Analysis for Illinois Redistricting

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1 Introduction

Gerrymandering, the practice of drawing electoral district boundaries to favor one party over another, has a complex history that intertwines with issues of race and representation in the United States. While gerrymandering can be used for purely partisan advantage, its application has often had racially discriminatory effects, sometimes intentionally so. This manipulation of electoral boundaries can dilute the voting power of racial and ethnic minorities, undermining their representation in government.

In this paper, we will walk you through our analysis of the Senate maps for the years 2020 and 2021, and the Presidential maps for the year 2020. Using the GerryChain library, we implemented a redistricting algorithm to assess Illinois's district maps. Our approach involved creating a graph from the shapefile data and initializing a partition with relevant electoral data. We employed a Markov Chain Monte Carlo (MCMC) method to perform random walks through different districting configurations. This method allowed us to simulate various redistricting plans and assess their fairness by tracking metrics such as cut edges, mean-median differences, and efficiency gaps. We visualized these metrics through histograms to identify potential instances of gerrymandering, which will be shown later in this paper.

1.1 Historical Roots of Racial Gerrymandering

The origins of racial gerrymandering trace back to the post-Civil War era and the subsequent periods of Reconstruction and Jim Crow. After the Civil War, African Americans were granted the right to vote through the 15th Amendment, leading to significant political participation by Black citizens in the South. However, this progress faced backlash from white supremacists who sought to maintain political and social dominance.

During Reconstruction, the redrawing of electoral districts was used as a tool to limit the political influence of newly enfranchised Black voters. Later, during the Jim Crow era, state legislatures employed gerrymandering along with poll taxes, literacy tests, and other discriminatory practices to further disenfranchise African American voters and ensure white political control.

1.2 The Voting Rights Act of 1965 and Its Impact

The Voting Rights Act of 1965 (VRA) marked a significant turning point. It sought to eliminate the barriers that African Americans faced, including discriminatory redistricting practices. Section 2 of the VRA prohibits voting practices or procedures that discriminate on the basis of race, color, or membership in one of the language minority groups identified in the VRA. Following the enactment of the VRA, courts began to address racial gerrymandering more directly. Cases like Thornburg v. Gingles (1986) set legal precedents for identifying and remedying racial gerrymandering. The courts ruled that district lines could not be drawn in a way that would dilute the voting power of racial minorities.

2 Legal Landscape, Partisan Dynamics, and Racial Demographics.

There are 59 total districts in Illinois. In Illinois, the responsibility for drafting redistricting plans primarily falls to the state legislature. The General Assembly, consisting of the House of Representatives and the Senate, drafts and passes the redistricting legislation. If the legislature is unable to agree on a plan, a backup commission is formed to handle the redistricting process.

This backup commission is an eight-member panel, with members selected by both the majority and minority leaders of the Illinois House and Senate. If this commission also fails to agree on a redistricting plan, a ninth member is randomly added to break the tie and finalize the map.

This system is designed to ensure that redistricting can be completed even in cases of significant political deadlock. The involvement of both legislative and commission processes is an attempt to balance interests and ideally reduce partisan gerrymandering, although political influences are still a significant factor.

In Illinois, redistricting is primarily handled by the state legislature, which draws both congressional and state legislative districts. This process is influenced by federal laws, particularly the **Voting Rights Act,** which aims to prevent racial discrimination. Notably, recent discussions have centered around potential reforms to make the redistricting process less partisan, though these have not yet resulted in significant changes. This ongoing debate is crucial as it could shape future redistricting efforts, potentially introducing independent commissions as seen in other states.

Illinois has been known for its Democratic-leaning tendencies at the state level, with Democrats holding a majority in both the State House and Senate. However, the state also has pockets of strong Republican support, primarily in rural areas and parts of suburban Chicago. This political landscape creates a complex environment for redistricting, as drawing boundaries can significantly impact the balance of power both locally and nationally.

