



**NUS | Computing**

National University  
of Singapore



**25<sup>th</sup>**  
NUS Computing  
Anniversary

# Chat on GPT

**18 April 2023**

**2:00pm to 5:00pm**





## Disclaimer:

**The session may be recorded and the recordings will be distributed/published by the organiser on social media.**

**If you have any concerns, please contact the organiser.**



[nuscomputing@nus.edu.sg](mailto:nuscomputing@nus.edu.sg)

## We need your participation too!

Our sessions today are interactive!

We need your input for these sessions to be most meaningful!

Please up/downvote questions or write your own by accessing the Poll Everywhere link to the right.



<https://pollev.com/chatongpt>

# Program

Time	Description
14:00 to 15:00	<p><b>Hands-on Working with and Understanding AI Tools</b>          Session Chair: Assoc Prof Heng Cheng Suang</p> <ul style="list-style-type: none"> <li>- Dr Xie Qizhe, Sea-NExT Joint Lab, NUS Computing</li> <li>- Rishabh Anand, Undergraduate Student, NUS Computing</li> <li>- Assoc Prof Heng Cheng Suang, NUS Computing</li> <li>- Jonathan Sim, Lecturer, Dept of Philosophy, NUS</li> </ul>
15:00 to 16:00	<p><b>Talks: AI Tools Here and Now – Implications and Policies</b></p> <ul style="list-style-type: none"> <li>• <b>Enhancing Productivity and Creativity with AI: ChatGPT, Tome, and Midjourney</b>  <i>Charina Ong, NUS Centre for Development of Teaching &amp; Learning</i></li> <li>• <b>From Learning Companion to Learning Threat – Examining ChatGPT's Trustworthiness in the Classroom</b>  <i>Dr Lek Hsiang Hui, NUS Computing</i></li> <li>• <b>The Potential Impact of GPT-like Tools on Computing Education and Career Opportunities</b>  <i>Assoc Prof Damith Chatura Rajapakse, NUS Computing</i></li> <li>• <b>ChatGPT – That GPTeacher and Cerebral Classmate</b>  <i>Assoc Prof Chen Zhi Xiong &amp; Assistant Dean (Education), NUS Medicine</i></li> </ul>
16:00 to 17:00	<p><b>Panel Discussion: Future Forward with AI</b>          Moderator: Assoc Prof Kan Min-Yen</p> <p><b>Panelists</b></p> <ul style="list-style-type: none"> <li>- Assoc Prof Loy Hui Chieh, Dept of Philosophy, NUS</li> <li>- Prof Hahn Jungpil, NUS Computing</li> <li>- Assoc Prof Martin Henz, NUS Computing</li> <li>- Dr Kiruthika Ragupathi, Associate Director, NUS Centre for Development of Teaching and Learning (CDTL)</li> </ul>
17:00 to 18:00	<b>Light refreshments</b>

# Welcome Address

**Professor Tan Kian Lee**

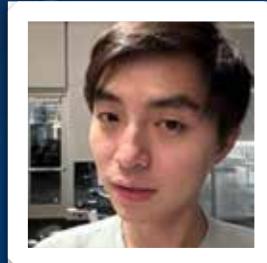
Dean, NUS Computing



# Interactive Demonstrations:



## Working with and Understanding AI Tools



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<https://pollev.com/chatongpt>

## An Introduction – Opposing Views and News Locally and Internationally!

Speaker: Heng Cheng Suang

Setting the stage for the entire seminar,  
highlights of major events/news that  
have taken the world by surprise!  
Before introducing the next few  
speakers and sessions, what are some  
“food for thought” we should bear in  
mind?



**30 NOVEMBER 2022**



**14 MARCH 2023**



OpenAI announces  
ChatGPT successor GPT-4



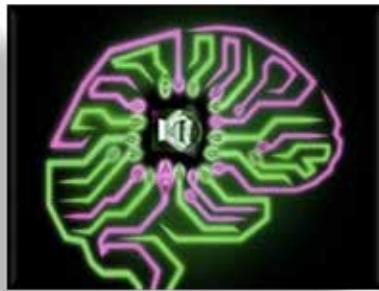
**5 jaw-dropping things  
GPT-4 can do that  
ChatGPT couldn't**



14 APRIL 2023

Science

## Alarmed tech leaders call for AI research pause



The Verge

**OpenAI's CEO confirms the company isn't training GPT-5 and 'won't for some time'**



2 SEPTEMBER 2022

The New York Times

*An A.I.-Generated Picture Won  
an Art Prize.  
Artists Aren't Happy.*



"Théâtre D'opéra Spatial" ~ Jason Allen

NOT ONLY TEXT, BUT IMAGES TOO ...

14 APRIL 2022

PetaPixel

## Artist Refuses Prize After His AI Image Wins at Top Photo Contest



“The Electrician” ~ Boris Eldagsen

NOT ONLY TEXT, BUT IMAGES TOO ...

**21 & 22 MARCH 2022**



**Fake AI photos are coming  
to a social network near you**



**NOT ONLY TEXT, BUT IMAGES TOO ...**

**27 MARCH 2023**

The  
Guardian

I thought I was immune  
to being fooled online.  
Then I saw the pope in a coat



**NOT ONLY TEXT, BUT IMAGES TOO ...**



# Let's have fun ;) Make a guess!



## Question



### Answers (by human)?

... **text** ...

... **text** ...

... **text** ...

... **text** ...



## Prompt



### Answers (by AI)?

... **text** ...

... **text** ...

... **text** ...

... **text** ...





# Human or Machine?



**VERSION A**



?

the fun!

**VERSION B**



?

the fun!  
started!

