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HOW TO PREVENT ELECTORAL MANIPULATION?

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Democratic societies hardly face any greater threat than electoral manipulation. Various forms exist and **gerrymandering** constitutes a very common and particularly dangerous one. The term stands for the redrawing of electoral district boundaries with an intention to manipulate electoral results on the basis of the geographical distribution of political support *(the diagram below illustrates how different district shapes may determine whether districts are won by a red or a blue party)*. While gerrymandering is typical for dictatorships as well as new and unstable democracies, it is omnipresent in the Western world (for example, the U.S.) too.

Gerrymanders, aiming to maximize their seat share, face a graph-theoretical optimization problem. I have proven that identification of the map yielding the largest seat share possible is **NP-complete**. This means that gerrymanders must use heuristic algorithms to create favourable electoral maps. I have thus developed an algorithm imitating real-life gerrymandering, implemented it in Java and used real-world electoral data to study its properties. I have shown that even this imperfect heuristic gerrymandering may easily reverse electoral results in favour of the gerrymander. The simulations have also suggested a plausible way of preventing gerrymandering; *if electoral districts are legally bound to be more-or-less balanced in terms of the electorate, gerrymandering options diminish rapidly*.

I would like to extend my research by modifying some assumptions and performing more real-data analysis. If successful, I could possibly help strengthen electoral democracy in many countries around the globe. Potential societal benefits of the research are therefore tremendous and far-reaching.

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