Artificial Intelligence (AI) in Healthcare: Ethical Considerations

Kyle Galbraith, PhD

May 11, 2019

Piedmont

Disclosures

No Relevant Disclosures

No irrelevant disclosures I want to mention

Piedmont

You've probably seen the headlines…

The New York Times

How Artificial Intelligence Could Transform Medicine

Artificial Intelligence is Ramping up in Drug Development

Published: May 07, 2019 | By Mark Terry

ALL TECH CONSIDERED

As Artificial Intelligence Moves Into Medicine, The Human Touch Could Be A Casualty

7:23

+ PLAYLIST

DOWNLOAD
EMBED
TRANSCRIPT

April 30, 2019 · 2:35 PM ET
Heard on All Things Considered

RICHARD HARRIS

Top 12 Ways Artificial Intelligence Will Impact Healthcare

Artificial intelligence is poised to become a transformational force in healthcare. How will providers and patients benefit from the impact of AI-driven tools?

3 ways AI is already changing medicine

They might surprise you.

By Julia Belluz | @juliaoftoronto | julia.belluz@voxmedia.com | Mar 15, 2019, 12:40pm EDT

f 🐦 ↗ SHARE

Don't worry. Robots aren't replacing doctors any time soon. | Getty Images/iStockphoto
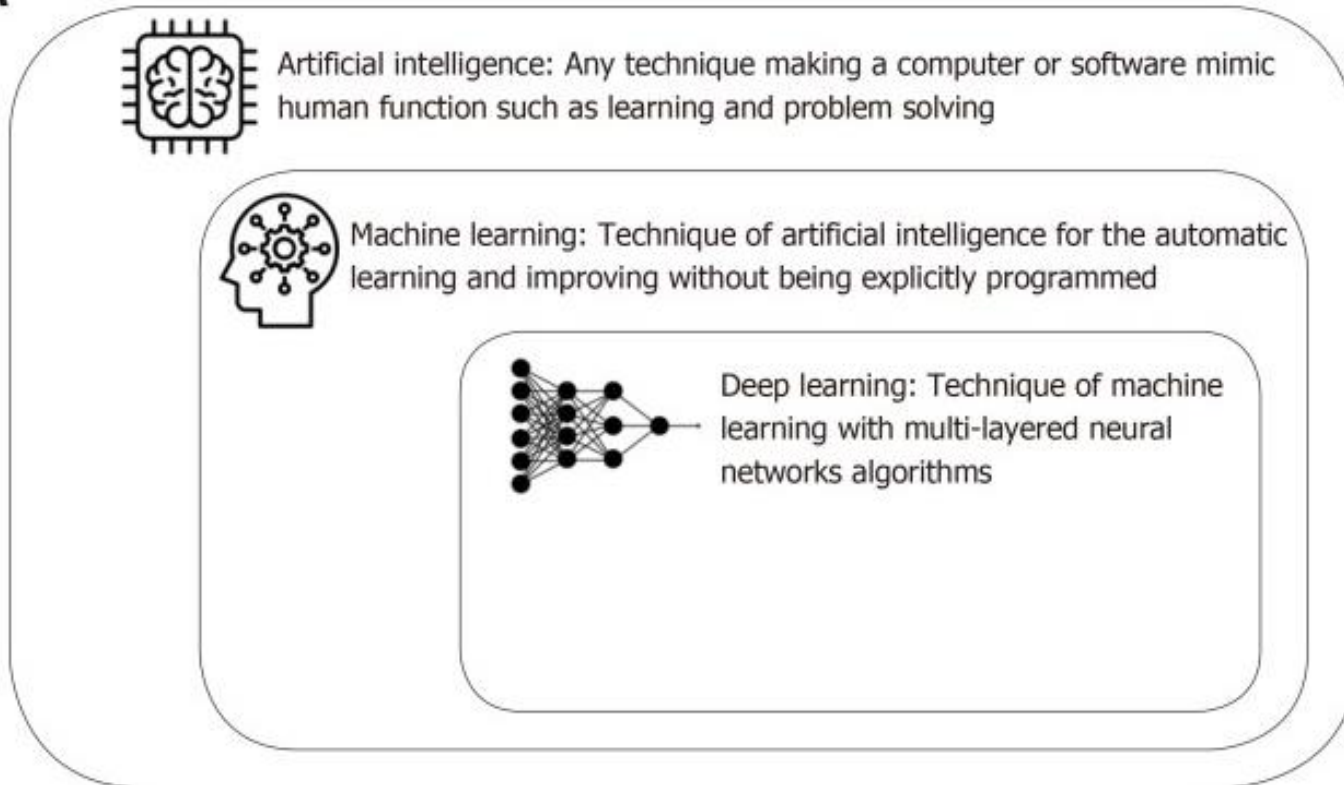
Piedmont

Overview

1. What is Artificial Intelligence (AI)?

2. How is AI being integrated into the healthcare context?

3. What do we mean by *ethics*?

4. What are some ethical concerns that AI poses?

What is Artificial Intelligence?

