

ARTIFICIAL INTELLIGENCE IN HEALTHCARE: EMERGENCE OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE INDUSTRY

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ABSTRACT

AI is increasingly accepted by industries and societies; the healthcare industry is of no exception. AI in Healthcare uses algorithms and software to aid or surpass the abilities of clinicians in the analysis and recognition of abnormalities. This paper will assess the level of implementation of AI in healthcare, evaluate its benefits as well as analyze the need for increasing or decreasing its use. A questionnaire was used to conduct the survey and clinicians were the survey population. The results of the study showed the desperate need to increase the use of AI in Mauritius and healthcare industry at large.

Keywords: *Artificial Intelligence, Healthcare, Diagnosis, patient management, prognosis, Treatment.*

Problem Definition and Gap Identification:

About 1.5 Million people die from cancer every year worldwide and 3 people break a bone every second due to osteoporosis globally. These and many other medical conditions can be prevented if detected early and this can be done with the use of CT scans, x-rays and MRIs (World Health Organization, 2011). The demand thereof for medical imaging services and specialized medical experts is continuously increasing, outpacing the supply of qualified radiologists and stretching them to produce more output, without compromising patient care. Only by adopting new technologies that significantly enhance the capabilities of radiologists and clinicians, can this crisis be reduced. Because of this, image interpretation and surgical use of AI are going to be the focus of this paper.

Research Questions and Objectives

This paper addresses the questions of:

1. Does the use of AI in healthcare aid in patient care and management procedures?
2. Should the use of AI be increased or decreased in healthcare systems?

and meets the objectives:

1. To assess the level of implementation of AI in healthcare in Mauritius
2. To evaluate the benefits of AI in healthcare (Radiological & Surgical procedures)
3. To analyze the need for increasing or decreasing the use of AI in healthcare

INTRODUCTION

Artificial intelligence is the teaching of machines to work and act like humans. It is basically about educating machines to perform tasks that are related to the human mind. It encompasses machine learning, robotics and automation of procedures (Hashimoto et al, 2018; MacEwen, 2019; Daley, 2019, Yu et al, 2018). Healthcare services are one of the fastest growing industries in the world and its one of the industries that uses a lot of AI to carry out its daily and specialized procedures. "AI has countless applications in healthcare. Whether it's being used to discover links between genetic codes, to power surgical robots or even to maximize hospital efficiency, AI has been a boon to the healthcare industry", (Daley, 2019).

In healthcare, artificial Intelligence is carried out by teaching computers to provide faster and accurate reading and analysis of diseases using knowledge of thousands of years of experience from millions of medical specialists (Davepoint and Kalakota, 2019). AI in healthcare refers to a collection of different technologies, not just one. Technology companies such as the International Business Machines (IBM) and Google have been of great use in developing AI algorithms for healthcare. These algorithms have already proved to be outperforming Radiologists

and other specialists at recognizing malignant tumors and thin line bone fractures. AI interprets radiology images and helps clinicians by detecting very small changes in images that would have been easily missed. It is also used by specialists to perform heart therapy procedures and treat cancer, to mention a few (Ilic and Markovic, 2016). Millions of previously encountered diseases or cases are transferred into the machines (machine learning process), teaching them to create unique algorithms that can uniquely identify the appearance of multiple diseases. Next time when shown a new scan the machine immediately recognizes the disease appearance and alerts of diseases (Jiang et al: 2017, Chong et al, 2018).

Uses of AI in Healthcare

There are currently more than 30 uses of AI in healthcare and there is still innovations and new developments on how much more can be done with it (Daley, 2019). Some of the uses of AI in healthcare include:

Using AI to reduce error and efficiently diagnose diseases. An example is that of the Zebra Medical Vision Company that produced an AI-Powered Radiology Assistant. This system analysis radiology images and reports its findings to radiologists. The other use is to develop new medicines like the Bioexcel Therapeutics Company uses AI to develop new medicines in neuroscience and immune-oncology fields. AI is also used to streamline patientcare experience; companies like Olive have created a platform that automates healthcare's most repetitive tasks. AI is used to mine and manage medical data; Tempus in Chicago uses a massive data library for personalized health, it scans through the world's largest collection of molecular and clinical data in order to personalize healthcare treatments (Daley, 2019; Ilic and Markovic, 2016).

