ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

Survey on Artificial Intelligence in Healthcare

Sushmitha Suresh [1]

M.Tech Student, Department of Computer Science and Engineering, Vidyavardhaka College of Engineering, Mysuru, Karnataka, India [1]

ABSTRACT: Artificial intelligence (AI) goal is to mimic human cognitive functions. The current status of AI applications in healthcare is observed and its future is discussed. AI can be applied to various types of healthcare data such as structured data and unstructured data. Machine learning methods, modern deep learning, as well as natural language processing are popular AI techniques. Machine learning methods are used for structured data. It includes the classical support vector machine and neural network. Modern deep learning, as well as natural language processing is used for unstructured data. Cancer, neurology and cardiology are major disease areas that use AI tools. In more details the AI applications in stroke is reviewed.

KEYWORDS: Machine learning, deep learning**,** and neural network.

I. INTRODUCTION

AI techniques have sent huge waves across healthcare. Artificial Intelligence or Machine learning in current times serves as the primary choice for data mining and big data analysis. There is an active discussion of whether AI doctors will eventually replace human physicians in the future. It is believed that human physicians will not be replaced by machines in the future, but AI can definitely assist physicians to make better clinical decisions. Due to the increasing availability of healthcare data and rapid development of big data analytic methods has made possible the recent successful applications of AI in healthcare AI techniques can unlock clinically relevant information hidden in the massive amount of data and also it can assist in clinical decision making.

In this article, the current status of AI in healthcare is examined as well as its future is discussed. First the four relevant aspects from medical investigators' perspectives are reviewed:

A. *Motivations*

AI can use sophisticated algorithms to 'learn' features from a large volume of healthcare data, and then it uses the obtained insights to assist clinical practice. It can also be used with learning and self-correcting abilities to improve its accuracy based on feedback. Diagnostic and therapeutic errors that are inevitable in the human clinical practice can be reduced with the help of AI system.

B. *Healthcare Data*

Before deploying AI systems in healthcare applications, they need to be 'trained' through data that are generated from clinical activities. The activities are screening, diagnosis, treatment and so on. Physical examination notes and clinical laboratory results are the other two major data sources. Image, genetic and electrophysiological (EP) data are distinguished because they contain large portions of unstructured narrative texts, such as clinical notes. AI applications focus on first converting the unstructured text to machine-understandable electronic medical record (EMR).

C. *AI devices*

AI devices mainly fall into two major categories. The first category includes machine learning (ML) techniques. It analyses the structured data such as imaging, genetic and EP data. The ML procedures attempt to cluster patients' traits, or infer the probability of the disease outcomes. The second category includes natural language processing (NLP) method. It extracts information from unstructured data.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

D. *Disease focus*

In spite of increasingly rich AI literature in healthcare, the research mainly concentrates around a few disease types: cancer, nervous system disease and cardiovascular disease

II. RELATED WORK

In [1] with effective learning and adaptation model, it provides solutions to several engineering applications. These include techniques such as Artificial Neural Network modelling, Reasoning based decision algorithms, Simulation models, DNA computing and Quantum computing among several others. With computers becoming the necessity of modern era, it becomes imperative for machine to adapt to the recent trend in the consumer industry. There has been a steady growth in demand for machines that are intelligent and can autonomously react to situations and clearly explain the reasons or the logic behind it. Therefore in layman terms, Artificial Intelligence (AI) can naturally be explained as an action a machine performs which otherwise would have been done by a human using his intelligence Machine Learning is the form of AI that enables machine to learn without being specifically programmed for each instance .

In [8] the fundamental aim in this context is to make decisions. At the root level, more than one neuron (the fundamental unit of a learning system) group together to form a network also called as a neural network is responsible for the Learning process. Clinical decision support systems (CDSS) were one of the first successful applications of AI, focusing primarily on the diagnosis of a patient's condition given his symptoms and demographic information.AI has also been useful for computer-aided detection of conspicuous structures (such as tumors or polyps) in medical images. Such approaches assist in the screening of mammography images, as well as the diagnosis of various forms of cancer, coronary artery disease, and congenital heart defects. More recent advances in machine learning and AI build predictive models and make real-time inferences from a large patient population for purposes including alerts, stratifying risk, and predicting the length of stay.

