Artificial Intelligence Advances in Correctional Medicine

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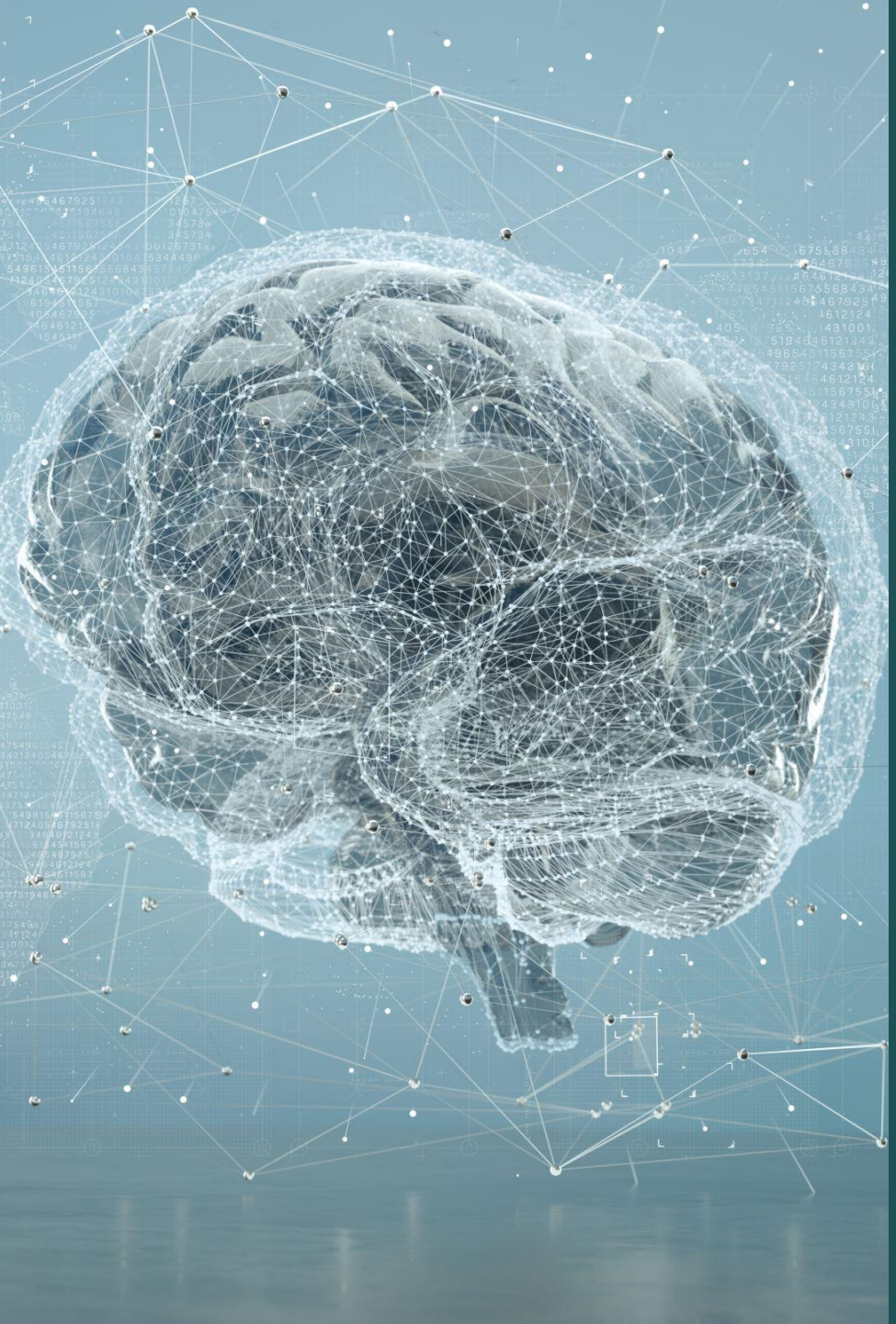

What is Artificial Intelligence (AI)

- Artificial intelligence (AI) is the ability of computer systems to perform tasks that normally require human intelligence, such as learning, reasoning, problem-solving, and decision-making.

- Unlike traditional programs with fixed rules, AI systems can often learn from data, adapt to new information, and improve their performance without being explicitly programmed for every situation.

Origins of AI

1940s-1950:

Alan Turing cracked the German's Enigma Machine encryption during WWII; and, in 1950, Turing says that computer programs could be taught to think like humans. He develops the "Turing Test" to put a computer's behavior to the test to determine if it has "human intelligence;" it's still used today

1956:

John McCarthy, an American computer and cognitive scientist, coins the term "artificial intelligence" during a workshop at Dartmouth College.

