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# The Progressive Evolutionary Impact of Turing Test into Modern Progressive AI and Machine Learning

## Record of Initial Ideas

Born in the modern society where technology is taking over almost every aspect of human activities, my interests in computing was evidence since my early age. I loved computer games and every time I could come across a new computer game, I would always think of best maneuvers to beat my opponents. However, my progressive interaction with computer games transformed by thoughts towards my future career. I was more curious to understand how computers could think and act like real life opponents without intensive human interventions. Therefore, my journey to pursue computer related career led me to research and read more about prominent inventions in computers and how they came into existence.

Therefore, as I advanced in my education, I realized that computers began from simple calculation machines like the Analytical Engines as early as 1820s with prominent scientists like Charles Babbage. The question regarding how computers could think and process information like human beings was derived from modern technology of artificial intelligence which seeks to simulate human behaviors into computing capabilities. My motivation towards this topic for my research was triggered when I came across Alan Turing and his influence since 1950s in the modern day artificial intelligence (AI). Therefore, realizing the rapid developments in AI which drives most technology researchers to program computers to act even better than human beings, I was more interested to determine how our intelligence could be comparable to AI. Out multiple researches and studies, I noticed that Turing presented one of the challenging questions which

remains a debate among most inventors as well as baseline for development of more sophisticated AI systems based on modern technologies. Turing test attracted my attention and interest when I came across Watson, one of the AI solutions developed by IBM in 2010 with attempt to pass the test. I therefore, sought to research further and investigate how an idea born more than 100 years ago before, the evolution of digital computers could attract attention of researchers and technology experts to this day by assessing the capability of Watson to pass Turing test.

### Project Theme

Turing test is based on imitation game which seeks to prove the capability of computer machines to think. The question is more elaborated by the imitation game which seeks to prove the intelligence of a human being against computing intelligence. Perhaps by assessing developments in AI and machine learning would disapprove Turing's belief that in 50 years' time after his invention, programmers would leverage on the storage capacity of digital computers to minimize the chances of a human interrogator in an imitation game to differentiate the computer's intelligence from human intelligence. This project will assess the success of Watson to prove the argument surround the passing of Turing test as well as the unique status of human beings as relates to AI.

This research applies qualitative analysis of existing scholarly literature to identify the trends in addressing the Turing's belief stated in previous section as well as inventions resulting to Watson as relates to advancement in modern AI and Machine learning. Through systematic analysis of publications, reviews, and journal articles, the research findings provided

comprehensive conclusion regarding Watson's ability to pass Turing test amidst unsuccessful attempts of successive interventions in the same area.

## Literature Review

### The Imitation Game and Machine Intelligence

The biggest question behind modern day artificial intelligence aims at constructing intelligent machines that could reason beyond the capabilities of people. However, studies suggest that the idea of AI is not a new but 1950s idea invented by one of the pioneers of computer science like Alan Turing. In 1947, Turing pointed out to the game of chess as an initial encounter in the prospects of intelligent machines (Rachlin, 2014). The computer scientist later in 1948 published a report on intelligent machinery where he first used imitation to investigate the capability of machines to possess intelligent behavior (Webb, 2018). According to Turing, there was possibility to rely on the storage capacity of the computer machines to make them think in the same way as human beings (Rachlin, 2014). The machine intelligence reasoning was mainly based on the idea of searches which later in 2011 was used by IBM in development of Watson machine believed to be successful in passing the Turing test.

Turing began a footprint in his idea by introducing three chess game players A, B, and C. one of the participants was replaced by a paper machine while the remaining two were human. This was the first version of the imitation game where one of the chess players was a mathematician while two other players had limited skills in mathematics and chess (Brackenbury & Ravin, 2002). According to Turing, it would be difficult for the two non-skilled players to

confirm if they were playing against the paper machine or the mathematically skilled player. Turing later in 1950 replaced the chess game with reasoning around how machines could be made to achieve intelligent behavior using question-answer sessions (Moor, 2003). The ability of a machine to think was therefore determined by ability of the machine to respond to unrestricted questions which could satisfy the aspects of human mind.

Turing test was derived from reasoning that machine can think to the capability of human. In this invention, Turing proposed that computers were able to mimic human response under specific condition which led to the question; can machine think? Turing test was therefore built on the basis of imitation game involving three parties where one of them was a computer, the other one human responder, and the third player was an interrogator isolated from the two players. The interrogator was to determine which player is a machine between the two players. Therefore, if the interrogator was not able to determine which of the players a human was and which was a computer, then the computer was assumed to have passed the test and said to be intelligent with ability to think like a man. According to research and studies, there has been no computer program that has approached the close to passing Turing test.

