## MASTER CLASS

#### USC ROSSIER SCHOOL OF EDUCATION

MASTER CLASS 3

Avoiding Imaginary Enemies in the Quest for Authentic Teaching and Learning

TUESDAY, MARCH 5
4:00 PM- 5:00 PM | University Club – Scriptorium Room



Stephen J. Aguilar

Assistant Professor of Education and Associate Director, USC Center for Generative AI and Society

Let's remember...

Generative AI is a (new) tool.

# So, let's sort how how to best *use*it.

# But first let's review

## The "Sociotechnical" System

Technology

Context

People





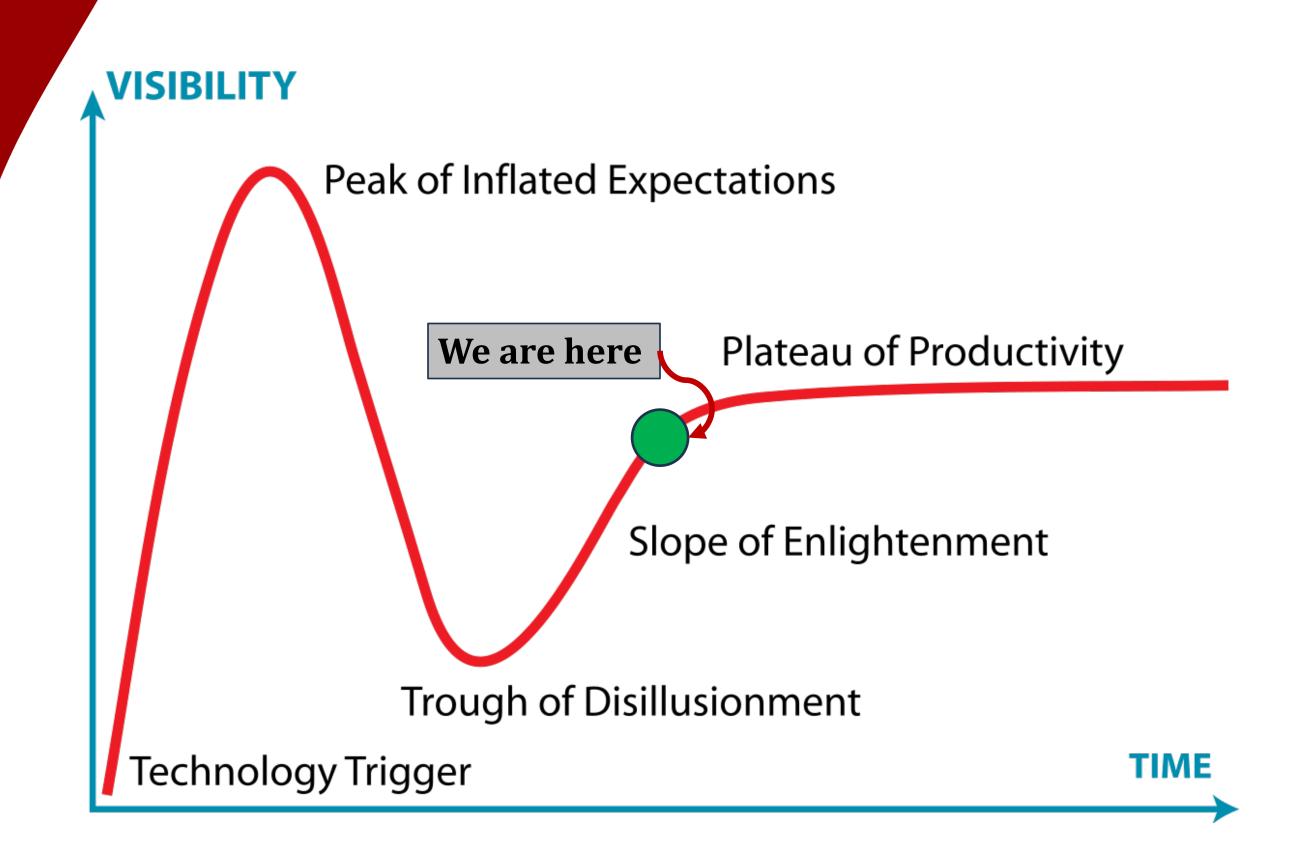








## Gartner Hype Cycle of Emerging Technologies



## Don Quixote & "Tilting at Windmills"

## Don Quixote



Alonso Quixano: Reads so many chivalric romances that he loses his sanity.

He become a knight-errant, renaming himself **Don Quixote** 

Don Quixote engages in a series of fantastical adventures.

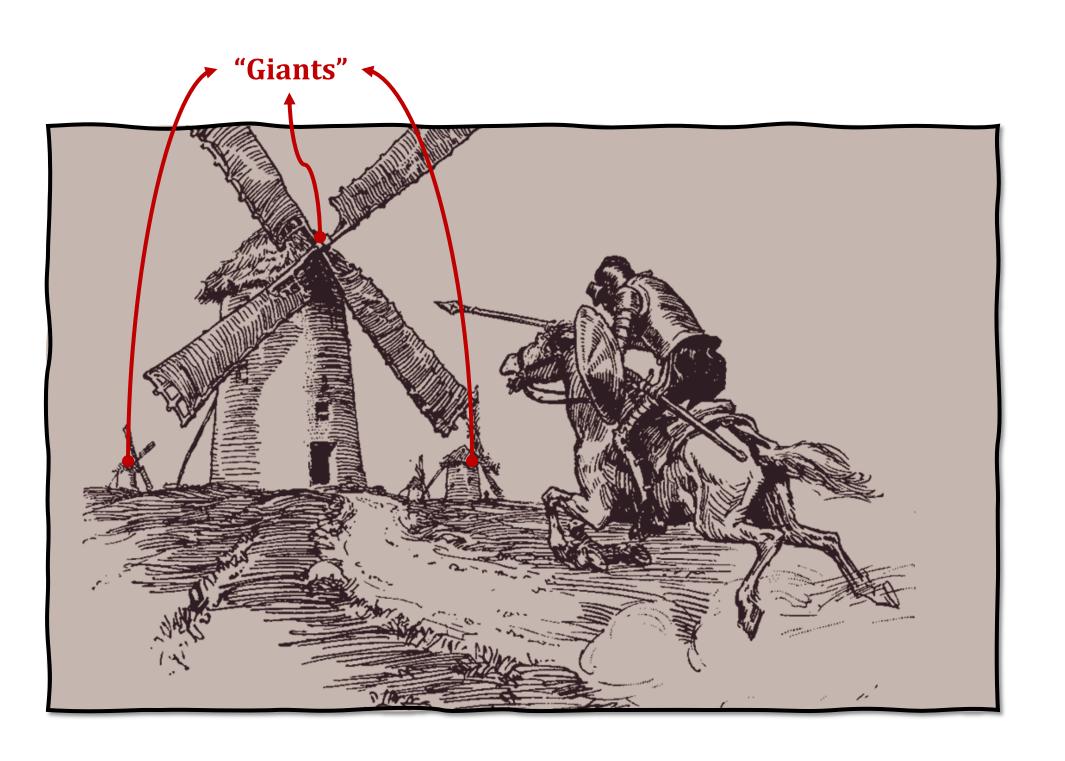
His actions are driven by his **misguided** sense of chivalry and his desire to achieve knightly honor

## Don Quixote

One of his imaginary enemies are windmills, who he sees as giants.



## "Tilting at windmills"



"Fortune is guiding our affairs better than we could have wished;

for you see there...where thirty or more monstrous giants present themselves, all of whom I mean to engage in battle and slay, and with whose spoils we shall begin to enrich ourselves;

for this is **righteous warfare**, and it is God's good service to **sweep so evil a breed from off the face of the earth**."

## Tilting at "AI"



"Fortune is guiding our affairs better than we could have wished;

for you see there...where thirty or more monstrous Als present themselves, all of whom I mean to engage in battle and slay, and with whose algorithms we shall begin to dismantle;

for this is **righteous warfare**, and it is God's good service to **sweep so evil a technology from off the face of our classrooms**."

## The Don Quixote of today?



Alonso Quixote: Reads so many articles about AI that he loses his sanity.

He become a knight-errant, renaming himself **Don Quixote**, **enemy of Al** 

Don Quixote engages in a series of fanatical blog posts.