Origins of AI

Robotics:

In 1948, William Grey Walter created the first autonomous robots, "Elmer" and "Elsie," which could navigate obstacles by sensing light and touch.

Gaming:

Arthur Samuel developed the first computer program to play checkers in 1952, which was also one of the first to learn from experience through self-play. Later, IBM's Deep Blue famously defeated chess grandmaster Garry Kasparov in 1997, demonstrating significant advancements in strategic decision-making.

Origins in AI

2006:

Geoffrey Hinton coins the term “deep learning” to explain new algorithms that let computers recognize objects and text within images and videos.

2011:

IBM’s Watson supercomputing system beats the two best human players of the TV game show Jeopardy—demonstrating an ability to understand and answer nuanced questions that had previously stumped computer programs.

2016:

Tesla and Ford announce timelines for fully autonomous vehicles.

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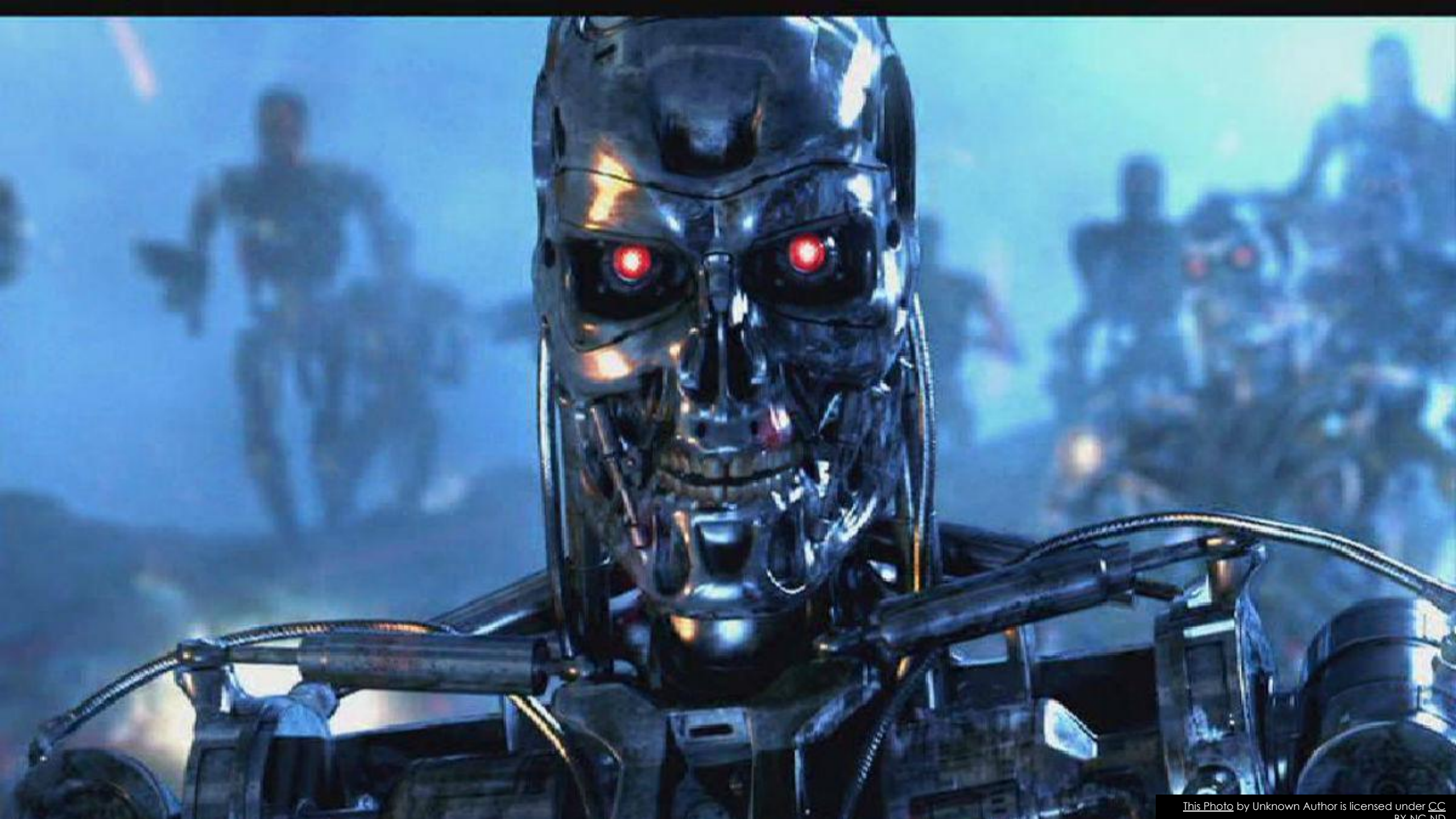

