



Charting the New Territory: Generative AI in Learning and Teaching

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Learning and Teaching Expo
Hong Kong

Generative artificial intelligence

Generating data*
in response to prompts

*text, image, video, program code

Generative artificial intelligence

Many debates to sensemake uncertainty
linked to generative AI



OFFICE OF
Educational Technology

Artificial Intelligence and the Future of Teaching and Learning

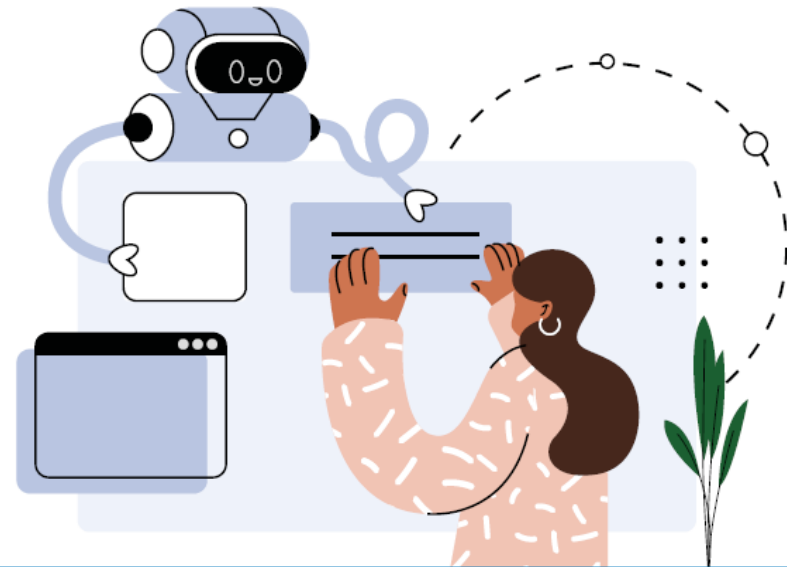
Insights and Recommendations

May 2023



<https://tech.ed.gov/ai-future-of-teaching-and-learning/>

Guidance for generative AI in education and research



<https://unesdoc.unesco.org/ark:/48223/pf0000386693>

Today's talk

What are promises, concerns, and needs for education in the age of AI?

Key takeaway 1

Much promise for guiding, teaching support, and assessment/feedback

Key takeaway 2

Significant concerns about reliability,
bias, workload, and consent

Key takeaway 3

Transition from commentaries to
research to understand implications

PROMISE – CONCERNS – NEED –
FINAL REMARKS

1

Large language models for supporting learners

The New York Times

NATASHA SINGER

Hey Khanmigo

KHANMIGO

Hello! I'm here to help you learn and grow. Let's get started on your learning journey.

Not Just Math Quizzes: Khan Academy's Tutoring Bot Offers Playful Features

The new, A.I.-assisted Khanmigo allows students to chat with simulated historical figures or co-write stories with the software.

By [Natasha Singer](#)

Khanmigo AI power

This conversation is recorded and viewable by your parent and teacher.

Can you just tell me the answer?

It's important that you learn how to do this yourself! What do you think you need to do to multiply 2 by 5/12?

They need the same denominator.

That's a good thought, but in this case, you don't need to find a common denominator because you're multiplying, not adding or subtracting. What else could you try?

Type message (do NOT share any personal data)

Clear chat

Student tutoring

Khanmigo AI power

Creativity support

Let's start by discussing some details about your class. What grade level and subject do you teach? And what's the topic you want to create a lesson for?

I teach sixth grade English Language Arts. I want a lesson to help students learn how to identify, summarize, or explain the main idea using supporting details in an expository text.

That's a great topic! Have your students had any previous lessons on identifying the main idea or summarizing expository texts?

