Health Care Using AI

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ABSTRACT: ***Breast cancer treatment is being transformed by artificial intelligence (AI). Nevertheless, most scientists, engineers, and physicians aren't ready to contribute to the healthcare AI revolution. In this paper, we discuss our experiences teaching a new American student undergraduate course that seeks to train the next generation for cross-cultural design thinking, which we believe is critical for AI to realize its full potential in breast cancer treatment. The main tasks of this course are preparing, performing and translating interviews with healthcare professionals from both Portugal and the USA. Since the course is offered in Portugal as a short-term faculty-led study abroad program, students can explore the effect of culture on healthcare delivery and the design of healthcare technologies. The learning tests demonstrated student growth for breast cancer treatment in many areas important for the development of AI. In respect to understanding breast cancer care, most students had undervalued the effect of cancer and its treatment on the quality of life of women before taking this course and most were unaware of the importance of multidisciplinary care teams. Regarding AI in medical, students became more mindful of data privacy issues and the need to consider the effect of AI on healthcare professionals.***

KEYWORDS: ***Artificial Intelligence, Breast Cancer, Cross-Cultural, Design Thinking, Education, Undergraduate.***

INTRODUCTION

Breast cancer is the most common form of female cancer which affects more than 2 million women worldwide each year. It was projected that 15 per cent of all deaths from cancer will be caused by breast cancer in 2018. While this disease is more prevalent in developed countries, its levels are increasing in nearly every area around the world. Early diagnosis is crucial to improving breast cancer outcomes. While breast cancer screening programs have decreased mortality associated with breast cancer, the detection process is labor intensive because there are many people to be screened, and it is difficult given that most of those people are luckily disease-free. In addition, the increasing number of long-term survivors of breast cancer has highlighted the extensive impact of breast cancer and its treatment on quality of life for women. Given the increasing availability of computer-process able medical data, it is now possible to bring artificial intelligence (AI) to bear on many of the remaining challenges in breast cancer care, and there is an urgent need to prepare for this by the next generation of researchers and practitioners.

AI is dedicated to improving treatment for breast cancer from screening to survival. Medical imaging has a long history of AI-related work for the identification and treatment of breast cancer. Most recently, in response to the excellent success of deep learning in processing images of natural objects, there has been a change in approach towards the use of Convolutional Neural Networks in breast cancer imaging. There is also concern about the potential of AI in the treatment of breast cancer, including breast surgery, surgical oncology, and radiation oncology. In addition, the increasing number of long-term survivors of breast cancer has highlighted the extensive impact of breast cancer and its treatment on quality of life for women. Given the increasing availability of computer-process able medical data, it is now possible to bring artificial intelligence (AI) to bear on many of the remaining challenges in breast cancer care, and there is an urgent need to prepare for this by the next generation of researchers and practitioners.

Nevertheless, AI innovations have not always had the expected effect in medicine. For example, there is significant controversy as to whether the computer-aided breast cancer detection systems that were deployed in clinical practice in the US as of the 1990s have any benefits at all. Moreover, some high-profile collaborative failures have recently occurred which sought to apply AI to oncology in the US. Concerns regarding potential risks to the use of AI in medicine were also shared. Finlayson addressed the risks of adversarial attacks on medical AI, in which inputs are intentionally designed to force the model to make a mistake. Finlayson argue that this form of hazard is just one of several potential failures in AI models because the "confidence" in a system is lost when its behavior can't even be predicted by its developers with absolute certainty.

Past AI failures in medicine and the possibility of potential AI threats in medicine point to the need for more workers at the intersection of the fields of technology and healthcare who are skilled in design thinking. The multinational design and consulting firm IDEO describes design-thinking as' a human-centered approach to creativity that draws on the toolkit of the designer to incorporate people's needs, technology possibilities and

market performance criteria.' We expand on this definition to describe cross-cultural design thinking as design thinking in the sense of products designed to work across cultural boundaries and/or designers who may cross cultural boundaries themselves. Cross-cultural design-thinking is important because health is a fundamental universal right, but significant cultural diversity can occur between countries and within a single country. AI technologies designed for breast cancer treatment in particular need to accommodate cultural diversity and designers need to be able to recognize the elements of the systems that need to be adapted for use in various cultural groups.

In this article, we discuss our experiences teaching a course aimed at training future American researchers and practitioners in cross-cultural design-thinking. Health education in the US continues after the bachelor's degree. The undergraduate years in the US therefore provide an excellent opportunity to offer potential scientists, engineers and clinicians a common collection of cross-cultural design-thinking skills and an understanding of the opportunities and challenges ahead for AI in breast cancer treatment.

