AI Ethics and Acceptance: Progress Made Towards Strategic Objectives

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Presentation Keywords – Ethics training; ethics consultancy; scoping review

Abstract

Introduction

Given the impact of biomedical AI on healthcare, the resolution of ethical issues and acceptance of AI has emerged as a major issue in trustworthy AI. To this end, the objectives of the ADAPT in SC Ethics and Acceptance team are as follows:

- Train our team in ethical and responsible AI design and development to help minimize bias in AI models.
- Assess stakeholder acceptance and willingness to use AI-enabled devices in diagnosis, treatment, and rehabilitation settings.
- Provide consultation services for researchers on ethical considerations for design, development, and dissemination of AI tools in healthcare.
- Identify barriers to AI acceptance and adoption among stakeholder groups.
- Bring together key stakeholders (researchers, developers, healthcare providers, patient advocates, foundations, trade organizations, and hospitals) in SC for a Biomedical AI Summit bi-annually.

Accomplishments

Objective 1: Train the ADAPT research team in ethical issues in AI design and development
The Ethics and Acceptance team has made significant progress in accomplishing the first objective – to train the broader ADAPT-SC team in ethical AI and development. Starting in early August 2023, the team met biweekly and discussed realistic parameters for training modules that team members across institutions and disciplines would need to complete. The team also identified the topics and subtopics most relevant to the ethical use of AI and put together a list of content areas that the training would ideally cover.
The next step was to search for existing webinars and training modules that covered the essential aspects of ethical AI design and development. We used several criteria during that search, including comprehensiveness and cost of the training. This search identified six potential online training programs that were evaluated for use and dissemination to the entire ADAPT team.

A member of the team enrolled in and completed each of these six training programs and collected information on a series of factors including *sponsoring organization, URL, cost, target audience, number of modules/sections, length to completion, last date updated, end-of-course quiz/assessment, and certificate issued.* The team member also noted whether relevant content areas were adequately covered within each training course. These content areas included: *ethics in design, ethics related to biomedical AI, ethics related to AI in healthcare, data privacy, patient and provider trust, transparency, safety, bias (unconscious, algorithmic), mitigating bias, access, allocation, informed consent, medical liability, medical error, quality of care, ethical human subjects research, and accountability.*

Once this information was collected, the Ethics and Acceptance team collectively evaluated and discussed which of these six training materials would be the best fit for the broader ADAPT in SC team. The team ultimately selected the "Ethics and Governance for Artificial Intelligence for Health" training program, sponsored by the World Health Organization, as the most holistic and appropriate for ADAPT in SC (https://openwho.org/courses/ethics-ai). After this training program was selected by the Ethics and Acceptance team, a submission portal was created on the EPSCoR website for people to submit their completion certificates. Then a notice was sent to every member of ADAPT-SC through the EPSCoR newsletter to inform them about the mandatory training and instructions to complete the training by January 31, 2024.

This notice also included links to the modules and the submission portal. After this deadline passed, there were still over 50% of the team members who had not completed their training and submitted their completion certificates. The team elected to extend the deadline. The new deadline is February 29th. It was decided that all those who join ADAPT in SC in the future will have month to complete the required ethics training.

Objective 2: Assess stakeholder acceptance and willingness to use AI-enabled biomedical devices

This team has also been conducting a scoping literature review to investigate the acceptance and willingness of stakeholders (including clinicians, providers, and patients) to use AI-enabled biomedical devices. The team is using the standard methodology for conducting scoping literature reviews, as outlined by Arksey and O'Malley (2005) and Levac et al. (2010). We have also been in consistent contact with a Clemson librarian and occasionally consulted a MUSC librarian to obtain input on each step of the process.

Using this methodology, a protocol was developed, and the team moved forward with creating a search strategy based on the scope of the study. All team members participated in a small pilot of the protocol and search strategy. That search strategy is being further tested and refined so the team can proceed to the next step, which is performing an initial screening of the articles based on the title/abstract.

Objective 3: Provide consultation services for researchers on ethical considerations for design, development and dissemination of AI tools in healthcare.

A REDCap survey was created to provide the ADAPT in SC team with a way to request ethics consultancy services. ADAPT in SC team members will be able to make their requests through this survey and intake form. This form can be found at: https://redcap.link/1zl8fwax.

