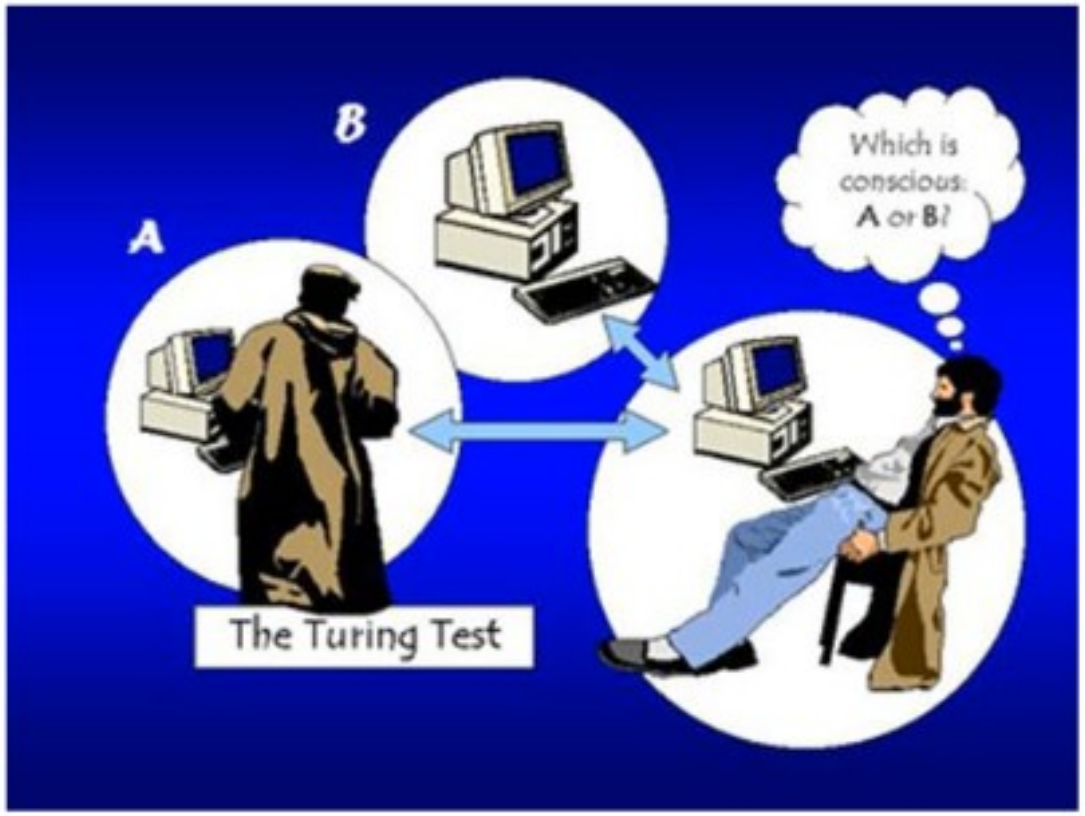
History of AI

- In 1943 McCulloch and Pitts presented a Boolean circuit model of brain.

- Turing Test in 1950 tries to detect to what point a machine can imitate the intelligence of human

https://www.youtube.com/watch?v=RfollkJMwA4

Turing Test (1950)



The computer passes the "test of intelligence" if a human, after posing some written questions, cannot tell whether the responses were from a person or not.

Dartmouth Workshop

- In 1956 a workshop was held in Dartmouth , Hanover, U.S.A with the participation of very prominent mathematicians.

- The Term Artificial Intelligence was coined at this workshop by **John McCarthy.**

- Just one year later, **Frank Rosenblatt** presented his perceptron as an artificial neural network.

Accordingly, **the seven basic pillars of AI** outlined in Dartmouth still stand today:

1. Automated computers.
2. How a computer can be programmed to use a language.
3. Development of neural networks.
4. Theory of the Size of a Calculation.
5. Self-learning.
6. Abstraction in AI.
7. Randomness and Creativity.

In order to achieve goals, the MIT played (and continues to play) a fundamental role. There, McCarthy and Minsky created the first AI project, which would produce so many results decades later.

