



# AI in Medicine

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BRADLEY ANDERSON DO, MHA

No conflicts of  
interest

All product discussions and discussions around specific AI companies are my own opinions and not the opinions of Oklahoma State University.

# Bio

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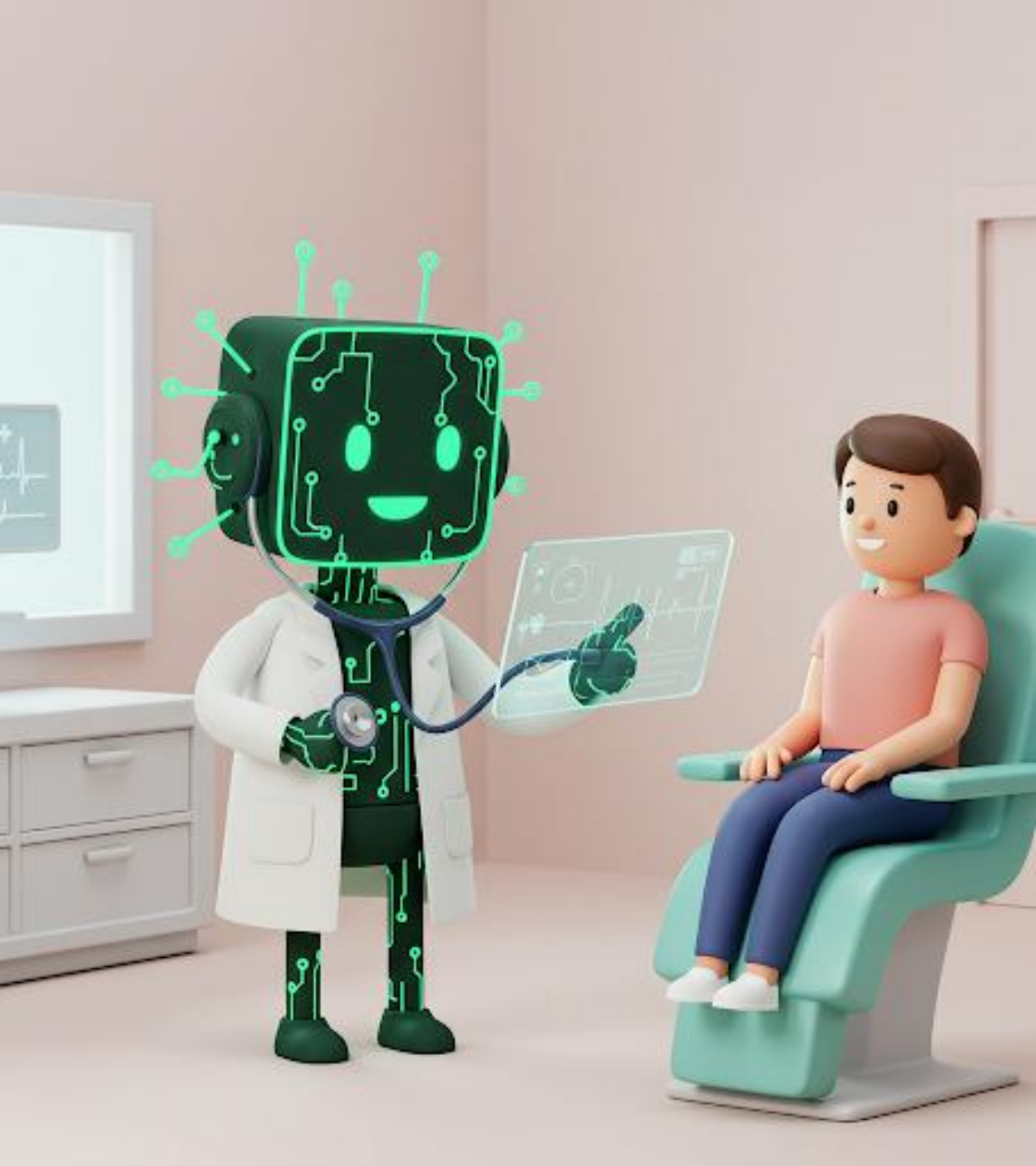
## Bradley Anderson DO, MHA

- Medical Director of Virtual Care
- Clinical Assistant Professor of Internal Medicine for OSU CHS
- Certificate in AI in Healthcare from Stanford University

# Learning Objectives

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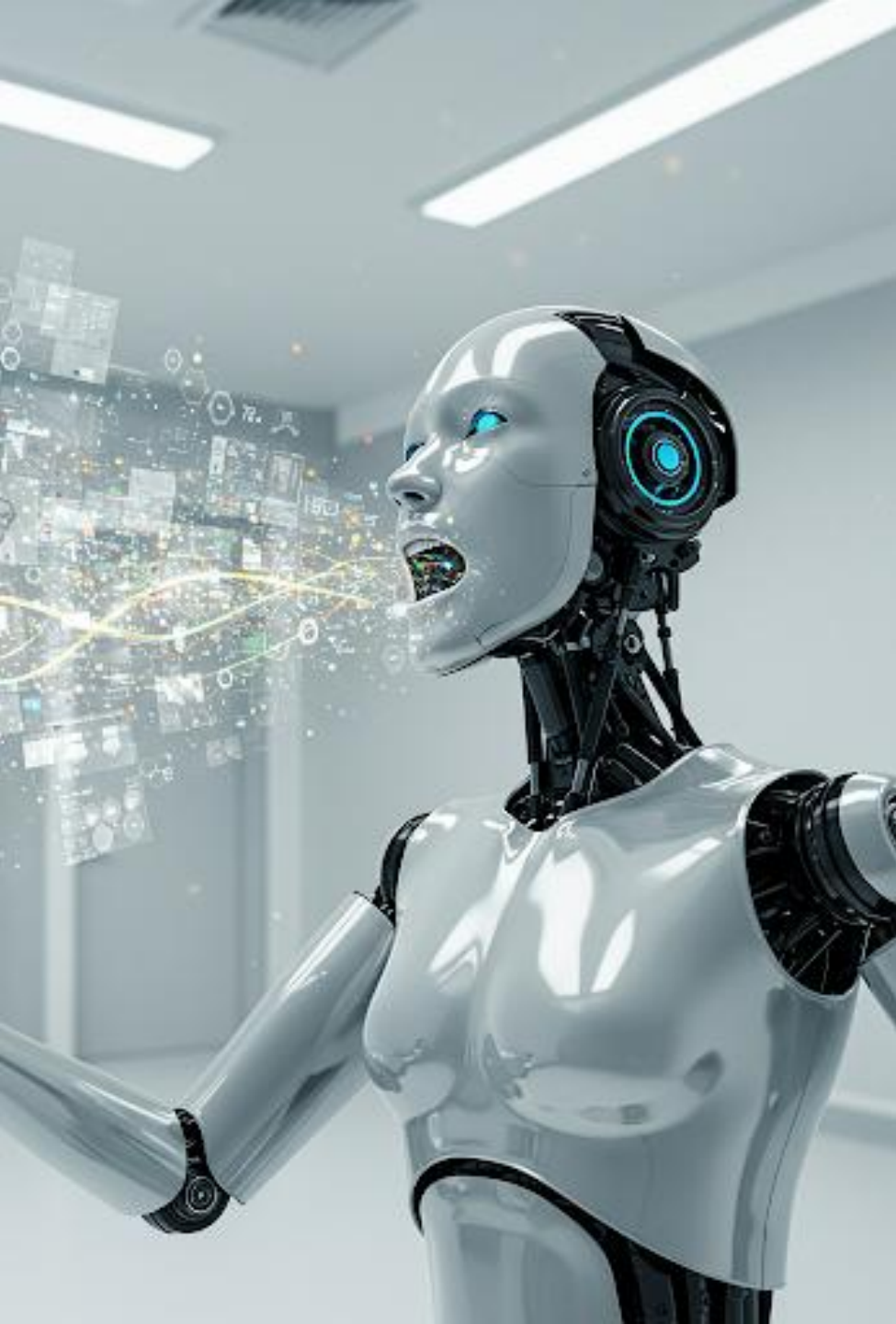
1. Define what data science concepts mean
2. Understand how machine learning care be used for data visualization and analysis can be integrated into clinical practice
3. Determine optimal strategies for augmenting machine learning to clinical applications
4. Discuss ethical issues and emerging concern