In [9] we get into some of the current uses of Artificial Intelligence now that you know its history. The ideas of AI from science fiction stories of long ago are pretty much a reality today. Who would have ever thought the story line from the Terminator trilogy would ever become a reality? We bring this up only because the military has incorporated the use of AI for several uses, of which I will explain later. Everywhere we look and go we run into some kind of device using artificial intelligence. AI is being used to help people in any field and walk of life work smarter and faster instead of harder. It is appearing in business with various decision support systems and knowledge bases, in bionics with various prosthetics which learn how its user moves, in warfare, in anti-terrorism efforts, in journalism, in anti-crime efforts, and even in video games. Artificial intelligence has been a very complex field and will remain so.

III. SYSTEM DESIGN

A. *Existing system*

Human beings can only emulate nature using technology and not replicate it in its exact likeness Human beings are prone to copy nature and all its grandeur. The method of choice is technology. Nature's creations are vastly superior to the technological advances made by humans. The ability of a living organism to process semi structured data without any formal input gathering and training is astonishing.

We would like to get into some of the current uses of Artificial Intelligence now that you know its history. The ideas of AI from science fiction stories of long ago are pretty much a reality today. Who would have ever thought the story line from the Terminator trilogy would ever become a reality? We bring this up only because the military has incorporated the use of AI for several uses, of which I will explain later. Everywhere we look and go we run into some kind of device using artificial intelligence. AI is being used to help people in any field and walk of life work smarter and faster instead of harder. It is appearing in business with various decision support systems and knowledge bases, in bionics with various prosthetics which learn how its user moves, in warfare, in anti-terrorism efforts, in journalism, in anti-crime efforts, and even in video games. Artificial intelligence has been a very complex field and will remain so.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

B. *Proposed system*

While acknowledging the past successes of the healthcare industry, this year's healthcare information and management system society(HIMSS) event still emphasized the need to embrace innovation across the industry, focusing specifically on what is needed to help catapult healthcare into a higher level of care delivery while keeping escalating care costs down. With the technology adoption challenges brought on by meaningful use now overcome, the industry is well on its way to being more comfortable with the day-to-day use of healthcare IT. However, the argument can be made that we still need to focus on improving end-user satisfaction with the current healthcare IT capabilities before we shift our focus to the next era of IT innovation.

IV. IMPLEMENTATION

In this section, we review the AI devices (or techniques). We categorise them into three groups: the classical machine learning techniques, the more recent deep learning techniques and the NLP methods.

A. *Classical ML*

ML constructs data analytical algorithms to extract features from data. Patient 'traits' and sometimes medical outcomes of interest are given as input to ML algorithms. Age, gender, disease history and so on are some of the common baseline data of a patient's traits. Besides the traits, patients' medical outcomes are often collected in clinical research. It includes disease indicators, patient's survival times and quantitative disease levels.ML algorithms can be divided into two major categories: unsupervised learning and supervised learning. Unsupervised learning used for feature extraction, while supervised learning is suitable for predictive modelling.

B. *Deep learning: a new era of ML*

Modern extension of the classical neural network technique is known as deep learning. Deep learning can be viewed as a neural network with many layers. Deep learning can explore more complex non-linear patterns in the data. due to the increase of the volume and complexity of data popularity of deep learning is also increasing. Deep learning uses more hidden layers so that the algorithms can handle complex data with various structures. The commonly used deep learning algorithms in the medical applications are convolution neural network (CNN), recurrent neural network, deep belief network and deep neural network. CNN is the most popular one in 2016.The CNN was first proposed and advocated for the high-dimensional image analysis. The properly normalised pixel values on the images are inputs for CNN. The CNN then transfers the pixel values in the image through weighting in the convolution layers and sampling in the sub sampling layers alternatively.

