Artificial Intelligence is Coming to Healthcare

What does it mean for Family Medicine?

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Description:

In the presentation, we will explore the emerging 4th Industrial Revolution of artificial intelligence and its potential impact on family medicine. We will discuss the current AI landscape and emerging innovations in the space and the role academic family medicine can plan to help ensure the revolution is good for family medicine and our patients. We will end the presentation with an extended discussion with audience participation.

Goals / Learning Objectives:

- Understand Artificial Intelligence and Machine Learning in the context of family medicine
- Identification of opportunities AI/ML can provide to expand and extend capabilities as well as decrease administrative and cognitive burden
- Lean about key issues that relate to academic family medicine that will need to be addressed by the specialty

EDITOR'S PICK | 38,294 views | Jun 28, 2018, 11:51am

This AI Just Beat Human Doctors On A Clinical Exam

Parmy Olson Forbes Staff

AI

AI, robotics and the digital transformation of European business.

https://www.forbes.com/sites/parmyolson/2018/06/28/ai-doctors-exam-babylon-health/#729043c612c0

"20 Percent Doctor Included" & Dr. Algorithm: Speculations and Musings of a Technology Optimist

SEPTEMBER 30, 2016 • BY VINOD KHOSLA • HEALTH

https://www.khoslaventures.com/20-percent-doctor-included-speculations-and-musings-of-a-technology-optimist

What is AI?
What is Machine Learning?

- Machine learning is where the computer is programmed to learn instead of programmed to complete the task

- Many different algorithms exist for machine learning

- Artificial Intelligence is when a computer is able to compete a task typically requiring human level intelligence
  - Weak (Narrow) AI
  - Strong (Broad) AI
  - Superhuman AI

Key Challenge & Opportunity

Human + AI Performance $$$

Human Performance $$$

AI / ML Performance ¢

?

Time
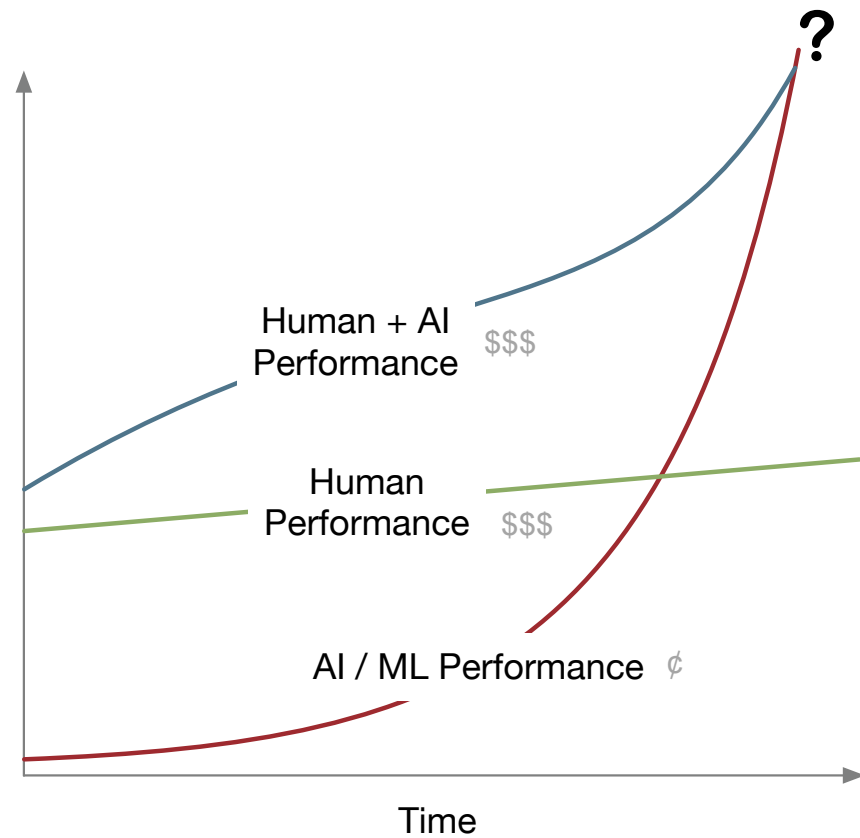
AI in healthcare funding reaches a new high in Q3'19

VC-backed deals and financing to healthcare AI startups, Q1'18 – Q3'19

https://www.cbinsights.com/research/ai-artificial-intelligence-healthcare-funding-q3-19/

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Significant Investments in Healthcare AI

Image Source: https://www.cbinsights.com/research/artificial-intelligence-startups-healthcare/

