



UKRENERGY



TRAINING COURSE 16TH – 20TH SEPTEMBER 2024

Energy Efficient Buildings

Utilization of AI in the Teaching and Research Process

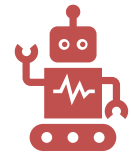
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Innovative Master Courses Supporting the Improvement of the Energy and
Carbon Footprint of the Ukrainian Building Stock*



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the European Union**

Introduction



What is AI?

AI refers to the simulation of human intelligence in machines.



Why is AI important?

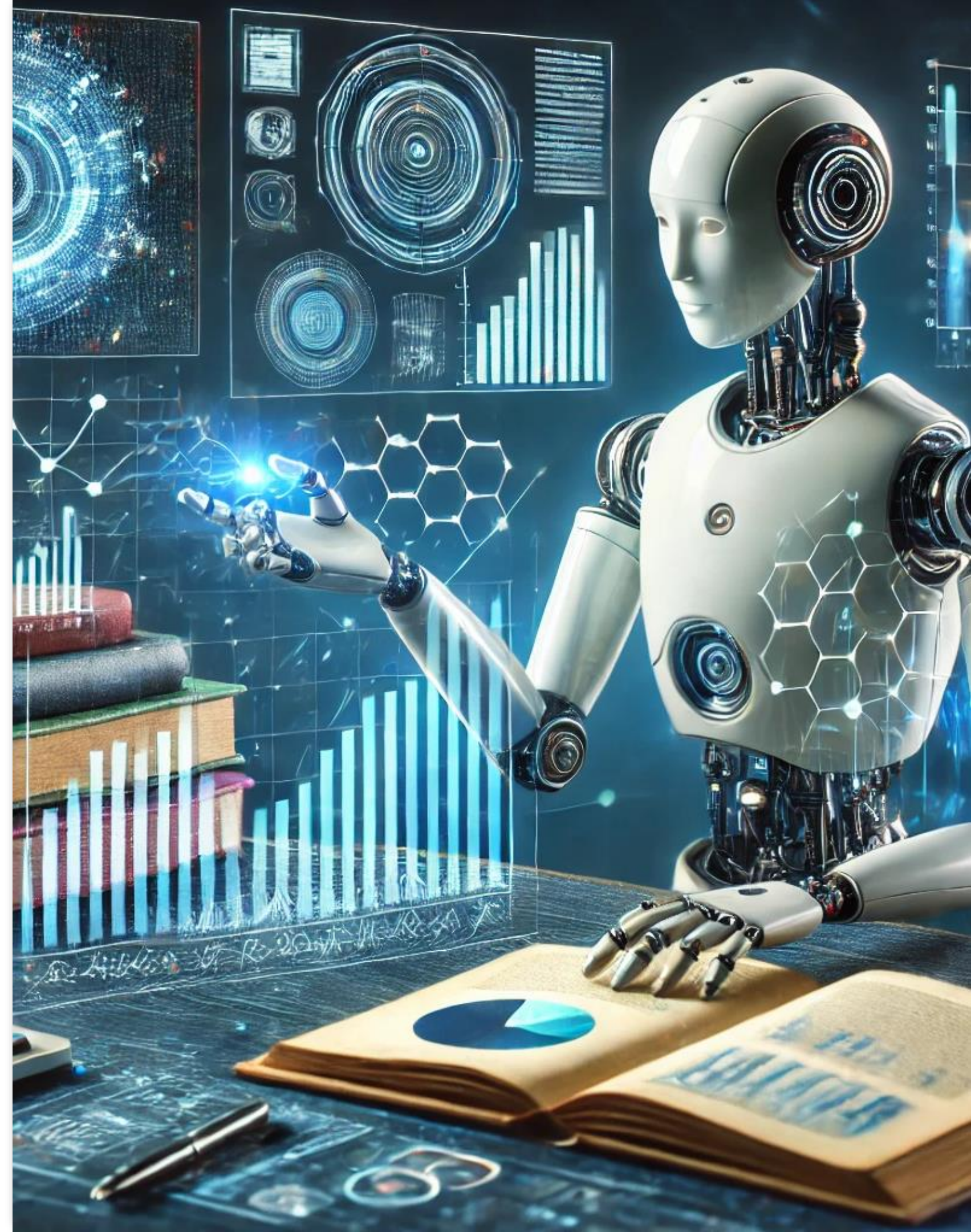
AI enhances efficiency, personalization, and innovation in education and research.