Claude Shannon	founder of Information and Communication Theory
D.M. Mackay	british researcher in Information Theory and Brain organization
Julian Bigelow	chief engineer for the von Neumann computer at Princeton in 1946
Nathaniel Rochester	author of the first assembler for the first commercial computer
Oliver Selfridge	named 'the father of Machine Perception'
Ray Solomonoff	inventor of Algorithmic Probability
John Holland	the inventor of Genetic Algorithms
Marvin Minsky	key MIT researcher in the early development of AI
Allen Newell	champion for symbolic AI and inventor of central AI techniques
Herbert Simon	pioneer in Decision making theory and a Nobel Prize Winner
John McCarthy	inventor of the LISP programming language

Definitions of AI

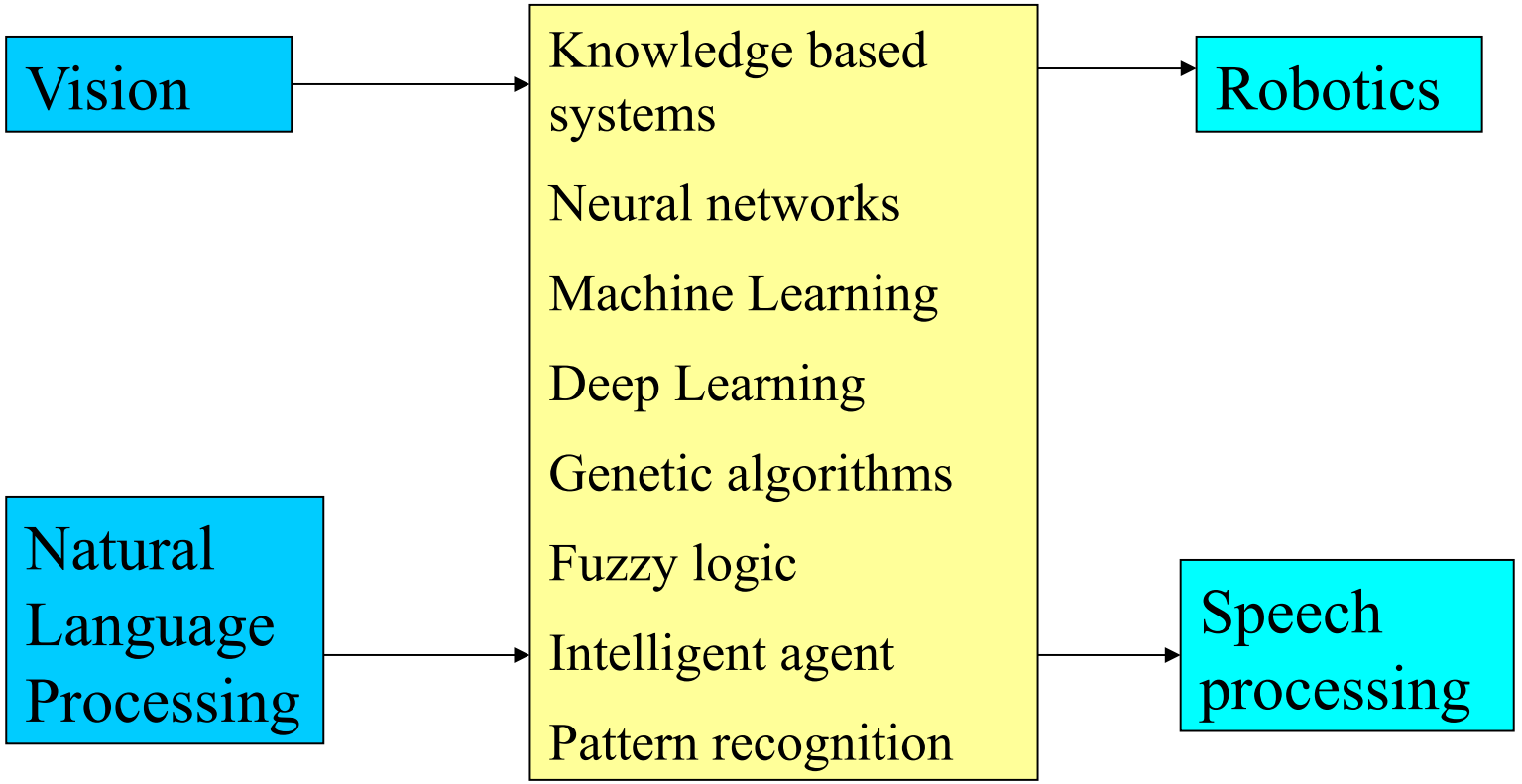
"The exciting new effort to make computers think . . . *machines with minds*, in the full and literal sense" (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . ." (Bellman, 1978)	"The study of mental faculties through the use of computational models" (Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act" (Winston, 1992)
"The art of creating machines that perform functions that require intelligence when performed by people" (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better" (Rich and Knight, 1991)	"A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes" (Schalkoff, 1990) "The branch of computer science that is concerned with the automation of intelligent behavior" (Luger and Stubblefield, 1993)

