A novel non-statistical methodology for detecting gerrymandering in parallel voting systems

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Gerrymandering is a practice intended to establish a political advantage for a particular party or group by manipulating electoral district boundaries. Switching from one electoral system to another one is frequently criticized by the opposition and is viewed as a means for the ruling party to stay in power. In particular, when the new electoral system is a parallel voting (or a single-member district) system, the ruling party is usually suspected of applying gerrymandering to increase the chance to win in a maximum possible number of districts.

Since it is extremely challenging to detect gerrymandering by using statistical methods, we propose a novel non-statistical methodology that has proven effective for detecting gerrymandering and computing fair districting under parallel voting systems. Our methodology is based on identifying the set of all feasible electoral outcomes and comparing the corresponding efficiency scores’ values. For identifying all feasible electoral outcomes, we formulate and solve several gerrymandering problems as integer linear programming problems.

We showcased the application of our approach to the Moldovan parliamentary elections of 2019. Our results suggest that contrary to previous studies’ arguments, there is no clear evidence to consider that the districting map used in those elections was unfair. Importantly, we also provide an example of the most equitable districting map that does not advantage any political party over another.