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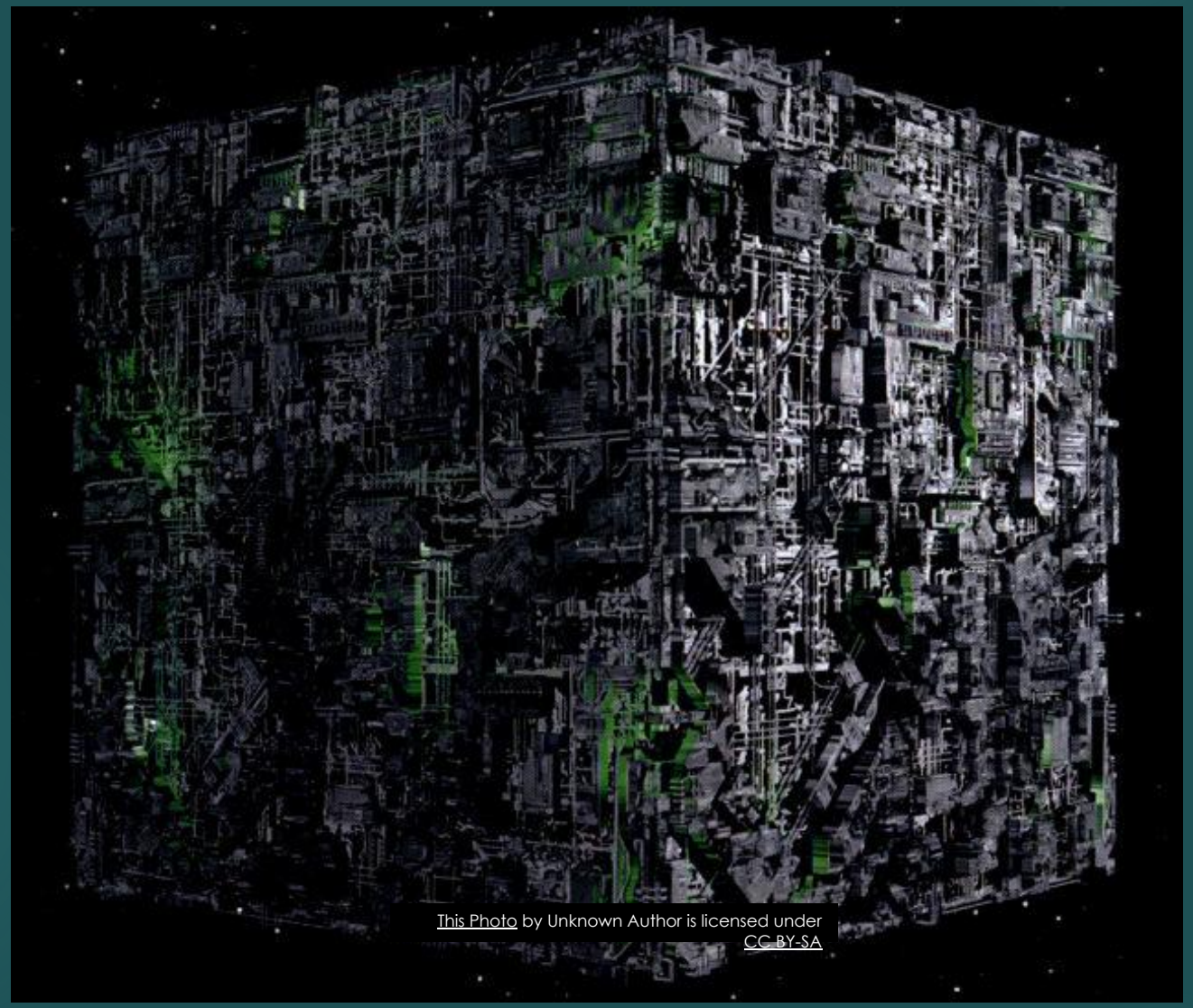

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Daily Uses of AI

AI in Healthcare

AI has improved healthcare by improving diagnostic precision, personalizing patient care, and optimizing operations. It helps address longstanding challenges like rising costs, staffing gaps, and unequal access to care.

Transforming Diagnostics and Treatment

Great at analyzing medical data, imaging scans, lab results, and genetic data to detect diseases more accurately and earlier.

Example: Google's AI system for breast cancer detection shows 94.5% accuracy, beating human radiologists and enabling faster, more accurate treatment

Daily Uses of AI

Personalized Learning

AI tools adapt content to each student's pace and style, leading to better engagement and results.

