ARTIFICIAL INTELLIGENCE

BEYOND THE HYPE

NICK PATEL M.D.

CEO & FOUNDER STEALTH CONSULTING
AGENDA

- What is AI vs Automation?
- AI Timeline
- Review components: ML, NLP, DL, Gen AI, LLMs
- AI Hype-cycle
- AI in Healthcare
- AI Ethics/Regulations
WHAT IS AI VS AUTOMATION?
ARTIFICIAL INTELLIGENCE IS A BROAD TERM FOR TECHNOLOGIES THAT ENABLE COMPUTERS TO LEARN AND THINK LIKE HUMANS

**Purpose:** Capability of machines or computer programs to perform tasks that typically require human intelligence. AI systems are designed to simulate human reasoning and decision-making processes, learn from data, and adapt to new situations. AI can handle complex and unstructured data and make predictions or decisions based on patterns and algorithms.

**Flexibility and Adaptability:** Can handle a wide range of tasks and adapt to changing conditions or data. They are flexible and can be applied to various domains, from healthcare diagnosis to autonomous driving.

**Decision-Making:** can make decisions or recommendations based on data and algorithms. For example, AI can recommend personalized content on a website or suggest treatment options for a patient based on medical data.

**Examples:** Personal assistants, self-driving cars, content creation, disease diagnosis, robotic surgery
AUTOMATION IS A BROAD TERM FOR TECHNOLOGIES THAT ARE PROGRAMMED TO DO PREDEFINED TASKS OR PROCESSES

**Purpose:** It is focused on streamlining repetitive and rule-based activities, often with the goal of improving efficiency and reducing errors.

**Flexibility and Adaptability:** They do not possess learning capabilities and do not adapt to new situations unless explicitly reprogrammed.

**Decision-Making:** Does not have make decisions but executes tasks as instructed (programmed) without interpreting the data or context.

**Examples:** COVID symptom checker chatbots, industrial robots on manufacturing assembly lines, automated email responses etc.
AI TIMELINE
1943

1947
Statistician John W. Tukey introduced the term “bit” for a binary digit, a unit of information stored in a computer.

1949
Donald Hebb published *Organization of Behavior: A Neuropsychological Theory* that proposed a theory about learning based on conjectures about neural networks.

1950
- Claude Shannon published “Programming a Computer for Playing Chess” articles on developing a chess-playing computer program.
- Alan Turing proposed the Turing Test in Computing Machinery and Intelligence, arguing that if a machine can trick a human into thinking that it’s human, then the machine has intelligence.

1951
Marvin Minsky and Dean Edmunds created the first artificial neural network using 3,000 vacuum tubes, simulating a network of 40 neurons.

1955
- Al Born-

1956
The Dartmouth Conference was held, with Dartmouth professor John McCarthy bringing together leading experts to discuss topics like natural language processing, computer vision, and neural networks.

1956
Scientists John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon coined the term “Artificial Intelligence,” which is defined as the “science and engineering of making an intelligent machine.”

1956
- Herbert Simon and Allen Newell created the first AI program, the Logic Theorist, which goes on to prove 38 of the first 52 theorems in Whitehead and Russell’s *Principia Mathematica*. 
1959
Arthur Samuel coined the term “machine learning.”

1961
The first industrial robot, Unimate, was deployed on an assembly line in a General Motors plant.

1966
- Oliver Selfridge published Pandemonium: A Paradigm for Learning, which described a model for how computers could recognize patterns not specified in advance.
- John McCarthy published Programs with Common Sense, which described the Advice Taker program for solving problems by manipulating sentences in formal languages so the program could “learn from their experience as effectively as humans do.”

1969
- Arthur Bryson and Yu-Chi Ho talked about backpropagation as a multi-stage dynamic system optimization method, which contributed to the success of deep learning in the 2000s and 2010s.
- Joseph Weizenbaum developed ELIZA, the world’s first chatbot and an ancestor of Alexa and Siri.

