Collaborative for Human Factors

Introduction to AI: ChatGPT & applicable research

Erkin Ötleş
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Hi, I'm Erkin Ötleş!

Medical Scientist Training Program Fellow

- MD: x2024
- Engineering PhD: 2022
- ML Dev & Implementation Lead

Previously:

- Healthcare Data & Decision Science Manager
- Epic Ambulatory Solutions Engineer

COI:

- Patent pending: AI prediction of health outcomes in patients with occupational injuries.
- Small amount of IRA stock in various technology & healthcare companies.
- Provide AI advising for several startups.

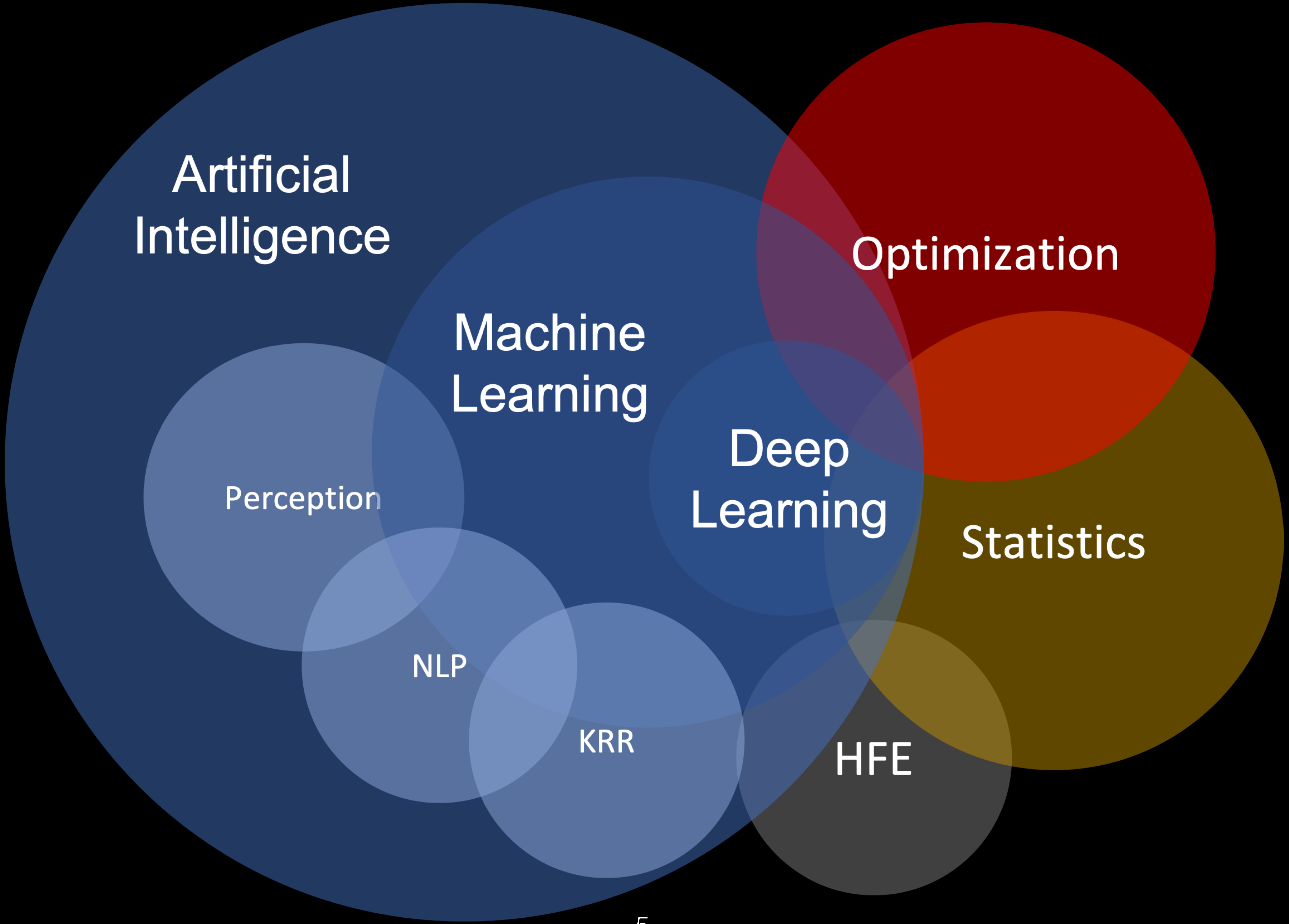
Introduction to AI

First, some definitions

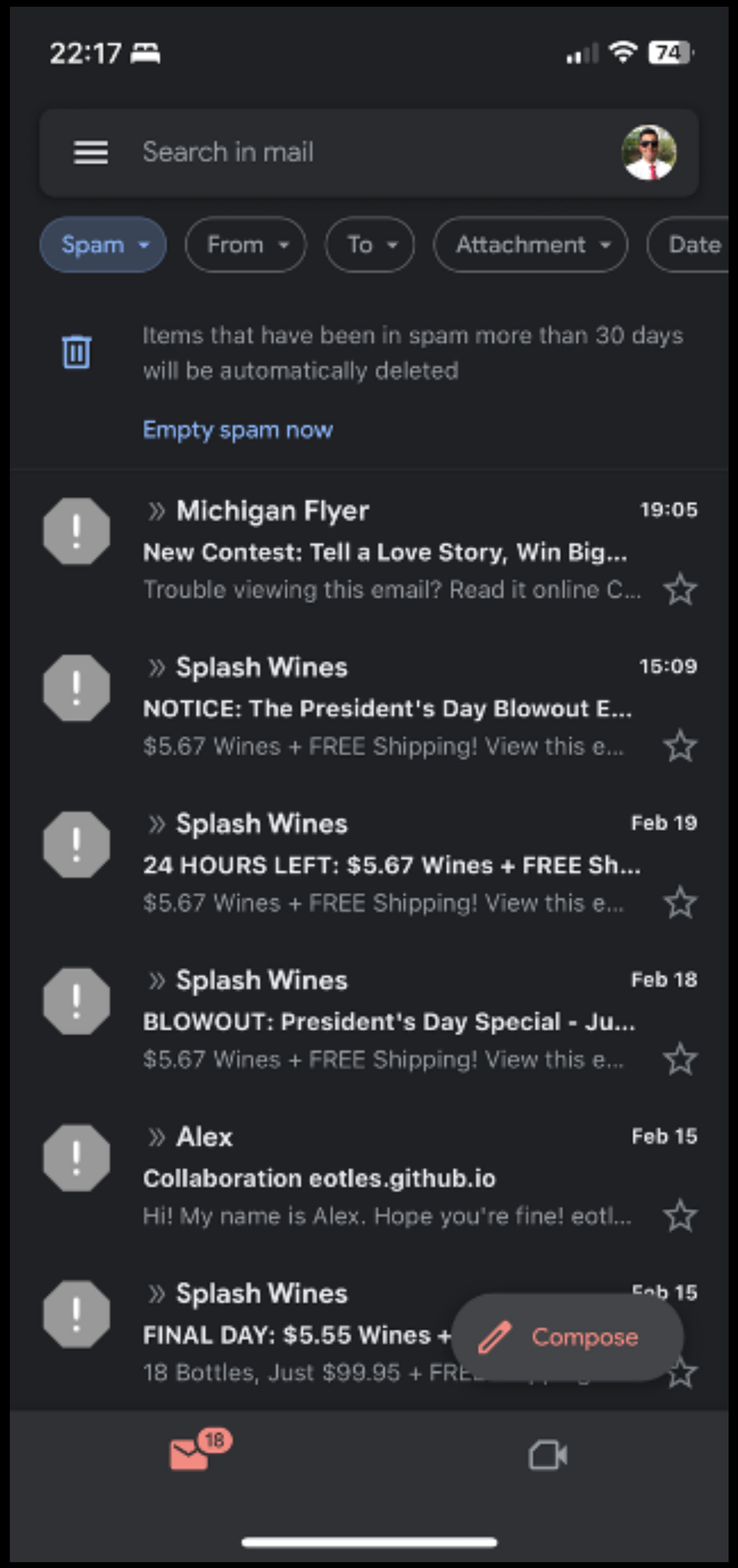
Artificial Intelligence (AI): *intelligence* (perceiving, synthesizing, and inferring information) demonstrated by machines

