How AI Affects Healthcare Today

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The applications of artificial intelligence (AI) are becoming more relevant to the healthcare system, especially in data analysis. The implications of AI are still in its early stages and there are important issues concerned with the use of AI in medicine. The issues are, but not limited to, patient privacy, malpractice responsibility, AI vulnerability, and the feasibility of using AI for medicine.

This paper also analyzes whether AI will replace healthcare workers altogether in future. Furthermore, the paper discusses in detail about the use of AI to solve existing issues in the healthcare system, such as the shortage of healthcare workers, patient mismanagement and time-consuming paperwork. It is also the objective of this study to communicate the exact views of the care providers and patients towards the implementation of this technology, including if they prefer the exclusive use of AI for primary care or more traditional methods. The paper also elaborates the role AI plays and might play in medicine, including points of contention that will arise from such roles.

Watch a video introduction by the authors at http://bit.ly/33vsxDE

Knowing Artificial Intelligence

The definition of artificial intelligence (AI) varies according to different sources, but the definition used for this article is that artificial intelligence are the algorithms working in the machines that simulate the intelligence of humans. Marvin Minsky, co-founder of the Massachusetts Institute of Technology's AI laboratory, described AI as "the science of making machines do things that would require intelligence if done by men." (Oconnor 2019)

The artificial neural network (ANN) is a tool used for machine learning in which the design is inspired by the human brain. It allows machines to be able to recognize patterns in data and categorize them by grouping similar data together. Neural networks learn to do these tasks by processing data that the scientists feed them. The machines repeat their tasks over and over to become more accurate over time (Snow 2019).

AI as a Potential Saviour of Healthcare

The medical field has a reputation of being a highly sensitive and careful job.. Most healthcare personnel are overwhelmed with a massive amount of information cycling within the system (Siphered 2018). Consequently, issues arise when the human potential inevitably fails

to reach the ideal standard of the healthcare system. Henceforth, Artificial Intelligence is believed to reorganize the flaws and glitches in the healthcare system caused by human errors (Morrissey 2019).

In prior to the direct analysis of human errors in the healthcare system, it is crucial to understand the strength of the medical errors in the field. In 2015, the National Academy of Medicine stated that about 5% of adults in the outpatient sector are misdiagnosed yearly (Bernstein 2017). According to the U.S. Centers for Disease Control and Prevention (CDC), out of 34.5 million hospitalizations, 251,454 deaths were due to medical errors (Hopkin 2016). Henceforth, the number beats the annual mortality rate of respiratory disease which claimed to be the third leading cause by CDC. In 2005 and 2010, two studies conducted in the Netherlands and the United States concluded that the human-cognitive errors had 96% and 74% contributions to diagnostic adverse outcomes respectively (GmbH 2019). Both numbers were higher than the systemic flaws attributed to the misdiagnoses.

Developing an alternative diagnostic method ran by AI could lower these unfortunate deaths. For instance, AI can be designed to do the mammoth tasks of comparing more than 10,000 images of the real result in order to narrow down the scope of its diagnosis. A team of scientists from MIT's Computer Science & Artificial Intelligence Laboratory and Massachusetts General Hospital are currently developing an AI system to analyse mammograms for breast cancer with the purpose to prevent the series of treatments due to false alarms and late diagnosis (GmbH 2019).

A more specific approach in correcting human errors in radiology is now being developed by two major medical institutes including Harvard Medical School and Beth Israel Deaconess Medical Center. Andrew Beck, a pathologist and the director of bioinformatics at the Cancer Research Institute at Beth Israel Deaconess believes that AI should have the ability to excel the routine yet critical task of identifying metastatic cancer cells in the patients' lymph nodes (Neale 2011). Their technology uses similar pattern of learning as that of the human neocortex. However, the neurons are replaced by neutral networks. In a process of identifying cancer cells, the AI-based diagnostic method was proven to be 92% accurate. However, when humans pathologist, aided by the AI program, the result came out with the astounding accuracy of 99.5%.Therefore, these results signals a promising beginning for a future where the catastrophes due to human error will eliminate.

Artificial Intelligence and Their Roles in Research and Development

Without research and development in modern technologies, the conventional process of treating patients would be dreadfully inefficient and ineffective. New diagnostic methods, drugs, assistive equipment and many more are born from research and development. These processes, unsurprisingly, are highly expensive and labor-intensive. The inclusion of artificial intelligence into research and development would greatly accelerate progress and improve cost-efficiency.

During the developmental process, tremendous amounts of data are generated and needs to be reviewed. Artificial intelligence becomes the perfect option to assist humans because machines are much better and faster at analysing data. What researchers simply need to do is tell exactly what to look for. This drastically cuts the manpower required to review those data and also eliminate possibilities of human error.

As an example, there are four primary stages to develop a new drug, identifying triggers, find effective countermeasures, clinical trials and find indicators of when the new drug should be utilized.

Finding triggers and indicators for the use of the drugs, both requires substantial checks in order to pinpoint the triggers. Finding possible treatment medicines also requires massive experimentation to check what works and what does not. Also, generating massive amounts of data and for clinical trials requires large-scale experimentations. This includes selecting proper candidates and correctly grouping them in order to reach credible conclusions. All the processes aforementioned generate gargantuan amount of data and artificial intelligence would assist in assorting the data and coming up with relevant information.

Even more interesting, artificial intelligent algorithms are also able to learn when they need to sort through massive amounts of data, called machine learning. This allows them to identify types of patterns, and potential patterns that researchers could be interested. As data accumulates over time, these assistants will become even better and more efficient, allowing them to perform with more independence to a certain extent. This would also allow them to spot patterns in data that researchers might have overlooked, therefore also enhancing the depth of the research too.

