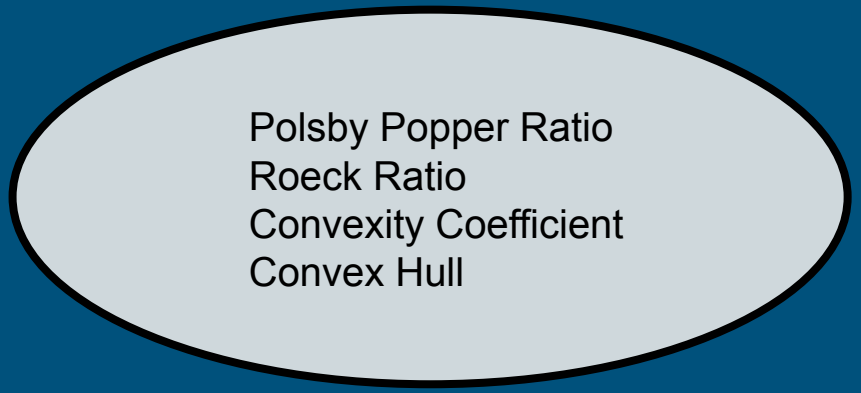


Currently Popular Metrics

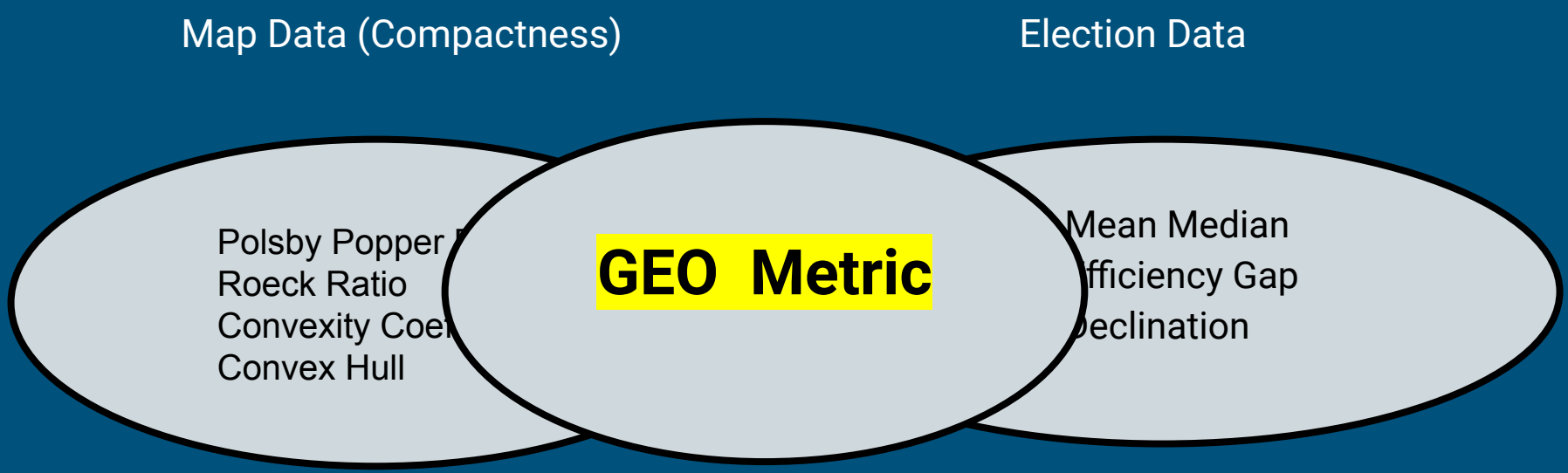
Map Data (Compactness)

Polsby Popper Ratio
Roeck Ratio
Convexity Coefficient
Convex Hull

Election Data

Mean Median
Efficiency Gap
Partisan Bias
Declination

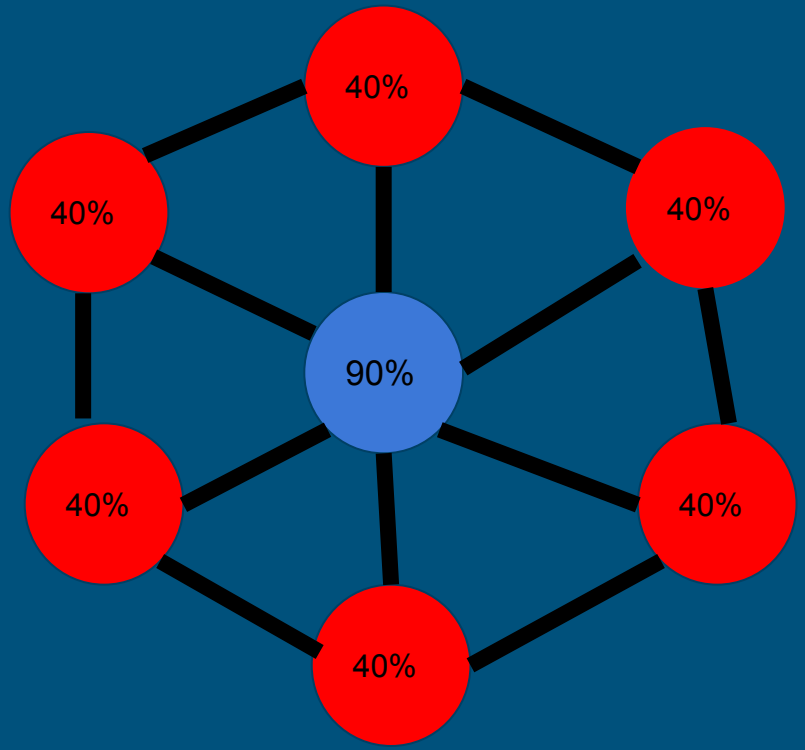
NEW: Geography and Election Outcome Metric



Uses Both Map Data and Election Data

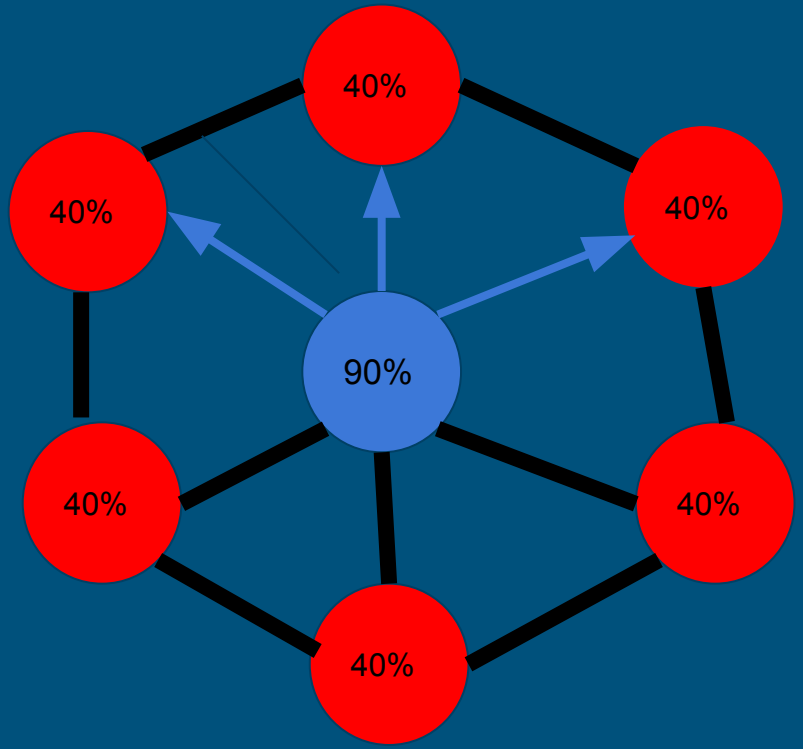
Marion Campisi, Thomas Ratliff, SS, Ellen Veomett

