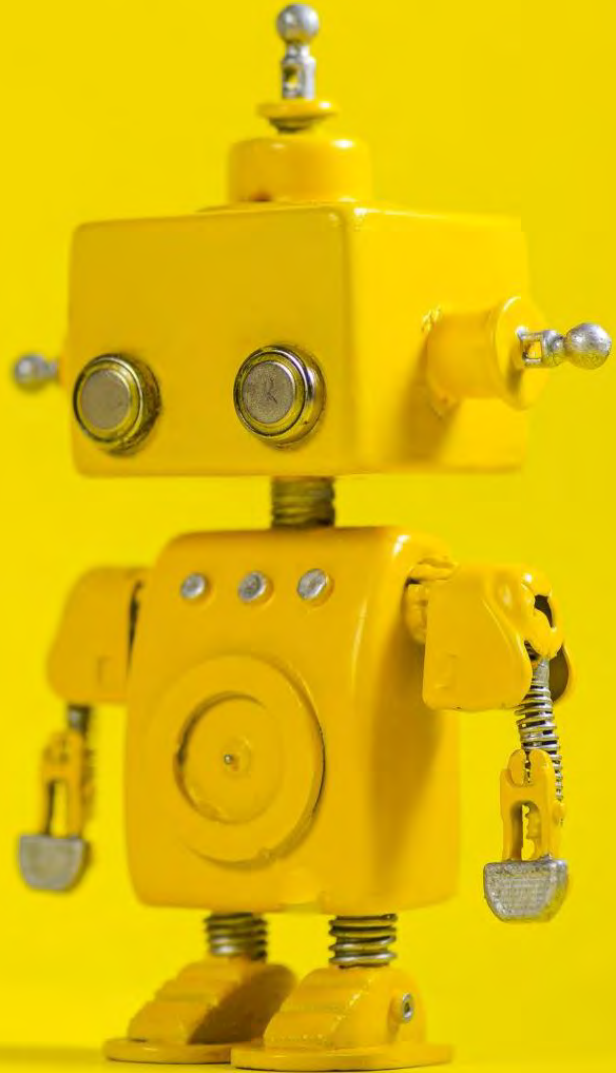# Harnessing AI in Education

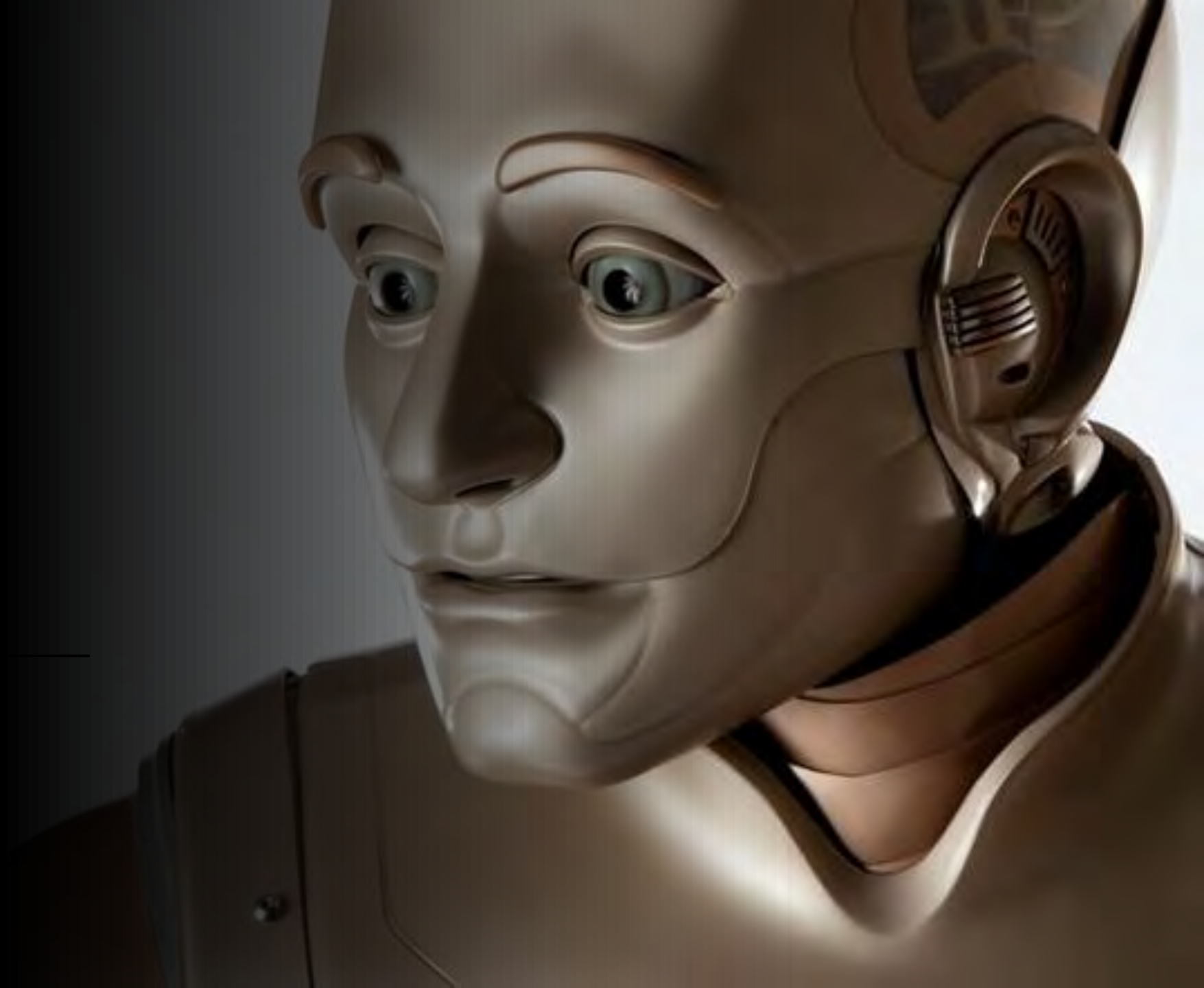Brian Trager & Kemoy Campbell

Terminology

- AI – Artificial Intelligence
- GenAI – Generative AI
- LLM – Large Language Models