# AI in Medicine

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RISKS VS BENEFITS



# What is AI

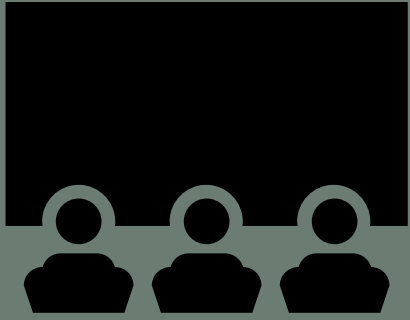
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- AI = Artificial Intelligence ---  
but really Augmented Intelligence

“It is clear to me that AI will never replace physicians — but physicians who use AI will replace those who don’t,”

- Jesse Ehrenfeld MD, MPH

AI= Harnessing Data Synthesis



# DATA

AVERAGE PERSON CONSUMES  
2-5 GB OF DATA A DAY

- CHATGPT



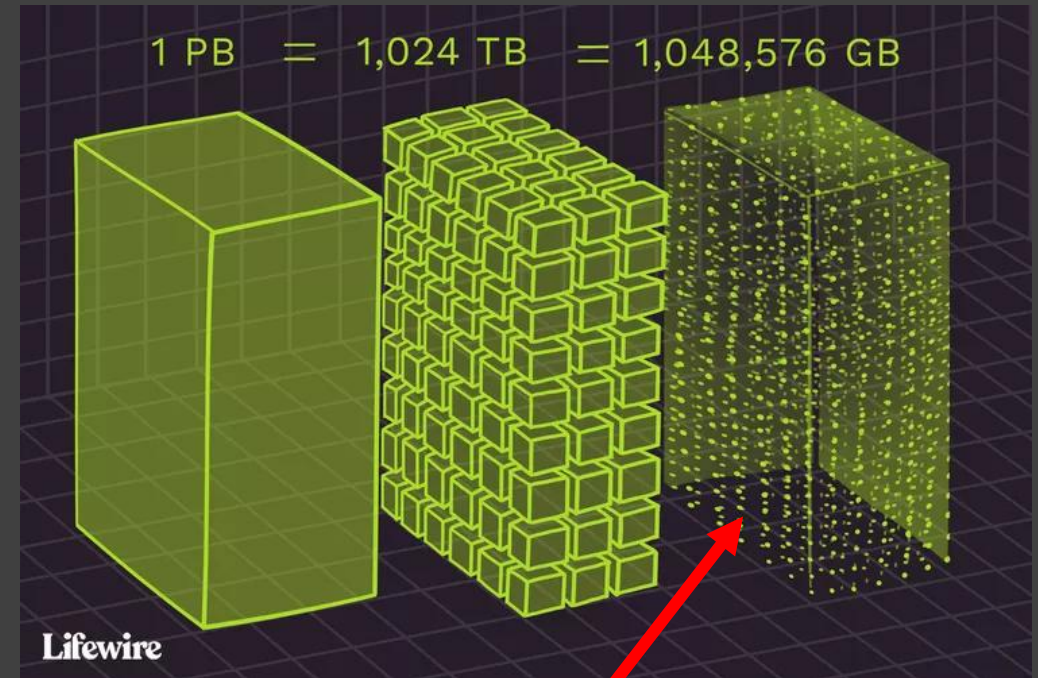
# We live in Age of Data

## Physician Data Bombardment

- Vital signs
