

MACHINE LEARNING IN HEALTHCARE OPPORTUNITIES AND FUTURE SCOPE

Mohammad Serajuddin¹, Zafarul Hasan², Ali Akhtar³, Amjad Khan⁴

¹College of Dentistry, ²College of Nursing, ³College of Pharmacy, ⁴Prince Sultan Bin Abdul Aziz College of Emergency Medical Services, King Saud University, Saudi Arabia

Abstract-

Innovative technologies have dominated human life and greatly improved it. Machine language is considered to be greatest creation of human history, this is something we are proud of because it has improved the accuracy and efficiency of our work. Several industries have expanded as a result of cutting-edge technology and provide top-notch service.

One of the technologies that is expanding in almost every industry in the world is machine learning. Today, numerous businesses all around the world are attempting to integrate machine learning into their systems. Machine learning is one of the technologies that has profound impact on Medical and health care sector. and has benefited from machine learning.

It has changed a crucial aspect of the healthcare sector. We can see into the future where healthcare providers will employ analytics and data to create better services, improve automated health care critical operations in real-time basis, and deliver improved processes. According to reports, the technology will address rising medical needs, enable more sophisticated procedures, and reduce costs.

Keywords: Innovative Technologies, Algorithms, Machine learnings

Introduction: -

Innovative technologies have dominated human life and greatly improved it. We are proud of technological revolution and digital integration, because it has improved the accuracy and efficiency of our work especially in Health sector[1]. Several start-ups and health care services have expanded as a result of cutting-edge technology and provide top-notch service.

Machine learning is one of the technologies that has everyone inbound. One of the technologies that is expanding in almost every industry in the world is machine learning[3]. Today, numerous businesses all around the world are attempting to integrate machine learning into their systems. The medical sector is one of the industries that has benefited from machine learning.

It has changed a crucial aspect of the healthcare sector. We can see into the future where healthcare providers will employ analytics and data to create better services, improve automated jobs in real-time, and deliver improved processes[4]. According to reports, the

technology will address rising medical needs, enable more sophisticated procedures, and reduce costs.

Definition of Machine Learning: A short overview

An essential part of artificial intelligence is machine learning. It assists in setting up and locating patterns in the massive dataset to facilitate decision-making. The machine learning apps use consistent methods to gather instructions for carrying out a specific set of activities.

The design of machine learning algorithms allows the machine to learn data independently of human intervention. Additionally, it enhances their predictive abilities without the need for training. Machine learning is being used by scientists and researchers to provide some innovative solutions that can definitively aid in the diagnosis and treatment of an ailment.

According to the survey, over **300 healthcare officials** claimed there is a problem with patient appointments. And over **70% claimed** that half of their patients are extremely involved in the treatment procedure. So, how to magnify this process?

See how machine learning affects the medical industry to learn more about the impact:

1. Enhance clinical trials and medical research- It takes years to get a conclusion while performing a clinical trial or any other type of medical study. It takes time and money, and there is no guarantee that the outcome will be accurate.

Machine learning, on the other hand, makes it possible to do so more quickly and intelligently. Based on elements like customer history, such as doctor visits and medical data, machine learning aids in predictive analysis for the clinical trials. Additionally, by using natural language processing methods, medical researchers could gain valuable insights without feeling the need to read every single one of them.

2. Rapid Disease and Diagnosis Detection- Machine learning's greatest advantage is its ability to recognise ailments and make an early diagnosis of illness. It identifies faster and with more precision than humans. The use of technology has made disease prediction more accurate than in the past. For instance, a deep learning-based prediction model may anticipate the onset of breast cancer up to five years in the future. The goal is to automate the process as quickly as feasible in order to create a commercially viable method of diagnosing and treating patients in a clinical setting.