- ML – Machine Learning
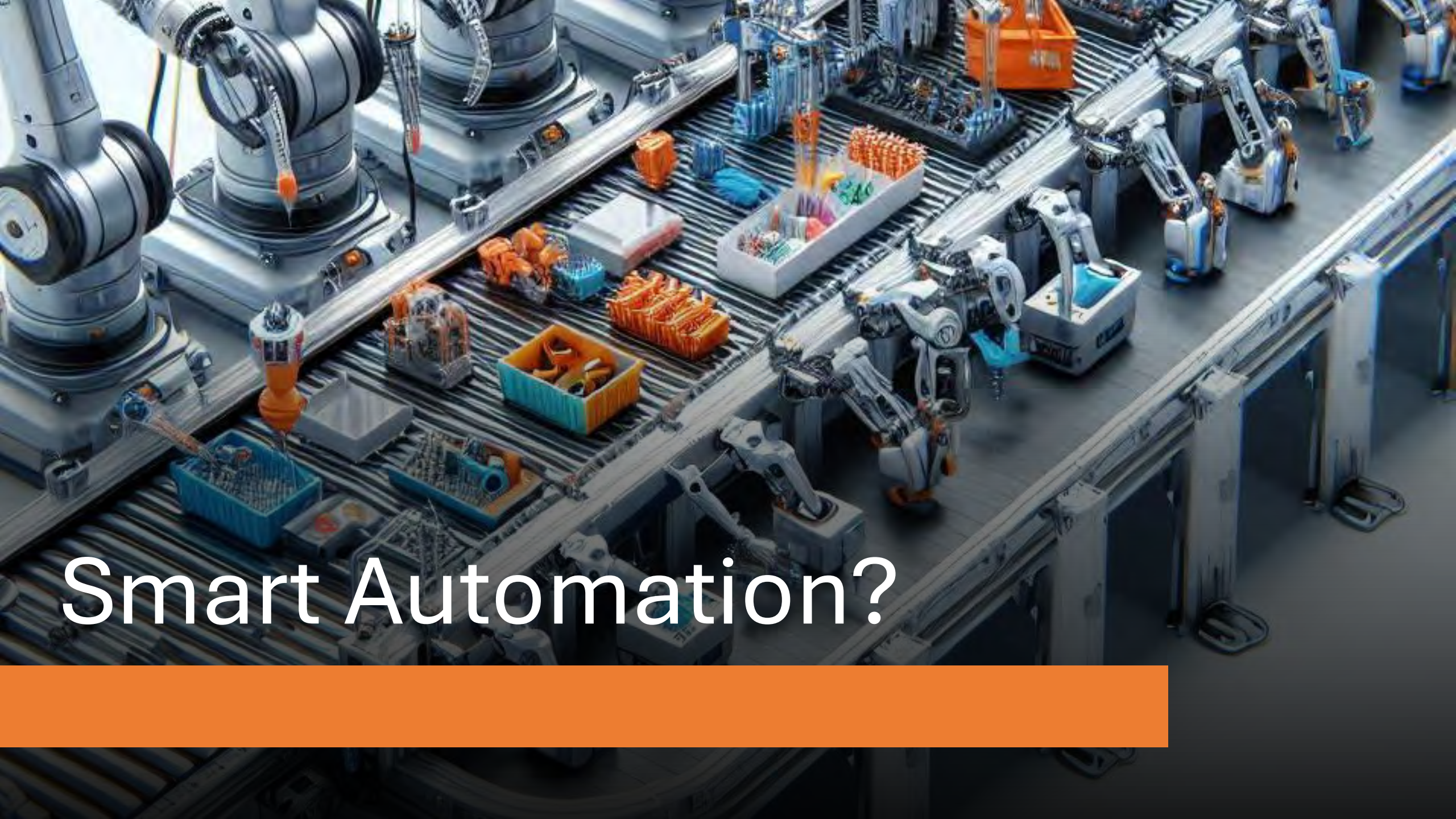- GPT – Generative Pre-trained Transformer

When you see the word **AI**, what is the first thing that comes to mind?

Robots?

Smart Automation?

Harvesting Data?

Smart(er) Assistant?