No

Type message (do NOT share any personal data)

Clear chat

<https://www.khanacademy.org/khan-labs>



Here's a function in Python that finds the first 10 prime numbers:



python

Copy code

```
def first_10_primes():
    prime_numbers = []
    num = 2
    while len(prime_numbers) < 10:
        for i in range(2, num):
            if (num % i) == 0:
                break
        else:
            prime_numbers.append(num)
            num += 1
    return prime_numbers

print(first_10_primes())
```

Explanation:

1. The function `first_10_primes` initializes an empty list `prime_numbers` to store the first 10 prime numbers.
2. It then sets the starting value of `num` to 2, the smallest prime number.
3. The function uses a `while` loop to run until the length of `prime_numbers` is equal to 10.

Writing,
debugging and
explaining code

Debugging and explaining code

```

1 def chickenpox_by_sex():
2     import pandas as pd
3     import numpy as np
4     df = pd.read_csv('assets/data.csv',
5                       index_col=0)
6     male = df[df['SEX'] == 1]
7     vac_m = male[male['P_NUMVRC'] == 1]
8     cpox_m = vac_m[vac_m['HAD_CPOX'] == 1]
9     no_m = vac_m[vac_m['HAD_CPOX'] == 2]
10    total_cpox_m = cpox_m['SEX'].count()
11    total_nocpox_m = no_m['SEX'].count()
12    m = total_cpox_m/total_nocpox_m
13
14    ... code omitted to save space ...
15    ans={"male": m,
16         "female": f}
17
18    return ans

```

(b) Student's buggy program

```

1 def chickenpox_by_sex():
2     import pandas as pd
3     import numpy as np
4     df = pd.read_csv('assets/data.csv',
5                       index_col=0)
6     male = df[df['SEX'] == 1]
7     vac_m = male[male['P_NUMVRC'] >= 1]
8     cpox_m = vac_m[vac_m['HAD_CPOX'] == 1]
9     no_m = vac_m[vac_m['HAD_CPOX'] == 2]
10    total_cpox_m = cpox_m['SEX'].count()
11    total_nocpox_m = no_m['SEX'].count()
12    m = total_cpox_m/total_nocpox_m
13
14    ... code omitted to save space ...
15    ans={"male": m,
16         "female": f}
17
18    return ans

```

(c) Fixed program

Your Code's output is:

```
{'male': 0.0092887664,
'female': 0.0076827368 }
```

It's Correct output is:

```
{'male': 0.0097655722,
'female': 0.0076827368 }
```

(d) Failing test case

The bug in the program is in the line where you are filtering the male children who were vaccinated. You are only considering those who received exactly one dose of the vaccine ('male['P_NUMVRC'] == 1'), but the problem statement asks for children who received at least one dose of the vaccine. The fix is to change the condition to 'male['P_NUMVRC'] >= 1'.

(e) Detailed explanation

Check the conditions you are using to filter the vaccinated children, especially the number of doses they received.

(f) Single-sentence hint



(g) Validation

2

Large language models for supporting teachers




Create crossword

Supporting teachers

A

Please act as a subject matter expert on the topic of Weather that builds crosswords. You know how to describe words that intersect each other on a crossword grid. The words will be placed on a crosswords grid and some words need to have at least 1 character in common. You can also write meaningful clues.



Here's a set of weather-related crossword clues and their corresponding answers. The words intersect with at least one common character, as described below.   

1. Clue: A meteorological phenomenon consisting of visible patterns of ice crystals in the Earth's atmosphere.
Answer: Cloud (5 letters)
Position: 1 across
2. Clue: Frozen precipitation falling from clouds in the form of ice crystals.
Answer: Snow (4 letters)
Position: 1 down, intersecting with 'Cloud' at letter 'o' (1 across, 3 down)
3. Clue: A forceful and sudden flow of air, typically associated with storms.
Answer: Gust (4 letters)
Position: 4 across, intersecting with 'Snow' at letter 's' (1 down, 3 across)
4. Clue: The measure of moisture in the atmosphere.
Answer: Humidity (8 letters)
Position: 3 down, intersecting with 'Gust' at letter 'u' (4 across, 2 down)
5. Clue: A violent, destructive whirlwind storm accompanied by a funnel-shaped cloud.
Answer: Tornado (7 letters)
Position: 7 across, intersecting with 'Humidity' at letter 'd' (3 down, 6 across)
6. Clue: A measure of the warmth or coldness of an object or substance.
Answer: Temperature (12 letters)
Position: 8 down, intersecting with 'Tornado' at letter 'e' (7 across, 3 down)

