The Arms Race of Code: A Historical Perspective on the Regulation of AI and Robotics

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Abstract

Marvin Minsky, John Mc Carthy, Claude Shannon (Senior scientist) and Nathan Rochester (Senior Scientist) of International Business Machines (IBM), marshalled the Dartmouth Conference in the year 1956.[1] The expression 'Artificial Intelligence' was coined at that conference, which was set off a new era of pioneering. The computer at that time was considered extra ordinary because an individual through the help of computer program could solve the algebraic problems, grammar errors, geometry theorems and much more.[2] It was beyond universe to think that intelligence could be programmed and insert in machine that can be so advanced. The scientist and experts predicted to build such intelligence that people will able to use in 20th century.[3] Some government agencies invested a lot in this technology such as DARPA (US Defence and Research Project Agency. Some political conflicts also rose like Cold War in AI innovation by Milton Keynes (UK) and Nuevo Mexico (USA), they were also scientists.

[1] History of Artificial Intelligence - Javatpoint. (n.d.). www.javatpoint.com. https://www.javatpoint.com/history-of-artificial-intelligence

[2] Kelley, K. (2023b). What is Artificial Intelligence: Types, History, and Future. Simplilearn.com. https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/what-is-artificial-intelligence

[3] What is the history of artificial intelligence (AI)? (n.d.). Tableau. https://www.tableau.com/data-insights/ai/history

THE BIRTH AND BOOM OF AI

Electromechanical calculator of Torres-Quevedo was the first computer machine that was developed through mechanical calculator of Babbage. At that time automata theory was introduced which was called as code breaker because it solved the challenging theories.[4] The automata theory was conceived as the first logical machine that operated codifying, generating, storing and using the information. Ramon Cajal developed the neuroscience and for the first time the hypothesis of neuron was put forward. The senior scientists- Mc Clulloch and Pitts evolved the connection between neuroscience and automata theory.[5] Hence together it was the first artificial neuron which after decades converted into intelligence algorithm and named it as 'perceptron'.[6] Von Neumann, one of the prominent scientists set the raise for the connectionism movement.

In the middle of the year 1970, the development of AI generated software's was cruised due to lack of finance and budget and the researchers didn't research their expectations. [7] In 1971, DARPA (defense advanced research projects agency) financed laboratories who were working in the projects of speech recognition and also with the wide-reaching vocabulary. The ray of hope again rose in the year 1980 until 1987, the programmers of AI sing out expert organization, they were adopted by many companies and knowledge possession became the focus of the research.[8] In the same period, Japan also showed interest and the Japanese sponsored AI programming with fifth generation computers inventiveness. The researchers with adverse reaction in 1974 were dubious about their progress and enthusiasm in work. But woefully the invention collapsed in 1987 as the companies such as IBM and Apple have upgraded their speed and had become extra powerful in the hardware and software market. Sadly, due to collapse billions of dollars were lost.

[4] SITNFlash. (2020, April 23). The History of Artificial Intelligence - Science in the News. Science in the News. https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/
[5] Business Standard. (n.d.). Artificial Intelligence - History, Uses, Types. www.business-standard.com. https://www.business-standard.com/about/what-is-artificial-intelligence
[6] History of Artificial Intelligence - Artificial Intelligence - www.coe.int. (n.d.). Artificial Intelligence. https://www.coe.int/en/web/artificial-intelligence/history-of-ai
[7] Kaur, G. (2023, April 2). A brief history of artificial intelligence. Cointelegraph. https://cointelegraph.com/news/a-brief-history-of-artificial-intelligence
[8] Gold, E. (2023). The History of Artificial Intelligence from the 1950s to Today. freeCodeCamp.org. https://www.freecodecamp.org/news/the-history-of-ai/

As the goals were not achieved DARPA stopped the funding to AI invention stating that it cannot be developed and Japanese also dropped the funding to the program. [9]