Overview of Presentation:

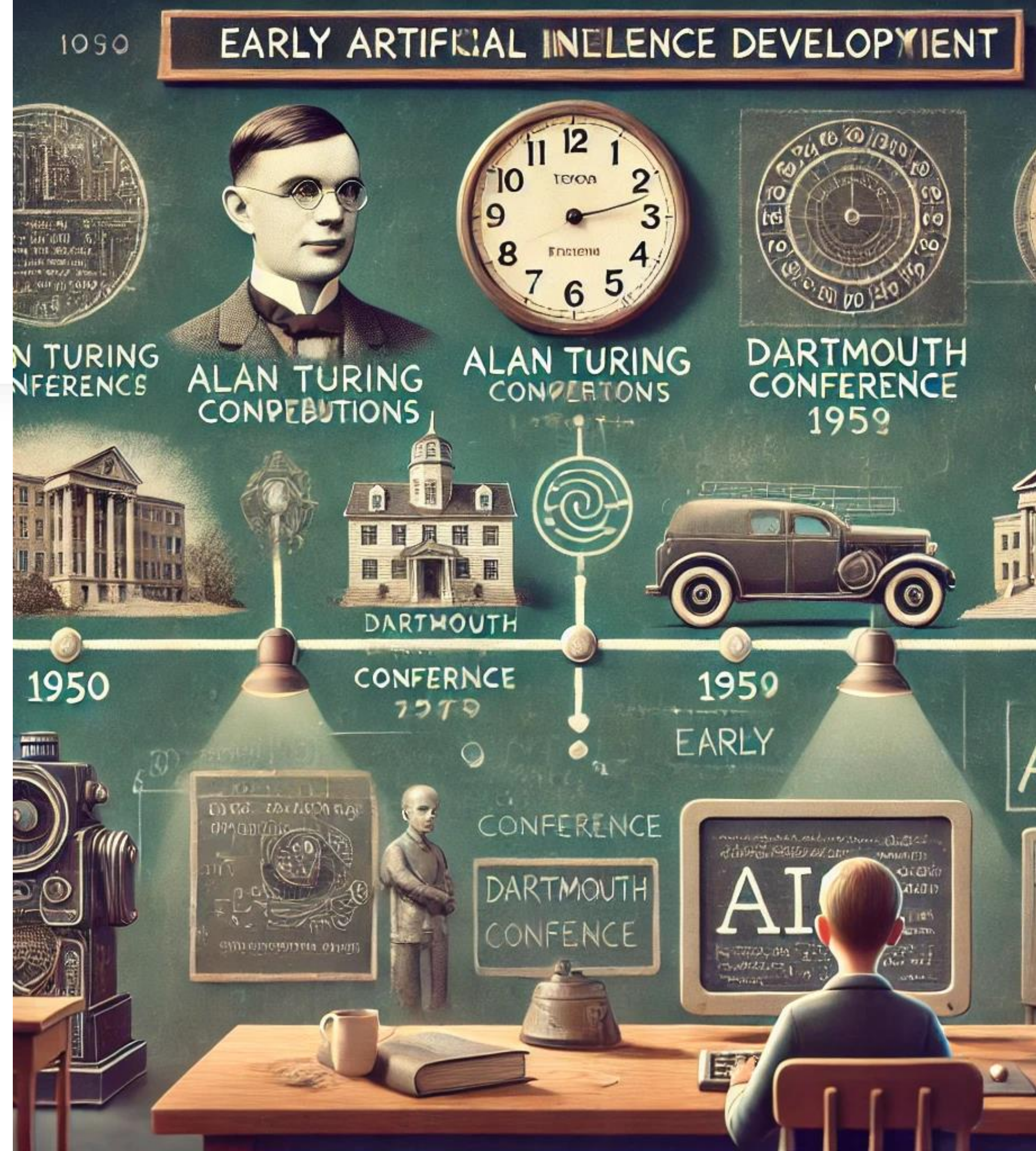
AI in Teaching: Personalization, automation, and engagement.

AI in Research: Data analysis, hypothesis generation, and predictive modeling.