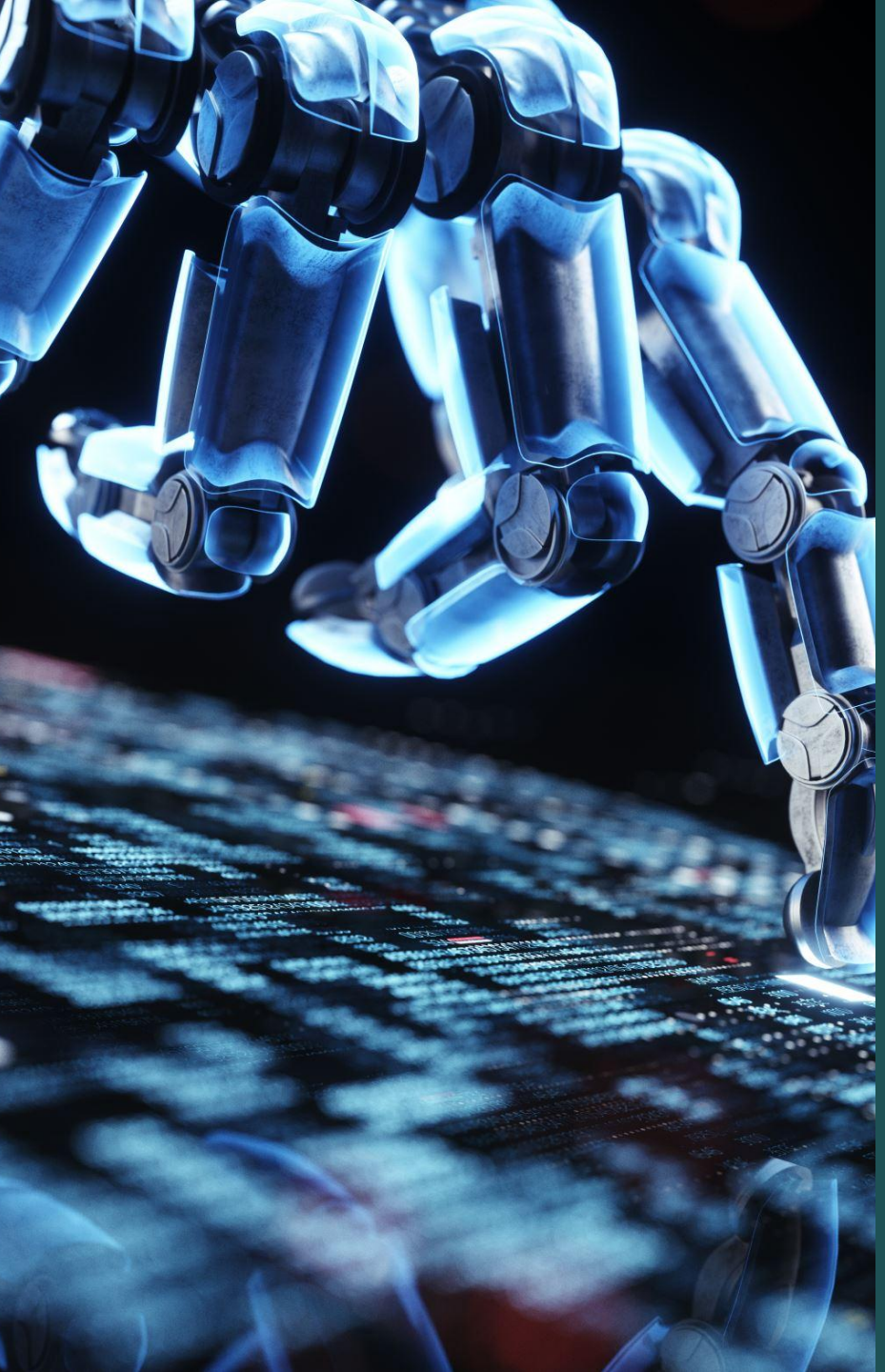
Example: Duolingo adjusts lessons based on user progress, increasing retention by 25%.

Daily Uses of AI

- **Predictive Maintenance**
- AI forecasts equipment failures, reducing downtime and cutting maintenance costs.
- **Example:** GE's AI tools optimize service schedules, saving millions in annual repairs.
- **Quality Assurance**
- AI-powered vision systems detect defects during production, helping ensure product quality.
- **Example:** BMW uses AI to catch defects early, reducing quality-related costs by 30%.

Daily Uses of AI

- **AI in Retail and E-Commerce**
- Retail and e-commerce businesses use AI to personalize shopping, streamline inventory, and enhance service. This sets a new standard for convenience and customer satisfaction.
- **Personalized Shopping**
- AI tracks consumer behavior and preferences to deliver tailored product recommendations, driving sales and improving the user experience.
- **Example:** Amazon’s recommendation engine generates 35% of its sales by serving highly relevant suggestions.