Sample of how GEO measures gerrymandering



Percentages of Blue vote share in each district

Sample of how GEO measures gerrymandering



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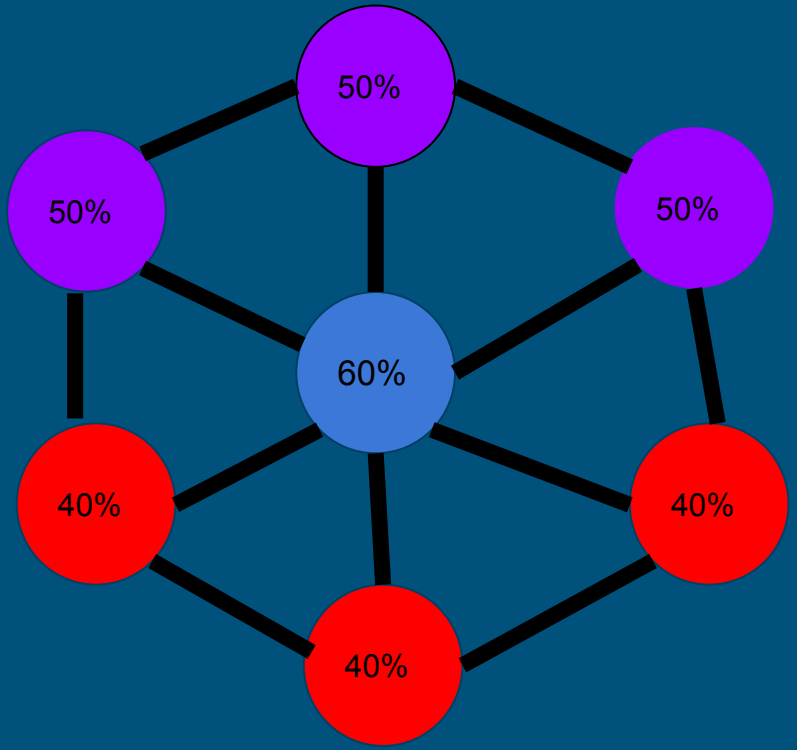

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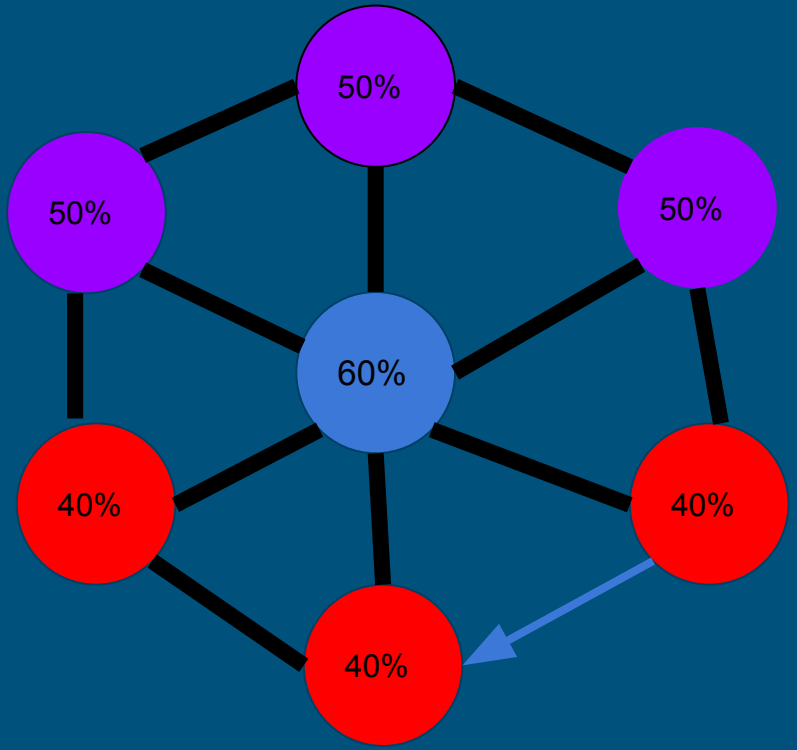

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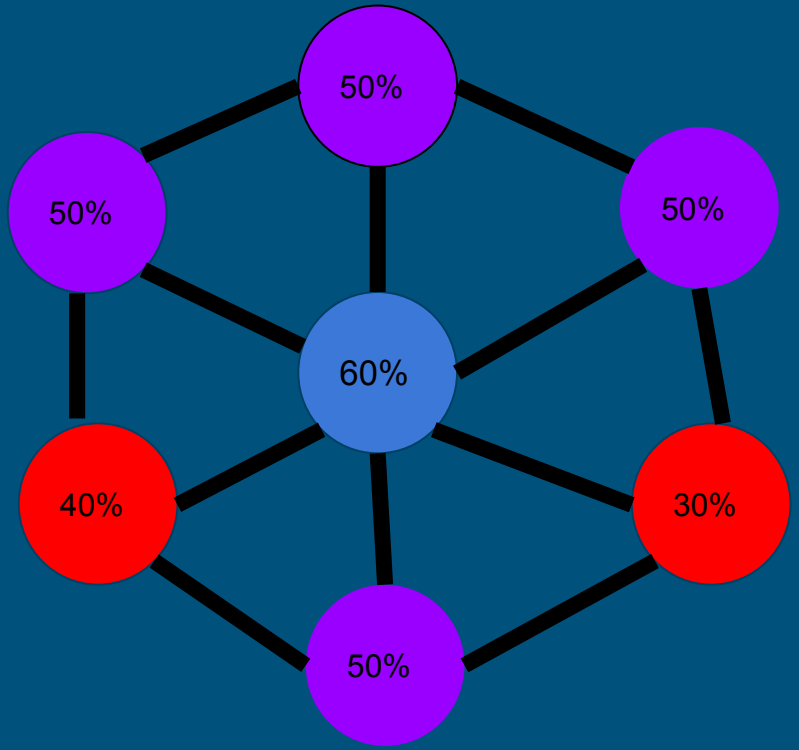

