Using large-scale dataset experiments and machine learning to discover new theories of decision-making

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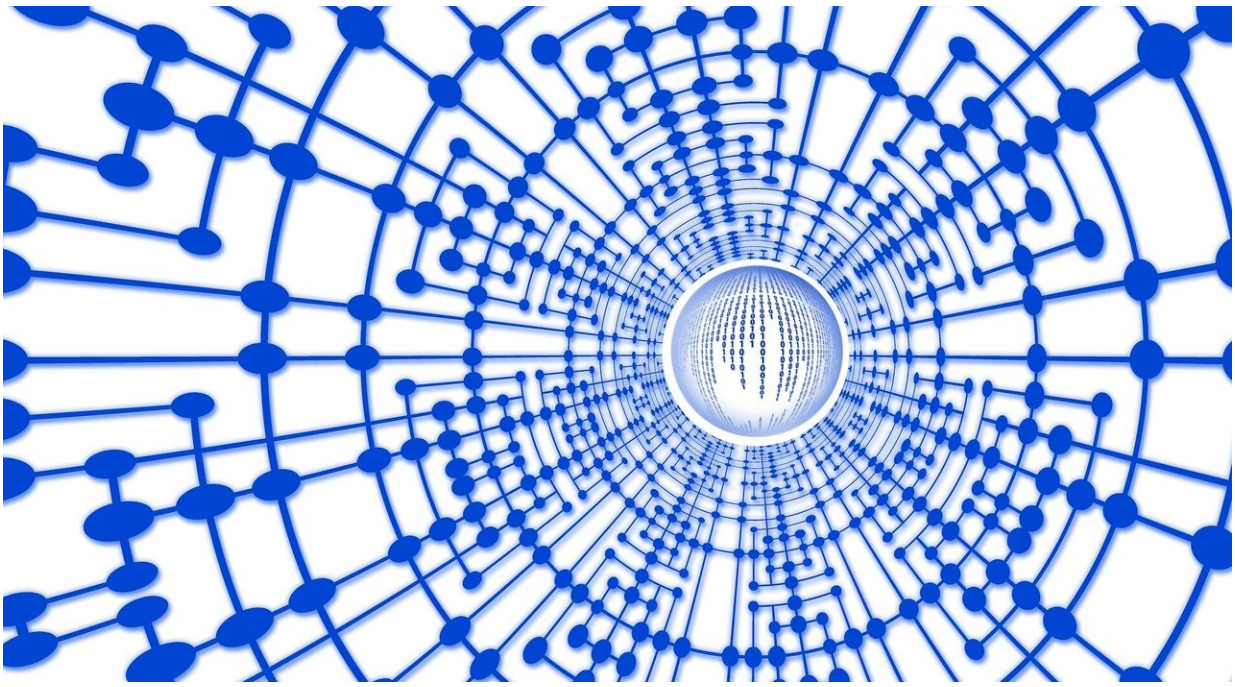

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A team of researchers from Princeton University along with one from Worcester Polytechnic Institute has developed a way to use large-scale dataset experiments and machine learning to discover new theories of decision-making. In their paper published in the journal *Science*, the

group describes their approach to using a common tradeoff experiment to generate large datasets for use in testing and developing new theories surrounding human decision-making. Sudeep Bhatia and Lisheng He with the University of Pennsylvania and Shanghai International Studies University, respectively, have published a Perspectives piece in the same journal issue outlining current issues with decision theory and the work done by the team in this new effort.

The process by which humans make decisions is both complex and seemingly arbitrary at times—still, psychologists would like to better understand the process as a means for better predicting the sorts of decisions people might make under various circumstances. To that end, theories that attempt to describe human decision-making have been developed. But as the researchers note, most are not very useful in the real world, and are difficult to discern from one another. In this new effort, the researchers have attempted to add a new tool to test current theories and to help develop new and better ones. The method uses machine learning to assist with the development of decision-making theories using large datasets.

Prior efforts at developing decision-making theories have generally involved the use of very small datasets due to their reliance on a host of initial assumptions. And such theories are rarely tested against one another. To overcome both problems, the researchers began with the idea of using a common decision-making experiment that involves volunteers deciding between two clear options. These options typically involve choosing which of two sums of money to accept. As an example, they may be asked to choose between an option of receiving $100 with a probability of just 10%, or $50 with a probability of 90%. Such experiments can be conducted with thousands of people which can lead to generating very large datasets.

In using this approach, the researchers using a dataset of 10,000

responses, found that their system was able to "mimic human decisions with a very high accuracy rate," and they claim that it greatly outperformed existing models.

More information: Joshua C. Peterson et al, Using large-scale experiments and machine learning to discover theories of human decision-making, *Science* (2021). DOI: 10.1126/science.abe2629

Sudeep Bhatia et al, Machine-generated theories of human decision-making, *Science* (2021). DOI: 10.1126/science.abi7668