ScienceFaces

SMU professor is one of AI's 10 scientists to watch

33-year-old studies autonomous machines and their behaviour

Ilyda Chua

For Assistant Professor Akshat Kumar, a teenage interest in computers and science fiction movies such as The Matrix has propelled him to become a rising star in the field of artificial intelligence (AI).

The 33-year-old's research focuses on agent-based systems – autonomous entities, or agents, such as self-driving cars or autonomous ships, and the effects of their behaviour on the environment.

He explains that an agent is like "an embodiment of an intelligent human being, but in software".

"So the question is, how do we recreate ourselves in software?" he asks.

The Singapore Management University (SMU) faculty member's interest in AI dates back to a love for computers in his teenage years, which eventually led to a fascination with sci-fi movies and AI while he was doing his bachelor's degree at the Indian Institute of Technology, Guwahati.

His thesis was on AI as well and he used an approach based on the human immune system to train a system to correct English grammar.

Today, Prof Akshat's work focuses on solving urban problems. His efforts led to recognition by the Institute of Electrical and Electronics Engineers (IEEE), the world's largest association of technical professionals. He was named by IEEE as one of "AI's 10 to Watch", an award acknowledging young but accomplished researchers who have contributed significantly to research in the field.

Prof Akshat, who is the first SMU faculty member to receive the award, explains that as autonomous agents begin to appear on the horizon, there is increasingly a need to further develop them.

"Such agent-based systems promise to radically improve productivity and safety while reducing human effort and risk," he says.

For example, autonomous ships could positively disrupt the maritime industry, but with such agents, there is a need to coordinate vessel traffic to allow for safer navigation, especially in congested waters or in situations of uncertainty.

"The real world is messy," says Prof Akshat. "So we want to find out how we can abstract out this messiness to use in computer simulations that we can use to approach real-life problems."

Also, as the world urbanises, there is an increasing need to move towards making the environment more sustainable.

"In the future, say 10, 20 years from now, the majority of the world will be living in urban cities," he says. "At the same time, our environment is getting more and more connected, for example, with smart homes and internet-of-things. So these multi-agent systems become crucial... not only in Singapore, but worldwide."

One possible urban solution would be an autonomous taxi fleet, especially as ride-hailing companies work on plans for driverless taxis. Grab, for example, previously announced that it intends to launch self-driving taxis in South-east Asia before 2022.

In the light of this, problems emerge, such as the need to position taxis strategically based on their changing local environment, explains Prof Akshat.

Such systems would then have to take into consideration factors such as demand, traffic and congestion, and the availability of other taxis in different areas, and coordinate the vehicles accordingly.

Such research is not without its challenges, says Prof Akshat.

Apart from the difficulties in forming algorithms that account for real-world messiness, getting access to data and domain expertise is a struggle.

"For the kind of research we do, we need real data. And if we want to eventually implement our systems, we need to get the support of strategic partners who are interested in implementing our work.

" But getting that kind of support takes a lot of time."

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Professor Akshat Kumar's research on autonomous entities leads him to ask: How do we recreate ourselves in software? PHOTO: SINGAPORE MANAGEMENT UNIVERSITY

TACKLING REAL-LIFE PROBLEMS

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PROFESSOR AKSHAT KUMAR, on simulations to solve real-life problems.

MULTI-AGENT SYSTEMS

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