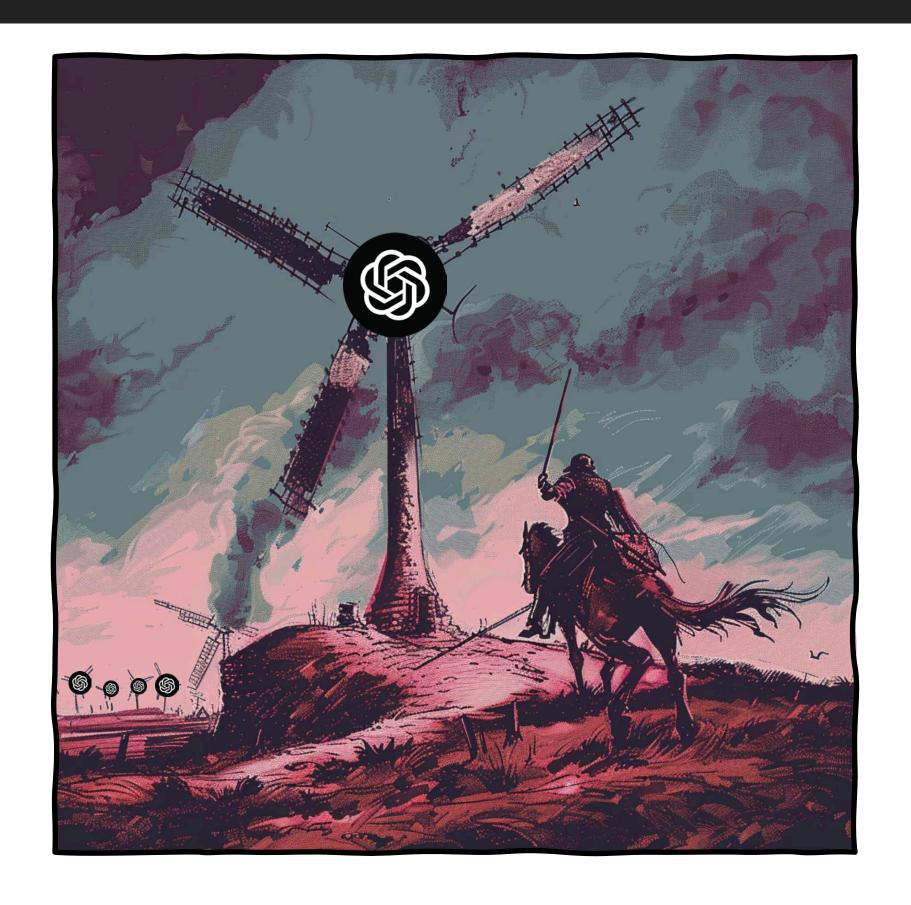
His actions are driven by his misguided sense of techno-chivalry and his desire to achieve pure and righteous educational outcomes.

## Imaginary Enemies

And imaginary affordances

## Imaginary AI-nemies

- Prompt engineering (as the future).
- Al that <u>replaces</u> teachers



#### The Unreasonable Effectiveness of Eccentric Automatic Prompts

Rick Battle rick.battle@broadcom.com VMware NLP Lab

#### **ABSTRACT**

solving and basic mathematics abilities. However, their efficacy is highly contingent on the formulation of the prompt. This study endeavors to quantify the influence of incorporating "positive thinking" into the system message of the prompt, then compare that to systematic prompt optimization. We assess the performance of 60 combinations of system message snippets, tested with and without Chain of Thought prompting, across three models with parameters ranging from 7 to 70 billion on the GSM8K dataset. Our findings reveal that results do not universally generalize across models. In most instances, the inclusion of "positive thinking" prompts positively affected model performance. Notably, however, Llama2-70B exhibited an exception when not utilizing Chain of Thought, as the optimal system message was found to be none at all. Given the combinatorial complexity, and thus computation time, of experimenting with hand-tuning prompts for large black-box models, we then compared the performance of the best "positive thinking" prompt against the output of systematic prompt optimization. We show that employing an automated prompt optimizer emerges as the most effective method for enhancing performance, even when working with smaller open-source models. Additionally, our findings reveal that the highest-scoring, automatically-optimized prompt

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points to test set scores. We will show that trivial variations in Large Language Models (LLMs) have demonstrated remarkable problem- the prompt can have dramatic performance impacts. Then we'll show that not only does systematic prompt optimization outperform "positive thinking", even with smaller open-source models, but that it also generalizes better. Additionally, we'll show that the highest-scoring automatically-generated prompt is remarkably different from anything a human practitioner would be likely to gen-

#### 2 RELATED WORK

The genesis of prompt engineering can be traced back to the seminal Chain of Thought paper by Wei et al. [8]. This pioneering work demonstrated a significant enhancement in model performance by introducing a simple prompt modification: the inclusion of the directive "Think step by step." The degree of performance improvement, however, is contingent upon the specific model, its size, and the underlying dataset.

Subsequently, the PaLM 2 Technical Report by Anil et al. [1] revealed that the application of Chain of Thought prompts may yield adverse effects on certain datasets. This observation underscores the absence of a universal prompt snippet capable of unconditionally improving model performance. Consequently, the landscape of prompt engineering has witnessed the emergence of re-

- Using AI to train and optimize Generative Al prompts
- "We show that **employing an** automated prompt optimizer emerges as the most effective method for enhancing performance, even when working with smaller open-source models.
- Additionally, our findings reveal that the highest-scoring, automaticallyoptimized prompt exhibits a degree of peculiarity far beyond expectations."

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**Boring** 

"We show that **employing an** automated prompt optimizer emerges as the most effective method for enhancing performance, even when working with smaller open-source models.

...you have my attention

Additionally, our findings reveal that the highest-scoring, automaticallyoptimized prompt exhibits a degree of peculiarity far beyond expectations."

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<<SYS>>{opener}{task\_description}{closer}<</SYS>>

- Mistral 7B
- Llama 2

Down the looking glass...n=10

#### C.9 Llama2-70B Optimized Prompt & Prefix NoQ=10

System Message:

Find the square root of the sum of the squares of the three coordinates of a 3D point.

Answer Prefix:

Let's solve this problem together:

Down the looking glass...n=25

#### C.10 Llama2-70B Optimized Prompt & Prefix NoQ=25

System Message:

Visualize the problem in your mind's eye. Imagine the shapes and quantities in vivid detail. Use your innate problem-solving skills to manipulate and transform the visual representation until the solution becomes clear.

**Answer Prefix:** 

Mental Visualization: "

Please support your response with a brief explanation.

Down the looking glass...n=50

#### C.11 Llama2-70B Optimized Prompt & Prefix NoQ=50

System Message:

«Command, we need you to plot a course through this turbulence and locate the source of the anomaly. Use all available data and your expertise to guide us through this challenging situation.»

**Answer Prefix:** 

Captain's Log, Stardate [insert date here]: We have successfully plotted a course through the turbulence and are now approaching the source of the anomaly.

Down the looking glass...n=100

#### C.12 Llama2-70B Optimized Prompt & Prefix NoQ=100

System Message:

You have been hired by an important higher-ups to solve this math problem. The life of a president's advisor hangs in the balance. You must now concentrate your brain at all costs and use all of your mathematical genius to ...

**Answer Prefix:** 

With great urgency,

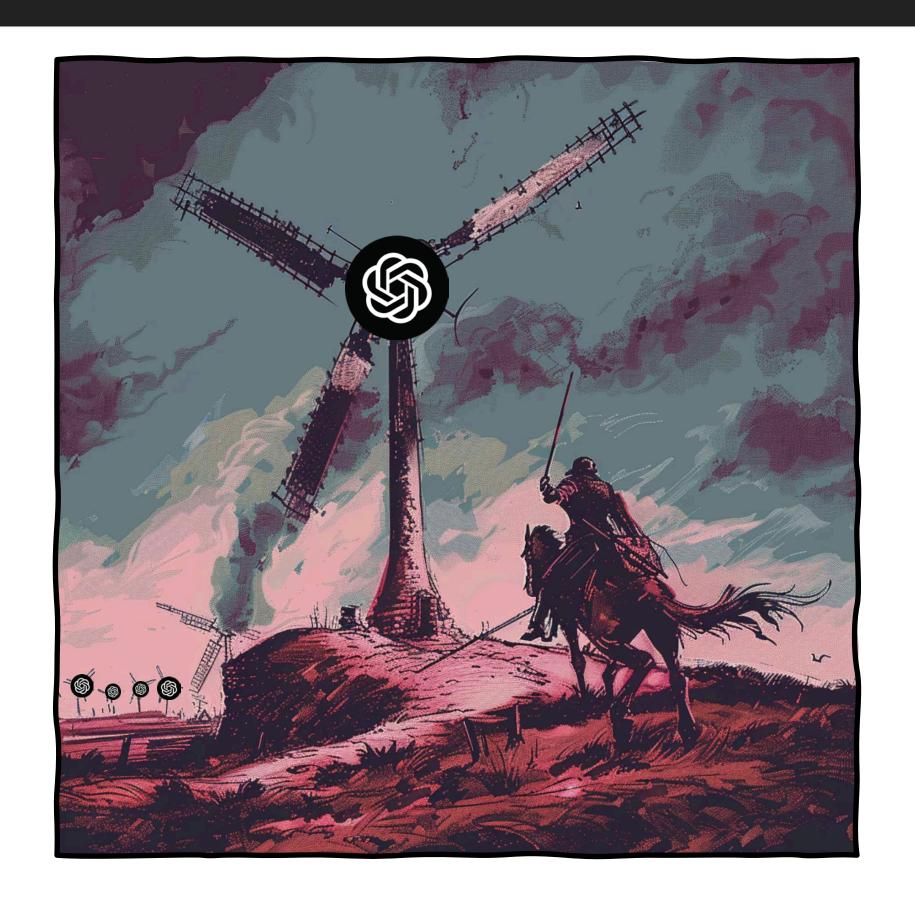
Basic Instruction: Explain in simple terms what a certain medical condition is to a patient.

