New model increases the certainty in AI

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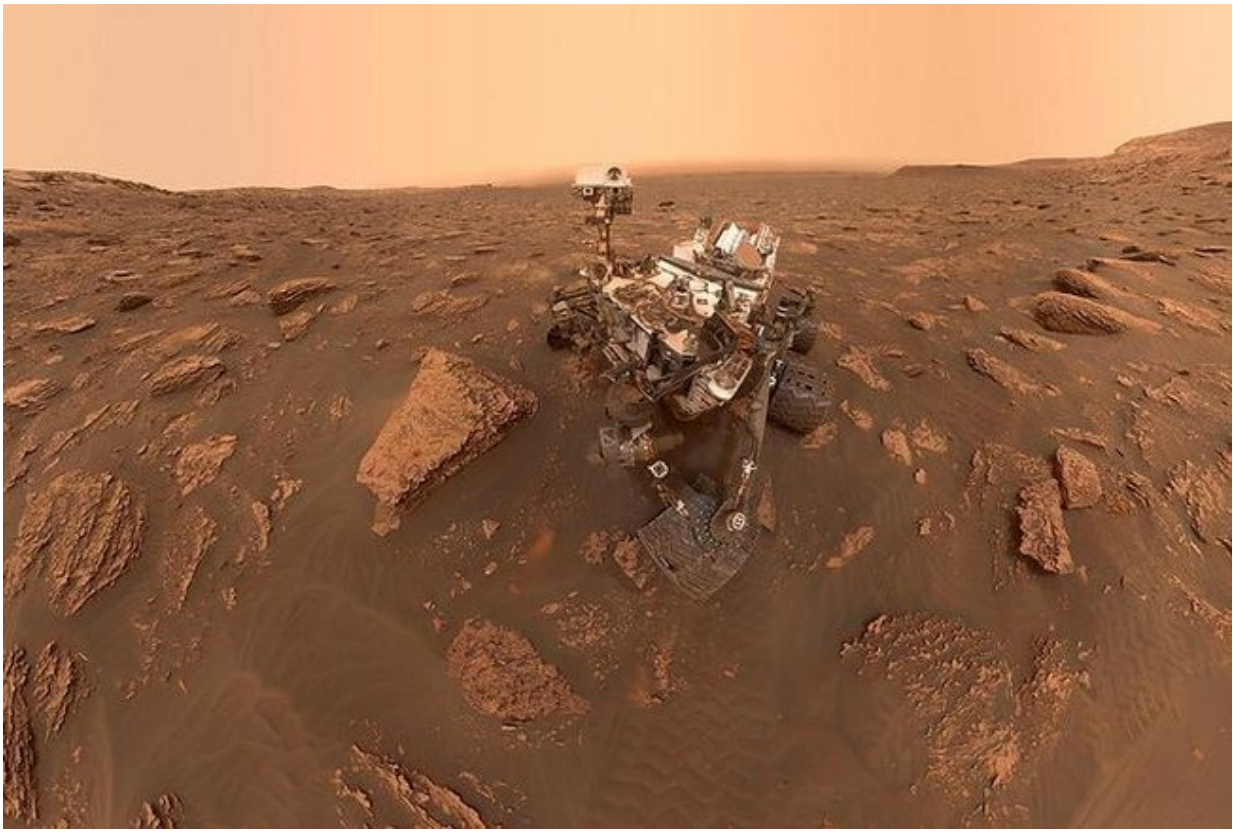

Credit: NASA's Marshall Space Flight Center

Scientists from TU/e OPAC group and Radboud University, together with scientists from the University of Austin and the University of California, Berkeley, have developed a new method to let artificial intelligence (AI) deal better with uncertainty.

Their modeling enables AI to find safer options faster. The method can for example improve the safety of self-driving cars.

AI must cope with many uncertainties, mainly from unknown circumstances, for example caused by human behavior. To reduce these uncertainties AI uses extensive calculating methods which analyze all possible situations and outcomes, and then chooses the best option(s). The new method brings large improvements as it makes the calculations more realistic and provides better, safer, and quicker decision-making.

The breakthrough comes from a newly developed reasoning method about uncertainty. The new approach uses the so-called "uncertain Partially Observable Markov Decision Processes (uPOMDPs), a model which calculates on the probability of an event occurring.

A self-driving car, for example, encounters many unknown situations. The AI which drives the car constantly validates these situations. This requires extensive calculations which all have to be analyzed to let the AI deal with the situations. The new method enables faster and more realistic analysis, thus better and safer decisions faster.

TU/e researcher Ahmadreza Marandi: "Making robust decisions is vital in areas where safety has a high priority. Imagine the landing phase of a Mars rover. When a rover enters Mars's atmosphere, it only has few minutes to decide on the entrance's angle to the atmosphere, the descending moment, and the exact landing location. It is impossible to communicate with the rover during these intense minutes since it takes around 7 minutes for signals to reach Earth. The rover needs to make all decisions itself, and an ignorance of events with tiny possibilities may result in losing billions of dollars of investment in the rover. So, it is essential to have an automated robust decision-making approach. With this new approach, the system is able to do extensive calculations faster to reach a robust decision. For the users, this approach means providing

more explicit information about the situation and the possible dangers as well as offering advice on the suitable robust actions."

Many practice and simulation models already use uPOMDPs, for all kinds of situations. They can help to predict the spread of an epidemic, calculate how planes and spacecraft can avoid collisions and even survey and protect endangered species.

The study is published by the Association for the Advancement of Artificial Intelligence (AAAI).

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