The state's racial diversity, especially in and around Chicago, adds another layer of complexity to redistricting. Illinois has significant populations of African Americans, Hispanics, and Asians, influencing how districts are drawn to ensure minority groups have a fair opportunity to elect representatives of their choice, as mandated by the Voting Rights Act. It is crucial to avoid splitting these communities in ways that dilute their electoral power.

As of 2023, Illinois' population breakdown by race is as follows:

- White (Non-Hispanic): 73.04%
- Black or African American (Non-Hispanic): 16.77%
- Asian (Non-Hispanic): 6.80%
- Two or more races (Non-Hispanic): 2.94%
- American Indian Alaska Native (Non-Hispanic): 0.10%

- Native Hawaiian Other Pacific Islander (Non-Hispanic): 0.03%
- Other race alone (Non-Hispanic): 0.33%

2.1 MALDEF Lawsuit over Redistricting Using ACS Estimates

Date and Context: Filed on June 11, 2021, by the Mexican American Legal Defense and Educational Fund (MALDEF). **Issue:** The Illinois General Assembly used American Community Survey (ACS) estimates for legislative redistricting instead of the 2020 Census data. Constitutional Challenge: The lawsuit argues this practice violates the U.S. Constitutionâs Fourteenth Amendment, specifically the "one person, one vote" principle. **Implications:** MALDEF contends that using ACS estimates, which sample only about 2.5 percent of the population, risks disenfranchising voters, especially in underrepresented communities like Latinos. The ACS lacks the detailed geographic data needed for accurate districting. **Current Status:** The lawsuit demands that the redistricting plans be redrawn with the official 2020 Census data once available, and it calls for judicial intervention to discard the current maps drawn using ACS estimates.

2.2 Federal Court Upholds Illinois Redistricting Amid Allegations of Diluting Black Voting Power

Date and Context: Ruling issued in 2021 regarding redistricting in the East St. Louis area. **Allegations:** Plaintiffs, including the East St. Louis Branch of the NAACP and other organizations, claimed the Illinois legislature's redistricting plan used race to dilute Black voting power to favor Democratic incumbents. **Court Ruling:** A panel of three federal judges ruled that the primary motivation for the redistricting was partisan, not racial. Since the guiding motivation was deemed political, it was considered constitutionally permissible. **Reactions:** Plaintiffs expressed disappointment, highlighting that the decision allows racial discrimination under the guise of partisanship. They vowed to continue advocating for equitable redistricting and protecting the voting rights of Black communities.

3 Gathering and Cleaning Data Using MAUP.

Our data preparation utilized the MAUP library to manage and manipulate geographic data. We imported shapefiles containing population, voting age population (VAP), and election data, transforming these datasets to a consistent coordinate reference system for accurate analysis. We performed precinct-to-block and precinct-to-district assignments, aggregating population and VAP data into election data for analysis.

3.1 Methodology: Markov Chain Process for Ensemble Analysis

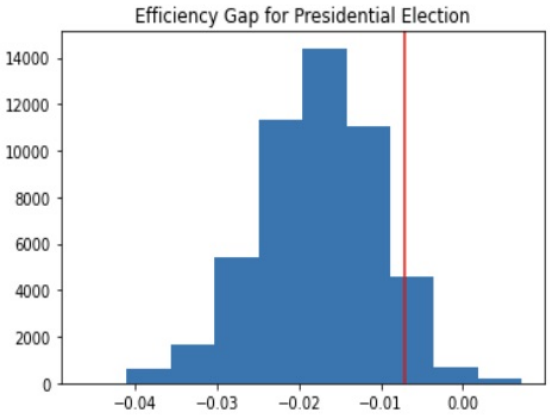
We used a Markov Chain Monte Carlo (MCMC) method to implement ensemble analysis. This involved creating a Markov Chain with the GerryChain library, starting with an initial partition of Illinois's districts. We defined a proposal function to generate new districting plans by recombining districts while maintaining population balance. We applied constraints to ensure each plan met population tolerance criteria and tracked metrics like cut edges, demographically won districts, mean-median differences, and efficiency gaps.