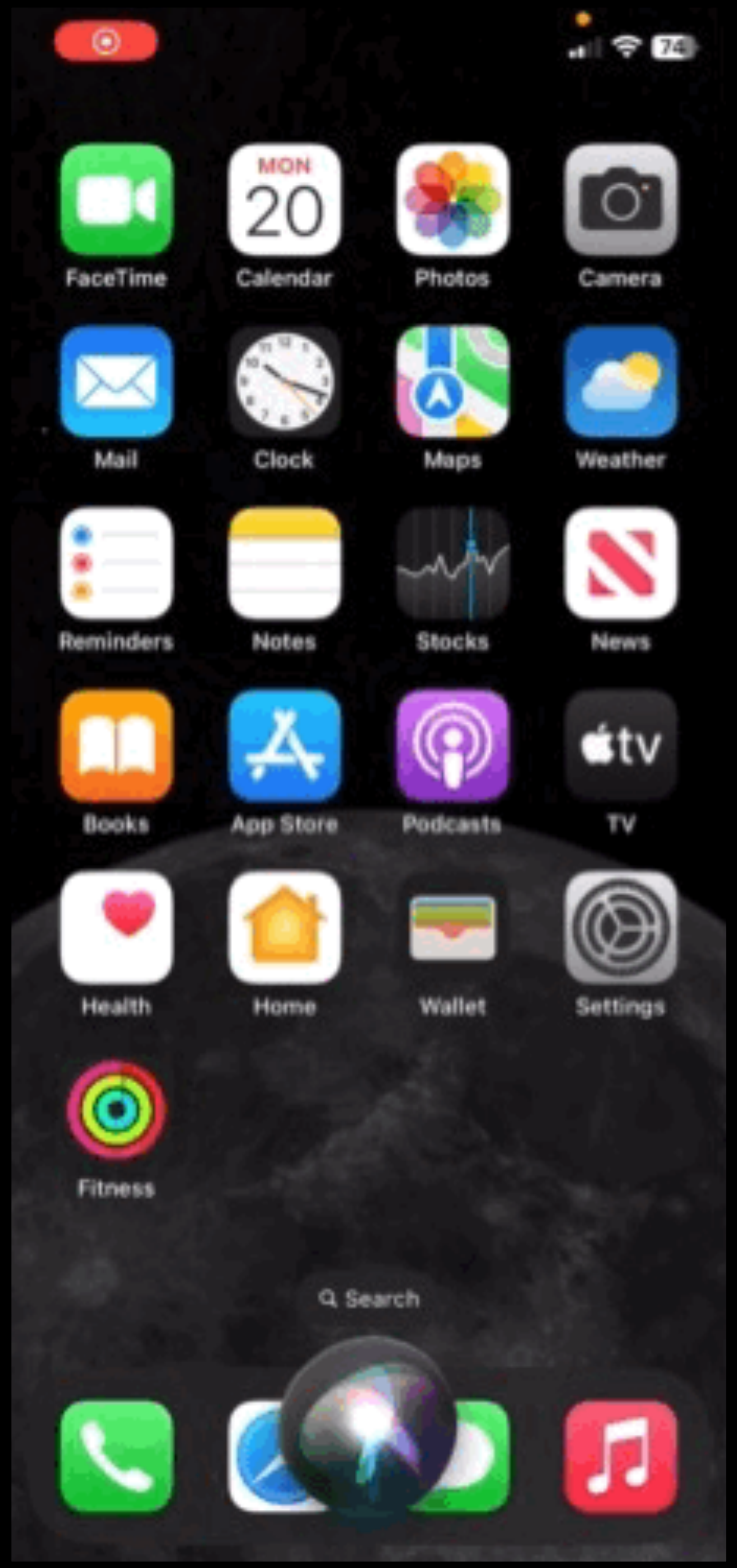
Machine Learning (ML): field of inquiry devoted to understanding and building methods that *learn* (use data to improve performance on a task).