3. Construct Better Predictive Analytics- The application of predictive analytics, machine learning, and data science provides opportunities to improve clinical decision support tools, create new healthcare procedures, and advance patient outcomes. Machine learning is being used in the healthcare industry to use health informatics to forecast health outcomes using predictive analytics, starting with more accurate diagnosis and treatment, and encouraging physician insights for customised and subsequent techniques. By interpreting data for decision-

makers and developing methodical approaches, machine learning also adds additional value to predictive analytics, enhancing overall business operations in the healthcare industry.

4. Monitor the medical records- It can be difficult to keep track of the details of medical procedures, patient visits, and doctor cases. It takes a lot of effort and money to maintain and update health records. However, machine learning technology has improved its performance. It was crucial in advancing the data entering procedure. However, because the majority of the process must still be produced manually, it still takes a long time to complete.

The future creation of intelligent health records, which will incorporate technology tools from the most basic to the most advanced levels to aid in clinical treatment recommendations and diagnosis, is now being worked on by a number of institutes.

5. Keep an eye on the health records- Keeping track of the specifics of medical procedures, patient visits, and doctor cases can be challenging. Maintaining and updating health data costs a lot of time and money. The performance of this system has enhanced thanks to machine learning technologies. It was essential for developing the data entry process. However, it still takes a long time to finish because a large portion of the process must still be generated manually.

Numerous institutes are currently working on the development of intelligent health records, which will combine technological tools ranging from the most basic to the most sophisticated levels to support clinical treatment

6. Analysis of Medical Imaging- Medical imaging diagnostics is one of the important applications of machine learning in the healthcare sector. The ground-breaking technology mentioned in Computer Vision is due to machine learning and deep learning. It has gained traction in the medical industry's effort, which relies on image diagnostic technologies for image analysis. The desire for more data specialists to be seen as part of this AI-driven diagnostic process develops as machine learning becomes more practical and advances in their crucial role.

7. Crowdsourcing for better Data- Crowdsourcing has recently been discovered by the medical business, and today academics and practitioners use the method to collect huge volumes of data that people contribute with their permission. Such crucial health information has multiple effects on how medicine will function in the future. In order to reveal, gather, and exchange diabetes and insulin data in real-time, the tool is a map based on crowdsourced information. The healthcare sector may still be searching for novel ways to apply data and improve the overall effectiveness of diagnostics, even with the advancements being made in the Internet of Things field.

8. Healthcare ML in the Future- The improvement in machine learning boosts the accuracy and performance of disease prediction to relieve doctors' stress. The fields of big data analytics, data science, and machine learning will change how the healthcare sector operates in the future. Machine learning still needs to be enhanced, and this is necessary for a number of reasons.

Objectives-

1. Enhance clinical trials and medical research
2. Rapid Disease and Diagnosis Detection
3. Construct Better Predictive Analytics
4. Keep an eye on the health records
5. Analysis of Medical Imaging
6. Crowdsourcing for better Data

Analysis:

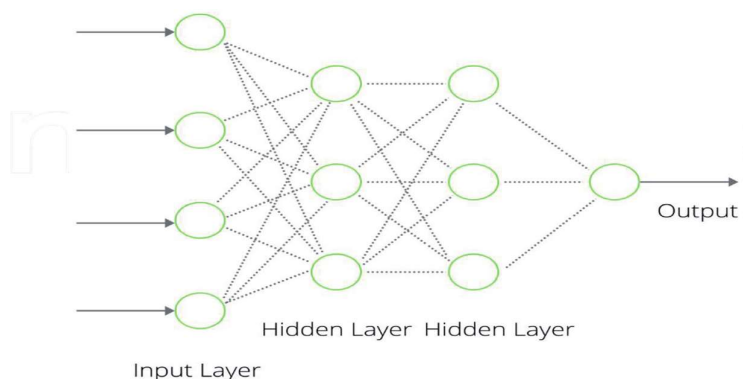


Fig-1

The medical care area has consistently had a very huge measure of data, generally put away as actual records in centers, clinics, administrative organizations, and biomedical organizations. With the push to electronic clinical records (EMR), this data is quickly being changed into a form which can be utilized by man-made intelligence innovations.