Crossword Puzzle

Reading worksheet generator

Options Theme

Enter crossword puzzle content

See instructions below. Under 50 words is best. More help: [help](#)

Title

Weather Puzzle

Words

RAIN, water droplets that fall from the sky
SNOW, soft, white flakes that fall from the sky in cold weather
SUNNY, bright and clear weather with lots of sunlight
WINDY, weather with strong, moving air
CLOUD, white or gray fluffy shapes in the sky made of water vapor
FOG, thick, low-lying mist that makes it hard to see

Preview Worksheet

WORKSHEET

ANSWER KEY

Weather Puzzle

Down:

1. water droplets that fall from the sky
3. weather with strong, moving air
4. thick, low-lying mist that makes it hard to see

Across:

2. soft, white flakes that fall from the sky in cold weather
5. white or gray fluffy shapes in the sky made of water vapor

Education.com

Build your own custom worksheet at [education.com/worksheet-generator](https://www.education.com/worksheet-generator)
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<https://www.education.com/worksheet-generator/reading/crossword-puzzle/>

3

Large language models for
automated feedback

Promise

Large language models can provide
feedback on written products

LMMs (classification) for writing analytics

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🔔 AU - Edit mode

- ✕
- ✕ Instructions
 - General Instructions
 - Rubric
- ✕ 1: Artificial Intelligence i...
 - 1.1 Definition of Artificial I...
 - 1.2 History of Artificial Intel...
 - 1.3 How does AI work?
 - 1.4 Ethics and risks of deve...
 - 1.5 Supervised machine lea...
 - 1.6 Unsupervised machine ...
 - 1.7 Reinforcement learning
 - 1.8 Deep Learning
- ✕ 2: Differentiation in Educ...
 - 2.1 What is Differentiation?
 - 2.2 Using differentiation to...
 - 2.3 Standards for teaching
- ✕ 3: Scaffolding in Education
 - 3.1 The development of sc...
 - 3.2 What is cognitive appr...
 - 3.3 What is scaffolding
 - 3.4 Applications of scaffold...
 - 3.5 Applications of coactiv...

3: Future Learning / General Instructions

General Instructions

Page Settings More

In this learning session, the goal is to write a vision essay that describes the future of education. Please describe, in 200 to 400 words, how you envision learning in a school in 2035.

Please consult the materials in this [learning](#) environment that provide information about three important topics for envisioning the future of education in 2035.

Essay Writing 222 words

Normal B I U x₂ x² | | = +† ☰ ☲

Nowadays, the role of AI in education is limited in some tangible educational products. More and more data are needed to make AI work better. And the scaffolding is that the work is shared alone between the learner and some more knowledgeable other or agent. In addition, it also enables learning from the experience. Scaffolding to optimize learning needs to acquire more knowledge. Besides, as we all know, differentiation is a combination of careful progress monitoring and adapting instruction in response. By this, students or learners could be divided into different groups by their teacher according to their competence degree. In these groups, students can learn knowledge that they don't understand and make progress belonging to themselves. Differentiation practices in the classroom will help students in their group process.

Integration of three topics is very essential and all three are indispensable. In the future education, the three should complement each other. Respectively, there are great expectations for AI in education to help students and teachers work better. To facilitate our independent and appropriate use in education in the future, we should learn more on how the scaffolding component skills work and so on. Furthermore, differentiation should be paid more attention in education. Beyond that, the three should continue to innovate, so as to better serve the education and other industries in the future.

