

# An In-Depth Comprehensive Analysis of Machine Learning Tools Applied in Biomedical Contexts: A Case Study Analysis



Arun Kumar Singh, Lokendra Kumar Tiwari

**Abstract:** With the wave of technological progress in this modern time, artificial intelligence (AI) has not only been introduced in various fields but is also being used worldwide, especially in healthcare. Artificial intelligence (AI) is slowly changing medical practices. Along with recent advances in machine learning, digital data acquisition, and computing infrastructure, AI applications are expanding into areas previously thought to be the province of human experts. In this research paper, we have focused how machine learning can be used to effectively provide solutions to many medical/biomedical issues, the paper identifies, challenges for further advances in Healthcare System AI systems, and summarized economic, legal, and social healthcare.

**Keywords:** Healthcare System, Artificial Intelligence (AI), Intelligent System, Machine Learning

## I. INTRODUCTION

Health has been a serious issue since ancient times. As time passes technology grows, and new modern health systems have innovative technologies to resolve diseases. However, due to the high cost of issues, the healthcare system is not able to reach publically in society. An emerging technology Artificial Intelligence (AI) arises and enhances the existing healthcare system. The objective of the AI to impersonate human cognitive functions fetches a healthcare paradigm. This can be run by analytics of healthcare data.

## II. LITERATURE REVIEW

The future of the medicine is enhancing in modern lifestyle. The outcome-based output will arise with the need in the core area of the healthcare system by reinforcement and realization of the data. There are certain chronicle histories of artificial intelligence, in 1950 British mathematician Bletchley Park fame Alan Turing from Britain's code-breaking center published a research paper titled.

“Can machines think?”, in this research paper author proved that machines can think just like an intelligent human, called “d “Imitation game” and after that popularly known as a Turing test [14]. In 1956, John McCarthy [1] explained intelligent systems in their research paper titled “Computing Machinery and Intelligence”, known as Artificial Intelligence (AI). After a long period, a keyword became “AI Winter” in 1960, The Gartner cycle model adopted new technology for a clear time and the model includes five phases, the first phase is innovation triggers, the second phase talks about Peak of Inflated Expectation, third tells Trough of Disillusionment fourth Slope of Enlightenment and Plateau of Productivity in the innovation.

Neural networks [2] are powerful machine learning methods that are used widely to learn data representations (features) at multiple levels of abstraction. These representations are useful for many applications such as reconstruction, classification, clustering, and recognition.

The term AI was defined by Russell and Norvig [3] to describe all systems that impersonate cognitive functions that are mainly associated with human characteristics such as problem-solving, learning, and speech. A more comprehensive characterization exists in Kaplan and Heinlein [4], where the study described the ability to learn from external data to interpret AI independently and achieve specific results through flexible optimization [12].

Whatever artificial intelligence systems are there, they are expanding rapidly in organization installations, including the transformation of business, the transformation of manufacturing sector, and which are generally expanding their reach as a human domain in particular [5].

According to research by Müller and Bostrom [6], the Artificial Intelligence System will reach all human potential by 2075 and some group officers are earning further development of AI for Super Intelligence may be bad for humans and society. Although Europe is leading in AI technologies. China accounts for 25% of global production in AI World and it is expected that China will emerge as the world leader in AI by 2030 [7] [8]. With the use of automation, the displacement of work will be estimated to be one-third by 2030 [9]. And for all these things there is a huge contribution of machine learning which furthers deep learning which is at a high level which is associated with machine learning architecture and these concepts that analyze neural network players on a large scale and in-depth [10]

With the development of artificial intelligence, smart machines are curbing work methods in industries. Companies are seeing an initial increase in process

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momentum and performance by implementing AI technologies [13].

However, there is significant unexpected potential in resuming business processes from the ground up as processes of self-improvement that can be, understood, acted on, and discovered in real time. Health industry leaders are positively optimistic about AI with more than three quarters responding that they plan to implement the AI strategy [Optum.com/IQ]. About 94% percent agree that AI technology is the most reliable path towards equitable, accessible, and affordable healthcare. Whereas others 75% are serious about implementing AI strategy [11].

Artificial Intelligence (AI) is a collection of integrated technologies that allow smart equipment in healthcare to expand the capabilities of humans by sensing, acting, and learning to execute health tasks. These new technologies include natural language processing, computer vision, intelligent agents, expert systems, machine learning, data analysis software (such as IBM Watson Health), data-based voice recognition (similar to Apple's Siri or Amazon's Alexa), diagnostic Tools, and chatbots. [www.accenture.com/health]. A new technology derived from AI, machine learning is a subset that provides software, machines, and robots with the ability to learn (without human intervention or assistance) without static program instructions. It has been used to generate personalized product recommendations for consumers, first identify the root cause of quality problems, then fix them, discover and suggest treatment options to physicians as well as many other applications. Such enabling processes depend on software, systems, robots, or other machines that use machine learning algorithms [www.accenture.com/insightdrivenhealth] [15].