The ever-watchful entity?
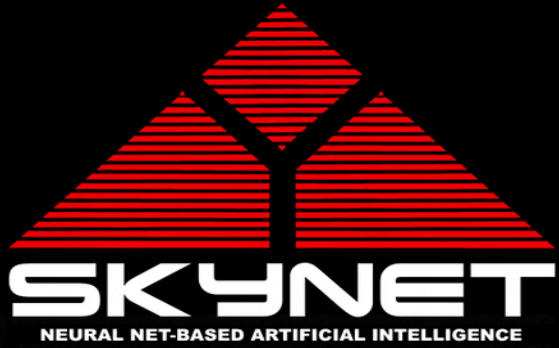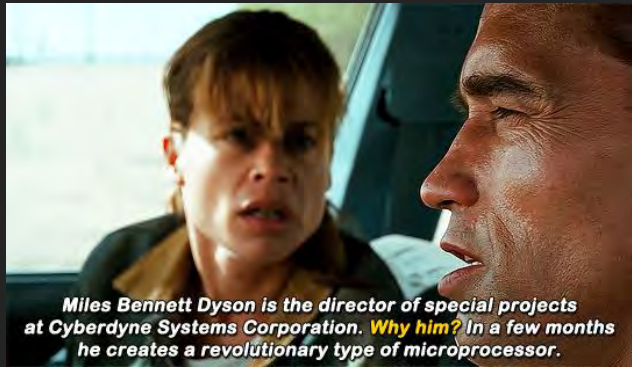
Terminator /SKYNET

Babysitter?
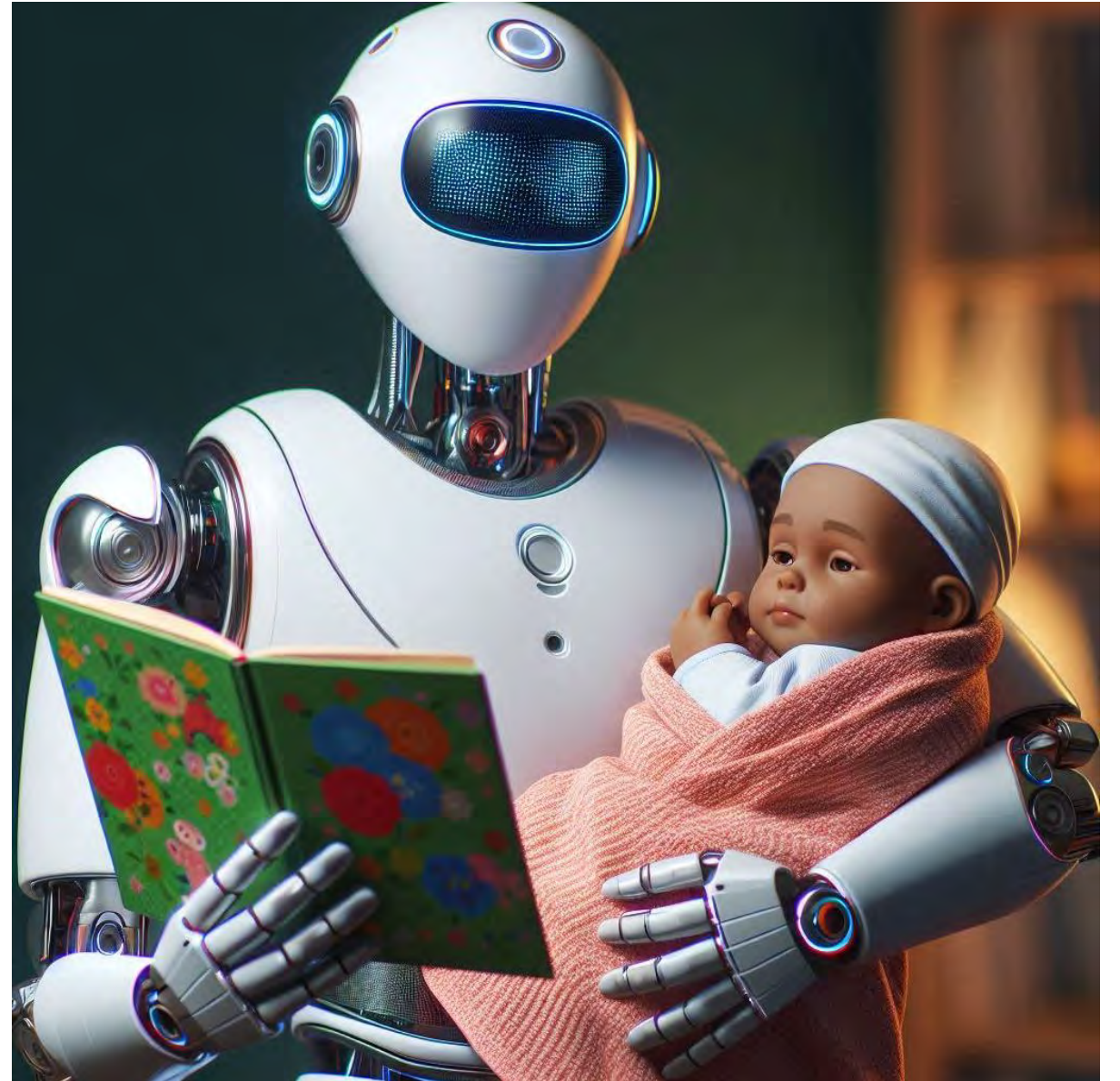
Kemoy Campbell

- Visiting Lecturer, NTID Information & Computing Studies

- Support faculty for cross-register students

- Advisor for NTID Offensive Defensive Research for Everyone (NODRE)

