Gerrymandering: Finding evidence of the beast

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Interested students should schedule a meeting to discuss this project prior to selection
Find updated project listing / availability at https://warwick.ac.uk/mpollock/projects

Overview

Gerrymandering is the act of manipulating the boundaries of an electoral constituency so as to favour one political party over others. The word originates from the 1812 re-districting of Massachusetts by Governor Elbridge Gerry, in which one particular district resembled depictions of the mythical salamander (see Figure 1) – Gerrymander is simply a portmanteau of Gerry and salamander. The assertion made by the evocative graphic was that the creation of such an oddly shaped district was a calculated act to benefit Gerry's party. Deliberate manipulation of a political system and the electorate is likely to pre-date this egregious example.

Figure 1: Illustration of the 1812 Essex South state senatorial district for the legislature of The Commonwealth of Massachusetts, as appearing in the Boston Gazette.

Although in many situations there will appear to be qualitative evidence supporting gerrymandering having taken place (such as 'oddly' shaped geographical regions, and unnatural apportioning of the electorate), and will be asserted by one political party of another, oftentimes the manipulation is subtle and defensible due to complicated sets of competing priorities for setting boundaries (for instance, respecting natural and historical boundaries, and ensuring substantive representation of minority groupings). Indeed, it is unclear

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what a 'fair' division of the electorate means – plurality voting systems by construction attempt to avoid many of the problems that arise in proportional representation systems (for instance, ensuring a direct link between the electorate and a representative, and that a single party is likely to emerge and govern with a consistent and transparent strategy).

A number of interesting possible gerrymandering directions are open to exploration, including devising metrics to measure the effect of gerrymandering [Warrington, 2018], and attempting to find fair (apolitical) boundaries within the constraints of a political system ([Kueng et al., 2018], [Jacobs and Walch, 2018]). The most natural initial focus of this project would be to explore and re-create the recent work of [Herschlag et al., 2018], in which a distribution over possible re-districtings in North Carolina was induced by weighting each according to non-partisan design criteria. This distribution was then sampled and the election outcomes computed for each sample in order to find whether the districting chosen for the election and the outcome was atypical. There are of course a number of interesting sub-topics to explore if a number of students are interested in this project. Students should ideally be interested in political topics, and have a background in Bayesian statistics and have studied (or be planning to study) Monte Carlo methods.

Selected References

[Herschlag et al., 2018] Herschlag, G., Kang, H. S., Luo, J., Graves, C. V., Bangia, S., Ravier, R., and Mattingly, J. C. (2018). Quantifying Gerrymandering in North Carolina. *arXiv preprint arXiv:1801.03783*.

[Jacobs and Walch, 2018] Jacobs, M. and Walch, O. (2018). A partial differential equations approach to defeating partisan gerrymandering. *arXiv preprint arXiv:1806.07725*.

[Kueng et al., 2018] Kueng, R., Mixon, D. G., and Villar, S. (2018). Fair redistricting is hard. *arXiv preprint arXiv:1808.08905*.

[Warrington, 2018] Warrington, G. S. (2018). A comparison of gerrymandering metrics. *arXiv preprint arXiv:1805.12572*.