

Evolution of Strategic Voting Behaviour: Data Analysis through an Agent-Based Model

Research Objective

This project aims to analyse the dynamics of strategic voting in an Agent-Based Model (ABM) with 11 agents: 5 right-wing, 5 left-wing, and 1 neutral agent casting blank votes. The agents interact with their 8 nearest or 80 neighbours, or weighted neighbours, to form coalitions and weaken the opposing side. The goal is to explore how strategic behaviour leads to coalition formation and how these behaviours evolve under different parameters. To achieve this, various methods and statistical models will be applied.

Methods and Statistical Models

- i. *Query-Based Model Exploration* / NumPy, pandas, matplotlib, seaborn
Explore how model outputs change with varying parameters and identify key factors influencing strategic voting.
- ii. *Genetic Algorithms* / deap, NumPy, pandas
Discover optimal parameter combinations and assess how neighbourhood influence (radius and vote strength) affects agent decisions.
- iii. *Monte Carlo Simulation* / NumPy, random
Run simulations to observe the model's behaviour under different conditions.
- iv. *Sensitivity Analysis* / SALib, NumPy, pandas
Examine how changes in parameters, especially radius and neighbour vote strength, affect outcomes.
- v. *Regression Analysis* / pandas
Quantify the impact of parameters (radius, neighbour vote strength) on agent decisions.
- vi. *Correlation and Interaction Analyses* / SciPy, pandas, seaborn
Investigate relationships and interactions between parameters and their combined effect on the model.

Data Sources, Access Methods and Results

Data will be obtained from the ABM's outputs, including agent decisions and interactions. The results, analysed with Python, will offer insights into strategic voting dynamics and the evolution of electoral processes.

References

- Angus, S. D., & Hassani-Mahmooei, B. (2015). "Anarchy" Reigns: A Quantitative Analysis of Agent-Based Modelling publication Practices in JASSS, 2001-2012. *Journal of Artificial Societies and Social Simulation*, 18(4). <https://doi.org/10.18564/jasss.2952>
- Lee, J., Filatova, T., Ligmann-Zielinska, A., Hassani-Mahmooei, B., Stonedahl, F., Lorscheid, I., Voinov, A., Polhill, G., Sun, Z., & Parker, D. C. (2015). The Complexities of Agent-Based Modeling Output Analysis. *Journal of Artificial Societies and Social Simulation*, 18(4). <https://doi.org/10.18564/jasss.2897>