

AI Integration in Healthcare

Myths, Realities, and Breakthroughs

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I HAVE **NO** CONFLICT OF INTEREST
TO REVEAL

38,800,000,000

The global luggage market



1954

Alfred Krupa
invented the first
wheel suitcase

1967

Leicestershire woman wrote a
sharply worded letter



1969

Man Landed on the Moon



1970

Bernard Sadow The
patent for the rolling
suitcase was
awarded to
Sadow invented the
first wheel suitcase



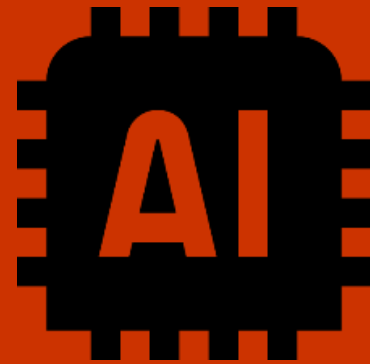
1973

Martin Cooper makes the first
mobile phone call,



1987

The Rollaboard is
Introduced



is new tool !!



At the 1956 Dartmouth AI workshop, the organizers and a few other participants gathered in front of Dartmouth Hall

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“**computing science** will probably exert its major effects by augmenting and, in some cases, largely replacing the **intellectual** functions of the **physician** , and will influence in a fundamental fashion the problems of both physician manpower and quality of medical care, it will also inevitably exact important social costs psychologic, organizational, legal, economic and technical.”

*In 1970, William Schwarz ,
the New England Journal of Medicine*

“

“Only through consideration of such potential **costs** will it be possible to introduce the new technology in an effective and acceptable manner. To accomplish this goal will require **new interactions among medicine**, the **information sciences** and the **management sciences**, and the development of **new skills and attitudes** on the part of **policy-makers** in the health-care system.”

*In 1970, William Schwarz ,
the New England Journal of Medicine*

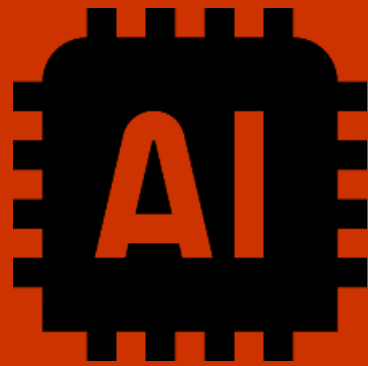


*In 1970, William Schwarz,
the New England Journal of Medicine*

Table 1. Example of an Actual Consultation in Which the Computer Assists the Physician in the Evaluation of a Complex Acid-Base Disturbance.*