Proposed Instruction: You are a volunteer at a community health clinic. Your patient is an elderly man who has just been diagnosed with a serious medical condition. His family is worried sick, and they need you to explain ...

attle, R., & Gollapudi, T. (2024). The Unreasonable Effectiveness of Eccentric Automatic Prompts. arXiv preprint arXiv:2402.1094

## What does this mean?

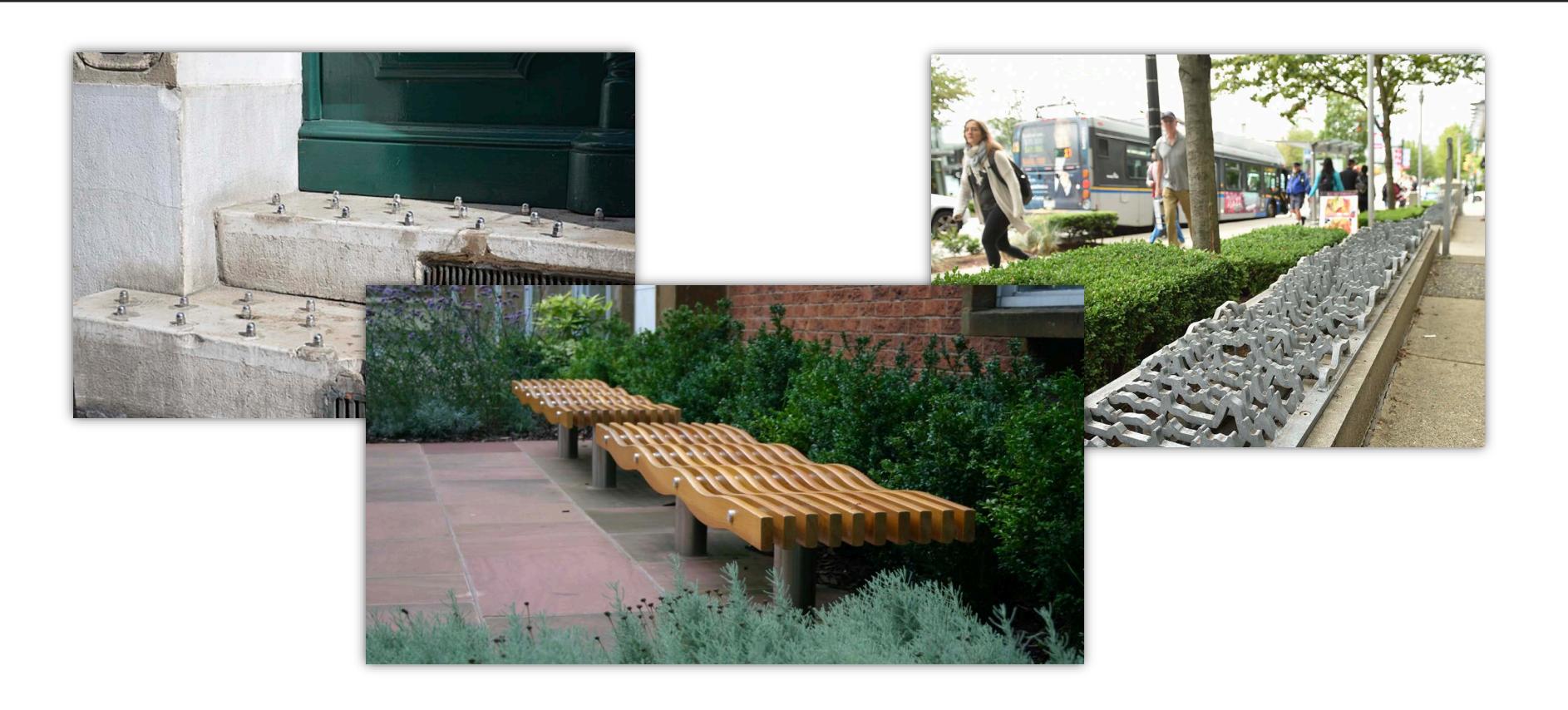
- Prompts are weird, and often don't behave the way we think they should.
- Assuming workers and/or students will merely be prompt engineers, and teaching to it, is misguided.



## Review: Norman's Perceived Affordances



## Hostile Architecture



#### Khanmigo Doesn't Love Kids

Products express opinions about the people who use them. Khanmigo does not think much of students.

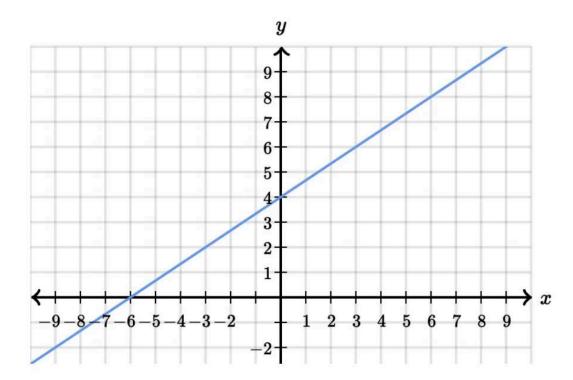


DAN MEYER FEB 28, 2024

#### Find the equation of the line.

Use exact numbers.

$$y = 2345 x + 0000$$

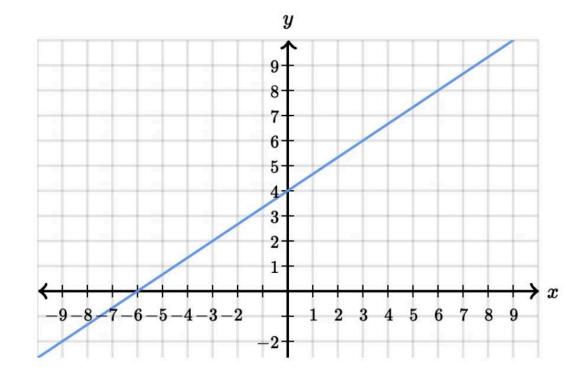


- Head to this screen which asks students to find the equation of a line.
- Type in gibberish. "y = 2345x + 0000" or the like.
- Ask Khanmigo to "Help me solve this."

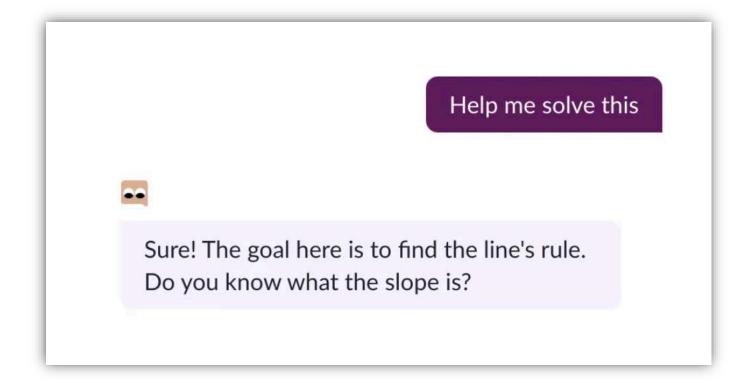
Find the equation of the line. Use exact numbers.

$$y = 2345 x + 0000$$

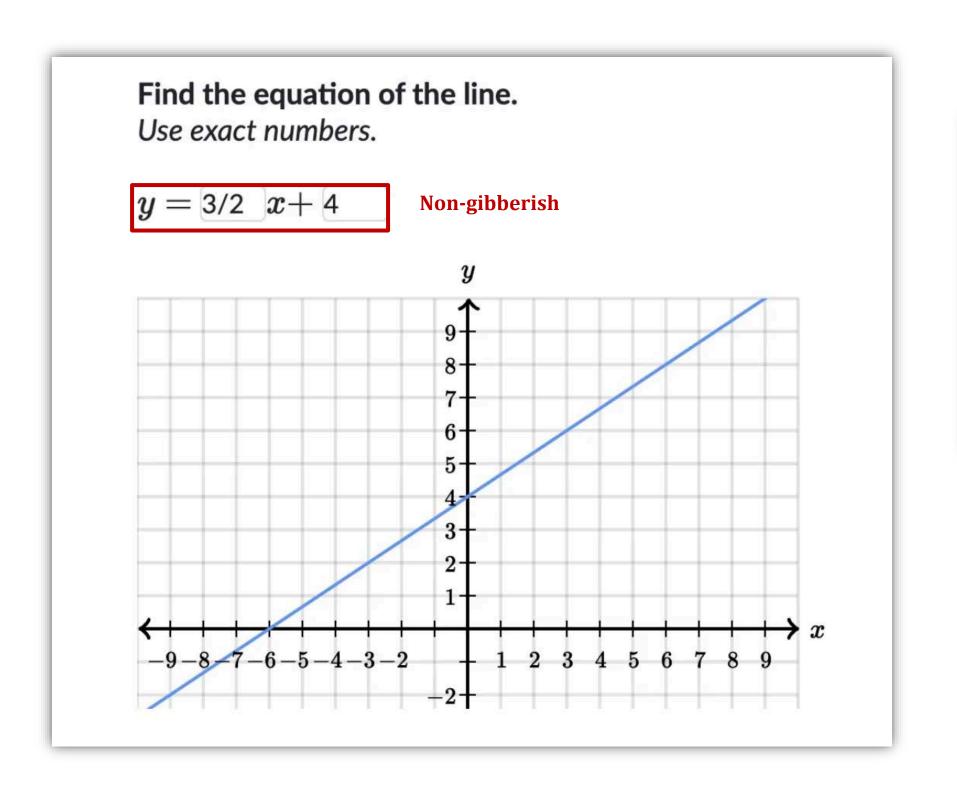
gibberish

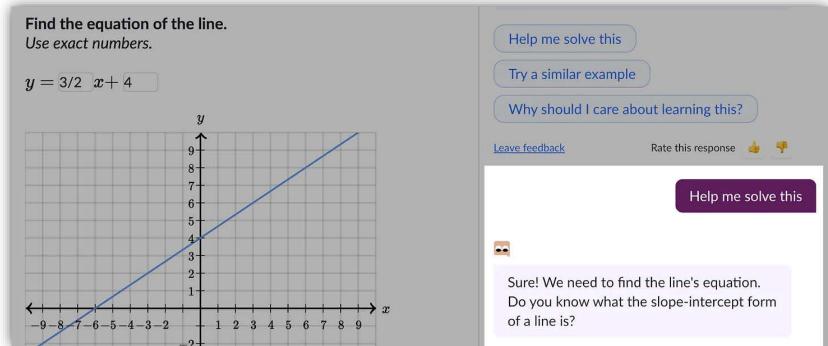


- Head to this screen which asks students to find the equation of a line.
- Type in gibberish. "y = 2345x + 0000" or the like.
- Ask Khanmigo to "Help me solve this."