Plan of Action

Going forward, the Ethics and Acceptance team will continue to work on completing the strategic objectives, specifically focusing on completing (a) the scoping review to assess stakeholder acceptance and willingness to use AI-enabled devices, (b) providing consultation services for researchers on ethical considerations, and (c) surveying stakeholder groups to identify barriers to acceptance and adoption.

Conclusion

This component of ADAPT in SC will result in a better understanding of the perceived challenges of integrating AI into healthcare; a large cadre of researchers and students will have been trained in a variety of ethics topics relevant to biomedical AI and have a better understanding of ethical challenges and best practices of AI in healthcare. Moreover, healthcare providers, patients, and stakeholder groups will have gained knowledge of best practices and ethical issues related to AI in healthcare. This component should help to minimize bias in AI models, improve transparency and trust in AI models, and address barriers to acceptance and adoption.

Example Applications of AI in Healthcare

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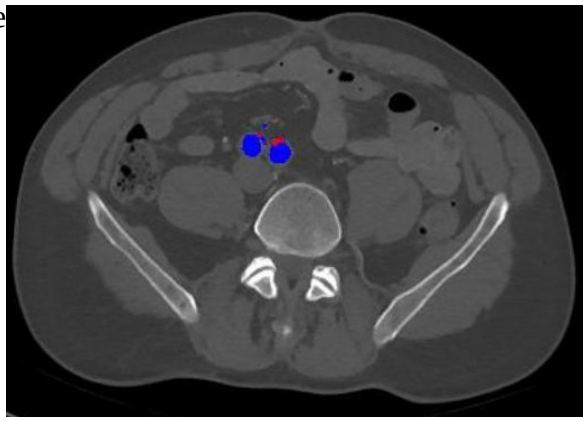
Presentation Keywords: AI, ML, Medical, Healthcare, CT-SCAN

Abstract:

Technology advances at a much faster rate than its adoption in the domain of healthcare. Closing the void created by these different rates requires a faster adoption of new and existing technologies in healthcare. Furthermore, the arrival of the new era of Artificial Intelligence (AI) and Machine Learning (ML), further highlights the disparity in the potential impact of AI versus its incorporation in different domains of health. Our overarching programmatic objective is to incorporate AI in a pragmatic and useful manner in different domains of AI. Future advances in healthcare will not only depend on integration of AI in existing healthcare procedures, but will also require integration of new sensor technologies such as wearable and smart technologies.

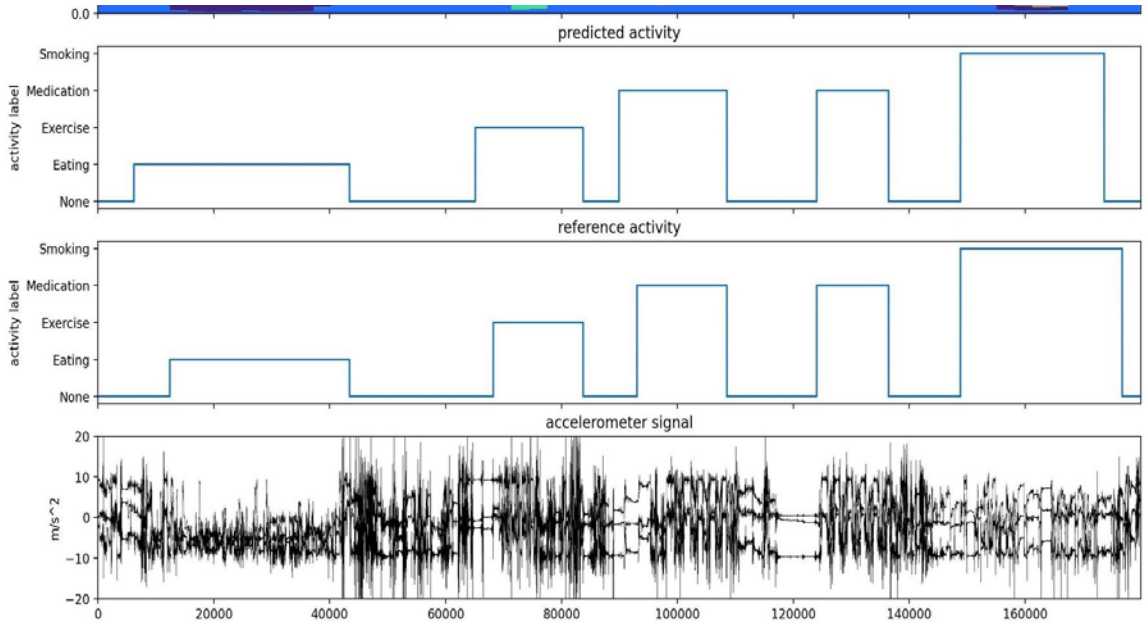
In this presentation, we will highlight some of the applications of AI in various domains of healthcare developed by numerous collaborators at USC. Two particular projects will be presented in more detail. The first topic will present the advances made in the use of AI to identify arterial system in humans using CT-SCANs. The segmentation technology is now capable of identifying the arterial system, including peripheral arterial system with high accuracy, identify the calcification plaques in each arterial cross-section, and provide a summary calcification-score in an autonomous fashion. Figure in the right illustrates one such example. In this image the blue segments denote the identified arteries and the red regions indicate the calcified plaque regions. The current technology is being modified to identify aneurysms to further develop an early identification model of those who will develop endoleaks after stent grafting procedure. This technology has been further modified for a similar application in mice.