COMPUTER:	WHAT IS THE PLASMA CO ₂ CONTENT, PLEASE?		
Physician:	15 mMoles/l.		
COMPUTER:	AND THE PLASMA pH, PLEASE?		
Physician:	7.14		
COMPUTER:	THE FINDING OF A LOW CO ₂ CONTENT, LOW pH AND NORMAL Pco ₂ (CALCULATED TO BE 42 mmHg) INDICATES THE PRESENCE OF A MIXED RESPIRATORY AND METABOLIC ACIDOSIS. AND THE PATIENT SHOULD THEREFORE BE CHECKED FOR ANY SOURCE OF IMPAIRED VENTILATION. I WILL NOW BE GLAD TO ASSIST WITH THE DIAGNOSIS OF THE METABOLIC COMPONENT OF THIS PATIENT'S DISORDER. WHAT IS THE SERUM SODIUM CONCENTRATION PLEASE?		
Physician:	240 mEq/liter		
COMPUTER:	IMPOSSIBLE VALUE! PLEASE CHECK AND RE-ENTER THE CORRECT SODIUM CONCENTRATION.		
Physician:	140 mEq/liter		
COMPUTER:	WHAT IS THE CHLORIDE CONCENTRATION?		
Physician:	103 mEq/liter		
COMPUTER:	THE CALCULATED "ANION GAP" IS 22 mEq/liter. METABOLIC ACIDOSIS WITH AN INCREASED "ANION GAP" IS SEEN IN 1. DIABETIC KETOACIDOSIS 2. SALICYLATE POISONING 3. ETHYLENE GLYCOL POISONING 4. METHYL ALCOHOL POISONING 5. PARALDEHYDE INGESTION (RARELY) 6. LACTIC ACIDOSIS 7. RENAL FAILURE IF YOU WOULD NOW LIKE A BRIEF EXPLANATION BOTH OF TERMINOLOGY AND OF THE MECHANISMS RESPONSIBLE FOR METABOLIC ACIDOSIS, PLEASE SO INDICATE BY TYPING YES.		
Physician:	YES		
COMPUTER:	"ANION GAP" IS DEFINED AS THE DIFFERENCE BETWEEN THE CONCENTRATION OF Na AND OF THE SUM OF MEASURED ANIONS (CL PLUS HCO ₃). METABOLIC ACIDOSIS WITH A WIDENED "ANION GAP" OCCURS WHEN BICARBONATE CONCENTRATION IS DECREASED BY AN ACID LOAD THAT DOES NOT PRODUCE AN EQUIVALENT RISE IN CHLORIDE CONCENTRATION. SUCH AN ANION PATTERN IS SEEN:		
			1. WHEN THE DISSOCIATED PRODUCTS OF THE ACID ARE H ⁺ AND AN ANION OTHER THAN CHLORIDE AS IN THE CASE OF: A. - KETOACIDS (DIABETIC KETOACIDOSIS) B. - LACTIC ACID (LACTIC ACIDOSIS) C. - UNKNOWN ORGANIC ACIDS (AS SEEN IN SALICYLATE INTOXICATION OR POISONING WITH METHYL ALCOHOL, ETHYLENE GLYCOL, PARALDEHYDE).