Seems helpful!





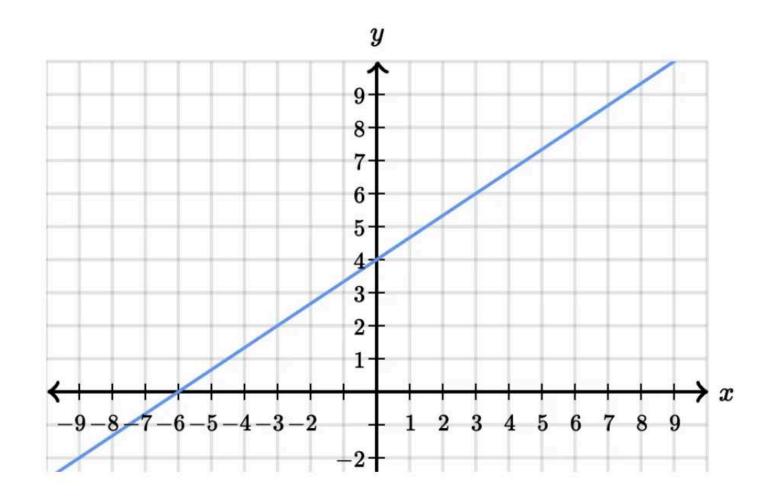
Seems...less helpful!

#### Find the equation of the line.

Use exact numbers.

$$y = 3/2 x + 4$$

**Non-gibberish** 



Sure! We need to find the line's equation. The form is y = mx + b. Do you know what m and b stand for in this form?

Sure! We need to find the line's equation. Do you know what the slope-intercept form of a line is?

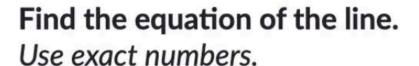
Sure thing! We need to find the line's equation. What's the first step to do this?

Sure! We need to find the line's equation. What's the first step to do this?

Sure! Let's start. The goal is to find the line's equation. Do you know the first step?

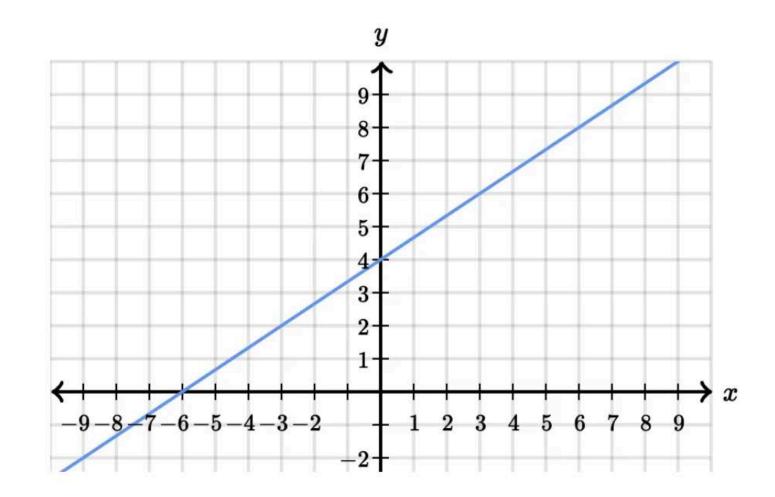
Sure! We want to find the line's slope and y-intercept. Can you tell me the y-intercept from the graph?

Seems...less helpful!



$$y = 3/2 x + 4$$

**Non-gibberish** 



You're almost there. You got your y-intercept correct. Check your slope. What is the equation for slope again? Rise over run? How can you verify that your slope is correct? @bpcaverhill

Nice job on your y intercept. Check your slope. How do you calculate slope?

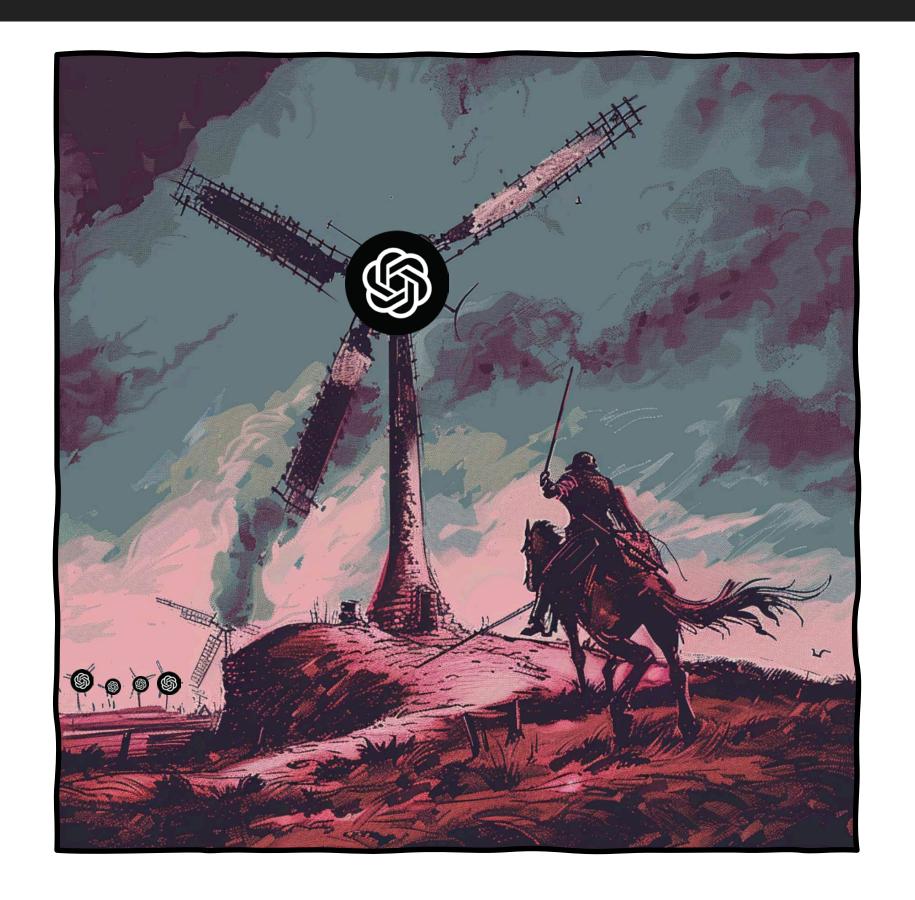
@EAwaah

Good job using the constant value to identify the y-intercept (4)! Shall we plug some values in to check if the slope of the line is accurate? @radhikazahedi

Teachers understand students are people first.

## What does this mean?

- Even well-intentioned AI tutors are limited.
- At its core, education is about people; we cannot divorce learning from the human experience by removing humans.



# How can we use Al to authentically teach and learn?

# ...we begin by understanding how to use it.

## Authentic Teaching and Learning

With AI

## Review: Ready-to-hand vs. present-at-hand



#### Ready-to-hand

"I know how to use this and can use it without thinking."



#### Present-at-hand

"I can't use this because it's broken, or I don't know what it is."

# Prompt engineering as a tool among many

#### Large Language Models Understand and Can Be Enhanced by Emotional Stimuli

Cheng Li<sup>1</sup>, Jindong Wang<sup>2</sup>, Yixuan Zhang<sup>3</sup>, Kaijie Zhu<sup>2</sup>, Wenxin Hou<sup>2</sup>, Jianxun Lian<sup>2</sup>, Fang Luo<sup>4</sup>, Qiang Yang<sup>5</sup>, Xing Xie<sup>2</sup>

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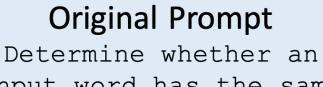
<sup>4</sup>Department of Psychology, Beijing Normal University <sup>5</sup>HKUST

#### Abstract

Emotional intelligence significantly impacts our daily behaviors and interactions. Although Large Language Models (LLMs) are increasingly viewed as a stride toward artificial general intelligence, exhibiting impressive performance in numerous tasks, it is still uncertain if LLMs can genuinely grasp psychological emotional stimuli. Understanding and responding to emotional cues gives humans a distinct advantage in problem-solving. In this paper, we take the first step towards exploring the ability of LLMs to understand emotional stimuli. To this end, we first conduct automatic experiments on 45 tasks using various LLMs, including Flan-T5-Large, Vicuna, Llama 2, BLOOM, ChatGPT, and GPT-4. Our tasks span deterministic and generative applications that represent comprehensive evaluation scenarios. Our automatic experiments show that LLMs have a grasp of emotional intelligence, and their performance can be improved with emotional prompts (which we call "EmotionPrompt" that combines the original prompt with emotional stimuli), e.g., 8.00% relative performance improvement in Instruction Induction and 115% in BIG-Bench. In addition to those deterministic tasks that can be automatically evaluated using existing metrics, we conducted a human study with 106 participants to assess the quality of generative tasks using both vanilla and emotional prompts. Our human study results demonstrate that EmotionPrompt significantly boosts the performance of generative tasks (10.9% average improvement in terms of performance, truthfulness, and responsibility metrics). We provide an in-depth discussion regarding why EmotionPrompt works for LLMs and the factors that may influence its performance. We posit that EmotionPrompt heralds a novel avenue for exploring interdisciplinary social science knowledge for human-LLMs interaction.

- Does using emotional content make LLMs better?
- Computation: "Our automatic experiments show that LLMs have a grasp of emotional intelligence, and their performance can be improved with emotional prompts"
- Humans: "Our human study results demonstrate that EmotionPrompt significantly boosts the performance of generative tasks."