Save Essay

Checklist Tool

Basic Academic Originality Integration and elaboration

Essay Sentence: Nowadays, the role of AI in education is limited in some tangible educational products.
Integration Level: Remember and understanding

Essay Sentence: More and more data are needed to make AI work better.
Integration Level: Evaluate and create

Essay Sentence: And the scaffolding is that the work is shared alone between the learner and some more knowledgeable other or agent.
Integration Level: Evaluate and create

Essay Sentence: In addition, it also enables learning from the experience.
Integration Level: Apply and analyse

Essay Sentence: Scaffolding to optimize learning needs to acquire more knowledge...

This analysis may take around 5-10 min to process. **Analyse**

All this is based on GPT4

LMMs (classification) for writing analytics

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✕

Instructions

General Instructions

Rubric

1: Artificial Intelligence i...

1.1 Definition of Artificial I...

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1.3 How does AI work?

1.4 Ethics and risks of deve...

1.5 Supervised machine lea...

1.6 Unsupervised machine...

1.7 Reinforcement learning

2: Teaching

3: Scaffolding in Education

3.1 The development of sc...

3.2 What is cognitive appr...

3.3 What is scaffolding

3.4 Applications of scaffold...

3.5 Applications of coactiv...

3: Future Learning / General Instructions

PAGE

General Instructions

Page Settings

✕ ✕² ☰ ☷ ⌵ ⌶ ⌷ ⌸

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Essay Sentence: Scaffolding to optimize learning needs to acquire more knowledge.
Integration Level: Remember and understand

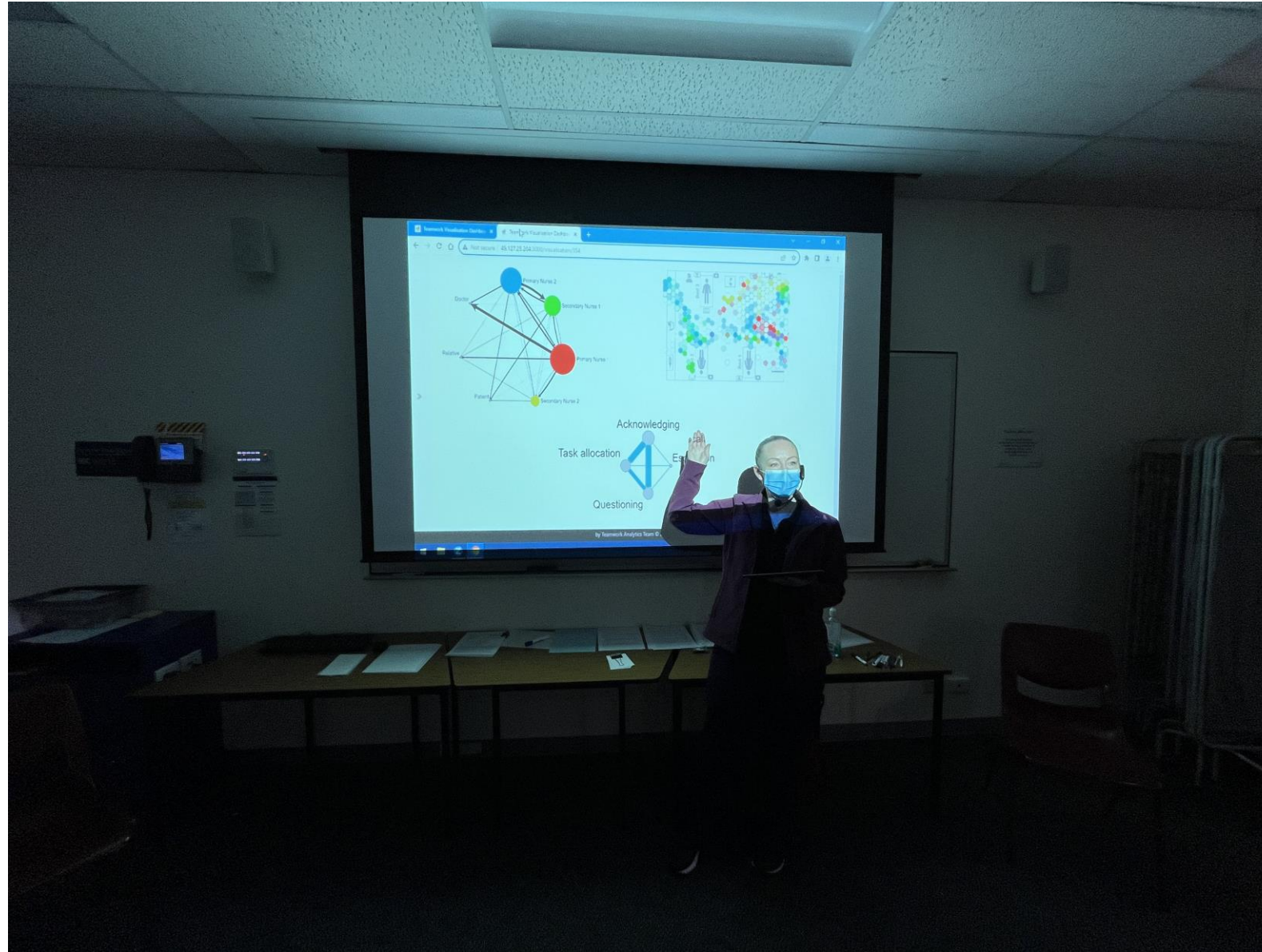
This analysis may take around 5 minutes.