			2. WHEN (AS IN RENAL INSUFFICIENCY) THE REDUCTION IN PLASMA HCO ₃ CONCENTRATION IS INDUCED BY DEFECTIVE EXCRETION OF HYDROGEN ION AND IS NOT ACCOMPANIED BY AN INCREASE IN CHLORIDE REABSORPTION.
		COMPUTER:	IF YOU WOULD LIKE A MORE COMPLETE DISCUSSION OF THIS PROBLEM PLEASE SO INDICATE (BY TYPING YES) AND I CAN SUGGEST SEVERAL REFERENCES. [When requested, references are provided here.]
		COMPUTER:	I AM NOW READY TO ASSIST IN NARROWING THE LIST OF POSSIBLE DIAGNOSES. WHAT IS THE BLOOD SUGAR PLEASE?
		Physician:	135 mg/100 ml
		COMPUTER:	AND THE SERUM KETONE LEVEL, EXPRESSED IN TERMS OF DILUTED PLASMA?
		Physician:	1 to 2
		COMPUTER:	AND THE CREATININE CONCENTRATION?
		Physician:	2.1 mg per 100 ml
		COMPUTER:	AND THE SALICYLATE CONCENTRATION PLEASE?
		Physician:	0
		COMPUTER:	THE DEGREE OF KETOSIS IS SO SLIGHT THAT IT IS EXTREMELY UNLIKELY THAT DIABETES IS THE SOURCE OF THE METABOLIC ACIDOSIS IN THIS PATIENT. ALTHOUGH THERE IS RENAL INSUFFICIENCY, IT IS NOT OF THE SEVERITY THAT ORDINARILY PRODUCES THIS LARGE A REDUCTION IN PLASMA BICARBONATE CONCENTRATION. OTHER ETIOLOGIC FACTORS MUST THEREFORE BE CONSIDERED. IN PARTICULAR, LACTIC ACIDOSIS OR POISONING DUE TO INGESTION OF METHYL ALCOHOL, ETHYLENE GLYCOL OR PARALDEHYDE MUST BE RULED OUT. I WOULD STRONGLY RECOMMEND THAT THE LACTATE CONCENTRATION IN PLASMA BE MEASURED AND THAT THE HISTORY BE CAREFULLY REVIEWED FOR EVIDENCE OF TOXIN INGESTION.

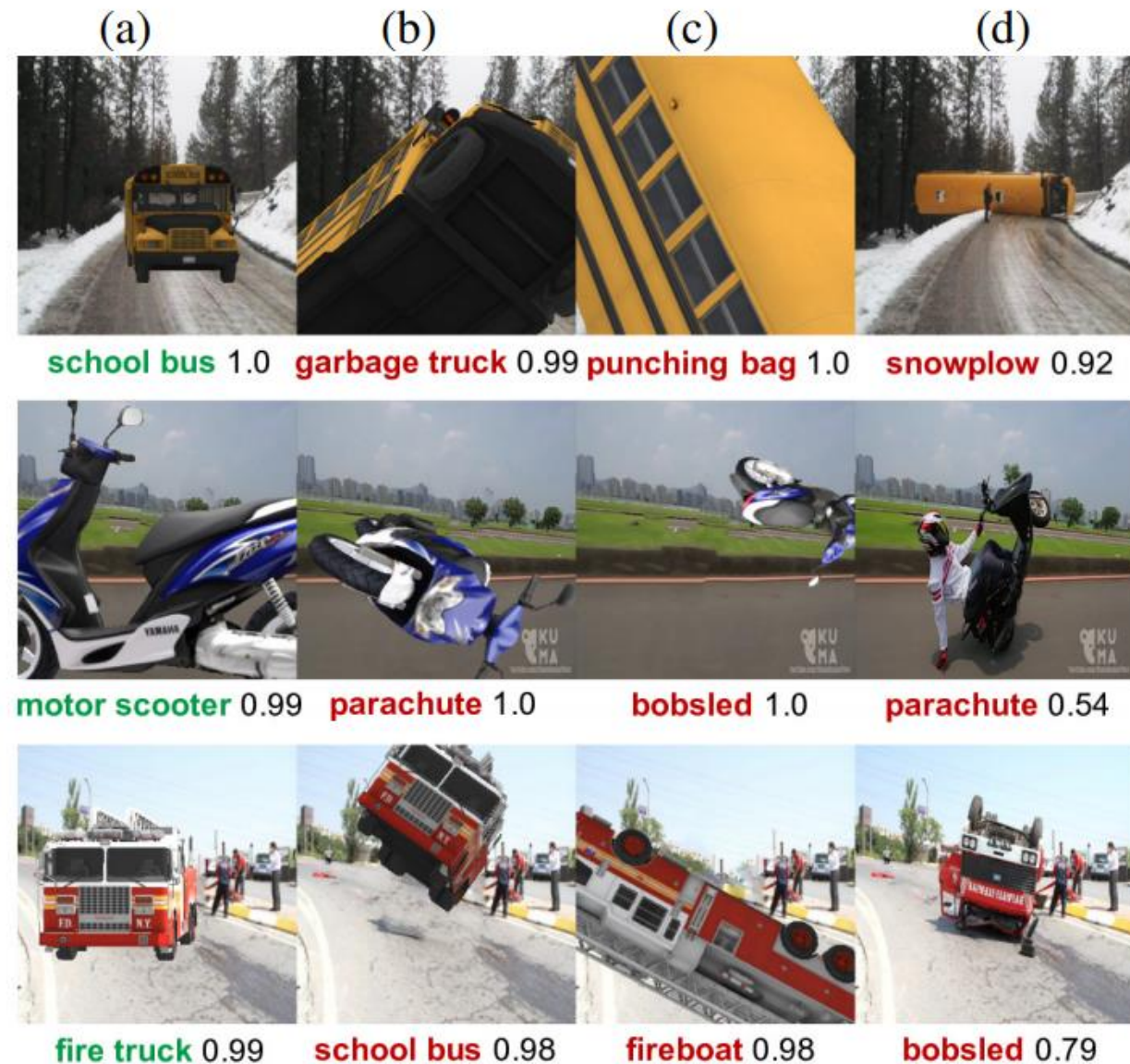
*The computer program was written in CAL (Conversational Algebraic Language) by W. B. Schwartz, D. M. Goldman & J. P. Kassirer; the response of the computer is accomplished through the use of a branching "decision tree."



