Day 3

Plenary Talk 4

Elections as a Complex System: Margins, Voter Turnouts and Universality

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Elections for public offices are large-scale examples of collective decision-making. As a complex system with multitude of interactions among agents, we can anticipate that universal macroscopic patterns could emerge independent of microscopic details. Despite the availability of empirical election data for several decades now, such universality, valid at all scales, countries, and elections, has not yet been observed. In this talk, we will first demonstrate the existence of universal characteristics using empirical election data drawn from 34 countries, spanning multiple decades and electoral scales. To understand these results, we introduce a parameter-free voting model and analytically show that the distribution of margins is driven by that of the voter turnout, and a scaled measure depending on margin and turnout leads to a robust universality. These analytical results agree with the results obtained from empirical election data. The deviations from the model predictions and universality indicate possible electoral malpractices. We argue that this universality is a stylized fact indicating the competitive nature of electoral outcomes.

References

[1] Ritam Pal, Aanjaneya Kumar and M. S. Santhanam, Universal Statistics of Competition in Democratic Elections, Phys. Rev. Lett. **134**, 017401 (2025).