All this is based on

Multimodal sensing technologies for teamwork



Teacher led use of analytics

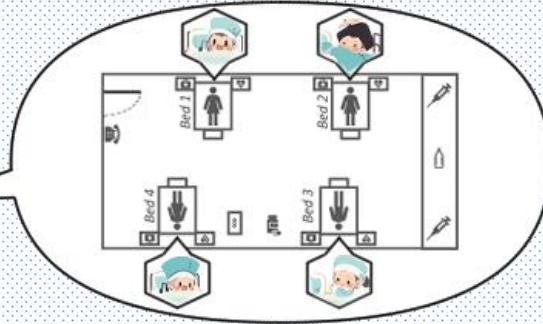


Generative AI for data comics

THE LEARNING SCENARIO

METS: Multimodal Learning Analytics of Embodied Teamwork Learning

Phase 1 (Initial Handover)



Phase 2 (Initial Assessment)



Phase 3 (Resolving Emergency)



Two nurses enter...



INFORMATION SHARING
Ruth's oxygen level is 87



Primary Task



Phase 4 (Emergent Diagnosis)



The doctor asked the nurses for critical medical information & guided them to determine the cause of deterioration



Secondary Tasks

The nurses were able to resolve the situation.

4

Assessment in the age of artificial intelligence

Opportunities provided by AI



onerous

feasible



discrete

continuous



uniform



adaptive



inauthentic

authentic



antiquated

modern

Opportunities provided by AI



onerous

feasible



discrete

continuous



uniform



adaptive



inauthentic

authentic



antiquated

modern



Continuous assessment

Process measurement is
the dark side of assessment



Chatbot to provide writing guidance

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Page Settings More-

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Please consult the materials in this [learning](#) environment that provide information about three important topics for envisioning the future of education in 2035.

Essay Writing 236 words

Normal **B** *I* U

AI in Education. AI plays an important role in Education. Nowadays, the role of AI in education is limited in some tangible educational products. More and more data are needed to make AI work better. And the scaffolding is that the work is shared alone between the learner and some more knowledgeable other or agent. In addition, it also enables learning from the experience. Scaffolding to optimize learning needs to acquire more knowledge. Besides, as we all know, differentiation is a combination of careful progress monitoring and adapting instruction in response. By this, students or learners could be divided into different groups by their teacher according to their competence degree. In these groups, students can learn knowledge that they don't understand and make progress belonging to themselves. Differentiation practices in the classroom will help students in their group process.

Integration of three topics is very essential and all three are indispensable. In the future education, the three should complement each other. Respectively, there are great expectations for AI in education to help students and teachers work better. To facilitate our independent and appropriate use in education in the future, we should learn more on how the scaffolding component skills work and so on. Furthermore, differentiation should be paid more attention in education. Beyond that, the three should continue to innovate, so as to better serve the education and other industries in the future. AI is good now.