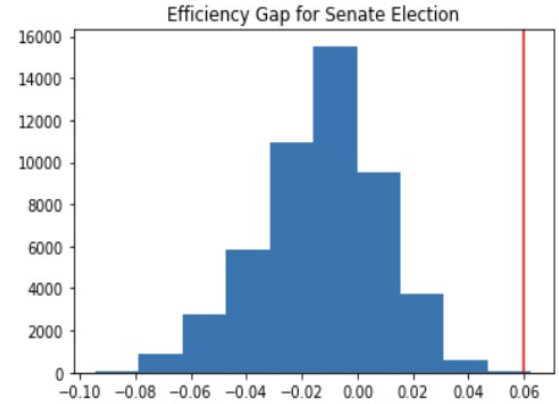
3.2 Creating a Markov Chain

We initialized a Markov Chain with an initial partition and proposal function to generate new districting plans. The chain accepted plans meeting population constraints, iterating through 50,000 steps to explore various configurations.

4 Ensemble Analysis

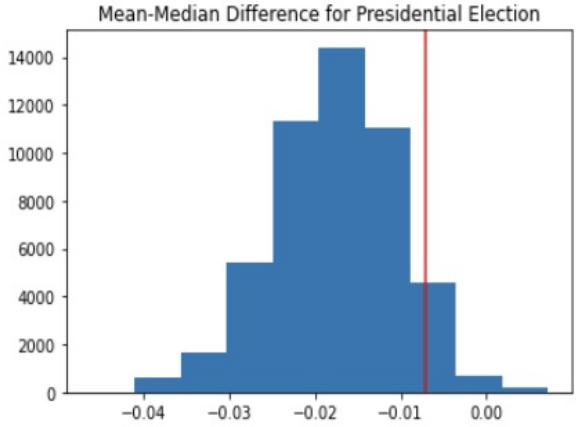
4.1 Efficiency Gap

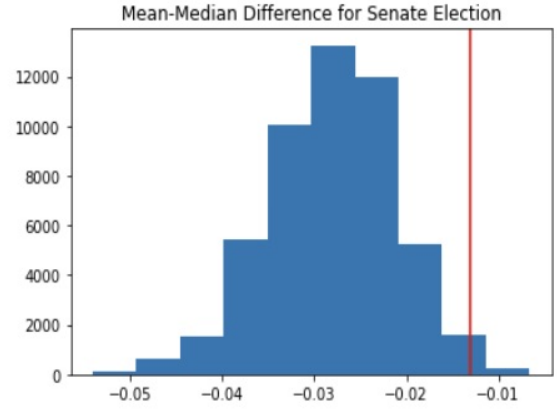




Both histograms for the efficiency gaps in Senate and Presidential elections suggest potential gerrymandering. The red line, representing the initial map, significantly deviates from the data distributions, indicating the map might favor Democrats by reducing their wasted votes. While the Senate election shows a broader negative efficiency gap, suggesting a more pronounced advantage for Republicans, the Presidential election histogram is tighter and closer to zero, hinting at a fairer vote distribution. Nonetheless, both graphs reveal that the initial districting may not reflect a truly equitable vote distribution, suggesting a mild but noticeable level of partisan gerrymandering that slightly favors Republicans.