Daily Uses of AI

- **Future Prospects**
- The AI education market is projected to reach $20 billion by 2027, fueled by personalized learning and broader global access.
- **AI in Entertainment and Media**
- AI is reshaping content creation, distribution, and audience engagement by delivering more personalized and immersive experiences.
- **Content Recommendations**
- AI studies user behavior to offer custom suggestions that keep viewers engage

AI Uses In Corrections

- Security
- Inmate Management
- Contraband Detection

Security Uses

- Slowly being implemented into facilities
- Surveillance is the primary use at this time to monitor both inmates and staff*
- AI can detect impending violence or escape attempts

Inmate Management

- Refers to the processes and strategies employed by correctional facilities to oversee daily activities , behavior, safety, and rehabilitation of incarcerated peoples.
- AI could monitor inmate conversations and detect words or signals that could indicate violence or escape plots and alert the officers to intervene.

Contraband detection

- AI is instrumental in detecting contraband concealment within prisons
- Diminishes time officers use need to review videos
- New technology to combine biometric and facial identification technologies to document prison visitors to combat prison drug trafficking .

Security Techniques

- China-Smart surveillance in cells, facial identification and movement analysis
- Hong Kong: Smart video surveillance, tracking wristbands and robotic arms
- South Korea: robot surveillance for violet and suicidal behavior
- UK: security cameras monitored by AI to stop smuggling of drugs, phones, and weapons
- USA: mass-monitoring system of inmate phone calls to detect suspicious behavior

Monitor Prisoner Communications

Major concern in most facilities

Diminishing staff at facilities prevents proper monitoring of information

AI technologies can assist humans with reviewing hours of inmate recordings in search for any words of phrases that could suggest any future plans, problems, or activities.

Biometric Modalities

- China and Hong Kong uses Fit Bits to track inmates and vital signs
- China uses cameras for facial recognition, finger printing, & voice recognition *
- Current discussion about inserting in U.S. prisons
- New Technology uses facial recognition that can detect emotions, contactless fingerprinting,

Detecting Contraband

Major problem within any correctional facility*

AI helps detect contraband by analyzing large amounts of data from sources like X-ray scans, video feeds, and sensor kits to identify anomalies that may indicate illegal goods or activities

Image and video analysis: AI models analyze X-ray images and video streams to automatically identify concealed items like drugs, weapons, or cell phones. It can distinguish between normal objects and hidden contraband based on patterns learned from vast datasets.

