The Case for Artificial Intelligence in Healthcare

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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The Case for AI in Healthcare

Why medical professionals should be educating themselves on AI in healthcare

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ABSTRACT

Artificial Intelligence (AI), is one of the fastest growing technology fields with one estimate putting its annual growth at 40% [1]. It has made its way into almost every major industry, and recently has been making headway into improving healthcare. However, before AI can reach its potential in medical care physicians must better understand the technology and how it works. There is a need for a curriculum on AI in healthcare specifically aimed at medical professionals. It would focus on how to interpret results, information on data bias and other training set risks, and limitations of the technology. There is evidence of this gap in understanding in the amount of misinformation that surrounds AI. Many doctors believe that if the technology advances far enough it could replace them entirely, while its primary goal is to assist them so they can care for more patients.

The current literature on educating medical professionals on AI focuses on supplementing current medical school instruction with classes and practice with AI throughout all the stages of education. While these courses are important and will help with the future of the industry, there is also a need for current medical professionals to educate themselves on the technology because they need to be active participants in the development of this technology.

Creating a course like described above is beyond the scope of this project, and instead an informational website developed to address these needs.

INTODUCTION

Artificial intelligence has growing potential in healthcare applications. Accenture estimates that clinical health AI applications can potentially create $150 billion in annual savings for the US healthcare economy by 2026 [2]. These potential savings come from many areas of the healthcare system including robot assisted surgery, virtual nursing assistants, and administrative workflow assistants. However, for this impact to be realized the medical community first needs to embrace AI and assist in its development.

One of the problems is that most active medical professionals have little to no training on the subject because of the young age of the technology. Current medical students will have the opportunity to take classes on the subject, but even for them there are no requirements on it for licensing. According to the list of tested subjects, the 2020 United States Medical Licensing Exam does not test students on AI, mobile healthcare applications, or telemedicine [3]. However, there are a number of initiatives being developed to include classes on technology in healthcare, some of which will be discussed in the next section.

RELATED WORK

The idea of teaching medical professionals about AI in healthcare is not new. A study done on the current state of medical education in healthcare discussed some of them main reasons for increased education citing practical issues like encountering AI-generated results as well as ethical concerns like potentially better patient care [4]. These ideas and others are discussed in more detail later in this report.

There are an increasing number of courses being offered in medical schools on the subject as mentioned in the previous section, ranging from the technical aspects to an overall study of the applications. A list of these course can be seen in Figure 1, along with the intuitions offering them. As you can see, the courses are still limited to scattered subject matter instead of a comprehensive curriculum, and only a select number of schools are offering any instruction at all.

Initiatives for AI in medical education

Institution	Project
Duke Institute of Health Innovation	Medical Students work together with data experts to develop care-enhanced technologies made for physicians
University of Florida	Radiology residents work with a technology-based company to develop computer-aided detection for Mammography
Carle Illinois College of Medicine	Offers a course by a scientist, clinical scientist, and engineer to learn about new technologies
Sharon Lund Medical Intelligence and Innovation Institute	Organizes a summer course on all new technologies in healthcare, open to medical students
Standard College for Artificial Intelligence in Medicine and Imaging	Involves graduate and postgraduate students I solving healthcare problems

	with the use of machine learning
University of Virginia Center for Engineering in Medicine	Involves medial students in the engineering labs to create innovative ideas in healthcare

Figure 1: List of current AI courses being offered at medical schools. [4]

There are online learning platforms are offering AI courses, some of which are specifically about its applications in healthcare. Coursera, for example, is a learning platform that specializes in offering college level courses in a flexible online format with curriculums developed by experts in the field and they have a variety of courses on the subject, some of which are discussed later in this paper.

The gap that this project is attempting to fill is getting the information available into the hands of the medical professionals that need it. This includes presenting basic information about the technology and providing evidence of its current and potential impact. It finishes by recommending three courses offered by Coursera and other platforms for further education.

SYSTEM DESIGN

Originally the plan for this project was to design a cursory course myself but because of the scope an informational website was built instead with an overview of some of the most important information on AI in healthcare, as well as recommended resources for further instruction.

The website, which can be found at the link cited below[1], was structured to introduce the topic gradually and convince the reader that further instruction was not only beneficial but essential for the future of healthcare. It was built using a free HTML template that was modified for the sections needed, and the code uploaded to a GitHub repository that can be found at the link cited below[2]. This repository was then connected to Heroku to host the actual website.

First the topic of AI was introduced to a non-engineering audience. This section included topics such as basic data science principles like data reliance and some common applications of AI that the reader may have encountered or heard about.

This was followed by sections on misconceptions and limitations of the technology to make sure the reader had a realistic understanding of the potential of AI. Specifically, concerns about AI technology replacing humans, learning on its own, and its objectivity were addressed. It was also important to communicate its dependence on data as well as the cost of implementing AI systems. This was all an attempt to both make the technology seem more realistic and to make sure the reader saw that it was not dangerous or harmful to their job market.

