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ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON BUSINESS

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HKUST PRESIDENT TONY CHAN ON TECHNOLOGY AND BUSINESS IN HONG KONG

A.I. AND THE NEW ERA OF BUSINESS

Some of the world's smartest minds are putting their heads together to use artificial intelligence for future good. Among other things, machine-led intelligence could help make businesses smarter, more efficient – and more profitable.

STORY **BONG MIQUIABAS**

Andy Chun, the chief information officer at City University of Hong Kong (CityU), has worked with his share of Hong Kong heavyweights. As well as looking after CityU's infrastructure, systems and services, Chun – who is also an associate professor at the university's computer science department – has developed artificial intelligence (AI) systems for a range of industries.

Chun's algorithms have helped the MTR Corporation schedule rush-hour trains, Hong Kong International Airport assign check-in counters to airlines, and the Hospital Authority to configure adequate staff rosters. He sees data analytics and the enhancement of applications and services as being vital to business growth.

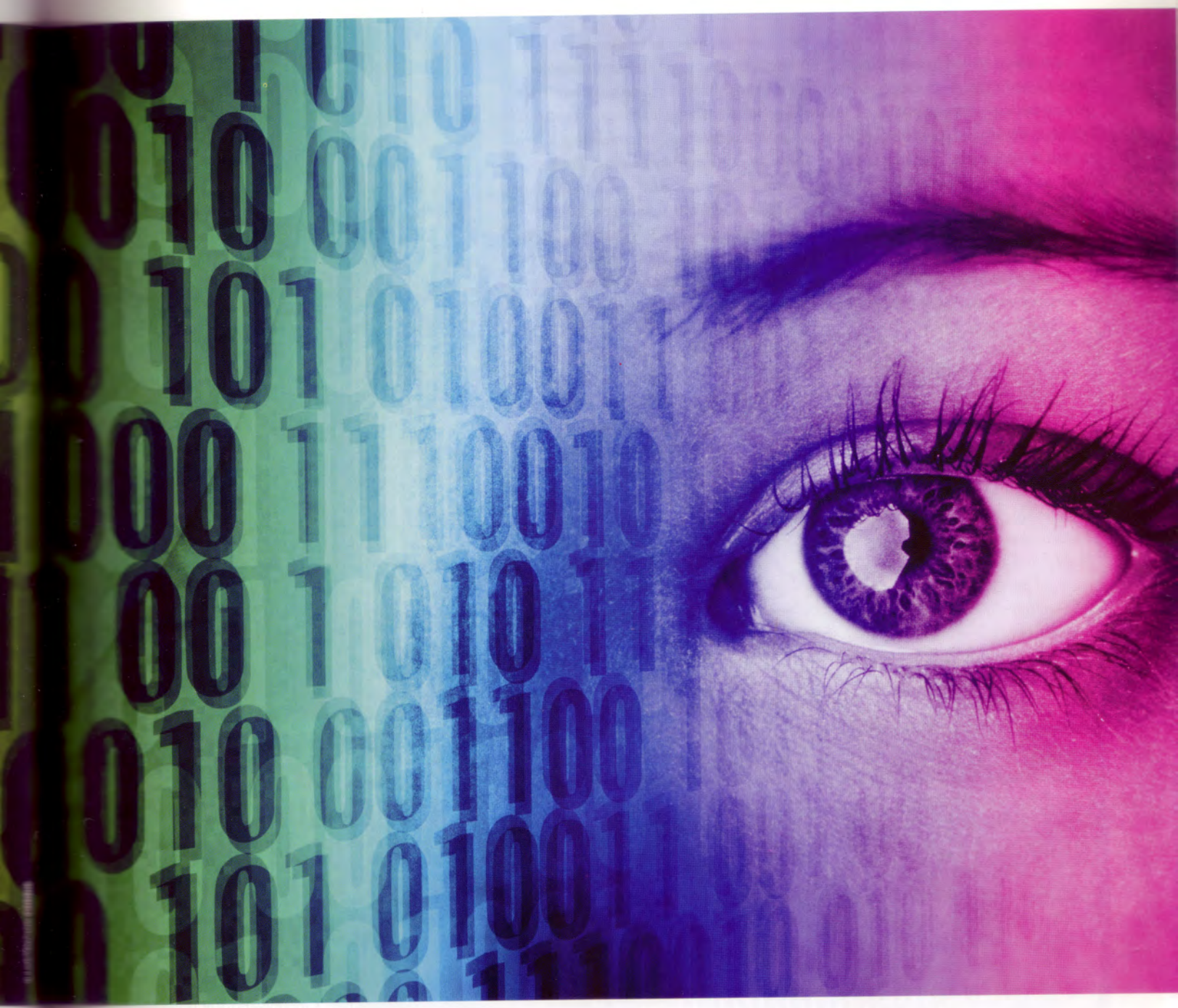
"Use AI to provide higher quality, more accurate, more intelligent services. That's where the money is at," Chun says. Still, he thinks that AI needs to become more generalised to have broader application.

