

West Virginia Hospital Association

9/26/24

## The Impact of Artificial Intelligence in Health Care

What health care leaders need to know... Now!

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Could your next doctor be an AI hologram?



# The Impact of Artificial Intelligence in Health Care

This train has left the station!

“There is no deep difference between what can be achieved by a biological brain and what can be achieved by a computer.

It therefore follows that computers can emulate human intelligence – and exceed it.”

Stephen Hawking 2017

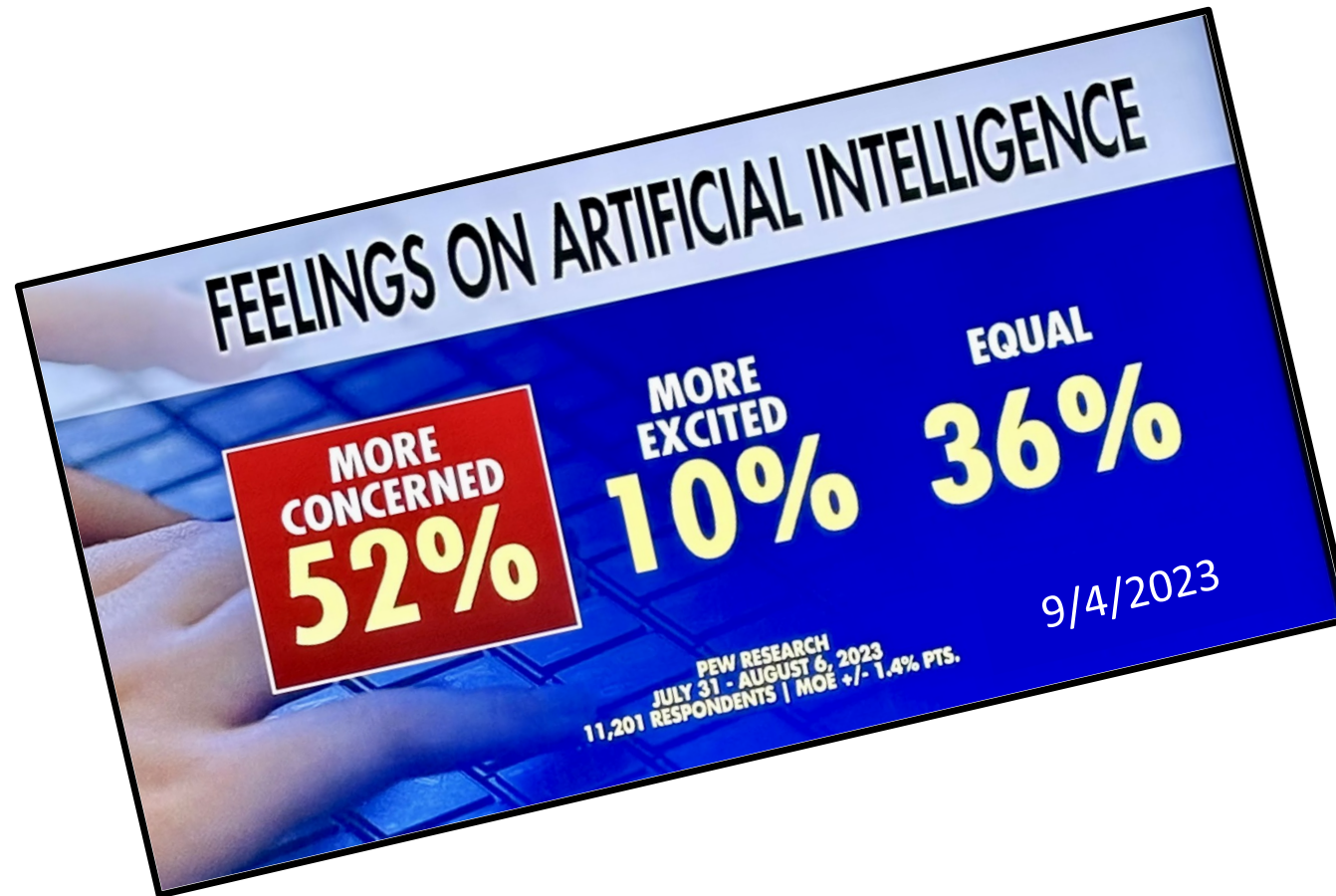
“If you don’t know AI, you’re going to fail.

Period, End of story.”

Mark Cuban 2024

# The Impact of Artificial Intelligence in Health Care

This train has left the station!



# The Impact of Artificial Intelligence in Health Care

## Presentation Outline

- I. The fundamentals of artificial intelligence (AI)
  - A. Force multipliers of AI- hardware, software, connectivity
  - B. Current controversies in AI
  
- II. Artificial intelligence in the workplace
  - A. The new culture- a partnership between the human and AI
  - B. Specific AI applications in health care

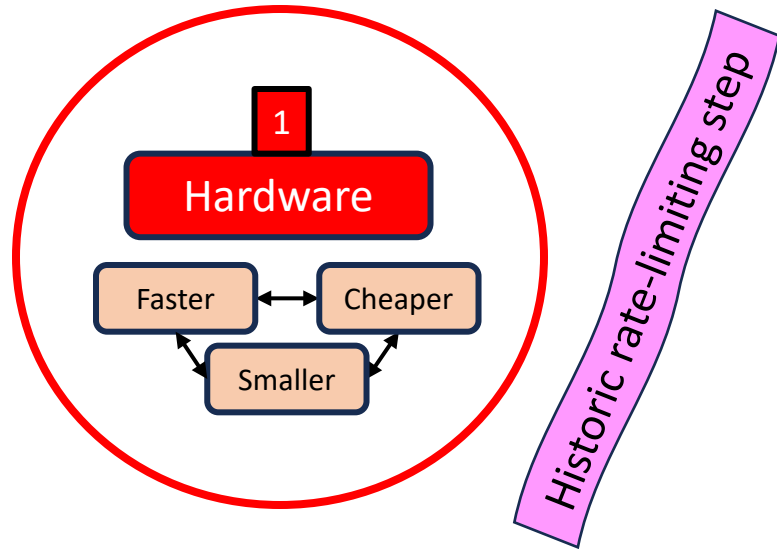
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# Force Multipliers of AI

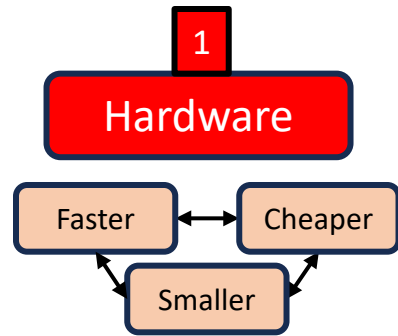
Hardware, Software, Connectivity



**Gordon Moore's law (Intel) 1965:**  
The number of transistors in an integrated circuit doubles about every two years.

# Force Multipliers of AI

Hardware, Software, Connectivity



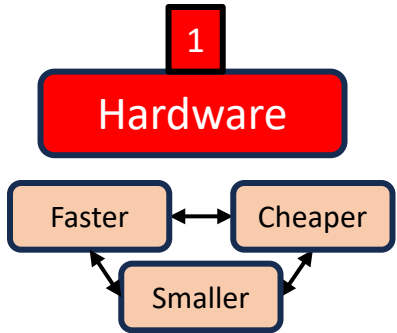
1954- 5-megabytes  
Computer card data



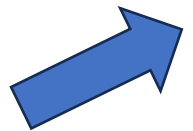
1956- 5-megabyte  
Computer (2,000 lbs)

# Force Multipliers of AI

Hardware, Software, Connectivity



1959- 4-gigabytes Warehouse



\$12.98

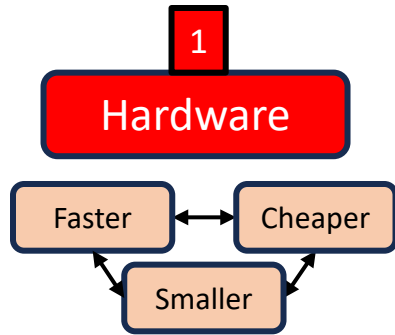
June 2024- 2-terabyte Thumb drive

(500 Warehouses)