<https://pollev.com/chatongpt>



## VERSION A

Ladies and gentlemen,

"Any sufficiently advanced technology is indistinguishable from magic." As Arthur C. Clarke famously said, advanced technology can often seem like magic, and that's certainly true when it comes to ChatGPT.

Welcome to our public seminar! Fear not, we're not here to perform any wizardry or conjure up any spells. Instead, we're here to explore the fascinating world of ChatGPT, a technology that is transforming the way we interact with language and information.

Today, we'll learn about how ChatGPT works, and how it's being used in various fields. So, let's dive into this magical world of ChatGPT, with open minds and a sense of wonder. Thanks for being here, and let's have some fun!



## Machine?



## VERSION B

Ladies and gentlemen,

"The limits of my language means the limits of my world." As philosopher Ludwig Wittgenstein once noted, language shapes our reality and worldview, and ChatGPT is expanding those limits in new and exciting ways.

Welcome to our public seminar, a cutting-edge technology that is changing the way we interact with language and information. I am excited to see so many of you here today as we delve into the workings of ChatGPT, explore its capabilities and limitations, and discuss its potential applications in various fields.

So, let's push the boundaries of our understanding of language and technology, and discover together what ChatGPT has to offer. Thank you for being here, and let's get started!

food for thought  
**#1**

# What AI (ChatGPT, GPT-4, etc.) Can do? vs Cannot do? Promises (+)? vs Perils (-)?

BUSINESS  
INSIDER

22 MARCH 2023

OpenAI just announced GPT-4,  
an updated chatbot that can pass  
everything from a bar exam to AP Biology.  
Here's a list of difficult exams  
both AI versions have passed.

- Wharton MBA exam
- The Uniform Bar Exam
- Law School Exams
- Stanford Medical School clinical reasoning final
- US medical licensing exam
- USA Biology Olympiad Semifinal Exam
- Microbiology quiz
- The SAT
- GRE
- AP Exams
- AMC Exams
- Essays
- Sommelier examinations

BUSINESS  
INSIDER

20 FEBRUARY 2023

ChatGPT failed miserably in Singapore's 6th-grade tests, averaging 16% for math and 21% for science. Days later, it was getting answers right.

THE STRAITSTIMES

14 MARCH 2023

*Why ChatGPT failed PSLE miserably but passed prestigious law exams*



food for  
thought  
**#2**

# Should govt, universities, workplace Ban?                                  vs                                  Embrace? Ignore?                                  vs                                  Integrate?



4 APRIL 2023

**Italy became the first  
Western country  
to ban ChatGPT.  
Here's what other countries  
are doing**



South China Morning Post

25 JANUARY 2023

**ChatGPT will force  
university education to evolve  
but it won't make it obsolete**



29 JANUARY 2023

**Don't fear ChatGPT:  
education will always  
trump technology**

food for  
thought  
**#3**

# Other important issues ... (not limited to these)

**Ethical?**

**vs**

**Legal?**

**Regress?**

**vs**

**Progress?**

THE STRAITSTIMES

21 MARCH 2023

ChatGPT advances are moving so fast regulators can't keep up

P

4 MARCH 2023

ChatGPT: The Good, The Bad, The Ethical And Legal Implications



Forbes

28 MARCH 2023

GPT-4 Released:  
What It Means  
For The Future Of Your Business

Forbes

7 APRIL 2023

Doomsday Predictions Around ChatGPT Are Counter-Productive





food for  
thought  
**#1**

**What AI (ChatGPT, GPT-4, etc.)**  
**Can do?                  vs      Cannot do?**  
**Promises (+)? vs      Perils (-)?**

food for  
thought  
**#2**

**Should govt, universities, workplace**  
**Ban?                  vs      Embrace?**  
**Ignore?                  vs      Integrate?**

food for  
thought  
**#3**

**Other important issues ...** (not limited to these)  
**Ethical?                  vs      Legal?**  
**Regress?                  vs      Progress?**

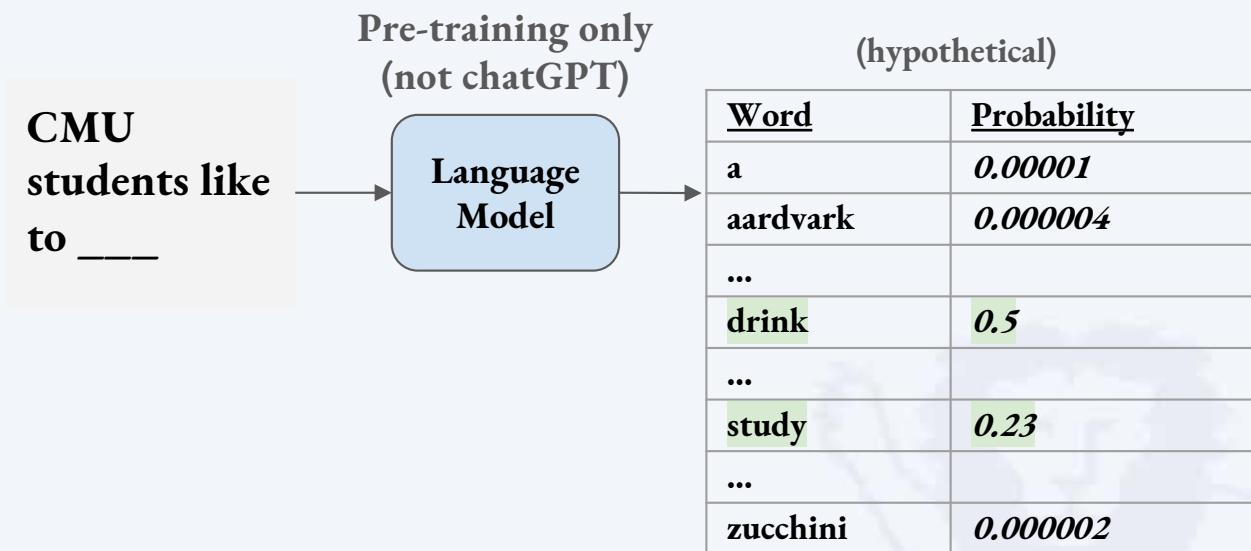
## LLM, ChatGPT and Beyond

Speaker: [Qizhe Xie](#)

The speaker will elucidate the reasons behind the success of Large Language Models (LLMs) and provide an overview of the mechanisms that enable them to function effectively. The talk will cover topics such as the role of massive datasets and compute, while also discussing real-world applications and future prospects.