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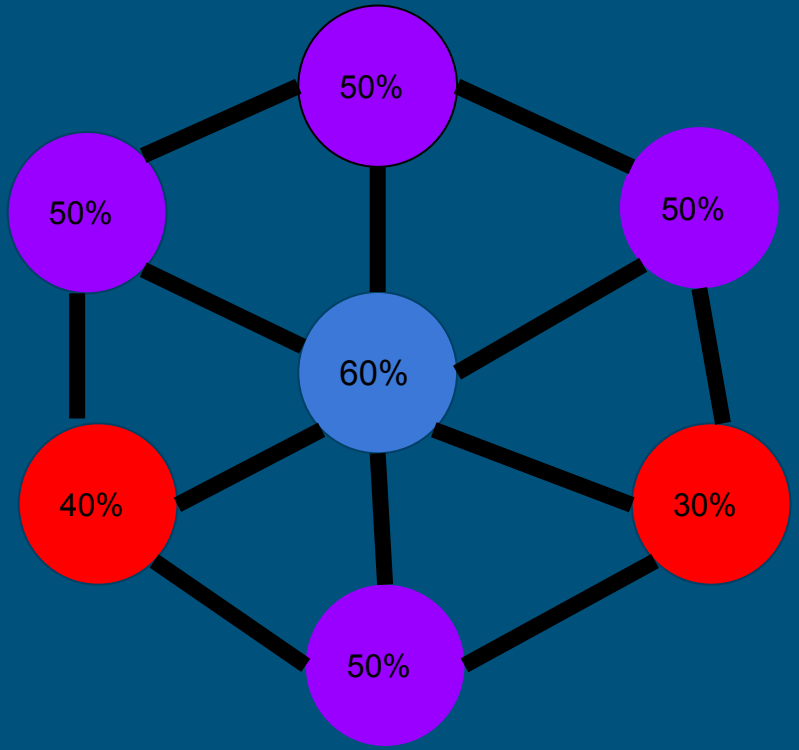
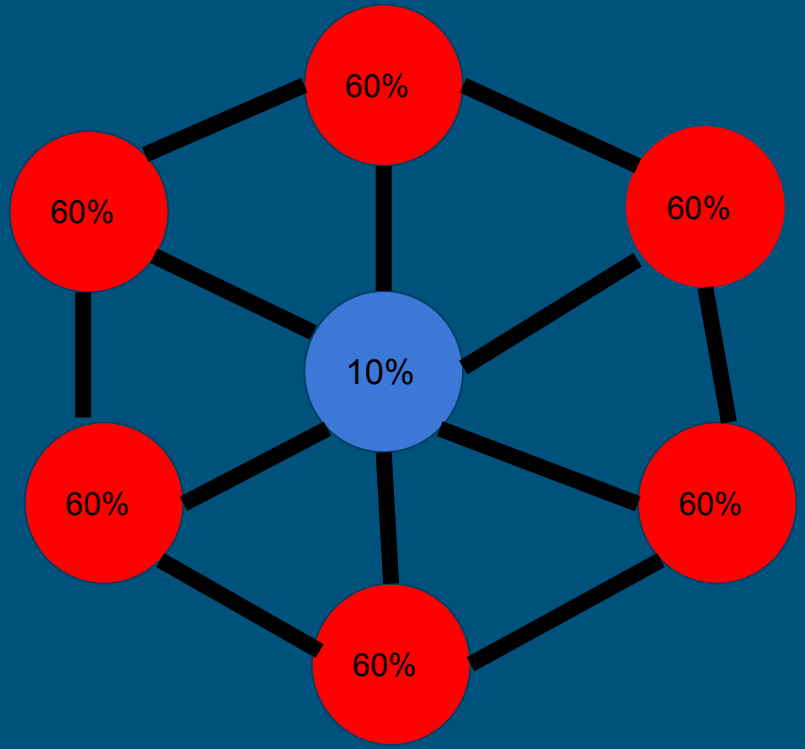


Blue Party GEO Metric Score 4

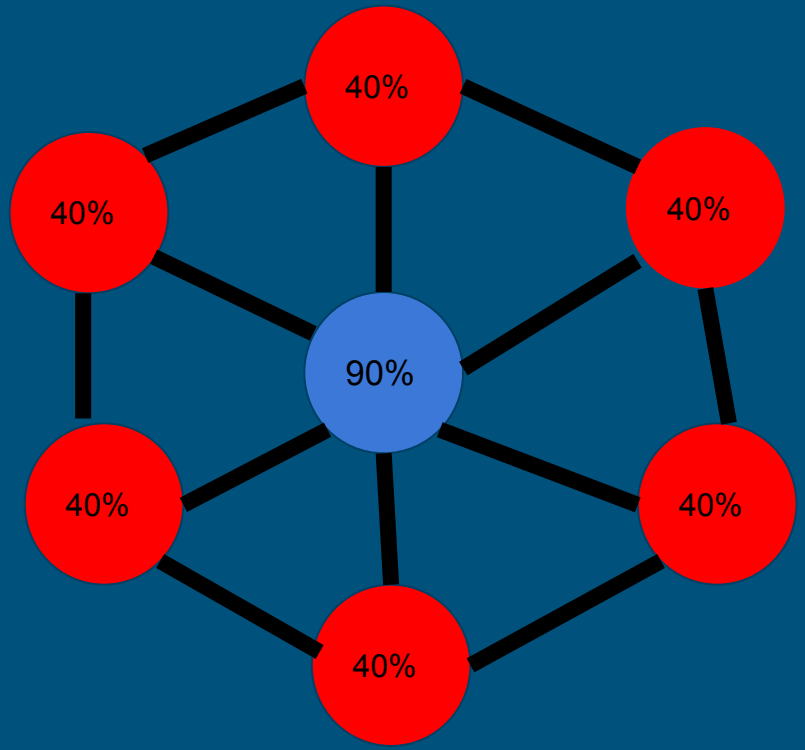
Sample of how GEO measures gerrymandering



Percentages of Red party vote share in each district

Red Party GEO Metric Score 0

Sample of how GEO measures gerrymandering



Blue Party GEO Metric Score 4

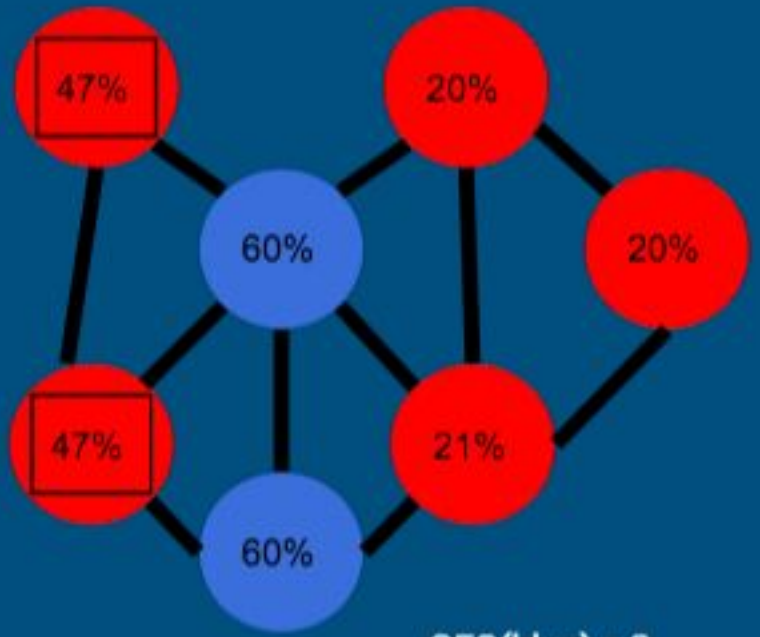
Red Party GEO Metric Score 0

Why is GEO More Effective?

Gives two score for the whole District Map - One for each party

Also identifies potentially packed and cracked districts

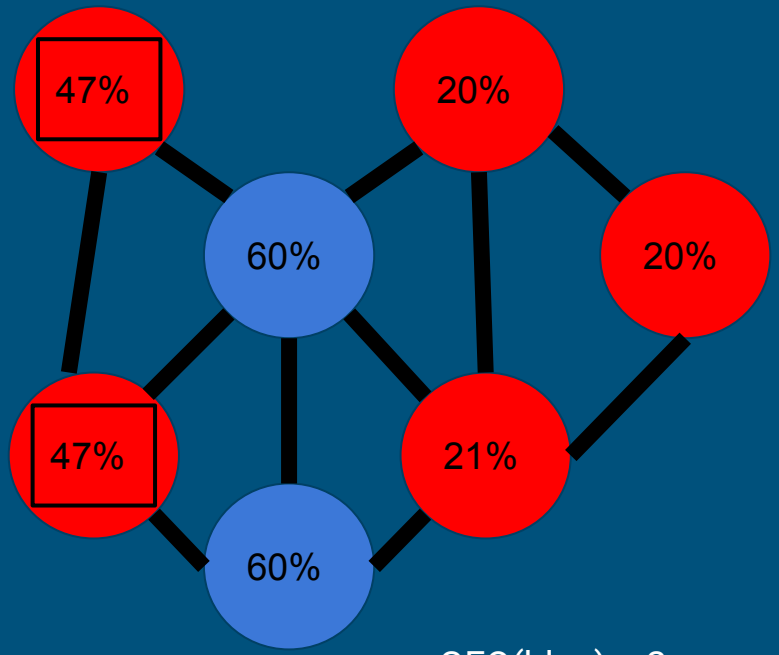
Why both Geography and Election Outcome Data?



