

BBC - iWonder - AI: 15 key moments in the story of artificial intelligence

The promise of intelligence

The quest for artificial intelligence (AI) began over 70 years ago, with the idea that computers would one day be able to think like us. Ambitious predictions attracted generous funding, but after a few decades there was little to show for it.

But, in the last 25 years, new approaches to AI, coupled with advances in technology, mean that we may now be on the brink of realising those pioneers' dreams.

1956

A 'top-down' approach

The term 'artificial intelligence' was coined for a summer conference at Dartmouth University, organised by a young computer scientist, John McCarthy.

Top scientists debated how to tackle AI. Some, like influential academic Marvin Minsky, favoured a top-down approach: pre-programming a computer with the rules that govern human behaviour. Others preferred a bottom-up approach, such as neural networks that simulated brain cells and learned new behaviours. Over time Minsky's views dominated, and together with McCarthy he won substantial funding from the US government, who hoped AI might give them the upper hand in the Cold War.

[Stanford University: 1956 Dartmouth Conferences proposal](#)

Every aspect of learning or other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it

In from three to eight years we will have a machine with the general intelligence of an average human being.

1969

Tough problems to crack

AI was lagging far behind the lofty predictions made by advocates like Minsky – something made apparent by Shakey the Robot.

Shakey was the first general-purpose mobile robot able to make decisions about its own actions by reasoning about its surroundings. It built a spatial map of what it saw, before moving. But it was painfully slow, even in an area with few obstacles. Each time it nudged forward, Shakey would have to update its map. A moving object in its field of view could easily bewilder it, sometimes stopping it in its tracks for an hour while it planned its next move.

[New York Times: Watch Shakey in action](#)

1973

The AI winter

By the early 1970s AI was in trouble. Millions had been spent, with little to show for it.

There was strong criticism from the US Congress and, in 1973, leading mathematician Professor Sir James Lighthill gave a damning health report on the state of AI in the UK. His view was that machines would only ever be capable of an "experienced amateur" level of chess. Common sense reasoning and supposedly simple tasks like face recognition would always be beyond their capability. Funding for the industry was slashed, ushering in what became known as the AI winter.

[YouTube: Lighthill & McCarthy debate AI on BBC TV](#)[John McCarthy reviews the Lighthill Report](#)

In no part of the field have discoveries made so far produced the major impact that was promised.

1981

A solution for big business

The moment that historians pinpoint as the end of the AI winter was when AI's commercial value started to be realised, attracting new investment.

The new commercial systems were far less ambitious than early AI. Instead of trying to create a general intelligence, these 'expert systems' focused on much narrower tasks. That meant they only needed to be programmed with the rules of a very particular problem. The first successful commercial expert system, known as the RI, began operation at the Digital Equipment Corporation helping configure orders for new computer systems. By 1986 it was saving the company an estimated \$40m a year.

[Wikipedia: Expert systems](#)

1990

Back to nature for 'bottom-up' inspiration

Expert systems couldn't crack the problem of imitating biology. Then AI scientist Rodney Brooks published a new paper: *Elephants Don't Play Chess*.

Brooks was inspired by advances in neuroscience, which had started to explain the mysteries of human cognition. Vision, for example, needed different 'modules' in the brain to work together to recognise patterns, with no central control. Brooks argued that the top-down approach of pre-programming a computer with the rules of intelligent behaviour was wrong. He helped drive a revival of the bottom-up approach to AI, including the long unfashionable field of neural networks.

[MIT: Rodney Brooks profile](#)[TED Talks: Rodney Brooks](#)

2002

The first robot for the home

Rodney Brook's spin-off company, iRobot, created the first commercially successful robot for the home – an autonomous vacuum cleaner called Roomba.

Cleaning the carpet was a far cry from the early AI pioneers' ambitions. But Roomba was a big achievement. Its few layers of behaviour-generating systems were far simpler than Shakey the Robot's algorithms, and were more like Grey Walter's robots over half a century before. Despite relatively simple sensors and minimal processing power, the device had enough intelligence to reliably and efficiently clean a home. Roomba ushered in a new era of autonomous robots, focused on specific tasks.

2005

War machines

Having seen their dreams of AI in the Cold War come to nothing, the US military was now getting back on board with this new approach.

They began to invest in autonomous robots. BigDog, made by Boston Dynamics, was one of the first. Built to serve as a robotic pack animal in terrain too rough for conventional vehicles, it has never actually seen active service. iRobot also became a big player in this field. Their bomb disposal robot, PackBot, marries user control with intelligent capabilities such as explosives sniffing. Over 2000 PackBots have been deployed in Iraq and Afghanistan.

[YouTube: Watch BigDog in action](#)[What is Boston Dynamics and why does Google want robots?](#)[BBC iWonder: Drones – Deadly robots or useful machines?](#)

2008

Starting to crack the big problems

In November 2008, a small feature appeared on the new Apple iPhone – a Google app with speech recognition.

It seemed simple. But this heralded a major breakthrough. Despite speech recognition being one of AI's key goals, decades of investment had never lifted it above 80% accuracy. Google pioneered a new approach: thousands of powerful computers, running parallel neural networks, learning to spot patterns in the vast volumes of data streaming in from Google's many users. At first it was still fairly inaccurate but, after years of learning and improvements, Google now claims it is 92% accurate.

[Tech Hive: Speech recognition through the decades](#)

Artificial intelligence would be the ultimate version of Google. It would understand exactly what you wanted, and it would give you the right thing.

2011

Man vs machine: Fight of the 21st Century

2014

Are machines intelligent now?