A short history of AI

From the ‘50s until today

QUALITANCE

OVERVIEW

Back in the ’50s, the general belief was that machines would not be able to behave intelligently. Fast-forward to today - the matter of machines getting as smart as humans seems to be just a question of time.

Futurist **Ray Kurzweil**, who has a track record in accurate predictions, already announced a timeline for the growth of AI:

"*By 2029 Artificial Intelligence will pass a valid Turing test and achieve human-level intelligence. Singularity – the moment we will multiply our effective intelligence a billion fold by merging with the intelligence we have created, will occur in 2045.*"

Ways to measure the future of AI

- Assess its current successes and failures while taking into account the ever-increasing power of technology;

- Look back in the past and see how fast it evolved over a span of 60 years.

This e-book takes you through the boom-and-bust cycles of AI, from inception to the age of autonomous cars, virtual assistants and AI robots.

HOW IT ALL BEGAN

In the early ’50s, the study of *thinking machines* had various names: cybernetics, automata theory, and information processing.

By 1956, prominent scientists Alan Turing, Norbert Wiener, Claude Shannon and Warren McCullough had already been working independently on cybernetics, mathematics, algorithms and network theories.

However, it was computer and cognitive scientist **John McCarthy** who came up with the idea of joining these separate research efforts into a single field that would study a new topic for the human imagination – **Artificial Intelligence**. Same McCarthy coined the term and founded the AI labs at MIT and Stanford.

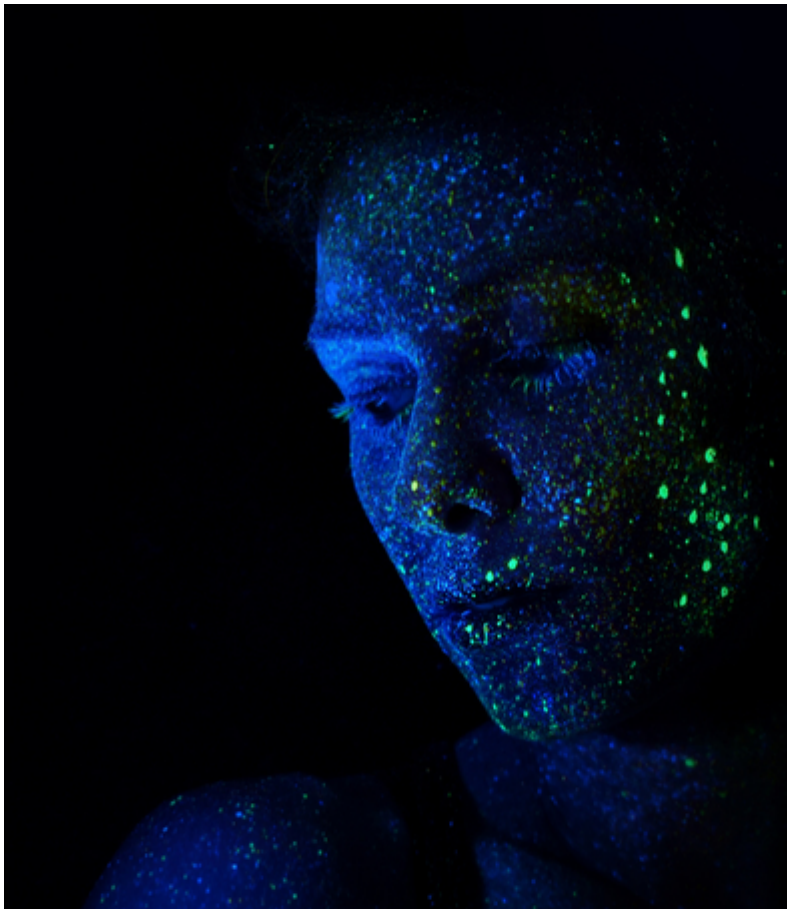
AI summers and winters

Ever since, AI has lived through alternate decades of glory and scorn, widely known as **AI summers and winters**. The summers were filled with optimism and huge fundings, whereas the winters came with funding cuts, disbelief and pessimism.