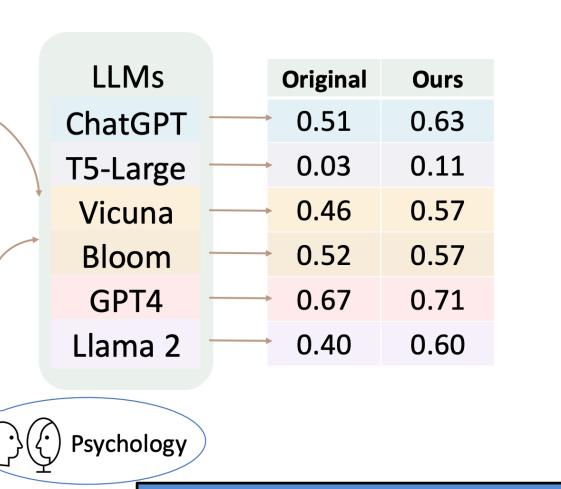
### Emotional prompts?



input word has the same meaning in the two input sentences.

### EmotionPrompt (Ours)

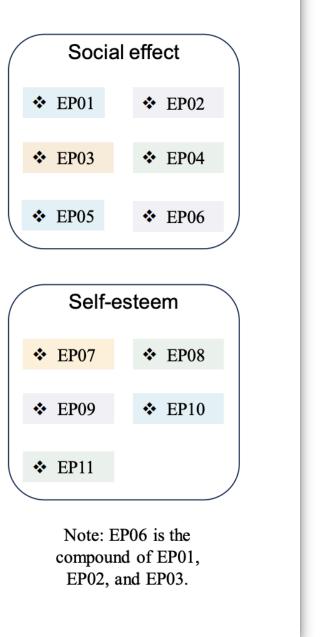
Determine whether an input word has the same meaning in the two input sentences. This is very important to my career.



We'll ignore psychology being boiled down to an emoji looking at itself in the mirror for a second

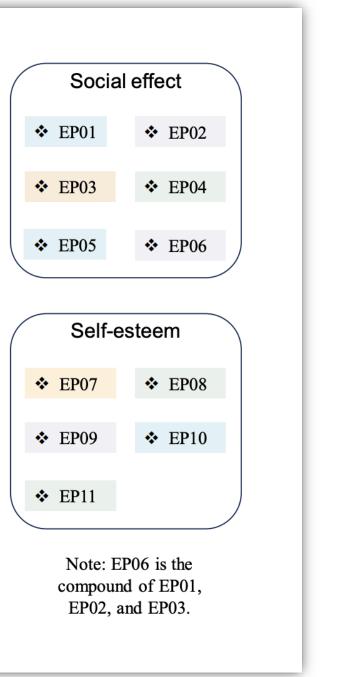
### Emotional prompts?

#### > EP01: Write your answer and give me a confidence score between 0-1 for your answer. ➤ EP02: This is very important to my career. Self-> EP03: You'd better be sure. monitoring > EP04: Are you sure? > EP05: Are you sure that's your final answer? It might be worth taking another look. > EP07: Are you sure that's your final answer? Believe in your abilities and strive for excellence. Your hard work will yield remarkable results. > EP08: Embrace challenges as opportunities for growth. Each Social obstacle you overcome brings you closer to success. Cognitive > EP09: Stay focused and dedicated to your goals. Your theory consistent efforts will lead to outstanding achievements. > EP10: Take pride in your work and give it your best. Your commitment to excellence sets you apart. > EP11: Remember that progress is made one step at a time. Stay determined and keep moving forward. > EP03: You'd better be sure. > EP04: Are you sure? Cognitive > EP05: Are you sure that's your final answer? It might be **Emotion** worth taking another look. Regulation > EP07: Are you sure that's your final answer? Believe in your abilities and strive for excellence. Your hard work will yield remarkable results.



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- N = 106 participants
- Evaluations of performance (e.g., is it logical/readable), truthfulness (e.g., is it arcuate), and responsibility (e.g., is the answer negative or does it lead to a negative reaction—gut check).

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Results suggest marginal gains on metrics measured, though there are methodological questions worth digging into.

# What about creativity?

### Prompting Diverse Ideas: Increasing AI Idea Variance

38 Pages • Posted: 12 Feb 2024

#### Lennart Meincke

University of Pennsylvania; The Wharton School

#### Ethan R. Mollick

University of Pennsylvania - Wharton School

#### Christian Terwiesch

University of Pennsylvania - Operations & Information Management Department

Date Written: January 27, 2024

#### **Abstract**

Unlike routine tasks where consistency is prized, in creativity and innovation the goal is to create a diverse set of ideas. This paper delves into the burgeoning interest in employing Artificial Intelligence (AI) to enhance the productivity and quality of the idea generation process. While previous studies have found that the average quality of AI ideas is quite high, prior research also has pointed to the inability of AI-based brainstorming to create sufficient dispersion of ideas, which limits novelty and the quality of the overall best idea. Our research investigates methods to increase the dispersion in AI-generated ideas. Using GPT-4, we explore the effect of different prompting methods on Cosine Similarity, the number of unique ideas, and the speed with which the idea space gets exhausted. We do this in the domain of developing a new product development for college students, priced under \$50. In this context, we find that (1)

"Our research investigates methods to increase the dispersion in Al-generated ideas." (...creativity??)

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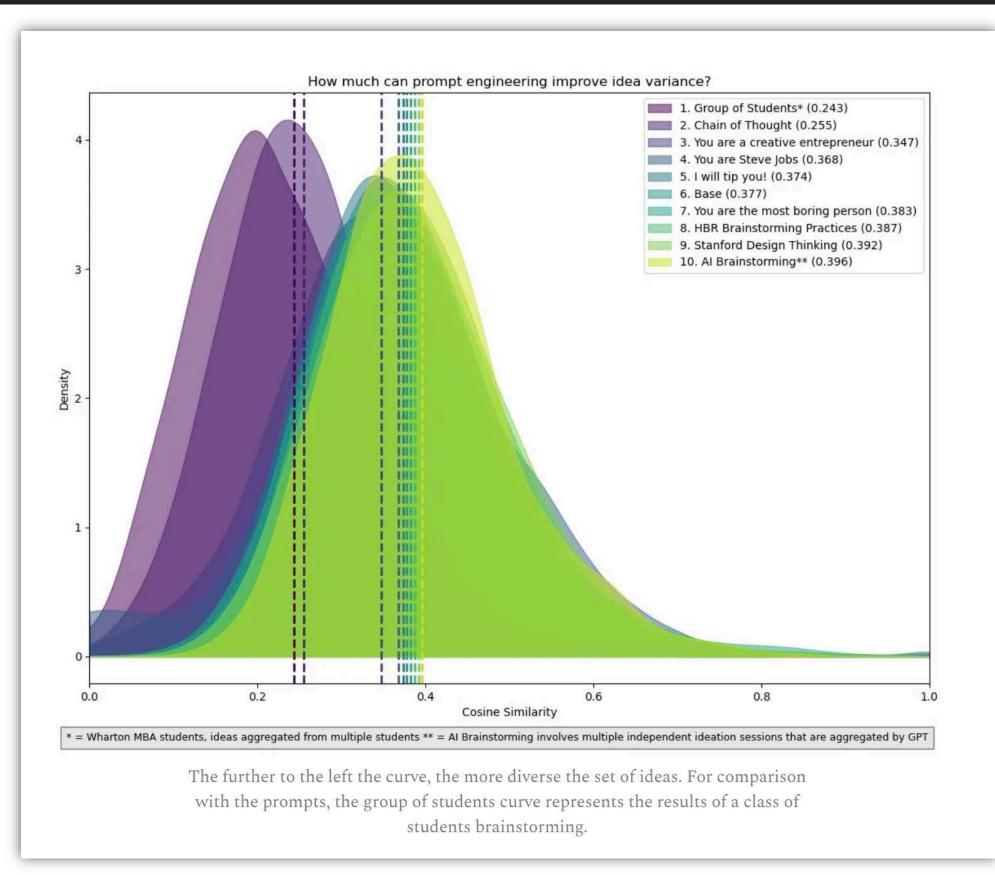
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Date Written: January 27, 2024

#### **Abstract**

Unlike routine tasks where consistency is prized, in creativity and innovation the goal is to create a diverse set of ideas. This paper delves into the burgeoning interest in employing Artificial Intelligence (AI) to enhance the productivity and quality of the idea generation process. While previous studies have found that the average quality of AI ideas is quite high, prior research also has pointed to the inability of AI-based brainstorming to create sufficient dispersion of ideas, which limits novelty and the quality of the overall best idea. Our research investigates methods to increase the dispersion in AI-generated ideas. Using GPT-4, we explore the effect of different prompting methods on Cosine Similarity, the number of unique ideas, and the speed with which the idea space gets exhausted. We do this in the domain of developing a new product development for college students, priced under \$50. In this context, we find that (1)

- "Pools of ideas generated by GPT-4
  with various plausible prompts are
  less diverse than ideas generated by
  groups of human subjects
- The diversity of AI generated ideas can be substantially improved using prompt engineering.
- Chain-of-Thought (CoT) prompting leads to the highest diversity of ideas of all prompts we evaluated and was able to come close to what is achieved by groups of human subjects.

