New AI tool predicts COVID-19 vaccine uptake

March 18 2024

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Findings of a new study led by researchers at Northwestern University and the University of Cincinnati could help public health officials lead more effective vaccination campaigns that overcome hesitancy.

The research team composed of [computer scientists](#), psychiatrists and

social scientists, created a predictive model using a powerful combination of machine learning algorithms and cognitive science. The novel interpretation method, coined "Comp Cog AI" by the team, uses small variable sets as opposed to the big data traditionally associated with AI.

The paper is published in the *Journal of Medical Internet Research*.

"While the importance of medical factors has played a large role in public health research, there is an emerging recognition that behavioral and emotional factors are just as important," said co-senior author Aggelos Katsaggelos. "In our research, we see that understanding an individual's behavioral factors may be useful in targeted vaccination initiatives such as during a pandemic."

Katsaggelos is the Joseph Cummings Professor of Electrical and Computer Engineering at Northwestern's McCormick School of Engineering and director of the Image and Video Processing Lab at Northwestern.

Researchers surveyed 3,476 adults across the United States in 2021 during the COVID-19 pandemic. At the time of the survey, the first vaccine by Pfizer had been available for more than a year.

Respondents provided information about their demographics such as where they lived, their income, highest education level completed, ethnicity and access to the internet. The respondents' demographics mirrored those of the United States based on U.S. Census Bureau figures.

Participants were asked if they had received either of the available COVID-19 vaccines. About 73% of respondents said they were vaccinated, slightly more than the 70% of the nation's population that

had been vaccinated in 2021.

Further, they were asked if they routinely followed four precautionary suggestions designed to prevent the spread of the virus: wearing a mask, social distancing, washing their hands and not gathering in large groups.

Patients were then asked to rank a random sequence of 48 pictures on a seven-point like-to-dislike scale of 3 to -3 in six categories: sports, disasters, cute animals, aggressive animals, nature and food.

Hans Breiter, a psychiatrist at the University of Cincinnati, said the goal of this exercise was to establish a unique snapshot of each respondent's judgments. These variables include concepts familiar to behavioral economists—or people who gamble—such as aversion to risk or loss or the point at which someone is willing to expose themselves to risk for a reward or else forfeit that reward to avoid risk.

"The framework for our judgment is important," Breiter said. "It gets at how we make choices about medical decisions."

The judgment variables and demographics were compared between respondents who were vaccinated and those who were not. Three machine learning approaches were used to test how well the respondents' judgment, demographics and attitudes toward COVID-19 precautions predicted vaccine uptake.

"Our research may be of interest to policymakers and health care professionals for designing efficient campaigns that focus on individuals most likely to respond to vaccination suggestions," said co-second author and Northwestern Ph.D. student Shamal Lalvani.

Provided by Northwestern University