Quite simply, artificial intelligence is an amazing substitute to humans when analyzing large amounts of data. They can sort through, identify patterns, correlations and relevant data much faster and accurate than a human researchers. They can also improve themselves to be better at their tasks through machine learning process. This results in significant cost and time reductions,both of which are considered as major bottlenecks in research and development. (GmbH 2019)

The Ethics of Artificial Intelligence in Healthcare

Use of AI may introduce an indirect vulnerability where doctors become overly dependent on these algorithms. Although the average human may not be able to fully understand the thought processes of an AI, it is certainly important that the physician can comprehend its basic processing technique. Physicians should use AIs to augment and support their diagnoses, instead of completely relying on them (Better Together). Therefore, it is in the best interest of healthcare institutions and medical schools to organize classes about AI to help their physicians and students to be more comfortable with this technology. Such classes will surely be well received, as both future and current doctors will want to improve their skills in applying AI in order to provide the best care possible. A study in Germany found that 83% of medical students believe that AI will help improve medicine (Strait-Wustl and Evangelou, 2018).

Using treatments suggested by algorithms places a new issue for malpractice claims. Some people wonder who is to blame if the doctor follows an AI's incorrect suggestions. Some suggest the blame lies with the doctor or else the company for providing a flawed algorithm (Pinto Del Santos et al. 2019).

This issue can be resolved if healthcare institutions only allow the use of highly accurate AIs with skills on par with a physician. In these cases, doctors should not be sued for following the suggestions of an algorithm that outperforms them at physician certification exam. To provide background, a doctor can be deemed negligent if they do not follow accepted medical procedures. Since, the AIs approved for healthcare service will be accurate most of the time, errors occurring from these AIs are surely statistical improbabilities and should be treated as such. Therefore, in rare cases where the AI suggestions lead to problematic conditions, it seems rather illogical to sue the doctor. The physician should not be at fault for choosing the most statistically reasonable path.

There is also the issue of whether the patient is comfortable with sharing their information for the development of an algorithm. A survey in the United Kingdom has revealed that 49% of those surveyed were uncomfortable with sharing personal data to improve healthcare services (Hempel 2018). Medicine is built upon the pillar of confidentiality and it must be respected, but algorithms can only achieve true effectiveness by having access to analyze the patient's big data. Patients may also be concerned with the high-profile data leak, especially in light of the recent cases of ransomware and other cyberattacks. However, consumers' opinions may change, as it happened before when big data analysis became a possibility. People gradually had less concerns as they became more familiar with big data, and recognizes that its benefits outweigh the risks. This shift in perspective is important for big data's use in various industries, and provides an example of how consumers will eventually perceive AI in healthcare (Fenech 2018).

Current Uses of AI

When it comes to using AI in medicine, some people think of it as something yet to come, however, AI is actually used more commonly than some people may realize. It has already substantially changed the medical world in several aspects as it is becoming more popular around the world. A 2016 report from CB Insights states that around 86% of the science and medical organizations use AI technology (Kent 2018). According to BMJ Journals, the primary role of AI is to "mimic human cognitive functions" but aim to handle a much larger amount of data and does so without human error.

Here are some current uses of AI in medicine:

Surgery. One of the most groundbreaking uses of AI is robot-assisted surgery. Physicians are able to perform more complex surgeries and incisions that are smaller and more precise with the help of A.I due to the control surgeons have over the robots. A.I. is used in the surgical field by mimicking the actions of a surgeon while the decision making is mostly done by the surgeons, however, some types of artificial intelligence are able to make basic medical decisions in a surgery (CB Insights Research 2018). For example, an A.I.-assisted surgery robot is able to suture extremely small blood vessels (AI Med 2018). It is reported that this type of surgery minimizes the pain, blood loss, scarring, the chance of complications, and recovery time for the patients. The Food and Drug Administration approved the use of robots in medical surgeries in 2000 and the approach has continued to spread to different hospitals.

Diagnosis. There are many approaches by which AI can be used to diagnose patients. Machines are able to analyze bodily fluids, tissues, and patient photos to diagnose diseases. They can also be used to identify cancerous tissues. Another example is the AI chatbot which allows patients to communicate their symptoms through an app. The patient describes his or her symptoms and the app will come up with the possibilities of different diseases, thus, acting as only a health guide but not an official diagnosis. The A.I. is able to connect the given information with existing material in its database and attempt to determine the appropriate course of actions for the patient. Babylon Health is an example of a health service app that uses artificial intelligence (Britt 2018). The app offers online consultations with real doctors as well as the Babylon Chatbot, powered by A.I., which is designed to answer medical questions any time of the day (Sennaar 2019).

Some people are concerned about their privacy due to the need to share medical data with the app. Babylon Health stores the patients' information in secure servers and with the patients' consent, the app may use the information to improve its services (Babylon Health 2019A).

Monotonous Jobs. Unlike us humans, machines do not get bored or tired. This means that they are able to do repetitive tasks without becoming exhausted, as well as doing them accurately and quickly. Having robots do things like data entry, error identification, and scan analysis could save a large amount of time on the part of the physicians and patients (when they have to wait for their results). The only possible drawback of AI after its widespread is a rise in unemployment in the field of work that does not require as much skill. Having said that, machines will probably not completely outweigh the need for humans because some tasks cannot be performed by A.I. because it lacks the empathy that humans possess (Babylon Health 2019B).

Acknowledgements

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