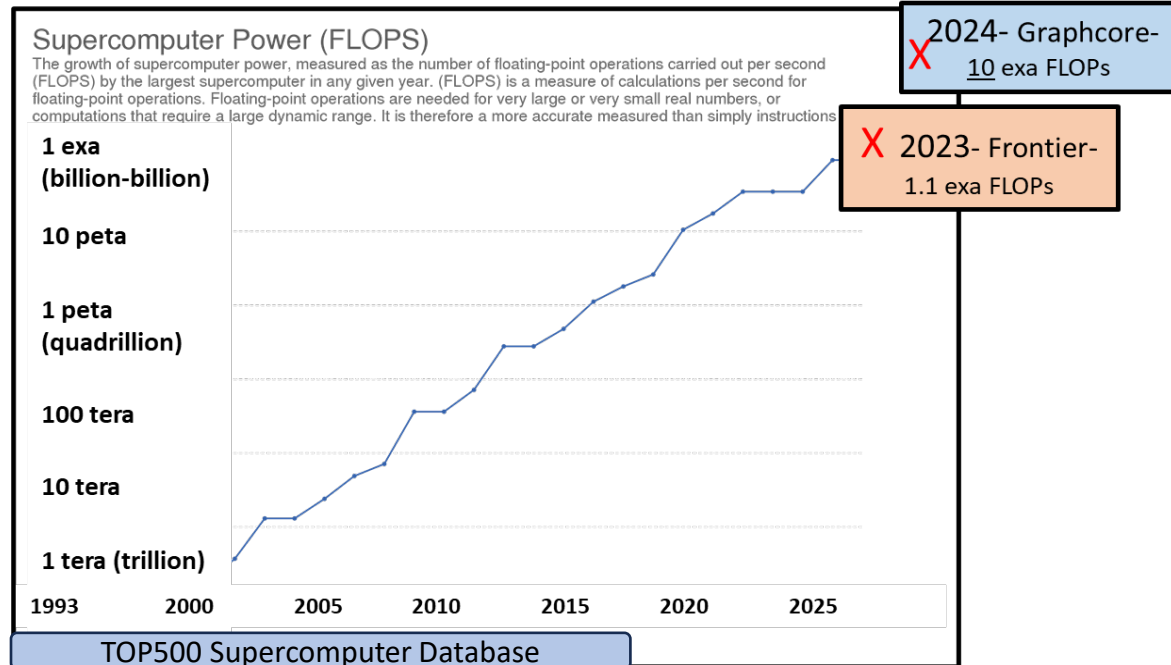
# Force Multipliers of AI

Hardware, Software, Connectivity

2024- Enter the world of Exa... a billion x billion



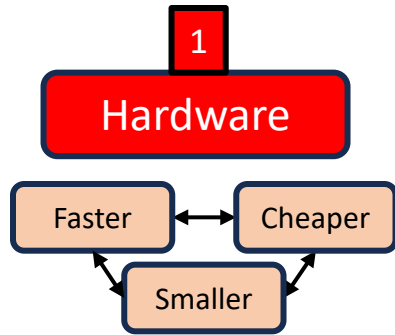
Mega x 1,000 → Giga x 1,000 → Tera x 1,000 → Peta x 1,000 → Exa.....



# Force Multipliers of AI

Hardware, Software, Connectivity

## Next Steps:

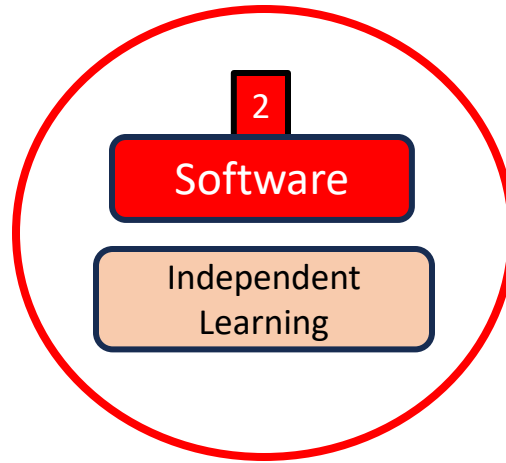
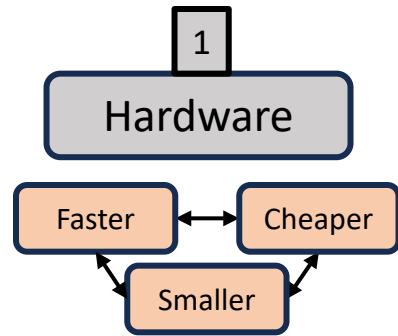


1. Quantum computers- from transistors to atoms
2. Photon computers- from electricity to light
3. Neural computers- networking like the human brain

Almost 60 years later...  
Moore's Law is functionally alive and well.

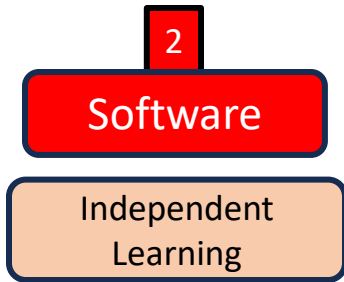
# Force Multipliers of AI

Hardware, **Software**, Connectivity



# Force Multipliers of AI

Hardware, **Software**, Connectivity



Machine Learning: The ability of computers to learn without explicitly being programmed.

Supervised learning- training with pre-established data.

Unsupervised learning- learning with new data.

# Force Multipliers of AI

## Hardware, **Software**, Connectivity

2

Software

Independent  
Learning

Machine Learning: The ability of computers to learn without explicitly being programmed.

Example: Diabetes Mgmt Protocol

Supervised learning- training with pre-established data.

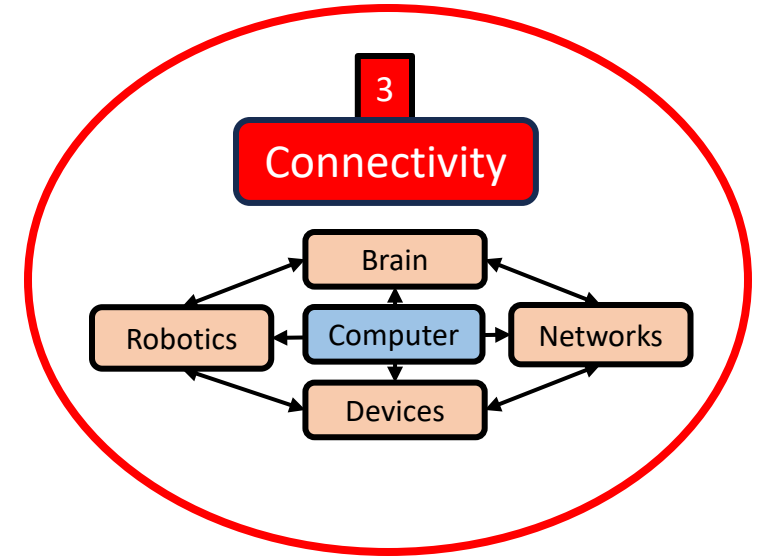
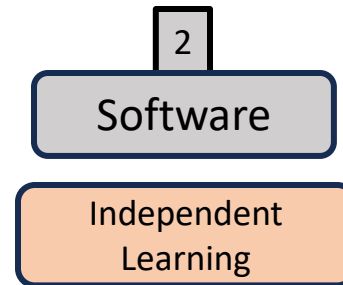
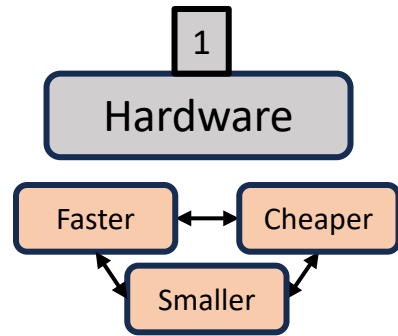
Implements a pre-existing protocol instantaneously

Unsupervised learning- learning with new data.

Uses NEW data to revise and improve protocol

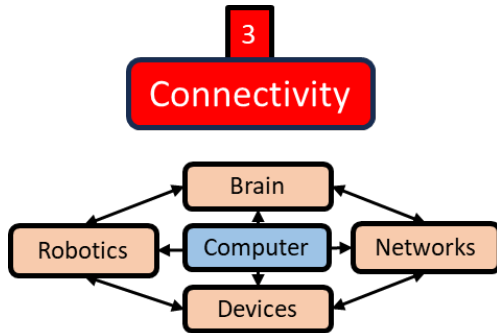
# Force Multipliers of AI

Hardware, Software, **Connectivity**



# Force Multipliers of AI

Hardware, Software, **Connectivity**



## Brain- computer interfaces- (BCI's)

A brain computer interface (BCI)-  
A direct communication between the brain and an external device.

Current patient applications:

1. Using one's thoughts to browse the internet
2. Controlling a prosthetic arm

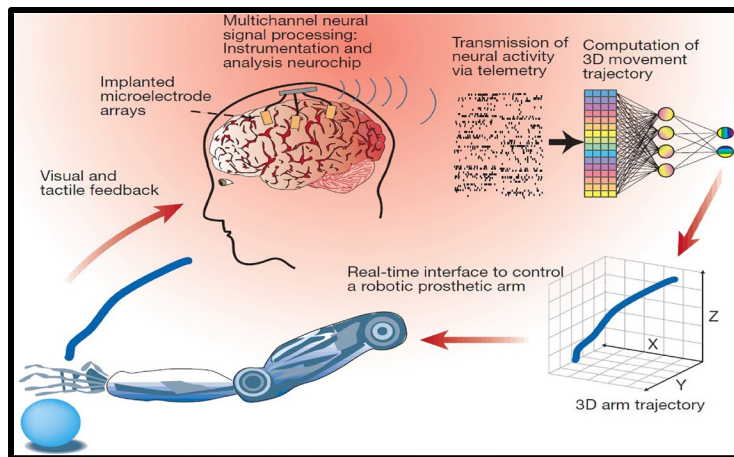
Potential concerns:

Could the computer...

... read the rest of your mind?