LITERATURE REVIEW

Methods focused on artificial intelligence (AI) have emerged as effective instruments for transforming medical treatment. Although machine learning classifiers (MLCs) have already demonstrated good performance in image-based diagnoses, it remains challenging to analyze complex and vast electronic health record (EHR) data. Here we demonstrate that MLCs can question EHRs in a manner similar to the hypothetic-deductive reasoning used by physicians and unearth correlations that had not been identified in previous statistical methods. Our model uses an automated natural language processing method to extract clinically relevant knowledge from EHRs using deep learning techniques[1]. Over 130 million people are in urgent need of humanitarian aid due to natural disasters, disease outbreaks and conflicts among other factors, according to the World Health Organization (WHO). Such health emergencies can undermine the stability of health care systems which are central to achieving the health goals of the United Nations (UN) Sustainable Development Goals (SDGs). It requires fast and responsible decision-making during a humanitarian health crisis. This is also difficult due to scarcity of knowledge, limited resources and stringent time constraints[2]. Artificial Intelligence (AI) healthcare development is increasingly accelerating, with future applications being demonstrated across various medicine fields. Examples of these strategies being successfully deployed into clinical practice are currently limited. This article discusses the main healthcare challenges and drawbacks of AI and examines the measures required to move these potentially revolutionary innovations from science into clinical practice[3]. This review paper provides a framework for evaluating the healthcare sector's readiness for artificial intelligence (AI) in developing countries: a combination of sufficient technical or technological skills, financial sustainability, and socio-political engagement embedded in a healthy psycho-cultural background may contribute to a smooth transition to an AI-powered healthcare sector. Using as a case study the Vietnamese healthcare market, this paper aims to explain the negative and positive influencers. With only about 1500 publications about AI according to the latest Elsevier AI report, Vietnamese physicians are still capable of applying the state-of - the-art AI techniques[4]. Describe how to enhance the eHealth contact systems by using artificial intelligence (AI) to increase immediacy. Methods: They examined significant gaps in eHealth communication systems, demonstrating how services frequently fail to adequately involve audiences and may even have negative impacts by undermining the successful transmission of knowledge intended to direct health decision taking and influence the adoption of health-promoting behaviors. Strategic use of AI in eHealth systems is shown to help improve immediacy by making health communication more engaging, important, exciting and actionable. Conclusion: AI can improve eHealth's "immediacy" by humanizing health promotion activities, fostering physical and emotional closeness, increasing credibility and excitement in health promotion activities, facilitating personal interest in contact experiences, increasing access to relevant communications, reducing healthcare staff demands, enhancing system efficiency and minimizing costs[5]. (AI) have leapt into the public eye over the past year, with many luminaries talking about the AI's challenge to humanity's future. During the past few decades, AI has become ubiquitous in our lives for automatic understanding, learning, and reasoning and decision-making. We schedule trips using GPS systems to optimize the road, based on the A algorithm. Our smartphones understand our voice and Siri, Cortana and Google Now understand our thoughts better. Computer vision recognizes faces when we take pictures with our cameras and remember individual people's faces when we upload those images on Facebook. Internet Search Engines rely on an AI subsystem fabric. AI provides hundreds of millions of people on every day with search results, traffic forecasts, and book and movie recommendations. AI translates into real

time between languages and speeds up the operation of our laptops by guessing what we are going to do next. Many comparers work on cars that can drive themselves— either with limited human control, or with absolute autonomy. AI methods play roles in science and medicine, beyond the forces of our everyday lives[6]. The emergence of computer graphics processing units, enhancement of mathematical models and availability of big data has allowed artificial intelligence (AI) to use machine learning (ML) and deep learning (DL) techniques to achieve robust efficiency for large social media applications, the Internet of Things, the automotive industry and healthcare. In particular, DL systems have enhanced image, voice, and motion recognition capabilities as well as natural language processing. Important developments of AI and DL systems in medicine have been demonstrated in image-centric specialties such as radiology, dermatology, pathology, and ophthalmology. New research, including pre-registered prospective clinical trials, have shown that DL systems are reliable and effective in detecting diabetic retinopathy (DR), glaucoma, age-related macular degeneration (AMD), premature retinopathy, refractive error, and digital fundus images to identify cardiovascular risk factors and diseases[7]. The future of health care will change drastically with entrepreneurs proposing approaches that transform how we use artificial intelligence (AI) to prevent, treat, and cure health conditions. This article offers a timely and important overview of AI-driven health care startups and describes emerging business model archetypes that business people from around the world use to introduce AI solutions to the marketplace. It identifies areas of value creation for the application of AI in health care and proposes an approach to designing business models for AI health care startups[8]. Methods focused on artificial intelligence (AI) have emerged as effective instruments for transforming medical treatment. Although machine learning classifiers (MLCs) have already demonstrated good performance in image-diagnoses, it remains challenging to analyze complex and vast electronic health record (EHR) data. Here we demonstrate that MLCs can question EHRs in a manner similar to the hypothetical-used by physicians and unearth correlations that had not been identified in previous statistical methods. The model uses an automated, natural language processing method to extract clinically relevant knowledge from EHRs using deep learning techniques[9]. Researchers who use artificial intelligence (AI) in life sciences are under pressure to evolve faster than ever. Big, multilevel, and interconnected data sets give promise to unlock new insights and accelerate breakthroughs. Just if there are more data available than ever before, only a fraction is being compiled, processed, interpreted, and analyzed. AI focuses on how computers learn from data, and imitates processes of human thought. AI improves learning ability and integrates decision support system at rates that change the health care future. This article explores machine learning applications in healthcare with an emphasis on clinical, translational, and public health applications with an overview of the critical role of privacy, data sharing, and genetic data[10].