- Strong interest in:
    - Artificial intelligence
    - Cybersecurity
    - Software architecture
    - Infrastructure engineering

Brian Trager

- Chairperson, NTID Information & Computing Studies

- Served as Associate Director for NTID Center on Access Technology
  - Worked on ASR projects with Microsoft Research
  - Project inspired the Microsoft Office team to add Live Captions
  - Involved in a pilot project building a custom voice model
    - Accuracy jumped from 35% to ~80%

https://blogs.microsoft.com/ai/ai-powered-captioning/

80% ... AI skills

AI in a nutshell

Artificial Intelligence

AI in a nutshell

Artificial Intelligence

Machine Learning

Artificial Intelligence
the field of computer science that seeks to create intelligent machines that can replicate or exceed human intelligence.

Machine Learning
subset of AI that enables machines to learn from existing data and improve upon that data to make decisions or predictions.

What is Machine Learning?

- As the name implies, the machine is learning
- Provide loads of information and it will learn things

A machine learning algorithm is <u>really</u> good at looking at patterns
AND
discovering patterns within data.

AI in a nutshell

Artificial Intelligence

Machine Learning

Deep Learning

Neural Networks →

Generative AI

1950s

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2017

Deep Learning
a machine learning technique in which layers of neural networks are used to process data and make decisions.

2021

Generative AI
create new written, visual, and auditory content given prompts or existing data.

AI in a nutshell

Generative AI

Foundation Models

Large Language Model (LLM)

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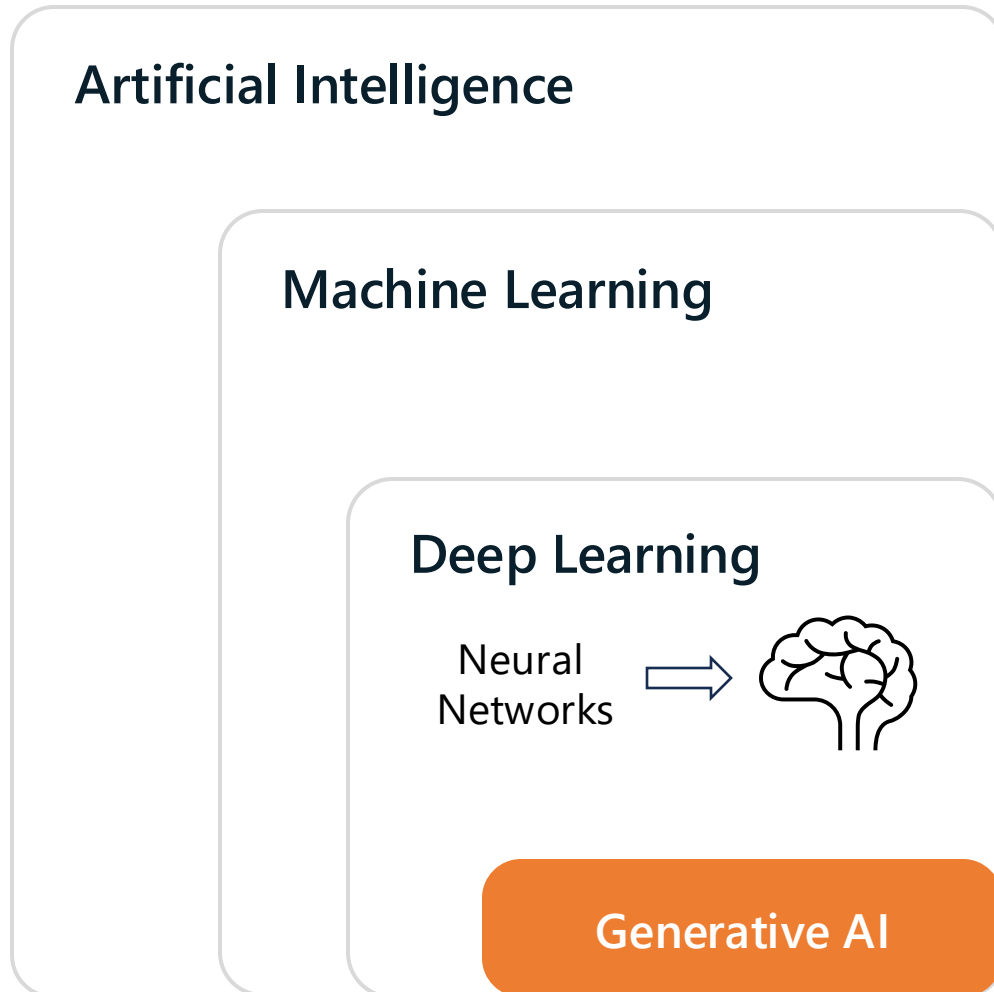

2017

Deep Learning

a machine learning technique in which layers of neural networks are used to process data and make decisions.

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Generative AI

create new written, visual, and auditory content given prompts or existing data.