Figure 1.1 Some definitions of AI. They are organized into four categories:

Systems that think like humans.	Systems that think rationally.
Systems that act like humans.	Systems that act rationally.

Source : Russel and Norvig Book

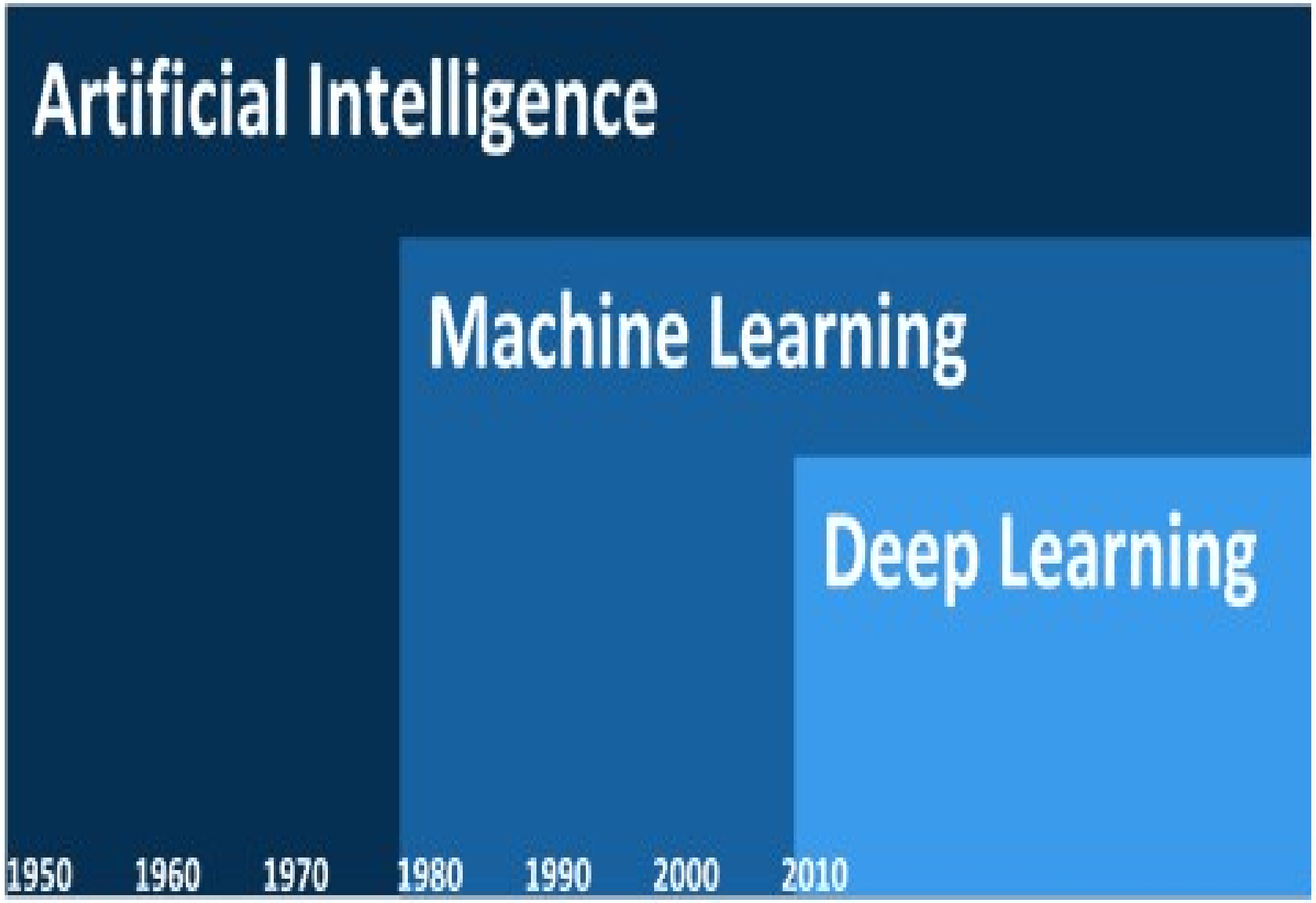
Human Intelligent Processing Models



Input

Processing

Output


Artificial Intelligence
Machine Learning
Deep Learning
1950
1960
1970
1980
1990
2000
2010

Intelligence

The ability to acquire and apply knowledge

Artificial Intelligence

A branch of Computer Science that is concerned with building systems that think and act like humans rationally.

Artificial Weak Intelligence

Specialises in one area and solves one problem

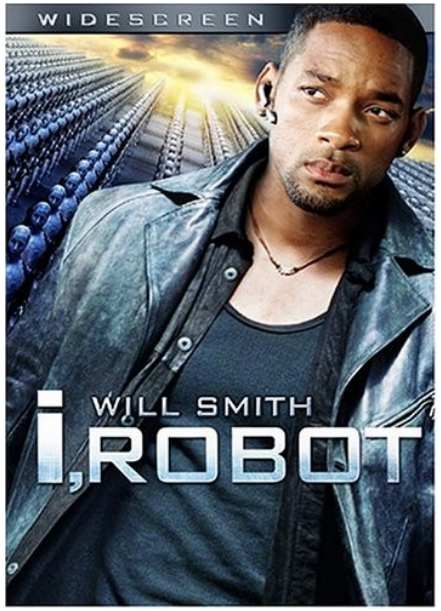
Artificial General Intelligence

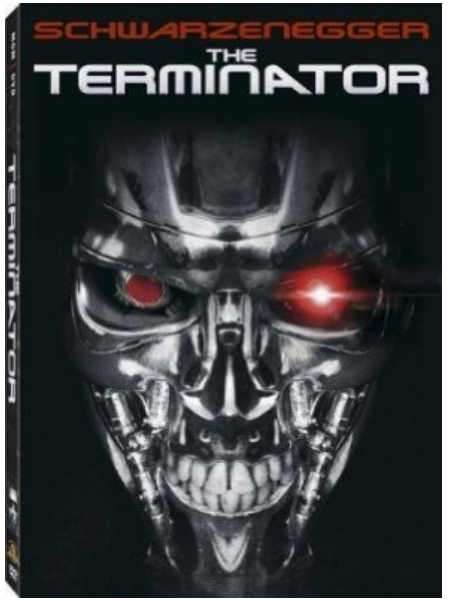
Refers to a computer that is as smart as a human across the board

Artificial Super Intelligence

An intellect that is much smarter than the best human brains in practically every field.

Artificial Intelligence in Movies





Arthur Samuels, who coined the phrase "machine learning," works with an early IBM machine and a checkerboard.

"Machine learning" coined (1959)

Arthur Samuel coins the term "machine learning," reporting on programming a computer "so that it will learn to play a better game of checkers than can be played by the person who wrote the program." This marks a historic point in our artificial intelligence timeline, with the coining of a phrase that will come to embody an entire field within AI.

Researchers spent six years developing Shakey.

Tough problems to crack (1969)

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.

Ken Olsen, founder of Digital Equipment Corporation, was among the first business leaders to realise the commercial benefit of AI.