Medical care data is very different in both structure and function. Visual information as clinical pictures is very unique in relation to familial history. The assessed measure of medical care information are around 150 exabytes (1 EB = 10¹⁸ bytes), however that number is in all probability which is exponentially vary. In-fact these enormous data sets, when in a digitized structure, are arranged as large Information in arranged algorithm, which include combination of Inputs and hidden processing layers, each hidden layers also functions in separate sequential algorithm, depicted in Fig.1

Historical traces of Machine learning and Artificial Intelligence, has indicated Man-made consciousness (simulated intelligence) been connected to the ascent of advanced registering machines. AI has its foundations during early IIInd world war. Was established the fact with the experiment of Alan Turing's path breaking work. The German Conundrum machine, during the Second Great World War, turned into the reason a bit for current software engineering. The Turing Test, which plans to check whether simulated intelligence has become vague from human knowledge, or play a significant role .

During WWII, the Allies had a huge strategic obstacle in the Atlantic. The US and its allies expected to set up secure transportation lines to move the two combat hardware and troops to Britain in anticipation of a central area European attack. Notwithstanding, the German U-boats were incredibly viable at dislodging and sinking a large number of the boats navigating these transportation paths through AI based calculations Models

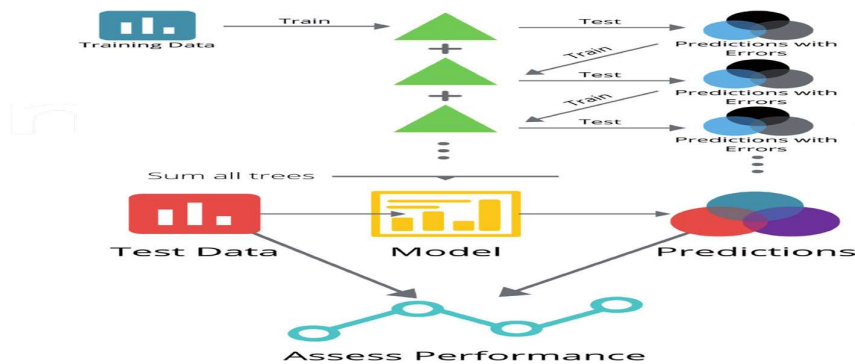


Fig-2

Conclusion

AI is a subset of computer based intelligence and the term was begat in the last part of the 1950s by Arthur Samuel who distributed a paper on preparing PCs to play checkers when he worked with IBM [5]. Simulated intelligence is best depicted as giving human-like knowledge to machines in a way that straightforwardly emulates the navigation and handling of the human heart. ML is the subset of man-made intelligence that spotlights on enabling machines to learn in an independent manner without any human mediation.

By the last part of the 1960s, researchers were previously attempting to help PCs to play fundamental games, for example, spasm tac-toe [6]. Ultimately, the possibility of brain organizations, which were in view of a hypothetical model of human neuron association and communication, was ventured into counterfeit brain organizations (ANNs) [7, 8]. These primary works laid lethargic for many years because of the difficulty and lacklustre showing

of the frameworks made. Figuring innovation had not yet sufficiently progressed to decrease the computational opportunity to a useful level.

The advanced PC period prompted outstanding expansions in both computational power and information stockpiling limit. With the presentation of IBM's Dark Blue and Google's AlphaGo in ongoing many years

According to the survey, over 300 healthcare officials claimed there is a problem with patient appointments[9]. And over 70% claimed that half of their patients are extremely involved in the treatment procedure. So, how to magnify this process?

See how machine learning affects the medical industry to learn more about the impact:

1. Enhance clinical trials and medical research- It takes years to get a conclusion while performing a clinical trial or any other type of medical study. It takes time and money, and there is no guarantee that the outcome will be accurate. Machine learning, on the other hand, makes it possible to do so more quickly and intelligently.

Based on elements like customer history, such as doctor visits and medical data, machine learning aids in predictive analysis for the clinical trials[10]. Additionally, by using natural language processing methods, medical researchers could gain valuable insights without feeling the need to read every single one of them.