Google

n

new york **state**

new york **state population**

new york **capital**

new york **population**

new york **map**

new york **cities**

new york **news**

new york **song**

Report inappropriate predictions

Seattle successfully
curbed infections while

MTA making plans for
NYC subway after

Top doctor who treated
Covid-19 patients on

AI in a nutshell
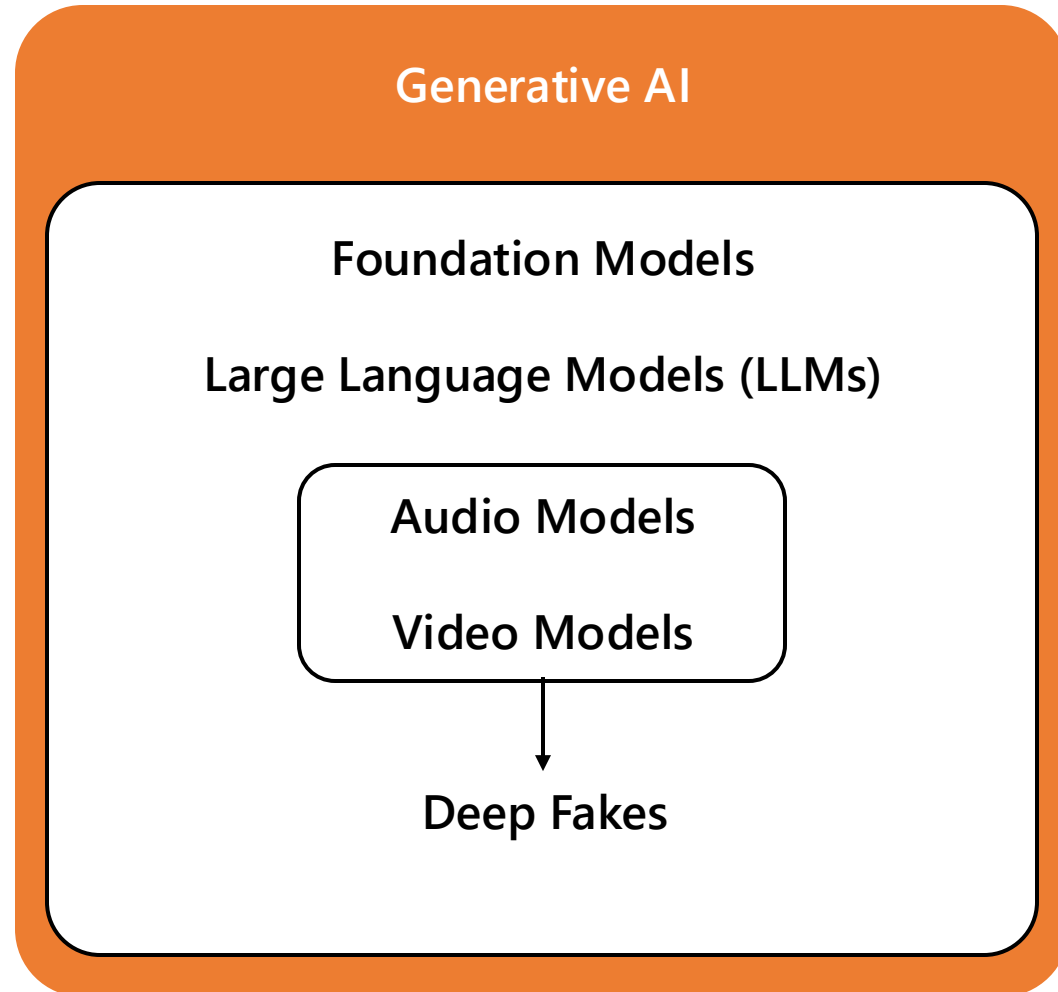
Generative AI

Foundation Models

Large Language Models (LLMs)

Audio Models

Video Models

↓

Deep Fakes

1950s

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Evolution of Technology in the education system

- Technology has and is currently transforming our education system
  - Audio-Visual aids
  - Emergence of computers in education
  - Internet & Open learning
  - Interactive technologies
  - Mobile Learning (M-Learning)
  - GenAI – ChatGPT, CoPilot, Gemini, Claude, etc.

Reality Check:

Students are using AI already.

Now what?

Ready or not, AI is coming to science education – and students have opinions

Can AI transform education?

AI Will Transform Teaching and Learning. Let's Get it Right.

ChatGPT: Educational friend or foe?

Are Your Students Ready for AI?

Generative AI's Impact on Learning and Development

AI is everywhere. How should schools handle it? Teachers' different approaches show its potential — and limits

Concerns about AI in classroom

What concerns do you have about the use of AI in education?