A solution for big business (1987)

After a long “AI winter” - when people began seriously doubting AI’s ability to reach anything near human levels of intelligence - 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.

A STATISTICAL APPROACH TO LANGUAGE TRANSLATION

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ABSTRACT

An approach to automatic translation is outlined that utilizes techniques of statistical information extraction from large data bases. The method is based on the availability of pairs of large corresponding texts that are translations of each other. In our case, the texts are in English and French.

Fundamental to the technique is a complete glossary of correspondences of final locutions. The scope of the proposed translation process is: (1) Partition the source text into a set of final locutions. (2) Use the glossary plus contextual information to select the corresponding set of final locutions into a sequence forming the target sentences. (3) Arrange the words of the target final locutions into a sequence forming the target sentence.

We have developed statistical techniques facilitating both the automatic creation of the glossary, and the performance of the three translation steps, all on the basis of an alignment of corresponding sentences in the two texts.

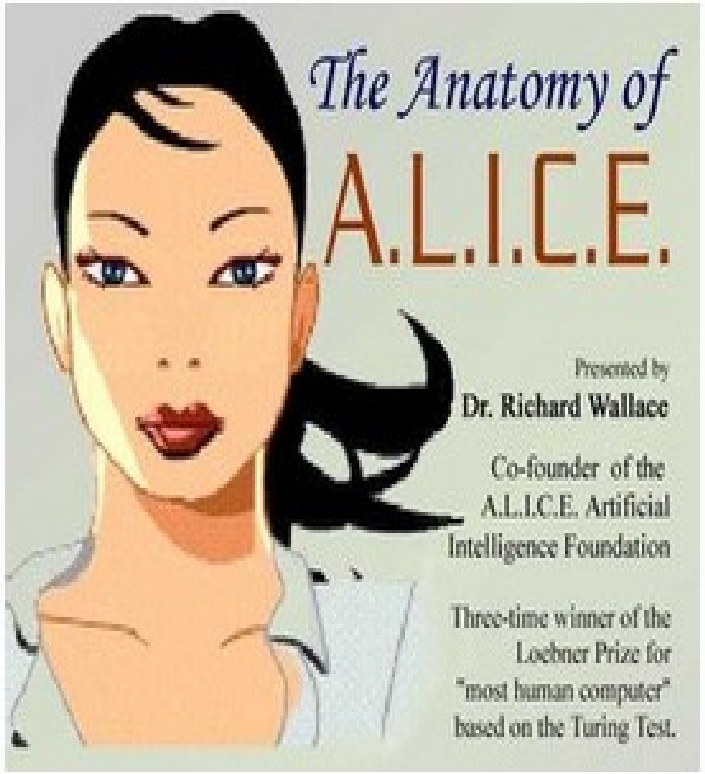
While we are not yet able to provide examples of French / English translation, we present some converging intermediate results concerning glossary creation and the arrangement of target word sequences.

The paper "A statistical approach to language translation," shifted real-world language problems from rules to probabilities that could be learned.

From rules to probabilistic learning

(1988)

Members of the IBM T.J. Watson Research Center publish "A statistical approach to language translation," heralding the shift from rule-based to probabilistic methods of machine translation, and reflecting a broader shift to "machine learning" based on statistical analysis of known examples, not comprehension and "understanding" of the task at hand (IBM's project Candide, successfully translating between English and French, was based on 2.2 million pairs of sentences, mostly from the bilingual proceedings of the Canadian parliament).



A.L.I.C.E. chatbot learns how to speak from the web (1995)

Richard Wallace develops the chatbot A.L.I.C.E (Artificial Linguistic Internet Computer Entity), inspired by Joseph Weizenbaum's ELIZA program, but with the addition of natural language sample data collection on an unprecedented scale, enabled by the advent of the Web.

Deep Blue "thinks like God" according to Gary Kasparov. From Andrew Marr's History of the World (BBC One, 2012).

Man vs. machine: fight of the 20th century (1997)

Supporters of top-down AI still had their champions: supercomputers like Deep Blue, which in 1997 took on world chess champion Garry Kasparov.