C. *Natural language processing*

NLP targets at extracting useful information from the narrative text to assist clinical decision making. An NLP consist two main components: (1) text processing and (2) classification. With the help of text processing NLP identifies a series of disease-relevant keywords in the clinical notes based on the historical databases. A subset of the keywords is selected through examining their effects on the classification of the normal and abnormal cases. To assist clinical decision making on alerting treatment arrangements, monitoring adverse effects and so on the NLP pipelines have been developed. NLP was used to automatically monitor the laboratory-based adverse effects. The NLP pipelines can be used in disease diagnosis. NLP can be used to extract the peripheral arterial disease-related keywords from narrative clinical notes.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

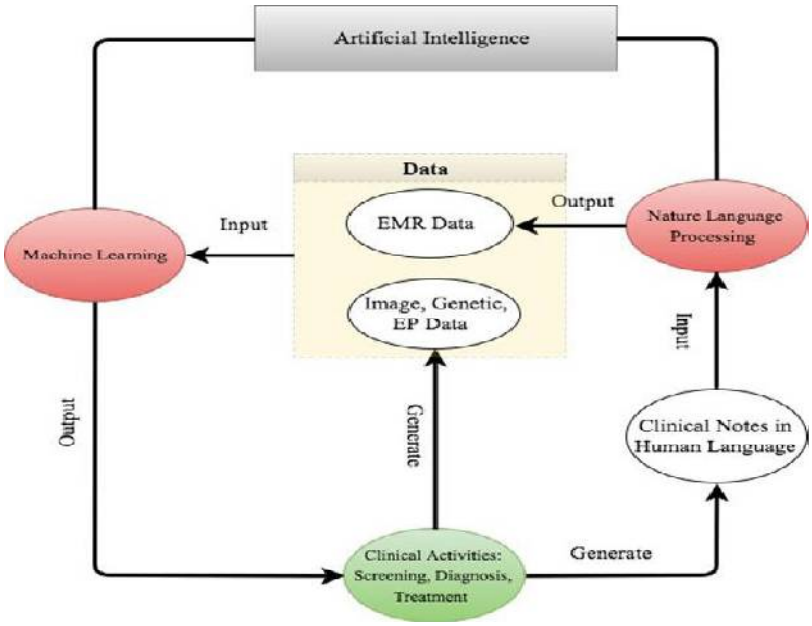

Fig: 1 the road map from clinical data generation to natural language processing Data enrichment, to machine learning data analysis, to clinical decision making

V. AI APPLICATIONS IN STROKE

Stroke is a common and frequently occurring disease. It affects more than 500 million people worldwide. It is the major cause of death in China and the fifth in North America. Due to this, research on prevention and treatment for stroke has great significance. AI techniques have been used in more stroke-related studies. Some of the relevant AI techniques in the three main areas of stroke Care are summarised early disease prediction and diagnosis, treatment, as well as outcome prediction and prognosis evaluation.

A. *Early detection and diagnosis*

A movement-detecting device for early stroke prediction was developed. Two ML algorithms — genetic fuzzy finite state machine and PCA — were implemented into the device for the model building solution. A human activity recognition stage and a stroke-onset detection stage was included in the detection process. For diagnosis of stroke, neuro imaging techniques, including MRI and CT, are important for disease evaluation.

B. *Treatment*

ML has also been used for predicting and analysing the performance of stroke treatment. SVM was used to predict whether patients with tPA treatment would develop symptomatic intracranial haemorrhage by CT scan. To improve the clinical decision-making process of tPA treatment, a stroke treatment model was proposed. by analysing practice guidelines, meta-analyses and clinical trials using Bayesian belief network. The model consisted of 56 different variables and three decisions for analysing the procedure of diagnosis, treatment and outcome prediction.

