UNIVERSITY OF MANNHEIM
Business School

CHAIR OF SERVICE
OPERATIONS MANAGEMENT
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Master Thesis Proposal

Optimization Models in Politics and Elections

In democratic systems, political parties play a crucial role in shaping policy, mobilizing voters, and structuring political competition. Yet, the success of a political party is not solely determined by its ideological stance or the popularity of its leaders. Increasingly, scholars and strategists are turning their attention to the concept of political engineering. This approach raises important questions: Can the performance or appeal of a political party be systematically improved through strategic intervention? What tools or mechanisms are most effective in enhancing a party's electoral success? And to what extent can political engineering reshape the competitive dynamics of a political system without undermining democratic principles?

Despite growing interest in these questions, the field of political engineering remains largely qualitative in nature. While there is a vast body of research on voter behavior, party systems, and electoral outcomes, relatively few studies have attempted to formalize these dynamics using mathematical or computational models. These studies have tackled problems such as the election campaign organization or the positioning of parties.

The objectives of this thesis are to:

- Broadly review and classify the application areas of optimization in politics and already existing models,
- present one model in detail, including a critical assessment of assumptions and limitations, positioning it in the literature,
- discuss whether it could be adapted for another voting system,
- suggest improvements, changes, data for such an adaption,
- implement the proposed model and solve it in a suitable modelling environment and discuss the results,
- identify future opportunities and challenges for integrating optimization models into political engineering,

Requirements

- OPM 781
- Profound knowledge in Operations Research
- Excellent analytical skills and an ability to transform real-world business problems into Operations Research models

Administrative information for writing a master thesis at the Chair of Service Operations Management can be found here.

Selected Literature Recommendations

Cochran, J.J., Curry, D.J., Radhakrishnan, R. *et al.* Political engineering: optimizing a U.S. Presidential candidate's platform. *Ann Oper Res* 215, 63–87 (2014). https://doi.org/10.1007/s10479-012-1189-z

Cochran, J.J. David J. Curry, Frankenstein for President, *Significance* 9 (5), 18–22 (2012), https://doi.org/10.1111/j.1740-9713.2012.00602.x

Murray, A. T. (2016). Maximal Coverage Location Problem: Impacts, Significance, and Evolution. *International Regional Science Review*, *39*(1), 5–27. https://doi.org/10.1177/0160017615600222

Güney, E., Ehmke, J. F., Borndörfer, R., & Kliewer, N. (2018). A Mixed Integer Linear Program for Election Campaign Optimization Under D'Hondt Rule. In Operations Research Proceedings 2017 (pp. 73–79). Switzerland: Springer International Publishing AG.

Güney, E. (2018). Efficient Election Campaign Optimization Using Integer Programming. Journal of Industrial Engineering and Management, 11(2), 341–348.

Shahmanzari, M., Aksen, D., & Salhi, S. (2020). Formulation and a two-phase matheuristic for the roaming salesman problem: Application to election logistics. European Journal of Operational Research, 280(2), 656–670.

Yang Jie, Lv Wenge, He Mingyu, & Zhang Hong. (2011). Verify Election Campaign Optimization Algorithm by Several Optimization Problems. 2011 International Conference on Information Management, Innovation Management and Industrial Engineering, 1, 543–546. IEEE.

Wilder, Bryan & Vorobeychik, Yevgeniy. (2017). Controlling Elections through Social Influence. 10.48550/arXiv.1711.08615.