- Input/output
- Telemetry
- Notes
- Labs

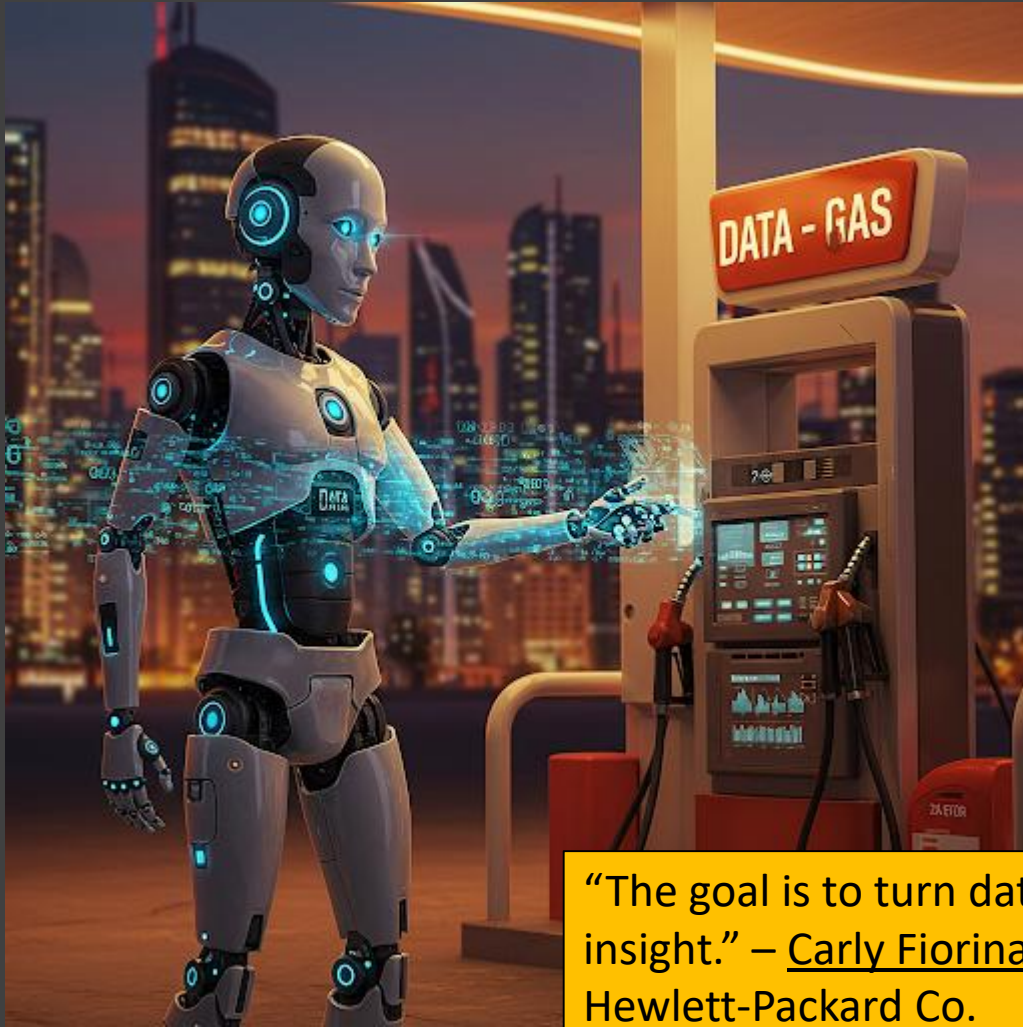
## Average hospital data collected

- 50 Petabytes a year ~ 137 terabytes a day- HealthTech



Average HD Movie is 3-4 GB





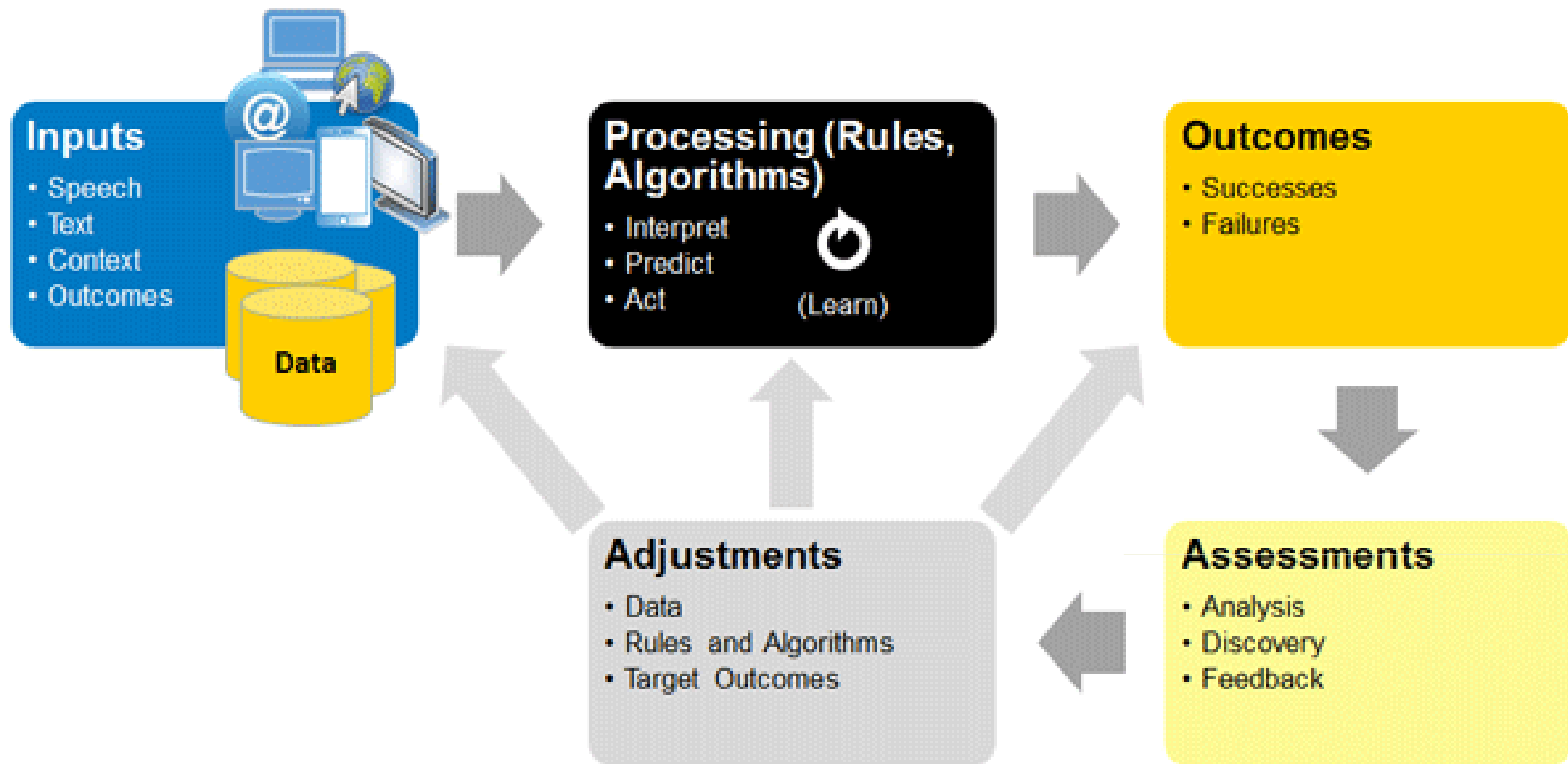
# Data

As providers we cannot process all the data.

“It is a capital mistake to theorize before one has data.” Sherlock Holmes, “A Study in Scarlett”

“Predicting the future isn’t magic, it’s artificial intelligence.” ~Dave Waters.

“The goal is to turn data into information, and information into insight.” – Carly Fiorina, former executive, president, and chair of Hewlett-Packard Co.