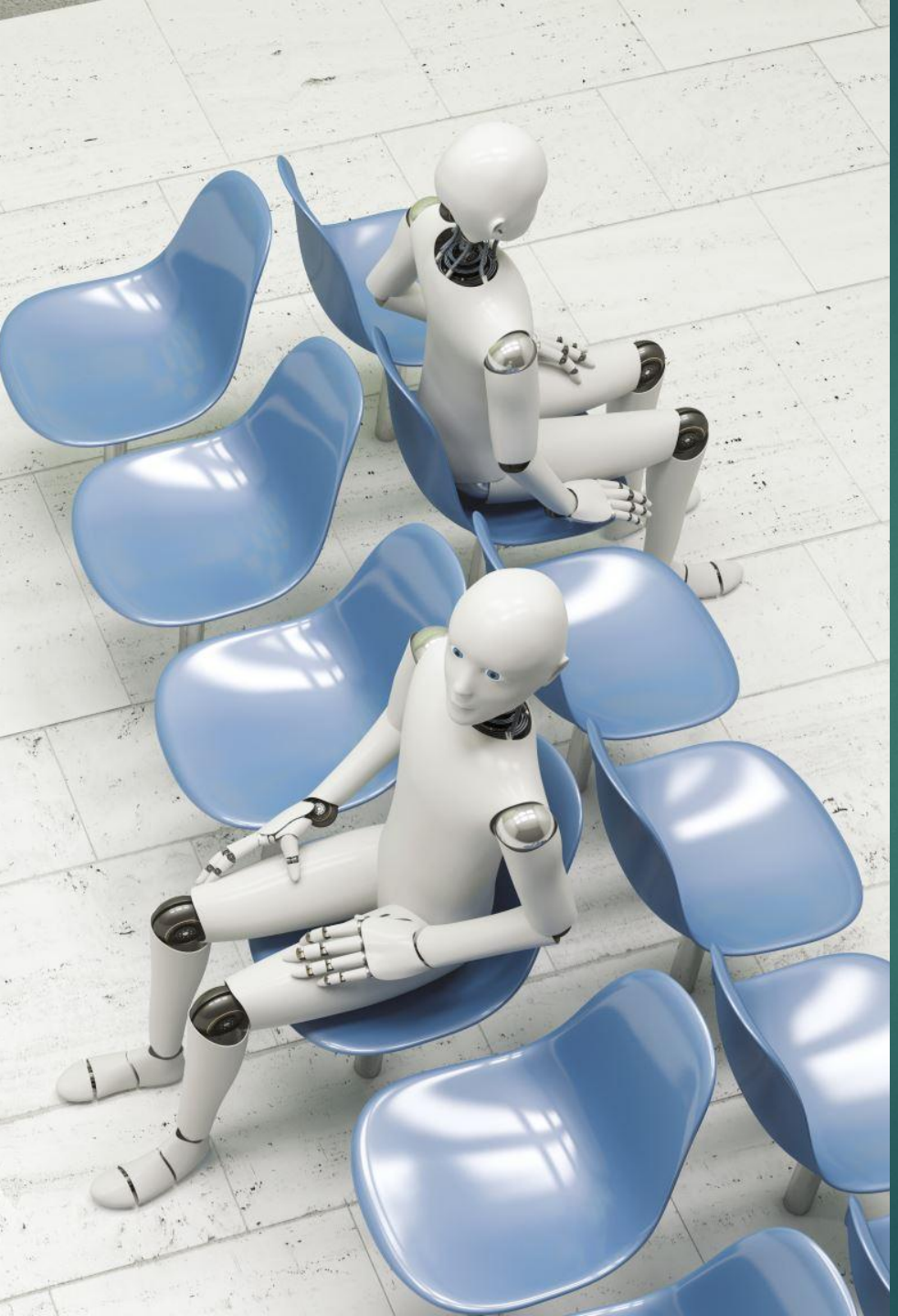
AI-powered body scanners: AI-enhanced millimeter-wave and X-ray body scanners automatically analyze scans to detect anomalies, directing staff to potential contraband concealed on or inside a person's body. This reduces reliance on invasive searches, decreases false positives, and improves throughput.

Detecting Contraband

Real-time anomaly detection: Systems can process data in real-time, sending alerts to human operators when an anomaly is detected, allowing for immediate intervention.

Synthetic data for training: AI can create realistic, synthetic data (like emulated X-ray images of vehicles with concealed items) to train and improve contraband detection algorithms without using sensitive real-world data.

Behavioral and video analytics: AI-driven video analytics continuously monitor surveillance footage to flag suspicious behavior, such as inmate fights, loitering in unauthorized areas, or the appearance of a weapon. This



Chatbots in Correctional Medicine

- Chatbots are used in correctional medicine for mental health support, rehabilitation, and to assist staff by providing inmates with 24/7 access to coping strategies, therapeutic techniques like Cognitive Behavioral Therapy (CBT), and educational resources

- They can also de-escalate situations, help manage stress and anxiety, and monitor for crisis situations, automatically alerting human staff when needed. Additionally, chatbots can personalize rehabilitation plans, track progress, and support educational and vocational training efforts.

AI Support in Mental Health

Facilities in New York and California have piloted AI driven mental health screen tools to assess suicide risk and emotional stability.

AI powered chatbots are being tested to support inmates with cognitive behavioral therapy (CBT)techniques, anger management, and mindfulness

ChatBot Uses-Simulated CBT coaches, journaling, real time coping strategies for stress, cravings and conflicts.

Probation and Reentry Assistance

UK Ministry of Justice tested a chatbot for probationers that reminds them of court dates, providers check-ins prompts and offers emotional support.

At the Cook County facility, program that us AI assistants for parolees to help navigate reentry challenges such as job search, housing, transportation, relapse prevention.

Youth Intervention and Diversion Programs

AI bots have been used in pilot programs to engage at risk youth, especially those exposed to gang environments

In Chicago and LA, chatbots embedded in texting apps have been used to stimulate “non-judgmental mentors” to teach teens self-regulation, goal setting, and conflict avoidance.

Assessing Recidivism Risk

Recidivism is one of the most fundamental concepts in criminal justice. It refers to a person's relapse into criminal behavior, often after the person receives sanctions or undergoes intervention for a previous crime.

Assessing Recidivism Risk

Recidivism is when an individual is released from prison and reoffends

One of the most hotly debated application in AI in Criminal Justice

May be used to inform programming assignment for inmates as well as parole decisions.