Brain metaphor is important…

Artificial intelligence: Any technique making a computer or software mimic human function such as learning and problem solving

Machine learning: Technique of artificial intelligence for the automatic learning and improving without being explicitly programmed

Deep learning: Technique of machine learning with multi-layered neural networks algorithms

Yang YJ and Bang CS. "Application of artificial intelligence in gastroenterology." *World J Gastroenterol* 2019 Apr 14;25(14): 1666-1683.

Piedmont

AI in Healthcare

Wellcome Trust (2018) identifies 5 ways AI touches healthcare:

- Process Optimization

- Pre-clinical Research

- Clinical Pathways

- Patient-facing Applications

- Population-level Applications

FASTER

MORE ACCURATE

PERSONALIZED

MORE COST-EFFECTIVE

Piedmont

AI – Process Optimization (Wellcome 2018)

Improving the "strategic deployment of resources, both physical and human."

- Staff scheduling

- Supply chain – procurement and distribution

- Quality/Performance improvement analytics

- Natural Language Processing for EMR

Piedmont

AI – Preclinical Research (Wellcome 2018)

Speeding the process of therapeutic development

- Rapid ID of drug candidates

- Modeling molecule interactions

- Predicting side effects based on molecule properties

- ID of possible drug repurposing

Piedmont

AI – Clinical Pathways (Wellcome 2018)

Harnessing AI to improve direct patient care

Studies already indicating AI systems capable of…

-Categorizing suspicious moles as "benign" or "cancerous" as accurately as a panel of 21 dermatologists (Estreva, et al., 2017).

-Detecting diminutive colon polyps more frequently than colonoscopy by GI physician alone (Wang, et al., 2019).

-Grading eye fundus images of diabetic retinopathy with same specificity and sensitivity as board-certified ophthalmologists (Gulshan, et al., 2016).

-Tracking ICU patient movement to reduce risk of delirium (Yeung, et al. 2019)

Piedmont

AI – Patient-facing Applications (Wellcome 2018)

Empowering patients and enhancing their experience

- AI "chat bots" to answer patient questions, coach/counsel patients

- Interface to allow patients to manage conditions from home

- Closed-loop insulin pumps (my favorite)

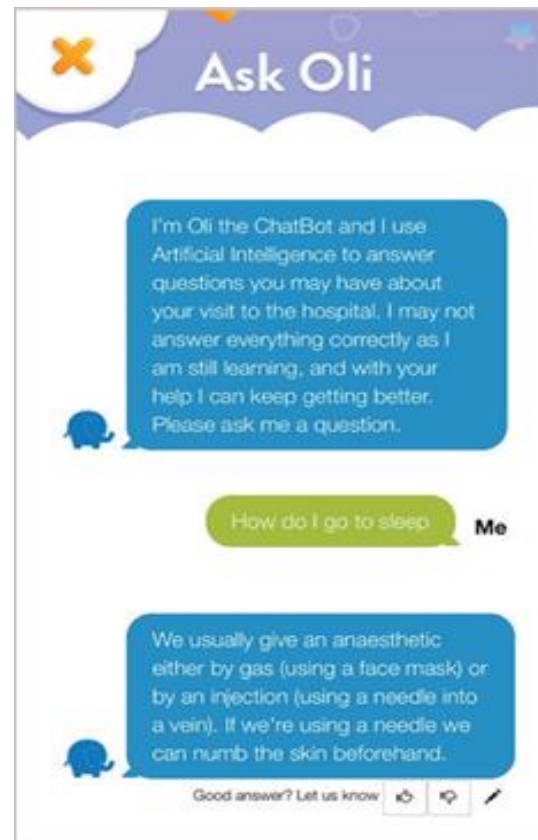- AI-informed consumer genetic testing

- At-home robot assistants

Image via Wellcome Trust

Piedmont

AI – Population-level Applications (Wellcome 2018)

Public health possibilities

- Predicting and responding to infectious disease outbreaks

- Predicting non-communicable conditions (childhood obesity)

- Collection of non-clinical data to examine potential health impacts

Image via pbs.org

Piedmont

What do we mean by *ethics*?