History of AI – Early Beginnings

- Early AI Development (1950s–1970s):
 - 1956: AI coined at the Dartmouth Conference.
 - Early work focused on symbolic AI and problem-solving.
- Turing Test (1950):
 - Alan Turing’s test for machine intelligence.
- Limitations:
 - Limited computing power and over-reliance on rule-based systems.



History of AI – Expansion and Challenges

AI Winter (1970s–1990s):

- Lack of funding and slow progress led to AI 'winters.'
- Over-promising results and under-delivery slowed AI progress.

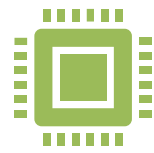
Expert Systems (1980s):

- Focus shifted to knowledge-based systems.
- AI systems used in medical diagnoses and industry (e.g., MYCIN).

Challenges:

- Difficulty in handling unstructured data and learning.

History of AI – Modern AI and Machine Learning



Resurgence in AI (1990s–2000s):

Increased computing power and access to large datasets revived AI.



Rise of Machine Learning:

Focus on training algorithms to recognize patterns and improve performance.



Breakthroughs:

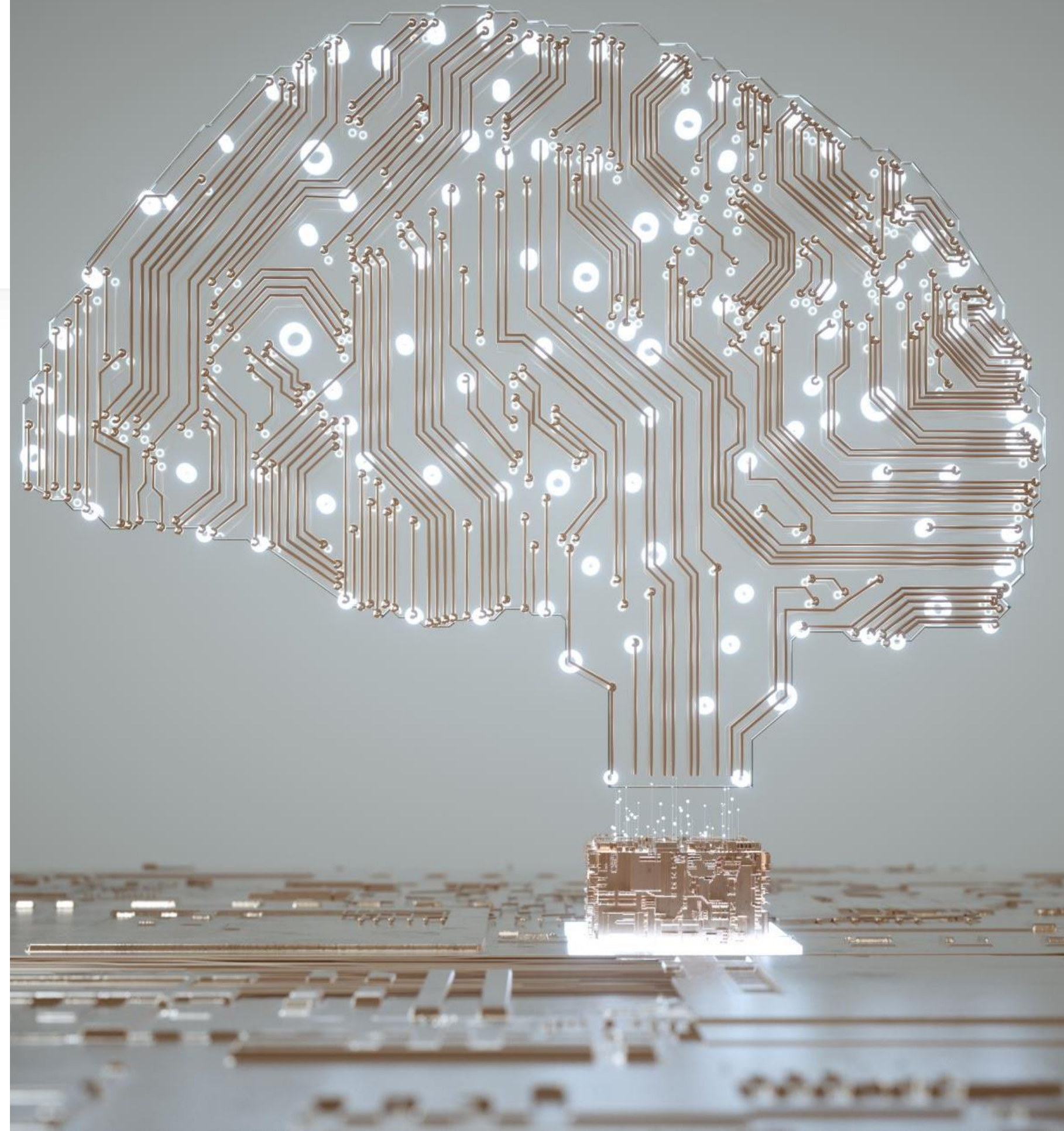
1997: IBM's Deep Blue beats world chess champion Garry Kasparov.