C. *Outcome prediction and prognosis evaluation*

Many factors affect stroke prognosis and disease mortality. ML methods have advantages in improving prediction performance. To better support clinical decision-making process a model was proposed for predicting 3-month treatment outcome by analysing physiological parameters during 48 hours after stroke using logistic regression. ML techniques was also used to identify factors influencing outcome in brain arteriovenous malformation treated with endovascular embolisation Brain images have been analysed to predict the of stroke treatment.

ISSN(Online): 2320-9801
ISSN (Print) : 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijircce.com

Vol. 6, Issue 3, March 2018

VI. CONCLUSION

The motivation of using AI in healthcare was reviewed. Presented the various healthcare data that AI has analyzed and surveyed the major disease types that AI has been deployed. The two major categories of AI devices: ML and NLP were discussed. We discussed the modern deep learning technique. We then surveyed the three major categories of AI applications in stroke care. A successful AI system must possess the ML component for handling structured data (images, EP data, genetic data) and the NLP component for mining unstructured texts. The algorithms then need to be trained through healthcare data before the system can assist physicians with disease diagnosis and treatment suggestions.

VII. FUTURE WORK

In future, this may translate into creation of promotional policies to accelerate investment in AI by rewarding the hospitals and the physicians who incorporates it into their workflow. Initial monetary investments can eventually be paid by the numerous advantages of AI. Despite of certain limitations, the advantages of these systems are numerous. With the aid of advanced AI and AmI, acute neurological emergencies may be timely managed, chronic neurological diseases may be recognized early, treatments may be individualized and the quality of life with neurological disability may be improved.

REFERENCES

1. Darcy AM, Louie AK, Roberts LW. Machine Learning and the Profession of Medicine, vol.315, no.6, pp.315:551, JAMA 2016.

2. D.B. Neill, “Fast Subset Scan for Spatial Pattern Detection,” J. Royal Statistical Soc. (Series B: Statistical Methodology), vol. 74, no. 2, , pp. 337–360,2012

3. S. Saria et al., “Integration of Early Physiological Responses Predicts Later Illness Severity in Preterm Infants,” Science Translational Medicine, vol. 2, no. 48, pp. 48–65, 2010.

4. Y. LeCun, Y. Bengio, and G. Hinton, “Deep learning,” *Nature*, vol. 521, no. 7553, pp. 436–444, 2015.

5. G. E. Hinton, S. Osindero, and Y.-W. Teh, “A fast learning algorithm for deep belief nets,” *Neural Comput.*, vol. 18, no. 7, pp. 1527–1554, 2006.

6. S.R. Levin et al., “Real-Time Forecasting of Pediatric Intensive Care Unit Length of Stay Using Computerized Provider Orders,” *Critical Care Medicine*, vol. 40, no. 11, pp. 3058–3064, 2012.

7. D. Lenat et al., “Cyc to Answer Clinical Researchers’ Ad Hoc Queries,” *AI Magazine*, vol. 31, no. 3, pp. 13–32, 2010.

8. Dilsizian SE, Siegel EL. Artificial intelligence in medicine and cardiac imaging: harnessing big data and advanced computing to provide personalized medical diagnosis and treatment, pp.16-441, *Curr Cardiol Rep* 2014.

9. Mannini A, Trojaniello D, Cereatti A, *et al.* A machine Learning Framework for Gait classification using inertial sensors: application to Elderly, Post-Stroke and Huntington's Disease Patients, vol.16, pp.134, *Sensors* 2016.

10. H. R. Roth *et al.*, “Improving computer-aided detection using convolutional neural networks and random view aggregation,” *IEEE Trans.Med. Imag.*, vol. 35, no. 5, pp. 1170–1181, May 2016.

11. Y. Zhang and P. Szolovits, “Patient- Specific Learning in Real Time for Adaptive Monitoring in Critical Care,” *J. Biomedical Informatics*, vol.41, no. 3, pp. 452–460, 2008.

12. S. Zhang *et al.*, “A deep learning framework for modeling structural features of rna-binding protein targets,” *Nucleic Acids Res.*, vol. 44, no. 4, pp. e32–e32, 2016.