Among the most significant progress in achieving better machines which could pass Turing test involved development of Chabots like ELIZA, Parry, and Eugene Goostman. Philosophers have also engaged in endless arguments regarding concept of modern AI and its capability to achieve human intelligence (Ho, 2022). In 1980, John Searle presented one of the experiments to invalidate the Turing test suggesting that computers could be programmed to understand a language but had no capability for real understanding of a language or

consciousness (Moor, 2003). IBM is one of the companies that have made progressive developments to further the passing of Turing Test using AI. In 2011, the company developed Watson which had probabilistic evidence based architecture with natural language processing capabilities.

### Methodology

This research involved qualitative analysis of peer reviewed publications to determine the progressive development in AI based on the original concept of Turing Test. In this research, IBM's Watson is used to demonstrate the capability of AI in natural language processing and ability of computers to think to the capability of human. Through comprehensive systematic review of multiple publications, this research reveals how Watson applied AI to beat two top human champions Brad Rutter and Ken Jennings in a game involving interpretation of complex cues with language nuances. Systematic literature review involves identification, selection, and critical evaluation of existing literature to determine conclusion to existing research problem. In this investigation, peer reviewed publications, technology websites, and case studies were used to identify practical application of IBM's Watson and how the solution was consistent with rapid development in AI to pass Turing tests. After searching electronic databases, 5 peer reviewed articles relevant to the topic were found to contain sufficient information about Turing test and Watson. The research also applied related concepts from Wired and Forbes website to identify some reviews regarding the success of Watson in attempt to pass Turing test.

### Results and Findings

IBM's Watson was developed on the concept of reconstruction of 21<sup>st</sup> century Turing test. This invention furthers the science of natural language processing (NLP) through an advanced architecture that allows question answer (Q/A) technology. In one of the studies, Watson system was described as having the ability to apply 100 different techniques in analysis of natural language through probabilistic evidence based architecture. The application uses 3000 core computer processors which can consume a space of about 8 refrigerators. The system's storage comprise of terabytes of books and information which allows for search capability. The system determines what a question asks and translates the natural language query into a comprehensible version in Watson to determine the appropriate answer. According to IBM the system is applicable in knowledge discovery especially in business premises.

Researchers have also attempted to assess the capability of Watson in passing the Turing test. In most of the studies and research publications, there is mixed arguments as to whether Watson was able to pass the Turing test (Dhar, 2013). Findings suggests that Watson demonstrated capability of passing the Turing test when it was able to play the game of Jeopardy by answering the questions within less than 3 seconds response time. Technology experts supports that Watson has ability to quickly execute different language techniques while analyzing questions to find candidates answers, score, and rank them. In 2011 Watson emerged as winner against Brad Rutter and Ken Jennings who were the biggest all time highest money winner and record holder with longest championship streak respectively. However, debates arise as whether the system was able to pass Turing test (Dhar, 2013). One of the arising issues with Watson is the inability to answer some of the basic questions which children could answer quickly. One of the famous instance was when Watson gave wrong Toronto answer on Jeopardy which makes

technology experts in AI to claim that it still needs further improvement. The ability for the system to summarize complex legal cases with intelligence to make sense of multiple data over the internet makes it a game changer in the progressive developments of AI system.

### Discussion and Evaluation

The invention of Watson follows the beliefs of Alan Turing in 1950 when he asserted that programmers will be able to advance digital computers to become more intelligent and process information at the levels of human beings. However, the fact that AI systems are able to operate at greater levels of intelligence, most of these systems rely on machine learning algorithms which depends on human input. Perhaps the arising question from the inability of Watson to answer simple basic questions is in line with the argument from extra sensory perception (ESP) presented by Turing. However, learning machines could be more creative more intelligent to address such objections if systems like Watson could experience further reach. Fact remains that AI can improve intelligence of computers but it is challenging to explain how such systems will achieve the neurological thinking capability of human. Nature remains complex phenomena that places human above the capability of digital computers in terms of perception and feelings. Every input or output still relies on human intervention. However, machine learning is likely to improve the capability of AI to utilize data in different form to relay meaningful inferences about real life phenomena.

### Conclusion

This research introduces concepts of Turing test by Alan Turing which was revolutionary in the space of digital computing in 1950s. Although the Turing test was ancient as it appears, it



has had significant impact on the modern AI computing and machine learning. The Ability of Watson to pass Turing Test in the game of Jeopardy is significant evidence of progressive buildup of the idea and how further development in AI is promising solution to making computers more intelligent. However, it is unlikely that computers will surpass human intelligence. The fact is that computers can be programmed to achieve desired level of intelligence but cannot think to the capability of man based on the natural phenomena of human brain which is rational in multiple ways.

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