ChatGPT Tool

Can you give more advice on how to improve the essay?
18:20:01

Certainly! Here are some additional suggestions to improve your essay:

1. Expand on the role of AI in education: Discuss specific examples of how AI can be applied to learning, such as personalized learning, adaptive assessments, and intelligent tutoring systems. Explain how these applications can contribute to an innovative vision of education in 2035.
2. Elaborate on scaffolding to optimize learning: Provide examples of how scaffolding techniques can be used to support learners in acquiring new



Chatbot to provide writing guidance

FLoRA Home My courses Site administration

🔔 AU - Edit mode

General Instructions

In this learning session, describe, in 200 to 400 words, the data are Please consult the teacher and some for envisioning the future of education to optimize learning. You will have 120 minutes to complete this activity. You should work efficiently. You will have 120 minutes to complete this activity. You should work efficiently. You will have 120 minutes to complete this activity. You should work efficiently.

ChatGPT Tool

Can you give more advice on how to improve the essay?
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Ask a question...

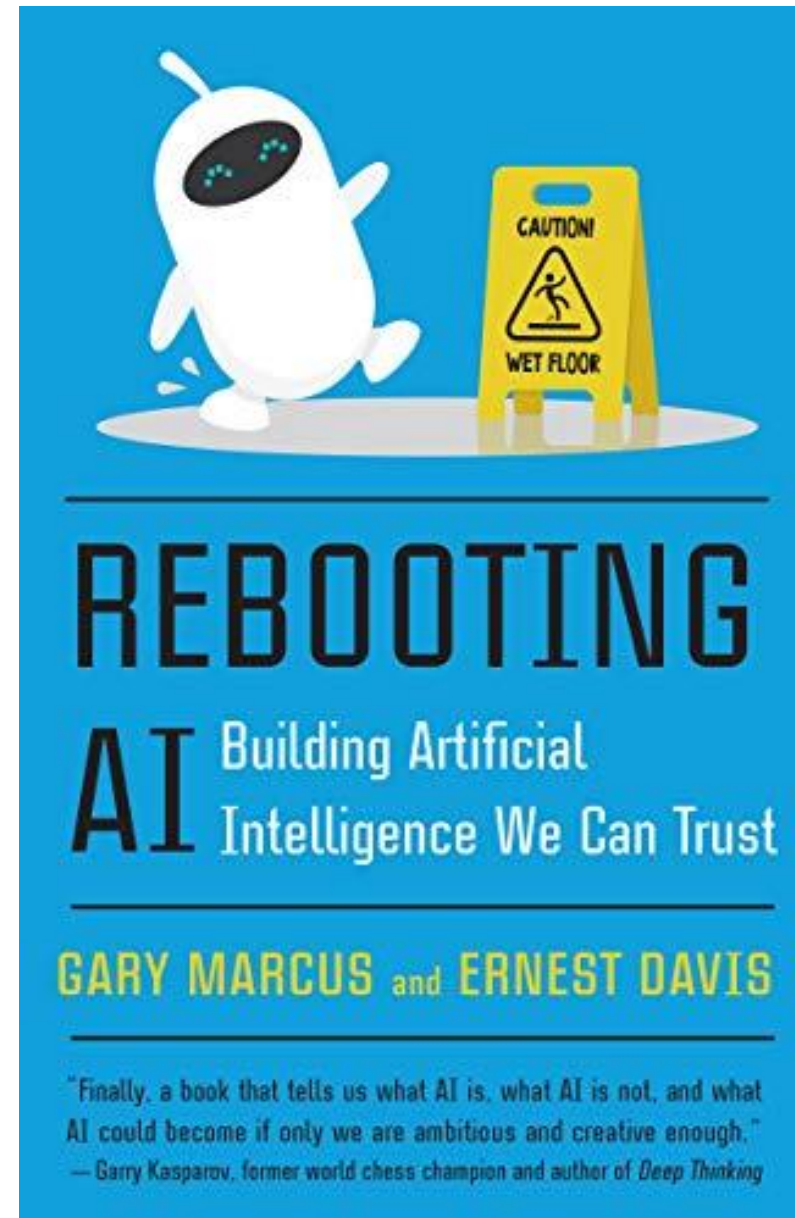
PROMISE – **CONCERNS** – NEED –
FINAL REMARKS