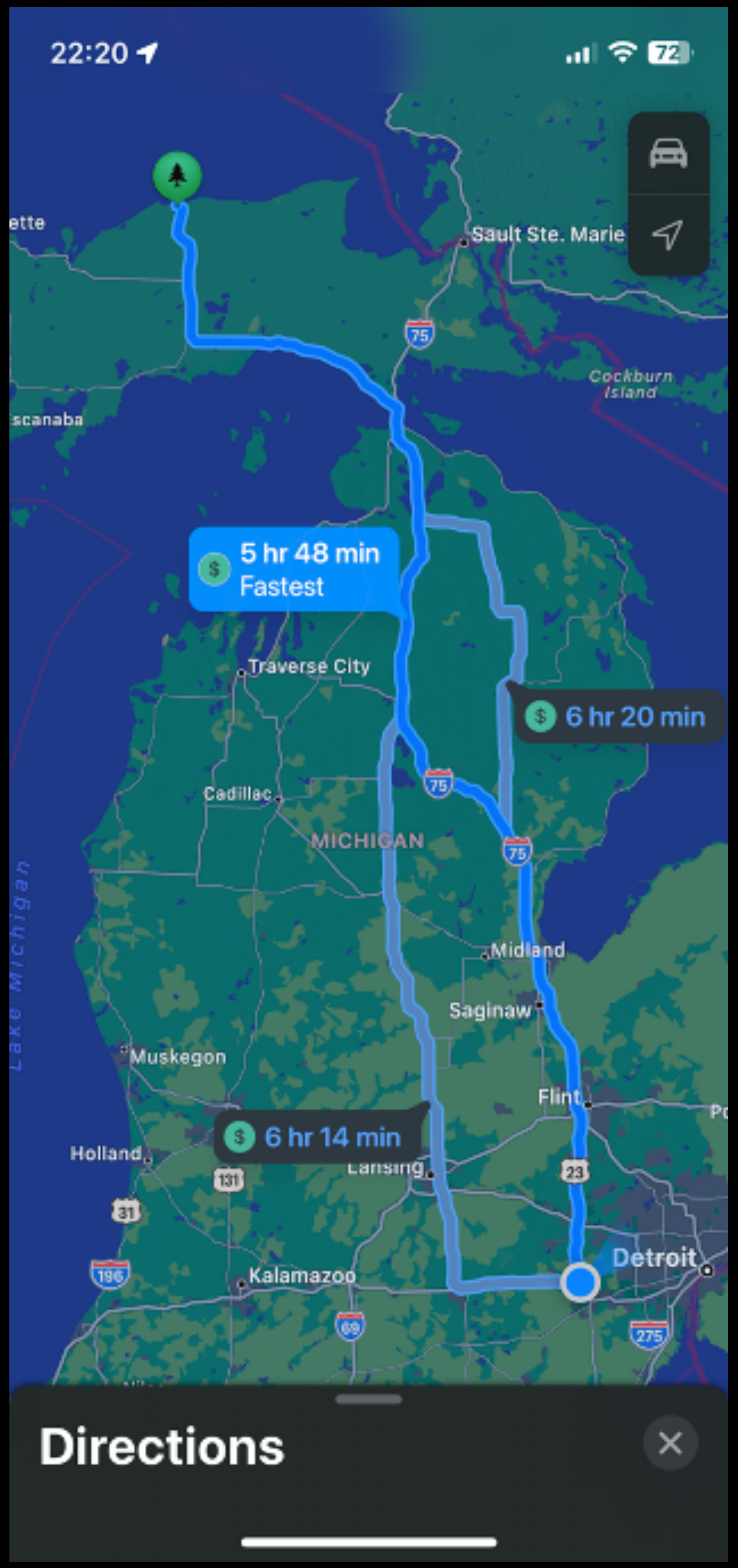
Nesting and overlapping concepts



AI is ubiquitous in everyday life







Many industries depend on AI

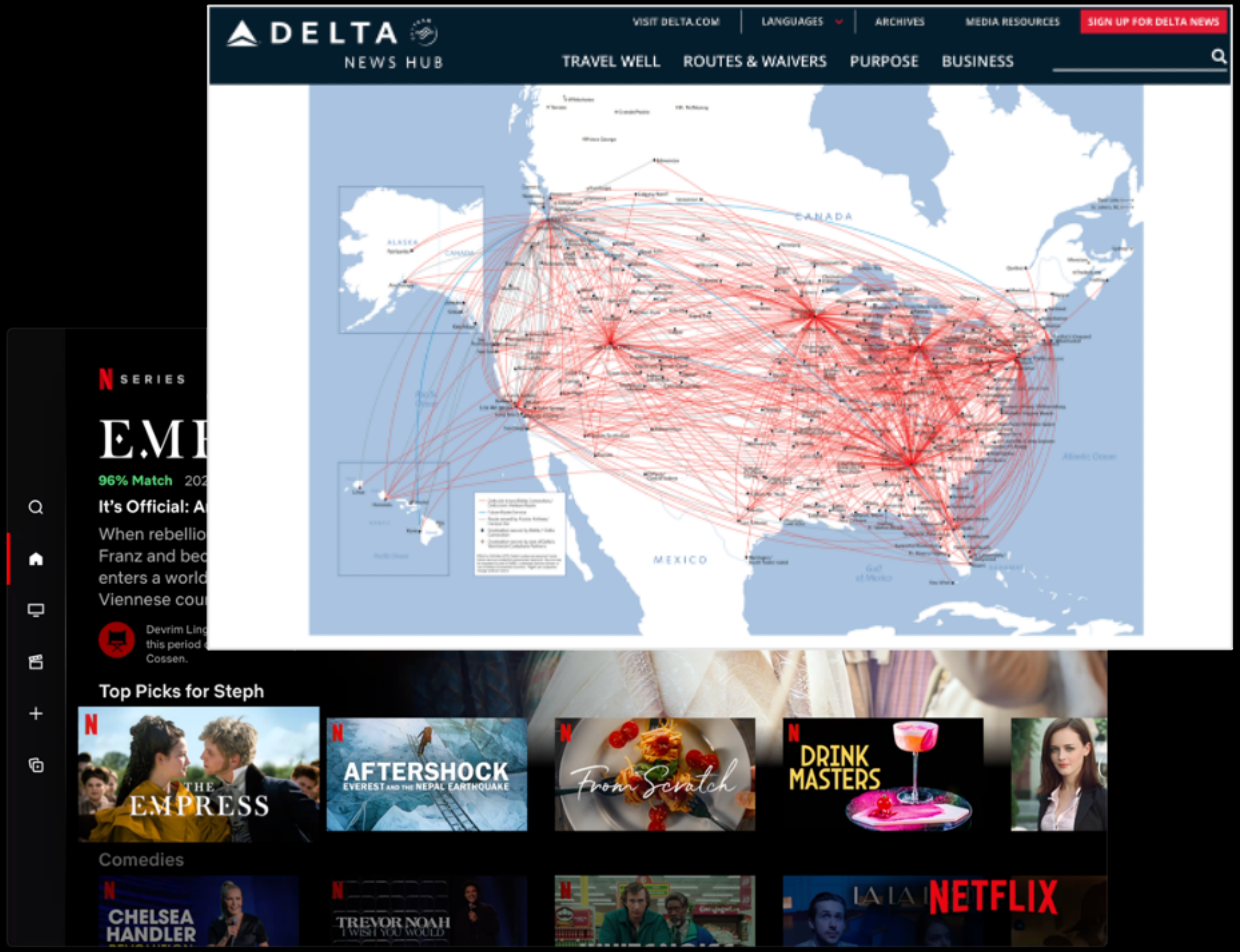
What routes should we fly?

When should we service our planes?

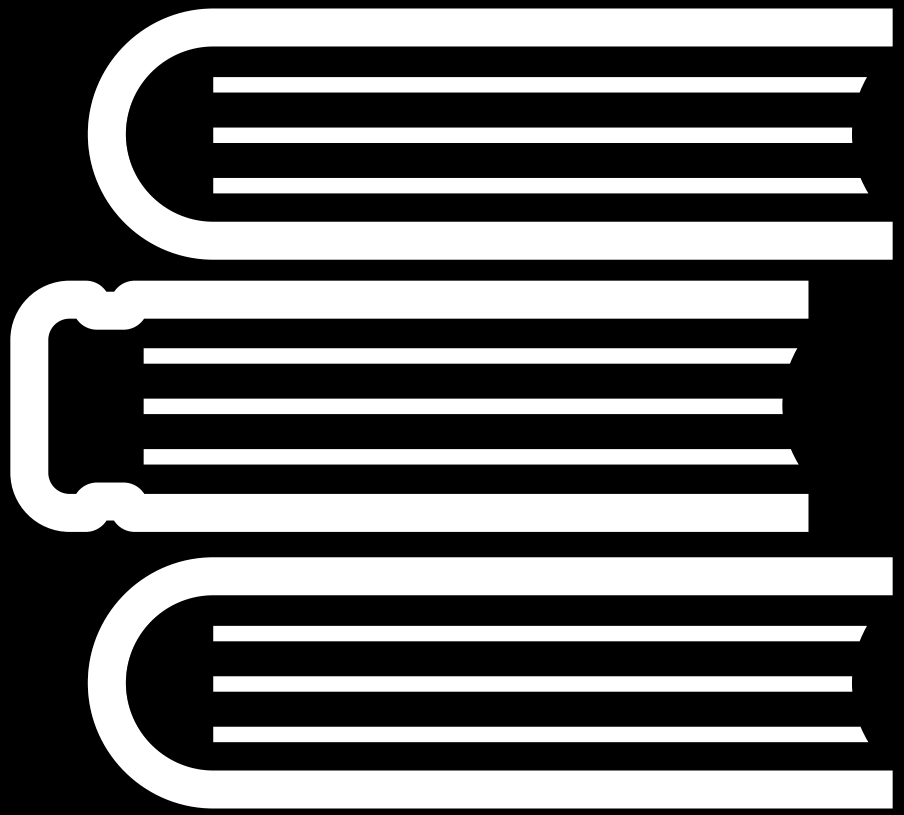
How should we price a product?