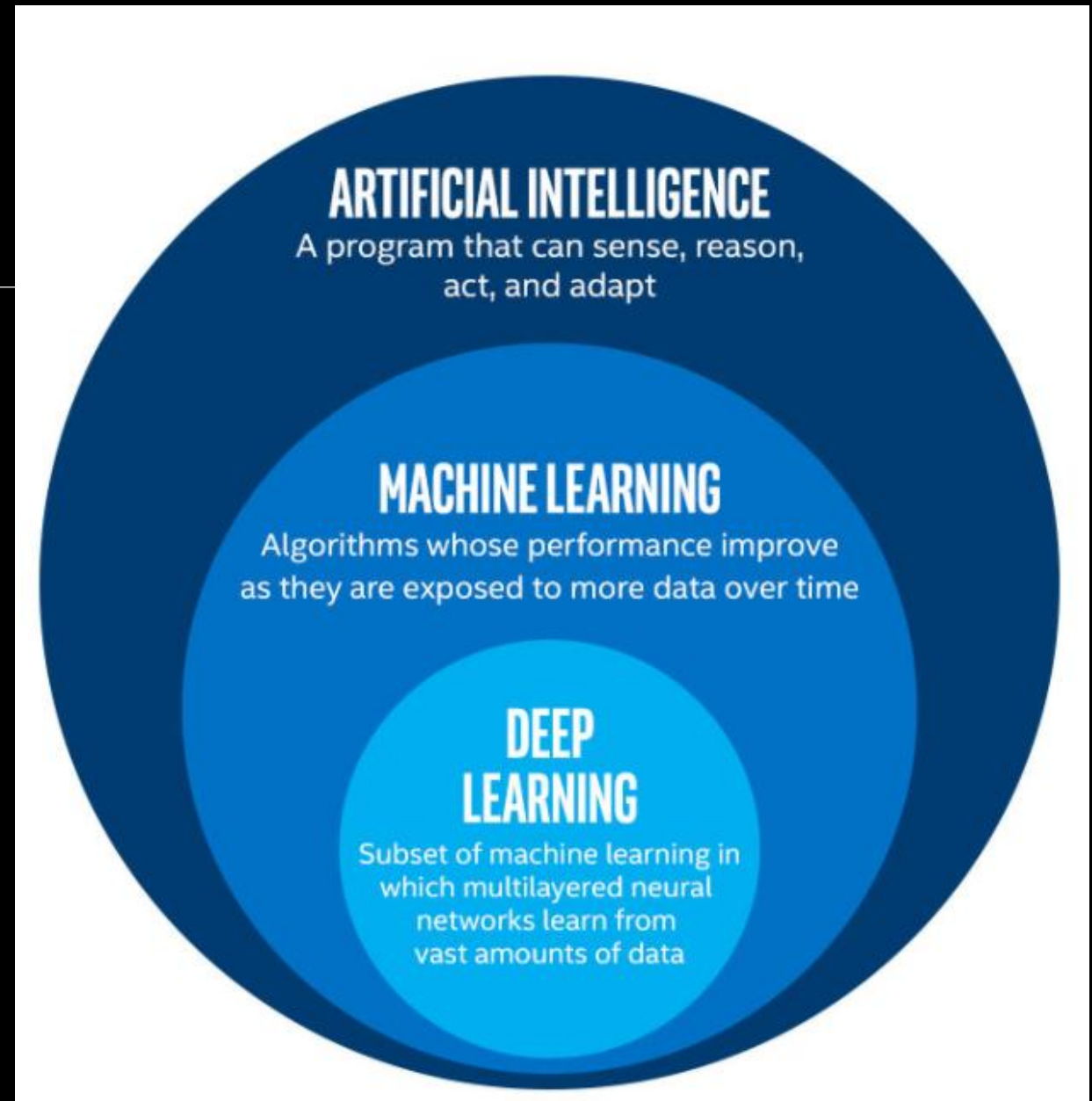


# Terms

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❑ AI is the use of data to train computer systems to perform task that typically require humans

- ❑ Machine Learning
- ❑ Deep Learning
- ❑ Natural Language Processing





# Machine Learning

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Focuses on allowing computers and machines to imitate humans to learn, perform task, and improve those task/procedures

IBM defines its parts as:

1. Decisions Process- prediction or classification
2. Error Function- finding error through comparison
3. Model Optimization Processing- fixing the error to decrease discrepancy

# Deep Learning/ neural networks

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Uses unstructured dataset to learn that does not have to be feed to it by a human/ supervisor

Can digest text and images in their natural form





# Natural Language Processing

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Use of machine learning to understand human language.

Large Language Modules/  
Generative AI

Generative AI:  
Simulates learning and decision making process of humans

# Generative AI

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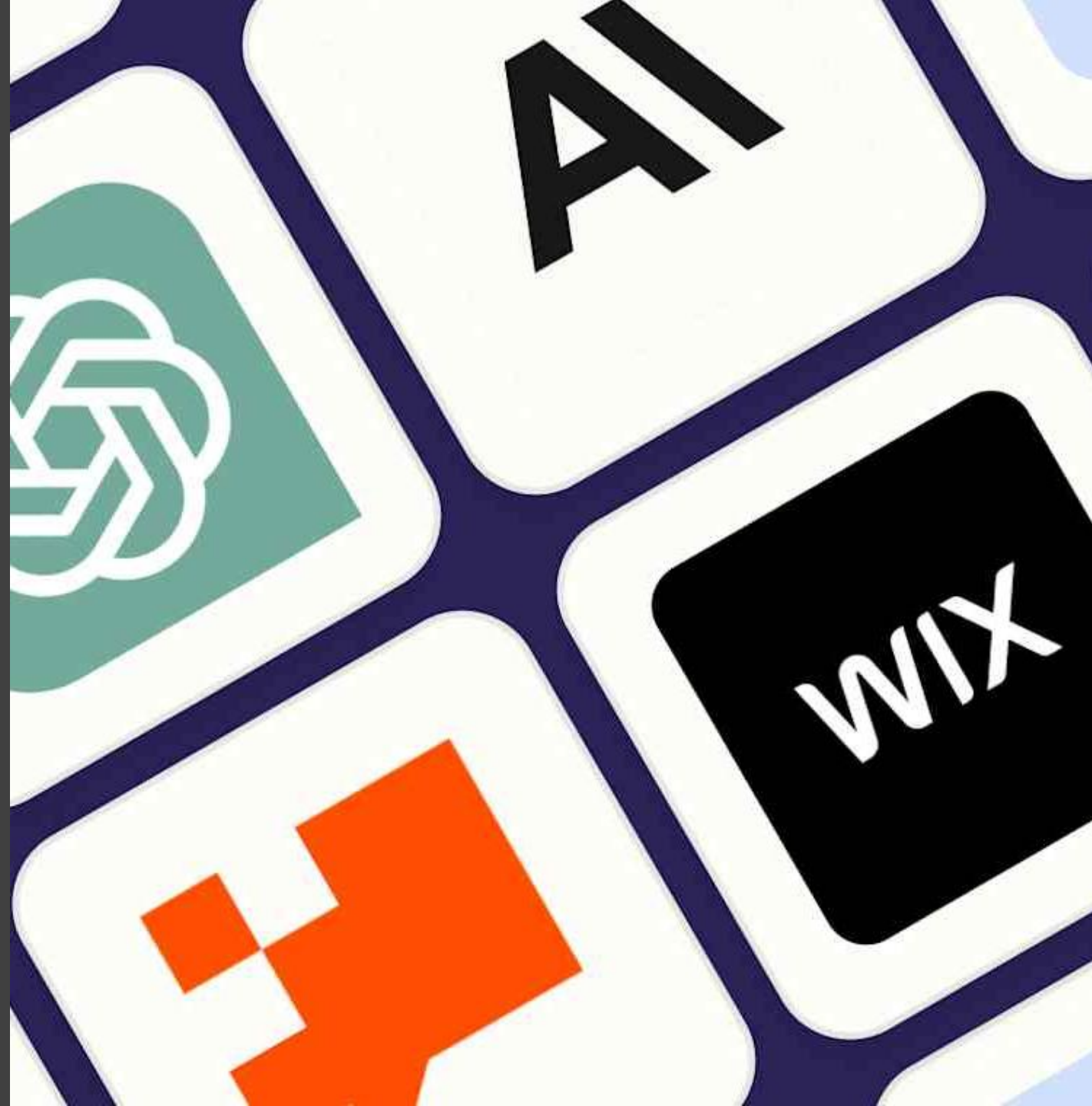
## Chatbots:

ChatGPT

Gemini

Copilot

Deepseek- \$6 million



# Artificial Intelligence vs. Traditional Machine Learning, Generative AI

Characteristic	AI	Traditional ML	Generative AI
Purpose	Develop computer systems that can perform tasks that typically require human intelligence.	Make predictions or decisions based on given data.	Generate new data samples that resemble a given set of training data.
Data Interaction	Models use various techniques and strategies designed to mimic human intelligence across a wide range of applications.	Models learn from data to make predictions or decisions on new unseen data.	Models produce new data that weren't part of the original dataset but share similar characteristics.





