Project Status Update: Optimal de-gerrymandering of voting districts

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Disclaimer

Apologies for the late submission – I had been looking at Gradescope and didn't realize there was a Canvas submission.

Progress

An optimizer has been written that can solve simple versions of the problem – however, its accuracy, robustness, and ability to scale are not completely certain.

Meanwhile, a more involved model has already been developed and preliminarily explored using the MATLAB `cvx` package. Although the final deliverable will ideally involve a handwritten optimizer, this allows the feasibility and scope of the project to be understood. It also allows the discovery of interesting aspects of the problem without worrying that these phenomena are due to errors or specifics of the optimizer.

A big factor in generating problems with non-trivial solutions is generating interesting populations. If there is too much homogeneity in the preference distribution, then the problem becomes degenerate, and there are many equally or nearly-equally good solutions. I'm currently trying to sample Gaussian processes to create realistic distributions with larger-scale structure.

Revised timeline

The most immediate task is to ascertain whether or not the project can utilize a professionally-developed optimization package (`cvx`) – the answer will determine the next two weeks of work.

If so, the remaining week will be devoted to creating a more advanced model, as well as exploring robustness of the solutions under uncertainty about underlying preference distribution. If not, the weekend will be spent ensuring correctness of the handwritten optimizer and adapting it to larger-scale problems.