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AI in Healthcare: The Good, the Bad and the Future

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1

Speaker Disclosure

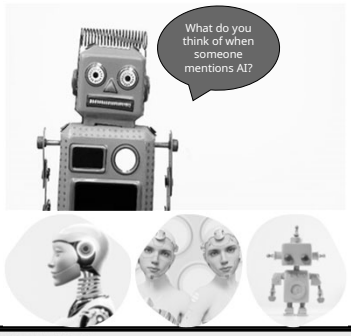
- I have NO financial disclosure or conflicts of interest with the presented material in this presentation.

2

Learning Objectives

- Explain the multiple ways artificial intelligence (AI) can be applied in health care.
- Describe the ethical considerations of the use of AI.
- Explore problems health care providers encounter that machine learning can help solve.
- Identify the pitfalls of AI in healthcare and workable solutions.

3

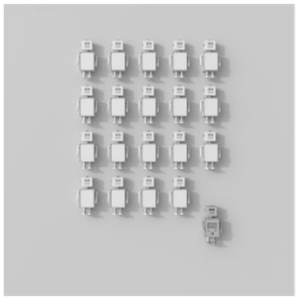


Artificial Intelligence

4

Artificial Intelligence

- Intelligence is the ability to learn.
- Artificial Intelligence
  - Theory and development of computer systems capable of performing tasks associated with human intelligence.
  - Recognizing speech, making decisions and identifying patterns.
  - Wide variety of technologies- machine learning, deep learning, and natural language processing (NLP).



5

Machine Learning

- Subfield of AI
- Most common
- Use of algorithms and data sets
  - Categorizing images
  - Analyzing data
  - Predicting price fluctuations

6

Deep learning

- Subset of machine learning
- Layers algorithms
- Neural networks
- Perform increasingly complex tasks

7

Natural Language Processing (NLP)

- AI subfield
- Computer science with linguistics
- Form of AI that allows computers to understand human language
- Written or spoken
  - Voice-activated digital assistants
  - Email-scanning programs to identify spam
  - Translation apps

8

Strong AI vs Weak AI

Strong AI

Capable of human-level intelligence
Artificial General Intelligence (AGI)
True AI
Turing Test

Weak AI

Artificial Narrow Intelligence (ANI)
Machine or deep learning to perform specific task
Daily AI

9

Types of AI

1. Reactive machines – playing chess
2. Limited memory machines- self-driving cars
3. Theory of mind machines
4. Self-aware machines

10

AI in Healthcare

- **First phase-** repetitive and administrative tasks, applications based on imaging- radiology, pathology and ophthalmology.
- **Second phase-** shift hospital to home- remote monitoring, alerting systems, virtual assistants. Expanding AI to other specialties, oncology, cardiology, neurology.
- **Third phase-** AI solutions based on clinical trials, focus on clinical decision support (CDS) tools. Integral part of healthcare.

11

First Phase- Research Results

- ChatGPT – women waiting to discuss core-needle breast biopsy results. 88% to 96% accuracy, consistency, definition provided, clinical significance. Management recommendation of high risk 52%. (Oluyemi, 2023).
- A study by Mass General Brigham, using ChatGPT, examined clinical decision-making processes in primary care and ED. 77% accuracy with final diagnosis and 60% differential diagnoses.
- Google Health in London compared accuracy of diagnosing respiratory and cardiovascular issues with primary care physicians using 20 SPs and text-based consultations. Outperformed physicians in conversation quality, explaining condition and treatment, and empathy (Nature, 2024).

12

Current Applications for AI

- **Medical Imaging**
  - AI powered image analysis for radiology
  - Automated detection of abnormalities in X-rays, MRIs and CT scans.
  - Examples: Google's DeepMind Health, Aidoc, Zebra Medical Vision
- **Disease Diagnosis**
  - AI algorithms for disease diagnosis.
  - Early detection of diseases such as cancer, diabetes, and cardiovascular conditions.
  - Example: IBM Watson for Oncology

13

Current Applications for AI

- **Personalized Medicine**
  - AI-driven personalized treatment plans.
  - Genetic profiling and analysis for tailored therapies.
  - Examples: Foundation Medicine, Tempus, Deep Genomics.
- **Drug Discovery and Development**
  - AI in drug discovery process.
  - Predictive modeling for drug efficacy and toxicity.
  - Accelerating drug development timelines.
  - Examples: Atomwise, Benevolent AI, Insilico Medicine.

14

Current Applications for AI

- **Virtual Health Assistants**
  - AI-powered virtual health assistants.
  - Chatbots for patient engagement and triage.
  - Remote monitoring and follow-up care.
  - Examples: Babylon Health, Ada Health, Your.MD.
- **Healthcare Operations Optimization**
  - AI for operational efficiency in healthcare facilities.
  - Predictive analytics for resource allocation and staffing.
  - Streamlining administrative tasks.
  - Examples: GE Healthcare's Command Center, Cerner's HealtheIntent.