GEO(blue) = 2

Why both Geography and Election Outcome data?

Any metric using only Election Outcome can't distinguish between these two maps.
But we're more likely to suspect the left one is the result of gerrymandering.



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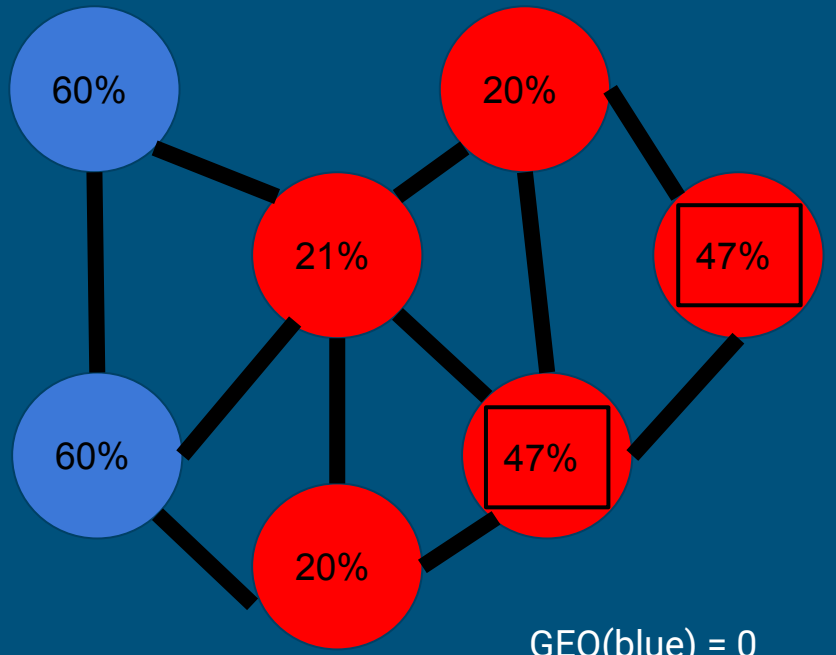

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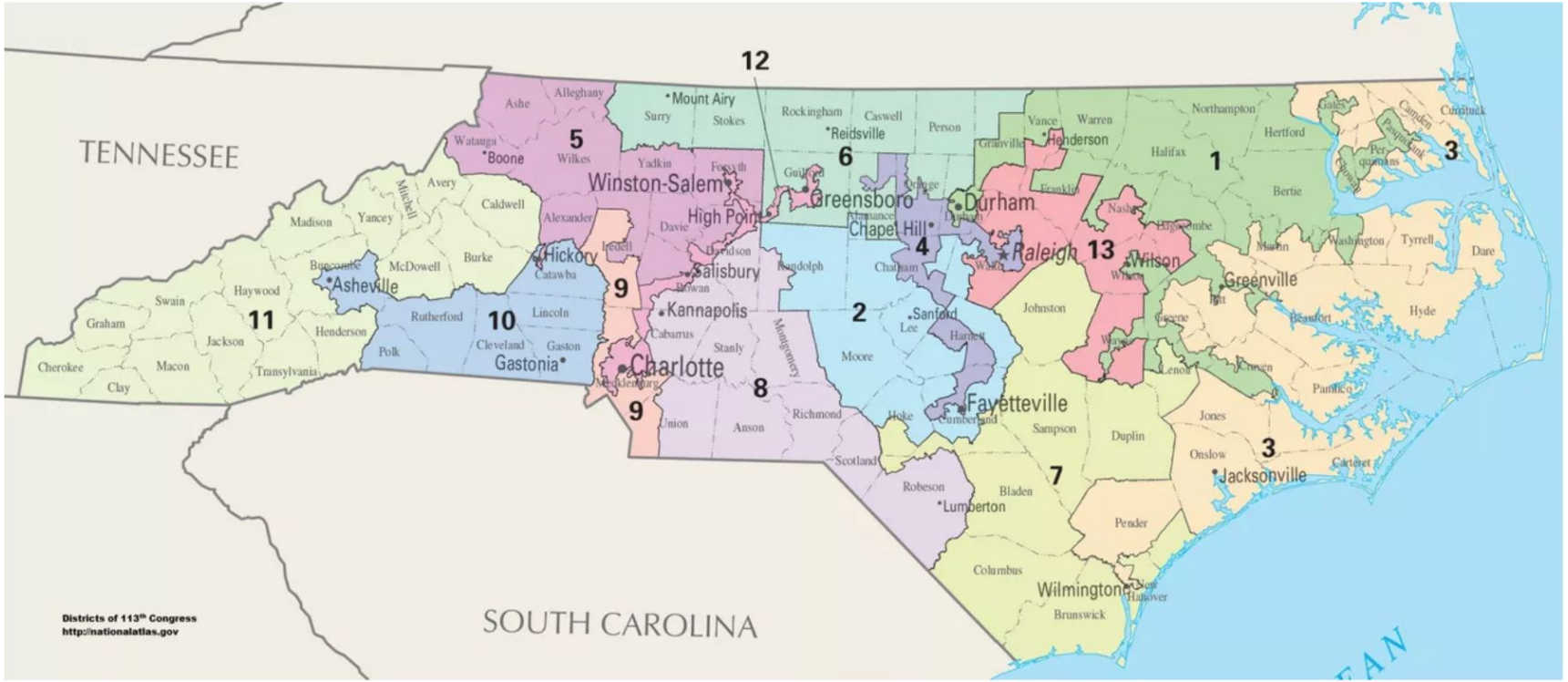
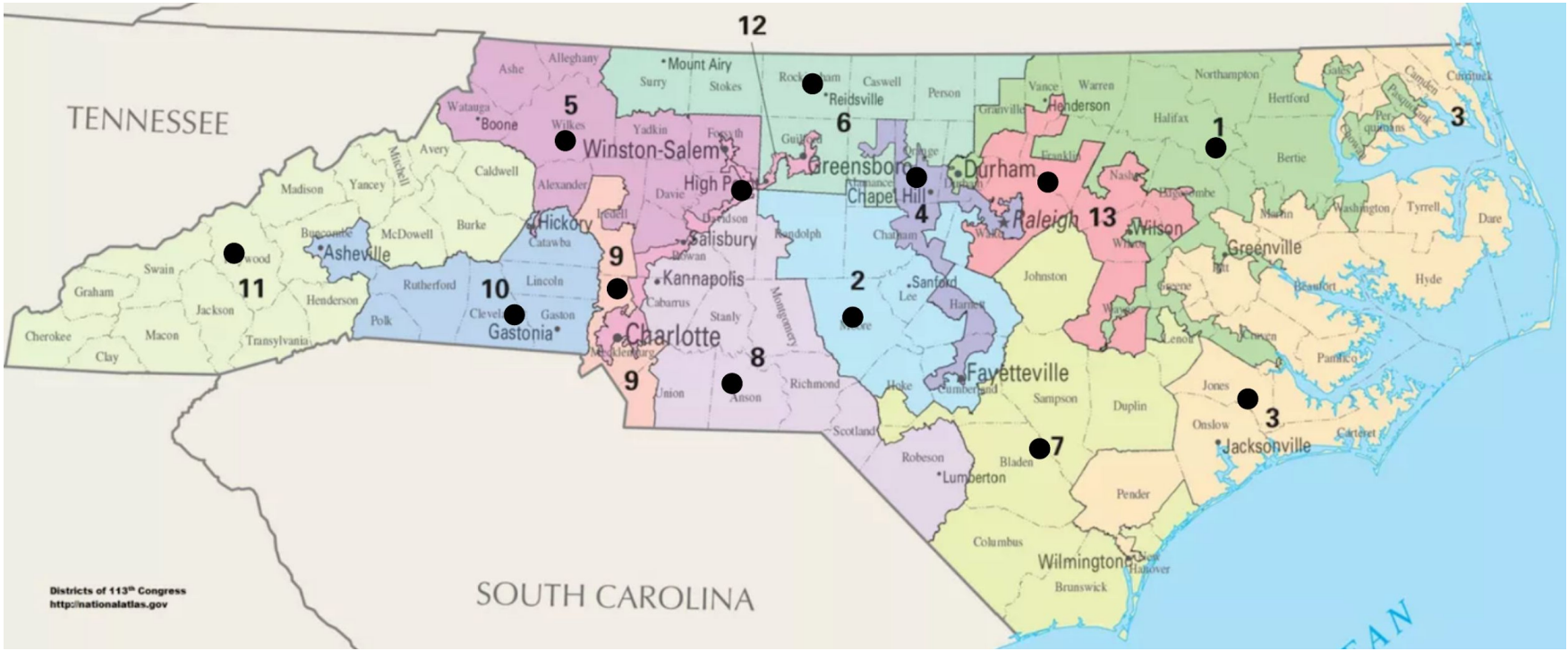
NC