# What are Language Models?



# What do language models learn from next-word prediction?

<b>Grammar</b>	In my free time, I like to {run, banana}
<b>Lexical semantics</b>	I went to the zoo to see giraffes, lions, and {zebras, spoon}
<b>World knowledge</b>	The capital of Denmark is {Copenhagen, London}
<b>Sentiment analysis</b>	Movie review: I was engaged and on the edge of my seat the whole time. The movie was {good, bad}
<b>Harder sentiment analysis</b>	Movie review: Overall, the value I got from the two hours watching it was the sum total of the popcorn and the drink. The movie was {bad, good}
<b>Translation</b>	The word for “pretty” in Spanish is {bonita, hola}
<b>Spatial reasoning</b>	[...] Iroh went into the kitchen to make some tea. Standing next to Iroh, Zuko pondered his destiny. Zuko left the {kitchen, store}
<b>Math question</b>	First grade arithmetic exam: $3 + 8 + 4 = \{15, 11\}$

[thousands (millions?) more]

Extreme multi-task learning!

# What can't language models learn from next-word prediction?

<i>Current world knowledge</i>	The stock price of APPL on May 1st, 2023 is {???
<i>Arbitrarily long arithmetic</i>	$36382894730 + 238302849204 = \{???\}$
<i>Many-step reasoning</i>	Take the nineteenth digit of Pi and multiply it by the e to the fourth power. The resulting ones-digit of the resulting number is {???
<i>Predict the future</i>	The winner of the FIFA world cup in 2026 is {???
<i>Information not in the training data</i>	Qizhe' s favorite color is {???
<i>Extremely long inputs</i>	[2,000 page Harry Potter fan-fiction] What happened after Harry opened the chest for the second time? {???

# Emergence in science

## General defn. in science

Emergence is a **qualitative change** that arises from **quantitative changes**.

Popularized by this 1972 piece by Nobel-Prize winning physicist P.W. Anderson.



With a bit of uranium, nothing special happens. With a large amount of uranium, you get a nuclear reaction.



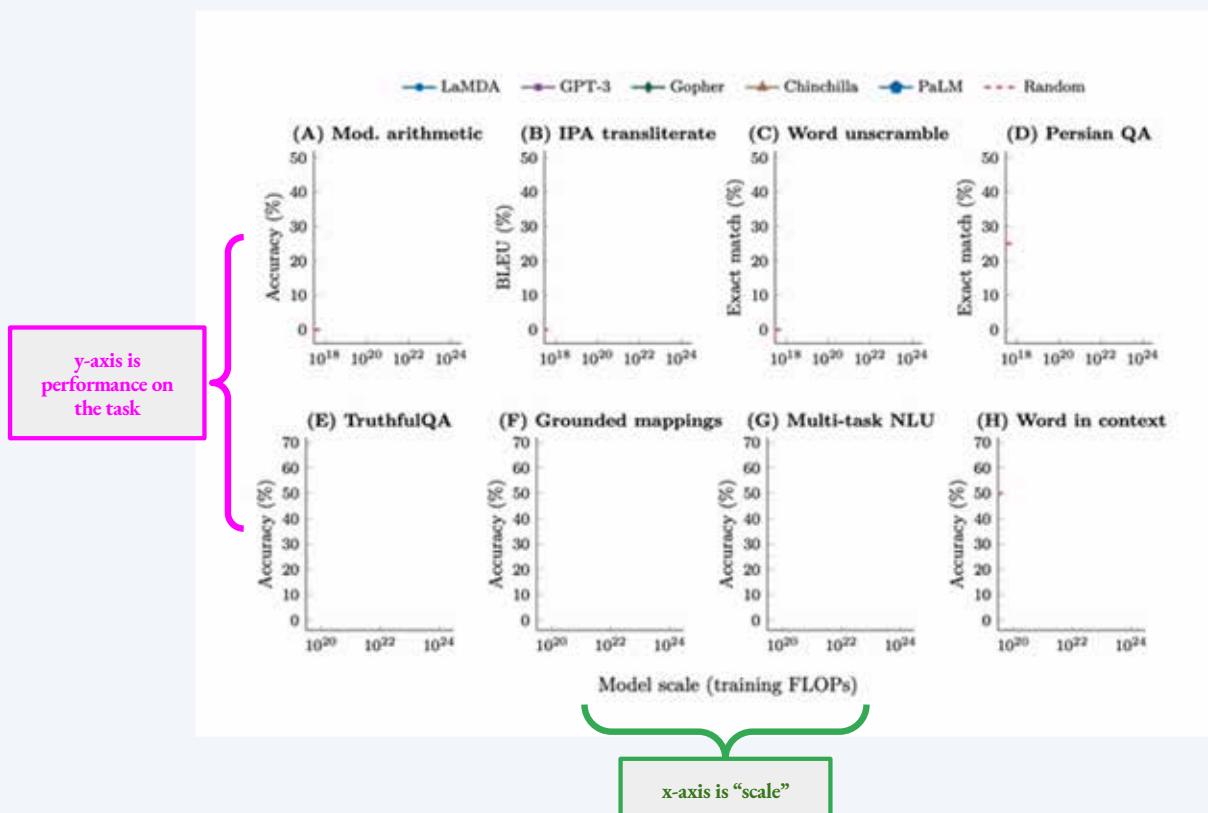
Given only small molecules such as calcium, you can't meaningfully encode useful information.