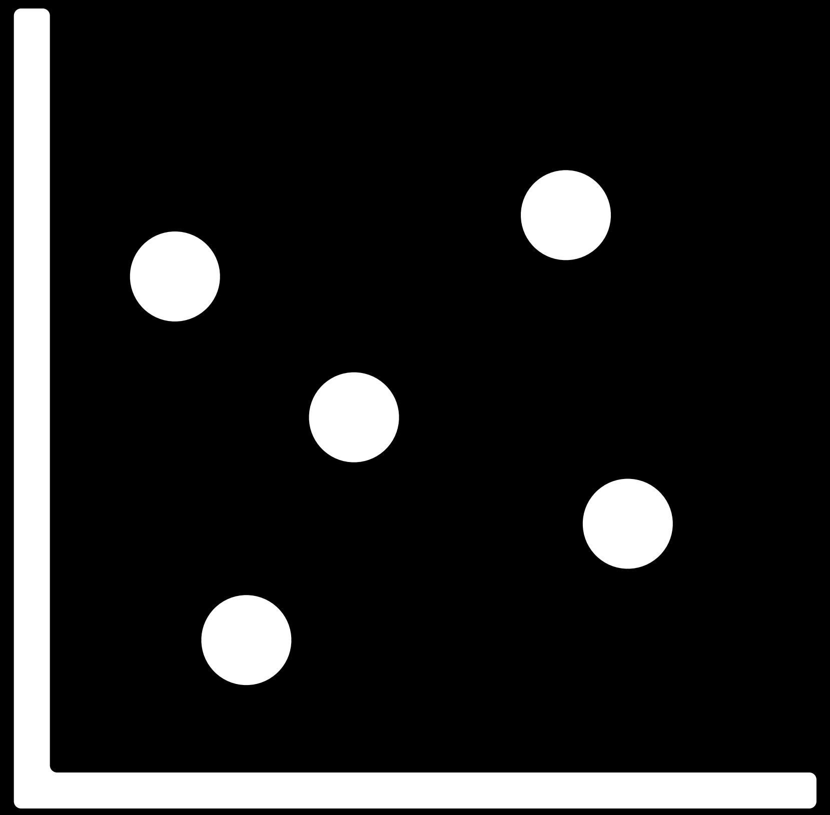
What content should we serve?

What products should we stock?



AI has the potential to advance medicine

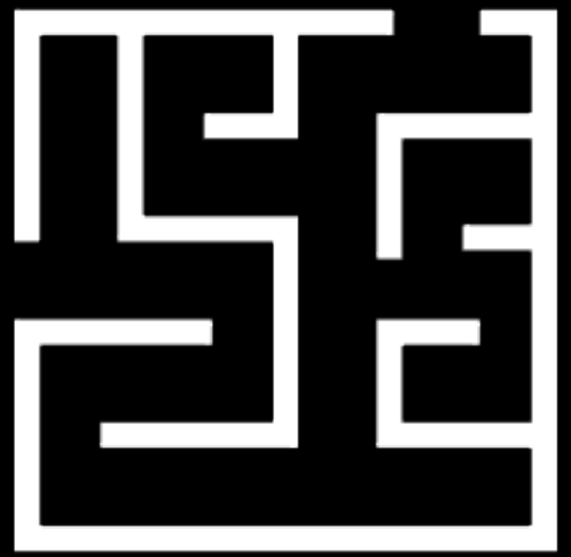




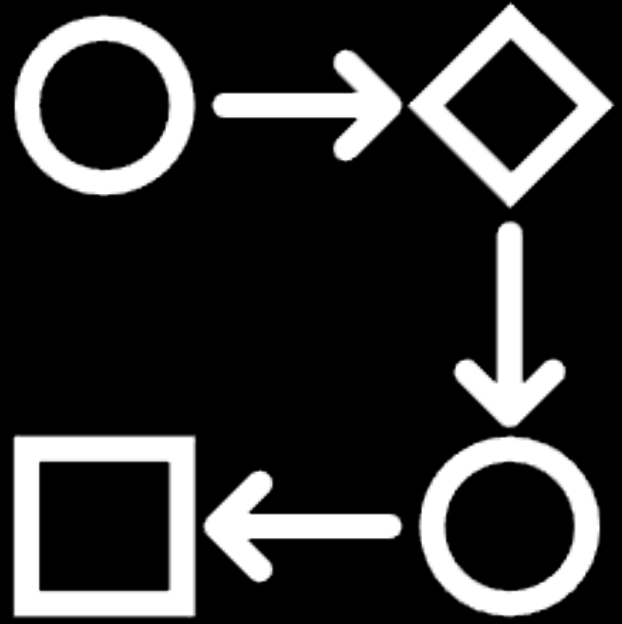
AI has techniques to rapidly **summarize** information, **predict** outcomes, and **learn** over time

Society has big expectations for AI in medicine

AI is not a part of medical education

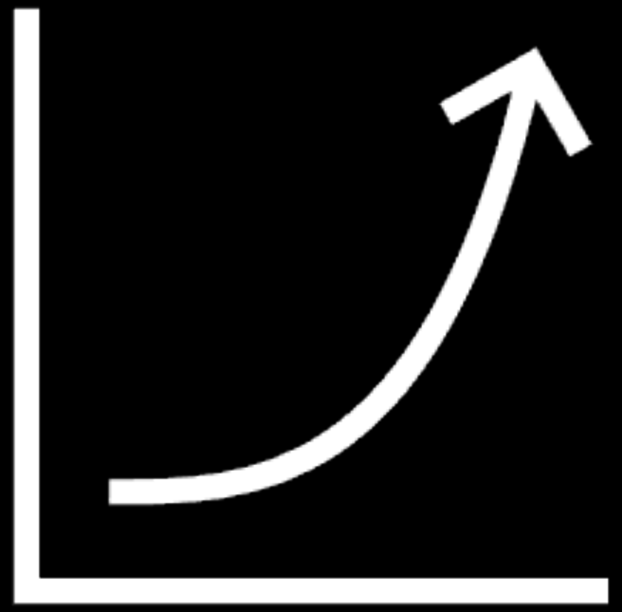


Use of AI in medicine is not straightforward



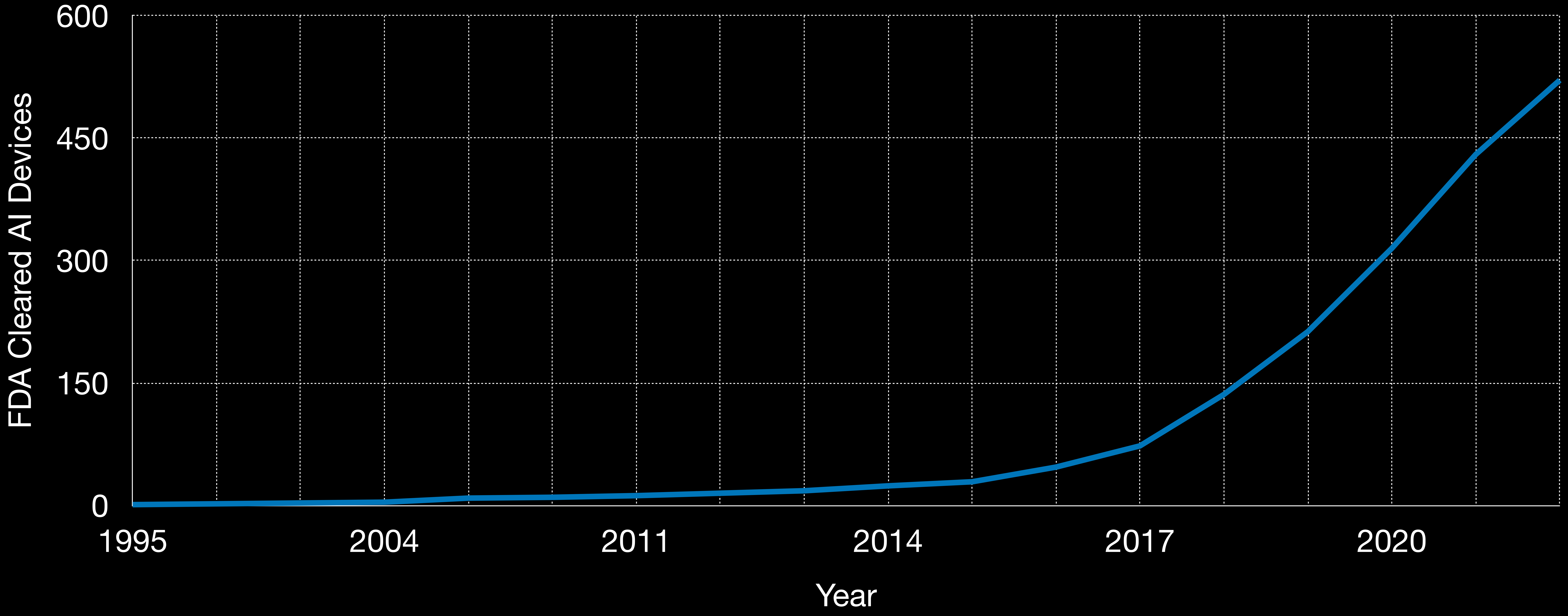
AI tools depend on complicated data and workflows that physicians understand

