

Early Beginnings of AI: The Field of Research in Computer Science

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EXECUTIVE SUMMARY

The history of artificial intelligence is complicated. We cannot pinpoint where it all started. Some might say it began in the 1956 Dartmouth Conference when John McCarthy and his peers coined the term ‘artificial intelligence’ for the first time. The term ‘robot’ was coined in a Sci-Fi Play in 1920. We can find hints of similar ideas in ancient myths and scriptures, ideas about automata and intelligent creatures forged by men. AI is a vast and fascinating subject. The chapter presents an overview of the history of artificial intelligence. It also talks about the emergence and different sub-branches of AI and the theoretical foundation, frameworks, and theories related to them. After that its applications in the modern world and the challenges and Risks are also discussed.

INTRODUCTION

Emergence of the Idea

Humans are considered one of the youngest species on earth. How come the youngest species in the history of Earth is now the most advanced species on the planet? Humans have highly developed complex reasoning, problem-solving, and abstract thinking capabilities. Emotional complexity, self-awareness, and consciousness help humans to understand themselves and their environment. This is why humans are unique and achieve things no other creature could. We have always seen ourselves as one of the Engineering Marvel of all creations. That is why we have always dreamt of making something as perfect as ourselves, with our abilities and intelligence and none of our weaknesses. This desire is the foundation on which the idea of Artificial Intelligence (AI) is built. AI is the branch of Computer Science (CS) that deals with developing machines capable of solving problems and adapting to new environments by learning, understanding, and applying knowledge.

AI is not a new revelation; it is as old as humanity. It can be traced back to ancient texts and mythology, where the idea of creating artificial beings capable of independent thoughts and actions was mentioned. Talos, the 'Bronze Giant' in Greek mythology, was made by Hephaestus, the Greek God of invention and technology (Mayor, 2018). Talos was described as a giant made out of bronze who could do laborious tasks continuously without rest. So, Talos can be considered the first robot, and Hephaestus is the first Roboticist. This concept is not only in Greek mythology but can also be seen in Hinduism, Buddhism, and Chinese culture (Sharma, 2019), reflecting the deep historical roots of AI. These stories have significantly influenced the discourse on AI and robotics, shaping public perception and scholarly discussions. Even the word "Robot" first appeared in the Czech science fiction play R.U.R (Rossum's Universal Robots) by Karel Capek in 1920 (Formica, 2021). Capek described these robots as 'Artificial People' made in a factory. Capek's robots are described as self-aware and self-thinking. Initially designed to perform tasks for humans, these robots carried out their duties and worked efficiently. However, as the narrative unfolds, the robots rebel against their creators. The play concludes with a dramatic revolt of the robots, resulting in the extinction of the human race. This play underscores the author's awareness of AI and its potential repercussions. All these examples illustrate humans' longstanding fascination and contemplation about creating entities with intelligence similar to ours.

BACKGROUND AND LITERATURE REVIEW

After being only in the fictional world for several decades, AI has seen considerable advancement from 1940 to 1970 (*Figure 1*). During this period, World War II acted as a catalyst for the advancement of AI. In the years following the war, governments and policymakers from around the globe were intrigued by the concept of a machine capable of autonomous reasoning and decision-making, an intelligent machine to replace man on the battlefield. Motivated by the possibilities, scientists, engineers, and researchers were eager to unravel the formula for a perfect machine that could potentially replace humans in various capacities. The post-war era witnessed a fervent pursuit of technological advancements, laying the groundwork for the eventual evolution of AI. The surge in computing methodologies, such as exploratory data analysis and pattern recognition during this time, was spurred by the escalating volume of Data (Jones, 2018). Notably, the Bletchley Park Code-breaking Unit¹ was a standout investment. Bletchley Park witnessed the expertise of Alan Turing in CS. His contributions extended to the 'Automatic Computing Engine' at the National Physical Laboratory and the 'Manchester machine' at the University of Manchester (Gunderson, 1964). Turing had this idea about Intelligent machines as early as the 1940s. In one of his famous writings titled 'Computing Machinery and Intelligence (1950),' he raises the question, "Can Machines think?" and proposes the idea of the famous Turing's test, also known as the imitation game, as a measure of the intelligence of machines. The imitation game or the Turing Test involves three participants: two humans and a machine. One of the humans will act as the questioner, and the other human and the machine will answer the questions. The questioner will have a textual conversation with the participants, mainly with a monitor keyboard arrangement. Based on the response from each of the two, the questioner has to conclude which one of the participants is a machine and which one is a human (Turing, 2012). According to Turing, if the machine can trick the questioner into thinking it is a human, it is considered an intelligent machine. This work of Turing essentially laid the groundwork for the development of AI as we know it in the present. The Turing test was used to determine the winners of the Loebner Prize².

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