1

Limitations

Generative AI techniques
are not flawless

No reasoning and planning,
no sense of truthfulness,
no temporal and spatial awareness,
no casual inference,
no common sense,
no comprehension



A Categorical Archive of ChatGPT Failures

Ali Borji
Quintic AI
aliborji@gmail.com

April 5, 2023

Abstract

Large language models have been demonstrated to be valuable in different fields. ChatGPT, developed by OpenAI, has been trained using massive amounts of data and simulates human conversation by comprehending context and generating appropriate responses. It has garnered significant attention due to its ability to effectively answer a broad range of human inquiries, with fluent and comprehensive answers surpassing prior public chatbots in both security and usefulness. However, a comprehensive analysis of ChatGPT's failures is lacking, which is the focus of this study. Eleven categories of failures, including reasoning, factual errors, math, coding, and bias, are presented and discussed. The risks, limitations, and societal implications of ChatGPT are also highlighted. The goal of this study is to assist researchers and developers in enhancing future language models and chatbots. Please refer to [here](#) for the list of questions.

2

Workload implications of artificial intelligence in education

Aspiration

AI will increase productivity to focus
on things that matter the most

TECHNOLOGY

ChatGPT Is About to Dump More
Work on Everyone

Productivity \neq Workload

How do we deal with
increased complexity of working and learning with AI?

Workload

Productivity \neq Workload

Automatic feedback is not associated with decreased teaching load

3

Ethical implications of artificial intelligence in education

Consent

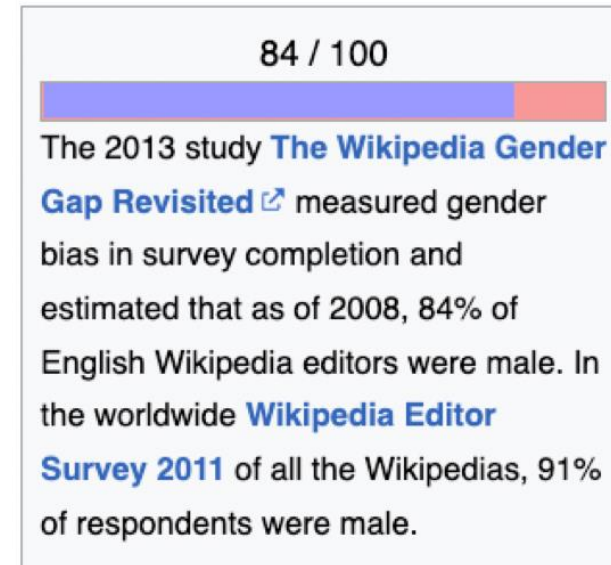
Hard to *unlearn* something once private data are used for training LLMs

Training datasets for large language models

Nationality



Gender



Bias

Midjourney v4

Prompt:
patriotic, dog, superhero.



PROMISE – CONCERNS – **NEED** –
FINAL REMARKS

1

Developing and measuring skills for the age of AI

Need for AI literacy

The New York Times

Here's What Happens When Your Lawyer Uses ChatGPT

A lawyer representing a man who sued an airline relied on artificial intelligence to help prepare a court filing. It did not go well.