Medical AI adoption increasing

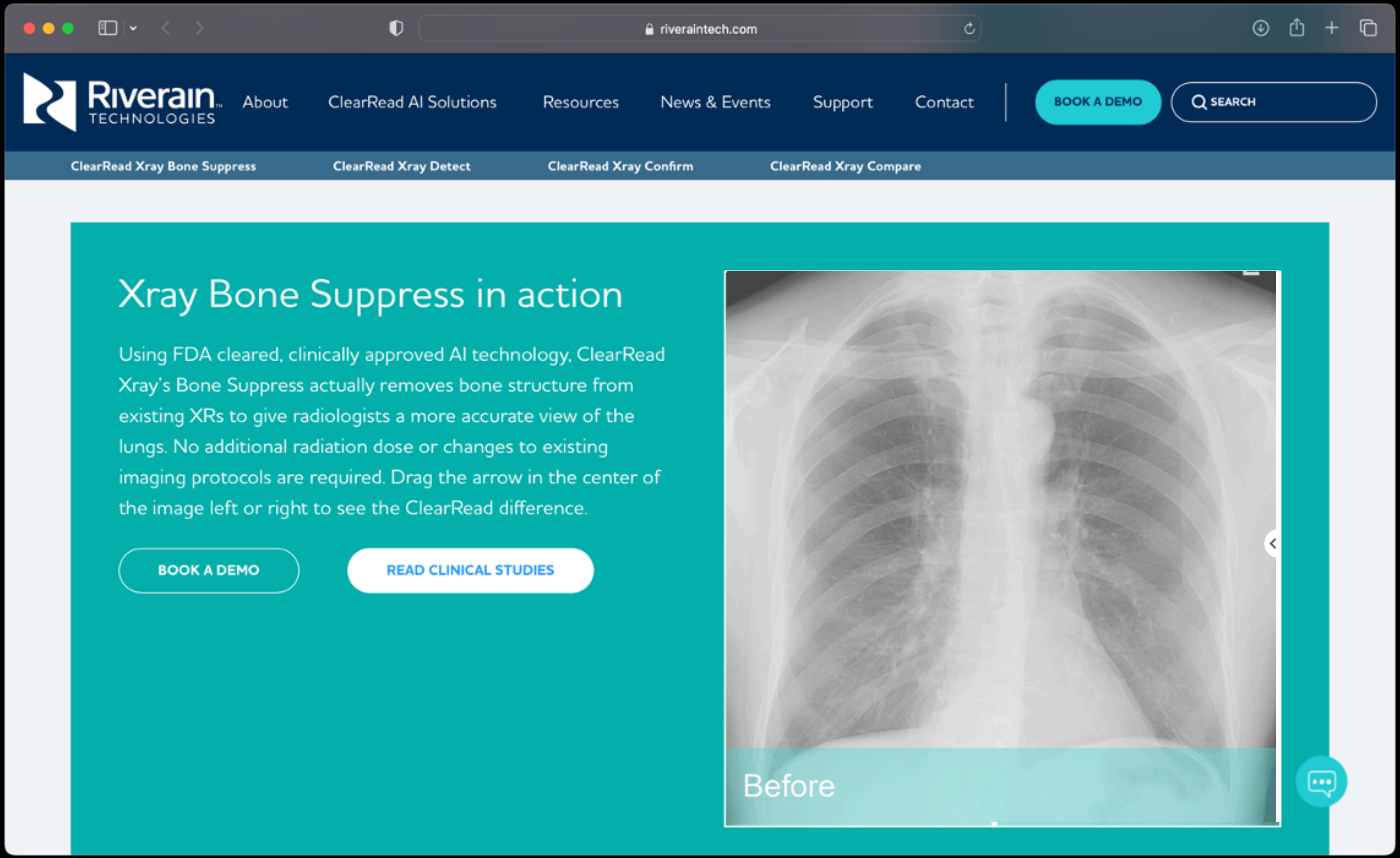


Learners unprepared to use, assess, and develop AI tools

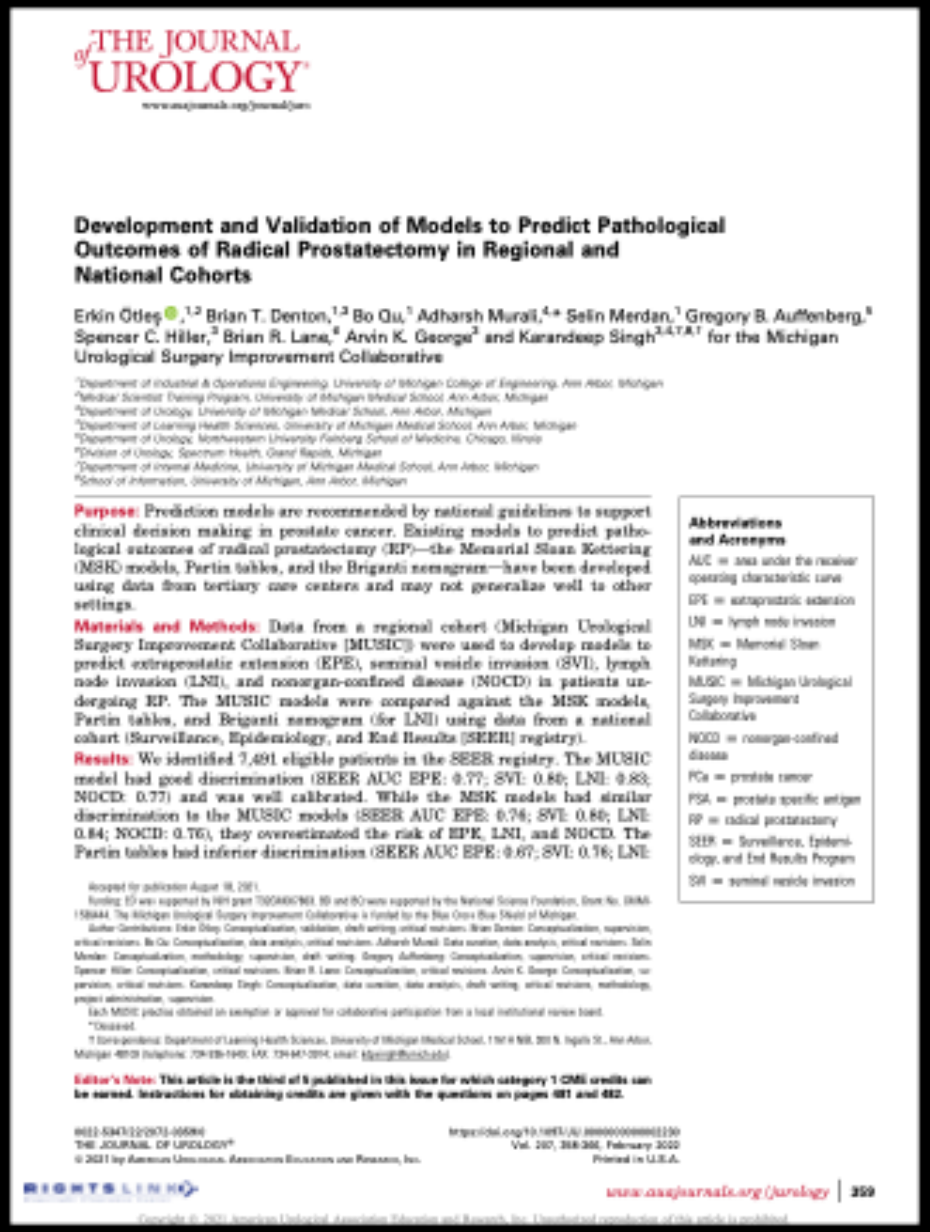
Increasing prevalence of medical AI



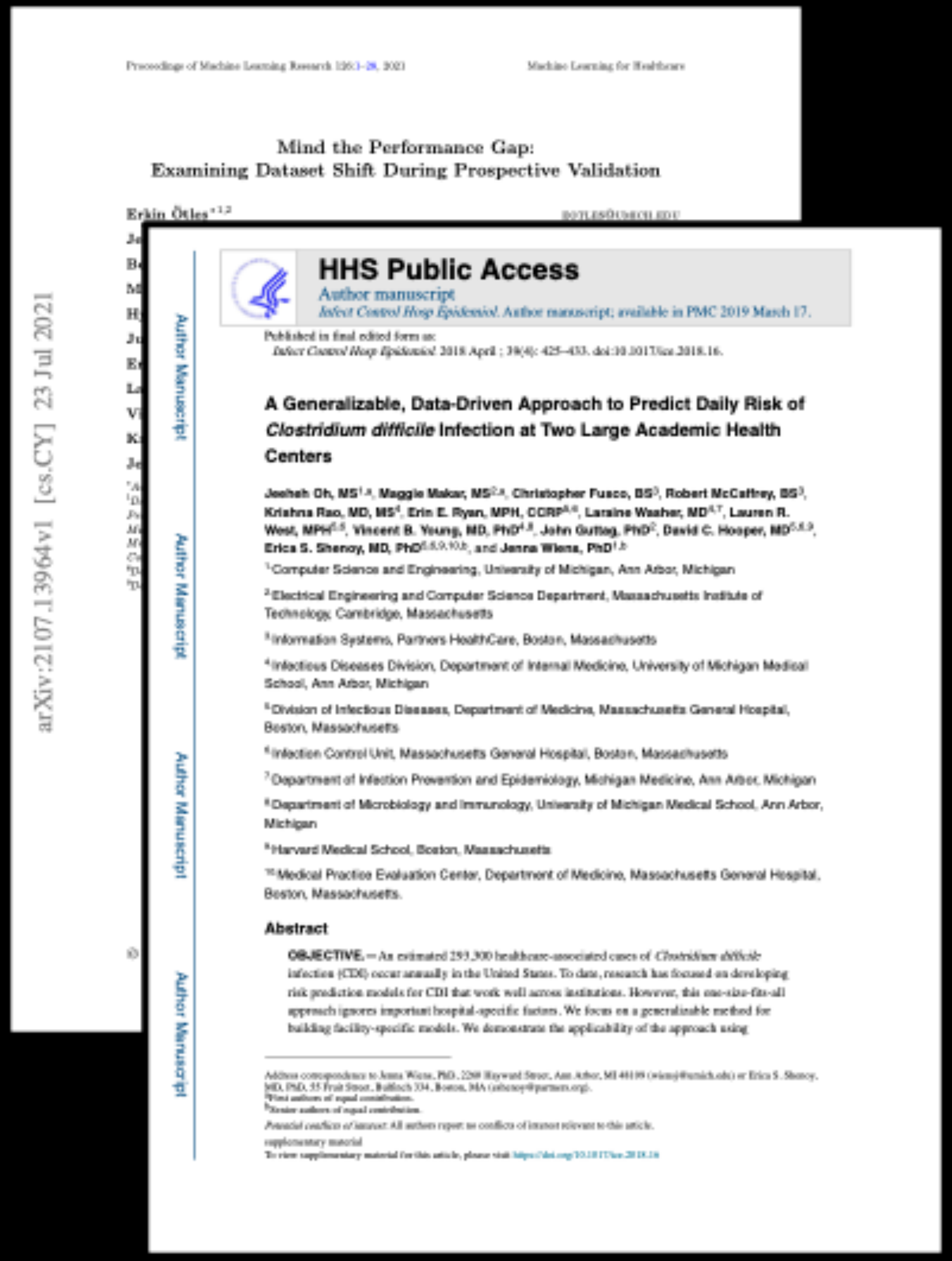
AI in use at Michigan Medicine



Michigan AI in use



Prostate Cancer Outcomes



In Hospital Infection Risk

Deterioration Risk

In Hospital Sepsis Risk

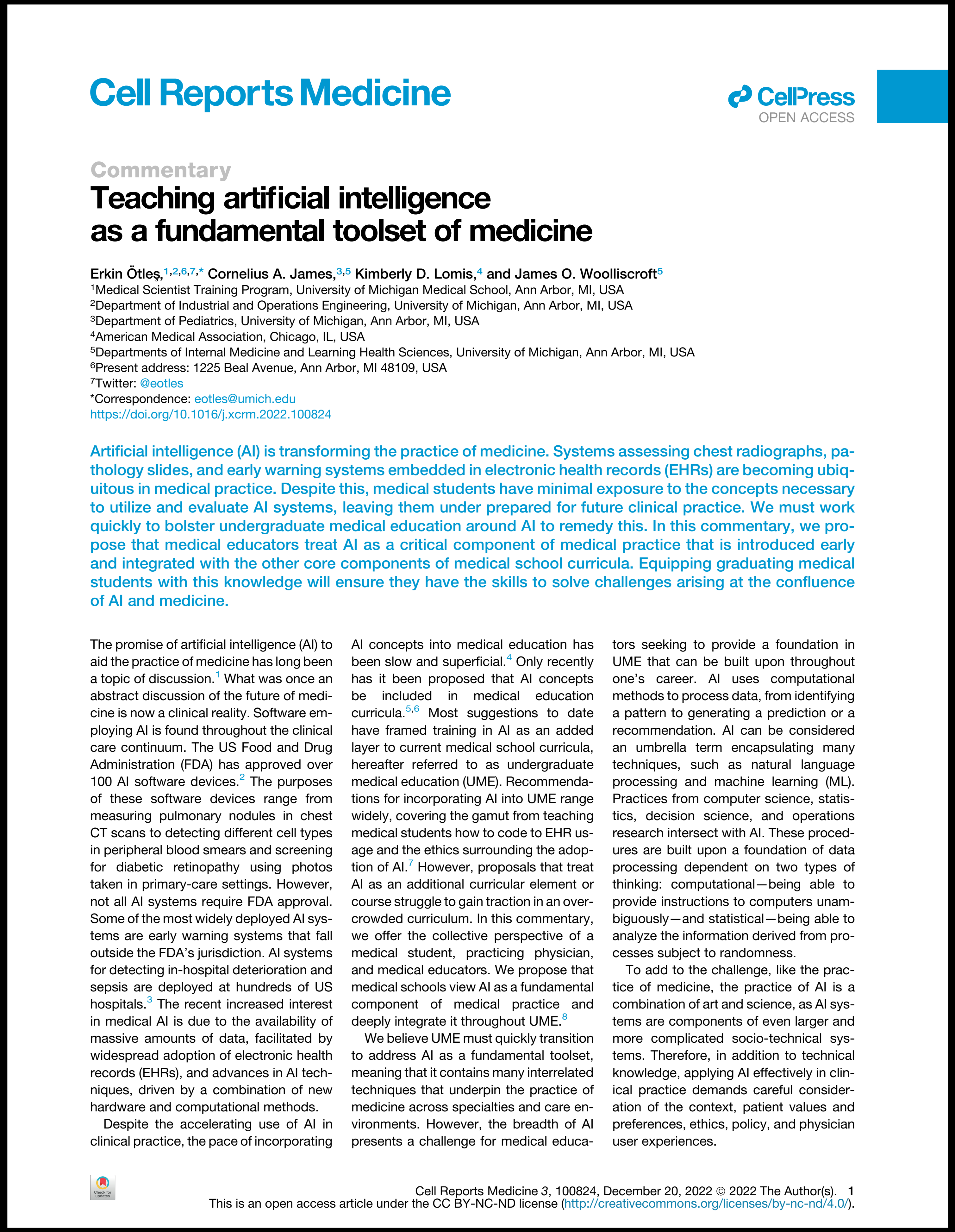
We’ve got to start training physicians on AI fundamentals

Physicians shouldn’t just be “users”

Should be actively involved in creating, evaluating, and improving AI

Leadership in AI dependent on:

- **understanding** how it works &
- **partnership** with engineers



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Commentary

Teaching artificial intelligence as a fundamental toolset of medicine

Erkin Ötleş,[1,2,6,7,*] Cornelius A. James,[3,5] Kimberly D. Lomis,[4] and James O. Woolliscroft[5]

[1]Medical Scientist Training Program, University of Michigan Medical School, Ann Arbor, MI, USA
[2]Department of Industrial and Operations Engineering, University of Michigan, Ann Arbor, MI, USA
[3]Department of Pediatrics, University of Michigan, Ann Arbor, MI, USA
[4]American Medical Association, Chicago, IL, USA
[5]Departments of Internal Medicine and Learning Health Sciences, University of Michigan, Ann Arbor, MI, USA
[6]Present address: 1225 Beal Avenue, Ann Arbor, MI 48109, USA
[7]Twitter: @eotles
*Correspondence: eotles@umich.edu

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Artificial intelligence (AI) is transforming the practice of medicine. Systems assessing chest radiographs, pathology slides, and early warning systems embedded in electronic health records (EHRs) are becoming ubiquitous in medical practice. Despite this, medical students have minimal exposure to the concepts necessary to utilize and evaluate AI systems, leaving them under prepared for future clinical practice. We must work quickly to