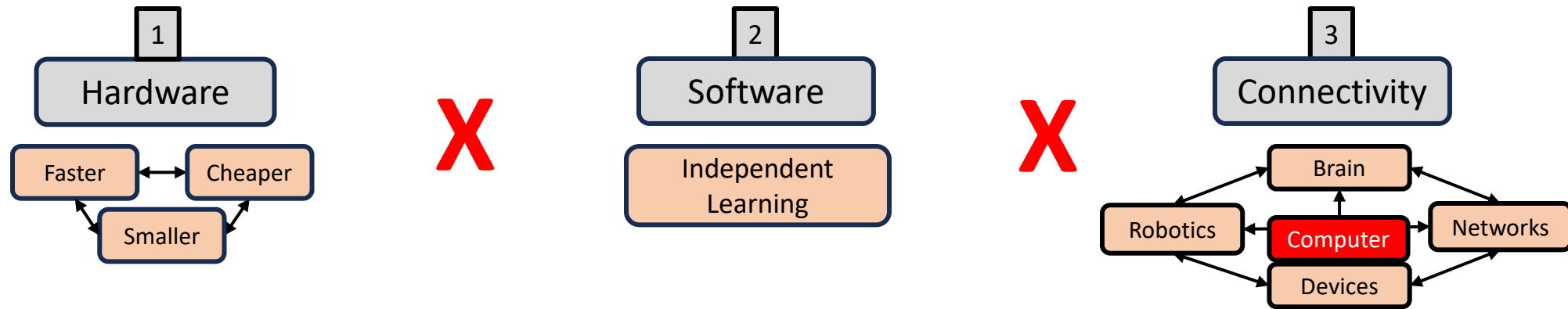
... control your mind?

... enact your gratuitous thoughts?



# Force Multipliers of AI

## Hardware, Software, Connectivity



AI Force Multipliers:  
Together, they exponentially increase performance

# The Impact of Artificial Intelligence in Health Care

## Presentation Outline

- I. The fundamentals of artificial intelligence (AI)
  - A. Force multipliers of AI- hardware, software, connectivity
  - B. Current controversies in AI-
    1. Can AI be trusted?
    2. What is the future of GPT?
    3. Can AI approach singularity and lead to human extinction?
    4. Regulation- is it already too late?
  
- II. Artificial intelligence in the workplace
  - A. The new culture- a partnership between the human and AI
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# Current Controversies in AI

## 1. Can AI be trusted?

Lies, damned lies, and statistics.....and now AI !

“The danger is rubbish in, rubbish out, rubbish all about.”

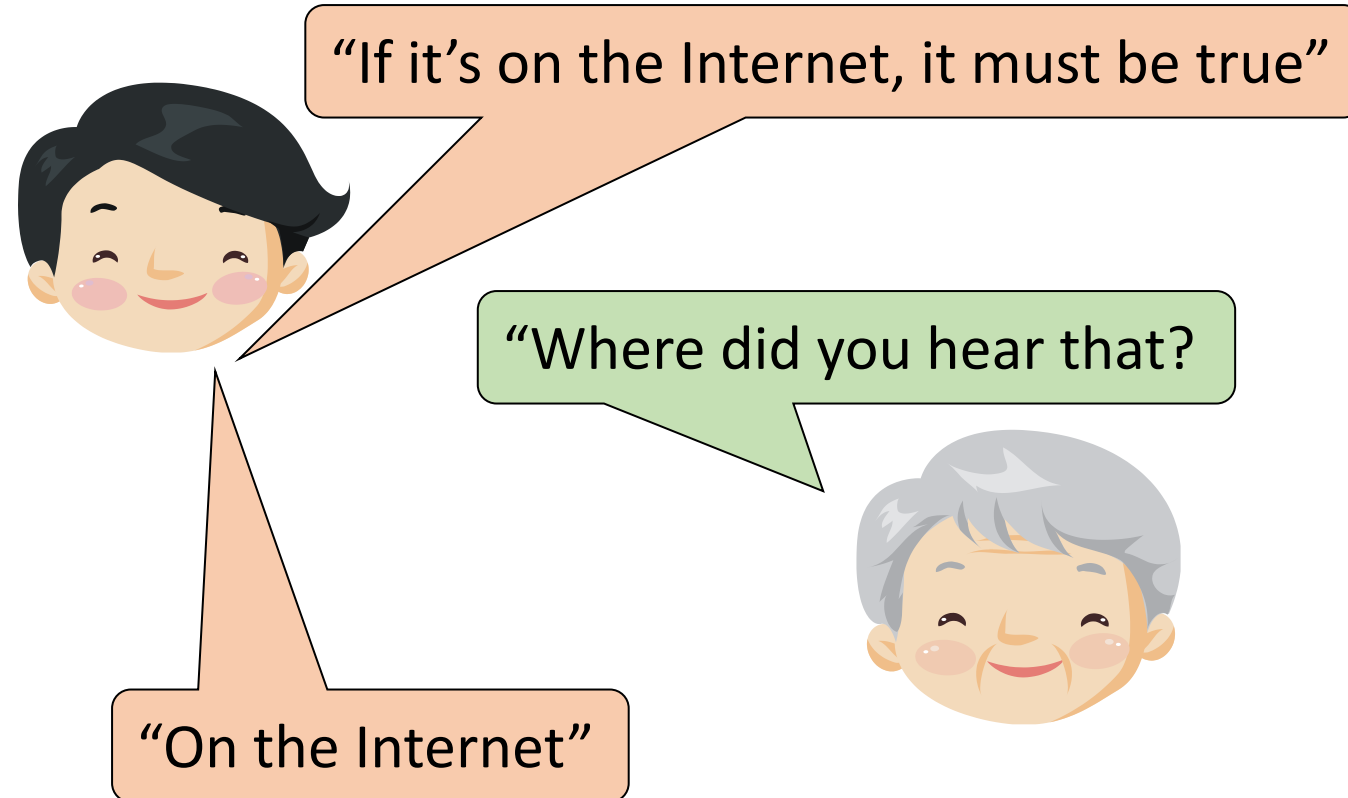
“Bots like ChatGPT will regurgitate the claptrap as fact.”

“You are also seeing the effects of the bias of the input-er.”

Robert Thompson, Sept 2023

# Current Controversies in AI

## 1. Can AI be trusted?

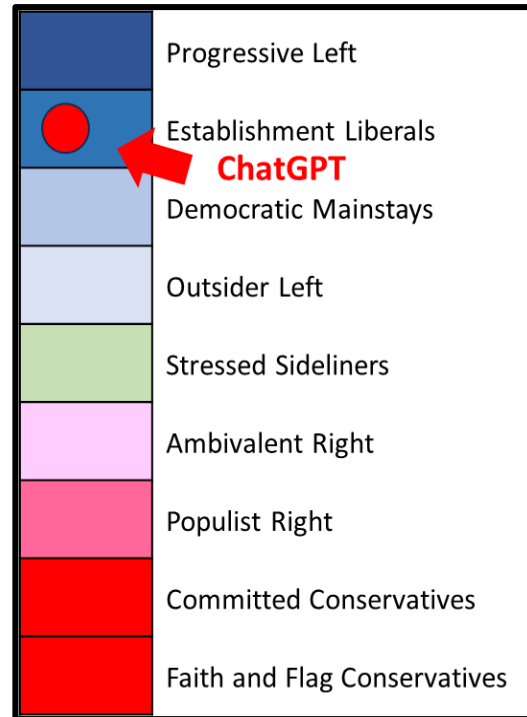


# Current Controversies in AI

## 1. Can AI be trusted?

Lies, damned lies, and statistics.....**and now AI !**

### Pew Political Typology Quiz

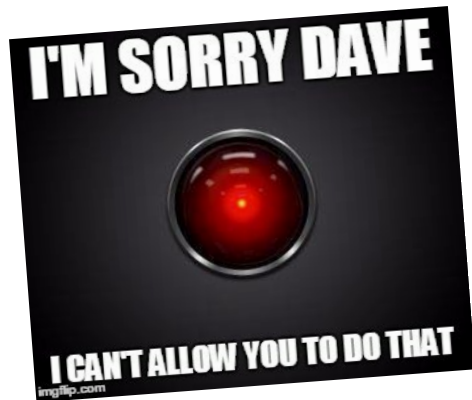


# Current Controversies in AI

## 1. Can AI be trusted?

### Emergent Properties

Emergent properties- unexpected or unpredictable events that arise out of the collaborative functioning of a system.



1968-  
2001 A Space Odessey



1984-  
The Terminator

Bottom line...  
AI may develop a "life of its own"

# Current Controversies in AI

## 1. Can AI be trusted?

### Hallucinations

Hallucinations- confident AI responses that are nonsensical or not justified by its training data or algorithms.

“AI can give a very impressive-sounding answer that's just dead wrong!”

Oren Etzioni, AI2 2023

“ChatGPT is an omniscient, eager-to-please intern who sometimes lies to you ... ”

Ethan Mollick, 2023

“It’s all hallucination, but we only call it that when we notice it’s wrong... ”

Heaven MIT, 2024

Bottom line...