Pros, system highlight the the potential to reduce human bias in decision making

Cons, systems have shown systemic biases embedded in the data used to make system

Recidivism Factors

AI systems, or algorithms, are trained on historical criminal records and other data points to identify patterns associated with reoffending. These systems analyze factors including:

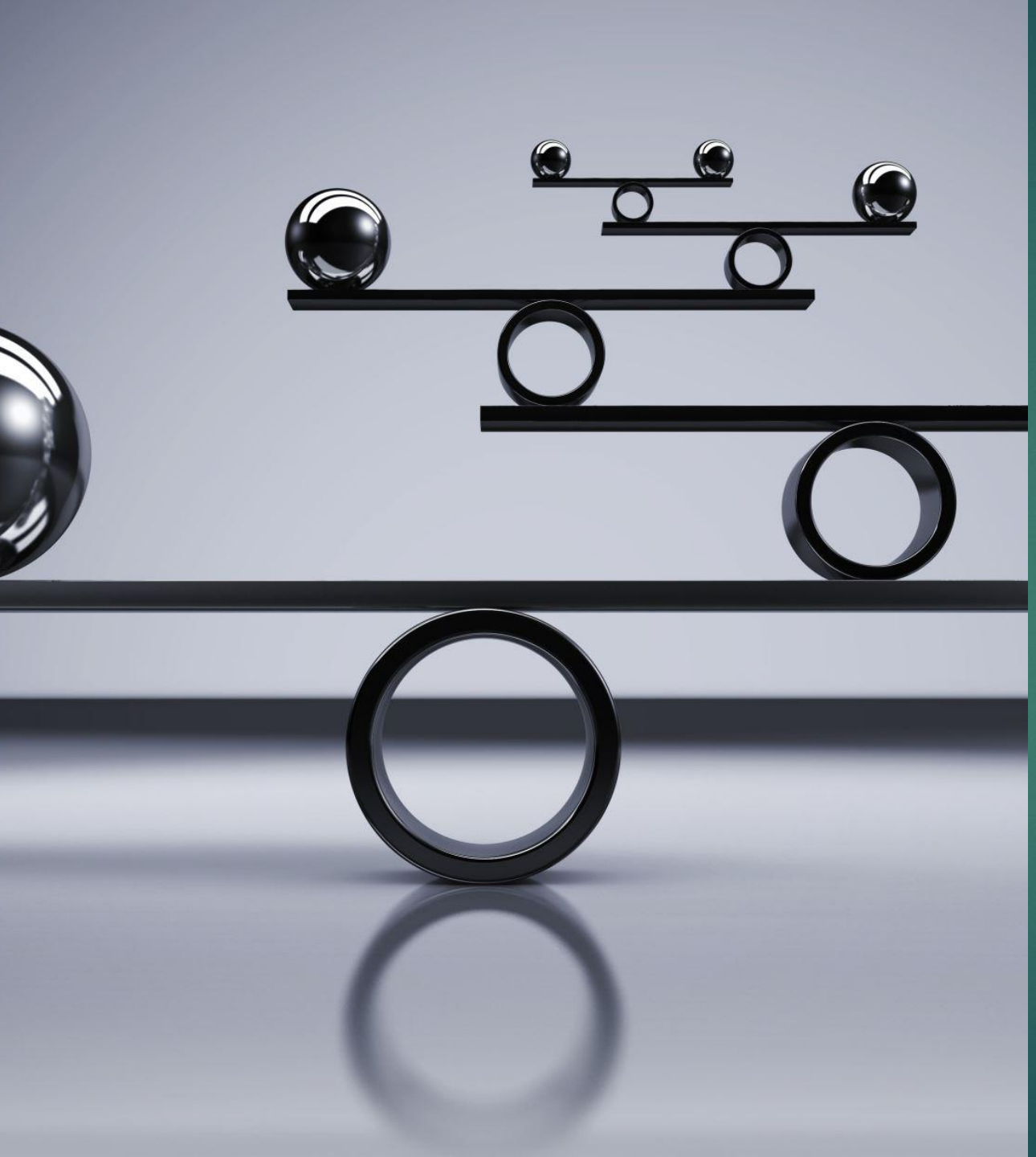
Criminal history: Previous offenses, number of arrests, and age at first arrest.

Demographic information: Age, employment status, education level, and substance abuse history.

Social and behavioral factors: Community ties and signs of delinquent behavior.

Recidivism Tool

- A well-known tool, Correctional Offender Management Profiling for Alternative Sanctions (COMPAS), uses these factors to produce risk scores for individuals that judges and parole boards can consider during their decision-making.



Ethical/legal considerations of AI in Healthcare

- Autonomy
- Transparency
- Accountability
- Liability and Malpractice
- Due Process

Autonomy

Foundational principle in healthcare ethics

Emphasizes a patients right to make informed decisions about their own care.