15

Current Applications for AI

- Mental Health Support
  - AI applications for mental health support.
  - Chatbots and virtual therapists for counseling and support.
  - Examples: Woebot, Wysa, Tess.
- Data Analytics and Population Health Management
  - AI for analyzing large-scale healthcare data.
  - Predictive analytics for population health management.
  - Examples: Health Catalyst, Optum, Innovaccer.

16

The Good- Ways AI can Help Healthcare

Offers numerous opportunities to **revolutionize** healthcare.

More **efficient**, **accessible**, and **personalized**.

Leading to **better health outcomes** for individuals and populations.

- Medical imaging interpretation
- Early disease detection
- Personalized treatment plans
- Drug discovery and development
- Virtual health assistants
- Healthcare operations optimization
- Mental health support
- Telemedicine and remote monitoring
- Clinical decision support systems
- Genomic medicine.

17

The Bad Ethical Considerations.

- **Privacy Concerns**
  - Patient Data Protection
  - Compliance with Regulations
  - Data Breaches

18

The Bad Ethical Considerations

- **Security Concerns**
  - Cybersecurity Risks
  - Interoperability Challenges
  - Supply Chain Risks

19

Ethical Considerations

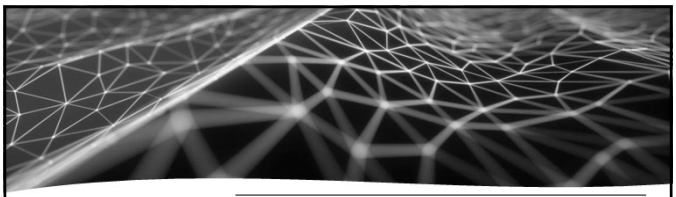
- **Bias Concerns**
  - Data Bias
  - Algorithmic Bias
  - Impact on Equity

20

Addressing AI Issues

- Multi-faceted approach
- Data governance practices
- Stringent security measures
- Ongoing monitoring
- Auditing of AI systems
- Transparency in algorithm development
- Commitment to diversity and inclusion
- Collaboration
- Development and Implementation of Ethical Guidelines and Standards

21

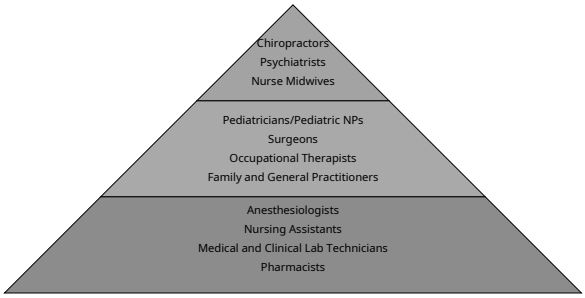


The Future of AI

AI will affect most jobs across all sectors – automation.
Healthcare has the lowest potential.
35% of time spent is automatable in Healthcare.
Varies by occupation.
Healthcare- augment rather than replace.

22

AI Healthcare Impact on Workforce



23

Regulation and Governance of AI

- **European Union**
  - High-Level Expert Group on AI (AI HLEG)
- **United States**
  - National Artificial Intelligence Research Resource Task Force/National AI Initiative Act of 2020
  - September 2023- Senator Schumer and leading tech CEOs met in Washington DC to discuss priorities and risks of AI and how it should be regulated.
- **United Nations**
  - UN Centre for Artificial Intelligence and Robotics (UNICRI)

24

AI in Nursing

- **American Nurses Association** (ANA)- 2022 Position Statement
- **American Association of Colleges of Nursing** (AACN)- resources for nursing faculty and students on integrating AI.
- **International Council of Nurses** (ICN)- advocates for nursing issues including the impact of AI and digital health on nursing practice.
- **Nursing Informatics Groups**- American Nursing Informatics Association (ANIA) and the Healthcare Information and Management Systems Society (HIMSS).

25

AI and Humans

- **Moore's Law**- computers are doubling their speed and memory capacity every 18 months.
- Computers will overtake humans in intelligence in 100 years.
- Ensure that computers have goals aligned with ours.
- Reap benefits while avoiding pitfalls.

26

AI and Humans

- Incalculable benefits vs adverse effects on human race
- Pay attention to AI safety.
- Set regulations to govern the creation of robots and AI.
- Ensure that robots will remain in the service of Humans.
- AI will surpass human intelligence.
- Major part of our lives – healthcare, work, education, and science.

27

The Future

- Predict what humans might achieve when our own minds are amplified by AI.
- Brain-computer interface
- Quantum computing.
- Don't fear change.
- Push boundaries and think BIG.

28

Our future is a race between the growing power of our technology and the wisdom with which we use it. Let's make sure that wisdom wins.

- Stephen Hawking

29

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30

Questions?

31