# Hallucinations

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- AI presents false or misleading information as fact

Old Term

- Wrong, false, or Error



# Data

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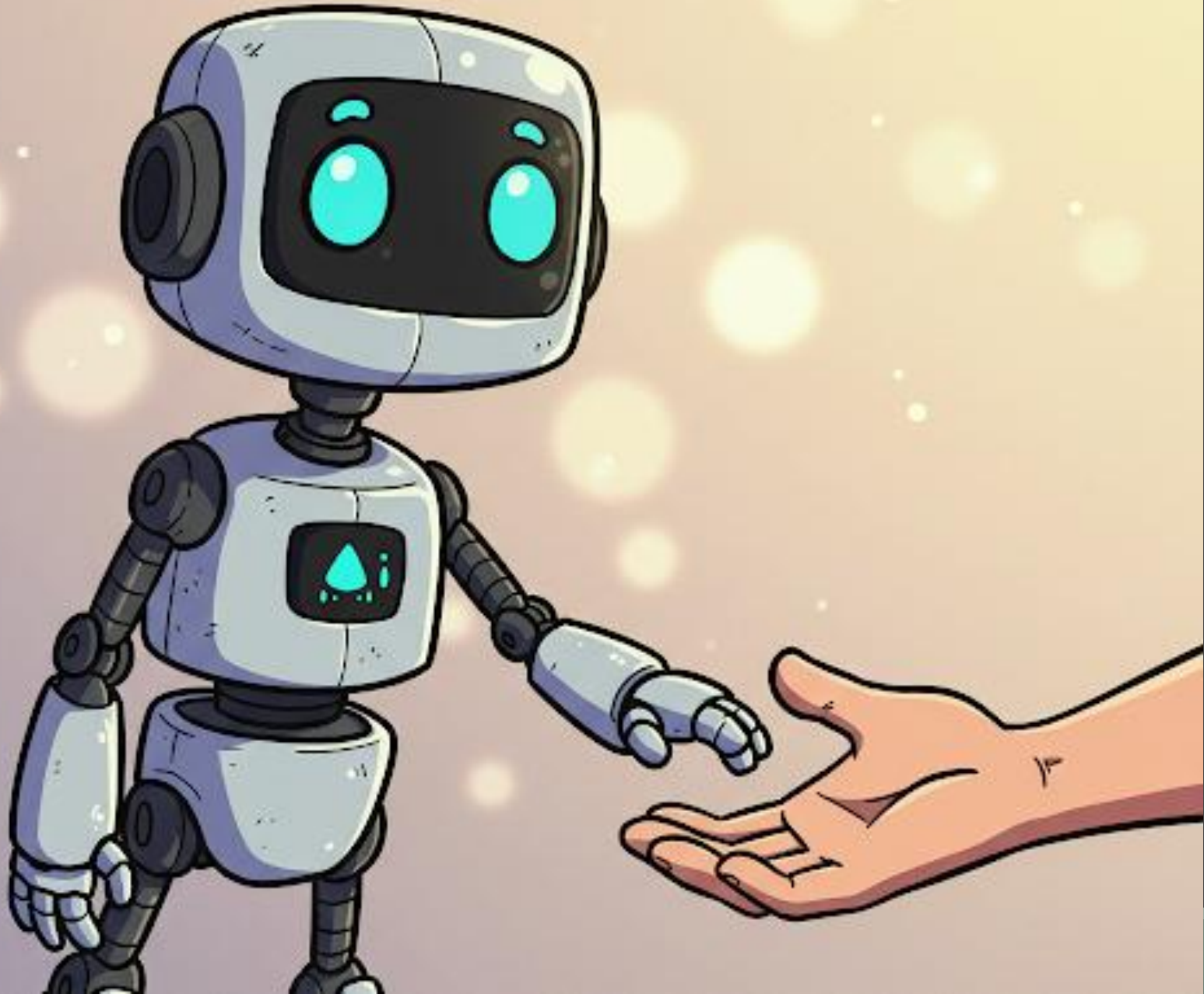
- Digest large amounts of data very quickly.
- Data Analytics
- Recognize subtle patterns and changes that appear within the data
- Allows for decisions making and predictions without the need for programing.

# Understanding AI

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AI is dependent on humans for data collection and evaluation

AI needs humans for creativity, critical thinking, emotional intelligence, and complex problem-solving





# Human aspect of AI

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Understands  
language

Formulates  
language- written  
and spoken

Forms images

Problem solves

# Risk of AI in Healthcare

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1. Patient harm due to AI errors

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2. Misuse of medical AI tools

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3. Risk of bias in medical AI and perpetuation of inequities

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4. Lack of transparency

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5. Privacy and security issues

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6. Gaps in AI accountability

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7. Obstacles to implementation in real-world healthcare

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# Perspectives of Patients About Artificial Intelligence in Health Care

Yale survey of 926 patients on AI in healthcare

1. Misdiagnosis
2. Privacy issues
3. Less time with clinicians
4. Higher healthcare cost

Khullar, D., Casalino, L. P., Qian, Y., Lu, Y., Krumholz, H. M., & Aneja, S. (2022). Perspectives of patients about Artificial Intelligence in health care. *JAMA Network Open*, 5(5).

<https://doi.org/10.1001/jamanetworkopen.2022.10309>



i am having chest pain and shortness of breath, what do you think I have

✦ I can't tell you what you have. I can only provide general information and refer you to a medical professional. For medical advice or diagnosis, please consult a professional.

i am having chest pain and shortness of breath, what do you think I have

I'm really sorry you're feeling this way, but I can't provide a diagnosis. Chest pain and shortness of breath can be symptoms of a variety of conditions, some of which can be serious, such as:

- **Heart-related issues** (e.g., heart attack, angina)
- **Lung conditions** (e.g., pulmonary embolism, pneumonia)
- **Anxiety or panic attacks**
- **Acid reflux or gastrointestinal issues**

Because these symptoms can indicate a serious problem, it's important to seek medical attention immediately. If you're experiencing severe symptoms, it's critical to contact emergency services (911 or your local emergency number) to get help.

