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Dr Trishan Panch

Co-Founder@Wellframe

Co-Director@HSPH “Applied AI for Healthcare”

Trishan Panch MD MPH

PCP@NHS

Co-Founder@Wellframe

President-Elect@HSPH Alumni Association

Co-Director@“Applied AI for Healthcare”

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Applied Artificial Intelligence for Health Care

 Online

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 \$2,350

“ This course teaches you all you wanted to know about AI but were science or engineering background who are interested in how to u outcomes.

Online Program Overview

Objectives & Highlights

Credits and Logistics

F

Online Program Overview

Artificial Intelligence (AI) and cognitive computing are projected to empower

It is estimated that if implemented correctly, AI could improve health outcom

There is no denying that AI is the future of health care, however AI technologi organizational issues, they typically do not have a detailed understanding of th of data intimidating. On the other hand, data scientists and technology profess

This program is everything you want to know about AI in health care, but are effectively developing AI. This course will bridge the two parties, opening the

You will learn from the leaders in health care AI, including prominent Harvard explore such topics as AI creation, potential implementation challenges, busin support system you can lean on after the program concludes.

During this program you will learn:

High tech

High *touch*

Context

Digital Health

- Impact
 - Empower patients and clinicians
 - Improve outcomes and experience
- Problem is that
 - Need to understand the world ex-ante
 - Need to be able to describe it in formal logic
 - The world needs not to change
 - (Or the change can be dealt with by humans outside the software)

AI

AI

a “General Purpose Technology”

Pervasive

Can be improved over time

Potential to spawn complementary innovations

The implementation of such technologies tends to result in

Displacement effect where human labour is displaced by machines in areas where machines have differential advantage

Productivity effect as operations become more efficient which allows savings to be invested on existing non-automatable tasks and on the creation of new non-automatable tasks, some of which involve directly working on the automating technology

Electronic supplementary material:
The online version of this article contains supplementary material.

Artificial intelligence, machine learning and health systems

Trishan Panch¹, Peter Szolovits², Rifat Atun^{3,4}

¹ Wellframe Inc., Boston, Massachusetts, USA

² Department of Electrical Engineering and Computer Science, Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

³ Department of Global Health and Population, Harvard TH Chan School of Public Health, Harvard University, Boston, Massachusetts, USA

⁴ Department of Global Health and Social Medicine, Harvard Medical School, Harvard University, Boston, Massachusetts, USA

Globally, health systems face multiple challenges: rising burden of illness, multimorbidity and disability driven by ageing and epidemiological transition, greater demand for health services, higher societal expectations and increasing health expenditures [1]. A further challenge relates to inefficiency, with poor productivity [2]. These health system challenges exist against a background of fiscal conservatism, with misplaced economic austerity policies that are constraining investment in health systems.

Fundamental transformation of health systems is critical to overcome these challenges and to achieve universal health coverage (UHC) by 2030. Machine learning, the most tangible manifestation of artificial intelligence (AI) – and the newest growth area in digital technology – holds the promise of achieving more with less, and could be the catalyst for such a transformation [3]. But the nature and extent of this promise has not been systematically assessed.

To date, the impact of digital technology on health systems has been equivocal [4]. Is AI the ingredient for such a transformation, or will it face the same fate as earlier attempts at introducing digital technology? In this paper, we explore potential applications of AI in health systems and the ways in which AI could transform health systems to achieve UHC by improving efficiency, effectiveness, equity and responsiveness of public health and health care services.

EVOLUTION OF AI AND MACHINE LEARNING

AI is a broad discipline that aims to understand and design systems that display properties of intelligence (**Box 1**) – emblematic of which is the ability to learn: to derive knowledge from data. This is a broad definition that arguably has some cross over with existing statistical techniques [6]. The recent explosion in

Artificial Intelligence and machine learning have the potential to be the catalyst for transformation of health systems to improve efficiency and effectiveness, create headroom for universal health coverage and improve outcomes.

AI

Primary Care

- Superhuman performance
- Reduced cost
- Patients as producers
- n=1
- Vigilant system

However

- Algorithmic failure is an issue **now**
- Not just an issue of malicious *superintelligence*
- CHD prediction
 - Disparities in prevalence and outcomes
 - Framingham
- CKD prediction
 - Disparities in prevalence and outcomes
 - eGFR

Bias

- Algorithmic bias is not *just* a technical issue.
- The data inequities that generate algorithmic bias are the same as those that determine who falls ill, who accesses care, who are represented in data sets used in health systems, how they are treated and who survives.
- If bias exists in society it will both manifest in health systems and be represented in algorithms.
- The presence of algorithmic bias should however not be the end of the discussion on the application of AI in health systems but the beginning of a new one on how algorithms can be developed in a way that minimizes bias and also how health systems eliminate the deeply entrenched inequities algorithmic bias may further reveal.

Artificial intelligence and algorithmic bias: implications for health systems

Trishan Panch^{1,2}, Heather Mattie³, Rifat Atun⁴

¹ Department of Health Policy and Management, Harvard T.H. Chan School of Public Health, Harvard University, Boston, Massachusetts, USA

² Wellframe, Boston, Massachusetts, USA

³ Department of Biostatistics and Executive Director, Health Data Science Masters Program, Harvard T.H. Chan School of Public Health, Harvard University, Boston, Massachusetts, USA

⁴ Department of Global Health and Population, Harvard T.H. Chan School of Public Health, Harvard University, Boston, Massachusetts, USA

Artificial intelligence (AI) is a family of techniques where algorithms uncover or learn associations of predictive power from data. An algorithm is a step-by-step procedure for solving a problem. The most tangible form of AI is machine learning, which includes a family of techniques called deep learning that rely on multiple layers of representation of data and are thus able to represent complex relationships between inputs and outputs. However, learned representations are difficult for humans to interpret [1].

AI is a potentially transformative tool for improving inference from data for care and population health [1]. However, while AI has demonstrated substantial potential in clinical applications [2], few large-scale deployments exist, and there are concerns [1]. First, AI is a misleading term. In practice it is more A than I. It is a defined process applied to 'narrow inference tasks' where large volumes of data are present and processing power is available to find associations. It is not, yet, a "general purpose" replacement for human intelligence or ingenuity. Second, whilst there are encouraging research findings in the use of AI in health care, little of this work has been applied in practice, rigorously evaluated or exposed to peer-reviewed publications, while widely publicised positive findings have been challenged [3]. Third, where AI has been used in the broader economy, concerns have emerged regarding its negative consequences in relation to 'bias': where AI could amplify inequities in society. For example, in the United States more African Americans have been denied loans or granted longer prison sentences compared to their Caucasian counterparts [4]. For many, the concern is not only that "algorithms are for the most part reflecting back the bias in our world" [5], but that they are doing so at potentially massive scale and without due oversight. Collectively, these shortcomings produce 'algorithmic bias', which at present, is not defined in the context of health systems.

Algorithmic bias occurs when the application of an algorithm compounds existing inequities in socioeconomic status, race, ethnic background, religion, gender, disability or sexual orientation to amplify them and adversely impact equity in health systems.

We define, for the first time, algorithmic bias in the context of AI and health systems as: "the instances when the application of an algorithm compounds existing inequities in socioeconomic status, race, ethnic background, religion, gender, disability or sexual orientation to amplify them and adversely impact inequities in health systems."

U

1. Understand the technology
2. Represent your patients
3. High Tech+High Touch

Dr Sharelle Barber

“Is AI going to reinforce the *master's* house or is it going to be a tool to help us bring it down?”