

# New algorithm based on biased assimilation models society polarization

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Anyone who has spent more than a few minutes watching some of the more partisan "news" networks lurking in the bowels of cable television is aware that America has grown more polarized in recent years. What's not so certain is why. In a paper published online March 27 in the *Proceedings of the National Academy of Sciences (PNAS)*, a team of researchers at Stanford has devised a mathematical model that helps demonstrate what's behind the growing rift.

Hint: It's you, not them.

"We believe that [polarization](#) is less a reflection on the state of our society, but instead stems from the process people go through to form opinions," said Ashish Goel, a professor in the Department of [Management Science](#) and Engineering (MS&E) and co-author of the paper.

## Prevailing theories

The prevailing sociological theory, known as homophily, is that like seeks like. Those who have similar opinions tend to aggregate together and reinforce opinions that grow more divergent from the center over time. This is the echo chamber model that would seem to gain validation in the era of talk radio, cable news and the Internet.

According to this theory, we are polarized precisely because we have

greater ability to choose our social networks and news sources. We narrowly tailor our information sources by selecting them based on how closely they mirror our own tastes.

Mathematical models that try to use homophily to explain polarization have come up short, however. Most are based on something known as De Groot's model that assumes that people form opinions in a way that minimizes overall disagreement within their network of friends and relations. As a result, an individual's opinion gradually converges to an average of those in his or her network, or so the theory goes. The flaw in these models is that they predict that opinions in society as a whole can only become more uniform over time, resulting in depolarization rather than polarization.

"We show that repeated averaging of opinions always results in less divergent opinions, even in networks where the people are like-minded," said Pranav Dandekar, a doctoral candidate in MS&E and a co-author on the paper. "You can't create outliers by averaging."

## **A different approach**

The Stanford team instead took a different approach based on a phenomenon well known in the social sciences called biased assimilation. In biased assimilation people more easily accept evidence that supports their opinion and, likewise, are prone to discredit evidence that does not fit. More specifically, people look at inconclusive evidence in a way that is most favorable to their existing point of view.

"It seems counter-intuitive that two individuals would arrive at a more divergent opinion when presented with identical information that is inconclusive, but that's what happens," said David Lee, a doctoral candidate in electrical engineering and a co-author of the paper. "You might think that seeing identical evidence would produce greater

moderation and agreement, but it doesn't."

"It seems we look at the world with rose-colored blinders. We see what we want and ignore what doesn't fit," Dandekar said.

## **Putting the model into practice**

The team has studied biased assimilation to help create Internet-based social systems that counteract polarization by what they describe as "surprising validators"—counterbalanced evidence that is presented by otherwise well-known and trusted sources. Imagine Rush Limbaugh or Rachel Maddow taking an unexpected stance. If you were aligned with one or the other, you might be more inclined to listen to the evidence if presented by the source most similar to you on other issues.

"We want to use the insight from our mathematical analysis to create recommendation engines and online collaboration tools to help people find common ground on difficult and divisive societal issues," Lee said.

One such example is [Widescope](#), a budgeting tool built by Goel's research group, in which people take on the role of Congress to allocate the federal budget as they see fit and to compare their budgets against those proposed by various people in Washington—Paul Ryan and President Obama for instance—to see where the differences are.

"What you learn when you see the two budgets side-by-side is just how similar they really are. By articulating the similarities rather than the differences we can focus on collaborating to find a solution," said Goel.

## **Algorithm in practice**

The team used their working model of biased assimilation to also study

the polarizing effects of three popular Internet-based recommender systems. Recommender systems are widely used on the Internet to deliver personalized search results, news articles and product suggestions based on the user's likes and dislikes.

It has been claimed that these systems contribute to polarization by compounding the echo chamber effect where, for example, a left-leaning user is recommended more liberal articles and a right-leaning user is recommended more conservative ones.

"The system that recommends the most relevant item to a user turns out to be always polarizing. The other two systems, which chose a random item liked by the user and recommends an item most similar to it, were polarizing only if the user was biased to begin with. It was surprising to find that biased assimilation provides a useful framework to analyze the polarizing effects of recommender systems." Dandekar said.

Provided by Stanford University

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