Given larger models such as DNA, you can encode a genome.



Suggested further reading:  
[Future ML Systems Will Be Qualitatively Different \(2023\)](#)

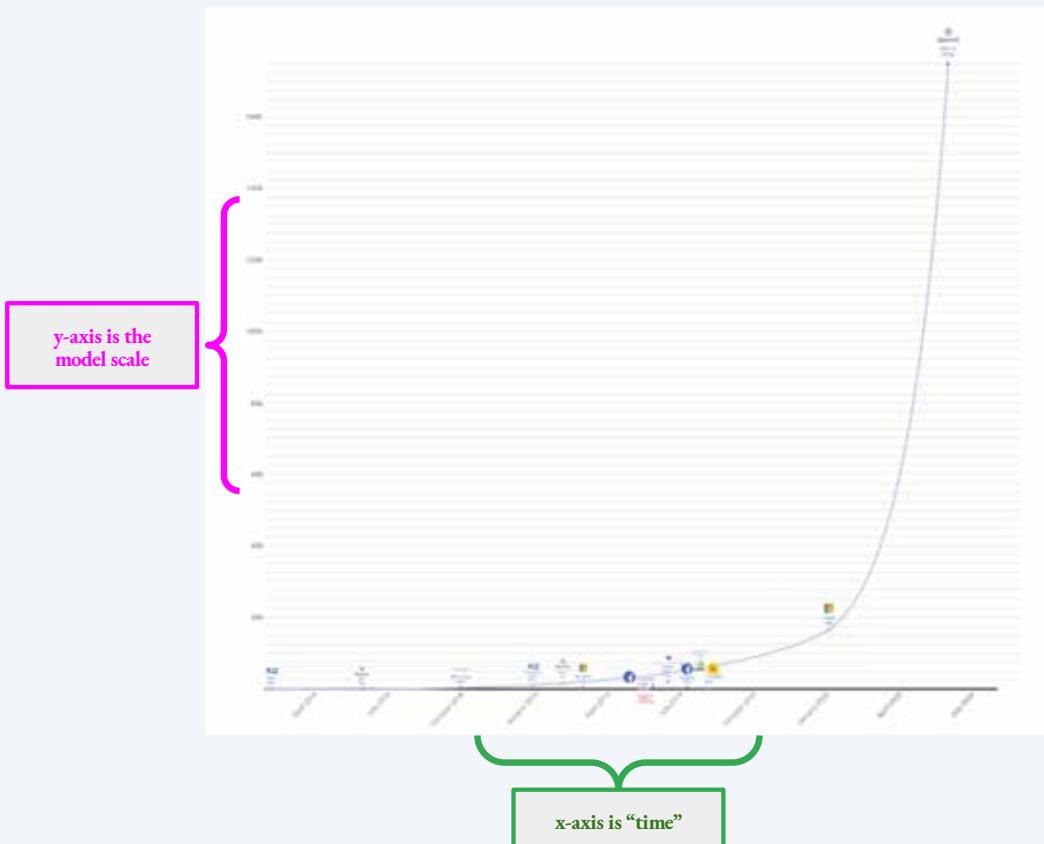
# Emergence in large language model (LLM)



Performance is flat for small models.  
Performance spikes to well above-random for large models.

Open research question: is it possible to predict emergence using only smaller model sizes?

# Scaling LLMs



- **GPT:** The first LLM that uses the Transformer architecture
- **GPT-2:** LLM are general purpose models
- **GPT-3:** Scaling up GPT-2
- **ChatGPT / InstructGPT:** Aligning GPT to follow instructions
- **GPT-4:** ??

# ChatGPT



GPT: supernaturally precocious child who learned from all human data

Details covered by Rishabh



ChatGPT: the child who follow human instructions



2018

Today (2023)

Future ...?

...
Protein discovery
Clinical diagnosis
Play chess well
High-level planning
Abstract reasoning
Simple math
Commonsense reasoning
Know world knowledge
Translation
Sentiment analysis
Generate coherent text
Be grammatically correct

...
Protein discovery
Clinical diagnosis
Play chess well
High-level planning
Abstract reasoning
Simple math
Commonsense reasoning
Know world knowledge
Translation
Sentiment analysis
Generate coherent text
Be grammatically correct

...
(?) Protein discovery
(?) Clinical diagnosis
(?) Play chess well
(?) High-level planning
(?) Abstract reasoning
Simple math
Commonsense reasoning
Know world knowledge
Translation
Sentiment analysis
Generate coherent text
Be grammatically correct

# Why did OpenAI succeed (my opinion)

## (1) Clear vision: AGI



Aimed for Artificial General Intelligence (AGI) at inception (2015).

## (2) Engineering + Research Culture



Member of the Technical Staff  
OpenAI  
Sep 2022 - Present · 8 mos

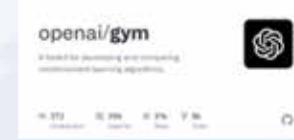
All of these come with great cost!

A top-down management approach, focus on engineering and research

## (3) Product-centric mindset



DALL-E 2



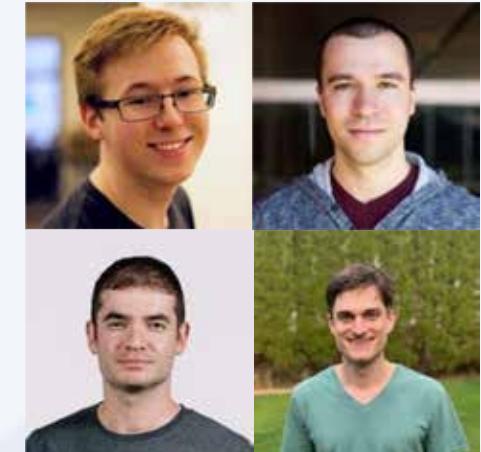
OpenAI Gym

Several orgs possessed both the technology know-how and insights. OpenAI built the right product.