1970
- Shakey, the first general-purpose mobile robot, was introduced. It was able to reason about its own actions.
- The first anthropomorphic robot, the WABOT-1, was designed at Waseda University in Japan.
1979
Kunihiro Fukushima developed neocognitron — a multilayered artificial, hierarchical, and neural network.

2000
Cynthia Breazeal at MIT developed Kismet, which can recognize and simulate emotions.

1997
Deep Blue, the first computer chess program, beat the reigning world chess champion, Gary Kasparov.

1969
Arthur Bryson and Yu-Chi Ho talked about backpropagation as a multi-stage dynamic system optimization method, which contributed to the success of deep learning in the 2000s and 2010s.

2001
Steven Spielberg released the A.I. Artificial Intelligence movie, in which a childlike android called David has the ability to love.

2006
Michele Banko, Oren Etzioni, and Michael Cafarella coined the term “machine reading,” an inherently unsupervised autonomous understanding of text.

2009
Rajat Raina, Anand Madhavan, and Andrew Ng published Large-scale Deep Unsupervised Learning Using Graphics Processors. They asserted that “modern graphics processors far surpass the computational capabilities of multicore CPUs, and have the potential to revolutionize the applicability of deep unsupervised learning methods.”

2011
A convolutional neural network won the German Traffic Sign Recognition competition with 99.46% accuracy, compared to humans at 99.22%.
2012
University of Toronto’s convolutional neural network achieved a 16% error rate in the ImageNet Large Scale Visual Recognition Challenge, an improvement from the 25% error rate achieved the year before by the best entry.

2017
Google DeepMind’s A.I. AlphaGo beat champion Lee Sedol in the complex board game of Go.

2022
OpenAI & DALL-E 2

2019
Quantum Computing

2023-24
Rapid expansion in AI capabilities

Watson, IBM’s natural language question-answering computer, beat two former champions on Jeopardy.
AI COMPONENTS
**“AI” IS AN UMBRELLA TERM THAT HAS MULTIPLE MEANINGS**

- **Artificial Intelligence**: Ability for a machine to **imitate human behavior**

- **Machine Learning**: Subset of AI that allows a system to **automatically learn from data** and improve from experience.

- **Supervised Learning**: Maps input to output so it’s able to **correctly classify new samples of data**.

- **Generative AI**: AI system capable of **generating text, code, images, audio, video** in response to prompts.
**MACHINE LEARNING (ML):** The heart of AI, allowing machines to learn from data. It includes various algorithms and techniques for building models that can make predictions or decisions without being explicitly programmed for the task.

**NATURAL LANGUAGE PROCESSING (NLP):** NLP enables machines to understand, interpret, and generate human language. This includes a range of tasks from speech recognition, language translation, and sentiment analysis to chatbots and virtual assistants.

**DEEP LEARNING:** A subset of machine learning, deep learning uses neural networks with many layers (deep neural networks) to analyze large amounts of data. It's particularly effective for tasks like image and speech recognition.

**ROBOTICS:** Robotics involves the design, construction, operation, and use of robots, often incorporating AI to allow autonomous or semi-autonomous function. Robotics is applied in manufacturing, healthcare, service industries, and exploration.

**COMPUTER VISION:** Computer vision enables machines to interpret and make decisions based on visual data from the world. Applications include facial recognition, object detection, and autonomous vehicles.

**LLMs (Large Language Models):** A type of artificial intelligence technology developed to understand and generate human-like text based on the input they receive. These models are a subset of machine learning models known as transformers, which have been designed to handle various tasks related to natural language understanding (NLU) and natural language generation (NLG).
Is this a **Cat** or **Dog**?

**CAT**

**DOG**

- Output Layer
- Activated Neurons
- Input Layer

Deep Neural Network
AI HYPE CYCLE
AI IN HEALTHCARE
CURRENT CHALLENGES

• Length of Stay
• 30 – Day readmissions
• ER wait times
• Primary care access
• Domestic utilization of HMH services
• Provider burnout
• Staffing constraints/rising costs
• Growth of catchment area
• Lack of a unified consumer experience
• Care gap closure
• Chronic disease management/Quality
Digital strategy is both an offensive and defensive play; it helps with growth but also prevents against market share loss to new entrants.