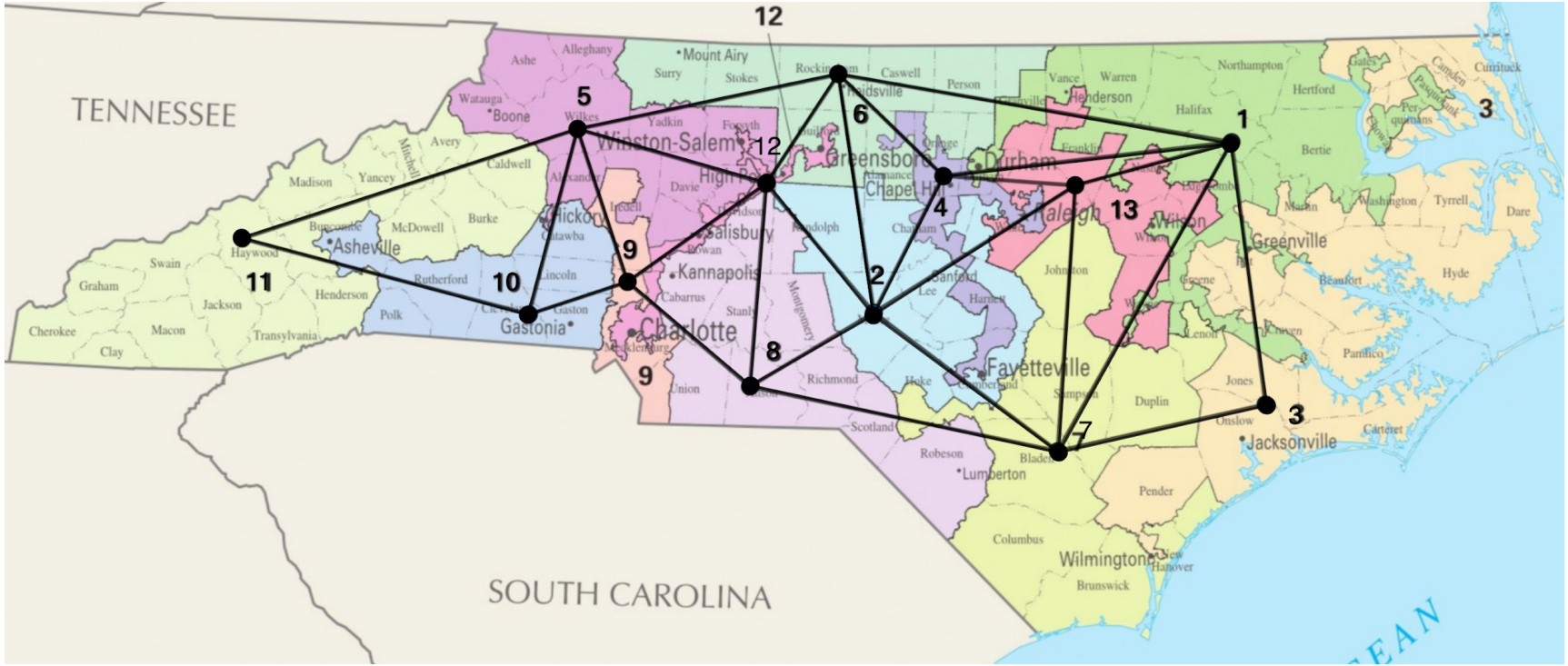
Start with a map of districts



Districts turn into vertices

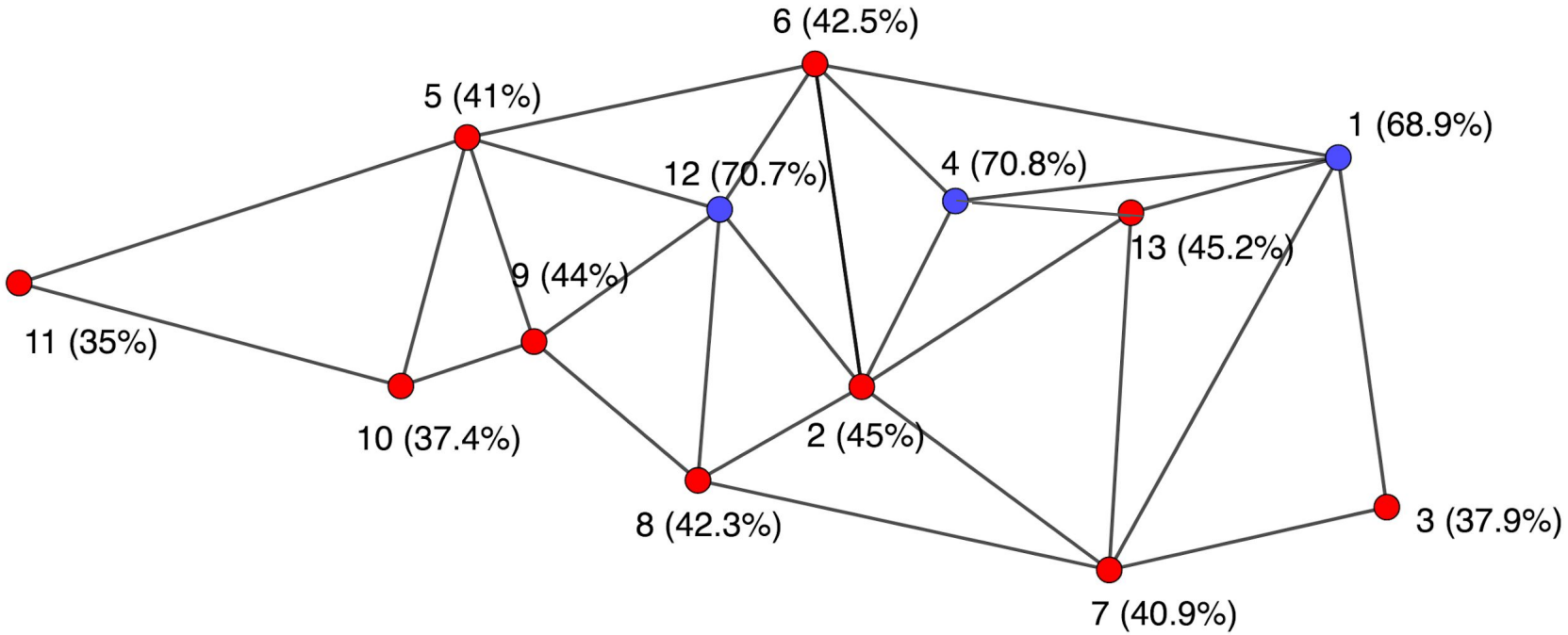


If two districts share a boundary, their corresponding vertices have an edge between them