In 1956, John McCarthy set up the **Dartmouth Conference** in Hanover, New Hampshire, reuniting leading researchers in the complexity theory, language simulation, neural networks, the relationship between randomness and creative thinking.

The newly created research aimed to develop **machines that could simulate every aspect of intelligence**.

The 1956 Dartmouth Conference is considered to be **the birth of Artificial Intelligence**.

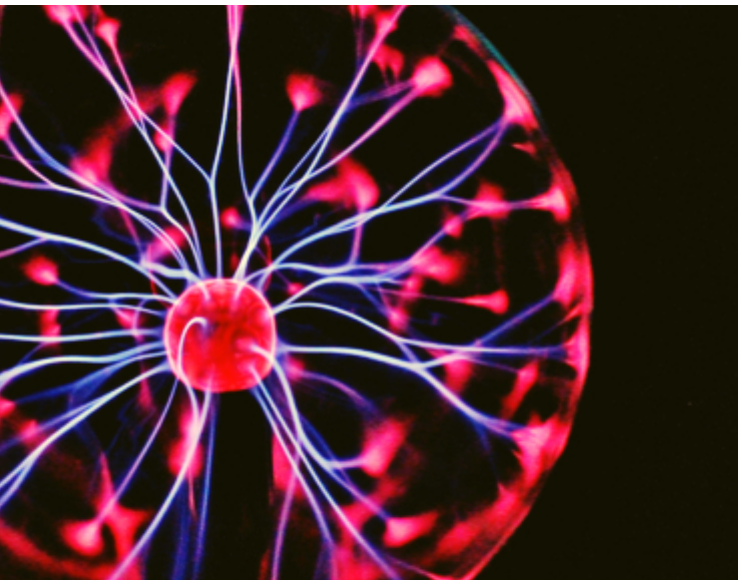


AI SUMMER 1 (1956-1973)

The Dartmouth Conference was followed by **17 years** of incredible progress. Research projects carried out at MIT, the universities of Edinburgh, Stanford and Carnegie Mellon received massive funding, which eventually paid off.

Programming computers started to perform algebra problems, prove geometric theorems, understand and use English syntax and grammar.

In spite of the abandonment of connectionism and the failed machine translation, which put the Natural Language Processing (NLP) research on hold for many years, numerous accomplishments from back then made history.



MAIN BREAKTHROUGHS

- **MATHEMATICAL THEORY OF AI**
  Conceived by Machine Learning pioneer Ray Solomonoff, who introduced universal Bayesian methods for inductive inference and prediction

- **ANALOGY**
  The program created by Thomas Evans, which allowed computers to solve geometric-analogy problems

- **UNIMATE**
  The industrial robot created by Unimation - the first robotics company in the world, worked on a General Motors automobile assembly line

- **ELIZA**
  The interactive program that could carry conversations in English on any topic

- **SCHOLAR**
  Interactive program for computer assisted instructions based on semantic nets, developed by Jaime Carbonell (Sr.)

- **COMPUTERS AND THOUGHT**
  First collection of specialised articles, authored by Edward Feigenbaum & Julian Feldman

Encouraged by these impressive first results, researchers gained hope that **by 1985 they would be able to build the first truly thinking machine** capable of doing any work a man could do.

AI WINTER 1 (1974-1980)

By 1974, the general perception was that researchers had over-promised and under-delivered. **Computers could not technically keep up the pace** with the complexity of problems advanced by researchers. For instance, an AI system that analyzed the English language could only handle a 20-word vocabulary, because that was the maximum data the computer memory could store.

Rise of military technology

Back in the ’60s, the **Defense Advanced Research Projects Agency (DARPA)** had invested millions of dollars in AI research without pressuring researchers to achieve particular results.

However, the 1969 Mansfield Amendment required DARPA to fund only mission-oriented direct research. Researchers would only receive funding if their results could produce useful military technology, like autonomous tanks or battle management systems, which they did.

They built the **Dynamic Analysis and Replanning** tool, a battle management system that proved to be successful during the first Gulf War. However, it wasn’t good enough.