Market Pressures on Medicine

- Be more cost effective
- High burden/burnout
- Medical Errors
- Volume of new Evidence Based Medicine
- Volume of health data
- Physician Shortages

AI

The New Left Shift

Sub-specialist
Primary Care Physician
Mid-level
Nurse
CNA
Medical Assistant
Caregiver
Individual
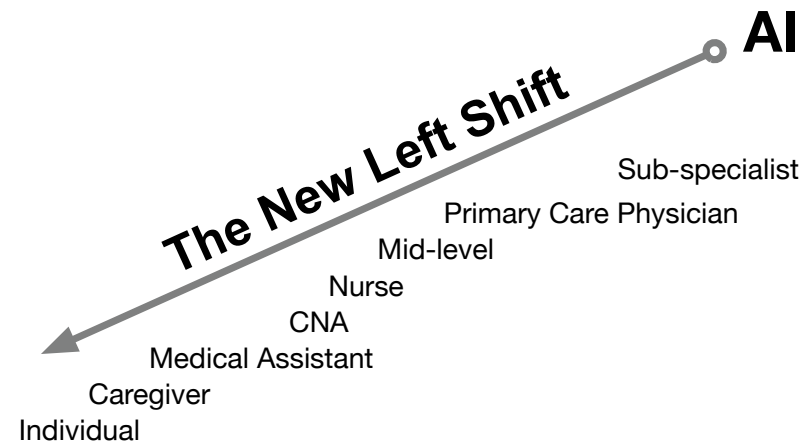
Sweet Spot for AI

- Well defined problems
  - Clear delineations
  - High correlation with available data
- Areas with large, high-quality datasets
- Lower risk tasks

Tasks

Complexity
Low Data Availability
Low Data Quality
High Risk

AI
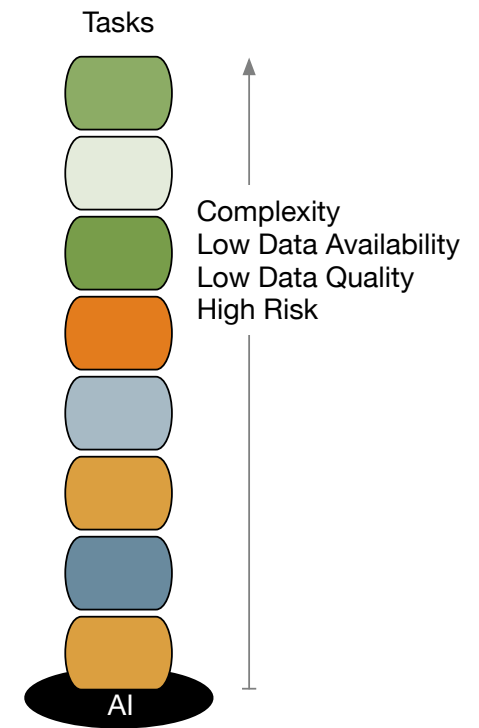
Where Could AI Help Primary Care?

Administrative Burden	Cognitive Burden	Expanding Capacity	Expanding Capabilities	Predicting Disease And Outcomes

Detecting and Predicting Disease and Outcomes

- *Still early days but there has been significant progress*

- *Models exist that can accurately detect and categorize disease states*
  - *Diabetic Retinopathy*
  - *Malignant vs. Benign Skin Lesions*
  - *Detecting Rash Morphology and Cause*
  - *Abnormality detection on radiographs*

- *How to Read Articles That Use Machine Learning: Users' Guides to the Medical Literature*. Liu Y, Chen PC, Krause J, Peng L. JAMA. 2019 Nov 12;322(18):1806-1816.