**Offensive Play**
Providing differentiated digital experience and value proposition, with investments in digital capabilities focused on convenience and personalization for volume growth.

- Aggressive focus on new customer volume growth
- Differentiating customer knowledge for retention
- Share of wallet growth through innovative products
- Focus on end to end ownership of customer relationship from wellness to sick care

**Defensive Play**
Empowers health systems in responding to business / market condition; with investments in capabilities that protect against the downside.

- Primary focus on market share retention
- Investment in digital channels and partnerships to counter the impact of new entrants
- Investment in “brilliant basics” capabilities to improve administrative and clinical experiences
- Focus on specific service lines and traditional inpatient and ambulatory services

**Hospitals with higher patient experience scores** show up to 50% higher profit margins than average peers.

**41% of patient revenue at risk for “poor” digital experience**, 1 in 5 patients have already switched providers due to poor digital experience.

Sources: 1) Press Ganey 2) Fierce Healthcare
ARTIFICIAL INTELLIGENCE IN HEALTHCARE
Role of AI in Healthcare

- End of Life Care
- Associated Care
- Early Detection of Ailments
- Improve Decision Making
- Giving a Superior Experience
- Expanded Access to Medical Services
- Help in Retirement
- Checking Health through Wearable
ARTIFICIAL INTELLIGENCE IN HEALTHCARE

Pros and Cons

Pros
- Better data-driven decisions
- Increased disease diagnosis efficiency
- Treatment time cut in half
- Integration of information
- Reduce unnecessary hospital visits
- Create time-saving administrative duties

Cons
- Concerns regarding privacy & security
- Lack of curated healthcare data
- High initial capital investment
- Lack of interoperability
- Reluctance from staff to embrace AI
- Potential for increased unemployment
ARTIFICIAL INTELLIGENCE IN HEALTHCARE
Challenges in Healthcare AI Market

- High initial capital requirement
- Potential for increased unemployment
- Difficulty in Deployment
- Reluctance among medical practitioners to adopt AI
- Lack of curated healthcare data
- Concerns regarding privacy and security
- Lack of interoperability between AI solutions
- State and federal regulations
AI AND AUTOMATION HAS TREMENDOUS POTENTIAL TO DISRUPT PATIENT CARE AND HOSPITAL OPERATIONS

- Create Personalized & Equitable Experiences
  - Analyze large amounts of patient data to create dynamic, real-time, and tailored experiences, products, services, and communication, that account for unique patient contexts and enable equitable outcomes

- Enhance Consumer Health Literacy
  - Fuel patient education by offering coherent, tailored explanations that simplify healthcare jargon and adjust for language translation to offer new ways to clarify and confirm understanding

- Streamline Administrative Efficiencies
  - Complement administrative staff by reducing manual, error-prone processes like claims processing and appointment scheduling associated with high cycle time and costs

- Alleviate Employee Burnout
  - Alleviate employee burnout leading to dissatisfaction and turnover by reducing time-consuming, manual tasks, and allowing staff to focus on patients and optimizing clinical outcomes

- Increase Patient Utilization & Adherence
  - Empower patients with easy-to-understand health information and ease of scheduling to access healthcare and understand the importance of adhering to patient visits and medication regimens
ChatRWD is the first application incorporating chat-to-database capability to help healthcare leaders advance and accelerate evidence generation rapidly saving organizations valuable time, money and staffing resources. **Cut observational research production from months to minutes, while maintaining precision, transparency, and producing rigorous evidence for healthcare.**

Rapid real world evidence generation with AI-powered chat to database

©2024 Atropos Health, Inc.

Confidential & Proprietary
ChatRWD is the first application incorporating chat-to-database capability to help healthcare leaders advance and accelerate evidence generation rapidly saving organizations valuable time, money and staffing resources.