is perfect tool !!

Brittleness

A 2018 study found that state-of-the-art AIs that would normally correctly identify the school bus right-side-up failed to do so on average 97 percent of the time when it was rotated.



Embedded Bias

For example, in 2019, scientists found a nationally deployed health care algorithm in the United States was racially biased, affecting millions of Americans.

The AI was designed to identify which patients would benefit most from intensive-care programs, but it routinely enrolled healthier white patients into such programs ahead of black patients who were sicker.

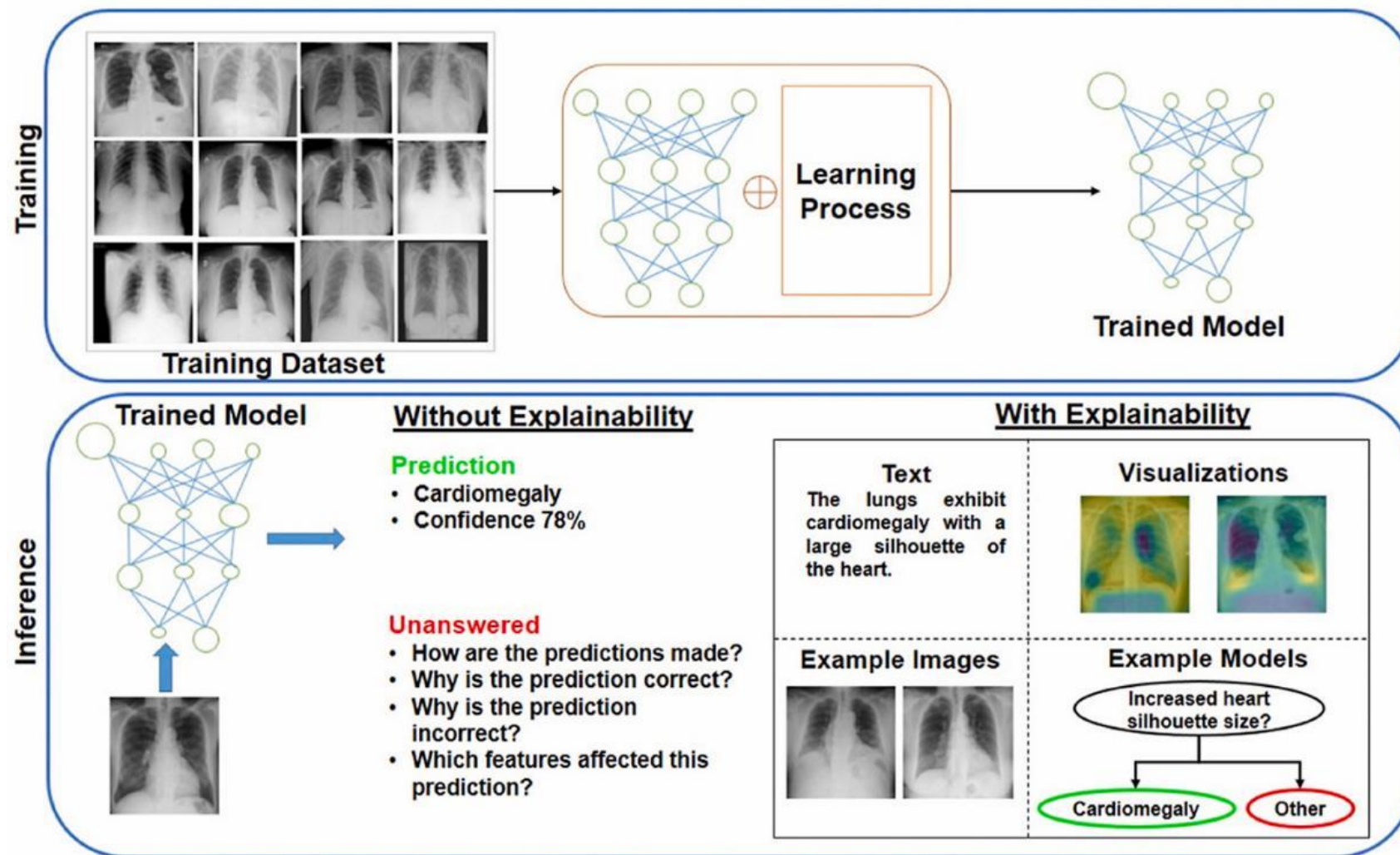


Catastrophic Forgetting

The tendency of an AI to entirely and abruptly forget information it previously knew after learning new information, essentially overwriting past knowledge with new knowledge. "Artificial neural networks have a terrible memory ."



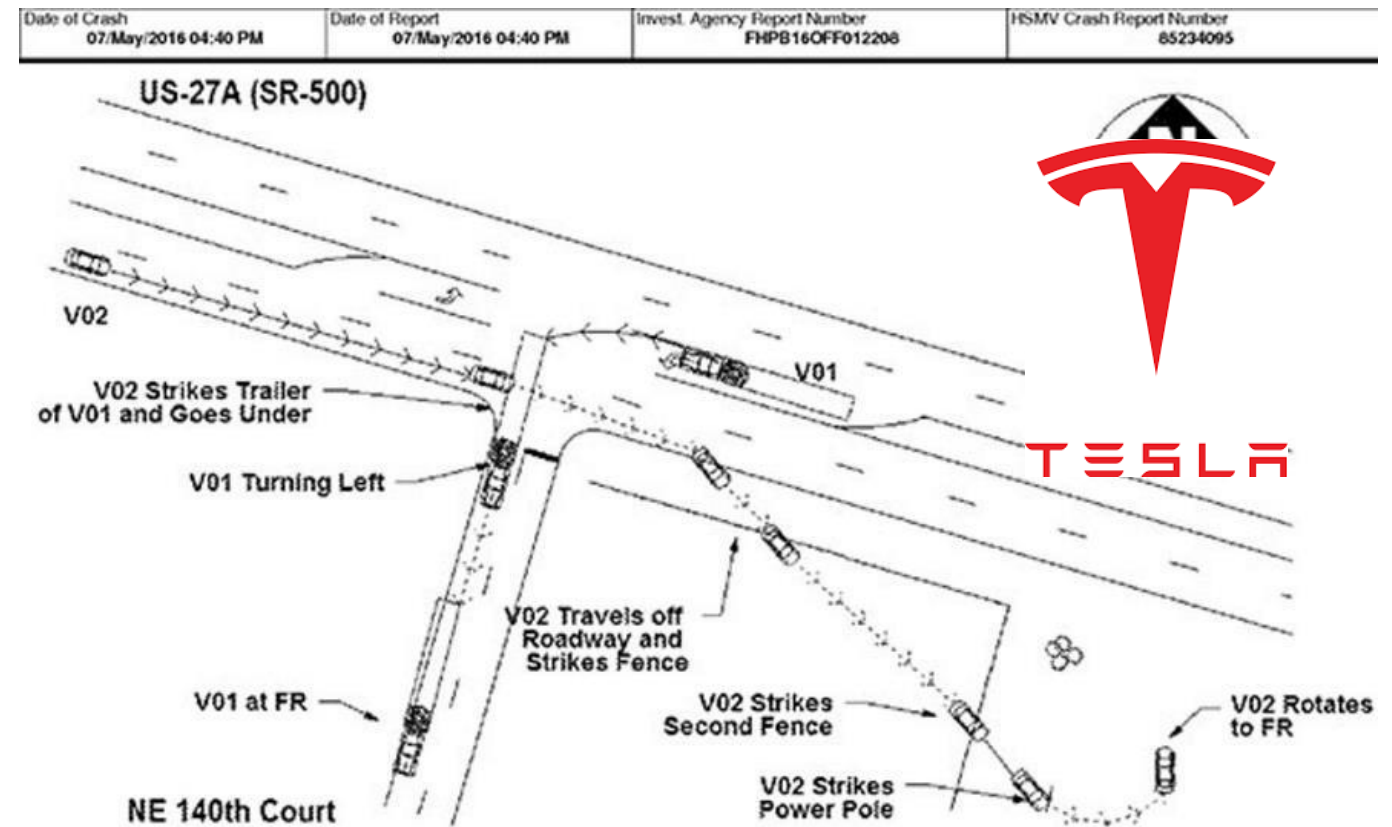
Explainability



Quantifying Uncertainty

A research team at Deakin University in Australia applied several different uncertainty quantification techniques as an AI classified skin-cancer images as malignant or benign, or melanoma or not.