Concern	Percentage
Plagiarism in essays/work	65%
Reduced human interaction in learning	62%
Data privacy and security	42%
Job displacement for teachers	30%
Unequal access to AI-powered resources	30%
Automation of manual tasks	23%
Other (please specify)	1%
N/A: No concerns in particular	4%
Not sure	1%
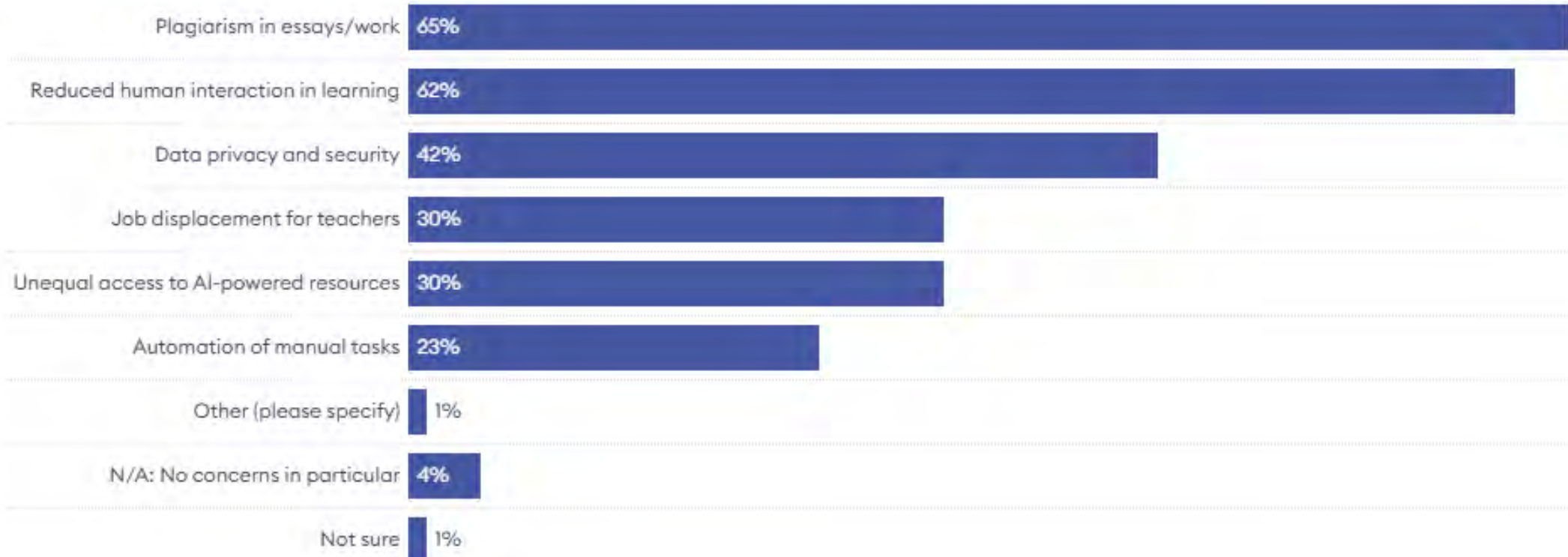
Perception of AI by Educators...

How it started?

25% of teachers in K-12 education feels that AI does more harms than good

32% express equal feeling about mix of both harm and good

35% unsure

55% of teachers believe AI improve educational outcomes

18% believe it hindered the outcome

17% believe there is no significant impact

10% unsure

Perception of AI by Educators...

How is it going?

AI can bridge the gap among minorities and "shy/quiet" students

The study also noted that Black and Latinx young people were "significantly more likely" to use AI than others surveyed.

AI can help teens get answers to questions they may be too afraid to ask adults, or for guidance on what to say in conversations.

How teens use AI

31% USE IT TO "MAKE PICTURES OR IMAGES,"

16% USE IT "MAKE SOUNDS OR MUSIC"

15% USE IT TO WRITE CODE.

53% USE IT FOR SEARCH

51% USE IT FOR BRAINSTORMING

Perception of AI by K-12 students

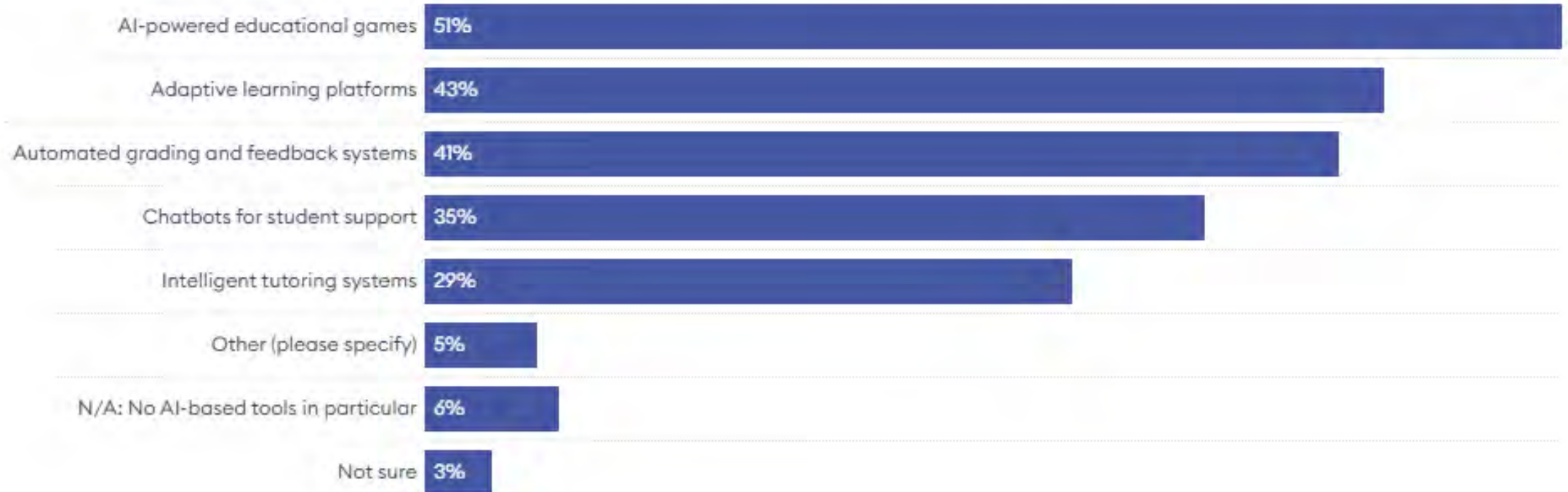**19%** used AI to help with schoolwork

69% say it's acceptable to use AI as a research tool.

