Homework Assignment 3: Algorithmic Redistricting

(Second Workgroup Project)

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GitHub:

https://github.com/MichaelRocchio/MSDS_460_Group/blob/main/Group_Assign2

Part 1 – Data Sources

Method & Results

Census demographics were used as source to gather both base information including resident population and their ethnic diversity. Population and ethnic makeup were already coded as per the enclosed PDF. We also gathered data regarding each county. This effort allowed us to attain a comprehensive snapshot of the populace, offering insights into the varying ethnic backgrounds that compose the community. The data encompassed not only the total number of inhabitants but also provided a detailed breakdown of the different ethnic groups represented, their relative proportions, and distribution across the census tracts.

Part 2 – Objective Function

Method & Results

We built our objective function based on an estimate of the racial qualities of each area. Specifically, our target is to optimize racially as determined by the assignment. By calculating distance between persons of a unique racial makeup, we identified a racial density, or what is being called 'compactness.'

Part 3 – Constraints

Method & Results

We explored constraints such as distance from each individual to other individuals, individual to the counties, and individuals to other individuals, similar and dissimilar. In the end, we decided to limit our constraints to demographic constraints that seemed relevant to the racial question and constraints based on the geographic realities of the area.

In structuring our optimization problem, we established constraints. First, we set a constraint of the number of districts based on the reality of the state. Secondly, we set a constraint based on population based again on the state. Third, we set a constraint that mandated each county must correspond to exactly one district, thereby preserving the integrity and administrative simplicity of county lines. These constraints were the core of our optimization problem.

Part 4 -- Solution

Method & Results

The optimal redistricting solution indicates the creation of districts that satisfy the following constraints set by the model: compactness, population limits, demographic representation (specifically white vs. non-white), and county adjacency.

Before submitting this redistricting plan to any state authority, it would be important to ensure that all legal requirements are met.

Concerns About the Solution

Some concerns I have about the solution may include:

1. **Accuracy of Data Integration:** The joining of different data sets based on string matching of county names may result in inaccuracies if there are mismatches or typos.

My code attempts to mitigate this with sorting and trimming whitespace or using a sorted index, but more robust methods of data validation and cleaning may be needed.

2. **Legal Compliance:** The plan must be reviewed for compliance with all applicable laws and court decisions regarding redistricting, including but not limited to the Equal Protection Clause and the Voting Rights Act.
3. **Political Considerations:** The output doesn't consider political data, which is often crucial to understanding how districts may perform in elections.
4. **Public Perception:** Even if the model's output is mathematically optimal, it may not be perceived as fair by the public or by political actors if it disrupts existing communities or political boundaries without clear justification.
5. **Errors in adjacency:** The model is not set up to recommend values for counties that it cannot find a more optimal solution for. This means that some counties will have a less equitable outcome.

Part 5 – Maps and Discussion

Method & Results

The recommendation for the state would depend on a thorough analysis comparing the algorithmic plan with actual and other potential plans. Key factors to consider in the recommendation include:

- **Population Equality:** Ensuring that each district has approximately the same number of residents to uphold the principle of one person, one vote.
- **Fairness:** Assessing whether the plan avoids racial or partisan gerrymandering.
- **Community Interests:** Preserving the integrity of communities of interest, which can include ethnic, cultural, economic, or regional groups.

Fairness and Equitability

No plan can be described as entirely fair and equitable without broad consensus and legal review. Both algorithmic and actual plans need to be scrutinized for their adherence to the principles of fair representation. It's also important to consider whether the plans give all communities, including minorities, an adequate voice in elections.

One Person, One Vote

The principle of equal representation is fundamental. The algorithm appears to incorporate this principle by including population constraints. However, the actual application in real-world scenarios would require detailed demographic analysis to ensure that districts do not dilute or amplify the voting power of certain groups disproportionately.

Next Steps

Before recommending the model's output, it would be prudent to:

1. Verify the integrity of the data integration and ensure all counties are correctly matched.
2. Conduct a legal review of the plan to ensure it complies with all relevant legislation and court rulings.
3. Present the plan for public comment and expert analysis to identify any potential issues not captured by the model.
4. Compare the plan with existing and proposed plans to ensure it represents an improvement in fairness and representation.