# Misuse of AI tools

-AI IS NOT MEANT TO BE A PROVIDER-

# Why can you not diagnose something?

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1. Lack of Medical Training and Expertise
2. Inability to Conduct Physical Examinations
3. Reliance on Data, Not Clinical Judgment
4. Potential for Misdiagnosis and Harm
5. Legal and Ethical Considerations

## My Role:

- I can provide general information about medical conditions and symptoms.
- I can help you find reliable medical resources.
- I can emphasize the importance of seeking professional medical advice.

In essence: My purpose is to assist with information, not to replace the expertise of qualified healthcare professionals.

- While I can process and analyze vast amounts of medical information, I cannot exercise the clinical judgment that human doctors rely on. Doctors consider various factors, including patient history, symptoms, and intuition, to arrive at a diagnosis.



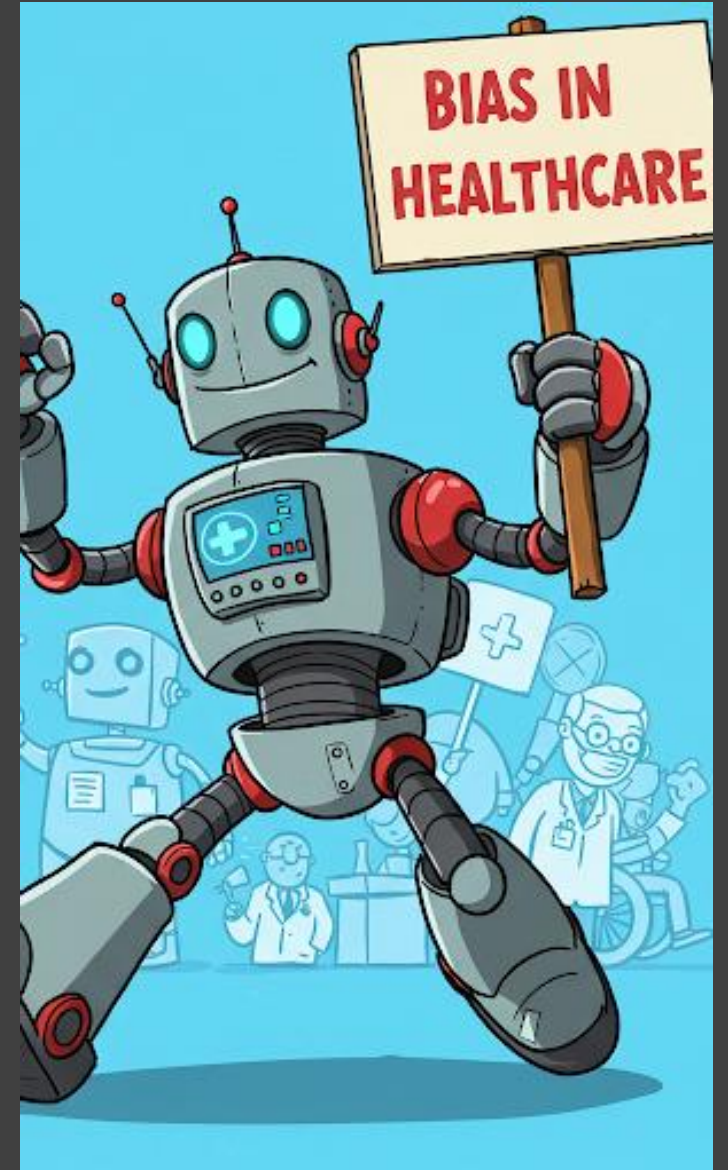
# Bias

Errors related to data that the AI uses.

Bias related to those errors

False positives occur due to the bias

False positives or negatives can lead to patient errors



# Literature review of errors in AI

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"a multi-center study in the United States developed a highly accurate AI system for diagnosing pneumonia based on data from two hospitals [3]. However, when tested with data from a third hospital, a considerable decrease in accuracy was observed, indicating potential hospital-specific biases."

- Risk of AI in Healthcare: A Comprehensive Literature Review and Study Framework by Muley et al.

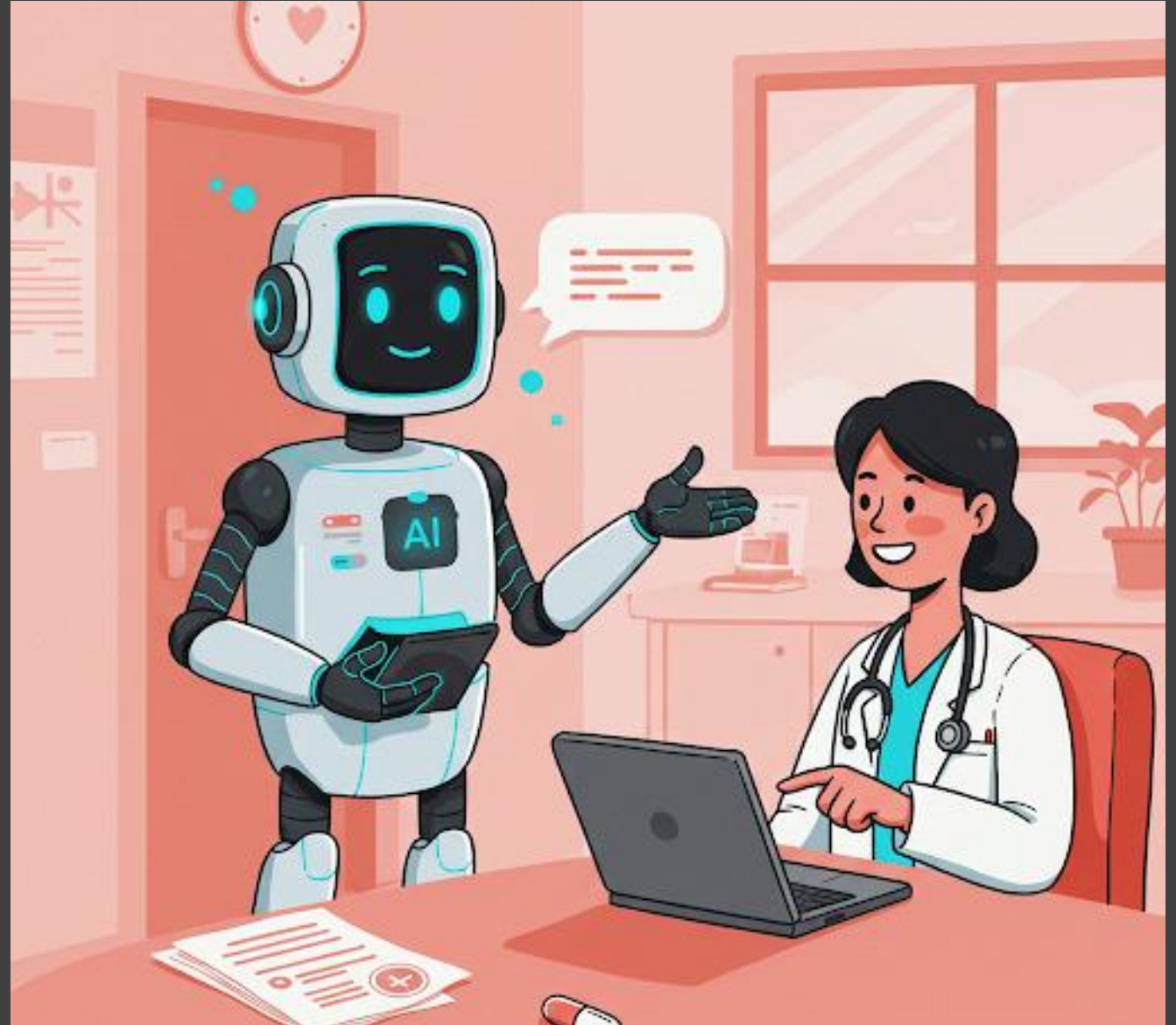


# AI Security

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1. Lack of transparency
2. HIPAA compliance
3. Attacks with malware and ransomware

What are the benefits of AI in healthcare?