2012: Deep learning models achieve breakthroughs in image and speech recognition.

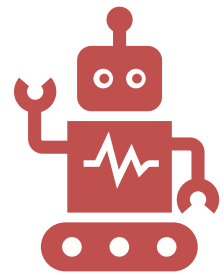


AI Learning Process

- How AI Models Learn Over Time
 - The video below demonstrates how AI learn through machine learning algorithms, improving their accuracy over time as they process more data.
 - https://www.youtube.com/watch?v=v3UBIEJDXR0&ab_channel=AIWarehouse
[e](#)



AI in the 21st Century



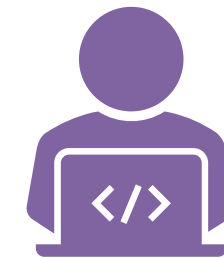
AI in Everyday Life:

AI powers digital assistants (e.g., Siri, Alexa), recommendation engines (e.g., Netflix), and more.



AI in Education and Research:

Personalized learning systems, predictive analytics, and AI-powered research tools.



Current Trends:

AI's role in data analysis, automation, and decision-making.
Integration of AI into fields like healthcare, education, and finance.

Transition to AI in Teaching and Research

- Next Sections:
 - How AI is transforming teaching: Personalization, automation, and engagement.
 - How AI is advancing research: Data analysis, hypothesis generation, and modeling.

AI in Teaching – Overview

- Key Transformations:
 1. Personalized Learning.
 2. Automated Grading.
 3. Intelligent Tutoring Systems (ITS).
 4. AI-powered Learning Management Systems (LMS).

Personalized Learning with AI

How AI Personalizes Learning:

- AI adapts the content to a student's pace and learning style.