# AI is a collective endeavor



Researchers who laid the foundations of Deep Learning in the 80s



Google invested heavily in AI and tech in general. Google was the pioneer on scaling up model size and compute.

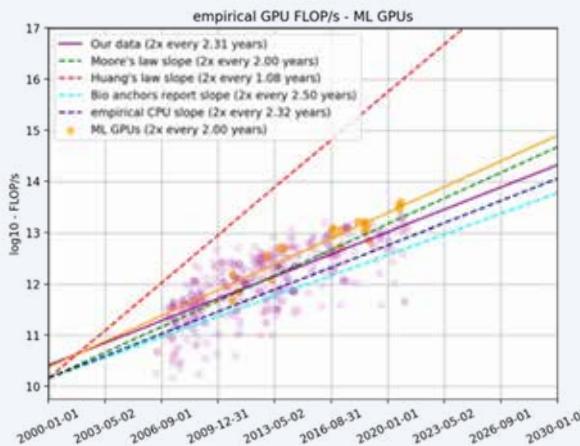
(e.g., A paper by Google used 10,000 GPUs in 2016)



Nvidia GPUs serve as the driving force behind the AI engine.

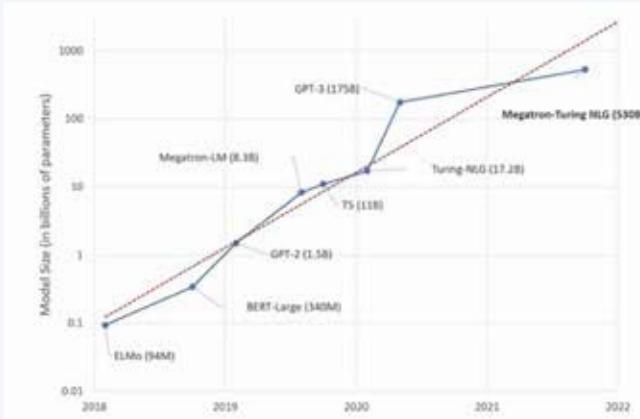
# Exponential growth of AI Intelligence

## (1) Hardware



Exponential growth of computing power

## (2) Model Size

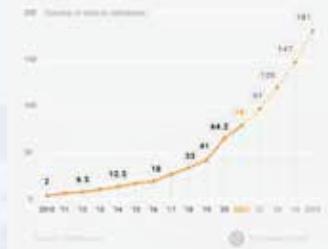


Exponential growth of model size

## (3) Data

**Volume of data created, captured, copied, and consumed worldwide**

The volume of data generated, consumed, copied, and stored is projected to exceed 180 zettabytes by 2025



Exponential growth of data

Scaling up AI = scaling up compute + model + data

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<http://pollev.com/chatongpt>