The discussion centered on the changing role of physicians as we move into the future of data-enabled technology applications, especially AI in healthcare delivery. How the various healthcare delivery and funding systems in place globally will be impacted by this evolution was an important consideration.

“As with other industries,” Dr. Fenwick said, “big data and predictive analytics, along with the democratization of medicine, are likely to provide direct access to medicine for the patient without the physician being the gatekeeper.”

Dr. Fenwick used the example of auto-pilot features in the airline industry. Pilots are necessary only when technology fails, but their presence makes passengers feel safe. “The riskiest element in all of these systems, whether the airline or healthcare industry, is the person involved,” he explained. “It’s time to disrupt the system.”

Agreeing with Dr. Fenwick, Dr. Fisk added: “The average doctor makes 64 errors per month. The augmented, or technology-assisted, clinician will drive huge improvements in quality and safety. Augmented clinicians will affect patients through everything they do, from diagnosis to intelligent surgery and treatment.” [https://www.elsevier.com/connect/ais-revolutionary-role-in-healthcare]

2018 saw unexpected mergers and partnerships, strong digital health innovations, and continued policy shifts in the health sector. With this base foot now projected, Health will bring significant changes in IT infrastructure in 2019, with

patient data in all its centers [https://www.elsevier.com/connect/7-predictions-on-healthcare-technology-for-2019]. Analytics will be the mainstay as health systems attempt to optimize in-house clinical data. The number 1 funding category in the same series was Data Analytics, in 2016, it was anticipated in the following years that the output generated would be many novels, but the real-world clinical value uncertainty would continue. Therefore, the performance of computational capabilities will be of paramount importance as it will open the door to a range of possibilities.

## III. HEALTHCARE SYSTEM THROUGH AI TECHNOLOGIES

- A device that you could use at home to test your blood for a variety of indicators
- An intelligent virtual health assistant that helps estimate costs, schedule appointments, explain coverage, bills, and payment options
- An intelligent virtual coach
- AI technology that analyses your genome/DNA to reveal genetic health risks
- An intelligent virtual nurse that monitors your health condition, medications, and vital signs at home
- Expanded patient reach (e.g., serving a broader population through digital tools)
- An intelligent virtual clinician that helps to diagnose health issues and navigate you to the right treatment options
- A surgical procedure where the surgeon is assisted by an intelligent robot in an operating theater
- A robotic device that draws a blood sample from a vein in your arm for testing purposes

From wearable technology for patients to technology that assists doctors with surgery, artificial intelligence is already a key player in medicine.

### A. Challenge

The biggest challenge in the health care system is data, which is increasing exponentially every year, analyzing such large data in real time in future is a big challenge. Because process of date to become the fruitful result is very sensitive.

By scanning the images, AI reduces the cost of the treatment of the patient, as well as treats with accuracy in a short time, catching the symptoms of the disease in the early stages of some diseases like eye disease breast and skin cancer and pneumonia etc.

In echocardiography, artificial intelligence analyzes the heart pattern and treats coronary heart disease.

### B. Legal and Regulatory Challenges

AI has substitution of human capabilities and capacity with high precision and accuracy, in line with the healthcare system people get benefits from the growth of AI, law, business compliance, and policy must accept the sustained integration. Some of the following measures may be considered to achieve the goal.

- introducing dedicated regulations for the use and monitoring of AI in healthcare;



- b) encouraging research and development in AI through government and tax incentives;
- c) regulating the liability framework of AI and medical advice provided using AI;
- d) encouraging investment in, and the use of, AI by the stakeholders in the healthcare sector; and
- e) Encouraging society to adopt and adapt to changing technology.

While government and society are making considerable efforts to ensure the consolidation of the use of AI in healthcare, as is true for any change, the devil will continue to remain in the details.

#### IV. CONCLUSION AND FUTURE DIRECTION OF WORK

With the advent of AI technology, doctors predict that in the future, these sophisticated machines will work with good quality and accuracy. We know that human physicians will not be replaced by machines in the future, but AI technology can certainly help physicians make better clinical decisions. In this research paper, we review the present status of AI in the healthcare system, as well as fully talk about its future. Even after the increasingly rich AI literature in healthcare, research mainly focuses on just a few diseases such as heart disease, nervous system disease, and cancer. All these diseases are the foremost cause of death; therefore, near the beginning diagnosis is very important to prevent the health condition of the patients from deteriorating.

#### DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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