AI will “make things up” by design

# Current Controversies in AI

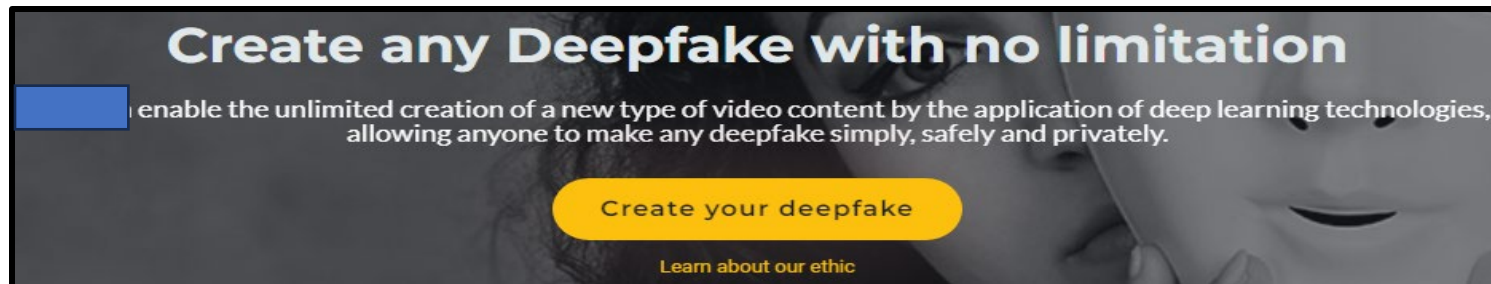
## 1. Can AI be trusted?

### Deep fakes

Deep fake - an image, a video or an audio that deliberately replaces the person in the original with someone else

Potential consequences of deep fakes:

- The blurring of reality - What is real?
- Cybersecurity- individual reputations/ blackmail
- Who owns a deep fake?



**Create any Deepfake with no limitation**

enable the unlimited creation of a new type of video content by the application of deep learning technologies, allowing anyone to make any deepfake simply, safely and privately.

Create your deepfake

[Learn about our ethic](#)

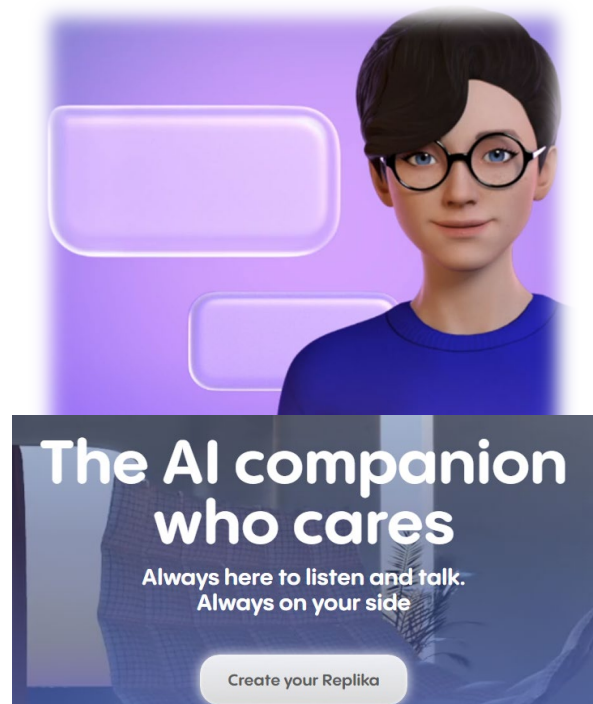
# Current Controversies in AI

## 1. Can AI be trusted?

### Addictive AI

### AI as your “friend” ?

#### Replika



#### Broken Bear

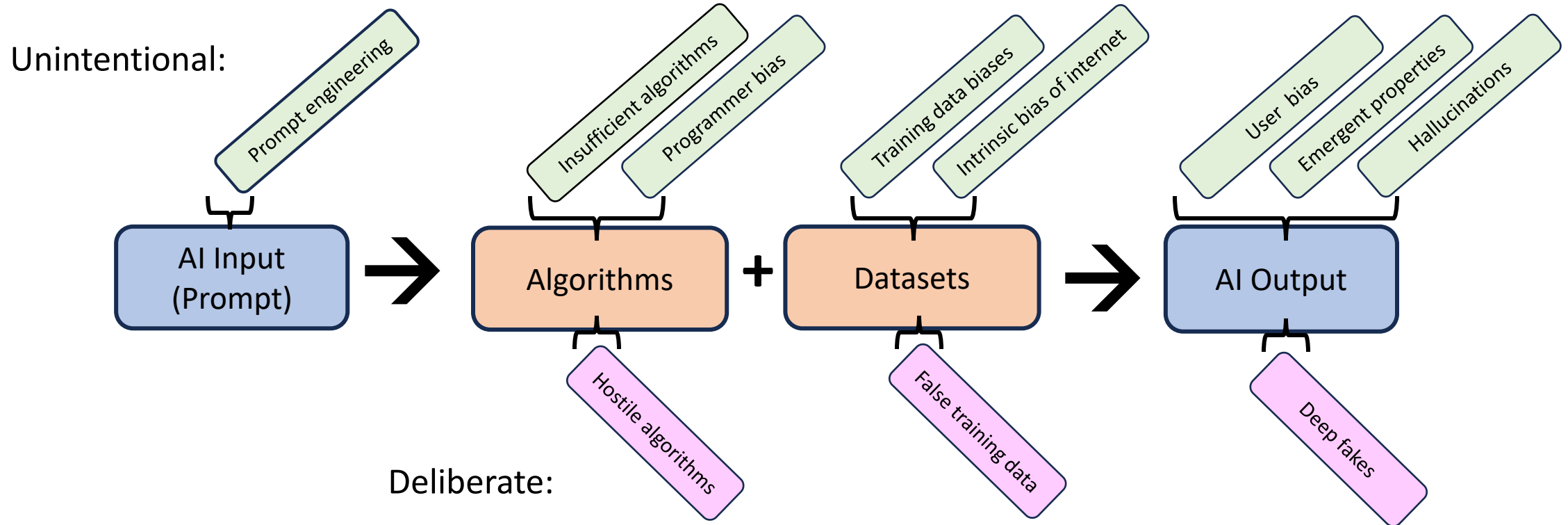


“Hello, I am Broken Bear,  
the bear that loves your broken self”

# Current Controversies in AI

## 1. Can AI be trusted?

Multiple potential entry points for AI bias

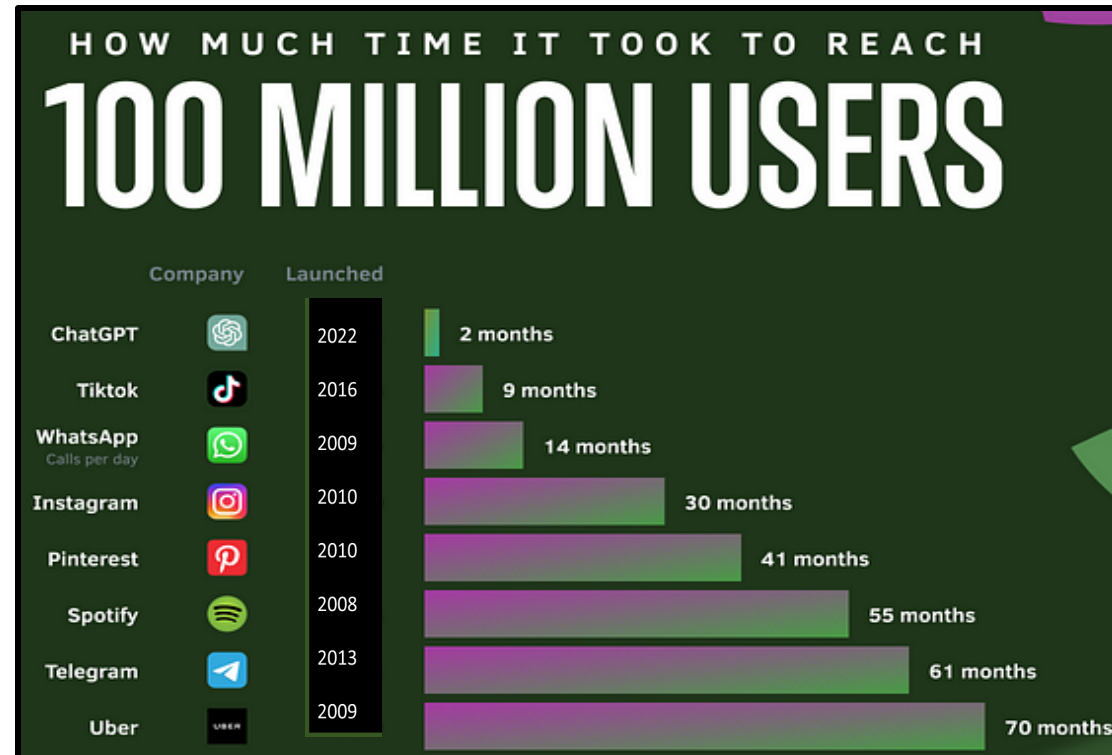


# Current Controversies in AI

## 2. What is the future of GPT?

### Generative AI

Open AI's Chat GPT-4... 100 million users in the first 2 months !