"Currently, AI is very good at expert-level knowledge in a very narrow field, but very weak in broad general knowledge such as good common sense," he adds.

This already looks set to change. AI's influence has recently been expanding far beyond academia and niche uses. A branch of AI called "deep learning" or "machine learning" – which involves artificial neural networks that simulate the human mind in learning from data – has been catching on fast in the tech and business worlds.

IBM's Watson, a computer system which uses natural language processing, information retrieval and automated reasoning to answer questions, competed on the US quiz show *Jeopardy!* in 2011, beating former winners.

Since then, IBM has created two Watson-related business units – Watson Group, which



develops cloud-delivered cognitive computing technology, and Watson Health, which aims to help doctors, researchers and insurers use personal health data to deliver personalised care.

In 2012, Google announced its acquisition of London-based start-up company DeepMind Technologies, which combines techniques from machine learning and systems neuroscience to build powerful general-purpose learning algorithms, according to DeepMind's website. The figure was not officially confirmed, but Google reportedly paid around US$$650 million for DeepMind, which developed a program that impressively demonstrated it can "learn" how to play – and master – video games, with superhuman ability.

THE BEST BRAINS

In May 2014, Baidu announced the appointment of AI researcher Andrew Ng as its chief scientist. Ng, who has been an associate professor of computer science at Stanford University since 2002, also co-founded online learning company Coursera – which has partnered with some of the world's top universities– in 2012.

Ng previously worked at Google, where he led the company's Deep Learning project, after joining the tech giant in 2011. His team developed one of the biggest deep learning systems in the world, which became known as "Google Brain". Comprising an artificial neural network of more than a billion connections, when it connected 16,000 computer processors and was presented with 10 million images from YouTube videos, the results – released in June 2012 – caused a sensation.

COMPUTERS THAT LEARN

Broadly speaking, the system learned "by itself" (the data fed to it was unlabelled) how to recognise objects – including, most famously, cats.

After presenting images to the network, the Google team "probed different neurons in the network to see if any of them were highly selective for (responded strongly to) particular common objects", software engineer Quoc Le said in a Google+ post describing the team's findings. "Perhaps in line with a stereotype about what goes on YouTube, we found a neuron that was highly selective to images of cat faces."

Ng says deep learning has many potential practical applications at Baidu. "Deep learning algorithms are a technology that enables our computers to look at a lot of data and make predictions," he says. "We apply this technology to a lot of different problems: such as [determining] what ads a user might be interested in, or predicting if a hard disk is about to fail, or computer security."

For internet search engines like Baidu, machine learning helps facilitate more effective advertising. "Users want to see the information most relevant to their information need; advertisers want their ads to be shown to the users most likely to be interested," says Ng. "Our deep learning algorithms have significantly improved our ability to show users the most relevant ads."

To help explain what's needed for development in AI, Ng makes an analogy with rockets. "You need a huge engine and a ton of fuel. Computers are the engine, the neural networks; the data is the rocket fuel. You need both to launch and send the space rocket to interesting places," he says.

Baidu Research has AI labs in Beijing and Silicon Valley, and works on select projects which it deems worth enough to pursue. "Our mission is to develop AI technologies that affect hundreds of millions of users," says Ng. "If we can't do that, then we don't take up the research." He's optimistic about future breakthroughs.