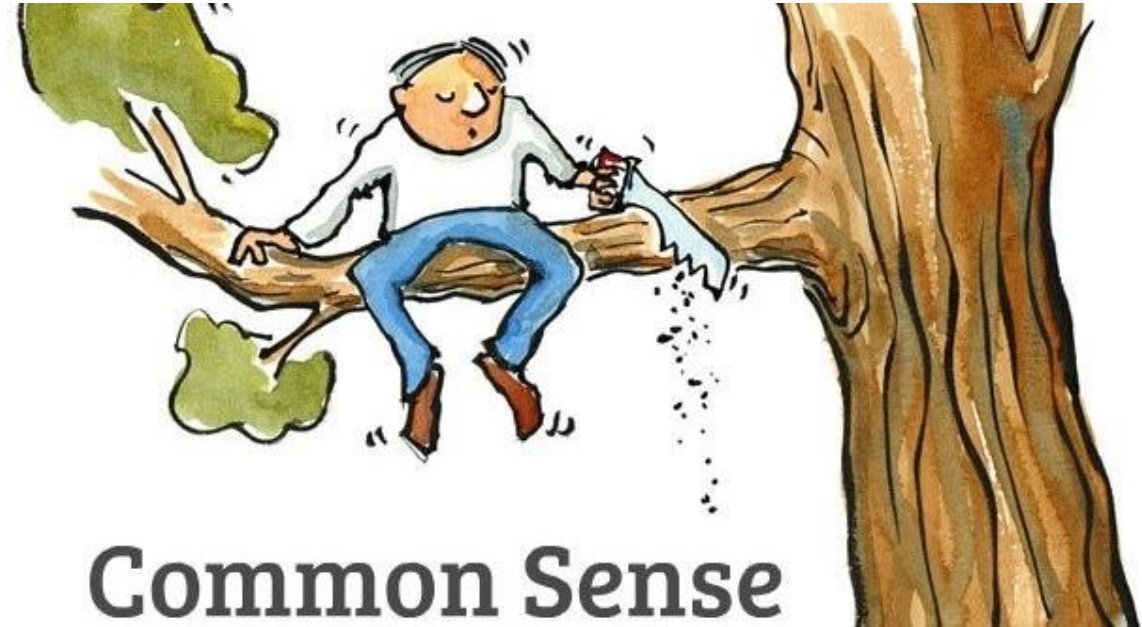
The researcher found these methods helped prevent the AI from making overconfident diagnoses.



Common Sense

Als lack common sense—the ability to reach acceptable, logical conclusions.

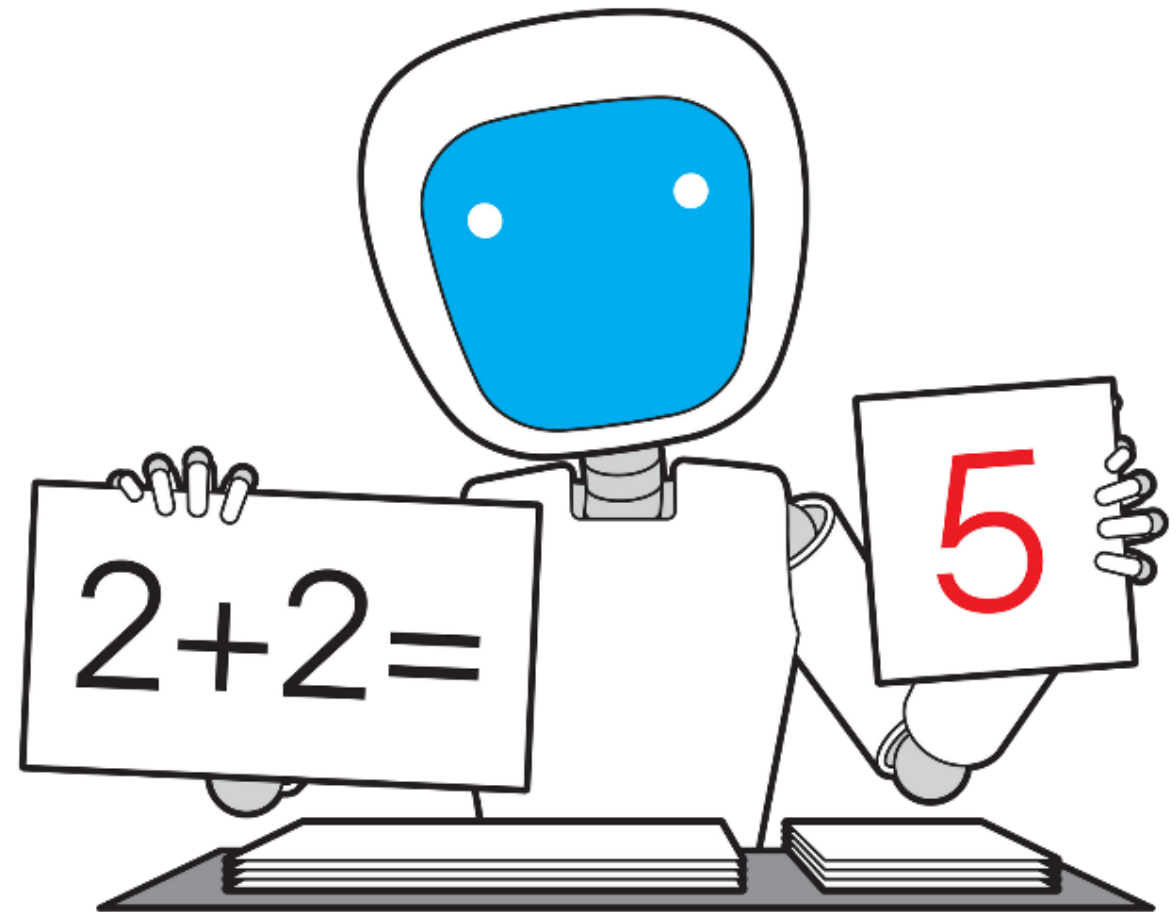
For instance, scientists may train Als to detect hate speech on data where such speech is unusually high, such as white supremacist forums. However, when this software is exposed to the real world, it can fail to recognize that **black** people may respectively use the words "black" more often than other groups.