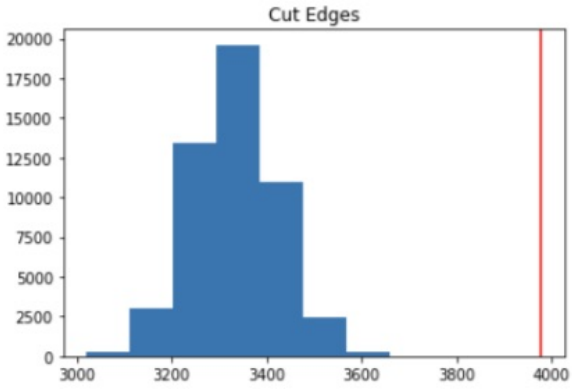
4.2 Mean-Median Analysis for Presidential and Senate Elections





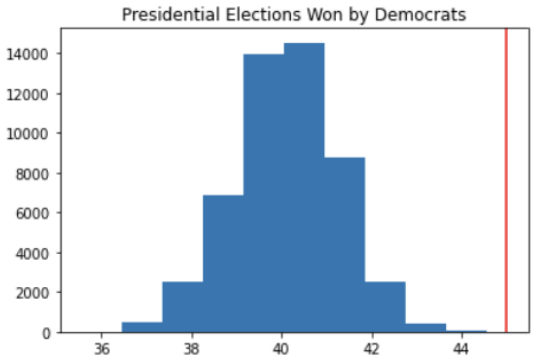
Both histograms for the mean-median difference in Senate and Presidential elections show slight negative values, which suggest a minor advantage for Republicans, aligning with the observations from the efficiency gap analysis. The histograms exhibit a mild skew towards negative values but remain close to zero, indicating the presence of some gerrymandering but not at a severe level. Despite this, the state of Illinois remains strongly Democratic. This mild skew in both elections suggests that while there may be slight gerrymandering benefiting Republicans, it does not drastically alter the overall Democratic dominance in the state. The histograms, with the red line representing the initial map, again suggest a potential deviation from what would be considered a perfectly balanced election outcome, reinforcing concerns about fair districting practices.

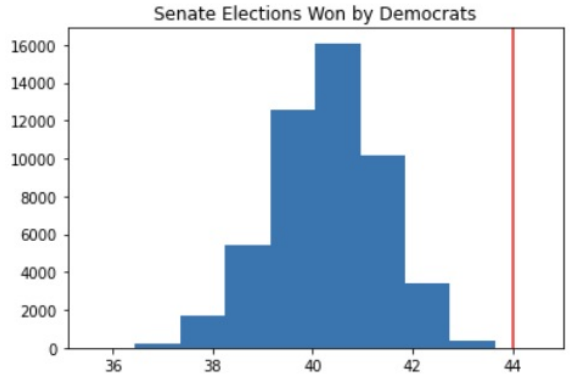
4.3 Cut Edges



The histogram of cut edges shows that the initial state, represented by the red line, has significantly more cut edges than the majority of the data points, which are grouped between 3000 and 3800. The higher number of cut edges in the initial map suggests that the districts are much less compact compared to the ensemble distributions. This lack of compactness can be a sign of gerrymandering, where districts are drawn in elongated or irregular shapes to achieve political advantages, often at the cost of logical geographical representation. The concentration of ensemble values around lower cut edge counts reflects more compact and regular districting, indicating that the initial setup deviates substantially from what might be considered more neutral or fair district shapes.

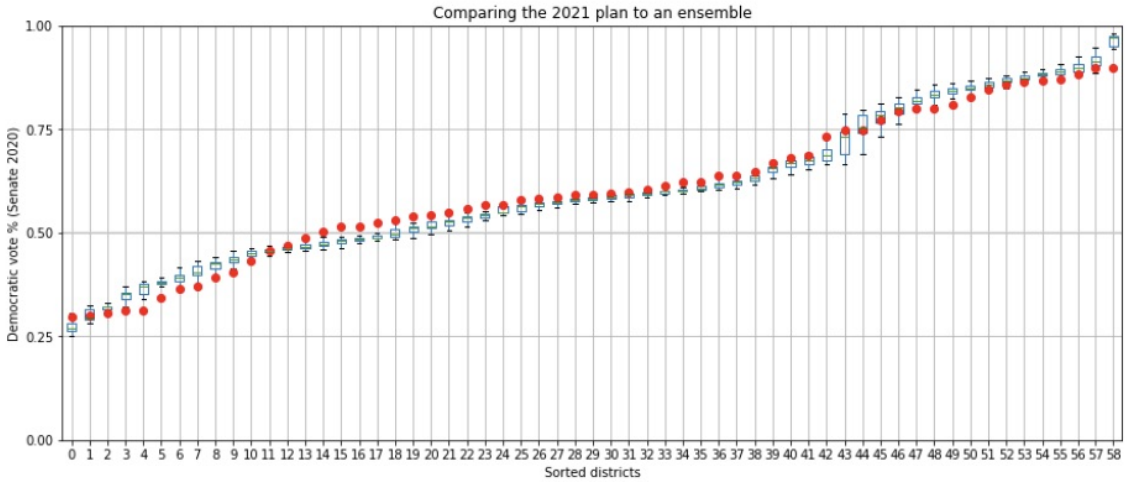
4.4 Analysis of Senate and Presidential Elections Won by Democrats