bolster undergraduate medical education around AI to remedy this. In this commentary, we propose that medical educators treat AI as a critical component of medical practice that is introduced early and integrated with the other core components of medical school curricula. Equipping graduating medical students with this knowledge will ensure they have the skills to solve challenges arising at the confluence of AI and medicine.

The promise of artificial intelligence (AI) to aid the practice of medicine has long been a topic of discussion.[1] What was once an abstract discussion of the future of medicine is now a clinical reality. Software employing AI is found throughout the clinical care continuum. The US Food and Drug Administration (FDA) has approved over 100 AI software devices.[2] The purposes of these software devices range from measuring pulmonary nodules in chest CT scans to detecting different cell types in peripheral blood smears and screening for diabetic retinopathy using photos taken in primary-care settings. However, not all AI systems require FDA approval. Some of the most widely deployed AI systems are early warning systems that fall outside the FDA’s jurisdiction. AI systems for detecting in-hospital deterioration and sepsis are deployed at hundreds of US hospitals.[3] The recent increased interest in medical AI is due to the availability of massive amounts of data, facilitated by widespread adoption of electronic health records (EHRs), and advances in AI techniques, driven by a combination of new hardware and computational methods.

Despite the accelerating use of AI in clinical practice, the pace of incorporating AI concepts into medical education has been slow and superficial.[4] Only recently has it been proposed that AI concepts be included in medical education curricula.[5,6] Most suggestions to date have framed training in AI as an added layer to current medical school curricula, hereafter referred to as undergraduate medical education (UME). Recommendations for incorporating AI into UME range widely, covering the gamut from teaching medical students how to code to EHR usage and the ethics surrounding the adoption of AI.