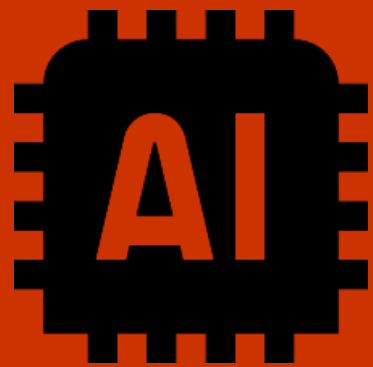


Math

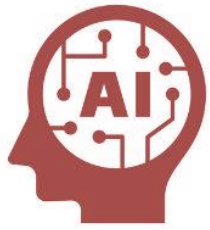
Although conventional computers are good at crunching numbers, AIs are surprisingly not good at mathematics at all.

You might have the latest and greatest models that take hundreds of GPUs to train, and they're still just not as reliable as a pocket calculator.





will replace Human !!



AI Will Replace Doctor



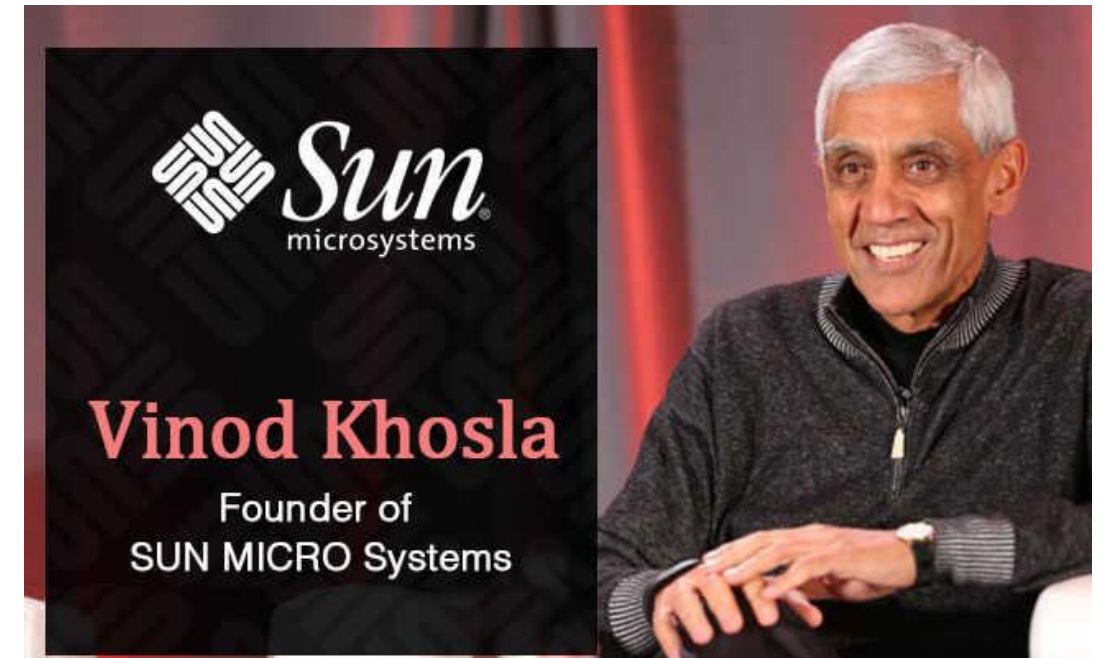
AI can replace 80% of what doctors do.

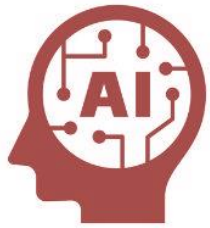


Much of what physicians do can be done better by sensors, passive and active data collection, and analytics.



Computers are better at organizing and recalling complex information than a hotshot Harvard MD.





AI Will Replace Doctor



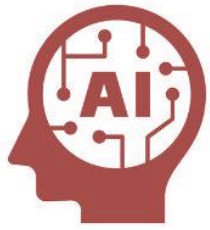
Medicine isn't just about inputting symptoms and receiving a diagnosis; it's about building relationships/Communications between providers and patients.



Over time, doctors will increase their reliance on technology for triage, diagnosis, and decision-making.

and Question is

“ Can this support Business automation eventually ?”



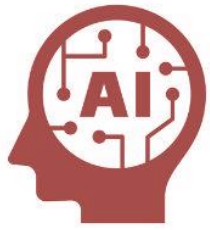
AI Will Replace Doctor



AI is not a replacement for a medicinal cure; however, AI can intervene and change behaviours or start treatment that would circumvent the disease from ever becoming present.



AI right algorithms can analyze whether and why a specific population may not respond to certain treatments versus another.



