

# Modeling suggests friendships may lead to lopsided elections

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Have you ever thought about not voting because your preferred candidate's victory seems assured? New Cornell research uses mathematical modeling to show that type of thinking can have the

opposite effect, resulting in the election of politicians who do not represent the preferences of the electorate as a whole.

And most surprisingly, the culprit of that disproportionate outcome is not political malfeasance: it could be your network of friends, whose expectations about the likely winner can distort your sense of the election's outcome and the value of your vote.

The group's paper, "How a Minority Can Win: Unrepresentative Outcomes in a Simple Model of Voter Turnout," published Nov. 22 in *Physical Review E*. The lead author is doctoral student Ekaterina Landgren.

The research was led by Steven Strogatz, the Jacob Gould Schurman Professor of Applied Mathematics in the College of Arts and Sciences and the paper's senior author.

"In democracies, it is very important to consider that sometimes the candidate who gets the most votes in an election or referendum isn't the candidate that most people would truly prefer," Landgren said. "There are some structural reasons for it. There's gerrymandering, there are malevolent agents. But our model focuses on a situation where this is not created on purpose, but emerges out of the way that people evaluate whether or not their vote will make a difference based on the people they know and the things they see around them."

Rather than sifting through election data and polling results, the researchers relied upon a [simple mathematical model](#) to randomly generate a variety of friendship networks, each with different assumptions and different levels of interaction, along with other factors, such as geographic proximity. After rendering these parameters in code, they tested the scenarios in simulations and then analyzed the statistics of the outcomes, oftentimes mathematically validating the results.

"One of the challenges was coming up with a model that is simple enough to set the stage really clearly, but also complicated enough to yield insights," said Jonas Juul, a postdoctoral researcher in Cornell's Center for Applied Mathematics and a co-author of the paper. "But it is an important point that this is a model. We don't believe this is an accurate representation of reality, but it is an investigation of how the shape and structure of social networks could influence elections."

The modeling highlighted two conditions that can be skewed by [social connections](#): "complacency," in which people don't bother voting because they are certain, based on their friends' expectations, that their preferred candidate will win; and "dejectedness," whereby people abstain from voting because they believe their candidate will lose anyway.

At the same time, some people in the minority are motivated to vote expressly because their preferred candidate appears to be vulnerable, and this can result, ironically, in the victories of politicians who do not have the support of the majority.

"In networks where there is some tendency to seek out like-minded people, it is easier for the minority to convince itself that they're in danger, that the election is going to be very close, than it is for the majority," Landgren said. "What is fascinating about it, from the mathematics perspective, is that the majority has more accurate information, on average, about the state of the friendship network, or of the overall opinions that exist in this network. So the majority sees there are more majority nodes, which is correct. The minority sees that there is roughly equal numbers of majority and minority nodes, which is not correct, but that is precisely the effect that allows them to win."

Of course, voters can be influenced by many different sources, from news coverage to the echo chambers of social media. However, the

researchers' mathematical modeling provides an effective way to isolate the impact of social connections on voters' decision-making processes—which are often opaque—and could also point the way to future studies that explore the many other factors to drive people to the polls.

"Even though our model is very simplified, a lot of its behavior surprised us," Strogatz said. "So just imagine how difficult it must be to predict voter turnout in reality. That's another reminder that the social sciences may be the hardest sciences of all."

**More information:** Ekaterina Landgren et al, How a minority can win: Unrepresentative outcomes in a simple model of voter turnout, *Physical Review E* (2021). [DOI: 10.1103/PhysRevE.104.054307](https://doi.org/10.1103/PhysRevE.104.054307)

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