[7] However, proposals that treat AI as an additional curricular element or course struggle to gain traction in an overcrowded curriculum. In this commentary, we offer the collective perspective of a medical student, practicing physician, and medical educators. We propose that medical schools view AI as a fundamental component of medical practice and deeply integrate it throughout UME.[8]

We believe UME must quickly transition to address AI as a fundamental toolset, meaning that it contains many interrelated techniques that underpin the practice of medicine across specialties and care environments. However, the breadth of AI presents a challenge for medical educators seeking to provide a foundation in UME that can be built upon throughout one’s career. AI uses computational methods to process data, from identifying a pattern to generating a prediction or a recommendation. AI can be considered an umbrella term encapsulating many techniques, such as natural language processing and machine learning (ML). Practices from computer science, statistics, decision science, and operations research intersect with AI. These procedures are built upon a foundation of data processing dependent on two types of thinking: computational—being able to provide instructions to computers unambiguously—and statistical—being able to analyze the information derived from processes subject to randomness.

To add to the challenge, like the practice of medicine, the practice of AI is a combination of art and science, as AI systems are components of even larger and more complicated socio-technical systems. Therefore, in addition to technical knowledge, applying AI effectively in clinical practice demands careful consideration of the context, patient values and preferences, ethics, policy, and physician user experiences.