1990, it was again the silver lining i.e. the hope in praise of artificial intelligence, the new concept came into existence that was 'intelligent agent'. An agent means a system that senses and captures the environment and takes action.[10] Intelligences being the crucial part and collaboratively they become single platform. The archetype aimed to mimic human activities in groups, societies, organization, etc. The intelligent agent was manifest to be multivalent hypothesis of artificial intelligence.[11] Further, in the late 1990s statistics studies such as frequents, fuzzy logic and probabilistic were linked to AI to make it deal with the decisions that were uncertain. A new wave of successful applications was developed in AI. The high speed through fuzzy logic was developed in many industries, household and other applications such as trains, gas and petrol tanks surveillance, air conditioners, vacuum cleaners, factory valves, transmission of gear automatically and much more.[12] The experts through leaning and experimenting inventions gave rise to the Machine Learning. For the techniques there was need of engineer for more effectiveness in the field.

The major developing years started i.e. 2000 with the introduction of Big Data with expeditious taking on of mobile and internet communication.[13] Development were made in improving computer vision, increase in the intelligent agents' capabilities and robots were able to perform multiplex duty through advancement in speech recognition, automobiles, natural language processing and much more.[14] These were the new challenges in artificial intelligence.

[9] Global, B. (n.d.). History of artificial intelligence. Bosch Global. https://www.bosch.com/stories/history-of-artificial-intelligence/

[10] The brief history of artificial intelligence: The world has changed fast – what might be next? (2022, December 6). Our World in Data. https://ourworldindata.org/brief-history-of-ai

[11] History of Artificial Intelligence. (2019, January 30). Queensland Brain Institute - University of Queensland. https://qbi.uq.edu.au/brain/intelligent-machines/history-artificial-intelligence

[12] Conocimiento, V. A. (2023, March 14). The History of Artificial Intelligence | OpenMind´s Timelines. OpenMind. https://www.bbvaopenmind.com/en/technology/artificial-intelligence/history-of-artificial-intelligence/

[13] Gil Press. (2016, December 30). A Very Short History Of Artificial Intelligence (AI). Forbes. https://www.forbes.com/sites/gilpress/2016/12/30/a-very-short-history-of-artificial-intelligence-ai/?sh=d9debb26fba2

[14] Foote, K. D. (2022, March 18). A Brief History of Artificial Intelligence - DATAVERSITY. DATAVERSITY. https://www.dataversity.net/brief-history-artificial-intelligence/

EVOLUTION OF AI ACCORDING TO SEASONS

Artificial Intelligence has several evolution cycles of springs (optimism) and winters (pessimism), elaborate:

- Initial Stage/ Birth of Artificial Intelligence (1952 – 1956): The bases of AI were already in existence like neural network and cybernetics. These bases aim in combing the scientific communities and the public.[15] In the year 1956 the Dartmouth Conference took place which boom the field of AI.
- First Spring (1956 – 1974): The computers were feed with software of solving geometric and algebra problems and also English. At that period, it was an impressive thing and there was hopefulness of general atmosphere.[16] The scientist at that time claimed that in upcoming 20 years they will be able to build fully intelligent computer/ machine.
- First winter (1974 – 1980): The negativism (winter) period started when media and public started asking question on the assurance of AI. Researchers and scientists were overemphasized with the burden and also there was limitation in the technologies at that time.[17] The first winter of AI was also due to instantaneous end of finance by companies and agencies like National Research Council, British Government and DARPA.
- Second Optimism (1980- 1987): This phase is known as second spring of AI. Expert systems played an important role in this period.[18] The systems were made to resolve the issues with the help of the logical rules procure by the experts. In this era characters and speech recognition was also revived through neural networks and connectionism.[19]
- Second winter (1987- 1993): Technical machines were displaced for running expert system in the computers. This session led to loss in finance as some companies went