Another use of AI is in robot assisted surgery. Examples are of a company called accuracy which developed a precision robotic treatment for cancer. The robot is called a cyber Knife System. This system uses robots that are in a shape of an arm to treat cancerous tumours all over the body. The robot tracks the tumour in real-time using a 6D motion and sensing technology. With these capabilities doctors and surgeons are able to treat only affected areas rather than the whole body. This robot aggressively tracks and attacks cancerous tumours while saving healthy tissue. The other example is that of a robot facilitated heart therapy; this is a very small mobile robot that is designed to facilitate therapy on the heart. Under a physician's control, the small robot enters the chest through a tiny cut or opening of the skin, makes its way to certain locations of the heart, when it reaches the surface of the heart it administers therapy (Daley, 2019).

Limitations of AI in Healthcare

It is without doubt that the use of AI in healthcare has brought great benefits with it; it has increased the accuracy of diagnosis and treatment of diseases, and due to this hospitals and other healthcare facilities are saving costs (Ilic and Markovic, 2016). It however comes without a shock that AI in healthcare has its limitations too. One of AI machines' limitations is that it's accuracy in identifying diseases is highly dependent on the amount of data previously uploaded in its systems regarding a particular disease. In cases where the data of a particular case is insufficient or incorrect then the AI machine will provide an incorrect or a not thoroughly analyzed diagnosis and treatment plan, which will have negative consequences on the patients (Hashimoto et al, 2018). On the other hand "A publically available National Institutes of Health (NIH) dataset of chest x-rays and reports has been utilized to generate AI capable of generating diagnoses of chest x-rays. Natural Learning Process was used to mine radiology reports to generate labels for chest x-rays and these labels were used to train a deep learning network to recognize pathology on images with particularly good accuracy in identifying a pneumothorax. However, an in-depth analysis of the data set by Oakden-Rayner revealed that some of the results may have been from improperly labeled data. Most of the x-rays labeled as pneumothorax also had a chest tube present, raising concern that the network was identifying chest tubes rather than pneumothoraces as intended", (Hashimoto et al, 2018).

RESEARCH METHODOLOGY

Primary data collection was carried out for this study. Close ended questions were used for the survey; a questionnaire containing 17 questions was given out to medical doctors and specialists for filling. The sample population was of clinicians in Mauritius and the sample group was the clinicians from the biggest private hospital in the Island. Simple random sampling technique was used and every clinician stood a chance of getting selected to partake in the survey. Secondary data was also collected by reviewing of AI papers in healthcare online using published journals from science direct and other scholarly sites.

Pilot testing or an experiment study of a small scale was conducted before the actual survey in order to evaluate the feasibility, costs, duration, adverse events, and improve upon the study design prior to performance of a full-scale research project. Hypothesis Testing was carried out too. The two hypothesis of the study were: the emergence of AI in healthcare will create more benefits in the patient care procedures, the other hypothesis were; the non implementation of AI in healthcare will impact with a significant decrease in the healthcare services.

Data Analysis

An investment on advance machines assists to diagnose, treat and provide prognostic information
17 responses

