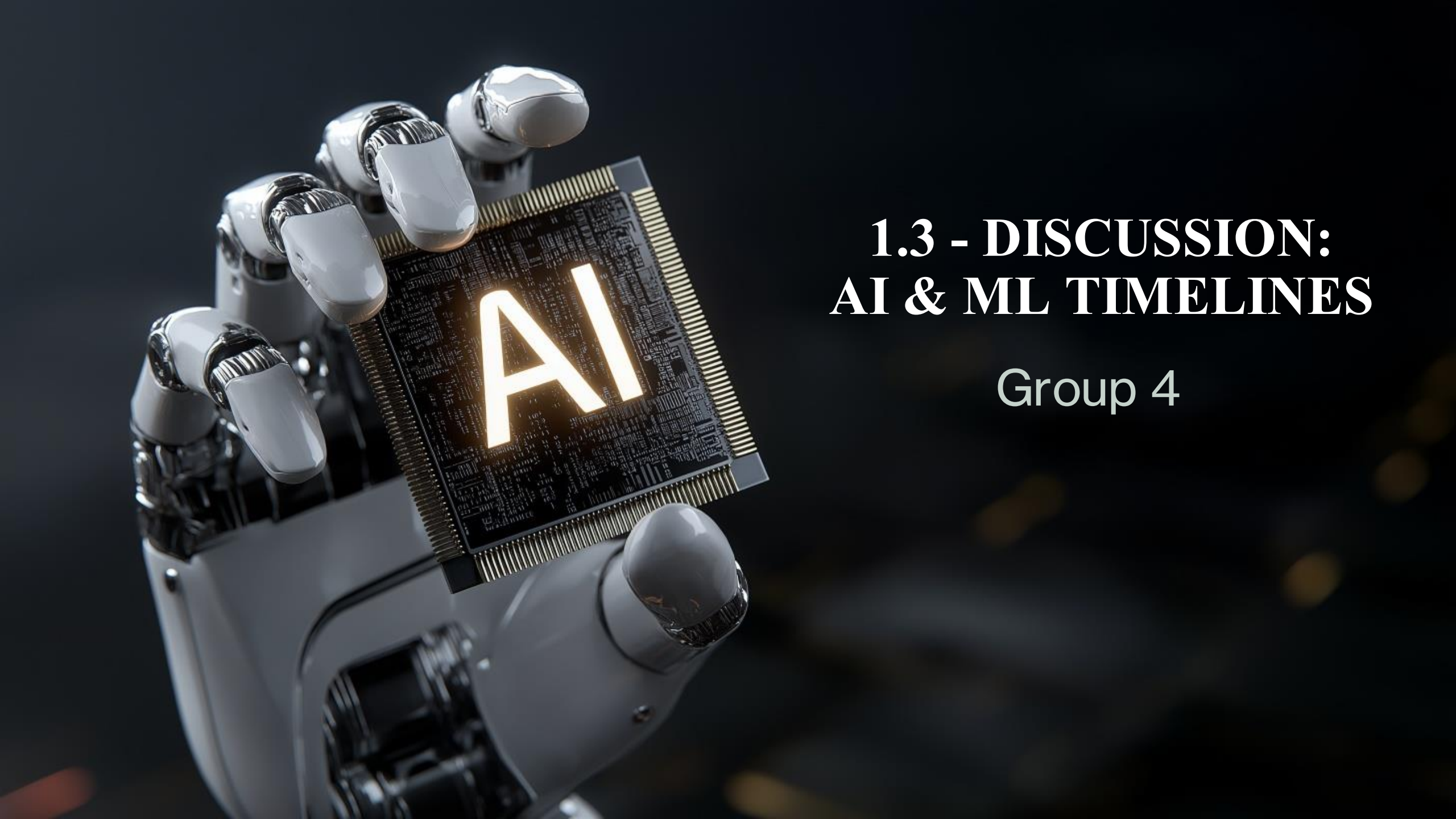


1.3 - DISCUSSION: AI & ML TIMELINES

Group 4

AI & ML TIMELINE

Foundational Stage

The Birth of AI

1940s–1950s

1956–1970s

Classical AI

Symbolic AI and Reasoning

AI Winter

Knowledge-Based Systems

1970s–1980s

1980s–1990s

Machine Learning Emergence

Learning from Data

Big Data and Deep Learning Era

Neural Networks

2000s–2010s

2020s–Present

Modern AI

Generative and Multimodal Intelligence

Historical Context

AI Winter

Recent Successes

Foundational Stage (1940s–1950s): The Birth of AI

- **1943 – McCulloch & Pitts Neural Network Model**
  First theoretical model of how a machine could mimic brain neurons — foundation of modern neural networks.
- **1950 – Alan Turing publishes "Computing Machinery and Intelligence"**
  Introduced the Turing Test, defining what it means for a machine to "think."
- **1951 – First AI Programs**
  Demonstrated that machines can make decisions and learn strategies through early game-playing programs (checkers and chess).
- **1956 – Dartmouth Conference: Official Birth of AI**
  John McCarthy coins the term "Artificial Intelligence" and establishes AI as a scientific field.