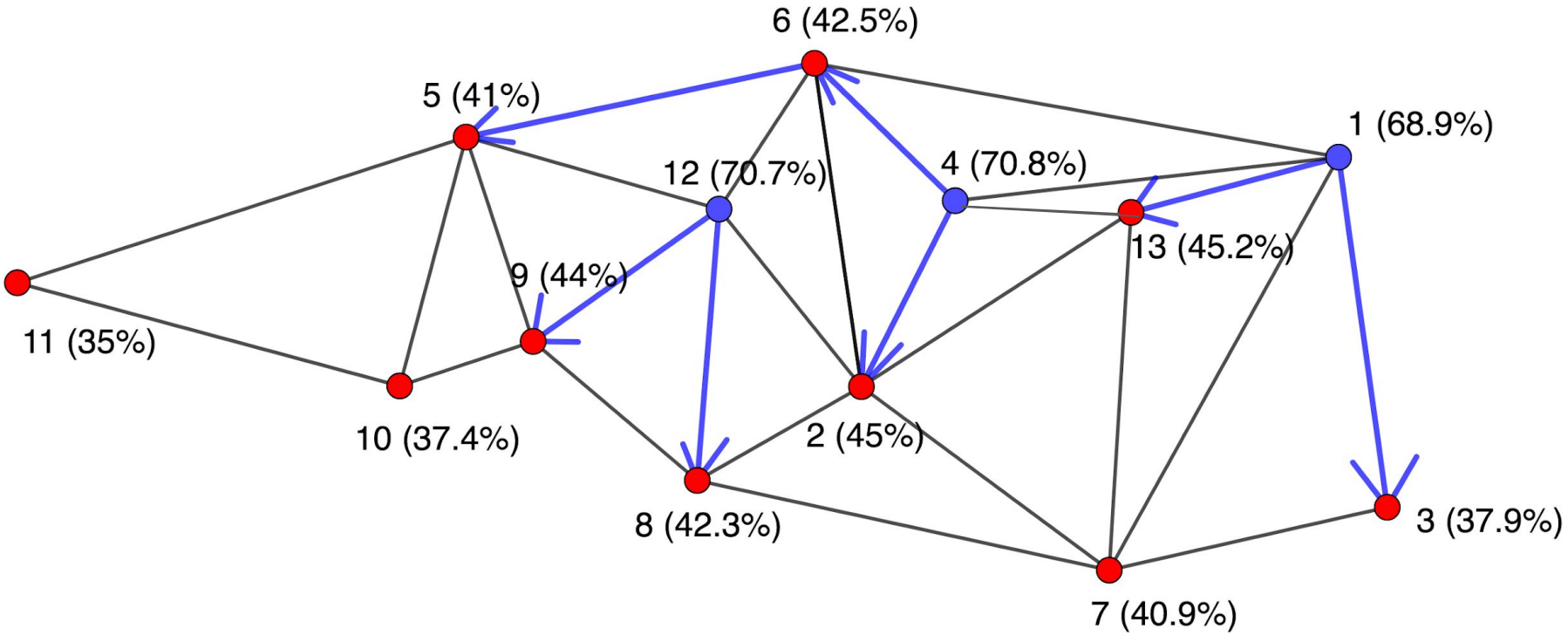


Big Idea

Votes are exchanged in a reasonable way between districts that share a boundary to see if Dem. party can win more seats

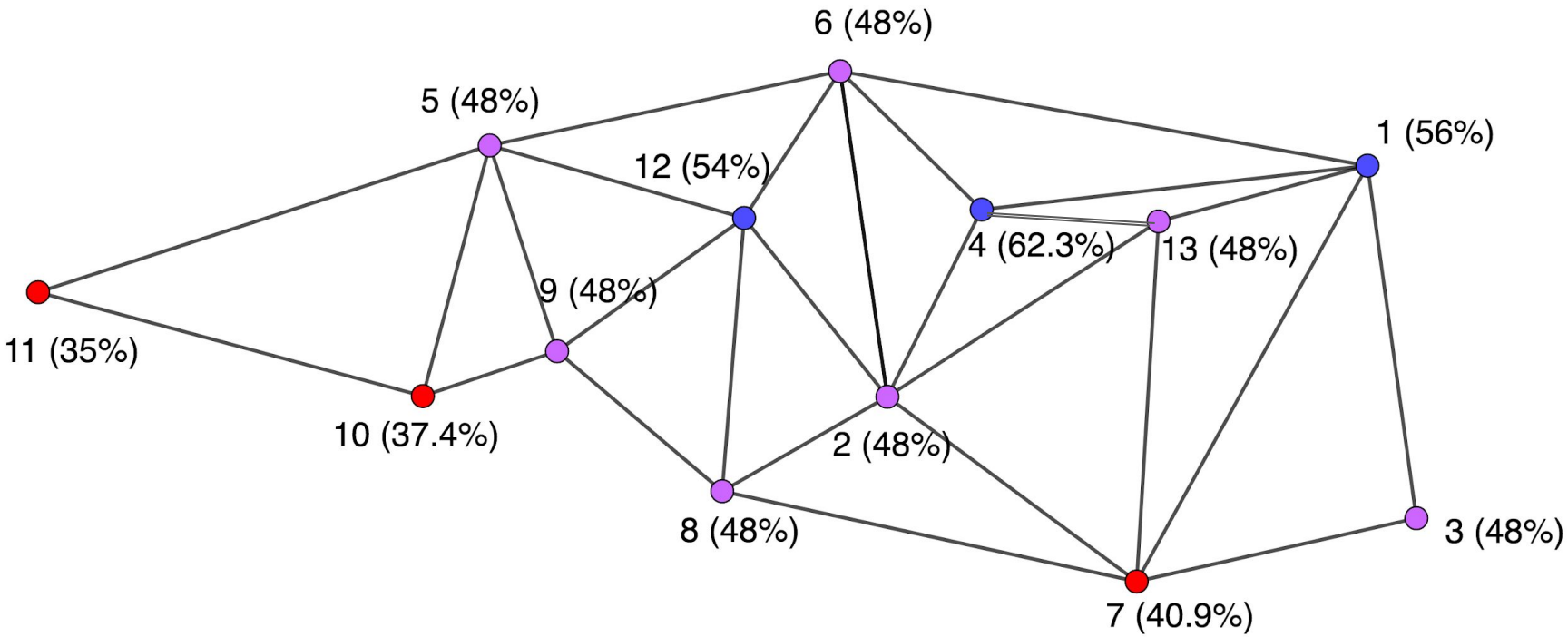


Potential Vote Movement: Democratic Party



NC Example

GEO(Dem.) = 7



Ensembles

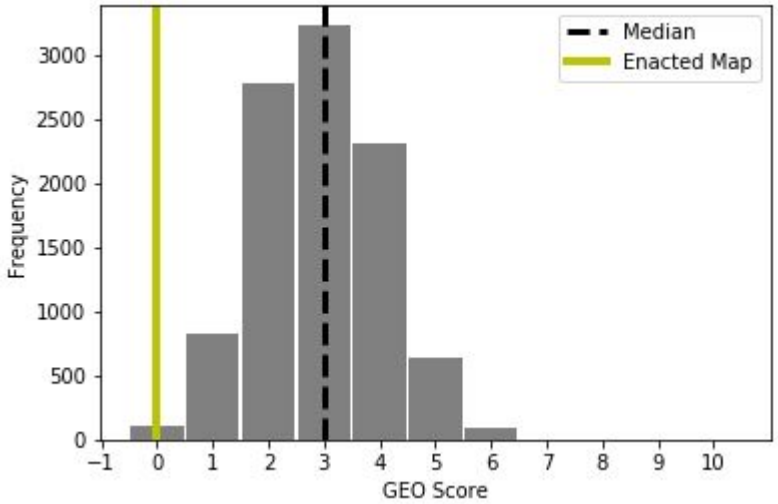
Generate tens of thousands or hundreds of thousands of maps

Satisfying conditions

Compare the proposed or enacted map to thousands of “similar” maps.