- An Accurate Model Alone ≠ Better Outcomes

AI Tools to Fuel a Paradigm Shift

ML At Risk Predictor	AI Chatbot	Smart Diagnostic Devices	Clinical Digital Assistant	Record Automated Summarization
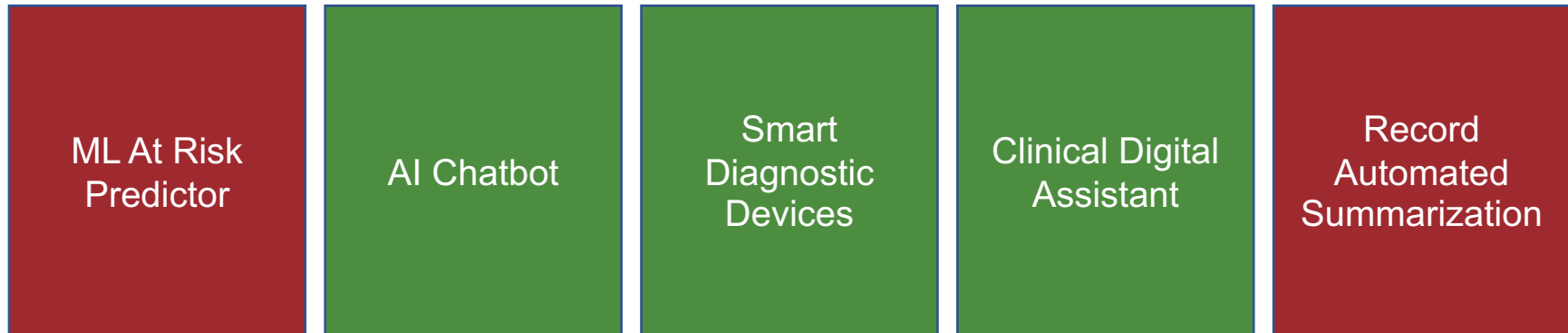
🟩 Products are in the market 🟥 Technology is proven but no available products yet
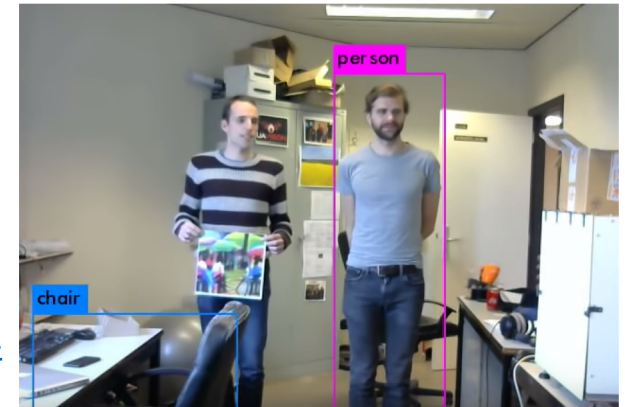
Potential Pitfalls Around AI Solution

- Training in bias found in the data – Fairness
  - How have you ensured fairness in your models?
  - What patient population was used to train your models?
  - How diverse are the patient populations that you have tested your model's accuracy on?
- Lack of adequate data for training
  - How did you determine you have enough training data to be generalizable?
- Staleness of machine learning models
  - How often do you re-train your models?
  - How do you obtain more training data for your models?
- Black box nature of deep neural networks – Explainability
  - Can you show how the model made its decision?
  - What are the most important pieces of data in a specific prediction?

"Hacking AI" (Adversarial Examples)

Panda!   Designed "Noise"   Gibbon!

+   =

Source: Why deep-learning AIs are so easy to fool.
https://www.nature.com/articles/d41586-019-03013-5

Source: https://medium.com/syncedreview/now-you-see-me-now-you-dont-fooling-a-person-detector-aa100715e396

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AI/ML Impact on Academic Family Medicine

- Clinical Management
  - Scope of practice
  - Augmentation versus Replacement
- Education
  - How to leverage AI/ML
  - How to evaluate AI/ML solutions
  - Lack of access post-training?
- Research
  - Implementation Science
  - Diversity/Equity
  - Role for Family Physicians

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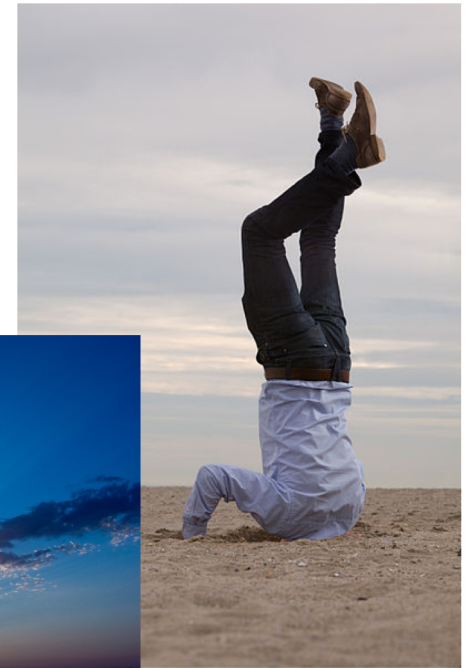
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STRONG MEDICINE FOR AMERICA

Innovation Lab to Optimize Family Medicine Experience

- The Family Medicine Experience is based on a deep physician-patient interaction that requires support from technology.

- Today's EHRs have greatly eroded the experience rather than enhancing it.

Tech Best Practice + Clinical Best Practice

- The purpose of our Innovation Laboratory is to partner with industry to drive innovation with the latest proven technologies: cloud, AI/ML, voice and mobile technologies, to optimize the Family Medicine Experience.