2. Rapid Disease and Diagnosis Detection- Machine learning's greatest advantage is its ability to recognise ailments and make an early diagnosis of illness. It identifies faster and with more precision than humans[11]. The use of technology has made disease prediction more accurate than in the past. For instance, a deep learning-based prediction model may anticipate the onset of breast cancer up to five years in the future. The goal is to automate the process as quickly as feasible in order to create a commercially viable method of diagnosing and treating patients in a clinical setting.

3. Construct Better Predictive Analytics- The application of predictive analytics, machine learning, and data science provides opportunities to improve clinical decision support tools, create new healthcare procedures, and advance patient outcomes. Machine learning is being used in the healthcare industry to use health informatics to forecast health outcomes using predictive analytics, starting with more accurate diagnosis and treatment, and encouraging physician insights for customised and subsequent techniques. By interpreting data for decision-makers and developing methodical approaches, machine learning also adds additional value to predictive analytics, enhancing overall business operations in the healthcare industry.

4. Monitor the medical records- It can be difficult to keep track of the details of medical procedures, patient visits, and doctor cases. It takes a lot of effort and money to maintain and update health records. However, machine learning technology has improved its

performance[12]. It was crucial in advancing the data entering procedure. However, because the majority of the process must still be produced manually, it still takes a long time to complete.

The future creation of intelligent health records, which will incorporate technology tools from the most basic to the most advanced levels to aid in clinical treatment recommendations and diagnosis, is now being worked on by a number of institutes.

5. Keep an eye on the health records- Keeping track of the specifics of medical procedures, patient visits, and doctor cases can be challenging. Maintaining and updating health data costs a lot of time and money. The performance of this system has enhanced thanks to machine learning technologies. It was essential for developing the data entry process. However, it still takes a long time to finish because a large portion of the process must still be generated manually.

Numerous institutes are currently working on the development of intelligent health records, which will combine technological tools ranging from the most basic to the most sophisticated levels to support clinical treatment

6. Analysis of Medical Imaging- Medical imaging diagnostics is one of the important applications of machine learning in the healthcare sector. The ground-breaking technology mentioned in Computer Vision is due to machine learning and deep learning. It has gained traction in the medical industry's effort, which relies on image diagnostic technologies for image analysis. The desire for more data specialists to be seen as part of this AI-driven diagnostic process develops as machine learning becomes more practical and advances in their crucial role.

7. Crowdsourcing for better Data- Crowdsourcing has recently been discovered by the medical business, and today academics and practitioners use the method to collect huge volumes of data that people contribute with their permission. Such crucial health information has multiple effects on how medicine will function in the future. In order to reveal, gather, and exchange diabetes and insulin data in real-time, the tool is a map based on crowdsourced information[13]. The healthcare sector may still be searching for novel ways to apply data and improve the overall effectiveness of diagnostics, even with the advancements being made in the Internet of Things field.

8. Healthcare ML in the Future- The improvement in machine learning boosts the accuracy and performance of disease prediction to relieve doctors' stress. The fields of big data analytics, data science, and machine learning will change how the healthcare sector operates in the future[14]. Machine learning still needs to be enhanced, and this is necessary for a number of reasons.

Innovative technologies have dominated human life and greatly improved it. Machine language is considered to be greatest creation of human history , this is something we are proud of because it has improved the accuracy and efficiency of our work. Several industries have expanded as a result of cutting-edge technology and provide top-notch service.

One of the technologies that is expanding in almost every industry in the world is machine learning. Today, numerous businesses all around the world are attempting to integrate machine learning into their systems[15]. Machine learning is one of the technologies that has profound impact on Medical and health care sector. and has benefited from machine learning.

It has changed a crucial aspect of the healthcare sector. We can see into the future where healthcare providers will employ analytics and data to create better services, improve automated health care critical operations in real-time basis , and deliver improved processes. According to reports, the technology will address rising medical needs, enable more sophisticated procedures, and reduce costs.