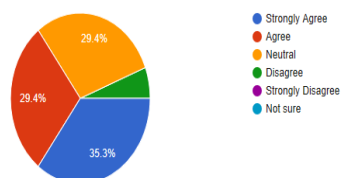


Figure 1

The level of use of AI in my department is satisfactory
17 responses

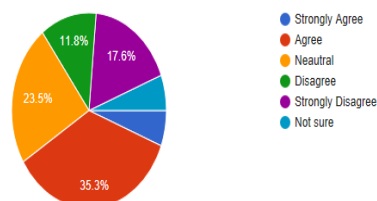


figure 2

AI in healthcare should be increased
17 responses

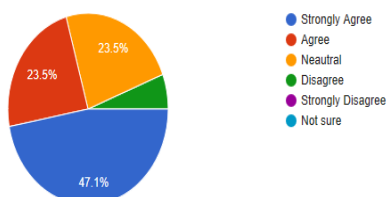


Figure 3

Healthcare services that you are willing to have AI assist you in?
17 responses

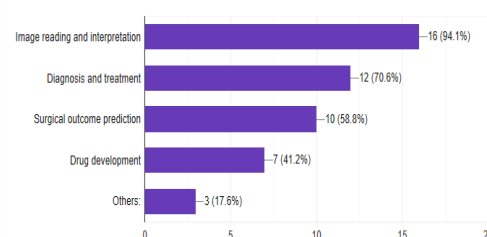


figure 4

There were 17 respondents to the survey. 52.9% of the respondents were male and 47.1% were female. Out of all the respondents 47.1% was from the Radiology department and the other 47.1% was from the others category (which included specialists from oncology, urology, pediatrics, internal medicine and all other fields not mentioned in the survey lists) and 5.9% was from the surgical department. The years of practice of the sample group used was almost evenly distributed along the spectrum of categories offered by the questionnaire; 29.4% had 0 to 5 years of experience, 19.6% had 5 to 10 years, 23.5% had 10 to 15 years and 29.4% had more than 15 years of experience. When asked if they understand AI in Healthcare industry, what it is and what it does, more

than 50% of respondents strongly agreed and agreed that they know what it is. 5.9% disagreed to knowing what it is. As shown in figure 1 above, out of the 17 respondents a sum of 64.7% agreed and strongly agreed that an investment in AI machines aids in the diagnosis, treatment, and prognosis of patients while 5.9% disagreed. This directly answers the research question “does the use of AI in healthcare aid in patient care and management procedures?” According to the results of figure 1 the answer is yes.

Figure 2 above shows responses that answer objective: to assess the level of implementation of AI in healthcare in Mauritius. 11.8% of respondents disagreed with this statement, which means they find the level of use of AI in their departments below average if not present at all. 35.6% acknowledged being satisfied with its level of use and 5.9% strongly agreed with the statement. More than half of the respondents were not satisfied with the level of uses of AI in their departments.

In figure 3, 47.1 % of the participants strongly agreed that AI in healthcare should be increased. 23.5% agreed to it being increased too. Only 5.9% of the participants thought it shouldn't be increased. This question directly answers the research question “should the use of AI be increased or decreased in healthcare systems?”

Figure 4 shows a summary of the medical fields that the respondents were willing to be assisted by AI in. 94.1% of the respondents indicated that they are willing to have AI assist them with Image reading and interpretation (radiology services), 70.6% said they are willing to be assisted with the Diagnosis and treatment of diseases, 58.8% selected surgical outcome predictions, 41.2% said drug development and 17.6% chose the others category which included anything else not mentioned in the list, such as procedure automation, daily patient care services etc.

Findings

94.1% of the respondents showed interest in having AI aid in image reading and interpretation. This shows how relatively scares radiologist are in comparison to the need of their services, it confirms the Gab identified in the medical field. Even in the presence of specialists, it is sometimes challenging for them to make diagnostic decisions based on what they see and the patient presents before them. In medical imaging, radiologists can miss minute pathologies and fractures, but with AI the machines can accurately detect abnormalities by using their pattern recognition algorithms and software thus reducing human error. In the results there were respondents who didn't know what AI is and even were unaware of its use in the healthcare industry, this should be rectified by encouraging them to read more about it or teaching them of its uses in the industry that work in.

With the use of AI in healthcare, Hospitals (clinicians and specialists) delivers more accurate analysis and treatment of diseases and so the society at large is improved health wise. Should the use of AI be increased in healthcare, hospitals and businesses will save costs because of the increased accuracy of diagnosis and treatment, there will be improve patient care and increased customer satisfaction (Dillion and Thatcher, 2019).

CONCLUSION

AI has proved to be of great benefit in healthcare, it has increased image interpretation and analysis, boosted surgical procedure outcomes and it is efficient in its operations. However, when the systems do not have sufficient information about a condition it will still make its diagnosis and suggest treatment without considering any potential unintended consequences. These poses as danger to the health of those patients it diagnoses and treats without sufficient information of their cases. On the other hand surgeons and radiologists are well-positioned to help integrate AI into their practices. They are ready to receive the assistance of these intelligent machines and in some way have them reduce their intensely busy workload. The industry is hungry and ready for this kind of relieve.

Based on the results of the survey, it is clear that the use of AI should be increased in the healthcare industry and facilities should strive to purchase these machines. Clinicians should be encouraged to familiarize themselves with the knowledge of the use of these advanced machines so that they become aware of the resources that could be at their disposal should need arise for them to advice management on which ones to be purchased and invested in.

Another survey should be conducted; one that will includes more hospitals and a wider spectrum and number of medical specialists. The researcher intends to continue with this study as her dissertation topic for the Masters

program she is currently in pursuit of, and find out more about how AI is currently being used, how it can be used in the future in healthcare and which of its limitations should be worked on and improved.

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