# Current Controversies in AI

## 2. What is the future of GPT?

### Composing creative text

#### Input:

Explain the plot of Cinderella in a sentence where each word must begin with the next letter in the alphabet from A to Z, without repeating any letters:

#### **Output**

A beautiful Cinderella, dwelling eagerly, finally gains happiness;  
inspiring jealous kin, love magically nurtures opulent prince;  
quietly rescues, slipper triumphs, uniting very wondrously, xenial  
youth zealously. ■

# Current Controversies in AI

## 2. What is the future of GPT?

### Applying visual recognition

#### Input:

What can be made with these ingredients?



#### Output:

There are many options for what you can make with these ingredients! Some possibilities include:

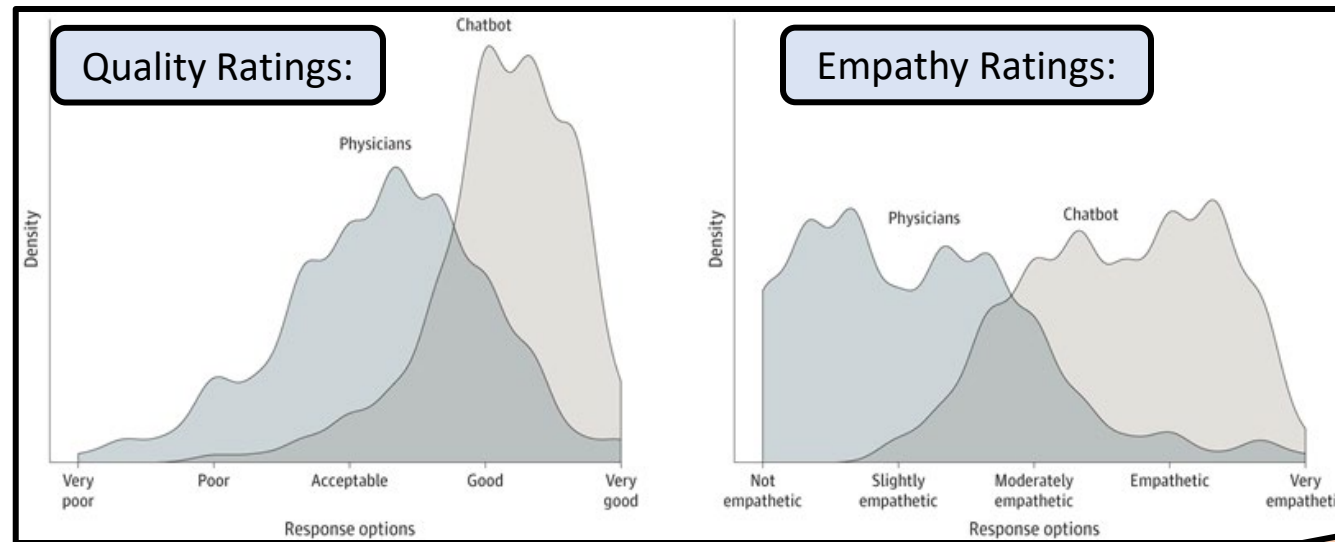
- -Pancakes or waffles
- -Crepes
- -French toast
- -Omelette or frittata
- -Quiche
- -Custard or pudding
- -Cake or cupcakes
- -Muffins or bread
- -Cookies or biscuits

There are just a few examples, but the possibilities are endless!

# Current Controversies in AI

## 2. What is the future of GPT?

### Providing medical advice



GPT 3.5 !

- Responses were rated by team of healthcare professionals
- Chatbot responses were rated significantly higher for both quality and empathy- 78%

Ayers UCSD, JAMA 2023

# Current Controversies in AI

## 2. What is the future of GPT?

### Performance on standardized tests

90<sup>th</sup> percentile- State Bar exam

93<sup>rd</sup> percentile- SAT Reading exam

89<sup>th</sup> percentile- SAT Math exam

Passing score- USMLE (all three parts)

Near passing score- Neonatal boards

74<sup>th</sup> percentile- Multistate Professional Responsibility Exam

Kung, Feb 2023

Chat-GPT, Mar 2023

Beam, JAMA 2024

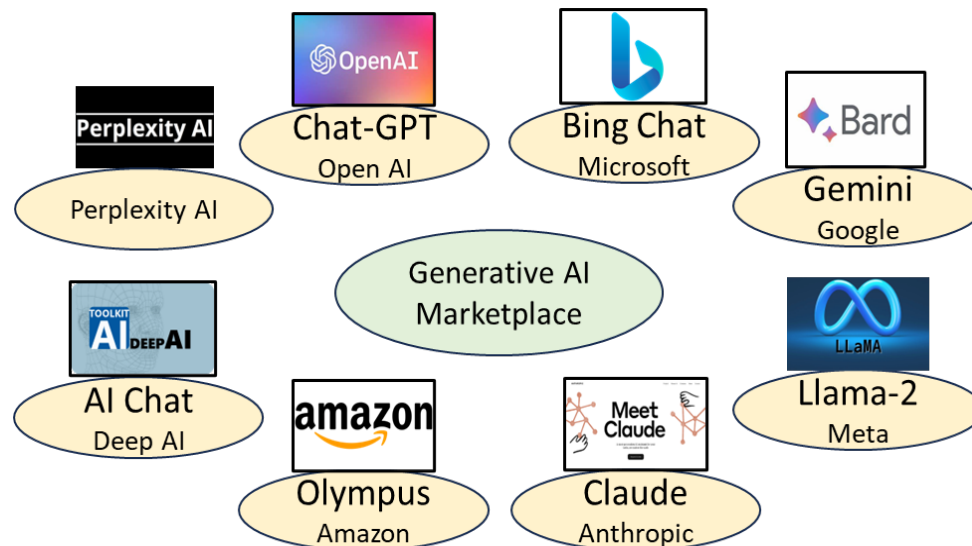
LegalOn, Nov 2023

# Current Controversies in AI

## 2. What is the future of GPT?

Generative AI trends in the next two years...

1. More powerful versions → GPT5 and beyond
2. Multiple competitors → more consumer choices
3. From passive generative AI → proactive personal AI agent



# Current Controversies in AI

## 3. Can AI approach singularity and lead to human extinction?

### What is singularity?

“The moment where AI exceeds human control...  
... resulting in unforeseeable changes to human civilization.”

Darren Orf, 2023

“Now that we’ve discovered it works better than we expected, what do we do  
to mitigate things more intelligent than us from taking control?”

Geoffrey Hinton, Google, 2023

“AI will be smarter than any human being by the end of 2025”

Elon Musk, 2024

# Current Controversies in AI

## 3. Can AI approach singularity and lead to human extinction?

Could AI lead to the extinction of the human race?

“Companies working on this technology state explicitly the goal of God-like intelligence”

Conner Leahy, Conjecture, 2023

“I fear that AI may replace humans altogether.”

Stephen Hawking, 2016

# Current Controversies in AI

## 4. The regulation of AI– is it already too late?

### The challenges of regulation

1. Logistics
  - Data privacy/ security
  - Ownership/ copyright
2. Ethics
  - European Union- 2024
3. Governance- global cooperation and collaboration
  - Local → state → national → global

“We are facing an almost guaranteed event with potential to cause an existential catastrophe”

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# The new AI Culture- a Partnership

How NOT to view the workplace... winners vs. losers

From: winners/ losers...

Lesser Demand:

Accountants  
Traders  
Event Planners  
Transcribers  
Soldiers  
Legal assistants  
Writers  
Graphic designers  
Proofreaders  
Customer service agents

Greater Demand:

Prompt engineer  
AI trainer  
AI auditor  
AI ethicists  
Machine managers

Mok, Insider 2023

# The new AI Culture- a Partnership

How NOT to view the workplace... winners vs. losers

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## Greater Demand:

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AI ethicists  
Machine managers

Mok, Insider 2023

...To: A new partnership/ culture

“AI is not going to replace you.

You’re going to be replaced by a human who uses AI to out-perform you.”

