

## HIGHER ED

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**A** SEARCH on the Internet on artificial intelligence (AI) produces various results. But in general, the term AI refers to the simulation of human intelligence processes by computer systems.

Recognising AI's capacity to influence both business and social settings via innovative solutions, several universities in Malaysia have focused on producing a diverse range of AI-related research papers and patents in recent years.

One of the focuses on AI by Universiti Teknologi Malaysia, for example, through its Centre for AI and Robotics (CAIRO) — which was established by the varsity's Malaysia Japan International Institute of Technology (MJIT) in 1997 — is machine vision.

"Applications such as pattern recognition using machine vision are very much needed in various industries. Some examples are applications such as license plate recognition system, tropical wood species recognition system, product grading system, and biometric system," said MJIT dean Professor Dr Ali Selamat.

He said at CAIRO, intelligent robotics were also an area of focus and robotics vision was the element that made robots intelligent.

A vision system enables autonomous robots to do path planning and path following, as well as avoid dynamic obstacles. CAIRO also works on various autonomous guided vehicles, with a focus on smart manufacturing.

"Apart from machine vision, CAIRO also uses AIs for control, optimisation, scheduling and fault diagnosis. One of the applications developed by Cairo is on power transformer fault diagnosis, which provides utility companies an intelligent tool for preventive maintenance of their power transformers," he said.

Other than research at CAIRO, advancements in AI in deep learning are applied in various disciplines.

"We are bringing AI technology into the classroom. Students can gain access to various open platform AIs for solving real engineering problems, such as Google's TensorFlow or big data analytics," he said.

Ali said CAIRO was also working on new AI technologies, such as deep learning neural networks, and looking at the prospect of using the technologies for applications in optimisation, control, fault diagnosis and pattern recognition, among others.

Universiti Putra Malaysia (UPM) has been actively looking into AI development since 2001, said vice-chancellor Professor Aini Ideris.

According to her, AI research and development at the university was undertaken by researchers from its Faculty of Engineering and Faculty of Computer Science and Technology.

UPM has established research groups to focus on intelligent and control system design, intelligence system engineering and intelligent computing, as well as smart farming technology.

"The AI-related subject matters we focus on at UPM include algorithms, models, robotics and intelligent systems — all of which are emerging technologies in AI," she said.

"As AI research has seen positive development, UPM is looking forward to applying AI technology to the field of agriculture for the benefit of humanity. In addition to that, UPM is moving to being more translational in its research approach," she said.

Among projects that reflect this is the Continuous Operating System for Microalgae Culture Optimised for Sustainable Tropical Aquaculture (COSMOS), which facilitates the establishment of an energy-efficient mass-culture system of



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## TRENDS

# AI solutions for human problems

high value microalgae using recycled nutrients from aquaculture pond sludge.

University Malaya (UM) prides itself as the only university that offers a Computer Science programme specialising in AI, and has a Department of Artificial Intelligence under its Faculty of Computer Science and Information Technology, that was formed in 1997.

The fundamental AI subjects focused by the faculty are machine learning, numerical methods, image processing and natural language processing.

"Natural language processing (NLP) is used to analyse text, allowing machines to understand how people speak. This human-computer interaction enables real-world applications, like automatic text summarisation, sentiment analysis, topic extraction, named entity recognition, parts-of-speech tagging, relationship extraction, stemming, and more.

NLP is commonly used for text mining, machine translations and automated question answering," said Professor Abrizah Abdullah, dean of the faculty.

"Image processing gives improved information for human interpretation and processing of image data for storage, transmission, and representation for machine perception. Image processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications. Medical image processing is a huge field, mainly due to the digitisation of medical

images," she said.

Abrizah said the main research area that the Faculty of Computer Science and Information Technology is currently active in is deep learning, a sub-field of machine learning.

"Research topics for deep learning include all types of big data analytics applications, especially those focused on computer vision, NLP, language translation, robotics and medical diagnostics.

"In the past, we have worked with the Royal Botanic Gardens in the United Kingdom to study how deep learning can be used in plant classification.

"We have also investigated deep learning models to teach a machine to synthetically draw paintings from famous artists, such as Vincent van Gogh and Pablo Picasso," she said.

Other AI-related research works are in healthcare and medicine, medical big data/data mining, medical image processing, text analytics/NLP and robotics.

"Some industries in Malaysia rely heavily on foreign workers simply because they do not attract Malaysian workers. These industries usually involve manual labour and are considered 3D [dull/difficult, dirty and dangerous] industries. Robots are more suitable for these tasks, which may also be life threatening in certain cases.

"Any potential research in this area would be the development of robots that would result in modernising and mechanising some of the tasks in these industries, thus encouraging and attracting more local participation," she said.



Professor  
Dr Ali Selamat



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