After this the question had to be asked, why should doctors care? Up to this point all the information presented was about AI in general, and this was the pivot into the context of healthcare. First, evidence was presented from the projection by Accenture cited earlier on the potential savings in healthcare by 2026 [2]. This information was intended to show that AI is and will continue to be a part of the healthcare system, as well as showing the different areas of healthcare that will be affected.

After this initial pivot into the context of healthcare, the following section presented some of the current technologies being used in the industry. Three specific technologies were presented, along with brief explanations into their applications and links to learn more. First was QuantX, a breast-cancer analysis system designed to assist radiologists in processing MRI images. It analyzes images and returns a likelihood score, and has been shown to reduce false negatives by up to 39% [5]. Next was Aidoc, another image-analyzing system that processes CT scans of the head and returns and urgency rating. It has been shown to significantly reduce turnaround time in trauma assessment [6]. Last was Arterys MICA, a similar system to the other two except it processes lung CT scans to identify and track nodules. It has been shown to reduce missed nodules by up to 70% [7]. The technologies chosen were all in the realm of diagnostics, specifically imaging, because this is the field that will probably be affected the most by AI. There are of course other fields like hospital administration and clinical studies that will be affected, but this is more on the logistical level and probably will not impact doctors on a day-to-day level as much.

The next section covered some of the specific reasons that medical professionals should seek education. Some of these were implied from earlier information, but laying them out directly seemed like the better way to communicate. There were three points listed: First, with AI having more and more of an effect on healthcare, new regulations are being developed all the time. Because these will directly affect how doctors do their jobs, they should be active and informed participants in the conversation. Second, doctors have a responsibility to give their patients the highest level of care possible, and in the near future that could very well involve using AI systems. However, to safely and effectively use these systems they need to be educated on the technology behind them. Lastly, whether doctors use the technologies or want to have anything to do with them, they will more than likely come into contact with AI systems in some form and may have to make decisions based on the results of one. Therefore, they need to know both where the information came from and the limitations and constraints of the technology that created it in order to make the right decision. These three points were determined to be the most important reasons and the intent was to drive home the need for educating medical professionals on AI.

The last real section of the website gave recommendations for resources to learn about AI. Three different courses were listed, each with a brief description of the depth it goes into as well as the pricing for the course. The first course, AI in Healthcare Specialization offered by Coursera [8], is more high-level, offering an overview of the problems facing the industry and then diving into how the building blocks of AI are being applied. The second

[1] https://james-perry-capstone2020.herokuapp.com/

[2] https://github.com/jbperry1998/Capstone_Website

course, AI for Medical Specialization offered by DeepLearnig and Coursera [9], goes farther into the details of the technology and includes some real-world applications based on real data. Lastly a course by MIT Management Executive Education [10] called Artificial Intelligence in AI is listed. It also touches on the overall field, but then focuses on the applications of AI in hospital management optimization. This is the only one of the three that is not free, costing $2,800. These three courses were chosen because they cover a variety of topics and all come from highly respected sources.

The website finishes with a contact section for any further questions or information. This was just a simple PHP script that connected the website to an email address and forwarded the messages

CONCLUSIONS

AI's place in healthcare is also still being debated and developed, and doctors have a responsibility to be active and educated members of that conversation. It has and will continue to have a significant impact on their field, and while current medical students have the opportunity to seek instruction on the subject through their institutions, current professionals in the field should also try to educate themselves as best they can. The goal of this project was to communicate this need to them, as well as providing recommended resources though which they can find the information they need.

FUTURE WORK

Future work on this project could take a number of different directions, and 3 of these will be discussed here.

First, there is still potential to create a full course on the subject of education medical professionals on AI. While there are many educational resources available, some of which were cited above, very few of them are designed specifically for medical professionals. Therefore, there is still a gap in the industry that needs to be filled. Taking on a project like this would involve working with current experts in the industry, both on the CS and medical side, as well as some of the producers of AI technology. To do it right would also potentially involve working with a company like Coursera that already has the infrastructure to create online courses, and guiding them in the right direction.

Another way of taking this project farther would be to polish the website and start promoting it. This website was created over about 25 hours including research. Given more time and resources, the format of the website would be improved, as well as the content. The developers could potentially partner with some of the companies offering the courses listed and get more input both from then and medical professionals on what kinds of information should be included. There would also have to be some backend development like buying an actual domain instead of using a third party, as well as setting up the email server and potentially a database for storing information. Promotion would also be a large project: for a website like this to be useful it needs to get views, and that doesn't happen without some sort of advertising. This could come from places like Google Ads or Facebook, but it is essential for the information to get out.

Lastly, this content could be turned into a seminar of sorts for doctors. This would be somewhere in between the scope of the two ideas mentioned above. The basic format would be to turn the information from the website into a presentation and then travel to hospitals or medical conferences to present it. This would most likely be in addition to the polished website mentioned above, as well as connecting with people in the industry to get into hospitals and conferences. Sponsorship would also be useful for this type of project, as travel and development would not be cheap.

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