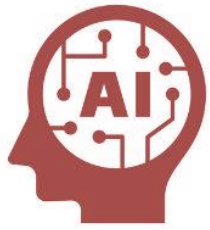
AI Will Replace Doctor



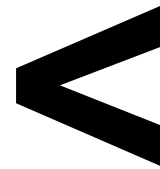
Most commercial flying is now done by auto-pilot



Algorithmic trading now drives most stock market volume

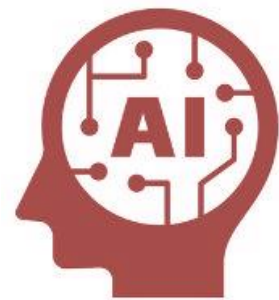


AI Will Decrease Healthcare Costs

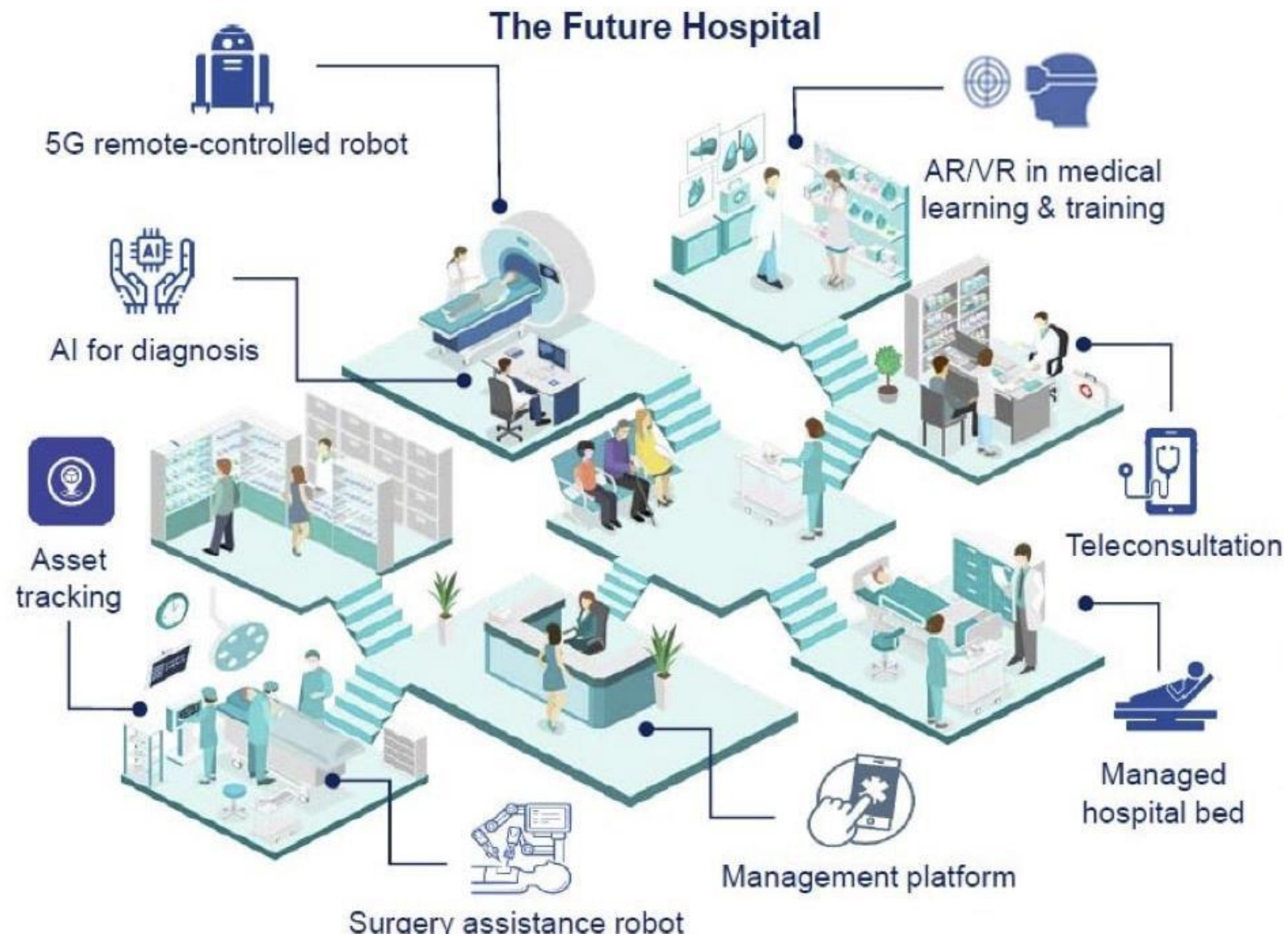


500 AliveCor ECG tests
less than \$1/daily

1 ECG test
done in hospital



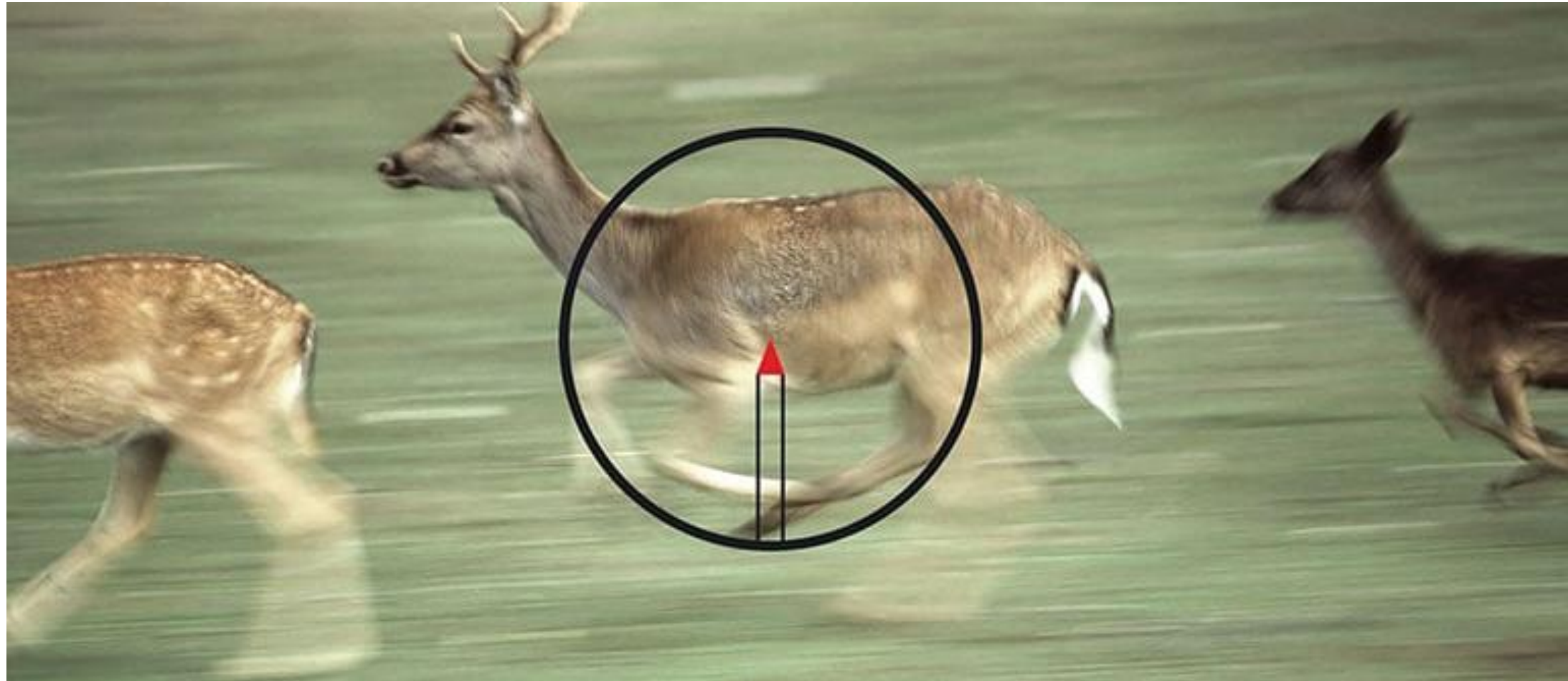
what exactly **AI** is supposed to
fix in Data Industry ?



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We need to introduce similar to the **gold