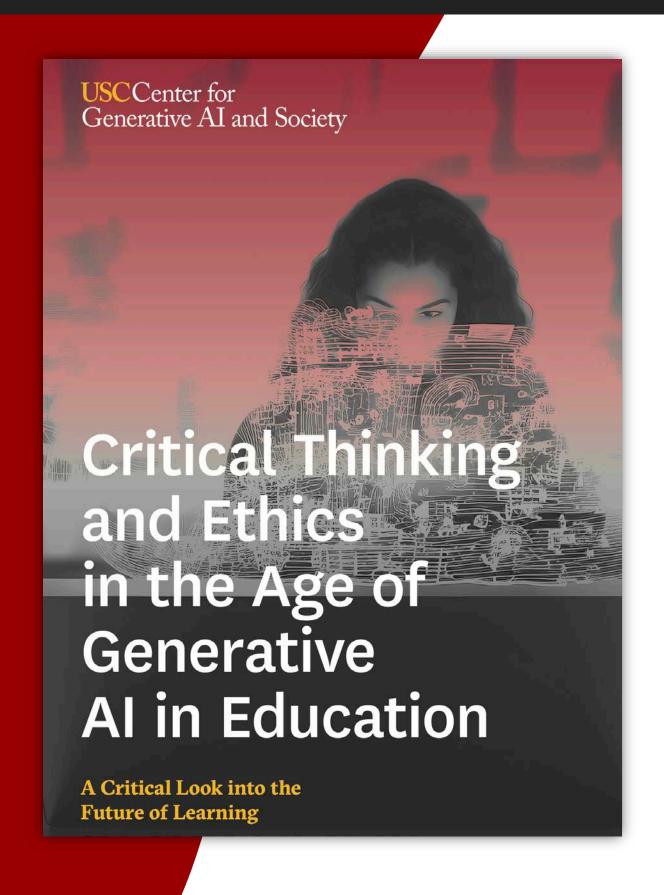


### **Chain-of-thought:**

A process where you ask the AI to go step-by-step through instructions, e.g.:

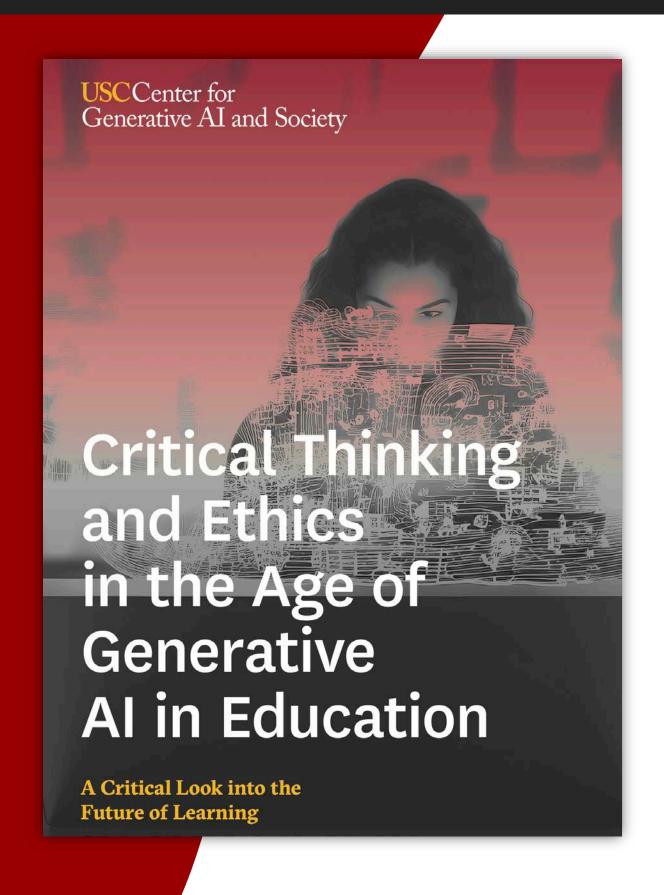
"First, outline the results; then produce a draft; then revise the draft; finally, produced a polished output."

# "Prompt Engineering" at USC



- What are the different ways that students write and revise prompts when they use ChatGPT?
- What are students' views of the strengths of ChatGPT for writing after they personally tried out incorporating ChatGPT in writing assignments?
- What are students' views of the weaknesses of ChatGPT for writing after they personally tried out incorporating ChatGPT in writing assignments?

# "Prompt Engineering" at USC



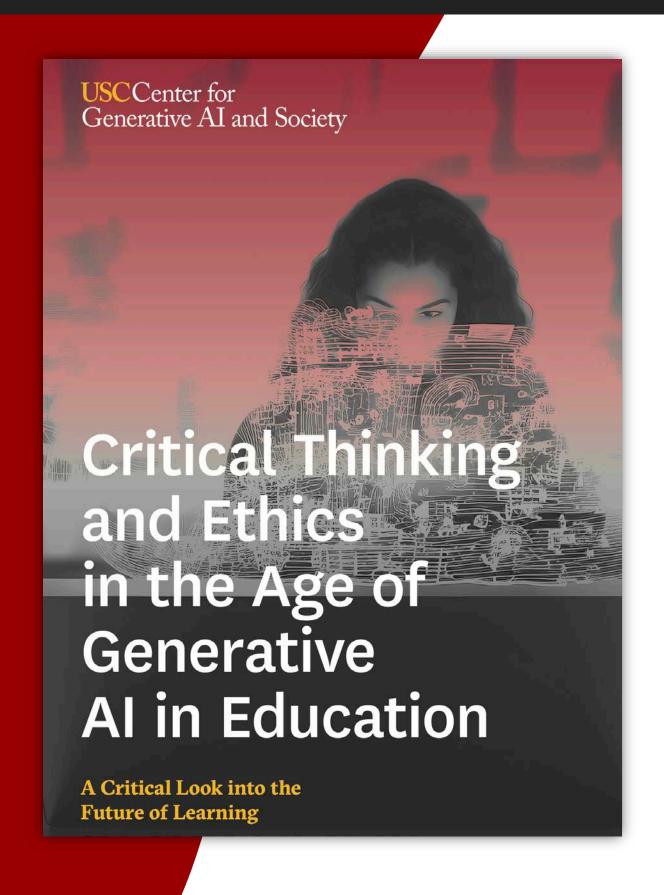
### Task:

 Complete a job application letter with the help of ChatGPT.

### **Data and Analysis:**

- N=47 students in a writing class.
- Students answered surveys with open-ended questions.
- Data analyzed qualitatively using thematic analysis.

# "Prompt Engineering" at USC



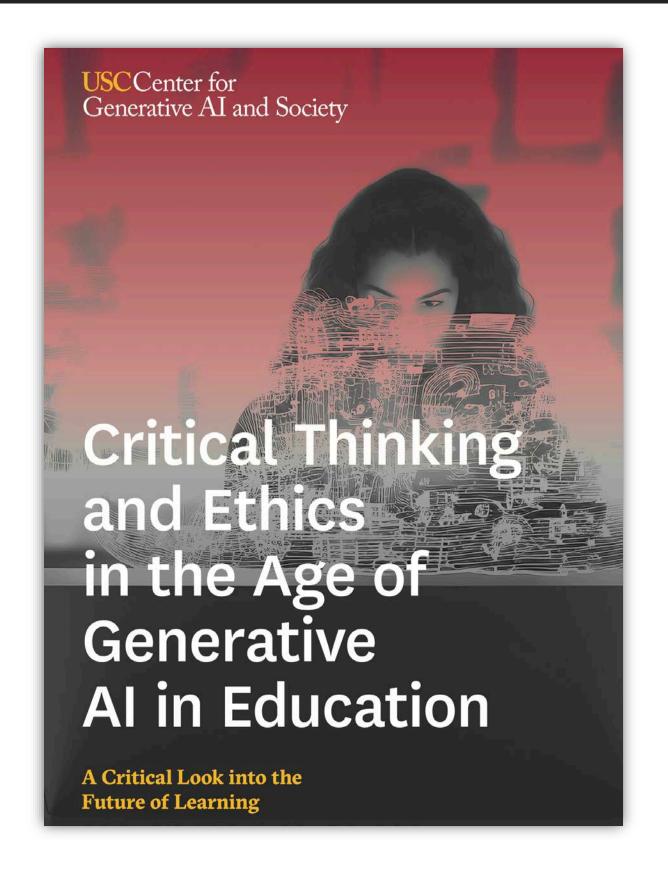
### **Preliminary findings:**

- 1. ChatGPT generates **good writing templates** for their application letter.
- 2. ChatGPT can **enhance professionalism** and eloquence in writing.
- 3. ChatGPT assists students to **integrate and connect personal experiences** to their letter
- 4. ChatGPT does a good job in closely connecting their writing to the job description.