39% say it's acceptable to use AI to solve math problems.

20% say it's acceptable to use AI to write essays.

Popular AI tools in education

What AI-based tools or applications have you encountered in educational settings?

Category	Percentage
AI-powered educational games	51%
Adaptive learning platforms	43%
Automated grading and feedback systems	41%
Chatbots for student support	35%
Intelligent tutoring systems	29%
Other (please specify)	5%
N/A: No AI-based tools in particular	6%
Not sure	3%

The 2 Sigma Problem

TUTORIAL
1-1*

MASTERY LEARNING
1-30*

CONVENTIONAL
1-30*

Summative Achievement Scores
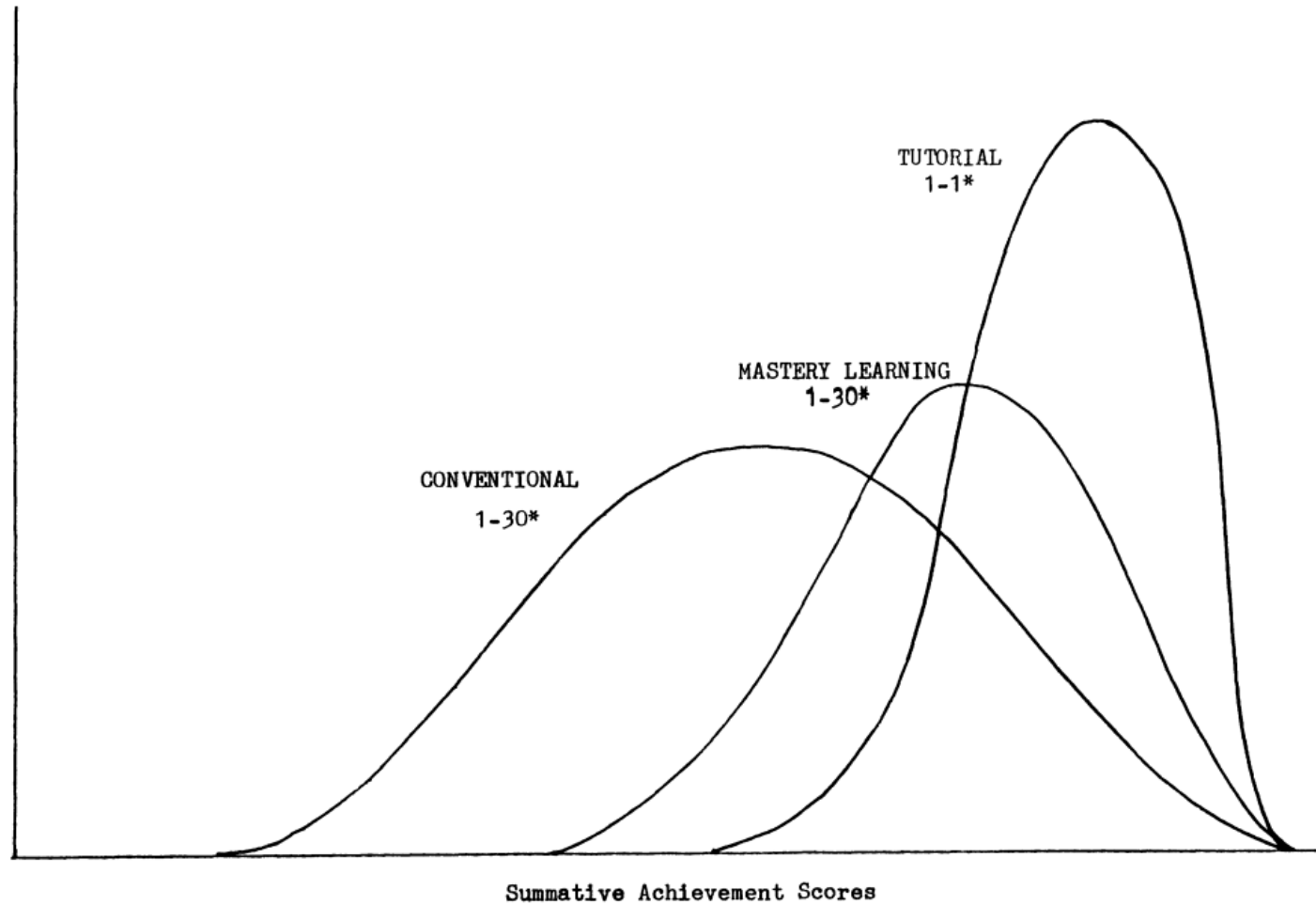
*Teacher-student ratio

