Artificial Intelligence in Human Health: a Sociotechnical Approach

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***Abstract*: Artificial intelligence (AI) in healthcare is the use of algorithms and software to inexact human cognition in the analysis of complex medical data. The primary aim of health-related AI applications is to analyze relationships between prevention or treatment procedures and patient outcomes. For many years, by necessity general practice in medicine has been to gather data and make generalizations. Now as we are in an age where masses of data can be collected and analyzed very quickly, personalizing treatment based on specific knowledge is becoming more feasible.This paper presents a study of various applications of artificial intelligence in healthcare system and tool and devices used in it.**

***IndexTerms*: AI, Robotics, ML, NLP**

I. INTRODUCTION

There is already an incredible amount of technology and automation in play in medicine.AI is getting increasingly sophisticated at doing what humans do, but more efficiently, more rapidly and at a lower cost. The potential for both AI and mechanical technology in healthcare is huge. Just like in our every-day lives, AI and robotics are progressively a part of our healthcare eco-system.

The utilization of AI and the Internet of Medical Things (IoMT) in consumer health applications is already helping people.AI increases the ability for healthcare professionals to better understand the day-to-day patterns and needs of the people they care for, and with that understanding they can give better input, direction and support for staying healthy.

II. USE OF AI IN MEDICINE

AI in medicine refers to the use of artificial intelligence technology / automated processes in the diagnosis and treatment of patients who require care. There are many background processes that must take place in order for a patient to be properly taken care of, for example:

- Gathering of data through patient interactions.
- Processing and result analyzing.
- Using multiple sources of data to come to an exact conclusion.
- Determining an appropriate treatment technique.
- Preparing and administering the picked treatment technique
- Patient monitoring
- Aftercare, follow-up arrangements and so on.

The argument for increased use of AI in medicine is that quite a lot of the above could be automated - automation often means tasks are completed more quickly, and it also frees up a medical professional's time when they could be performing other duties, ones that cannot be automated, and so are seen as a more valuable use of human resources. The goal is a balance between the effective use of technology and AI and the human strengths and judgment of trained medical professionals.

III. AI APPLICATIONS IN HEALTHCARE SYSTEM

Some of the applications of AI in medicine are given below

1. Robotic surgical systems

Robotic surgical system, with robotic arms, precise movement and magnetized vision, allows doctors to precision surgery that wouldn't be possible with an entirely manual approach.

When paired with augmented reality programs, which overlay digital cues and images atop real ones, AI can provide surgeons with real-time information. This ranges from dividing the brain into various regions for neurosurgery to laying MRI scans and other symbolism over a patient's body (giving doctors X-ray vision). Complex software will power advanced hardware, giving specialists an extra safety net and giving some peace of mind for patients.

2. AIs will predict disease

A basic advantage of AI comes from its strength in gathering and analyzing reams of data and drawing conclusions from its analysis. Who will probably to get cancer? AI predicts danger of death from coronary illness more precisely than specialists. Scientists have designed aa AI model that can predict risk of death in patients with coronary heart disease (CHD).

The potential for increased AI usage in medicine is not just in a reduction of manual tasks and the freeing up of physician's time, increasing efficiency and productivity - it also presents the opportunity for us to move towards more 'precision medicine'. Artificial narrow intelligence will most likely help healthcare move from traditional, 'one-size-fits-all' medical solutions towards targeted treatments, personalized therapies, and uniquely composed drugs."

3. Monitoring of Chronic Conditions

Conditions like diabetes, cholesterol, fertility issues and cardiac heath are managed by normal observing and way of life changes. Constant conditions are the single-. Associated PoC gadgets help generate a lot of data about the user's body parameters. This can be combined with lifestyle information such as food habits, exercise, etc. by an AI algorithm to deal with the conditions and alter dosage of medication.

4. Drug discovery

The AI has the potential to make drugs too. One of the prevalent names in this field is Atomwise, which uses deep learning process to reduce the time taken to find new medications.

5. Therapy

AI Therapy is an online course for people struggling with social anxiety

Tool used in health care

Deep Variant, is an AI tool for precision medicine.