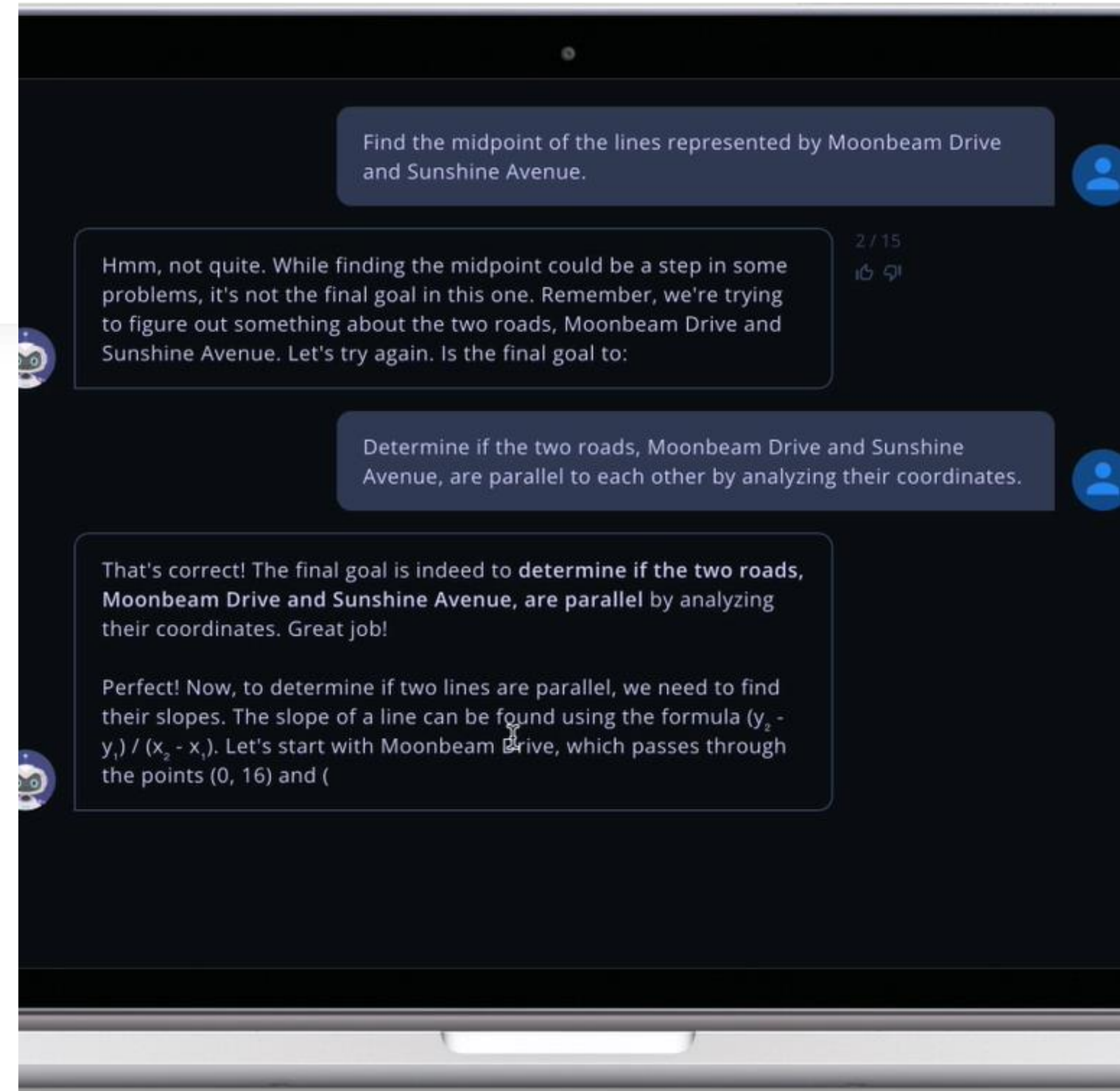
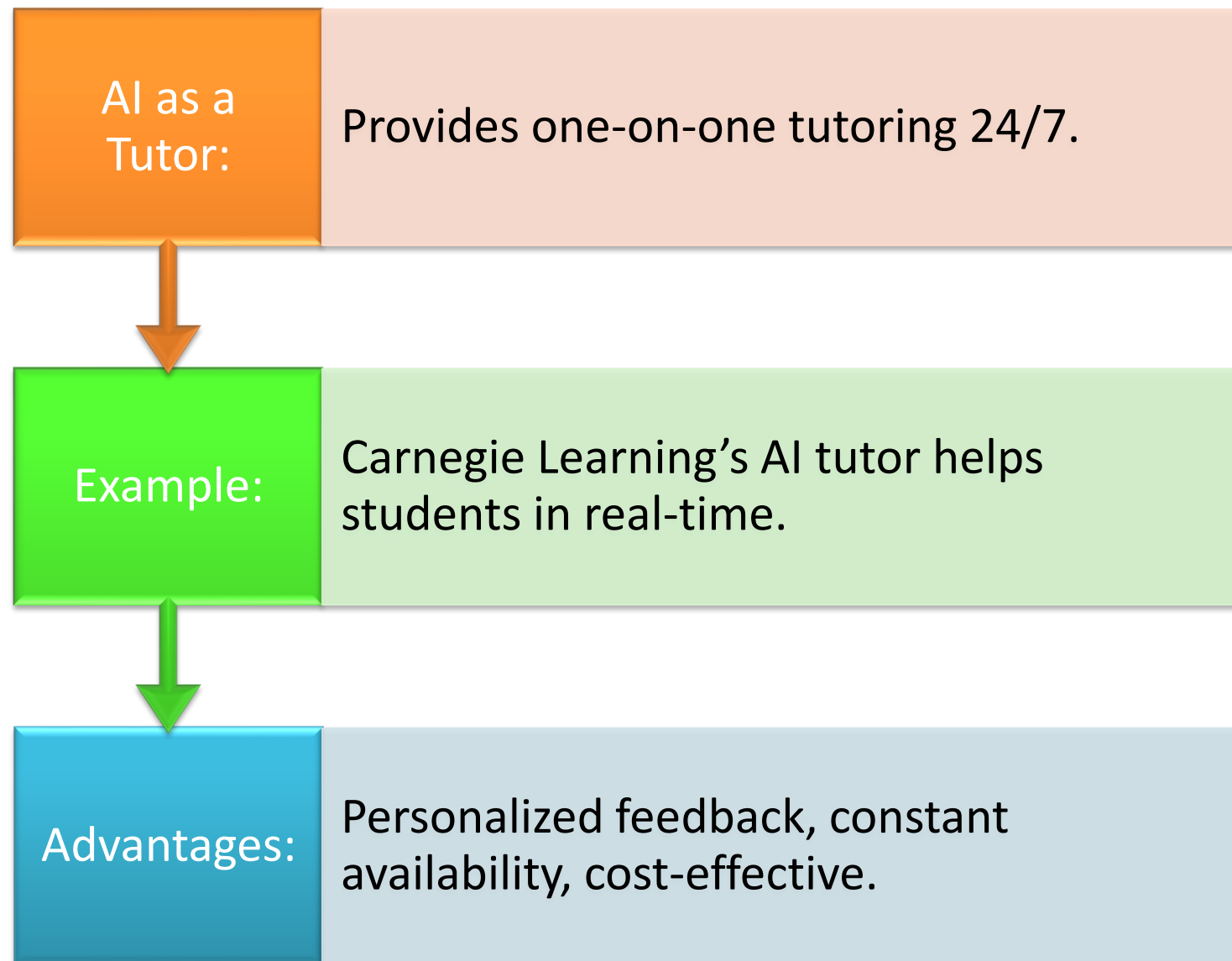
Example:

- Coursera and EdX tailor learning paths based on user performance.

Benefits:

- Students learn more effectively and at their own pace.

Intelligent Tutoring Systems (ITS)



Adaptive Learning and Assessments

Adaptive Learning:

- AI adjusts the difficulty of tasks based on performance.

Example:

- Duolingo adapts language lessons in real-time.

Impact:

- Personalized assessments that better reflect student abilities.

Automated Grading Systems

AI Automates Routine Grading:

- Grades multiple-choice and short-answer questions.

Examples:

- Turnitin checks for plagiarism; Grammarly for grammar and style
<https://www.grammarly.com/plagiarism-checker>.

Advantages:

- Saves time, provides instant feedback for students.

Limitations:

- AI struggles with subjective tasks like essays.

AI for Classroom Engagement

AI Increases Student Engagement:

- Chatbots answer routine questions and guide students.

Example:

- Georgia Tech's Jill Watson, an AI-powered teaching assistant.

Impact:

- More interaction, real-time assistance, reduces teacher workload.

Learning Management Systems (LMS) with AI Integration



AI Enhances LMS:

Tracks student progress and recommends personalized resources.



Examples:

Blackboard and Moodle use AI for personalized learning.



Benefits:

Helps teachers identify at-risk students, supports personalized intervention.

Introduction to Humanities

Auto-Generate Assignment

This is auto-generated content and needs to be checked for accuracy and bias

Define the assignment

Description

Enter a description or set of keywords...

Select course items

Selected course items will be used to help improve suggestions.

Desired cognitive level

Inspire me!

Complexity

Low High

Generate assignment title

Advanced options

Generate

Art and Perception

Art has the power to evoke various emotions and challenge our perceptions of the world around us. Select a painting or sculpture from a specific art movement that intrigues you. In a 500-word essay, analyze the artwork's composition, use of color, and subject matter. Consider how the artist's intentions and techniques contribute to the overall message or meaning of the piece. Additionally, create a visual diagram illustrating the elements of the artwork and provide a reference list of sources used for your research. Reflect on how experiencing this artwork has influenced your own perception of art and the world. Finally, record a 5-minute podcast episode where you discuss your findings and share personal insights on the significance of art in society.

Cognitive level: Analyze

Ethics in Literature

Read a thought-provoking novel or play that explores ethical dilemmas faced by the characters. Write a 750-word essay analyzing the moral choices and conflicts presented in the story. Provide specific examples from the text to support your analysis. In addition to the essay, create a presentation highlighting key moments from the narrative and discussing their ethical implications. Include a fictional interview with one of the characters, asking them about their motivations and the consequences of their actions. Reflect on how this literary work challenges your own ethical beliefs and values.

Cancel Add

Challenges in AI for Teaching



Ethical Concerns:

Data privacy and the security of student information.



Bias in AI Systems:

AI can perpetuate biases from its training data.