# Human in the Loop

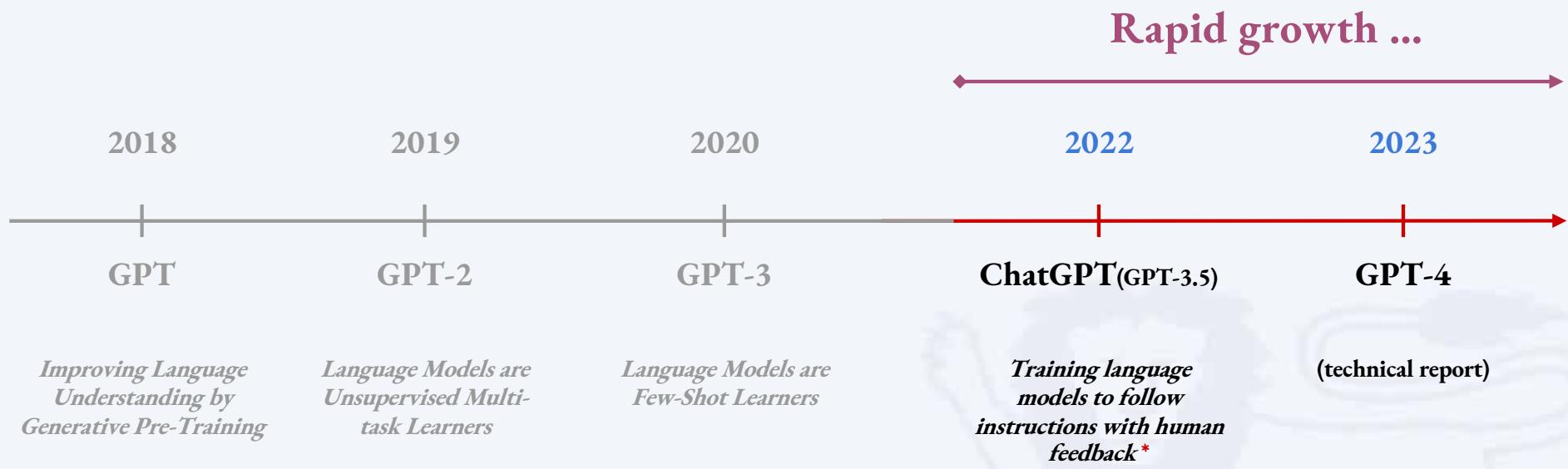
Rishabh Anand

@rishabh16\_



# The GPT Series

GPT → Generative Pretrained Transformer



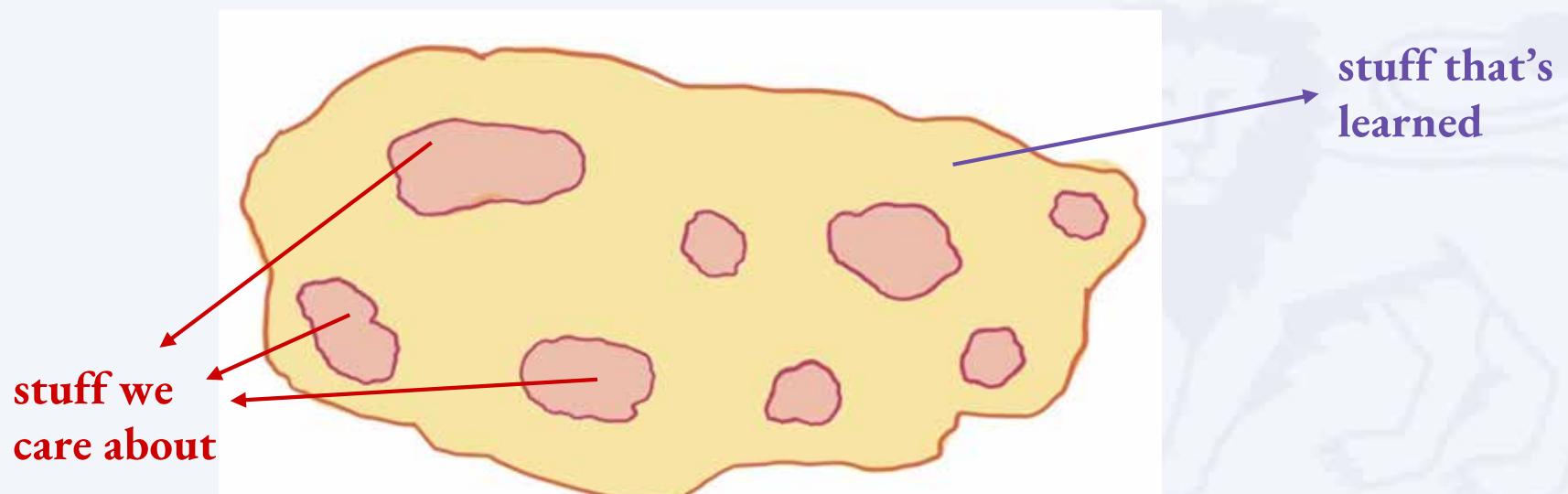
\* GPT-3.5 is built on top of *InstructGPT* with a different data collection setup

# Reinforcement Learning from Human Feedback



# (Large) Language Models

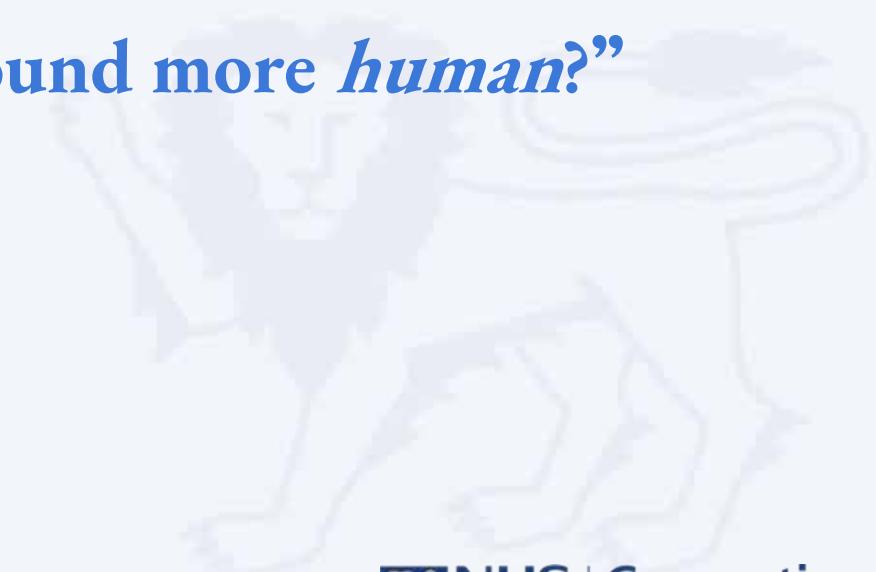
- Language Models (like GPT-X),
  - are chaotic
  - model a “giant mass of people” ~ Minqi Jiang, MetaAI
- For different prompts, you can get wildly different outputs
- We must “snip out” the ugly, less-preferred parts



# RL from Human Feedback

- Provides a friendlier interface to interact with LMs
- Biases the underlying model to generate human-aligned content
- Improves reliability, honesty, and safety of LLMs

“How do we get LLMs to sound more *human*? ”

