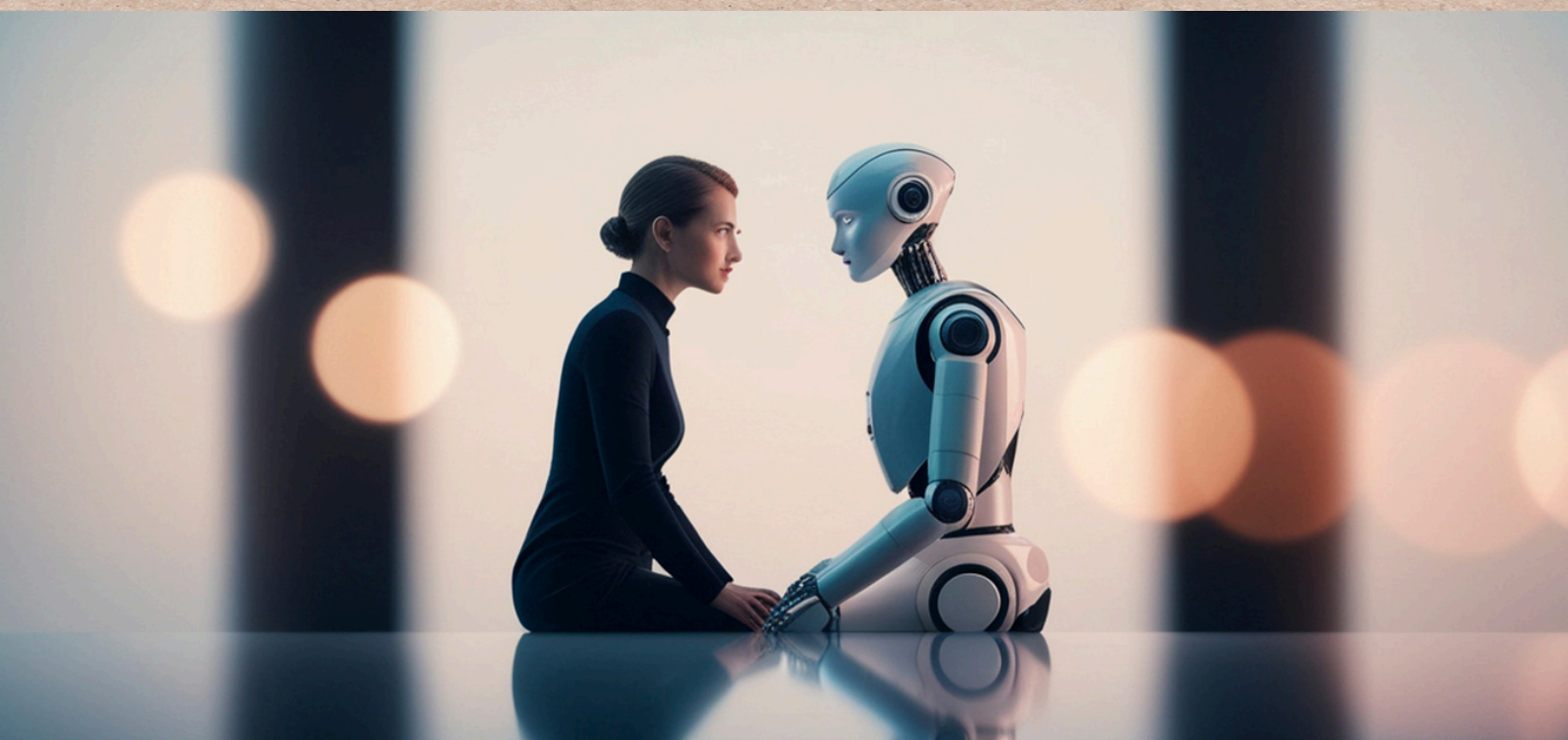


# THE RISE AND FALL AND RISE AGAIN OF ARTIFICIAL INTELLIGENCE

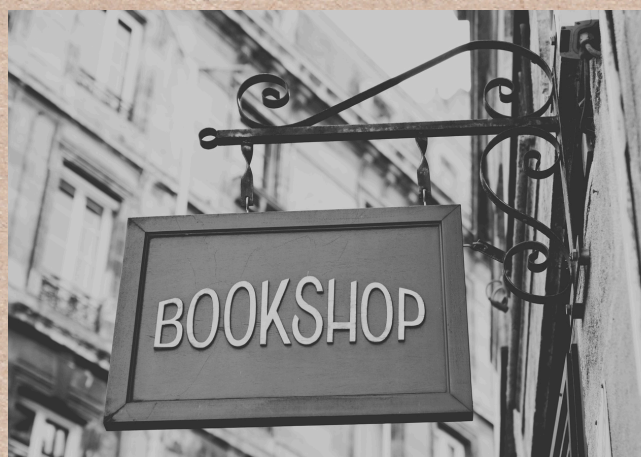
Professor Dato' Dr. Abu Bakar Abdul Majeed



In the winter of 1987, after submitting my thesis and while waiting for the viva, I had plenty of time on my hands. Wandering through the less frequented streets of Sheffield, I stumbled upon a little bookstore. I found a book on 'Artificial Intelligence (AI) - Can Machine Think?' (I've forgotten the exact title, though) and somehow was attracted to this concept of an artificial brain phenomenon that the author tried to postulate. Because the book was second-hand, I could afford it.

My doctoral work revolved around how anaesthetic agents suppressed brain functions, including consciousness. During general anaesthesia, consciousness is lost, hence consequently intelligence is temporarily turned off.

Hence, it would seem to me that intelligence could only exist if there is consciousness. I was curious to find out if the so-called 'intelligent machine' also had consciousness.



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## AI AND HUMAN INTELLIGENCE

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The book kicked off by describing how a group of thinkers like John McCarthy and Marvin Minsky, who coined the term "Artificial Intelligence", met at Dartmouth College in 1956. Earlier, Alan Turing, the British mathematician and logician, who led the team cracking the German Enigma code during World War II, posed the question, "Can Machines Think?" (1950) in his seminal paper "Computing Machinery and Intelligence." Turing introduced the Imitation Game, or the "Turing Test," as a practical way to appraise machine intelligence. The Imitation Game (2014) is an acclaimed biographical thriller starring Benedict Cumberbatch as Alan Turing. Presumably, the 1956 Dartmouth Summer Research Project on Artificial Intelligence is the birthplace of modern AI.

The book then introduces three aspects of AI, namely natural language processing, expert systems which are AI branches, and machine learning which acts as the bridge between human communication and automated decision-making. The author of the book, also highlights 'heuristic' which separates AI from human intelligence (HI) in terms of structure, speed, and adaptability, with AI excelling at rapid data processing and pattern recognition, while HI possessing superior adaptability, intuition, and context awareness. AI uses algorithmic shortcuts for efficiency, whereas HI is biological, energy-efficient, and emotionally driven.

Although HI, too, is efficient, or more precisely economical in the processing of certain information like relying whether rightly or wrongly on stereotyping, it cannot challenge AI's speed and thoroughness. After all, the neural network for learning of an AI system, like ChatGPT 4 is believed to use 16 specialised, smaller neural networks or "experts". Each expert has roughly 111 billion parameters. In generating a response, the model activates only 2 of these 16 experts, using roughly 280 billion parameters, rather than the total estimated 1.8 trillion parameters or artificial neural networks arranged in about 120 different layers. Just for comparison, the number of synapses that make up the neural network of the human brain is 100-1000 times more.

