Name : SANDILE KHOZA

Student No: 32462409

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Theory Assignment: AI , The Past and the Present

Part 1: Historical

Three Key Historical Events in AI

1. **The Dartmouth Workshop (1956)**

   o **Importance :** Often regarded as the birth of AI as a formal field, this workshop brought together pioneers like John McCarthy, Marvin Minsky, and Claude Shannon to explore the idea of creating machines that could simulate human intelligence.

   o **Impact :** It introduced the term "Artificial Intelligence" and set the foundation for AI research, shifting from philosophical speculation to structured scientific inquiry. The workshop proposed that learning, reasoning, and problem-solving could be mechanized, inspiring decades of research.

2. **The Development of Expert Systems (1969–1986)**

   o **Importance:** Systems like DENDRAL (for chemical analysis) and MYCIN (for medical diagnosis) demonstrated that AI could solve specialized real-world problems by encoding expert knowledge into rule-based programs.

   o **Impact:** Expert systems proved AI's practical utility, leading to commercial applications in medicine, finance, and engineering. However, their reliance on hand-coded rules made them brittle and difficult to scale, contributing to the "AI Winter" of the late 1980s.

3. **The Deep Learning Revolution (2011–Present)**

   o **Importance :** Advances in neural networks, particularly AlexNet (2012), showed that deep learning could outperform traditional methods in image recognition. Later, AlphaGo (2016) defeated world champions in Go, a milestone previously thought decades away.

   o **Impact:** Deep learning has transformed industries, enabling breakthroughs in speech recognition (Siri, Alexa), autonomous vehicles (Tesla, Waymo), and

medical diagnostics (AI-assisted radiology). However, it also highlighted challenges like data dependency and computational costs.

GPS vs. LISP

GPS (General Problem Solver, 1957)

- **Advantages:**
    - One of the first AI programs to simulate human problem-solving.
    - Used heuristic search to solve puzzles and mathematical theorems, influencing cognitive science.
- **Disadvantages:**
    - Limited to well-defined problems (e.g., logic puzzles).
    - Could not learn or adapt to new scenarios.
- **Historical Impact:**
    - Demonstrated that human-like reasoning could be formalized computationally.
    - Inspired later AI systems, including expert systems and automated planners.

LISP (1958)

- **Advantages:**
    - First high-level AI programming language, designed for symbolic reasoning.
    - Flexible and powerful for AI research (e.g., early work in natural language processing).
- **Disadvantages:**
    - Complex syntax made it less accessible for general programming.
    - Performance limitations compared to modern languages like Python.
- **Historical Impact:**
    - Dominated AI research for decades (used in projects like SHRDLU and early robotics).
    - Influenced modern functional programming languages (e.g., Clojure, Racket).

Part 2: Cutting-Edge AI

Real-World Applications

1. **Healthcare – AI in Diagnostics**

   o **Technology:** Deep learning models (e.g., LYNA) analyze medical images to detect diseases like cancer and diabetic retinopathy with superhuman accuracy.

   o **Impact:** Reduces diagnostic errors, speeds up treatment, and improves outcomes, especially in underserved regions.

2. **Robotics – Autonomous Vehicles**

   o **Technology:** AI-powered perception (LiDAR, computer vision) and reinforcement learning enable self-driving cars (Waymo, Tesla).

   o **Impact:** Reduces accidents caused by human error, improves traffic efficiency, and enhances mobility for disabled individuals.

3. **Natural Language Processing (NLP) – Large Language Models**

   o **Technology:** Models like GPT-4 and Gemini generate human-like text, translate languages, and assist in coding.

   o **Impact:** Used in customer service, education, and content creation, but raises concerns about misinformation and job displacement.

Challenges in AI Development

1. **Data Bias**

   o AI models trained on biased datasets (e.g., facial recognition performing poorly on darker skin tones) can reinforce discrimination.

   o **Impact:** Erodes trust in AI systems and leads to unfair outcomes in hiring, policing, and lending.

2. **Data Scarcity & Quality**

   o High-quality labeled data is expensive and scarce in fields like rare disease diagnosis.

- **Impact:** Limits AI performance in critical applications, requiring synthetic data or transfer learning.

3. **Ethical & Security Risks**

   - AI can be misused for deepfake propaganda, autonomous weapons, or mass surveillance.

   - **Impact:** Governments and corporations are developing AI ethics guidelines to prevent harm.

Addendum: AI Chat Links

- **ChatGPT Conversation:** [Claude](#)

Conclusion

AI has evolved from theoretical beginnings to transformative real-world applications. While historical milestones like the Dartmouth Workshop and expert systems laid the groundwork, modern AI powered by deep learninis s reshaping industries. However, challenges like bias, data scarcity, and ethical risks must be addressed to ensure AI benefits society responsibly.