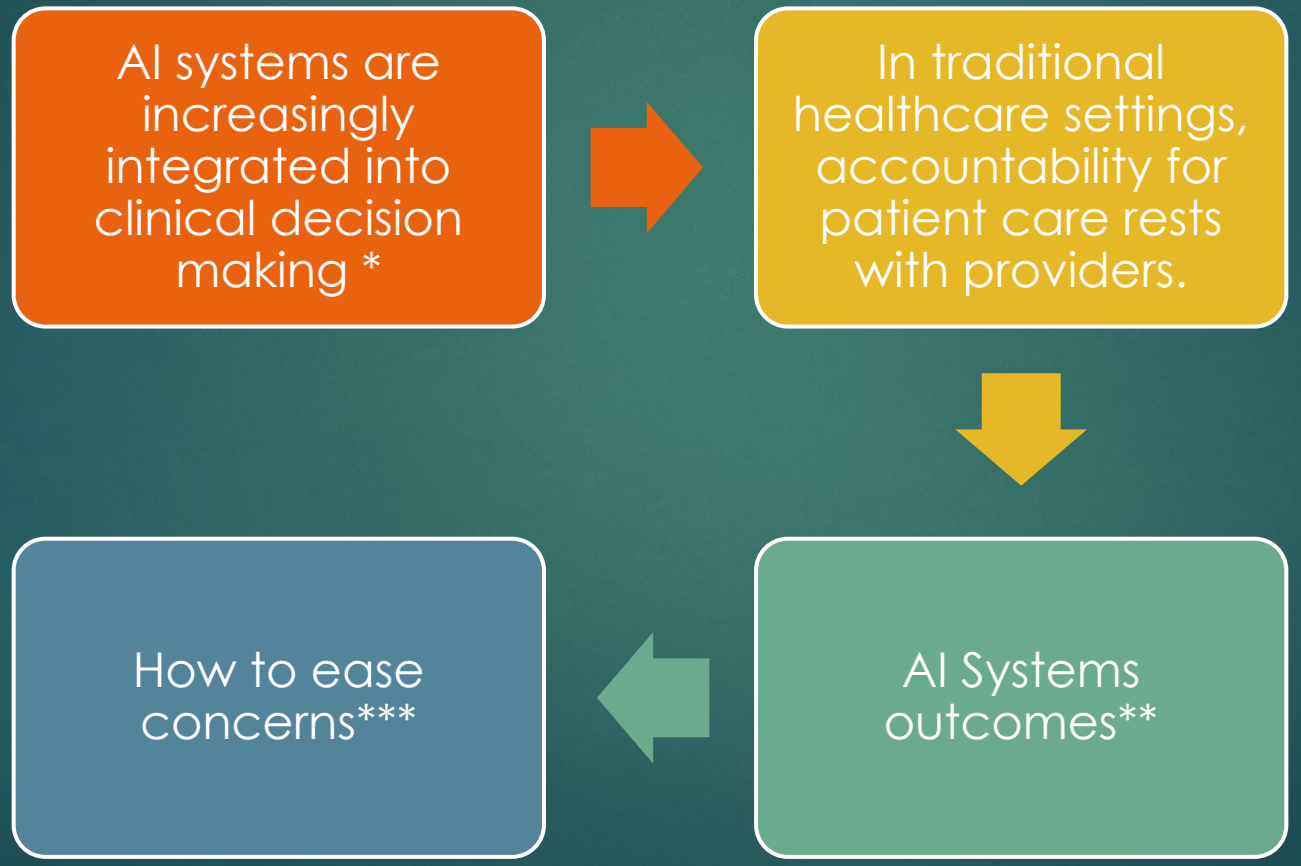
Less Autonomy

Patients not Up to date on care

Transparency

- Black Boxes
- Transparency and need for explainability is needed for providers/patients to trust AI decisions
- Full transparency is essential in complex cases where clinical judgement and human experience is a complement.

Accountability



Liability and Malpractice

Legal challenge in AI-assisted healthcare

Traditional medical malpractice law holds providers accountable for bad decisions.

In AI errors with decisions, it can be unclear who is responsible for error?

Solutions**

Flawed AI algorithms vs providers who make decisions based on those flawed algorithms

Institutions responsibility ***

Algorithm Audits

Key Takeaways

- AI has the potential to improve correctional outcomes, increase efficiency and reduce cost.*
- AI is unlikely to fully replace humans in corrections and supervision applications in the near future
- AI-enabled technologies provide opportunities to automate certain task and increase the efficiency of over burden officers
- AI enables more sophisticated surveillance and monitoring
- AI has the potential to improve human decision making