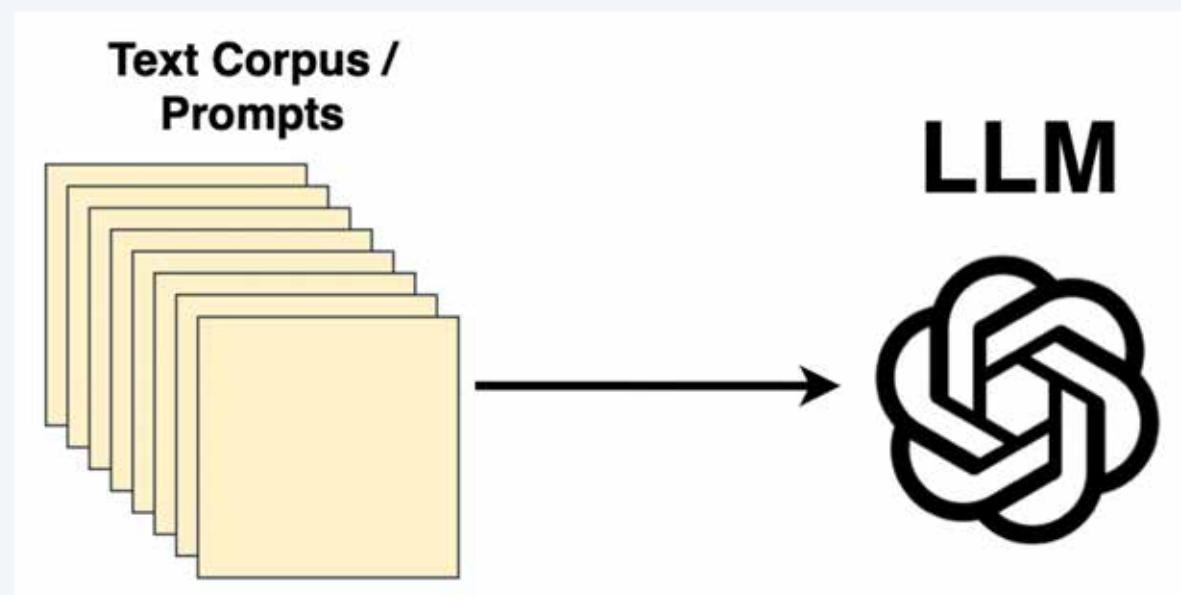


# RL from Human Feedback



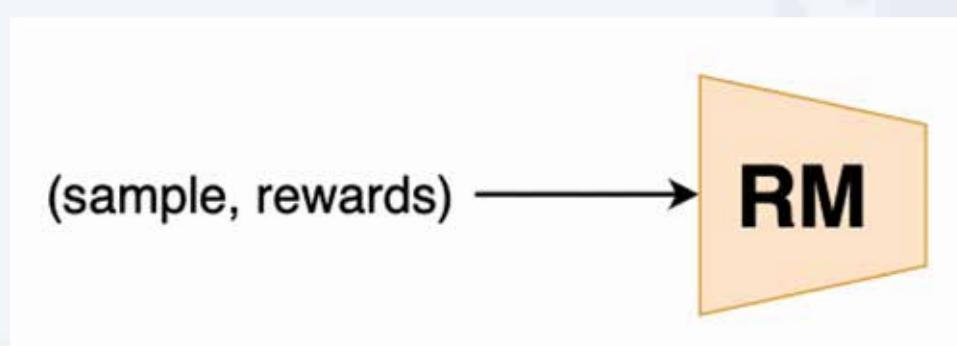
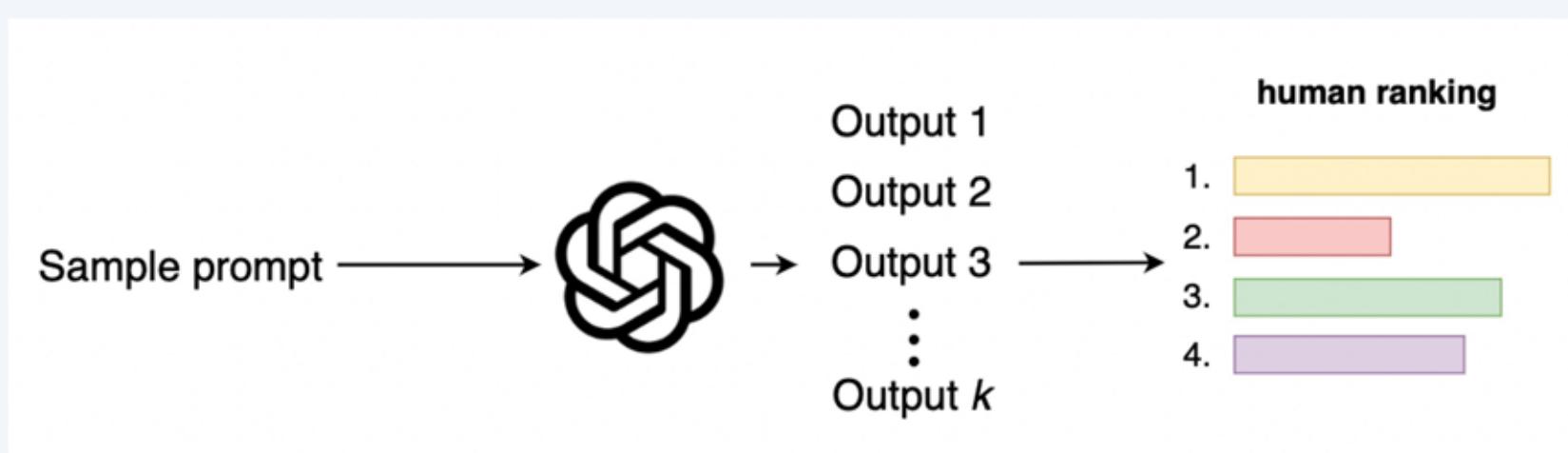
# RL from Human Feedback