Cut observational research production from months to minutes, while maintaining precision, transparency, and producing rigorous evidence for healthcare.
AI AND AUTOMATION CONTINUES TO GROW ACROSS HEALTH SYSTEMS

1. Use automatic speech recognition (ASR) technology and natural language processing (NLP) to convert patient conversations into medical notes.

2. Use of Artificial Intelligence (AI) for early identify cancer patients from pathological reports and radiology image text.

3. Use Artificial Intelligence (AI) and Machine Learning (ML) solutions to solve for empty ORs and match with surgeons looking for block time.

4. Use Artificial Intelligence (AI) to increase operations efficiencies and improve care experience in an ER setting.

5. Use advanced imaging technology and Artificial Intelligence (AI) to automatically analyze CT perfusion images of the brain.

6. Use Artificial Intelligence (AI) and Robotics Process automation (RPA) optimize revenue cycle functions.
## Pragmatic Approach to Prioritizing and Scaling the AI and Automation Across the Network

<table>
<thead>
<tr>
<th>Diagnostic and opportunity identification</th>
<th>Strategy and Operating model</th>
<th>Use case development and execution</th>
<th>Culture change and sustained impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Holistic and comprehensive approach to identifying opportunities</td>
<td>• Develop compelling, aligned, enterprise-wide vision and strategy tied to the business strategy</td>
<td>• Develop prioritized road map of opportunities based on impact and feasibility</td>
<td>• Proceed with further use cases in waves progressively building internal capabilities</td>
</tr>
<tr>
<td></td>
<td>• Outline elements of analytics operating model and build alignment across the organization</td>
<td>• Prepare and stand-up infrastructure to deliver use case</td>
<td>• Embrace a new culture and capabilities to enable impactful and lasting change (e.g., training)</td>
</tr>
<tr>
<td></td>
<td>• Identify use cases</td>
<td>• Pilot use to create proof of concept</td>
<td></td>
</tr>
</tbody>
</table>
AI REGULATION AND ETHICS
WITH GREAT POWER...
AI ETHICS

- **National AI Initiative Act**: Aims to support and guide AI research and policy development.

- **Algorithmic Accountability Act**: Proposed legislation that would require companies to conduct impact assessments of automated systems for risks and biases. Various states like California have their own regulations, such as laws regarding facial recognition and other AI technologies.

- **White House Executive Order**: New standards for AI safety and security, protects Americans’ privacy, advances equity and civil rights, stands up for consumers and workers, promotes innovation and competition.
Valid AI
Valid AI generally refers to artificial intelligence systems that are effective, reliable, and perform as expected according to their designed tasks. The criteria for an AI being "valid" could include:

**Accuracy:** The AI performs with a high level of correctness in its predictions or tasks.

**Reliability:** The AI provides consistent results under varying conditions.

**Transparency and Explainability:** The AI’s decisions can be understood and interpreted by humans.

**Ethical Considerations:** The AI adheres to ethical guidelines, ensuring fairness, privacy, and accountability.

Safety and Security: The AI is designed with robust safety features to prevent harmful outcomes and protect against security breaches.

CHAI
CHAI stands for Center for Human-Compatible Artificial Intelligence. It is a research center at the University of California, Berkeley. CHAI’s focus is on developing artificial intelligence systems that are provably aligned with human interests. Key aspects of CHAI’s research include:

**Alignment:** Researching ways to design AI systems whose goals and behaviors can be aligned with human values throughout their operation.

**Value Learning:** Developing techniques for AI systems to learn values effectively and safely from human behavior and preferences.

**Intervention:** Ensuring humans can safely and effectively intervene in an AI system’s operation.

**Robustness:** Designing AI systems that behave well under a wide variety of conditions, particularly in ways that the designers did not specifically anticipate.
"AI is a fundamental risk to the existence of human civilization in a way that car accidents, airplane crashes, faulty drugs or bad food were not — they were harmful to a set of individuals within society, of course, but they were not harmful to society as a whole." – Elon Musk
THANK YOU