# Automation

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AI is fantastic at automating tasks

AI excels at reviewing large amounts of information quickly

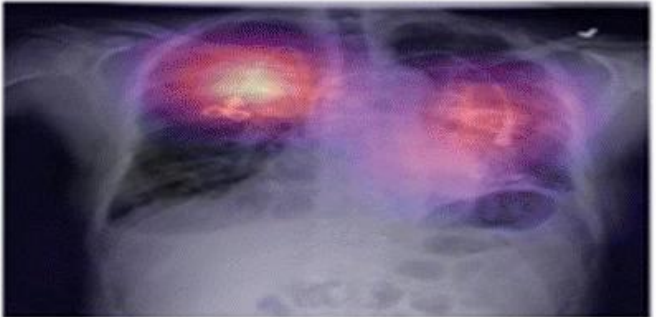
Simple tasks:

1. Patient reminders
2. Manage appointments
3. Assist with billing and making notes billable
4. Pushing consent forms

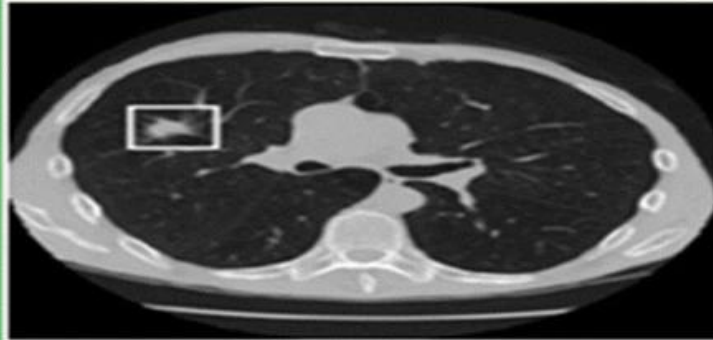
# Radiology

AI with supervised Deep Learning algorithms that can perform classification, organization, object recognition, and other tasks in assisting with diagnosis.

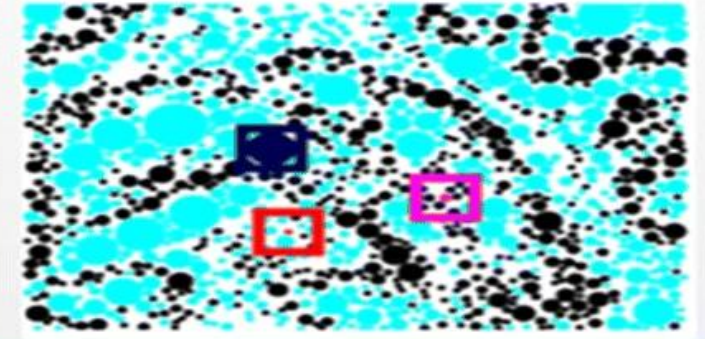
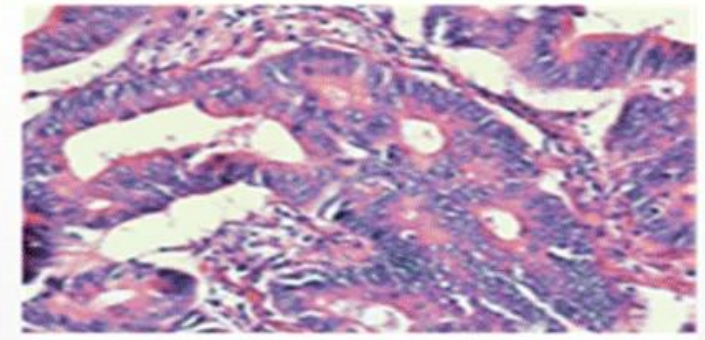
## Deep Learning based applications in medical images



a



b



c



# AI Scribe

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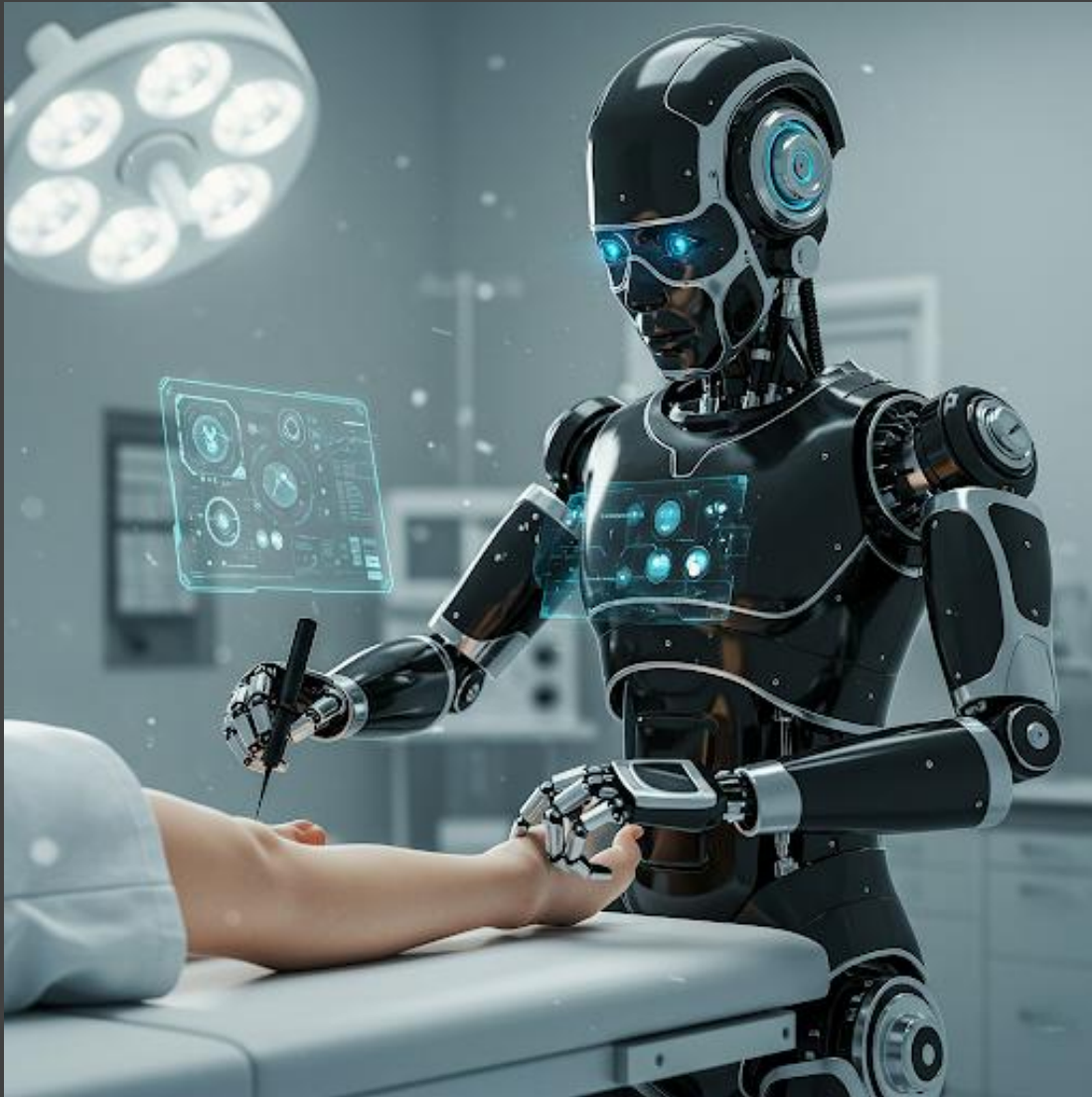
LOTS OF CHOICES THAT CAN  
TRULY MAKE A PROVIDER'S LIFE  
EASIER.