The histograms for Senate and Presidential elections depict Democratic wins, with the initial redistricting plan (indicated by the red line) significantly exceeding typical outcomes observed in the ensembles. For both Senate and Presidential races, the number of seats won by Democrats in the initial plan reaches 44. This stark deviation suggests that the initial redistricting was likely designed to favor Democrats, aligning with findings from the mean-median and efficiency gap analyses that also identify the initial plan as an outlier. This pattern of results indicates a potential use of gerrymandering to structurally enhance Democratic victories beyond what would be expected under more neutral redistricting scenarios.

4.5 Marginal Box Plot



The marginal box plot illustrates the distribution of Democratic support across districts, arranged from least to most Democratic based on the 2021 plan. The red dots representing actual Democratic vote percentages show a non-uniform distribution that increases toward the latter districts, which could indicate strategic districting. The blue boxes symbolize the range of Democratic support across an ensemble of plans, providing a benchmark for expected variability under non-partisan conditions.

Significant deviations of red dots from these blue boxes, especially at the ends of the range, hint at potential gerrymandering tactics like vote packing or cracking to manipulate outcomes. While several districts exhibit deviations that suggest targeted gerrymandering, many others align closely with the ensemble's expectations, suggesting that any widespread manipulation might be concentrated in specific key areas rather than uniformly applied across all districts.

5 Conclusion

Our comprehensive analysis of various metrics, including efficiency gaps, mean-median differences, cut edges, election outcomes, and a marginal box plot, consistently points towards gerrymandering in the Illinois state senate map. This conclusion is further supported by the outcomes of two legal cases which confirmed that the redistricting has led to vote dilution among Black and Latino communities, strategically benefiting the Democratic Party.

Efficiency Gap and Mean-Median Difference: Both metrics showed slight negative values, suggesting a systematic, small, advantage for Republicans in terms of vote efficiency. However, the initial plans (marked by red lines in our histograms) are significant outliers compared to ensembles, indicating deliberate efforts to enhance Democratic performance beyond typical statistical expectations.

Cut Edges Analysis: The initial districting map displayed a substantially higher number of cut edges than ensemble averages, pointing to less compact and more irregularly shaped districts. This lack of compactness is often a sign of gerrymandering, intended to manipulate electoral boundaries to favor a particular party, in this case, the Democrats.

Election Outcomes: Histograms for both Senate and Presidential elections under the initial plan show a number of Democrat-won districts that significantly exceed what is common in the ensembles, suggesting that the districts were drawn to maximize Democratic wins.

Marginal Box Plot Analysis: This plot revealed that the actual vote percentages for Democrats (red dots) in several districts significantly deviated from expected non-partisan ranges (blue boxes). These deviations, particularly noticeable at the tail ends of the district range, are indicative of strategies like vote packing or cracking, further pointing to gerrymandering.

The findings of our data alongside several lawsuits leads us to believe that the Illinois state senate map has been manipulated with the intent to dilute minority voting power and secure electoral advantages for the Democratic Party.

6 Sources

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