The IBM-built machine was, on paper, far superior to Kasparov - capable of evaluating up to 200 million positions a second. But could it think strategically? The answer was a resounding yes. The supercomputer won the contest, dubbed 'the brain's last stand', with such flair that Kasparov believed a human being had to be behind the controls. Some hailed this as the moment that AI came of age. But for others, this simply showed brute force at work on a highly specialised problem with clear rules.

The Roomba vacuum has cleaned up commercially – over 10 million units have been bought across the world.

The first robot for the home (2002)

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.

According to Google, its speech recognition technology had an 8% word error rate as of 2015.

Starting to crack the big problems

(2008)

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.

ImageNet democratizes data (2009)

Stanford researcher Fei-Fei Li saw her colleagues across academia and the AI industry hammering away at the same concept: a better algorithm would make better decisions, regardless of the data. But she realized a limitation to this approach—the best algorithm wouldn't work well if the data it learned from didn't reflect the real world. Her solution: build a better dataset. "We decided we wanted to do something that was completely historically unprecedented. We're going to map out the entire world of objects." The resulting dataset was called ImageNet. Fei-Fei Li released ImageNet, a free database of 14 million images that had been labeled by tens of thousands of Amazon Mechanical Turk workers. AI researchers started using ImageNet to train neural networks to catalog photos and identify objects. The dataset quickly evolved into an annual competition to see which algorithms could identify objects with the lowest error rate.

Robots are now able to learn mathematics.

Dance bots (2010)

At the same time as massive mainframes were changing the way AI was done, new technology meant smaller computers could also pack a bigger punch. These new computers enabled humanoid robots, like the NAO robot, which could do things predecessors like Shakey had found almost impossible. NAO robots used lots of the technology pioneered over the previous decade, such as learning enabled by neural networks. At Shanghai's 2010 World Expo, some of the extraordinary capabilities of these robots went on display, as 20 of them danced in perfect harmony for eight minutes.

Watson is now used in medicine. It mines vast sets of data to find facts relevant to a patient's history and makes recommendations to doctors.

Man vs machine: fight of the 21st century (2011)

In 2011, IBM's Watson took on the human brain on US quiz show Jeopardy. This was a far greater challenge for the machine than chess. Watson had to answer riddles and complex questions. Its makers used a myriad of AI techniques, including neural networks, and trained the machine for more than three years to recognise patterns in questions and answers. Watson trounced its opposition – the two best performers of all time on the show. The victory went viral and was hailed as a triumph for AI.

In many states in America it is legal for driverless cars to take to the road.

Are machines intelligent now? (2014)

Sixty-four years after Turing published his idea of a test that would prove machine intelligence, a chatbot called Eugene Goostman finally passed.

But very few AI experts saw this a watershed moment. Eugene Goostman was seen as 'taught for the test', using tricks to fool the judges. It was other developments in 2014 that really showed how far AI had come in 70 years. From Google's billion dollar investment in driverless cars, to Skype's launch of real-time voice translation, intelligent machines were now becoming an everyday reality that would change all of our lives.

Lee Sedol vs AlphaGo, 2016

AI artwork sells for $432,500, and Christie's becomes the first auction house to offer a work of art created by an algorithm.

AI art makes $432,500 at an auction

(2018)

Can a machine generate the next Picasso masterpiece on its own? This question was thrust into the limelight by artist collective Obvious, a Paris-based trio fascinated by the artistic potential of artificial intelligence. Obvious fed an algorithm 15,000 images of portraits from different time periods. The algorithm generated its own portraits, attempting to create original works that could pass as man-made. When it went under the hammer in the *Prints & Multiples* sale at Christie's in October 2018, *Portrait of Edmond Belamy* sold for an incredible $432,500, signalling the arrival of AI art on the world auction stage.

openAI Five defeat World Champions in Dota2 -2019

AI made history as neural networks defeated human world champions in a best-of-three contest at Dota 2, a popular and complex online strategy game. OpenAI Five, the AI agent developed by the namesake research lab, managed to perform the feat.

Thank You

Questions?