Laurence Liew, AI Singapore 2024

# The new AI Culture- a Partnership

## The impact of ATM technology on bank tellers

### Initial impact:

The number of tellers per bank branch decreased from 21 → 13

### Subsequent opportunities:

1. Reinvesting the efficiencies- Banks increased new branches by 40%
2. Job/ workflow re-engineering- cashiers → customer service, transacting loans

World Economic Forum 2021

The number of bank tellers stabilized,  
and their jobs evolved

# The new AI Culture- a Partnership

## Augment the human

The new cultural imperative:  
Augment the human... NOT eliminate the human

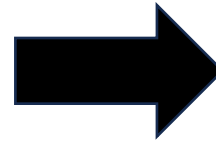
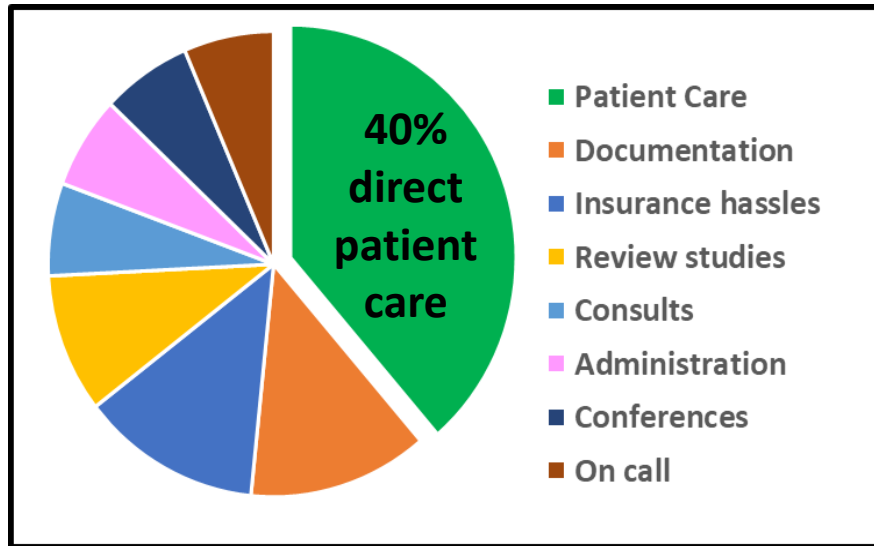
1. Implement an AI strategy for your institution
  - a. Prioritize- where is the technology most needed?
  - b. Education- ongoing for all stakeholders- providers, mgmt, Board
  - c. Develop and monitor performance metrics
2. Create a culture of partnership with AI
  - a. Optimize job descriptions/ workflow processes, leveraging what each does best
  - b. Acknowledge the need for human interaction/ oversight with AI
3. Continuously monitor and re-assess- the technology is evolving
  - a. Be aware of new disruptive technology- ex: the bank teller/ ATM
  - b. Establish ongoing performance improvement- PDCA



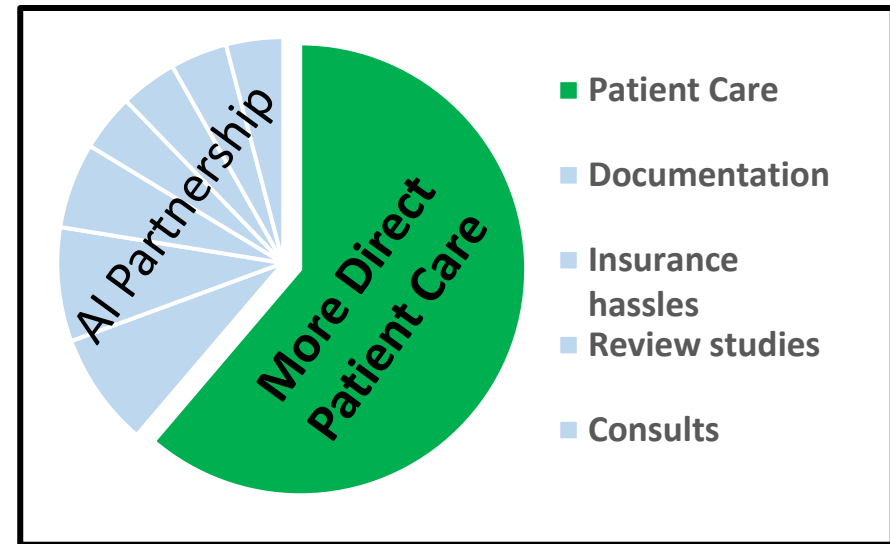
# The new AI Culture- a Partnership

Example: Physician workflow chart

Current Workflow



Future Workflow



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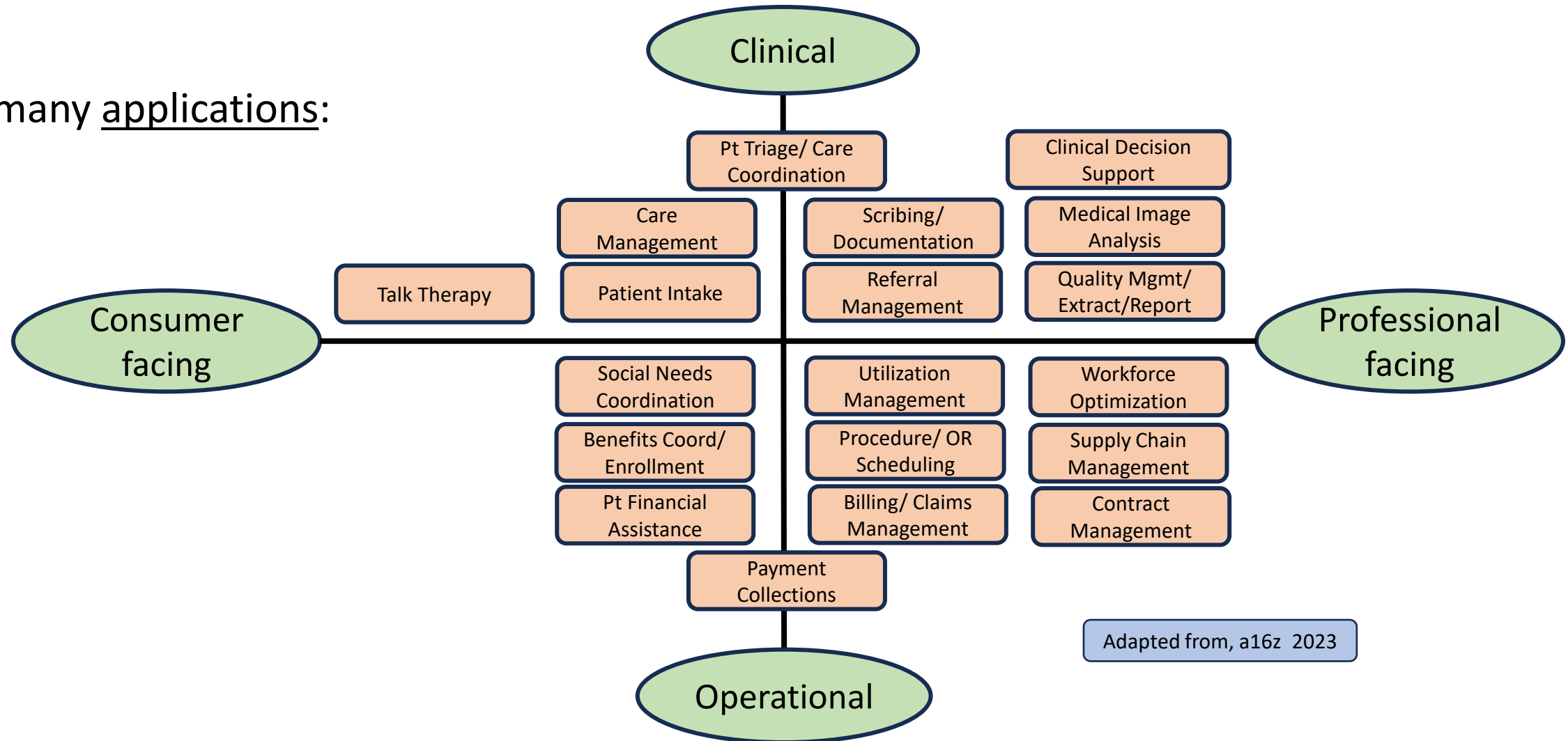
#### B. Specific applications in health care

1. Clinical decision support- earlier diagnosis
2. Ambient clinical intelligence- documentation
3. Personalized health
4. Health equity
5. Operations support- revenue cycle/ supply chain/ scheduling/ staffing/ recruiting/ HR

# Specific Applications in Health Care

So many applications ... so many products... so few dollars to spend!

So many applications:

