The Problem: Gerrymandering

Gerrymandering is the act of redrawing district lines so as to favor one political party over another.

Current Solution: The Efficiency Gap

\[ EG = \frac{\text{Net Wasted Votes}}{\text{Total Votes}} \]

Votes are considered “wasted” if they are cast for the losing party, or if they are votes for the winning party over the 50% threshold needed to win the election.

Issues with The Efficiency Gap

- No votes should ever be considered “wasted”
- Does not address extremist candidates
- Increases polarization and weakens political competition

The Beginning of a New Metric

\[ S_m = \left( \frac{\text{Seats won by winning party}}{\# \text{ of districts}} \right) - \frac{1}{2} \]

\[ V_m = \left( \frac{\text{Votes for winning party}}{\text{total votes}} \right) - \frac{1}{2} \]

\[ C^* = \text{average of all districts' } C_i^* \text{'s} \]

\[ C_i \text{ for each district} = \frac{\text{absolute value of difference in votes}}{\text{total votes}} \]

\[ C_i = \frac{S_m - (2 - C^*)V_m}{\frac{1}{2} - 2V_m^2} \]

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Conclusion:

- The efficiency gap has been relied on heavily to detect gerrymandering, but it is far too simple to account for the complexity of the modern political scene.
- While this new metric is a step in the right direction, it can still be improved upon. Using the efficiency gap, states are said to be gerrymandered if their efficiency gap is greater than 8%. This new metric needs a threshold to determine when a state has been gerrymandered.

\[ C_i^* \text{ will fall into one of 3 categories:} \]

<table>
<thead>
<tr>
<th>Competitive</th>
<th>Potentially Competitive</th>
<th>Non-Competitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{If } C_i \leq 0.1 )</td>
<td>( \text{If } 0.1 &lt; C_i \leq 0.3 )</td>
<td>( \text{If } C_i &gt; 0.3 )</td>
</tr>
<tr>
<td>( \text{Then } C_i^* = \frac{1}{2} C_i )</td>
<td>( \text{Then } C_i^* = C_i )</td>
<td>( \text{Then } C_i^* = \frac{C_i + 1}{2} )</td>
</tr>
</tbody>
</table>

\[ S_0 = 123456789:67888>3>4:74256789=3>4:4743H7425 - DE \]

\[ V_0 = 24789:67888>3>4:74256789=3>4:4743H7425 - DE \]

\[ C^* = \text{average of all districts' } C_i^* \text{'s} \]

\[ C_i \text{ for each district} = \frac{\text{absolute value of difference in votes}}{\text{total votes}} \]

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