

Undergraduate Thesis Prospectus

A Curriculum for Artificial Intelligence in Healthcare

(technical research project in Computer Science)

Artificial Intelligence in Healthcare: A Professional Dilemma

(sociotechnical research project)

by

James Perry

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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.

James Perry

Technical advisor: Aaron Bloomfield, Department of Computer Science

STS advisor: Peter Norton, Department of Engineering and Society

General Research Problem

What role should artificial intelligence play in clinical support?

In artificial intelligence (AI), programs draw conclusions from information, emulating human reasoning. Computer scientists train artificially intelligent programs with large datasets upon which systems such as self-driving cars depend. To the technology sector, AI may be a lucrative opportunity; Landi (2020) estimates 40 percent annual market growth. But AI's proper place in healthcare is controversial, and the approval process has been criticized (Keane & Topol, 2018). To some physicians, AI in healthcare is best committed to freeing their time for patient care, and is no replacement for personal care. On other hand, the producers of the technology are described as "bullish on their products and the prospect of getting FDA approval" by the FDA commissioner (Miliard, 2018).

A Curriculum for Artificial Intelligence in Healthcare

How can the information gap between technical developers of AI technology and medical professionals be bridged in the most efficient and beneficial way?

Before AI can improve medical care, physicians must better understand the technology and how it works. This curriculum would instruct medical professionals to a level where they can make informed decisions about the technology to use it in the best way possible. This project will be completed in the Computer Science department, with Professor Bloomfield.

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. Medical schools only offer a small number of optional courses which

focus on future applications (Paranjape et al., 2019). My proposal aims to give current medical professionals a full understanding of AI and current technologies so they can use them effectively and actively participate in the decision process for deciding the role of AI in healthcare.

I will reach out to professionals creating the technology to find out what information they believe is most important for medical professionals to know. This will include how to interpret results, information on data bias and other training set risks, and limitations of the technology. I will combine this with information on current and emerging products, including current practices on vetting and approving new technologies.

Upon completion, this curriculum will include a comprehensive overview of how AI works including its benefits and drawbacks, as well as a survey of current technologies in the industry and their performance. The curriculum will serve as a guide to help medical professionals make informed decisions about the technologies available to them, and encourage active participation in the decision-making process for the future of the technology in healthcare.

Artificial Intelligence in Healthcare: A Professional Dilemma

How are medical professionals, medical tech companies, hospitals, patient advocates, and others competing to draw the line between appropriate and inappropriate use of AI in medicine?

AI has growing potential in healthcare applications. The FDA recently approved the first ever AI-assisted screening process for diabetic retinopathy, a condition that can lead to blindness if not caught early (FDA, 2018); however, medical professionals questioned the limitations of the study used for the approval process, bringing up concerns about data bias, sample size, and consistency (Keane & Topol, 2018).

Participants in this issue include medical professionals, medical technology companies, hospitals, and the patients themselves. Physicians are divided over AI in healthcare. To some, it promises to diminish human fallibility; to others, it's a threat to essential professional discretion (Keane & Topol, 2018). Some doctors also fear getting replaced by AI systems. Dr Pearse Keane says that at AI conferences, he is often asked: "Will AI replace healthcare professionals?" (Topol, Verghese, & Keane, 2020). Others warn that human care is essential; for example, Dr Abraham Verghese contends that "the great promise of AI for us is that it will free up time so we can spend better quality time with the patient" (Topol & Verghese, 2019). Patients have the most at stake. Longoni and Morewedge (2019) found that patients tend to distrust medical AI because it is impersonal and can compromise the patient-doctor relationship (Longoni & Morewedge, 2019). The National Center for Health Research (NCHR), a patient advocate, has cited problems with the FDA approval process stemming from limited understanding of the technology itself (NCHR, 2019).

Medical technology companies promote their systems and seek more routine FDA approval (Miliard, 2018). Amazon, Microsoft and other AI industry leaders have joined with the Consumer Technology Association (CTA) to develop an industry standard (CTA 2020). According to Gary Shapiro, CTA's CEO, it "creates a firm base for the growing use of AI in our health care-technology that will better diagnose diseases, monitor patients' recoveries and help us all live healthier lives" (Anandwala & Cassagnol 2020). Massachusetts General Hospital is an advocate of AI in medicine. To reduce costs and improve surgery, it developed the Surgical Artificial Intelligence and Innovation Laboratory in partnership with MIT (Mass General, 2020).

Logoni, Bonezzi, and Morewedge (2019) found patients trust AI results more when they guide medical professionals' judgments, rather than substitute for them. Esmaeilzadeh (2020)

showed that patients' reservations about the software include include ethical, regulatory, and above all technical doubts (Esmaeilzadeh, 2020). Coombs (2020) found that hospital administrations are most interested in the legal and ethical implications of medical AI systems. Lai, Brian, and Mamzer (2020) found that the tech companies that produce medical AI systems seek the data they need to train their models from hospitals.

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