Artificial Intelligence in Medicine

Abstract

Artificial Intelligence is on upswing. It is the technique used to make computers think like human. It gave a "smart" to a machine. The implication is that machines can take a lot of jobs from human. However, with new kind of application machines can do, a lot of new jobs will be create. This talk aims to explain what is AI and how it works for medicine. Many successful projects that use AI to a benefit in medicine will be explored. The danger of intelligent machines of the future will also be discussed.

Artificial Intelligence can be defined as an intelligent agent that acts like human. This includes software services (aka Apps) and automated reasoning (such as medical diagnosis) and automated machines (like robot vacuum, automated factory etc.). There are many tasks that AI can perform and some of the task AI are even better than human. These are some example of the tasks that AI can do: understand human speech, identify objects from pictures, play games, analyse big financial data, drive cars, control robots, automate many jobs.

There are two approaches that allow AI as a computer program to behave intelligently: using Logic, and using Memory and Learning. The first approach is using Logic. Computer programs can perform deductive reasoning. They can make conclusion from some axiom and facts. Logical statements can be made about the situation in the real world. Given known facts, results such as the diagnosis of a patient and be inferred. There are limit to such approach as for a useful system, large amount of rules and facts are required.

Second approach to intelligent is to use Memory and Learning. We can imitate human brain by encoding information and memory into a large connected network. This network responses to input with a correct output. The relationship of this input/output can be learn from large amount of data without human intervention. This type of approach is called Artificial Neural Networks.

An example for such system is an Artificial Neural Networks to recognise Prabhas' Face. I can show a lot of my face pictures from many angles. Then I can train a kind of network to remember this face. I also train a lot of pictures of not-my-face. So, now the network can distinguish between my-face and not-my-face.

One of the most powerful technique to create artificial intelligence is Machine Learning. Recently, there are several achievements by Machine Learning that compete with human experts successfully. With these encouragements, a lot of interest and investment have been poured into this field with promising results. I will explain the basic technique of Machine Learning, especially Deep Learning and Convolutional Neural Network. This form of Machine Learning can digest huge amount of data and creates mathematical models that can be used to perform classification and prediction tasks. The application for this ability to learn from large data has been exploit in many projects. I will illustrate a number of examples and discuss the current trend.

Speaker CV

Prabhas Chongstitvatana is a professor in the department of computer engineering, Chulalongkorn University. He earned B.Eng. in Electrical Engineering from Kasetsart University, Thailand in 1980 and Ph.D. from the department of artificial intelligence, Edinburgh University, U.K. in 1992. His research involves robotics, evolutionary computation, computer architecture, bioinformatics. He is a lifetime member of Thailand Engineering Institute, senior member of Thai Academy of Science and Technology, senior adviser of Thai Robotics Society, founding member of Thai Embedded System Association and IEEE Robotics and Automation Society. He was the president of ECTI Association of Thailand 2012-2013. He has been awarded "National Distinguished Researcher" by National Research Council of Thailand in 2009. His current interest is in building Quantum computer.