GEO Analysis: Pennsylvania Senate Election 2016

Republican:



Not Possible to Improve Their Outcome

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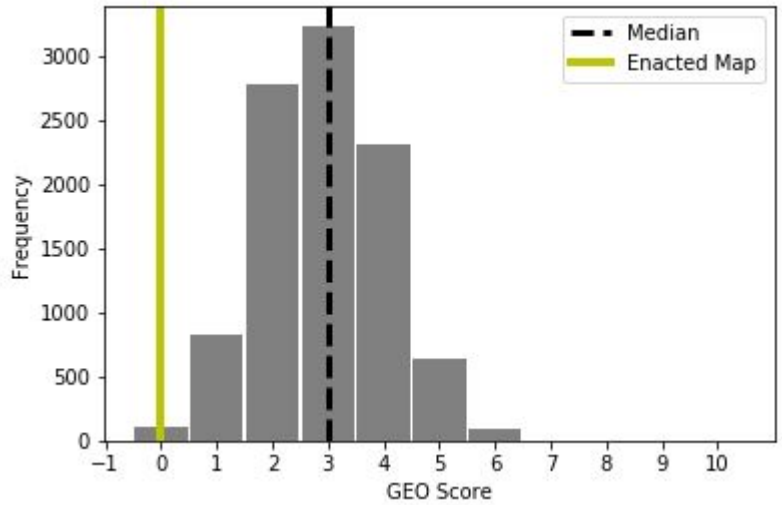

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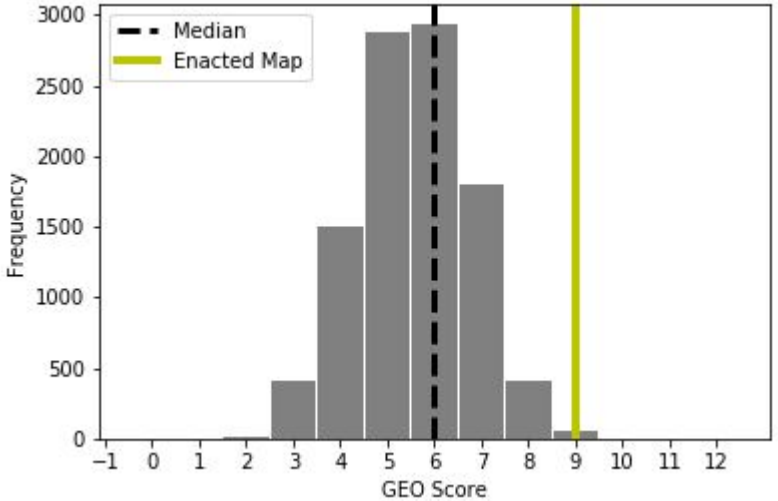
Democrat:



A lot of Potential to Improve Outcome

GEO Analysis: North Carolina Presidential Election 2016

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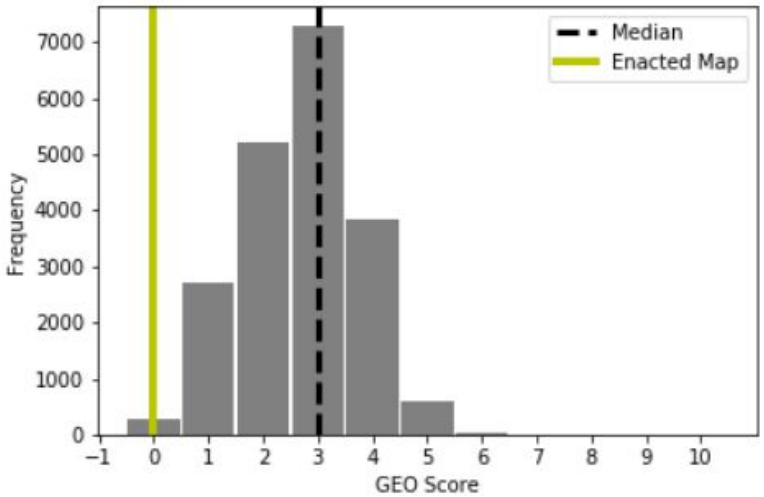

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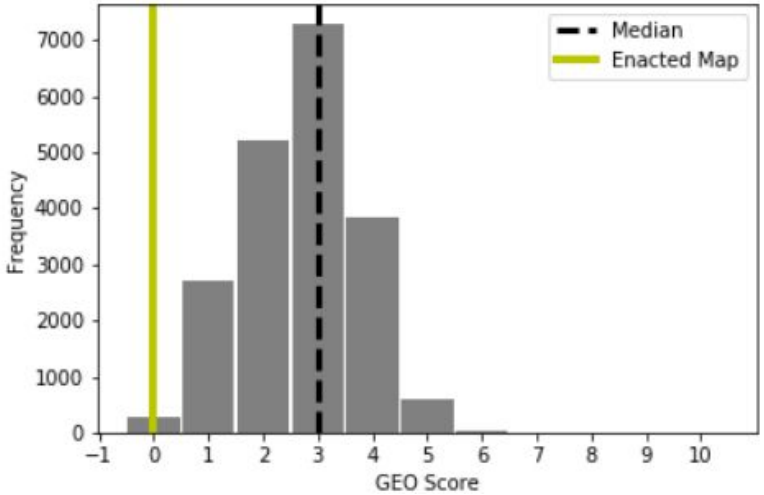

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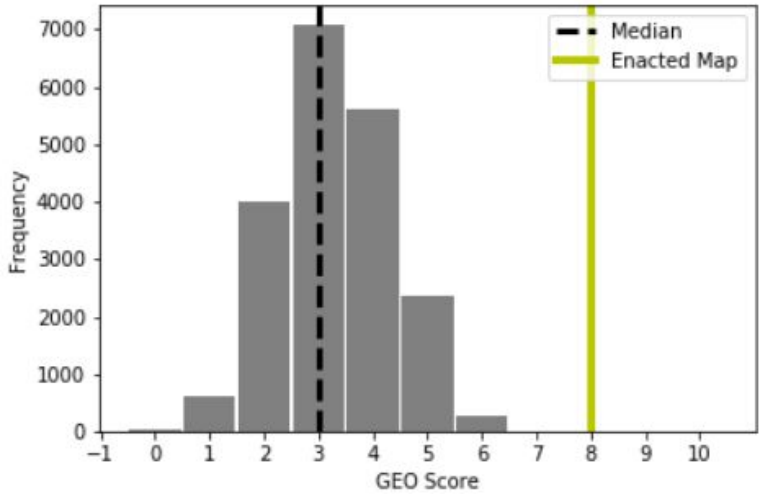
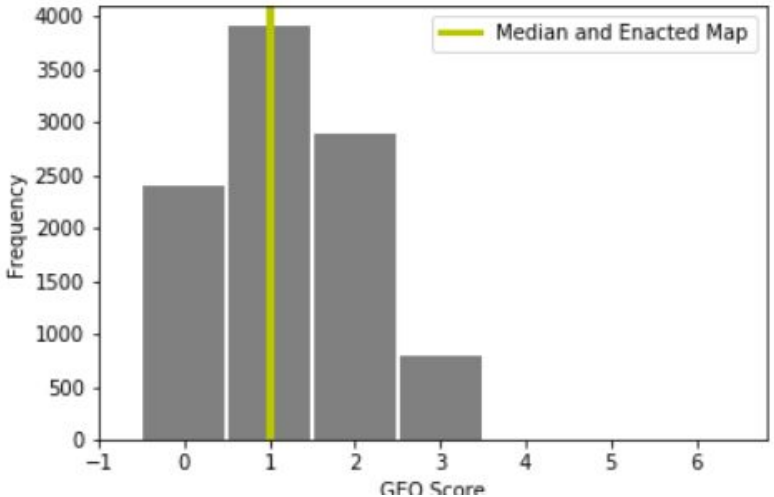


