ARTIFICIAL INTELLIGENCE AT HEALTHCARE INDUSTRY

Article *in* Bodhi An Interdisciplinary Journal · January 2021

CITATIONS
0

READS
471

1 author:

Pratham Agrawal
VIT University
1 PUBLICATION **0** CITATIONS

SEE PROFILE

ARTIFICIAL INTELLIGENCE AT HEALTHCARE INDUSTRY

PRATHAM AGRAWAL
20BDS0142
School of Computer Science & Engineering
VIT, Vellore, India

Introduction

Over the years, human intelligence has developed multiple folds. Hamet P &Tremblay J. It had been the year 1930s, the humankind had the primary computer working almost the scale of present-day rooms. The 1970s was the time we started using mini-computers within the healthcare sector. From using the computers for hospital billing, financial applications, and physician billing to using the computers for diagnosis and treatment recommendations, nowadays, computers play a significant role in various domains of the healthcare sector. All of this has been possible only due to the development of Artificial Intelligence (the branch of computer science which is used to develop software and machine which are capable of doing task with the same level of human intelligence and sometimes more than too).

Davenport (2019). These days, AI has been a great help in diagnosis, treatment recommendations, patient engagement and administrative activities to the professional healthcare workers. Studies suggests that AI can now perform some task such as diagnosing the disease equal to or better than humans. There are a lot of areas where the traditional medical healthcare systems can't rescue a person from falling in the prey of death. Some of the domains can be protected easily with the help of the Artificial Intelligence.

Rita (2019). Mentioning some of the challenges faced by the sector are:

1. Payment processing and invoicing

Many people don't have a problem in affording their treatment, but do have issues with affording the after-treatment medicine. There are demands for an effective billing processes and procedure models, where quality is determined first and then comes the quantity. This could lead to patient billing at a lower cost. This requires large scale implementation of change in healthcare payment processing models. Now this is where Artificial Intelligence can do the work very efficiently and effectively.

With proper trained data sets from clinical activities, like screening, diagnosis, treatment assignment and other, AI can be deployed in this area for a human like functioning or even a better functioning.

2. Enhanced and efficient outcome prediction and Diagnosis prediction:

In the medical world, there are cases, where human intelligence makes errors in finding out the disease and the cause behind it. Taking the example of radiology, AI is not only spotting malignant tumours, but the rate of consistency and precision is also better than the human intelligence. In a way, Machine learning techniques like deep learning, NLPs does have an edge over in diagnosis prediction and outcome prediction.

3. Harnessing Advanced Health Technology

Over the years, there has been a great increase in the number of connected devices in the medical sector and experts believe that there will be a more than 20% increase by 2022.Looking at the benefits of Artificial intelligence and Machine learning in the healthcare sector, more healthcare professionals and leaders should join hands with the software companies to develop new models and scenarios to improve adoption of new technology in the healthcare sector.

4. Information and integrated healthcare services

Artificial Intelligence and IoT connected devices provide a huge amount of data that can be used for

training new AI techniques and improve the past ones. This data can be also used by the physicians, healthcare professionals for training purposes and research purposes. However, not only capturing and monitoring data is not sufficient. Most care providers, lack architecture and data management systems deployed for the data that comes from various sources. The problem that still lies is that the companies uses relational databases that can't hold unstructured data.

To encounter this, healthcare companies can switch to non-relational database and plan models for all type of management layers.

There are numerous reasons where the healthcare sector lacks and face problems which can be resolved with the advanced technologies in AI, ML and deep learning. In present day, AI has definitely assisted many physicians, healthcare professionals and clinicians. Paranjape et.al. (2020) Besides all these studies, there is also a belief that it will take many years for AI to replace humans for broad medical process domains.

Literary Survey

Davenport, K. et.al. (2019). AI described both the potential that Artificial Intelligence is able to bring change and also the barriers that prevent AI from the stepping into the modern healthcare problems. Study also described that the demand of the AI in the healthcare sector will increase exponentially as the complexity and rise of data in healthcare. The major domains where AI will be useful and currently deployed are diagnosis, treatment recommendations, patient engagement and adherence, and administrative activities. There are different types of AI technologies. Some of the current technologies deployed is the use of machine learning in finding out welter a person will acquire a certain disease or no. More complex models of machine learning like deep learning is helping the healthcare sector in recognition of potentially cancerous lesions in radiology images. Deep learning is extensively used in radiology for identification of tumours and other diseases that are beyond human eye's perception. Other technologies as a part of Artificial intelligence like Neural networks are used in understanding, creation and classifications of clinical administration. Physical technologies like surgical robots are on field to assist surgeons. They aim to provide superpower to surgeons, improving their precision and take important decisions carefully. Though there are many reasons so as to incorporate AI into healthcare systems, but still the scientists consider many years for AI to completely replace humans for broad medical domains. Some of the hurdles faced by the AI to take stance in healthcare systems are there are issues raised for accountability, transparency, permission and privacy. Medical staff members couldn't hold accountability for the process done by an AI technology.