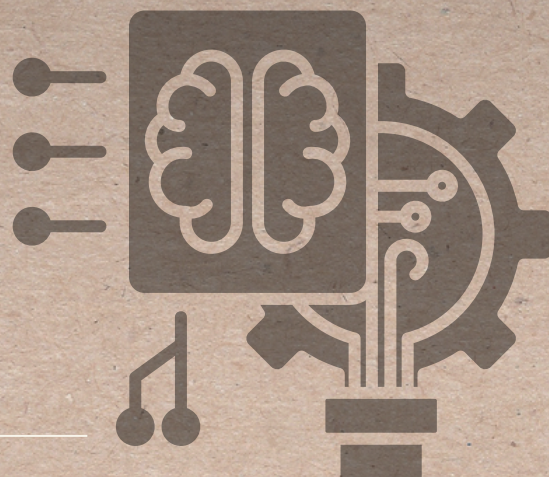
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## THE RISE

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Going back to the Dartmouth Workshop of 1956 that pioneered AI, much hope (or hype?) was attached to it as the official request to organise the event entitled 'A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, by John McCarthy et al., 1955, claimed that "every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it". The workshop's overwhelming optimism-believing machine intelligence was just one summer away set a precedent for the industry.

Early developments and challenges included ADALINE (1960) by Bernard Widrow and Marcian Hoff. This was an early, adaptive single layer neural network system that could learn from data inputs, setting the scene for modern machine learning. The year 1966 saw the introduction of the earliest chatbot (ELIZA by Joseph Weizenbaum) and autonomous robot (Shakey by Stanford Research Institute).



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## THE FALL

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However, algorithms used in basic logic problem-solving systems such as ADALINE and ELIZA were very different from those required to imitate the information processing and decision-making capabilities of the biological brain. Thus, the overconfidence in developing AI with human-like intelligence within a decade began to fizzle out in the late 1960s. What is referred to as the "AI Winter", set in.

The AI winter from 1970 to 1990 is a seasonal metaphor in which progress and interest in AI began to freeze. Computers at the time lacked the processing power required to perform highly complex tasks. Research funds on AI-related programmes were withdrawn. The cost of expert systems proved to be tremendously high and therefore, unsustainable. There was also limitations in systems updating and upgrading. The market for AI-related hardware collapsed. Slowly but surely, interests in AI started to fade.

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## THE 'RISE AGAIN'

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Fortunately, AI did not disappear altogether during the "AI Winter" period. Against all odds, it bounced back in the 1990s. The initial rise provided the foundational framework for everything from natural language processing to modern generative models. The AI revival was powered by the convergence of enhanced computational power, the availability of the massive datasets via the Internet, and intensification of neural network architecture.

The AI phenomenon of the 21st century seems irrepressible. Huge investments have been put into it. In 2026, the four major tech companies—Microsoft, Alphabet, Amazon, and Meta—announced that they would spend over \$650 billion on AI programmes. There is not even the slightest doubt regarding the possibility of an AI bubble bursting. Even Malaysia has declared that by 2030, it will be an AI nation. It would seem that this time, AI is here to stay.

AI is, and will be expected to contribute to almost all areas of life. Its application is fast becoming an indispensable tool in health care. In pharmacy, for example, AI is accelerating and cutting down the cost of discovering new drugs. Machine learning and multi-omics are integrated to determine novel and highly selective drug targets. With AI assistance, cases of medication errors are bound to decrease, and potentially risky polypharmacy can be avoided. Drug optimisation and personalised therapy will be increasingly attainable and accessible.

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## THE FUTURE

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Will AI suffer another downturn? It would be unlikely, especially if safety and ethical standards are ascertained. In fact, even higher expectations are placed on AI in the coming years. By 2030, the next wave of Artificial General Intelligence (AGI) is predicted to be commonplace. Combining AGI and digital clone technologies would enable personalised healthcare services for individuals who could afford them. It is as though having a pharmacist assisting with any issues related to your health and well-being, anytime, anywhere.

Last but not least, regardless of future progress in AI development and application, the central question remains whether an AI-enabled machine possesses consciousness and can therefore be considered akin to human intelligence. Or simply put, without consciousness, can there be intelligence? From a neuroscientific perspective, I believe the answer is no. Humans will remain indispensable, unless of course, machines come to possess consciousness.

SOME SENTENCES WERE DEVELOPED VIA AI ASSISTANCE, BUT THE CHOICE OF SENTENCES WAS BY THE AUTHOR