The second project consists of the use of smart devices to perform Human Activity Recognition (HAR). Over three decades of research conducted internationally, have concluded that comprehensive models of human health must comprise complex interactions of biological, behavioral, and environmental factors. While there have been substantial technological advances in studying the biological and environmental basis of diseases, technologies for characterizing human behavior in real-world contexts has lagged the biological sciences and only recently has become a focus for attention.

Better understanding of human activities in an unobtrusive and passive ways will be an indispensable tool in better understanding the correlative or causative relationship between social determinants of health and diseases. Engaging in daily activities is crucial for maintaining optimal health for humans as it promotes physical fitness, mental well-being, and overall vitality. Regular activities such as exercise, proper nutrition, and sufficient sleep contribute to a balanced lifestyle, reducing the risk of chronic diseases and enhancing the body's immune system. In this track of research we have demonstrated the ability to detect smoking, eating, drinking, and medication activities with high accuracy using sensor data collected on smartwatches in real-time. Figure below shows one example of human activities with the raw data, self-reported activities, and automatically detected activities in the bottom, middle and top

panes respectively. Our current approach is deployed on edge-devices and passively monitors accelerometer and gyroscope data to identify smoking topology (the number of puffs, inter-puff-distance, and puff duration), the number of bites eaten in one session, the number of medications taken in a day, and detect various forms of fall.



Collectively, we demonstrate the potential of AI and its contributing role to healthcare during the early phases of intervention and the later phases of diagnosis or prognosis. AI in healthcare streamlines processes, enhances diagnostic accuracy, and improves patient outcomes by analyzing vast amounts of medical data with speed and precision. From predictive analytics to personalized treatment plans, AI has the potential to assist healthcare professionals in making informed decisions, leading to more efficient and tailored care. Its integration holds the potential to revolutionize healthcare delivery, offering advancements in early disease detection, resource optimization, and individualized patient care.

Artificial Intelligence-Supported Connected Vehicles Technology for Traffic Incident Detection and Management

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Keywords: secondary crashes; wireless connectivity; connected vehicles; traffic incident detection

Abstract

Traffic crashes are one of the leading causes of death in the United States, claiming the lives of over 42,000 in 2021 alone. A significant portion of these incidents are secondary crashes, which are crashes which would not have occurred if they had not been preceded by an earlier one in the vicinity. Studies have revealed that secondary crashes comprise 20% of all incidents and are responsible for 18% of all fatalities on freeways. Among the rapidly emerging technologies in transportation systems, connected vehicle technology is most prominent, in which vehicles communicate with other vehicles, pedestrians and infrastructure elements via wireless technologies. It has been proven in earlier studies that connected vehicles can accurately determine the state of traffic within reasonable accuracies. This study presents an artificial intelligence-supported connected vehicle application for real-time traffic incident detection. This study also develops a traffic management system to divert incoming traffic away from an incident location so that any risk of secondary crashes is significantly reduced. Our findings indicated the connected vehicle technology developed in this study reduces secondary crashes and subsequent delays on freeways.