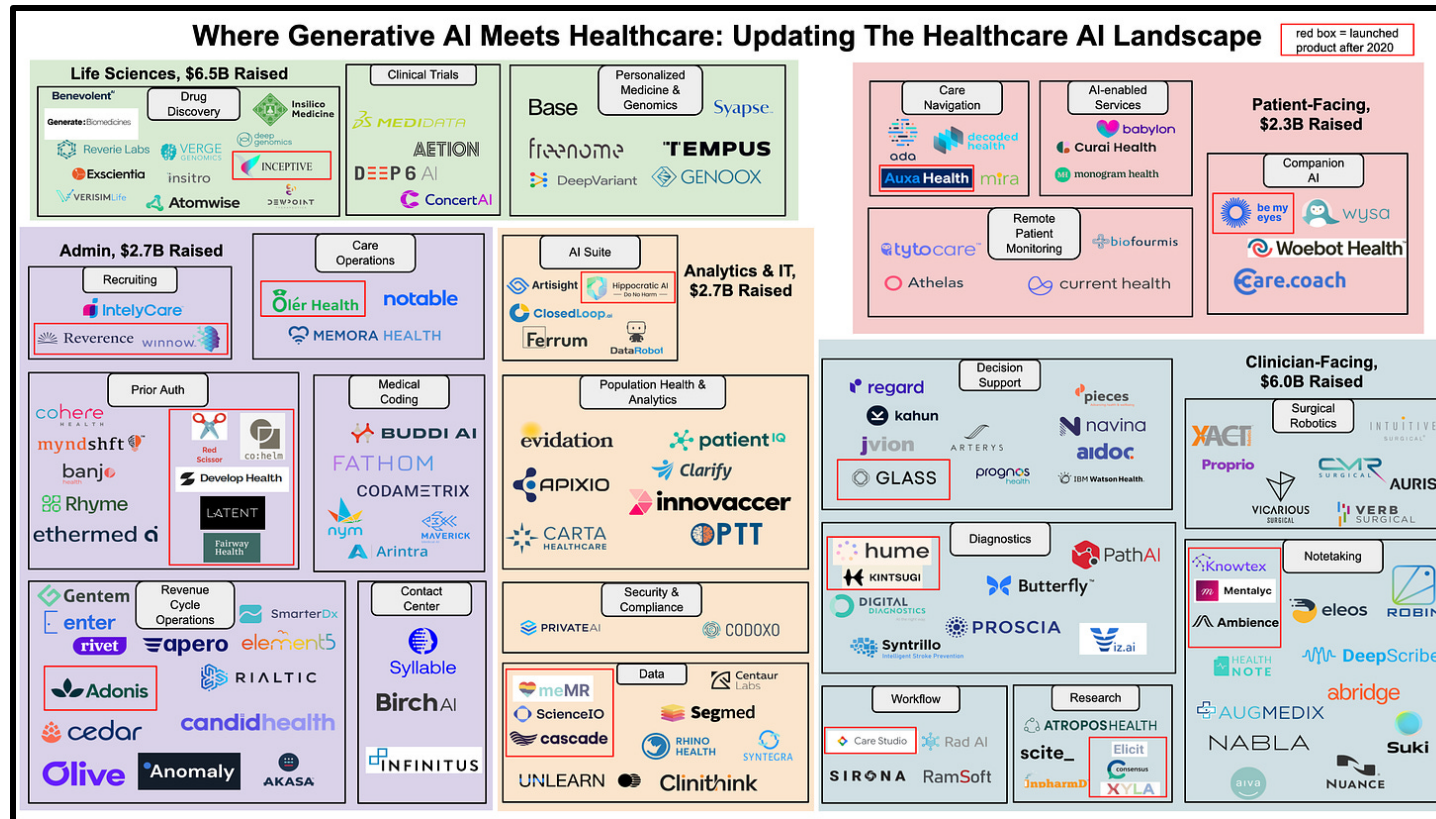


Adapted from, a16z 2023

# Specific Applications in Health Care

So many applications ... so many products... so few dollars to spend!

So many products:



.... And so few dollars

# Specific Applications in Health Care

## 1. Clinical decision support

Clinical decision support (CDS)-  
A system that provides information to help providers with decisions and actions

### A. Earlier detection of disease:

- Genomics- lifetime genetic predictions
- Radiology- chest X-rays, mammograms
- Pathology- pre-cancerous cells
- Heart murmurs- the digital stethoscope
- Mental health- dementia, depression, counseling

### B. Real time disease monitoring:

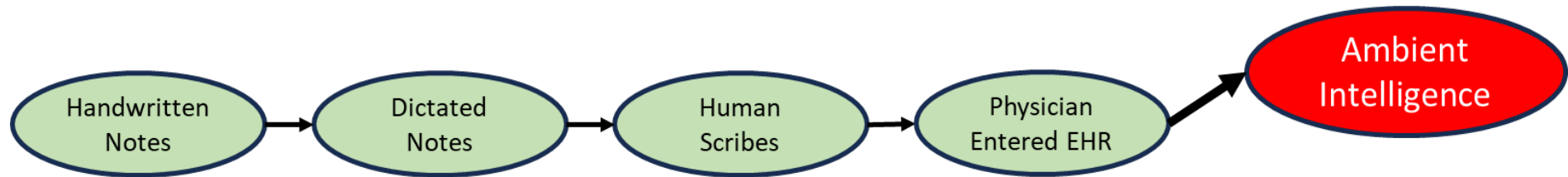
- Sepsis
- Atrial fibrillation/ stroke prevention
- Adverse drug events
- New drug development
- Wearable devices

# Specific Applications in Health Care

## 2. Ambient clinical intelligence

Ambient clinical intelligence (ACI)-  
Combining AI and voice recognition technology to document  
patient encounters in real-time

The evolution of clinical documentation:



In 2023 the average physician spends 6.2 hours/day  
on the computer

# Specific Applications in Health Care

## 2. Ambient clinical intelligence

Ambient clinical intelligence (ACI)-  
Combining AI and voice recognition technology to document  
patient encounters in real-time

### A multicenter study:

#### Results:

- Saved 5.5 hours/week/user
- 76% reduction in after hours work
- 60% better quality
- More empathic responses

#### Future Capabilities:

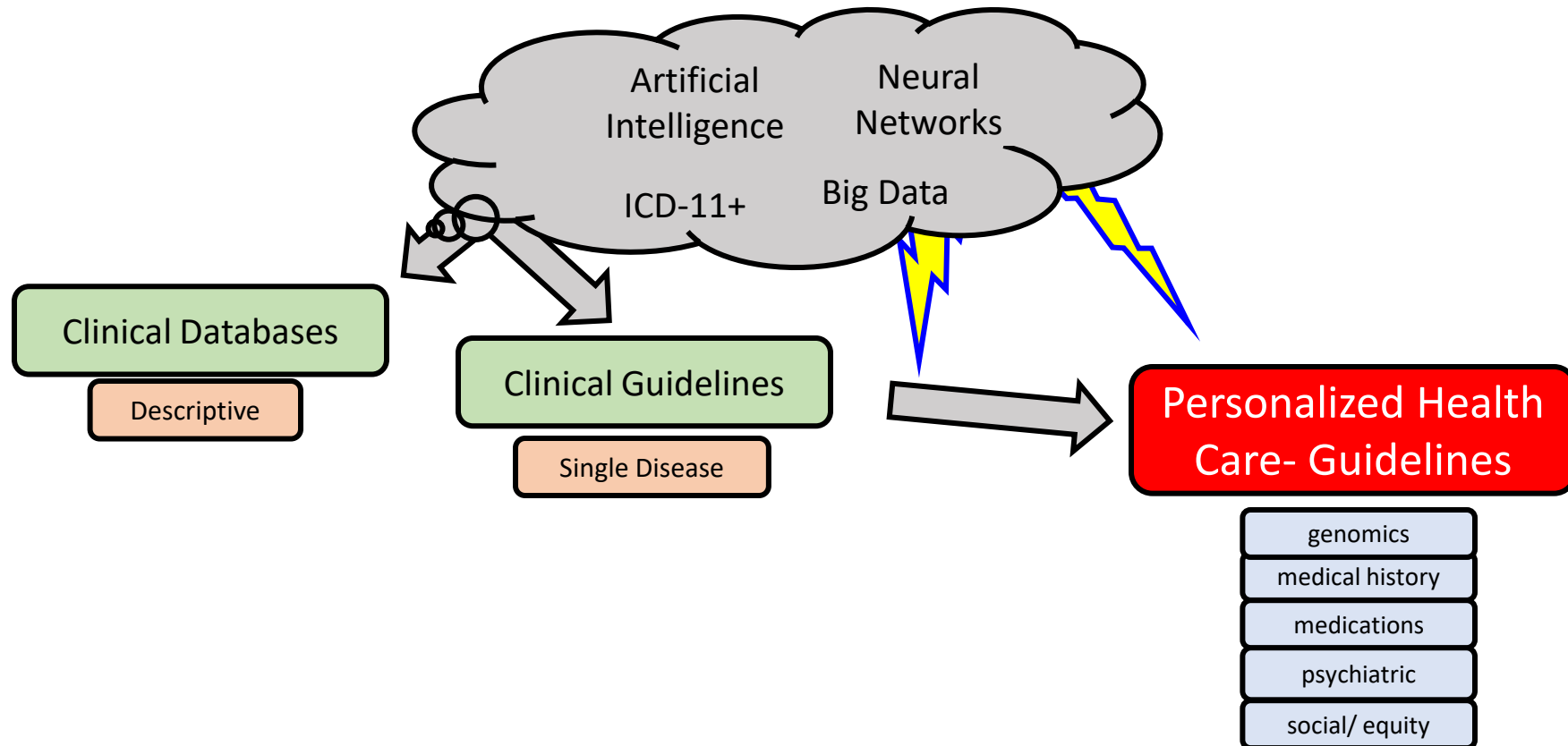
- DRAFT response to patient messages
- Generate billing/procedural codes in real time

Epic 2023

# Specific Applications in Health Care

## 3. Personalized health

### The future of databases and guidelines



# Specific Applications in Health Care

## 4. Health equity

### Achieving health equity

US life expectancy has decreased by 2.7 years

- 6.6 years for the American Indian/Alaska Natives- (1944 levels)
- 4.2 years for Hispanic Americans
- 4.0 years for Black Americans
- 2.4 years for White Americans

CDC 2023

The power of AI will be required to analyze vast databases and provide individual recommendations