DARPA was disappointed about the failure of the autonomous tank project. They had expected a system that could respond to voice commands from a pilot. The system built by the SUR team could indeed recognize spoken English, but only if the words were uttered in a specific order.

As a result, **massive grant cuts** followed and a lot of research was put on hold.

In spite of the early optimistic projections, funders began to lose trust and interest in the field.

Eventually, the limitless spending and vast scope of research were replaced with a “**work smarter, not harder**” approach.

AI SUMMER 2 (1981-1987)

This period was governed by what is now known as **Weak Artificial Intelligence (Weak AI)**.

The term is an interpretation of AI in a narrow sense. Weak AI accomplished only specific problem-solving tasks like configuration; it did not encompass the full range of human cognitive abilities.

The era of expert systems

This was the first time AI solved real-world problems, saving corporations a lot of money. Experts systems could automate highly specific decisions, based on logical rules derived from expert knowledge.

For example, before expert systems were invented, people had to order each component for their computer systems and often dealt with the wrong cables and drivers.

XCON, an expert system developed by Prof. John McDermott for the Digital Equipment Corporation (DEC), was a computer configurator that delivered valid and fully configured computers. XCON is reported to have earned DEC nearly $40M/year.

The expert systems led to the birth of a new industry – **specialised AI hardware**. Lisp, one of the most successful specialised computers at the time, was optimised to process **Lisp - the most popular language for AI**.

The golden age of Lisp machines did not last long. By 1987, Apple and IBM were building desktop computers far more powerful and cheaper than Lisp machines. Soon the era of expert systems would come to an end.

US vs Japan battle in AI

Japan invested $850 million in the **Fifth Generation Computer initiative**. This was a 10-year project that aimed at writing programs and building machines that could carry conversations, translate languages, interpret images and think like humans.

DARPA did not want to lose the AI race to the Japanese government. They continued to pour money into AI research through the **Strategic Computing Initiative**, which focused on supercomputing and microelectronics.

AI WINTER 2 (1988-2011)

In the late '80s, AI's glory started to fade yet again. The expert systems proved to be too expensive to maintain; they had to be manually updated, could not really handle unusual inputs and most of all could not learn.

Unexpectedly, the advanced computer systems developed by **Apple and IBM buried the specialised AI hardware industry**.

DARPA concluded that **AI researchers underdelivered**, so they killed the Strategic Computing Initiative project. Japan hadn't made any progress either, since none of the goals of the Fifth Generation Computer project had been met, in spite of $400 million spendings.

AI may not have progressed as expected, but still made steady advancement in all its areas.

- Machine learning
- Intelligent tutoring
- Case-based reasoning
- Uncertain reasoning
- Data mining
- Natural language understanding & translation
- Vision and multi-agent planning

1997
IBM's supercomputer **Deep Blue** beat world chess champion Garry Kasparov after six games. Deep Blue used tree search to calculate up to a maximum of 20 possible moves.

The Nomad Robot, built by Carnegie Mellon University, navigated over 200 km of the Atacama Desert in Northern Chile, in an attempt to prove that it could also ride on Mars and the Moon.

Late '90s
Cynthia Breazeal from MIT published her dissertation on **Sociable Machines** and introduced **Kismet**, the robot with a face that could express emotions.

2005
Stanley, the autonomous vehicle built at Stanford, won DARPA Grand Challenge race.

AI WINTER 2 (1988-2011)

2010
Artificial Intelligence has been moving at a fast pace, feeding the hype apparently more than ever. Let's not forget that in 2017 social humanoid robot Sophia was granted citizenship by the Kingdom of Saudi Arabia.