IV. THE AI DEVICES: ML AND NLP (MACHINE LEARNING AND NATURAL LANGUAGE PROCESSING)

We classify them into three groups: the classical machine learning techniques, the more recent deep learning techniques and the NLP methods.

Classical ML

Machine Learning constructs data analytical algorithms to extract features from collected data. Inputs to these algorithms include patient 'traits' and sometimes medical outcomes of interest. A patient's features commonly include baseline data, such as age, gender, disease history and so on, and disease-specific data, such as diagnostic imaging, gene expressions, EP test, physical examination results, clinical symptoms, medication and so on. Besides the features of patient's medical outcomes are often collected in clinical research. These include disease symptoms, patient's survival times and quantitative disease levels, for example, tumor sizes. To fix ideas, we denote the jth attribute of the ith patient by Xij, and the outcome of interest by Yi. Depending on whether to incorporate the results, ML algorithms can be divided into two major categories: unsupervised learning and supervised learning. Unsupervised learning is notable for feature extraction, while supervised learning is reasonable for predictive modelling via building some relationships between the patient attributes (as input) and the outcome of interest (as output).

More recently, semi supervised learning has been proposed as a hybrid between unsupervised learning and supervised learning, which is suitable for scenarios where the outcome is missing for certain subjects. Clustering and principal component analysis (PCA) are two important unsupervised learning methods. Clustering groups subjects with comparative attributes together into clusters, without using the results. Clustering algorithms results the cluster labels for the patients through maximizing and minimizing the similarity of the patients within and between the clusters. Well-known clustering algorithms include k-means clustering, hierarchical clustering and Gaussian mixture clustering. PCA is mainly used for dimension reduction, particularly when the attribute is recorded in a large number of dimensions, such as the number of genes in a genome-wide association study.

PCA projects the data onto a few principal component (PC) directions, without losing excessively data about the subjects. In some cases, one would first be able to utilize PCA to reduce the dimension of the data, and after that use clustering to group the subjects. On the other hand, supervised learning considers the subjects' outcomes together with their attributes, and goes through a certain training process to determine the best results associated with the inputs that are closest to the outcomes on average. Usually, the result formulations vary with the outcomes of interest.

Clearly, compared with unsupervised learning, supervised learning provides more clinically pertinent results; hence AI applications in healthcare most often use supervised learning. (Note that unsupervised learning can be used as a component of the preprocessing step to reduce dimensionality or recognize subgroups, which in turn makes the follow-up supervised learning step more efficient.) Relevant techniques include linear regression, logistic regression, naïve Bayes, decision tree, nearest neighbor, random forest, discriminant analysis, support vector machine (SVM) and neural networks.

Natural Language Processing (NLP)

NLP is a type of artificial intelligence that enables computer programs to process and analyze unstructured data, such as free-text physician notes written in an EHR.

The image, EP and hereditary information are machine-understandable so that the ML algorithms can be directly performed after proper preprocessing or quality control processes. However, large proportions of clinical information are in the form of narrative text, for example physical examination, clinical laboratory reports, operative notes and discharge summaries, which are unstructured and incomprehensible for the computer program. Under this context, NLP focuses at extracting useful data from the narrative text to help clinical decision making. An NLP pipeline contains two main components: (1) text processing and (2) classification. Through text processing, the NLP recognizes a series of disease-relevant keywords in the clinical notes based on the historical databases. Then a subset of the keywords are chosen through analyzing their effects on the classification of the normal and abnormal cases. validated keywords then enter and improve the structured data to support clinical decision making. The NLP pipelines have been developed to help clinical decision making on alerting treatment arrangements, monitoring adverse effects and so on.

V. CONCLUSION

AI is changing healthcare. It changes the role of the doctors and the role of the patient. It will change the medical world – in diagnosis, in treatment, in disease detection, in treatment disciplines and more. In the year ahead, and especially in the following five to ten years, man-made brainpower will bigly affect the medicinal services industry and the manners by which human services related organizations use AI.

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