Making the best decision: Math shows diverse thinkers equal better results

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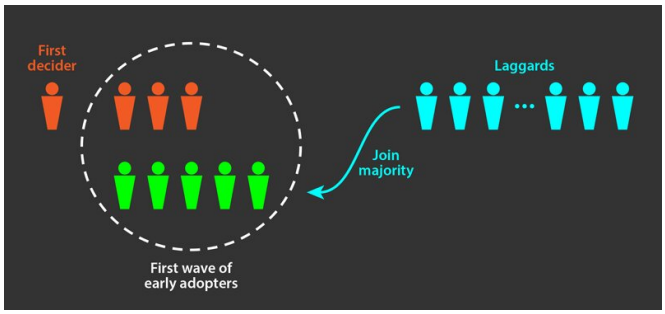

Sketch of the collective decision-making process described by Karamched et al. In a population of undecided agents (blue), an early adopter (red) makes a poor decision. Seeing this decision, a set of early adopters follow suit, but a slightly larger set of early adopters (green) picks the most beneficial solution. After observing the decision-making dynamics of the early adopters, laggards make their decision, leading a large fraction of the population to correct the initial, poor decision. Credit: APS/Alan Stonebraker

Whether it is ants forming a trail or individuals crossing the street, the exchange of information is key in making everyday decisions. But new Florida State University research shows that the group decision-making process may work best when members process information a bit differently.

Bhargav Karamched, assistant professor of mathematics, and a team of researchers published a new study today that tackles how groups make decisions and the dynamics that make for fast and accurate decision making. He found that networks that consisted of both impulsive and deliberate individuals made, on average, quicker and better decisions than a group with homogenous thinkers.

"In groups with impulsive and deliberate individuals, the first decision is made quickly by an impulsive individual who needs little evidence to make a choice," Karamched said. "But, even when wrong, this fast decision can reveal the correct options to everyone else. This is not the case in homogenous groups."

The paper is published in *Physical Review Letters.*

Researchers noted in the paper that the exchange of information is crucial in a variety of biological and social functions. But Karamched said although information sharing in networks has been studied quite a bit, very little work has been done on how individuals in a network should integrate information from their peers with their own private evidence accumulation. Most of the studies, both theoretical and experimental, have focused on how isolated individuals optimally gather evidence to make a choice.

"This work was motivated by that," Karamched said. "How should individuals optimally accumulate evidence they see for themselves with evidence they obtain from their peers to make the best possible decisions?"

Krešimir Josi?, Moores Professor of Mathematics, Biology and Biochemistry at the University of Houston and senior author of the study, noted that the process works best when individuals in a group make the most of their varied backgrounds to collect the necessary materials and knowledge to make a final decision.

"Collective social decision making is valuable if all individuals have access to different types of information," Josi? said.

Karamched used mathematical modeling to reach his conclusion but said there is plenty of room for follow-up research.

Karamched said that his model assumes that evidence accrued by one individual is independent of evidence collected by another member of the group. If a group of individuals is trying to make a

decision based on information that is available to everyone, additional modeling would need to account for how correlations in the information affects collective decision-making.

"For example, to choose between voting Republican or Democrat in an election, the information available to everyone is common and not specifically made for one individual," he said. "Including correlations will require developing novel techniques to analyze models we develop."

More information: Bhargav Karamched et al. Heterogeneity Improves Speed and Accuracy in Social Networks, *Physical Review Letters* (2020). DOI: 10.1103/PhysRevLett.125.218302

Provided by Florida State University

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