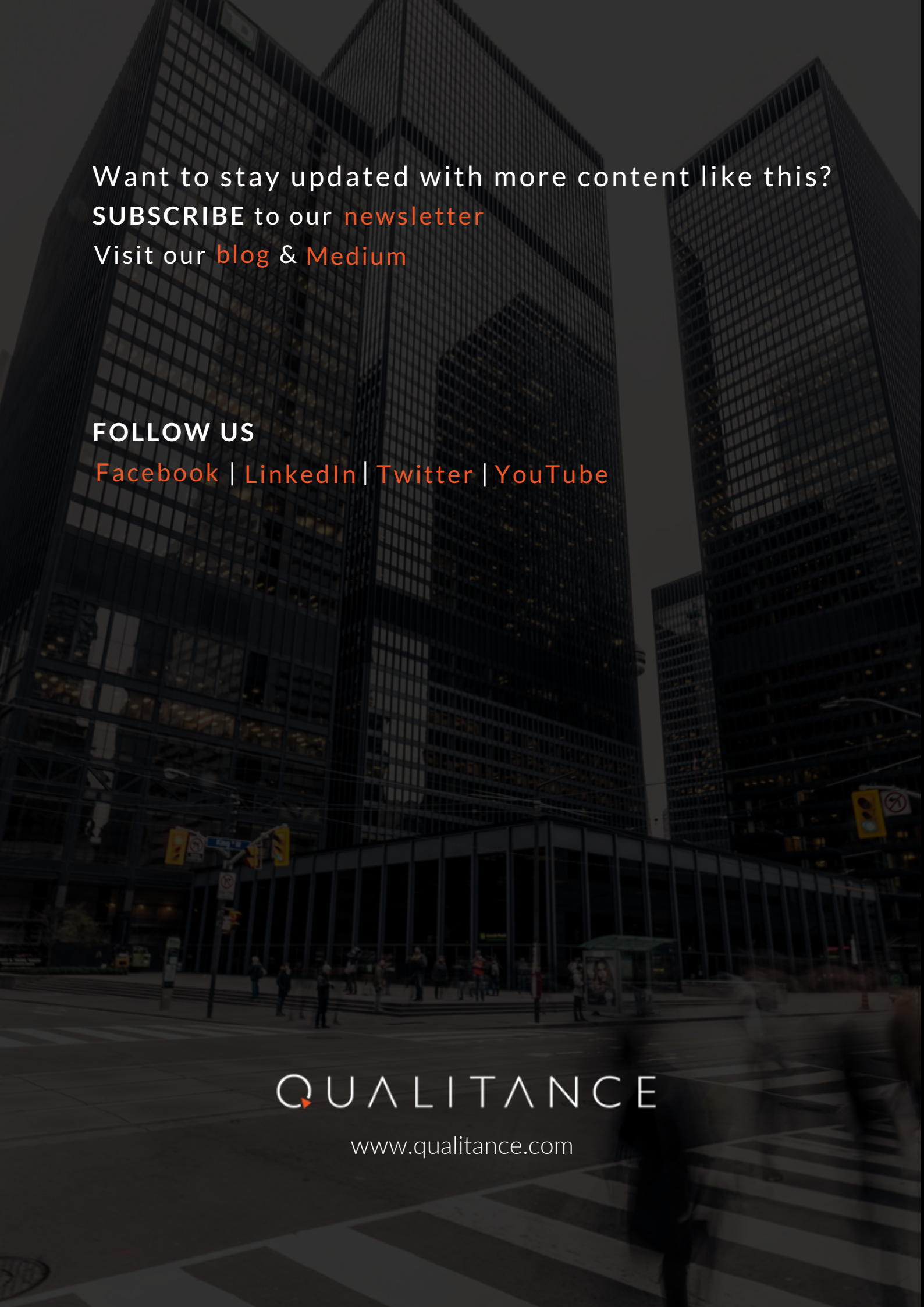
2018
British filmmaker Tony Kaye announced that his next movie, **Second Born**, would star an actual robot, trained in different acting methods and techniques.

AI has a lot in store for humanity - especially since the technologies developed by AI researchers in the past two decades have proven successful in so many fields: machine translation, Google's search engine, data mining, robotics, speech recognition, medical diagnosis, etc.

Find out more about AI's biggest breakthroughs over the last 10 years in this short review.

RECOMMENDED READINGS

- Ray Kurzweil's "Coming Singularity" and "Singularity Is Near"
- Kismet, the Robot
- Deep Blue beating world chess champion Kasparov
- The proposal for the Dartmouth Summer Research Project on AI



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