Ethics is an *activity*…something we *do*…

- Clarifying values we hold as individuals, communities, professionals.

- Evaluating our ideas, actions, policies in light of those values.

- Articulating reasons for the choices we make.

Piedmont

Ethics in Healthcare

Many ways to *do* ethics…

- Teleological

- Deontological

- Virtue-based

- Appeals to principles

Image via Wikipedia.org

Piedmont
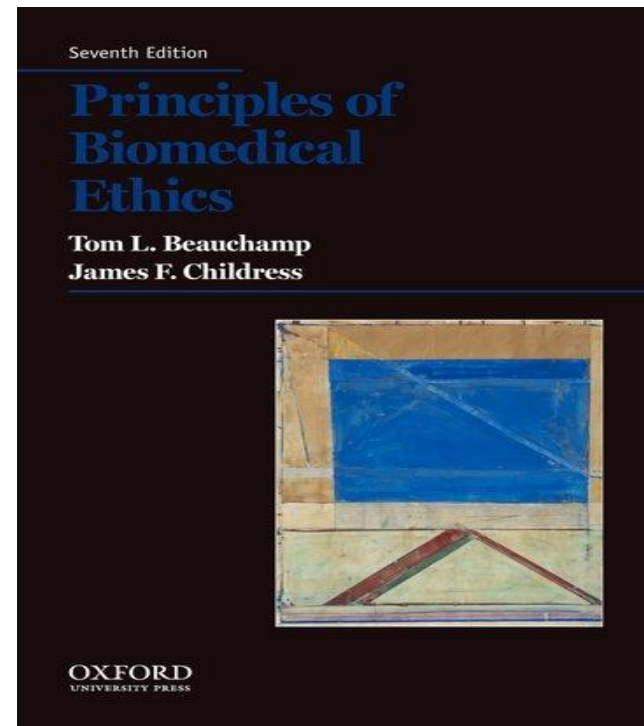
Accepted Bioethics Principles

Beauchamp and Childress, *Principles of Biomedical Ethics*

1. Autonomy

2. Beneficence

3. Nonmaleficence

4. Justice

Healthcare Ethics and AI

In light of these four principles, some unsettled questions arise:

1. Will AI destroy the physician-patient relationship?

2. How will clinicians inform patients about AI's role in their care? Do they need to?

3. AI requires vast amounts of data…are we setting ourselves up for a disaster? Are we asking patients to give up their privacy?

4. Are AI systems *really* devoid of human bias, error?

5. Who might miss out on AI's potential benefits? Will AI exacerbate existing inequalities?

6. Who bears responsibility when AI makes a mistake?

Piedmont

References

Beauchamp TB and Childress JF. *Principles of Biomedical Ethics*, 7th ed. Oxford: Oxford University Press, 2012.

Esteva A, Kuprel B, Novoa RA, et al. "Dermatologist-level classification of skin cancer with deep neural networks." *Nature* 2017 Feb 2;542(7639): 115-118.

Gulshan V, Peng L, Coram M, et al. "Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs." *JAMA* 2016 Dec 13;316(22): 2402-2410.

Topol E. *Deep Medicine: How Artificial Intelligence can Make Healthcare Human Again*. New York: Basic Books, 2019.

Wang P, Berzin TM, Brown JRG, et al. "Real-time automatic detection system increases colonoscopic polyp and adenoma detection rates: a prospective randomized controlled study." *Gut* 2019 Feb 27. doi: 10.1136/gutjnl-2018-317500.

Wellcome Trust. "Ethical, Social, and Political Challenges of Artificial Intelligence in Health." April 2018. Available online: https://wellcome.ac.uk/sites/default/files/ai-in-health-ethical-social-political-challenges.pdf.

Yang YJ and Bang CS. "Application of artificial intelligence in gastroenterology." *World J Gastroenterol* 2019 Apr 14;25(14): 1666-1683.

Yeung S, Rinaldo F, Jopling J, et al. "A computer vision system for deep learning-based detection of patient mobilization activities in the ICU." *NPJ Digital Med* 2, Article number 11: 11 (2019). Online: https://www.nature.com/articles/s41746-019-0087-z.

Piedmont