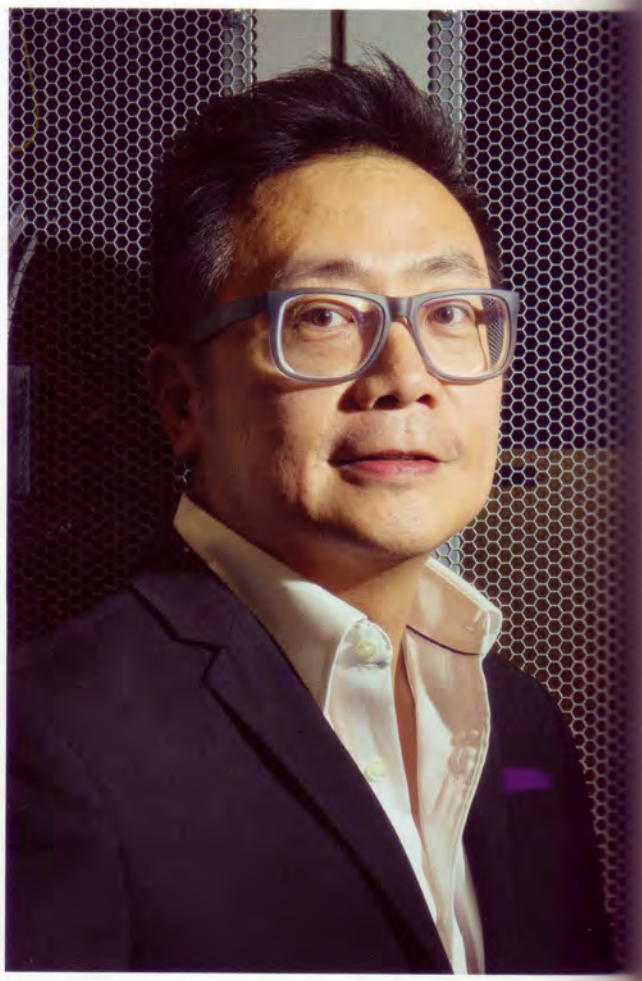
"At Baidu Research, we're creating leading technology and hope to have a positive impact on business. Right now, we're rapidly learning the next generation of deep learning technologies ... We're working with bigger computers and much more data, so we're allowing technology to take off."

Ng is particularly engaged in speech recognition and the ability of computers to respond to language directives and questions. "This is one thing I'm really getting excited about," he says. "We have the potential to reach a tipping point due to deep learning."

Ng thinks the developments are particularly important because of the major shift that's being made from computers to mobile devices, and cites ordering a taxi and telling a TV what channels to find as some day-to-day examples of how the technology could be used.

Ng, whose family is from Hong Kong (his mother, Tisa Ho, is the executive director of the Hong Kong Arts Festival), works primarily at Baidu's research lab in California and regularly visits the company's headquarters in Beijing.

Ng maintains strong ties with Hong Kong, where he spent part of his early childhood, and continues to visit every Christmas.



"USE A.I. TO PROVIDE HIGHER QUALITY, MORE ACCURATE, MORE INTELLIGENT SERVICES. THAT'S WHERE THE MONEY IS AT"

— Andy Chun, City University of Hong Kong

ABOVE
Andy Chun, chief information officer and associate professor in computer science at the City University of Hong Kong

LOCAL BREAKTHROUGHS

Meanwhile, Hong Kong-based AI company Insight Robotics has been making waves both locally and abroad. The start-up – which took part in the Hong Kong Science and Technology Parks' incubation programme – was named the Entrepreneur of the Year at the IBM SmartCamp Global Finals in Las Vegas in February. It received US$2 million in its latest round of fundraising last October, having earlier received US$2 million in seed funding.

Insight Robotics creates its own algorithms and collects and analyses data. As Rex Sham, co-founder and the company's chief analyst, explains: "We are very strong in the software side, but not in the hardware or carrier side. We buy the drones from a Chinese manufacturer and we put in our sensors. We develop the sensors and cameras and we sell the whole package to our operators."

The company offers a range of robotics-based technology solutions, relating to wildlife detection, agricultural surveying and mapping, and pipeline and electrical fault detection. Perhaps most famously, its drones – already deployed in rural areas across a number of Chinese provinces – use advanced thermal imaging sensors and AI vision to detect wildfires.

Getting into this area was a strategic decision. "As a start-up, we need to pick a few things," says Sham. "We cannot pick something where industries already have keen competition, like national security or public safety industries, like CCTV cameras. We picked forestry at the time [because] there was no competition."

Insight Robotics also collects and analyses agribusiness data. Its

"DEEP LEARNING ALGORITHMS ARE A TECHNOLOGY THAT ENABLES OUR COMPUTERS TO LOOK AT A LOT OF DATA AND MAKE PREDICTIONS. WE APPLY THIS TECHNOLOGY TO A LOT OF DIFFERENT PROBLEMS"

—Andrew Ng, Baidu

FROM TOP
Andrew Ng, Baidu's chief scientist, previously led the Deep Learning project at Google.
Baidu's Beijing headquarters.

drones equipped with sensors can survey thousands of hectares of plantations, such as for palm oil, within hours, stitching together thousands of photos of exceptional clarity. "We sell our drone solution to a local operator that will apply for the aviation licence in different countries, like in Malaysia," explains Sham. "We collect a processing fee for the data processing." Their software can even analyse the photosynthetic activities of plants.