# Specific Applications in Health Care

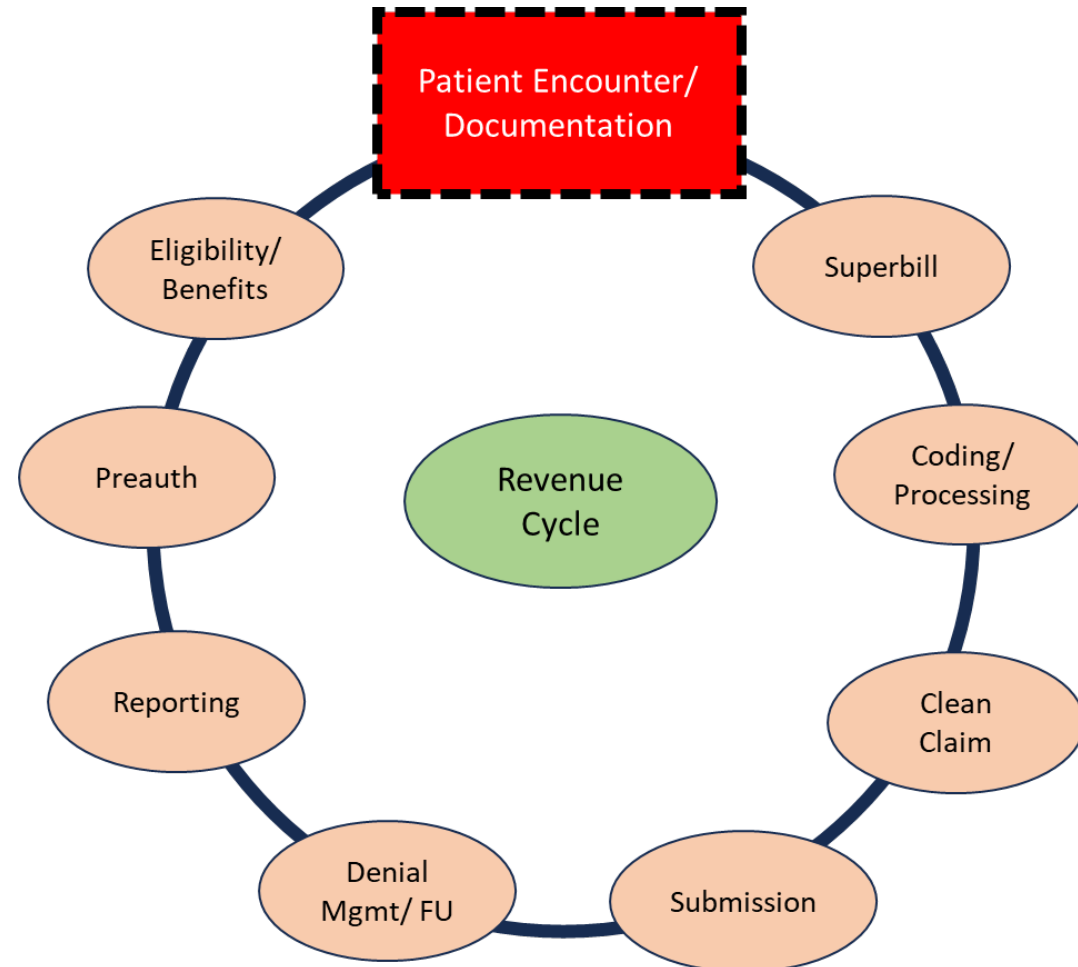
## 5. Operations support

### A. Revenue Cycle



Artificial Intelligence as the “control tower”

- Pre-authorization management
- Rapid production of a clean claim
- Proactive denial management
- Report monitoring



# Specific Applications in Health Care

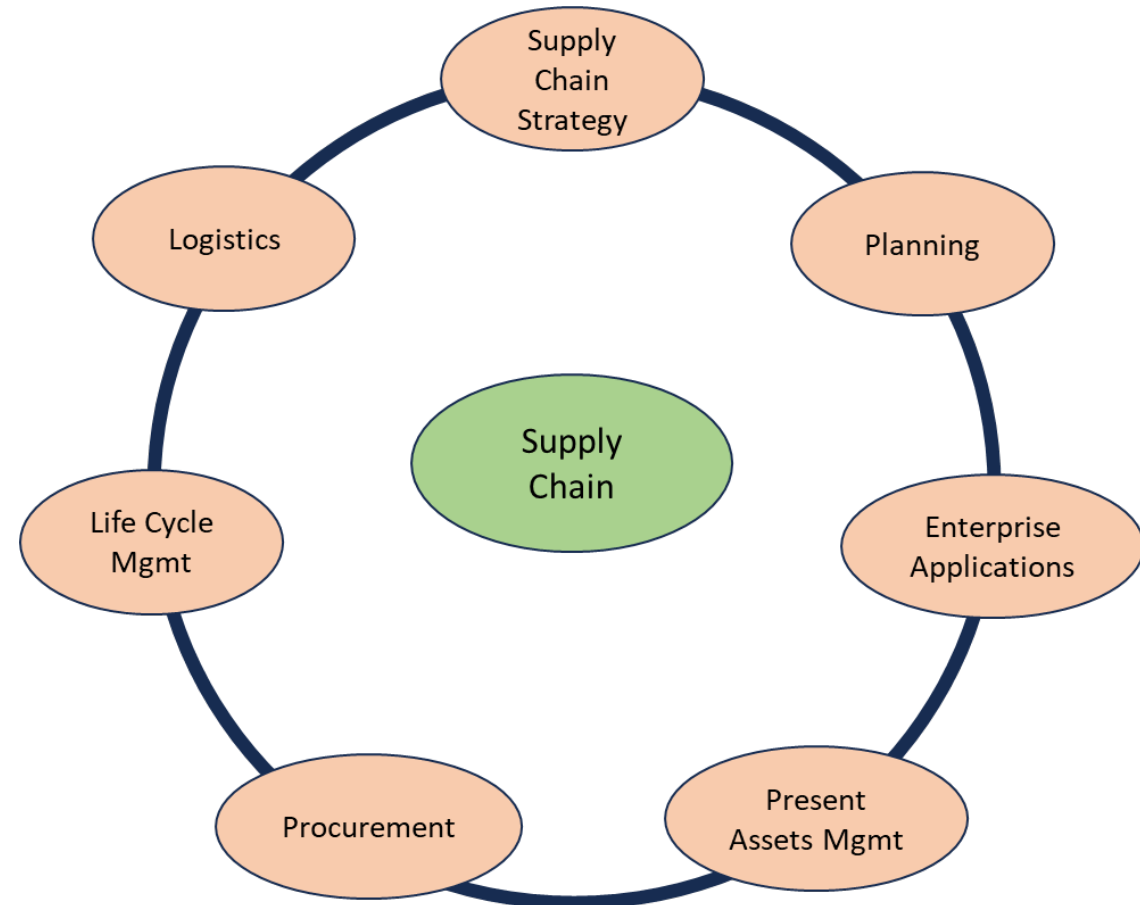
## 5. Operations support

### B. Supply Chain



Artificial Intelligence as the “control tower”

- Real time forecasting of supply/demand
- Anticipating new products
- Management of life cycles
- Accelerate decision making
- Automation of repetitive tasks



# Specific Applications in Health Care

## 5. Operations support

### C. Scheduling/ Staffing



OR, ASC, out-patient clinics  
Toward more efficient management

Artificial Intelligence as the “control tower”

- Predictions of surgical case duration
- Coordinate flow of care
- Identify surgeries with high risk of cancellation
- Better utilization of block time
- Adverse outcomes alerts



# Specific Applications in Health Care

## 5. Operations support

### D. Human Resources



## The critical role of human resources

### Managing the cultural transition

- Redesigning job descriptions/ core competencies
- Optimizing staffing models/ ratios and workflow
- Developing/ providing ongoing training and assessments

### Employee retention/ recruitment

- Earlier identification of employee dissatisfaction
- Better applicant screening – competencies/ skills sets/ fit
- Forecasting turnover/ dynamic HR models
- Identifying and managing AI use by applicants



# Specific Applications in Health Care

Your future physician??

“Within 5-6 years, the FDA will approve a primary care app qualified to practice medicine like your primary care physician”

Vinod Khosla, Microsystems, May 2023



# The Impact of Artificial Intelligence in Health Care

## I. The fundamentals of artificial intelligence (AI)

### A. Force multipliers of AI

1. Hardware- faster/ smaller/ cheaper
2. Software- unsupervised learning
3. Connectivity- computer/ brain/ networks/ robotics/ devices

### B. Current controversies in AI

1. Can AI be trusted?
2. What is the future of generative pretrained transformer (GPT) ?
3. Can AI approach singularity and lead to human extinction?
4. Regulation- is it already too late?

## II. Artificial intelligence in the workplace

### A. The new culture- a partnership between the human and AI- [optimizing the human](#)

### B. Specific AI applications in health care

1. [Clinical decision support- earlier diagnosis and management](#)
2. [Ambient clinical intelligence- documentation](#)
3. [Personalized health](#)
4. [Health equity](#)
5. [Operations support- revenue cycle/ supply chain/ scheduling/ staffing/ recruiting/ HR](#)

To the world you may be just one person,  
But to one person you may just be the world.

*Unknown*