METHOD

Students completed their Global Learning and Intercultural Awareness and Ability self-assessments separately, at the beginning of the course and again at the end of the course. On completion of the self-assessments students were ranked, not their self-assessed level of success. The self-assessments employed rubrics from the American Colleges and Universities Association. Using approved psychometric scales. In addition, students responded to free-response prompts, adapted from the collection of foreign engineering programs proposed by the University of Michigan.

Students engaged in five field trips-two to health care facilities and three to research facilities. They visited the Hospital Breast Unit in Porto, and the Champalimaud Surgical Center Breast Unit in Lisbon. Such systems vary significantly from one another. Hospital is the largest hospital in northern Portugal and the cornerstone to providing health care through the National Health Service. Champalimaud Clinical Center is, on the other hand, a private entity that does not offer coverage through the National Health Service but has arrangements with private insurance firms. Students engaged in different cultural events which were planned. They went on guided tours through Porto, Lisbon, Sintra, the Douro Valley and the National Park. The students had a short yet immersive Portuguese language class, a hands-on introduction to traditional Portuguese cooking and a lively class in traditional Portuguese dances. Additionally, under the guidance of a dedicated program assistant, a Portuguese student enrolled in the Faculdade de Engenharia da Universidad do Porto, there were various opportunities for semi-structured and individual cultural interactions during the 4-week program in Portugal. Students wrote a paper at the end of the course to focus on their experience as a whole in the programs. They chose three photos taken during the program in the first part of the study, and wrote a short caption for each picture describing how it captures an aspect of Portuguese culture. They wrote brief essays on the influence of

culture on healthcare delivery, and the influence of culture on the design of healthcare technologies, especially those based on AI methods, in the second and third sections of the study. They were directed to use the Rolfe model of reflection.

After conducting all of the interviews with healthcare professionals, each student demonstrated their expectations for working on a project relevant to the various disciplines of healthcare. Taking into account these biases the students were allocated to specific classes. For the basis of their project, each group selected one actionable problem statement articulated as a tweet from its assigned healthcare discipline. Every group has suggested a solution to their selected actionable statement of issue. They presented their suggested approach in abstract form, following the design criteria of an abstract proposal by the US National Institutes of Health (NIH). Because the course centered on the design process's' empathize' and' define' modes and the course timeline was compressed, the students were challenged to formulate a solution and write it in abstract form within just a few hours. Students were encouraged to review, as examples, abstracts of supported NIH report projects.

The course offering discussed in this paper included 16 students. Eleven of the students were majors in biomedical engineering and the other five students were majoring in other disciplines related to health, such as psychology or public health. Before taking this course, seven students had completed 2 semesters of instruction at UT Austin; six had completed 4 semesters; and three had completed 6 semesters. Half of the students identified as females and half identified as males.

CONCLUSION

Through this course the students recorded significant growth through global learning and intercultural awareness and skills. They quickly acquired an awareness of Portugal and its inhabitants. They noted, for example, that preserving history in Portugal is a widely-shared interest. Additionally, students who hadn't met each other before quickly became friends and formed successful teams.

Via interviews with Portuguese and American healthcare practitioners as well as field trips to Portuguese hospitals and research facilities, the students became more aware of the trade-offs under various healthcare payer systems, i.e., a private insurance-based national health system vs. one and the implications for the technologies required. Those interactions have influenced many students in advocating improvements in the US healthcare system through active roles.

Previously, most of the students were unaware of the importance of multidisciplinary teams in breast cancer treatment. They also gained more recognition for the effect that breast cancer and its treatment have on the quality of life for women. We also became more concerned about healthcare qualities beyond the efficacy of diagnosis and treatment that affected the patient experience, such as waiting times.

Students improved their understanding of systemic approaches to the design process and became more mindful of limitations such as affordability. Prior to this course, most students had not given much thought to healthcare data privacy or its consequences for the advancement of AI systems. Finally, the students expressed increased awareness of the value of empathy in the professions of science and engineering, especially with regard to considering the effect of potential AI systems on healthcare staff.

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