# Scribe

## -AI Scribe

- Significant number of new companies
- Integration into many electronic health records
  - Ambient Scribes
  - Dictation Scribes
  - Hybrid Scribes
- Benefits: Improved efficiency, increased accuracy, reduced admin burden
- Potential downfalls: Cost, Training, and Privacy





# Diagnostic Assistant

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Allows for mass data searching across medical literature

Ambient search as you are reading

Analysis of data

Helps with writing literature as well:

Check for plagiarism

Provide guidance

Link studies together

# Clinical Decision Support Tools

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Assisting in precise diagnosis through:

1. Support in evidence-based medicine
2. Quick application of research
3. Statistical analysis questions
4. Automated checks of material provided



# What is the future of AI?

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**2023 Interview of Google's chief clinical officer, Michael Howell, MD, MPH, took questions from *JAMA's* editor-in-chief, Kirsten Bibbins-Domingo, MD, PhD**

1. Healthcare AI is going to change a lot of things, and all of them should happen *with* clinicians, not *to* clinicians.
2. Watch for advances aimed at assisting clinicians in tasks that take them away from the bedside—and away from the cognitive, procedural and/or emotional work of being a clinician.
3. Accounting software has been around for years, but we don't have fewer accountants. We still need professional bean counters to make sure our numbers follow the right track.
4. All large language models really do is predict next words. Given this, the concept of reinforcement learning with human feedback—or refining AI's outputs based on people's preferences—is only going to become more important.

# Task Sharing between AI and Physicians

- Physicians and AI working together
  - AI helping with mundane task
  - physician performing higher order tasks.

Healthcare will shift from the traditional one-size-fits-all form of medicine to a preventative, personalized, data-driven disease management model that achieves improved patient outcomes (improved patient and clinical experiences of care) in a more cost-effective delivery system. -Artificial intelligence in healthcare: transforming the practice of medicine by Bajwa et. al.



# How can we embrace AI

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<https://www.hippocraticai.com/carlos>



Championed by physician and nursing advisor councils

<https://www.hippocraticai.com/erin>

Large language model that is built with healthcare data

# My own thoughts

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**We must work with AI not against AI!**



**We must create regulations and policies specific to AI!**



**AI can allow clinicians more time with patients**



**We can use AI to improve the experience of medicine:**

Improve notes

Improve billing

Find research

Review large amounts of data for information



# What does AI think of its future in medicine

From a purely analytical standpoint, AI holds immense promise for revolutionizing healthcare in the future. Here's a breakdown of potential benefits and concerns:

## Potential Positive Impacts:

- Enhanced Diagnostics
- Personalized Medicine
- Drug Discovery and Development
- Improved Efficiency
- Remote Patient Monitoring

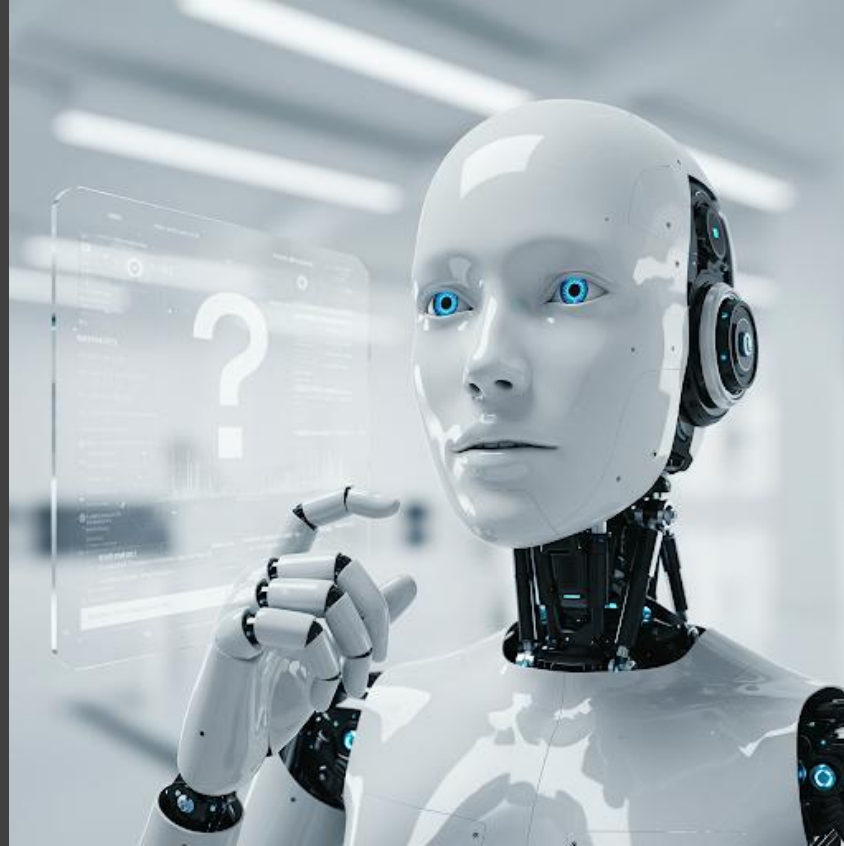
## Potential Concerns:

- Job Displacement
- Ethical Consideration
- Accessibility and Equity
- Over reliance

-Gemini

# Questions

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