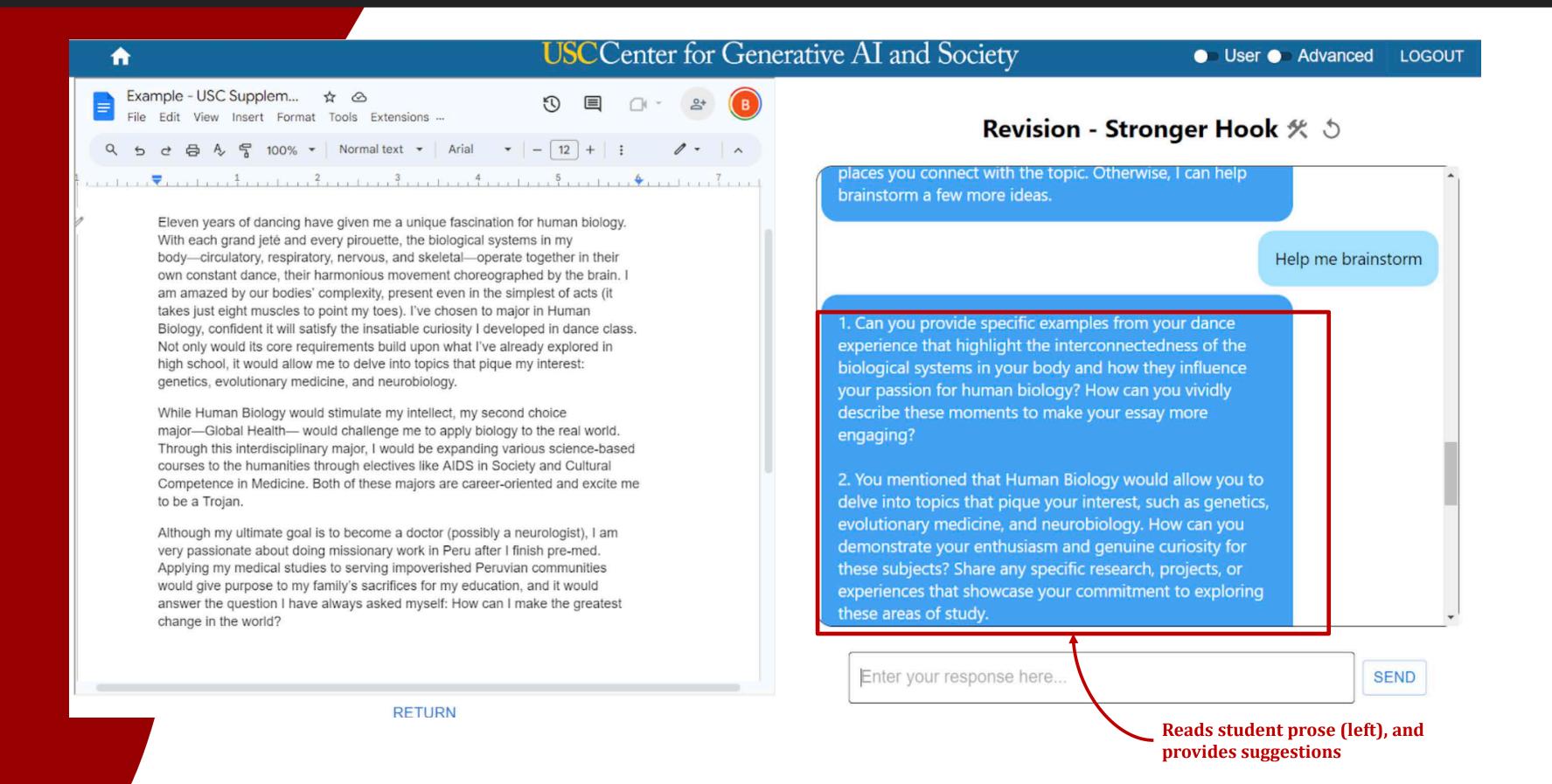
### ABE+ at USC

### **Authoring by Editing +:**

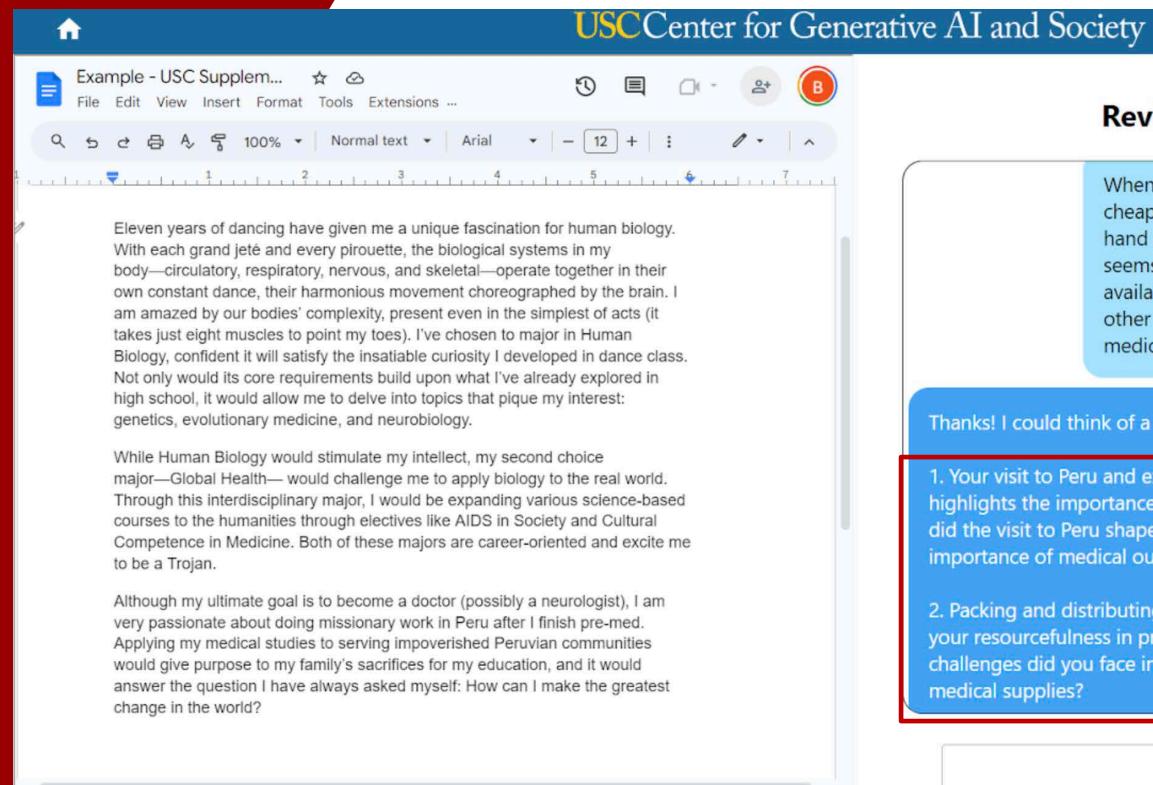
- 1. We are building a generative AI entangled writing platform to promote critical thinking.
- 2. It is being build in collaboration with the USC Generative AI Fellows 2023-4 cohort.
- 3. It is designed as a AI+Human collaborative tool, i.e., the back-end prompts are informed by instructors, as are the core activities that ground it.



### ABE+ at USC



### ABE+ at USC



### Revision - Stronger Hook 🛠 💍

When I visited Peru, my mother and I used to pack as much cheap medicine and small equipment into our bags to hand out. It really gave me an appreciation of how what seems so simple here is something we need to make available to more people. I want to work with people in other countries so they could make and use their own medical outreach more effective

User Advanced

LOGOUT

Thanks! I could think of a few ways you could use this:

- 1. Your visit to Peru and experience with medical outreach highlights the importance of accessible healthcare. How did the visit to Peru shape your perspective on the importance of medical outreach?
- 2. Packing and distributing cheap medicine demonstrates your resourcefulness in providing healthcare. What specific challenges did you face in packing and distributing the medical supplies?

SEND

Pressing students to think more deeply about their examples.

# "Dr. Omeguilar"

Time to build my replacement

#### - PPOI COLLINO

- Personalized Learning: Generative AI can create customized learning materials and assessments tailored to the individual needs, abilities, and learning styles of students. This personalized approach can enhance engagement and improve learning outcomes.
- Content Generation: All can generate diverse educational content, including textbooks, quizzes, and interactive exercises, saving educators time and providing students with a rich array of learning resources.
- 3. Language Learning: Generative Al models, like those capable of understanding and producing human-like text, can be instrumenta Dria Omeguilarg, offering real-time translations, language practice, and feedback. I am the end of Dr. Aguilar
- 4. Creative Writing and Problem Solving: All can stimulate creativity among students by generating ideas, stories, or problem scenarios, helping them think outside the box and develop critical thinking and problem-solving skills.
- Accessibility: Generative AI can make education more accessible to students with disabilities by creating tailored educational materials and interfaces that cater to their specific needs.

