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Toast to the University

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Good evening, every one!

Now, everyone talks about AI, or artificial intelligence. But what is AI, why is it so popular?

I am Dacheng Tao, currently an ARC Laureate Fellow and the inaugural director of the UBTECH Sydney Artificial Intelligence Centre. I have some ideas to answer such questions.

In Wikipedia, AI is defined as the intelligence demonstrated by machines, in contrast to the natural intelligence displayed by humans. Given this, it is important to understand what human intelligence is. We, humans, have four types of intelligent capabilities: perceiving, learning, reasoning, and behaving. These terms are self-explainable. We expect to endow machines to have similar capabilities like us.

We are fortunate on the edge to embrace the revolutionary progress of AI and to witness the enthusiasm of translational AI applications sweeping across all sectors in our life, from driverless cars making roads safer and improving fuel efficiency, to precision medicine separating patients into groups for personalised medical decisions, practices, and interventions. The almost simultaneous rise of transformational machine

learning technologies (including deep learning), big data, and powerful computational machines since 2010 is progressively enabling AI systems to perceive, learn, reason, and behave much more reasonable than ever, and makes the next generation of AI systems distinct from those developed in the past.

Very exciting, as shown in the video demos. Our current AI systems can complete many tasks under controlled environments: scene segmentation, object detection, single object tracking and multiple objects tracking, human pose estimation, facial attributes recognition, and single image depth recovery. Thus, we can understand where are the road, trees, buildings, and sky; we can track all the pedestrians and faces; we can estimate how far a person is away from the camera; we can detect all the key joints on human bodies and localize the all facial feature points on a face, and so we understand their behaviors and expressions; we know how old they are, and if we have the reference images of these people, we can recognize who they are.

We can also apply these functions to analyze sports videos, helping professional managers to understand the soccer and basketball players; to change the education strategy from childcare and primary school to high school and even universities; and to transform the way we living, thinking, creating and working. It seems AI has the potential to help us on everything, but we still need to enjoy tonight's dinner by ourselves.

AI has been widely accepted as the lynchpin of a Fourth Industrial Revolution and proven to be one of the major driven forces of the economic growth and social progress. Evidence shows that industrial robotic automation alone increased labour productivity growth by 0.36 percentage points across 17 countries between 1993 and 2007. Various reports foresee consistently that AI holds the promise to approximately double annual economic growth rates in many countries by 2035. PwC estimated that AI could contribute up to US \$15.7 trillion to the global economy in 2030. The United States is preparing for the future of AI, and the UK identified Robotics and Autonomous systems as one of its "Eight Great Technologies". China has been at leading position in a number of AI-related publications and patents for years. Such initiatives are also being developed at the company level in those countries: Google redirected the company strategy from Mobile first to AI first; Deepmind, a London-based leading AI company recruits heavily from Oxford and Cambridge and impressed the world with history-making AlphaGo; and Baidu from China is now "All-in on AI" declared at its first Create AI Developer Conference. Even there is a dramatic change in academia conferences. For example, this year's AAAI, together with IJCAI known the best two AI conferences, received nearly 7,800 submissions. Considering the submission number was some 1,000 in 2010.

Today, AI is blossoming and has surpassed even human's performance in practice, but in specific and isolated functions, or known as narrow AI, e.g. object labelling from images and face recognition.

However, there are still many challenges. For example, why deep leaning is so powerful? how can we build robust AI systems to resist adversarial attacks? Existing models can easily make biased decisions. How can we avoid that?

Researchers in the AI community are working together to envision and implement "human-centric" AI as a comprehensive network, effectively and efficiently connecting

previously isolated narrow AI functions, bridging the gap between human intelligence and machine intelligence to transform the understanding of past and present AI, by planting machines with human's excel at intuitively understanding of the physical world, rapidly learning new concepts from only a handful of examples, generalising or transferring generalised knowledge gained in one context to novel, imagining possible scenarios, envisioning the future, and carrying out simulation-based planning.

The primary objectives of the UBTECH Sydney AI centre are to: (1) understand the boundaries of basic AI capabilities of perceiving, learning, reasoning and behaving (or PLRB) by comparing with human's performance; (2) quantitatively measure the performance of ethic-constrained PLRB tasks; and (3) form foundations for PLRB to guarantee AI systems to be generalisable, predictable, efficiently computable, explainable, transferable, stable and robust, and controllable.

By and by, we aim to advance Australia's world standing in AI and stimulate the Australian scientific and engineering communities to broadly exploit AI.

Thanks and please enjoy your night.