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ChatGPT

ChatGPT = Chatbot + GPT3

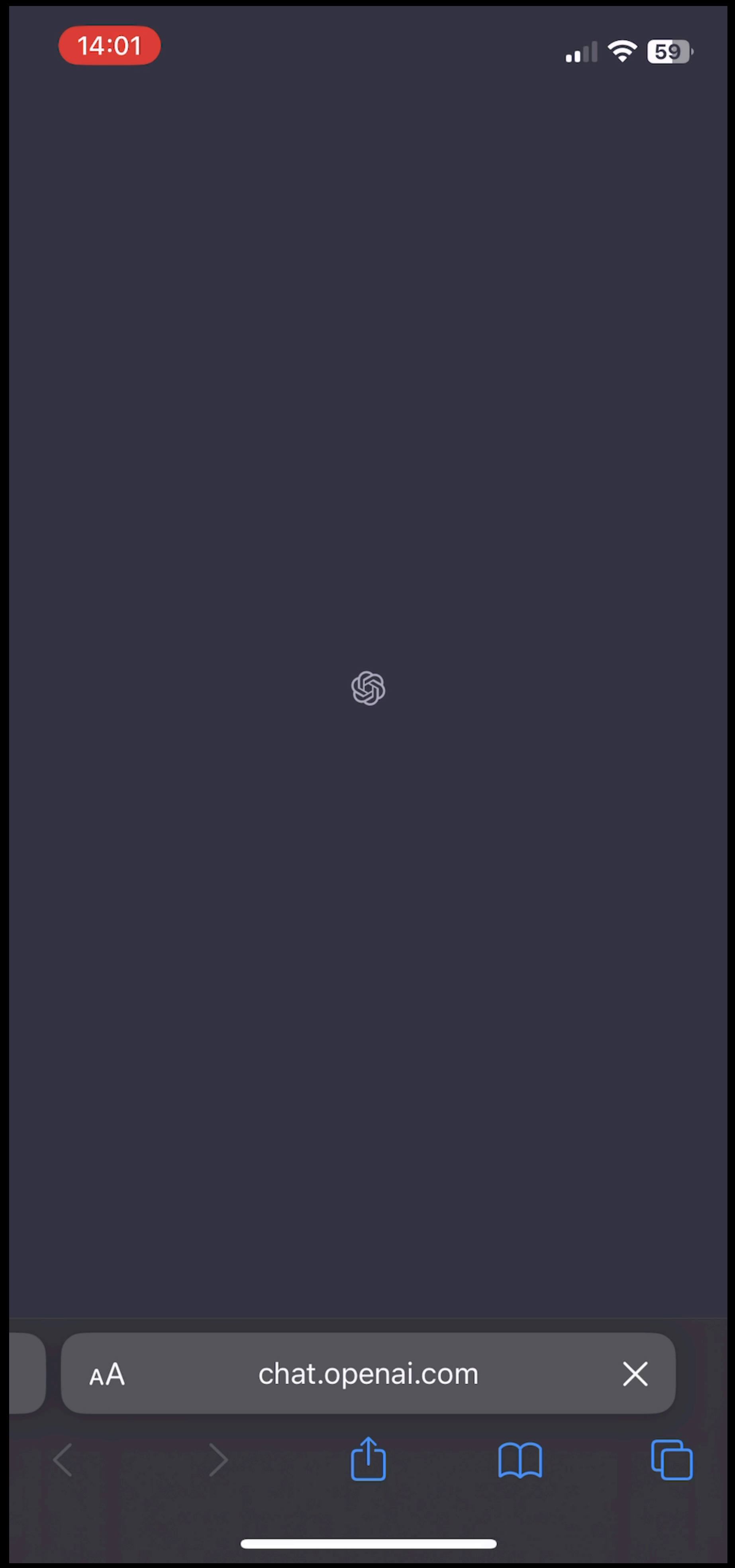
Chatbot: developed by OpenAI
mix of supervised & reinforcement learning

GPT3: Generative Pre-trained Transformer 3
type of **large language model** (fancy predictive text)

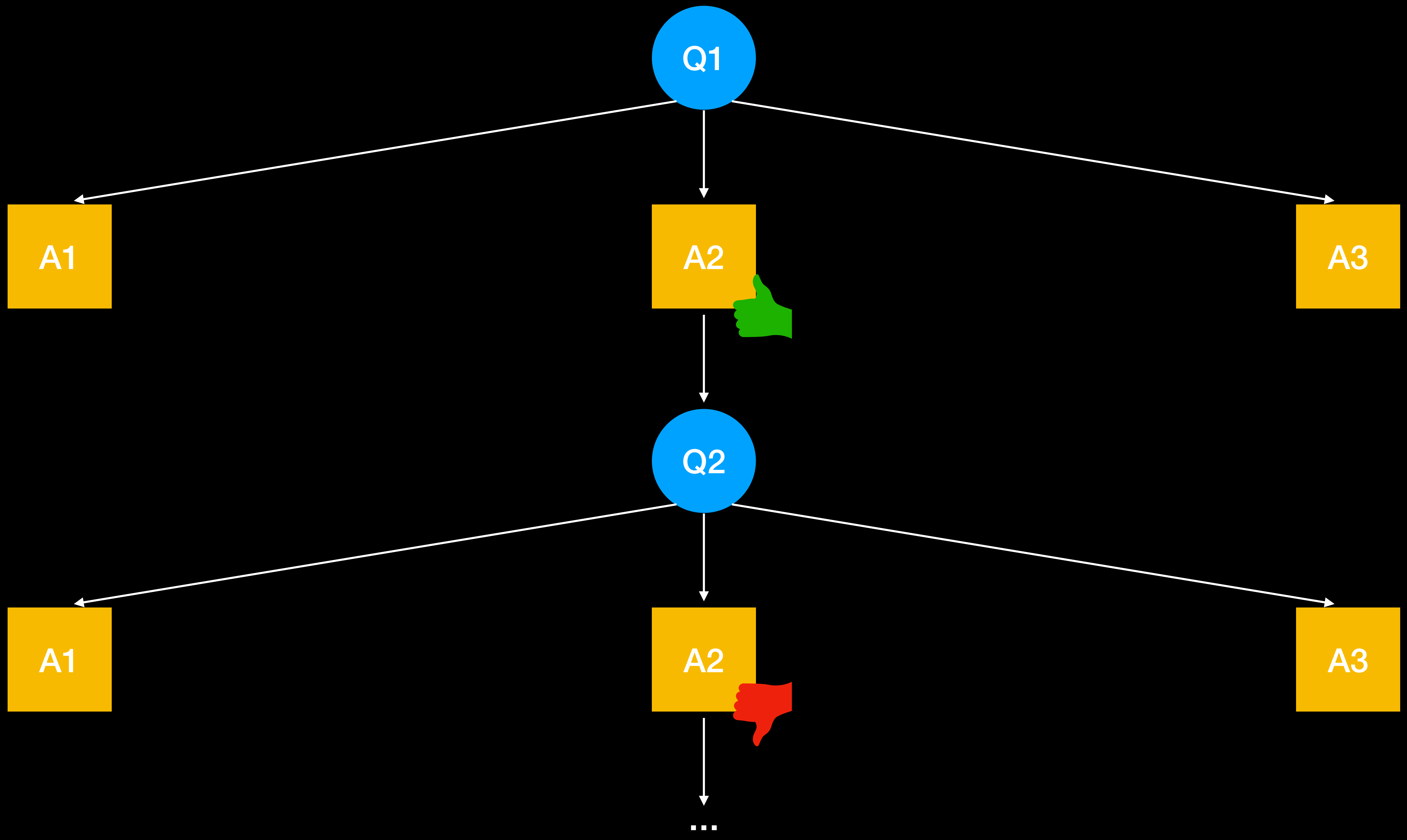
"The quick brown fox jumps over the ______"

Lazy 95%
Slow 2%
Fun 1%
…
Zyzzyva 0%

Trained on all available text on the internet



Chat is a branching tree



Major issues with large language models

- Based on what ever data it was trained on
  - May not be relevant, accurate, or pleasant
- Generative process is inherently stochastic
  - Response choices and sentence construction depend on sampling distributions randomly
- Hard to evaluate and verify
  - How often will it be right? What is right?

Recap

AI provides medicine with a set of powerful tools

We need to train physicians to be active leaders of the development and evaluation of these tools

ChatGPT is cool, but problematic

Healthcare AI cycle is dependent on physician-engineer collaboration

Interfaces between physician users and AI tools will need significant human factors engineering

Questions?

Comments? Concerns? Violent disagreements?

Erkin Ötleş
Twitter: @eotles
eotles.com