"We cannot find out what the problem is, but we can find the early results of those incidents, like insect invasion, disease-spreading, lack of water, lack of nutrients," says Sham. "And then the computer will automatically colour it and you can send people to the exact location to tackle the problem." End-user clients can log in to their computer to view data on a user interface.

There are other industries in which AI is making a big impact. "Quite a lot of medical developments are being achieved by big data analysis," Sham says. Describing new wearable devices, he says: "Originally you could only know of your health status when seeing a doctor. But now, just by wearing a watch, there [can be] a highly trained doctor located in the US looking at your data at any time."

All these developments bode well for the future. "I think from society's point of view, the large deployment of data collection or data analysis will help the whole world work with higher efficiency and save quite a lot of people's lives," Sham says. But he points out that it is crucial to safeguard the security of data.

"When you have powerful machines that can collect data in such an efficient way, there will be a big impact if the data falls into the wrong hands," says Sham, citing privacy concerns and also the potential for unscrupulous people to manipulate commodity markets using agribusiness data.

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— Rex Sham, Insight Robotics

FINANCE IN THE NEW AGE

AI has also been a game-changer in the world of finance. The ability of computers to synthesise and act upon vast quantities of data at superhuman speed holds obvious appeal in the business world.

Hong Kong-based company the Algorithmic Trading Group relies entirely upon automation to execute its stock trades. "In our business, you either have to be fast, or you have to be smart, or you cheat," says Tom Voute, one of the company's co-founders. "Cheating is out of the question for us and, fortunately, for most. 'Fast' is really expensive."

AI helps traders get "smart" by finding opportune market positions, which involves coming up with clever algorithms. This raises a question: could virtual traders become fully independent of humans? "Full independence would sound really attractive," says Voute. "But in the end, it's still about [human] common sense."

Similarly, Ng says: "We're so far away from really understanding how the brain actually works. Computers can be more intelligent, but they're still not sentient."

Andrew Romero, an investment banker with

ABOVE
Insight Robotic's aerial survey solutions use unmanned aerial vehicles equipped with sensors that can provide high-resolution photos of agricultural crops.

OPPOSITE PAGE
Rex Sham, co-founder and chief analyst of Insight Robotics.

Oberon Securities in New York, believes companies could look to cyber security specialists to potentially help enhance business growth. "My advice to business owners is to keep an eye out for new technologies that can potentially be incorporated into their businesses," he says. "A cyber security adviser may be helpful with this if they are actively scanning the market for the best products and services and can make tailored recommendations."

Romero, who co-founded an AI company and is currently reviewing opportunities with Hong Kong firms, says he knows of a number of AI outfits that have relocated to the city. "Part of the reason for this enthusiasm has to do with the fact that China is a world power that is growing quickly," he says.

As tech giants have weighed in on AI innovations and have been introducing broader, finance-related services such as mobile payment systems, big banks have also been getting in on the action, recognising the potential of big data analyses.

Late last year, UBS acquired Singapore-based Sqreem Technologies, which won a competition called the UBS Innovation Challenge. The bank sought pitches for a method of delivering personalised content to clients, based on information taken from available data. In a video presentation, Sqreem's founders showed how a cloud-based AI-driven computing engine could go through a range of openly available, unstructured data to find out about the interests of millions of Singaporean residents, according to Bloomberg last December.

Interest in deep learning has been fuelled by AI-related events and communities. On a recent Saturday afternoon in May, around 150 people gathered to take part in the Exponential Future Symposium held at the Hong Kong Polytechnic University. Loosely based on the idea that "exponential technologies" (technologies that have an exponential growth curve) will lead to the radical transformation of the world, the event sought to facilitate discussion of the technologies and their associated risks and rewards.

Speakers included visionaries now based in Hong Kong. AI guru Ben Goertzel – a scientist, author, researcher and entrepreneur who founded OpenCog and who has lived and worked in a number of countries – expounded on the need for open-source development to enable transformative technologies.

Mark Tilden, a former NASA scientist turned industrialist who makes robots, showed the audience some tottering creations, eliciting chuckles. Tilden, a barrel-chested Canadian who sports his signature fedora, spoke with a matter-of-fact conviction that robots will eventually be as commonplace as home nurses.

Tilden also posed an interesting question. "When can you trust the technology?" he asked the captivated Hong Kong audience. "Not when it impresses your cat, or your mom, or your supervisor – when it impresses your customer!"