- **Summary:** These milestones laid the foundation for artificial intelligence — transforming theoretical computing into a pursuit of machines capable of reasoning, learning, and problem-solving.

Classical AI (1956–1970s): Symbolic AI and Reasoning

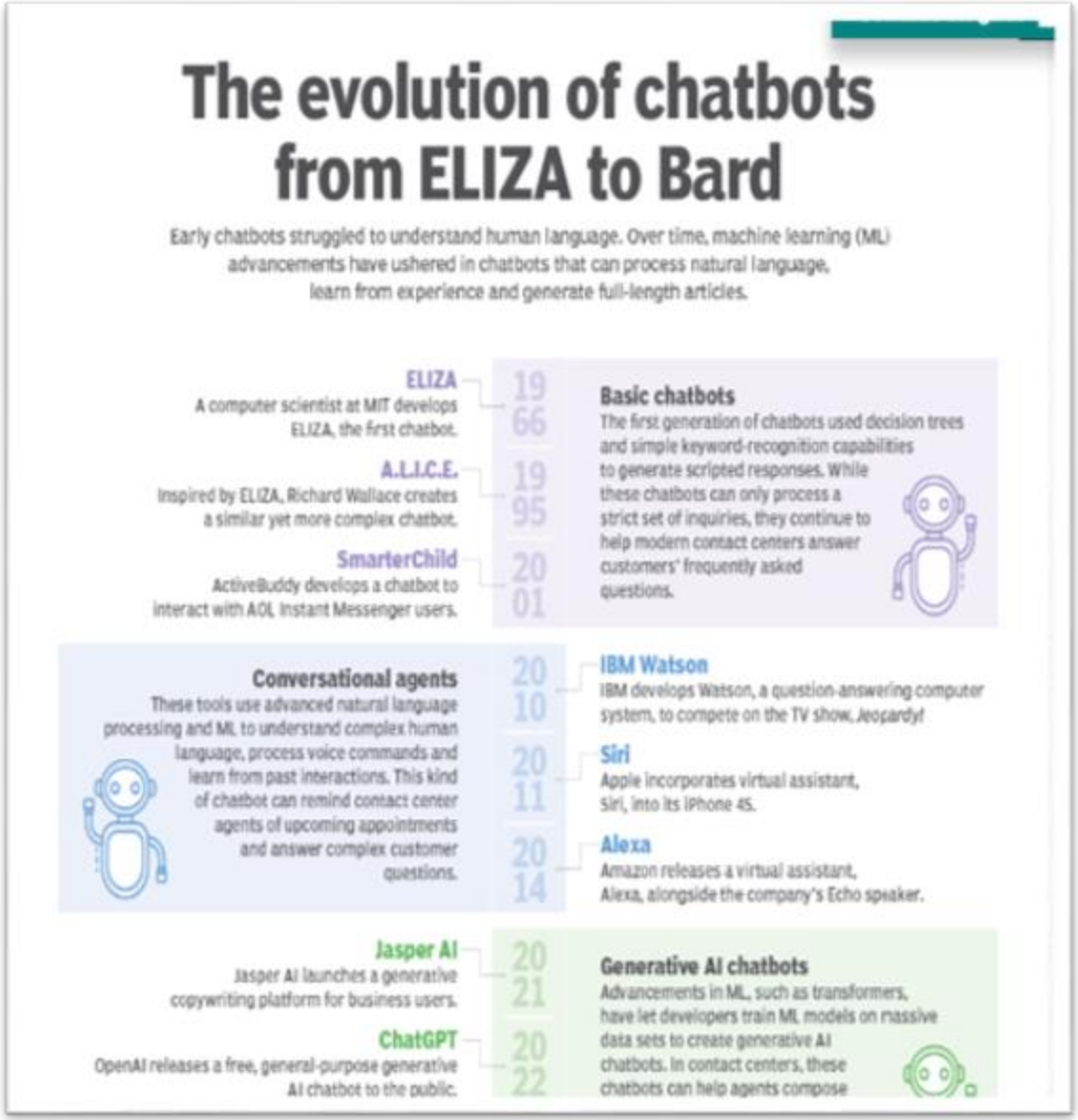
Key idea

Intelligence can be represented through symbols and logical rules.

Milestones

Early programs like the Logic Theorist and ELIZA simulated reasoning and conversation.

- **1957 — Perceptrons**: Frank Rosenblatt developed the **Perceptron**, the first algorithm for supervised learning of binary classifiers. John McCarthy developed the programming language Lisp.
- **1959** — Arthur Samuel coined the term machine learning in a seminal paper . Oliver Selfridge published "Pandemonium: a model that could adaptively improve itself to find patterns in events.
- **1964** — Daniel Bobrow developed STUDENT, an early natural language processing (NLP) program designed to solve algebra word problems,
- **1965** — Dendral, which assisted organic chemists in identifying unknown organic molecules.
- **1969** — Minsky and Papert's *Perceptrons* exposed limitations of single-layer networks (e.g., XOR problem), triggering the first *AI Winter* due to reduced research interest and funding.