[15] Team, D. (2019). History of Artificial Intelligence – AI of the past, present and the future! DataFlair. https://data-flair.training/blogs/history-of-artificial-intelligence/
[16] Ray, S. (2021, March 4). History of AI - Towards Data Science. Medium. https://towardsdatascience.com/history-of-ai-484a86fc16ef
[17] Appendix I: A Short History of AI. (n.d.). One Hundred Year Study on Artificial Intelligence (AI100). https://ai100.stanford.edu/2016-report/appendix-i-short-history-ai
[18] History of AI – Wachemo University e-Learning Platform. (n.d.). https://wachemo-elearning.net/courses/introduction-to-emerging-technologies/lessons/chapter-3-17/topic/3-2-history-of-ai/
[19] A Brief History of AI - That's AI. (n.d.). That's AI. https://www.thats-ai.org/en-GB/units/a-brief-history-of-ai

into insolvency. The researchers and scientist again lost faith in the growth of AI as there was no funding for the programs.

- Background of AI (1997- 2000): This era is called as background of AI because from year 1997 until 2000, AI field was processing at the back of scenes; there was no announcement and promises made about the development of AI.[20] Major funding was also done and resources were made powerful. Major implementations in specified areas came into being and the concept of machine learning was compounded with the AI.
- Third Spring/ Present Spring (2000- present): internet bloomed in 2000 century and new concepts came into existence and in public use such as web, internet, deep learning that leads to the abstraction of Big Data revolution.[21] Everyday there is new creativity, the intelligent machine are becoming super intelligent. Is it possible that AI can surpass the human intelligence? AI can complete never replace human workforce. Therefore, the era is in which we exist and the innovations are very successful and useful in thirst spring.

HISTORY OF ROBOTICS

The historical background of robotics far flung to 350 B.C. A Greek mathematician viz. Archytas victoriously build a mechanical bird, the bird could propel (means move forward) itself by using steam.[22] Archytas was brilliant mathematician, through his discovery and introductory of man to erect an automaton came into existence. The term 'robot' was coined by a Czech writer Karel Capek in the year 1921 in a play R.U.R (i.e. Rossum's Universal Robots). The origin of term 'robot' is Czech which means 'forced work'.[23] The first-time term robot officially was use in R.U.R.

Further Isaac Asimov, he was not a scientist, he was a writer who like to study and write about robots and has written various short stories in year 1940 until 1950.[24]

[20] Messier, A. (2023, April 21). What is the history of AI? Fox News. https://www.foxnews.com/tech/history-ai
[21] Goncalves, P. (2023, January 20). A Brief History of Artificial Intelligence - AI for Good Foundation. AI for Good Foundation. https://ai4good.org/blog/a-brief-history-of-artificial-intelligence/
[22] Robotnik. (2022). History of robots and robotics. Robotnik. https://robotnik.eu/history-of-robots-and-robotics/#:~:text=The%20first%20industrial%20robots%20were,was%20sold%20to%20General%20Motors
[23] Pa, W. (n.d.). Robotics: A Brief History. https://cs.stanford.edu/people/eroberts/courses/soco/projects/1998-99/robotics/history.html
[24] History of Robots and Robotics. (n.d.). https://www.thomasnet.com/articles/automation-electronics/history-of-robotics/

Isaac Asimov presented with three laws of robot. The three laws of robotics can also be cast as the definition. Being his keen interest in robotic, he is also admired.

The three laws of robotics stated by Isaac Asimov are-

i. A robot may not hurt a human being
ii. A robot must accept the orders of human being
iii. A robot must keep safe its own existence.