References

- [1] Jakimowicz JJ, Cuschieri A. Time for evidence-based minimal access surgery training—simulate or sink. *Surg Endosc.* 2005;19(12):1521–2. Epub 2005/10/26. pmid:16247572.
- [2] Bitterman N. Technologies and solutions for data display in the operating room. *J Clin Monit Comput.* 2006;20(3):165–73. Epub 2006/05/16. pmid:16699740.
- [3] Ahmed MN, Toor AS, O’Neil K, Friedland D. Cognitive Computing and the Future of Health Care Cognitive Computing and the Future of Healthcare: The Cognitive Power of IBM Watson Has the Potential to Transform Global Personalized Medicine. *IEEE Pulse.* 2017;8(3):4–9. Epub 2017/05/24. pmid:28534755.
- [4] O’Reilly-Shah VN, Gentry KR, Walters AM, Zivot J, Anderson CT, Tighe PJ. Bias and ethical considerations in machine learning and the automation of perioperative risk assessment. *Br J Anaesth.* 2020. Epub 2020/08/26. pmid:32838979; PubMed Central PMCID: PMC7442146.
- [5] Blumenthal-Barby JS, Krieger H. Cognitive biases and heuristics in medical decision making: a critical review using a systematic search strategy. *Med Decis Making.* 2015;35(4):539–57. pmid:25145577.
- [6] Wolf FM, Gruppen LD, Billi JE. Differential diagnosis and the competing-hypotheses heuristic. A practical approach to judgment under uncertainty and Bayesian probability. *JAMA.* 1985;253(19):2858–62. pmid:3989960

- [7] Graber ML, Franklin N, Gordon R. Diagnostic error in internal medicine. *Arch Intern Med.* 2005;165(13):1493–9. pmid:16009864.
- [8] Kirch W, Schaffii C. Misdiagnosis at a university hospital in 4 medical eras. *Medicine (Baltimore).* 1996;75(1):29–40. pmid:8569468.
- [9] Liu XX, Faes L, Kale AU, Wagner SK, Fu DJ, Bruynseels A, et al. A comparison of deep learning performance against health-care professionals in detecting diseases from medical imaging: a systematic review and meta-analysis. *Lancet Digit Health.* 2019;1(6):E271–E97. WOS:000525871300011. pmid:33323251
- [10] Nagendran M, Chen Y, Lovejoy CA, Gordon AC, Komorowski M, Harvey H, et al. Artificial intelligence versus clinicians: systematic review of design, reporting standards, and claims of deep learning studies. *BMJ.* 2020;368. WOS:000523764500002. pmid:32213531
- [11] Rivera SC, Liu XX, Chan AW, Denniston AK, Calvert MJ, Grp S-AC-AW. Guidelines for clinical trial protocols for interventions involving artificial intelligence: the SPIRIT-AI extension. *Lancet Digit Health.* 2020;2(10):E549–E60. WOS:000581145100012. pmid:33328049
- [12] Liu X, Cruz Rivera S, Moher D, Calvert MJ, Denniston AK, Spirit AI, et al. Reporting guidelines for clinical trial reports for interventions involving artificial intelligence: the CONSORT-AI extension. *Nat Med.* 2020;26(9):1364–74. Epub 2020/09/11. pmid:32908283; PubMed Central PMCID: PMC7598943.
- [13] Tcheng JE. Optimizing strategies for clinical decision support: summary of a meeting series. *National Academy of Medicine;* 2017.
- [14] Shortliffe EH, Sepúlveda MJ. Clinical Decision Support in the Era of Artificial Intelligence. *JAMA.* 2018;320(21):2199–200. Epub 2018/11/07. pmid:30398550.
- [15] Norgeot B, Quer G, Beaulieu-Jones BK, Torkamani A, Dias R, Gianfrancesco M, et al. Minimum information about clinical artificial intelligence modeling: the MI-CLAIM checklist. *Nat Med.* 2020;26(9):1320–4. Epub 2020/09/11. pmid:32908275; PubMed Central PMCID: PMC7538196.