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Prof Thalmann with Nadine, a humanoid robot that acts and speaks like a human. PHOTO: ALICIA CHAN FOR THE STRAITS TIMES

NADINE

A companion robot designed by Professor Nadia Thalmann, director of the Nanyang Technological University's Institute for Media Innovation.

Nadine is a humanoid robot that acts and speaks like a human. She can answer questions posed to her, remember past conversations and even gauge how a person is feeling by reading their facial gestures.

These are enabled through machine learning, which lets her learn speech patterns, recognise words and correct her database of facial gestures.

Her creator, Prof Thalmann, said: "Learning is just the first step. Our future research is linking learning with memory to build a stronger relationship between robot and human."

One of the ambitious future goals for Nadine is to act as a robotic caregiver for the sick or elderly. For instance, she can stand in as a virtual human presence to help people with Alzheimer's by talking to them and keeping them company.

FOODAI

A machine learning-powered software developed by a team at the Singapore Management University (SMU), led by Dr Steven Hoi, an associate professor of information systems.

FoodAI allows users to snap pictures of various types of food which the software will recognise immediately. It currently has a database of more than 100 types of cuisine, ranging from chilli crab to duck rice. The team is expanding its database to more than 1,000 different food types and to better differentiate similar-looking dishes, such as pasta from mee goreng.

The food-recognition code will soon be released as an API which allows app developers to integrate it into their apps, such as those which help users track calories.

MALICIOUS URL FILTER

A machine-learning algorithm that SMU's Dr Hoi is working on with the Defence Ministry to identify malicious links in e-mails in real time.

Traditional methods of catching such links rely on software cross-referencing to an established blacklist of URLs known to be malicious. This makes systems potentially vulnerable to new links not in the blacklist.

Machine-learning software can identify the patterns of such links, such as their IP address or s source, and prevent such links from appearing in a user's inbox. Such software can reduce the chances of users clicking on malicious links, and falling prey to cybercrime, by blocking the links with up to 97 per cent accuracy.

Lester Hio

What is machine learning?

Machine learning is a subset of the field of computer science known as artificial intelligence (AI), which seeks to simulate the workings of a human brain.

Machine learning is a form of programming, where the software improves its response after learning from previous responses, rather than following only scripted responses.

Nascent forms of machine learning first emerged some 20 years ago. The most modern form is "deep learning", which tries to model the neural networks of the human brain by identifying millions of patterns in large datasets to predict the next outcome.

It plays an important role in big data analytics and is currently the rage in machine-learning research, given the accessibility of big data and computational power.

Professor Lee Wee Sun, vice-dean of undergraduate studies at the National University of Singapore's School of Computing, says "true" AI is still far off in the future because there are four requirements for software before it can be deemed "intelligent": learning, planning, reasoning and knowledge representation.

So, while machines may currently be able to crunch large amounts of data and make accurate decisions, such as when to buy and sell in the stock market based on statistical predictions, the human mind may never be replaced in areas like artistic creativity or coming up with novel solutions to open-ended problems.

Lester Hio