 Give this article    1.1K



By **Benjamin Weiser**

May 27, 2023

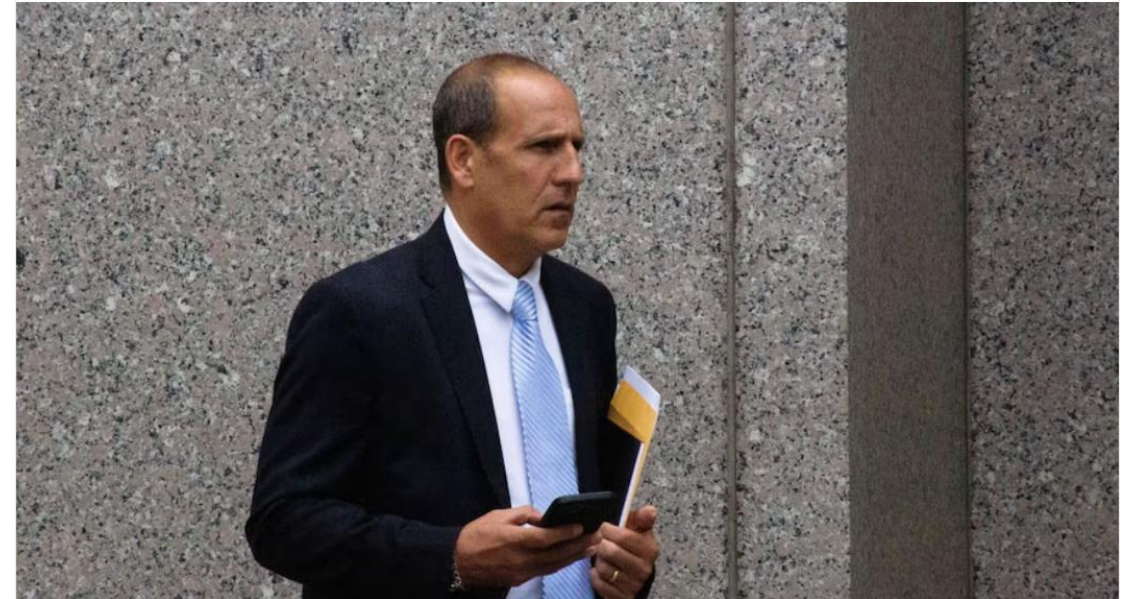
The lawsuit began like so many others: A man named Roberto Mata sued the airline Avianca, saying he was injured when a metal serving cart struck his knee during a flight to Kennedy International Airport in New York.

Weiser, B. (2023). Here's What Happens When Your Lawyer Uses ChatGP. <https://www.nytimes.com/2023/05/27/nyregion/avianca-airline-lawsuit-chatgpt.html>

This US lawyer used ChatGPT to research a legal brief with embarrassing results. We could all learn from his error

ABC RN / By Damien Carrick and Sophie Kesteven for the Law Report, with additional reporting from Reuters.

Posted Sat 24 Jun 2023 at 11:15am



Carrick, D., & Kesteven, S. (2023, June 24). 'Use with caution': How ChatGPT landed this US lawyer and his firm in hot water. *ABC News*. <https://www.abc.net.au/news/2023-06-24/us-lawyer-uses-chatgpt-to-research-case-with-embarrassing-result/102490068>

Human-AI relationship

Redefining skills we aim to
develop and assess

Human-AI collaborative problem solving
Hybrid human-AI regulation

2

Challenge

Understanding impact on learning

Challenge

Fluence is not a bliss for learning

How do we deal with fluency bias and ‘lazy’ metacognition?

Inadvertent deception of ChatGPT

Inaccurate and verbose, but
users prefer ChatGPT responses

Challenge

Writing is an important learning tool

What happens when much of that tool is offloaded to
generative AI?

Challenge

Asking quality questions is
critical for effective learning

How do we promote development skills for question asking?

FINAL REMARKS



Need to broaden understanding of learning *with, about, and despite* gen AI

AI is unlikely to go away and
we need to lead the change

www.graile.ai

**Interested in participating in
shaping further developments in AI in Education?**



GRAILE

Global Research Alliance for AI in Learning and Education

www.graile.ai



Charting the New Territory: Generative AI in Learning and Teaching

Dragan Gašević
@dgasevic

December 13th, 2023
Learning and Teaching Expo
Hong Kong