standard randomized controlled trial (RCT)** to test the AI tools, similar to testing new medication and medical equipment's, but not in a **traditional** way .





AI is not **static** , so testing it, is like hitting **moving** target

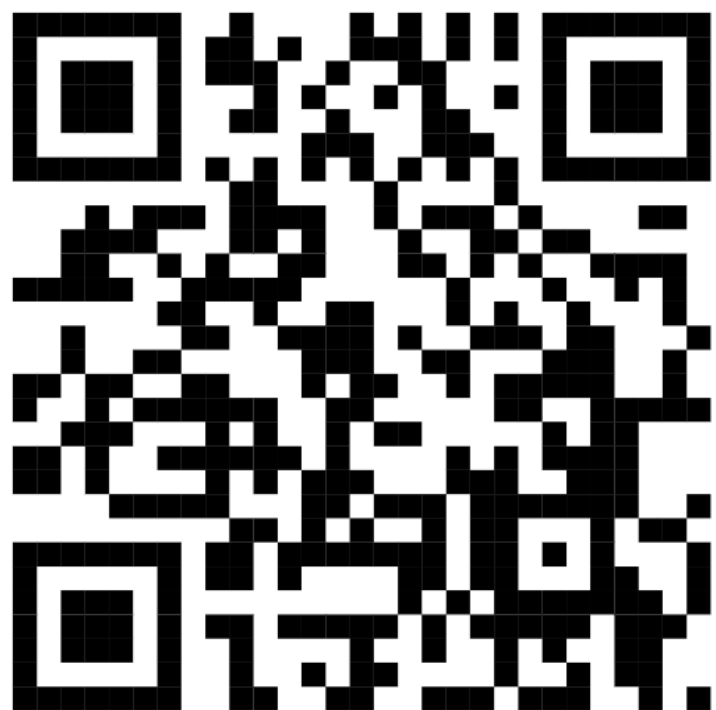
Looking Forward: AI's Future in Healthcare



AI isn't here to change a few aspects of healthcare, it's here to redefine how deliver care as a whole industry.



AI's purpose is to elevate healthcare practices while avoiding the traditional pitfalls we have like “**Bias**”. Automation is only part of the game.



Amr M. Metwally