Jiang, J. et,al* (2017) AI technologies vastly used in 3 disease areas that are cancer, neurology and cardiology. The major areas where currently AI is used and the areas where in future, AI can be incorporated are detection/ diagnosis, treatment and evaluation. Using algorithms designed by humans, AI can learn from a large volume of data and then process the data accordingly to provide assist to the medical staff. The AI devices are mainly of 2 types: machine learning that helps in analyzing structured data and natural language processing which analysis an execution for unstructured data, which then is converted to structured form for the ML machines to analyze them and provide the results. The three main leading causes of deaths: cancer, neurological and cardiovascular diseases can be prevented by early diagnoses. This is where AI is of great significance. With AI system the procedure on imaging, genetic, EP or EMR can be improved. ML techniques takes in personal traits, medical information as input dataset. These values are then processed into different kinds. Neural Network is the most common technique used to identify and diagnose cancer. A more complex form for neural network can be termed as deep learning which is used in the case where the complexity of data is more and it would need more algorithms to solve. One of the recently developed and certified deep learning-based model Convolution

neural network (CNN) has been implemented in the medical sector in order to help and assist in diagnosis of diseases. Since there are many hurdles in full time implementation of AI in healthcare. First and foremost been the regulations, current ones lack the standards to assess the safety and efficacy of the AI system. The second hurdle comes from data exchange. There are very less chances that once an AI system is laid down, the continuous supply of data remains limited.

Ketan, M. et.al (2020), As long as there are new diseases coming up, the world demands more efficient healthcare system, so as to make the people thrive. There is a need for superior technology which can be used to deliver to the needs to the people. There are tons of new sources for data that gives us enormous dataset and values which can be very useful. There are various types of datasets, some include real life evidence, molecular information, data from wearables devices, mobile apps. The data sets are vast and the human brain can't function. According to the survey hosted by the Health Information Technology for economical and clinical health act (HITECH Act of 2009), a doctor had to spend 29 hours reading in order to stay updated. Artificial intelligence here comes into play by using ML and NLP techniques and ease the human's work. AI has also made some serious advancements in NLP natural language processing Machine learning, and deep learning. Today, AI can help us increasing false positive results in screening for breast cancer, assisting robotic surgery. Though there are challenges also faced by AI in the healthcare sector. Nothing comes easy. Challenges faced by the AI technologies to incorporate in the medical sector are: first and foremost, the black box phenomenon which makes it hard for the professionals because they have to take the last action / decision even AI gives you a record. This also leads to misinterpretation and confusion between patient's understandability and his disease and there occurs privacy also. In order to fully incorporate AI into our medical healthcare systems, the medical staff, professionals, residents and students should be educated and trained vigoursoly in these areas to get the best of the two.

Sandeep, J. et.al (2019). With the growth of the artificial intelligence and all other AI techniques, the healthcare industry has seen some major advancements. Patient administration, clinical decision, patient monitoring, healthcare inventions and medicine developments are some of the major areas where Artificial Intelligence are used in modern healthcare. Also, there are some predictions that in some upcoming years, some of the activities that clinicians and physicians will be performed by the AI substituted technology. Studies that represented and formulated that the efficacy and potential of AI-enabled health applications. Infect, AI-enabled medical devices in the market has been facilitated by the United States Food and Drug Administration. For the healthcare administration, AI and data-mini techniques are the responsible techniques that are responsible for augmenting clinical care and lessening administrative demands. Machine learning can also potentially help personalize treatment decisions for patients. Machine learning techniques results in radiology and pathology have been quite positive and effective for patients. Adoption of electronic devices has helped the medical staff by giving access to digital data for monitoring patients. The AI enabled software and hardware has helped the medical staff by getting a close look at the cardiovascular and respiratory monitoring. Healthcare and Medicine developments has seen a major boost with the incoming AI techniques. With the help of ML and NLP, the world has seen less expensive and speedier diagnostic and treatment services. Future of AI and healthcare system looks very fruitful. Machine learning is used and fast-tracked for drug development. Other techniques are still in development and could be anytime available. Also, there is a great hype that soon AI techniques will replace the human physicians, but the scientists have predicted that this hype seems to be false for another couple of years.

Koichiro, O. et.al. Radiology is one of the medical branches that got the most benefit from the

latest developments in the Artificial Intelligence. The development in the Deep Learning with the convolutional neural network has been one of the most popular usage and the most promising too. An image diagnosis is the most important thing in the branch of radiology. One of the other deep learning techniques is one can assist image processing at linear stages. This means, that one can have a look at the segmentation of organs and tissues. Deep learning modules, also helps clinicians, trainees andpatients to gain competence and confidence in different diagnoses. Secondly, deep learning methods also help in decreasing the workload in radiology. Third, the deep learning modules also helps to alert patients, physicians and radiologists what would require some urgent medication help. Besides, these advantages, there are certain limitations. There are certain calculations, theories and features that needs complex interpretation, which sometimes isn't easy. In addition to this, deep learning doesn't necessarily fit and show consistent performance when the data doesn't match with the data during the training sessions. In summary, the slope for deep learning in the field of radiology is positive. This is because of the high image recognition tasks. AI can be expected to bring a change in the radiology branch and also the healthcare sector.