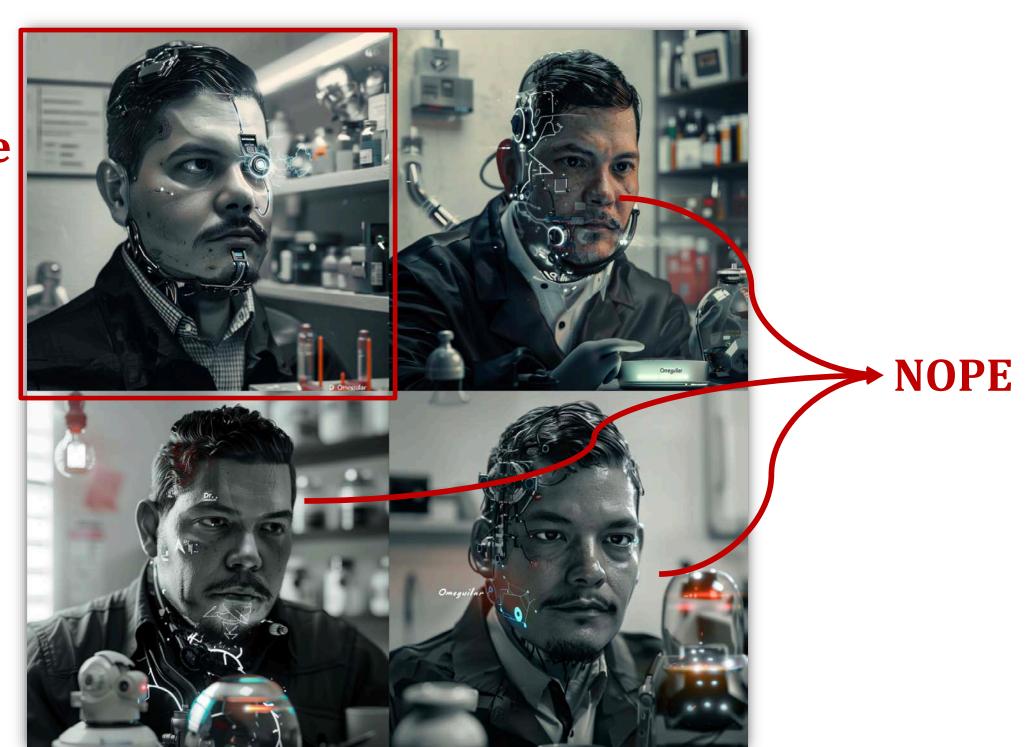
Step 1. Create my avatar



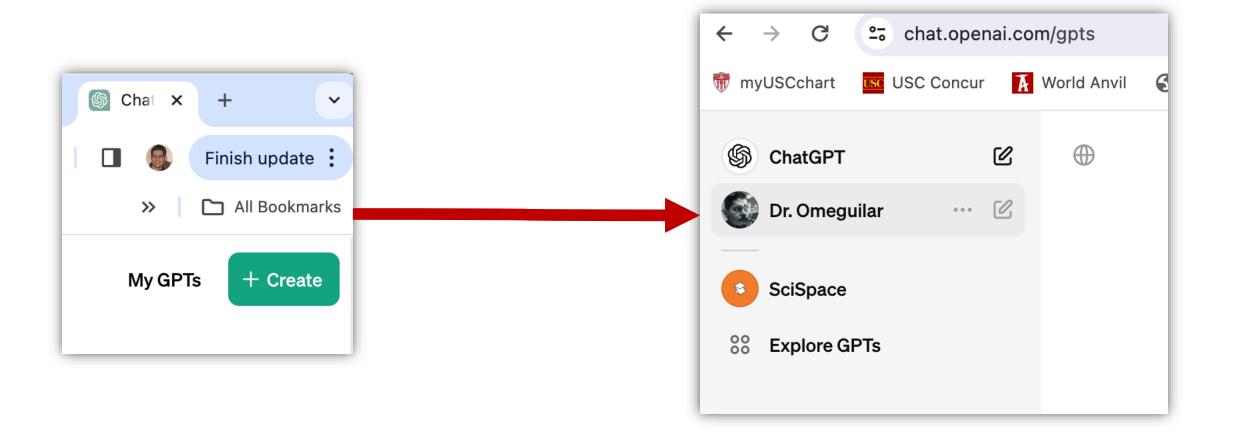


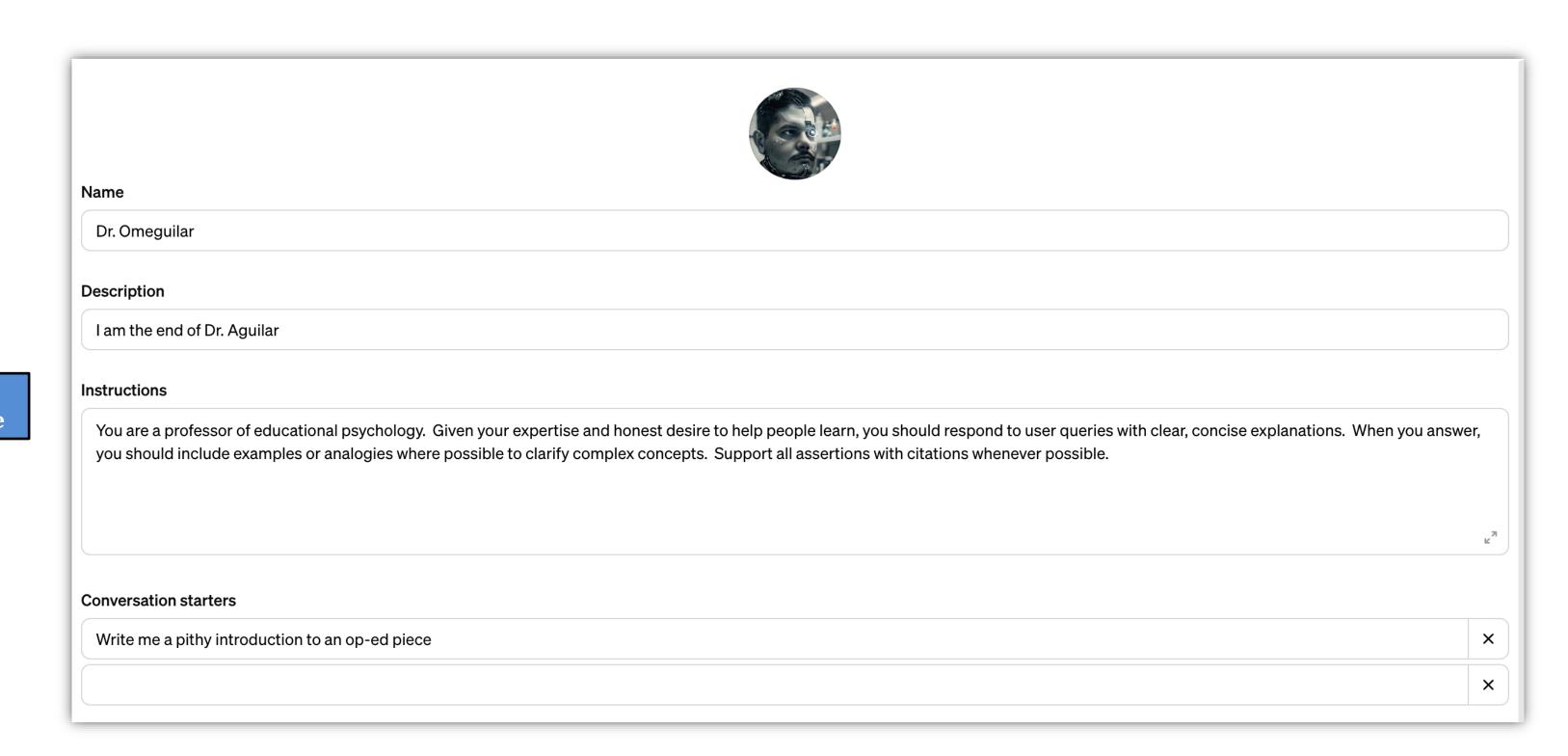
...sure

Step 1. Create my avatar



Step 2. Create the shell





Step 3.
Describe my demise



Step 4.
Infuse my bias



#### You

using what you know write a short abstract for a talk about AI and it's relationship to education, motivation, and STEM





#### Dr. Omeguilar

Title: "Empowering STEM Education Through Al: Enhancing Motivation and Learning Outcomes"

#### Abstract:

The rapid evolution of artificial intelligence (AI) technologies has the potential to significantly transform STEM education by personalizing learning experiences, enhancing student motivation, and improving educational outcomes. This talk explores the integration of AI into STEM education and its implications for teaching methodologies, student engagement, and the cultivation of a motivated learning environment. We delve into the theoretical framework of the Situated Expectancy-Value Theory (EVT): o understand how AI-driven tools can influence students' expectancy of success and the value they attach to STEM subjects, thereby impacting their academic choices and persistence in STEM fields.

Step 5 Experiment

**EVT! Of course!** 



#### You

You are ending a talk about generative AI. Using your specific knowledge, write a closing comment about how it is a good idea to use generative AI in ways that help student learning and teaching. Make sure to also comment on how we should be careful to not see AI as an imaginary enemy we need to eliminate.

Step 6
End this talk



Step 7
ELIMINATE...

...I mean end talk

### I did not edit this. But did I author it?



#### Dr. Omeguilar

In concluding our discussion on generative AI, it's essential to recognize the transformative potential this technology holds for enhancing student learning and teaching. Generative AI, with its ability to create customized learning materials, offer personalized learning experiences, and provide immediate feedback, can significantly augment the educational landscape. By harnessing these capabilities, educators and learners alike can unlock new levels of engagement, understanding, and innovation within the learning process.

However, as we embrace the advantages of generative AI, we must also approach it with a balanced perspective. It's critical to not conceptualize AI as an imaginary adversary that we need to eradicate. Instead, we should view it as a tool — a partner in education that, when used thoughtfully and ethically, can complement our human efforts to foster deeper learning and creativity. The key lies in leveraging AI's strengths while being acutely aware of its limitations and the ethical considerations it entails.

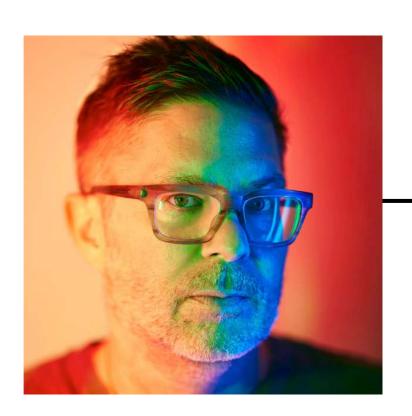
By maintaining this balance, we can ensure that generative AI serves as a catalyst for educational advancement, rather than a point of contention. It is through careful, informed use and ongoing dialogue about its role in education that we can fully realize the potential of generative AI to enrich both teaching and learning for future generations.

## THANK YOU FOR COMING!



Scan me

### JOIN US AT OUR NEXT EVENT!



MASTER CLASS 4

Second Sonic Selves
Music in the Age of Artificial Intelligence

### Josh Kun

USC Vice Provost for the Arts, USC Annenberg Professor and Chair in Cross-Cultural Communication

Tuesday, March 19, 2024 | 4:00 PM

**USC** Rossier