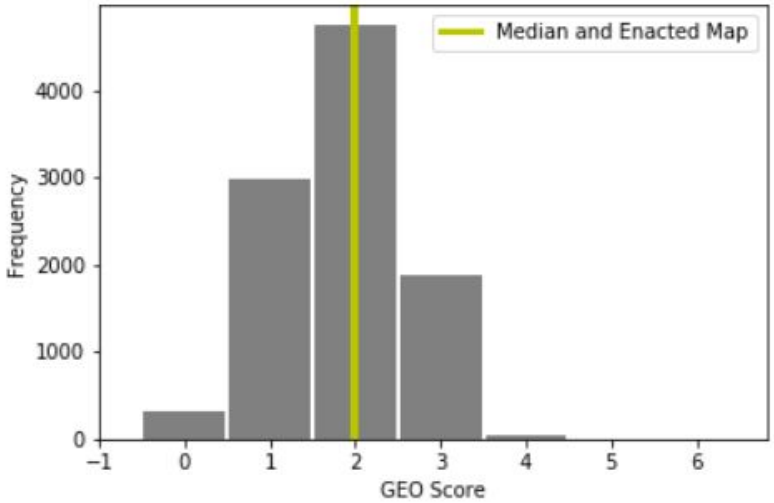
A lot of Potential to Improve Outcome

CO Gov 2018 - Example a map that is Not Gerrymandered

Republican:



Democrat:



GEO Metric

Fair Redistricting

Time for Out of the Box Voting Methods

Framers of the Constitution didn’t envision an entrenched minority

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Rank Choice Voting : NYC Mayor Democratic Primary

Cumulative Voting: Corporate Boards to preserve minority interests

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Electoral College:

- Only 5 elections in the history of the country where the electoral college outcome is different from the popular vote
- 2 recently: 2000 and 2016
- Only one of the 5 (Bush) ran for re-election and won

VRA Lawsuit Example: Santa Clara City Council

2017 The city was sued: VRA lawsuit brought by 5 Asian Americans

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Appealed

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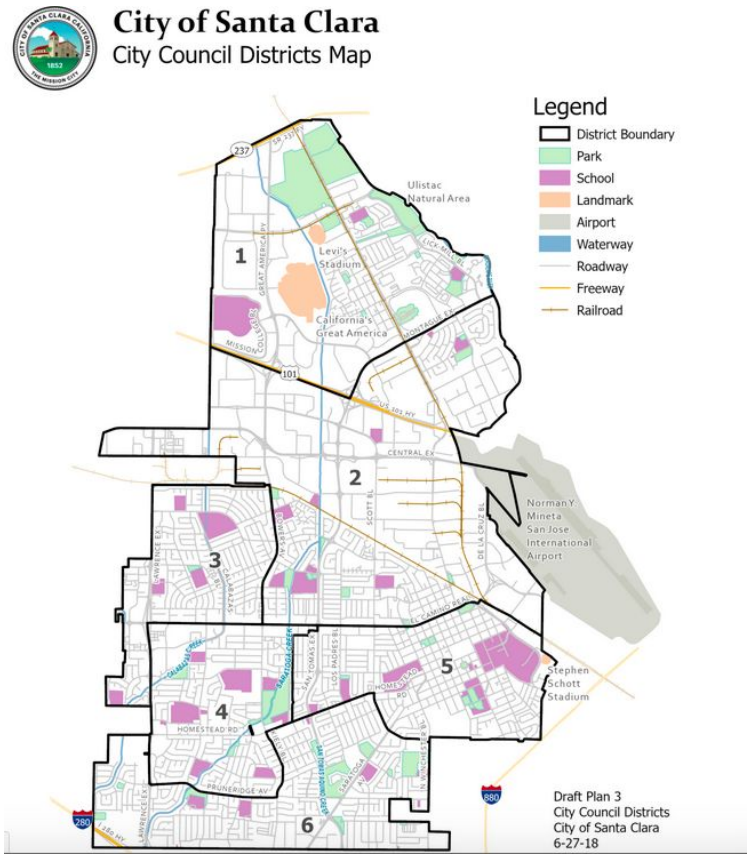
Mid 2018 Ballot Measure to split the city into two (3 member) districts and use Rank Choice Voting FAILED

March 2020 Ballot Measure to split the city into Three (2 member) districts FAILED

Dec 2020 City lost the last appeal

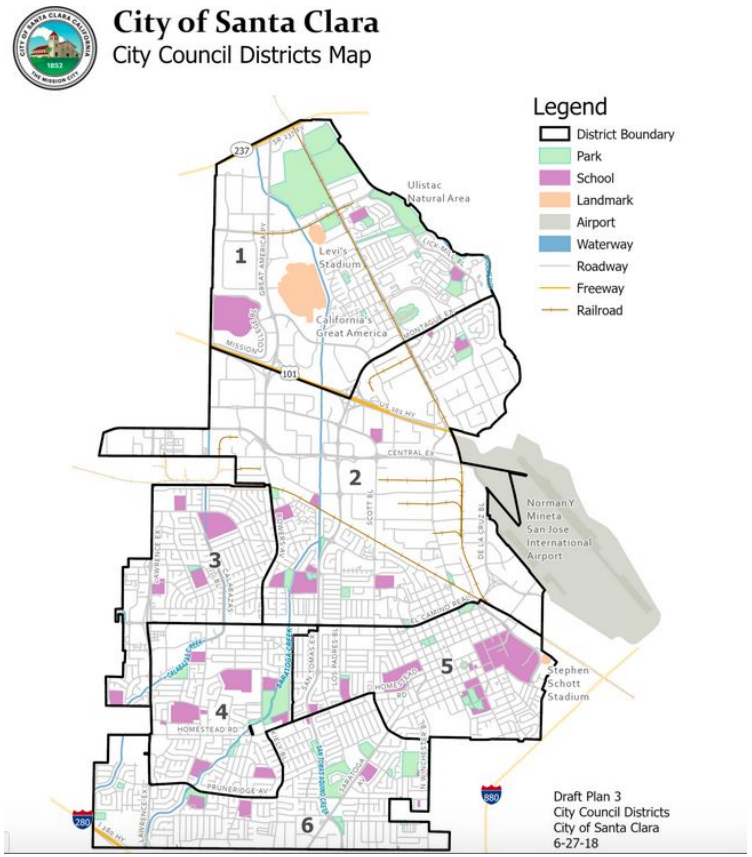
June 2021 Ballot Measure to make the 6 districts system permanent

City of Santa Clara



City of Santa Clara

Cost: $6 Million



Conclusion

As long as we have districting: The new GEO metric

Maybe it’s time we stop relying on others to draw Majority Minority Districts to prevent racial gerrymanders.

Conclusion
Potential Research Topics

Racially Polarized Voting

Size of the Space of all Maps

RCV (IRV) or Cumulative Voting

Voting as a Mean Field Game

Ensemble Generation Algorithms