Rushabh shah & Alina Chircu (2018). The Developments in the Artificial Intelligence and Internet of Things has provided several significant benefits to patients, physicians, payers and drug developers. Internet of things (IoT) is a set of technologies that enable machines to communicate and provide instant data analysis and results. The two IoT and AI together is responsible for the huge development in the healthcare system. IoT has a role in collecting and monitoring data-set which further is forwarded to the AI technologies where the data is analyzed and the required actions are taken. These applications have numerous potential benefits for patients, their caregivers, doctors, and hospitals. However, the doctors and patients both should understand about the consistent regulations for data security, systems efficacy, safety and privacy. The IoT wearables and AI connectivity have together led to the disease detection, treatment, patient care and sensor networks.

Advantages

1. Artificial intelligence in healthcare has an edge over the human clinical practice in terms of early detection and diagnosis. Through various methods of machine learning, NLPs being performed on the EMR, Image, Genetic, and EP data, Artificial intelligence can help medical professionals in terms of achieving early diagnoses. The data fed could also be clinical notes in human language, clinical activities, screening, diagnosis, or treatment references.
2. An AI system deployed in the medical sector can help physicians by assisting them in providing up-to-date medical information from different literary sources. In addition to this, AI can also help reduce diagnostic and therapeutic errors that are inevitable from the human clinic practice.
3. Earlier, finding results and conclusions from unstructured data was a tedious process. But with the assistance of Natural Language Processing, a module of computing can help extract useful information from the unstructured data (physical examination, clinical laboratory reports, operative notes, and discharge summaries) to help medical professionals. NLP can also help in fast and more accurate decision making by alerting treating arrangements, monitoring the conditions of the patients.
4. Another major advantage of Artificial Intelligence can be found in understanding the disease mechanisms in different kinds of people. Artificial intelligence can help design and structure personalized medical plans or therapies.
5. With the help of AI modules, scientists and technicians can create highly effective drugs with clinical outcomes that greatly exceed standard therapies. Biotechnicians have been able to create drugs with the help of AI search modules which has indeed benefitted the human race to survive off from some deadly diseases.

6. Artificial Intelligence has helped mental healthcare professionals in analyzing human behavioral data which is used to identify the risks of mental illnesses. Furthermore, it has helped to identify the measure of risks of suicide among patients with psychiatric disorders.
7. Wearables based on Artificial Intelligence have been used to record, analyze and monitor a patient's real-time information of vital signs like blood pressure, heart rates, saturation, body temperature, blood glucose, and sleep quality. These wearables have improved healthcare quality and patient satisfaction.
8. In terms of a hospital-external environment, AI has found its way with the development of Assistive robots. These robots are specially designed for elderly and handicapped people. One of them is the Smart walker which detects obstacles on the road and suggests a more convenient and safer path.
9. Not only does AI in healthcare helps save the lives of patients but also medical professionals. A program developed by Stanford University, which takes care of the hand hygiene of doctors and nurses. This system can help medical personnel to be protected from hospital infection as much as possible.
10. Artificial Intelligence is to be considered as unrivaled assistance in surgery. With the AI surgical system, humans can perform movements with great precision and accuracy. These systems can also help patients with reducing pain, blood loss, and reducing the risks of side effects.

Conclusion

By reviewing the past, present, and future usage and application of Artificial Intelligence in the medical sector, Al has attracted substantial attention in medical research, It is still impossible to replace human intelligence with Artificial Intelligence. Studies support the above statement with two main hurdles such as the regulations which lack a standard to assess the safety and efficacy of the AI system and the other hurdle is the data exchange (Once an AI system is deployed with historical data, the continuation of future and updated data becomes an issue). Researches also show that the future of AI in healthcare would be very beneficial in handling diseases, early diagnoses, and prevention.

References

Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. *Future healthcare journal*, *6*(2), 94.

Hamet, P., & Tremblay, J. (2017). Artificial intelligence in medicine. *Metabolism*, *69*, S36-S40.

https://builtin.com/artificial-intelligence

https://www.finoit.com/blog/top-10-healthcare-challenges/

Paranjape, K., Schinkel, M., & Nanayakkara, P. (2020). Short Keynote Paper: Mainstreaming Personalized Healthcare–Transforming Healthcare Through New Era of Artificial Intelligence. *IEEE journal of biomedical and health informatics*, *24*(7), 1860-1863. Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., ... & Wang, Y. (2017). Artificial intelligence in healthcare: past, present and future. *Stroke and vascular neurology*, *2*(4), 230-243.

Reddy, S., Fox, J., & Purohit, M. P. (2019). Artificial intelligence-enabled healthcare delivery. *Journal of the Royal Society of Medicine*, *112*(1), 22-28

Rita Sharma. Top Challenges Healthcare companies face today. Retrieved from

Shah, R., & Chircu, A. (2018). IOT AND AI IN HEALTHCARE: A SYSTEMATIC LITERATURE REVIEW. *Issues in Information Systems*, *19*(3).

Yasaka, K., & Abe, O. (2018). Deep learning and artificial intelligence in radiology: Current applications and future directions. *PLoS medicine*, *15*(11), e1002707.