In the year 1948 and 1949, American- British neurophysiologist namely, William Grey Walter who worked in Bristol at Burden Neurological Institute had generated two autonomous robots, Elmer and Elsie.[25] The robots shaped like tortoise and they had three wheels to mobilize. One of the more interesting and impressive features in these two robots was that whenever they run short of battery, they themselves through their wheels can go to the nearest charging point and can charge themselves.[26] This was an incredible intelligence of that era.[27] And further such intelligence kept inventing. Like in the year 1970, Freddy and Freddy II through the help of robot could arrange the wooden blocks and assemble rings on pegs by operating video cameras: 3 DOF and 5 DOF (degree of freedom) techniques. The use of DOF video camera was fascinating in robots. [28]

In 1989, one of the cheapest robots was invented by the scientists at MIT and they named it 'Genghis'. The key implementation of the robot was its behavioural algorithm that makes the robot act like actual insect. Several robots were mechanised and many came into existence in different industries. In some places robot existence was/is of great use also that made man life easier. The prominent advancement, development and feature of robots came in 2000 century. The latest challenge of 21st century is the self-driving cars, but they still more refinement due to some ethical and legal issues.[29]

[25] Robotics History - javatpoint. (n.d.). www.javatpoint.com. https://www.javatpoint.com/robotics-history
[26] Simon, M. (2020, April 16). The Complete History and Future of Robots. WIRED. https://www.wired.com/story/wired-guide-to-robots/
[27] Moravec, H. P. (2023, April 27). Robot | Definition, History, Uses, Types, & Facts. Encyclopedia Britannica. https://www.britannica.com/technology/robot-technology
[28] 13 Milestones in the History of Robotics. (n.d.). Aventine. https://www.aventine.org/robotics/history-of-robotics
[29] Ibid 8

Robonaut 2 is the new generation robot; they are helpful in space for astronauts.[30] They are utmost robots till date as being first humanoid robots in the history of robotics.

ARTIFICIAL INTELLIGENCE AND ROBOTIC CONTEMPORANEOULY

Artificial Intelligence and Robotics have customary origin and prolonged history of scientific and interlinking discussion. The birth and boom of AI and robotics evolved at the same period around 1950s but at that time there was no understandable difference between them.[31] The ground being the 'notion of intelligent machine' automatically leads to robotics. Scientist discussed and argued on the point that every machine is not robot and AI assuredly with virtual elements. Also, like compounding the mechanisms there were many technical issues and problems that were needed to be concluded with the designing of the robot and interlink with the Artificial Intelligence.[32] Comprehensible differences were seen in the year 1970s when robotics development was focused on automation whereas AI experts used robots to demonstrate their act in everyday environment. Invention and development in robotics made the industries sophisticated, also AI researchers and experts dismissed robotic test bed due to unconstrained environment. The issues leading got solution in 1990s, robots again came in the field with AI. Also, competition in the market and laboratories took place. Finally in 90s robotics played major role in re-establishing relationship between robotic and artificial intelligence. [33]Now it has become the promising evolution at European level. The experts have identified the built of intelligence in robot but the line between robotics and artificial intelligence is tough to establish. Concurrently, both the field together are flaunting the industries.

[30] A Brief History of Robotics since 1950 | Encyclopedia.com. (n.d.). https://www.encyclopedia.com/science/encyclopedias-almanacs-transcripts-and-maps/brief-history-robotics-1950

[31] Sakovich, N., & Sakovich, N. (2023). How Artificial Intelligence and Robotics Are Changing Our Lives. SaM Solutions. https://www.sam-solutions.com/blog/ai-and-robotics-impact-on-our-lives/

[32] Andras, I., Mazzone, E., Van Leeuwen, F. W. B., De Naeyer, G., Van Oosterom, M. N., Beato, S., Buckle, T., O'Sullivan, S., Van Leeuwen, P. J., Beulens, A., Crisan, N., D'Hondt, F., Schatteman, P., Van Der Poel, H. G., Dell'Oglio, P., & Mottrie, A. (2020). Artificial intelligence and robotics: a combination that is changing the operating room. World Journal of Urology, 38(10), 2359–2366. https://doi.org/10.1007/s00345-019-03037-6

[33] Turing. (2022). Why Does Artificial Intelligence Matter in Robotic Technology? www.turing.com. https://www.turing.com/kb/artificial-intelligence-in-robotic-technology