Opportunities for AI in Education

Personalize learning

Improve accessibility

Build AI literacy for all

Equip students with skills

Defend at machine speed

Protect your data

Accelerate Learning

INCLUSIVELY DESIGNED

Enabling Equitable Education

SIMPLIFIED AND SECURE IT

Prepare Students for the Future

Improve Efficiency

Engage learners

Analyze data efficiently

Create and customize content

Enhance support services

Unlock productivity

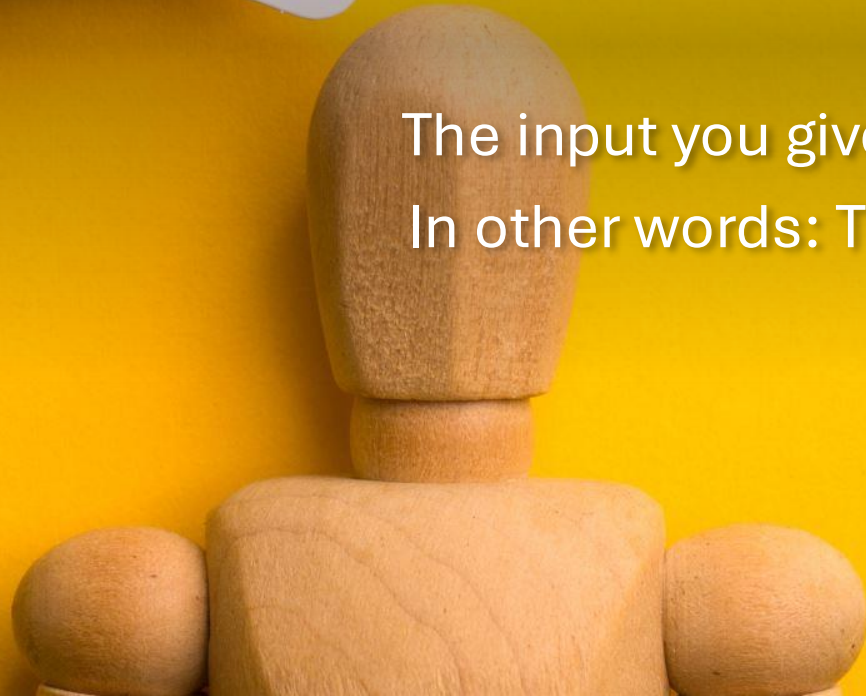**Automate processes**

What is a prompt?

The input you give to generate a desired output

In other words: The thing you ask to get an answer

Prompt Engineering

The art and science of designing effective queries or instructions to get desired responses

Prompt Engineering

In other words:

Ask better questions to get better answers

Use prompt engineering to get more precise, creative, and domain-specific answers and to eliminate some common challenges.
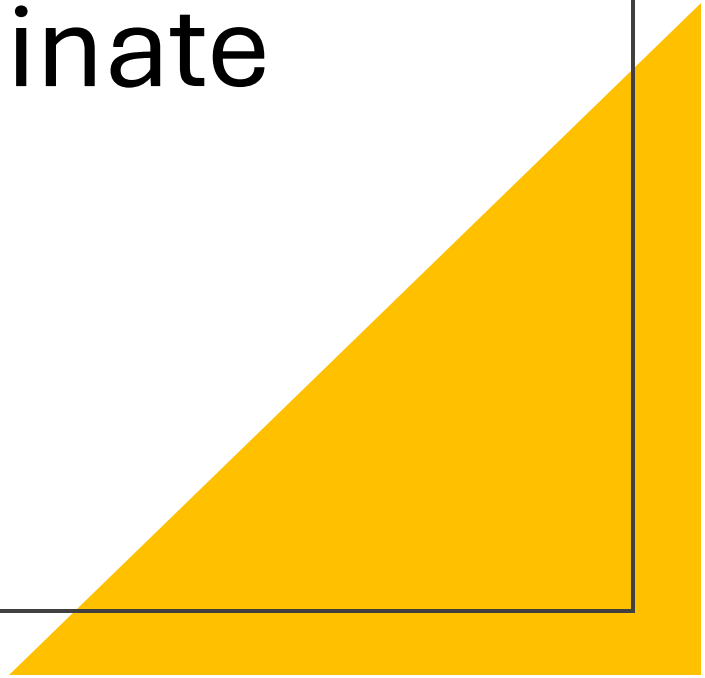
Common Challenges in Prompt Engineering

- Model bias
- Unpredictability
- Lack of real-world knowledge
- Language and cultural nuances
- This applies to all LLMs

What makes an effective prompt?

Persona – What role should the model play?

Instructions – What should the model do?

Input content – Text to be processed by the model (If you want the model to summarize or create content, etc.)

Format – Requirements around format for the output, if any.

Additional information – Any other helpful context or background

AI
Demonstration

Trends and Future Directions

Questions?

AI tools for Math and Science

- Wolfram Alpha
- Julius
- Socratic
- Photomath
- Symbolab
- Magic school AI
- Eduaide
- Flexi
- ChatGPT

- Labster AI - [Demo](#)
- Khanmigo
- Sizzle
- Prodigy
- PhysicsGPT
- Socratic AI
- Chemistry Chem GPT
- DragonBox
- Gemini
- Copilot