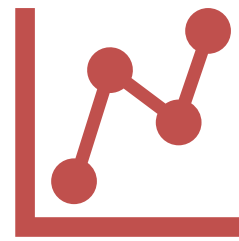
Human Oversight is Essential:

AI should augment, not replace, human teachers.

AI in Research – Overview

- Key Areas in Research:
 - Data analysis and pattern recognition.
 - Predictive modeling and simulations.
 - AI-assisted hypothesis generation.

AI in Data Analysis and Pattern Recognition



AI in Data Analysis:

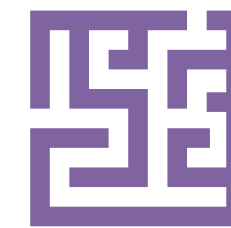
Processes vast datasets quickly.



Example:

IBM Watson assists researchers by analyzing research papers.

Google Scholar



Benefits:

Helps identify patterns and trends that humans may miss.

Natural Language Processing (NLP) in Research



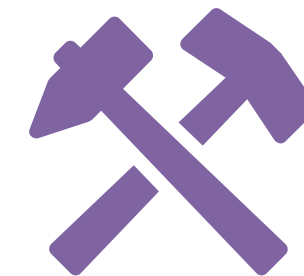
NLP Analyzes Text:

Summarizes research papers and extracts key insights.



Example:

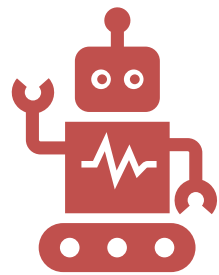
NLP systems extract insights from academic journals and patents.



Benefits:

Speeds up literature reviews and data mining.

Predictive Modeling and Simulations



AI Builds Predictive Models:

Simulates experiments and predicts outcomes.



Example:

DeepMind's AlphaFold predicts protein structures.

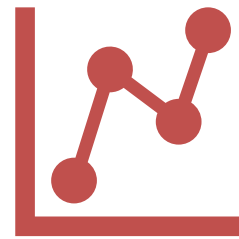
AlphaFold has predicted over 200 million protein structures – nearly all catalogued proteins known to science



Impact:

Faster experimentation and reduced manual errors.

AI-Assisted Hypothesis Generation



AI Suggests New Research Directions:

Analyzes existing data to identify gaps.



Example:

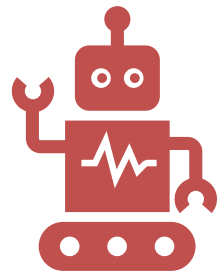
AI proposes hypotheses by recognizing patterns in prior studies.



Impact:

Expands research possibilities by suggesting unexplored areas.

Robotics in Experimental Research



AI-powered Robotics in Labs:

Automates repetitive tasks like pipetting or sequencing.



Example:

High-throughput screening in drug discovery.
https://www.youtube.com/watch?v=RrA_IBiGLFU&t=155s&ab_channel=mylabBRAND



Benefits:

Faster experiments, fewer errors, and more accurate results.

Collaborative Research Platforms

AI Connects
Researchers:

- Recommends relevant papers, suggests collaborators.

Example:

- ResearchGate uses AI to recommend papers and potential collaborators.

Impact:

- Fosters global research collaboration.

Challenges and Ethical Considerations in AI Research



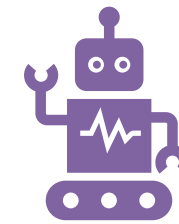
Bias in AI Models:

AI can inherit biases from its training data.



Data Privacy Concerns:

Sensitive research data may be exposed to AI systems.



Over-reliance on AI:

AI can assist but must be combined with human judgment.



Lack of Transparency (Black Box):

Many AI models, especially deep learning systems, operate as "black boxes," meaning their decision-making processes are not easily interpretable.

Future of AI in Teaching and Research



AI's Evolving Role:

From support tool to a partner in education and research.



New Opportunities:

AI-driven immersive learning (e.g., VR classrooms).

Interdisciplinary research powered by AI (e.g., healthcare, sustainability).

Conclusion

- Key Takeaways:
 - AI in Teaching: Personalized learning, tutoring systems, grading.
 - AI in Research: Data analysis, predictive modeling, collaboration tools.
 - Challenges: Ethical concerns, bias, privacy issues.
 - Future: AI as a partner in driving innovation.

Q&A

Questions and Answers.