AI Winter and Knowledge-Based Systems (1970s–1980s)

Overview

During the 1970s–1980s, AI advanced with **knowledge-based (expert) systems** that encoded human expertise into rules, becoming the first commercially successful AI. But technical limits and high expectations led to funding cuts and stalled progress, resulting in the **AI Winters**.

Key Developments

- Rise of expert systems (MYCIN, XCON)
- Rule-based, symbolic reasoning
- Used in medicine, business, and finance
- Showed AI's value in specialized tasks

Challenges Leading to AI Winter

- High cost & hard to maintain
- Couldn't scale or learn — manual rules
- Limited computing power
- Funding dropped as expectations weren't met

Impact

- Major funding cuts → **AI Winter**
- Shift toward data-driven, statistical methods
- Lesson: AI must be **scalable & self-learning**, not rule-based

Revealed both the potential and limits of early AI, leading to today's data-driven, scalable, self-learning models instead of hand-coded rules.

Machine Learning Emergence (1980s–1990s): Learning from Data

- **Motivations:**
  - Development of computing power make "Machine that reason" to "Machine can learn"
  - Real-world problems were too complex to capture with symbolic reasoning.

- **Key facts:**
  - Revival of neural networks.
    - Can perform pattern recognition tasks like image recognition and handwriting digit recognition
  - Rise of Probabilistic Models and Statistical Learning, example models include:
    - Logistic regression: credit score
    - SVM: text categorization
    - PCA: image compression
  - Machine learning research formalized different types of learning
    - Supervised learning: Learning from labeled examples
    - Unsupervised learning: Discovering patterns in unlabeled data
    - Reinforcement learning: Train the agent by balancing trial and error to maximize a reward

- **Impacts:**
  - The focus shifted from symbolic reasoning to data-driven pattern recognition.
  - ML has become a systematic and distinct discipline within AI.

Big Data and Deep Learning Era (2000s–2010s): Neural Networks Reborn

***Key Idea*:**

- Revival of neural networks due to Big Data and powerful GPUs.
- Deep models trained efficiently on massive datasets.
- Marked the start of modern AI breakthroughs in vision, speech, and automation.

***Major Milestones*:**

- GPU advancements enabled efficient model training.
- Explosion of Big Data from the internet and sensors.
- ImageNet 2012 revolutionized computer vision (AlexNet).
- Deep models improved speech recognition.
- Development of CNNs, RNNs, and LSTMs.

***Focus Areas*:**

- Pattern recognition and automation across industries.
- Large-scale learning from vast datasets.
- Foundation for self-driving cars, recommendation systems, and AI applications.

Modern AI (2020s–Present) And Future Trends in AI

- **2020–2021 – Generative AI Revolution**
  AI tools like GPT-3 and **DALL·E** created human-like text and images, redefining creativity and productivity.
  Later expanded with **ChatGPT**, **Gemini**, **Claude**

- **2022–2023 – Multimodal AI**
  Models like GPT-4V and **Gemini 1.5** combined **text, image, and speech** understanding for human-like versatility.

- **2023–2024 – Edge & Federated AI**
  AI processing moved to local devices (Apple Siri, Tesla Autopilot, NVIDIA Jetson) for **speed, privacy, and real-time** decision-making.

- **2024–Present – Ethical & Responsible AI (e.g., Palantir, Microsoft, Google)**
  Companies like **Palantir** lead in building transparent, secure, and human-supervised AI systems, ensuring fairness and accountability in real-world applications.

Future Trends

- **Autonomous Agentic AI (2025–2030, e.g., Microsoft Copilot, OpenAI Agents)**
  AI will manage complex, multi-step workflows independently, acting as intelligent partners in work and daily life.
- **Next-Gen Computing (2025–2035, e.g., Quantum & Neuromorphic Systems)**
  Quantum and brain-inspired chips will deliver faster, energy-efficient AI performance.
- **Synthetic Data & Specialized Models (2026–2032)**
  AI will train on synthetic data and task-specific models for better accuracy, privacy, and reduced bias.
- **Toward AGI (2030–2040, e.g., OpenAI, DeepMind, Anthropic)**
  Research continues toward human-level reasoning AI, with focus on safety, ethics, and control.

Conclusion

From the symbolic reasoning of the 1950s to generative intelligence in the 2020s, AI has evolved through constant innovation. The future of AI lies in creating ethical and collaborative systems that support and empower humans, not replace them.

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Ron Krijan The history of artificial intelligence: Complete AI timeline: *https://www.techtarget.com/searchenterpriseai/tip/The-history-of-artificial-intelligence-Complete-AI-timeline*

Thank You!