1. Pretrain a LLM on a body of text [GPT-X, for instance]



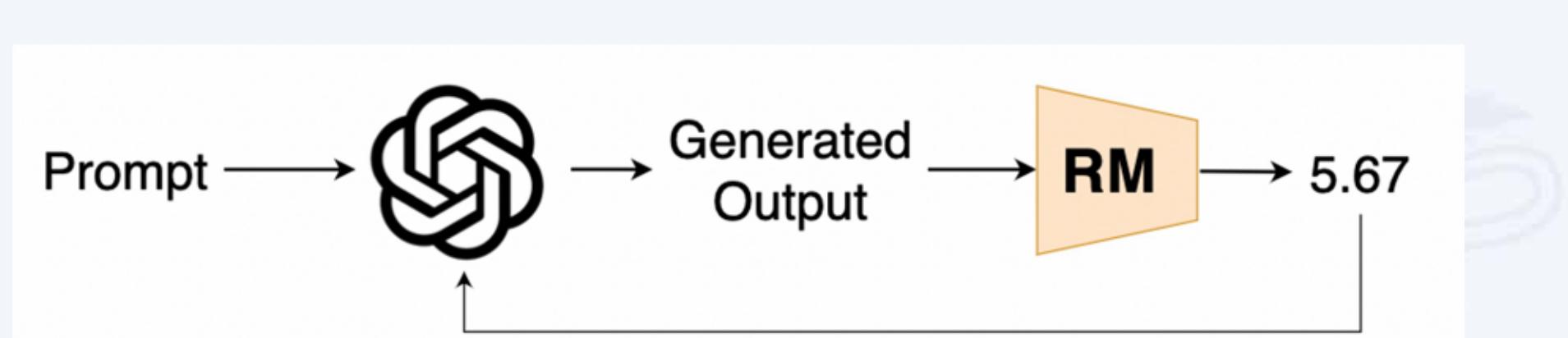
# RL from Human Feedback

1. Pretrain a LLM on a body of text [GPT-X, for instance]
2. Train a Reward Model (RM) → “how would a human feel?”

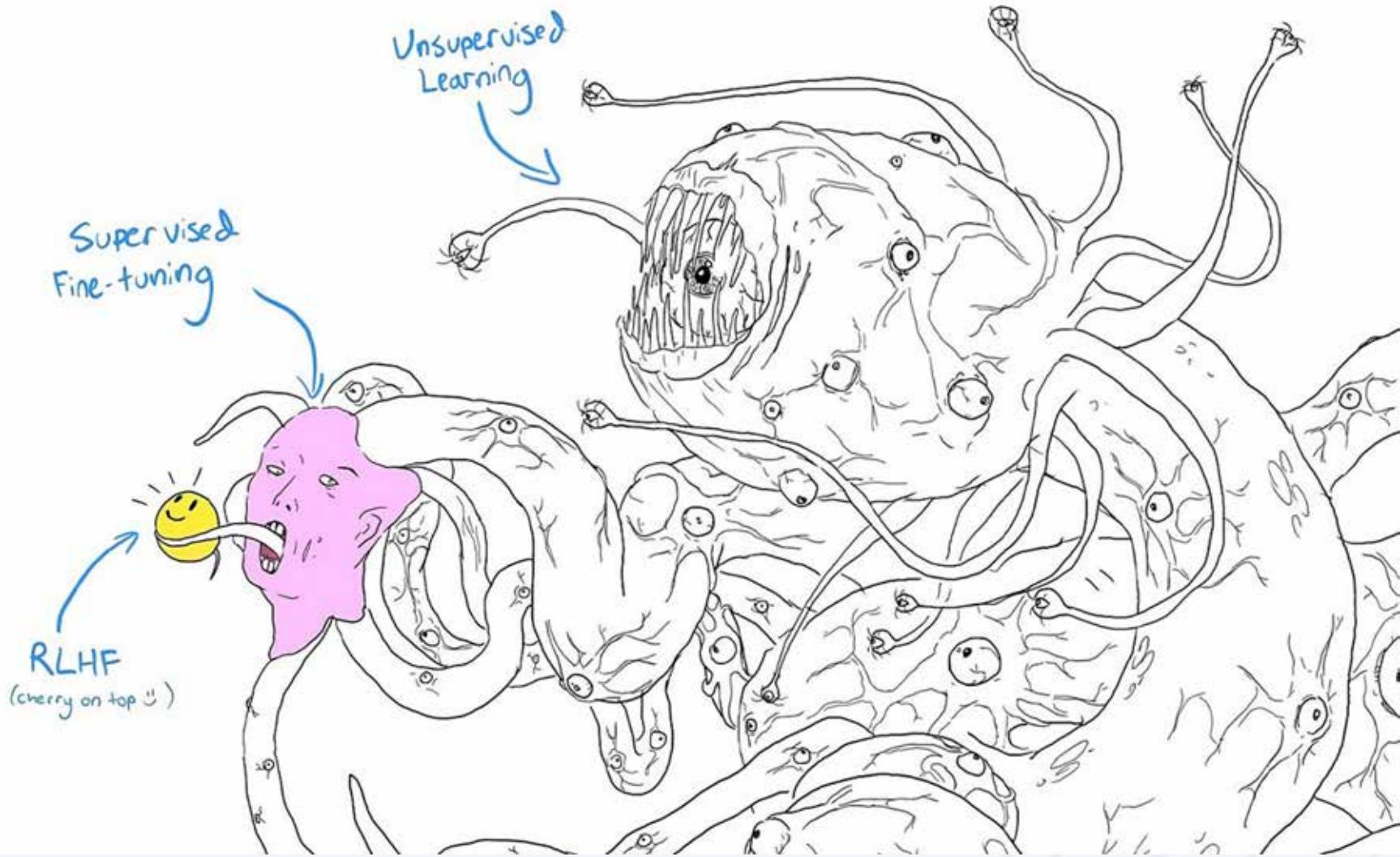


# RL from Human Feedback

1. Pretrain a LLM on a body of text [GPT-X, for instance]
2. Train a Reward Model (RM) → “how would a human feel?”
3. Finetune using RL [LLM agent predicts words and is scored]



# LLMs + RLHF



[source]

# ChatGPT for Students



## Ask Away!

- Treat ChatGPT as you would a friend
- Want something? Just ask for it!
- The art of “Prompt Engineering” with ChatGPT

Use ChatGPT as a personal tutor!

# The Possibilities

- Digestible explanations
- Summarising Long-form content
- Peer Review + feedback



# Generate Digestible Explanations

Model  
GPT-4

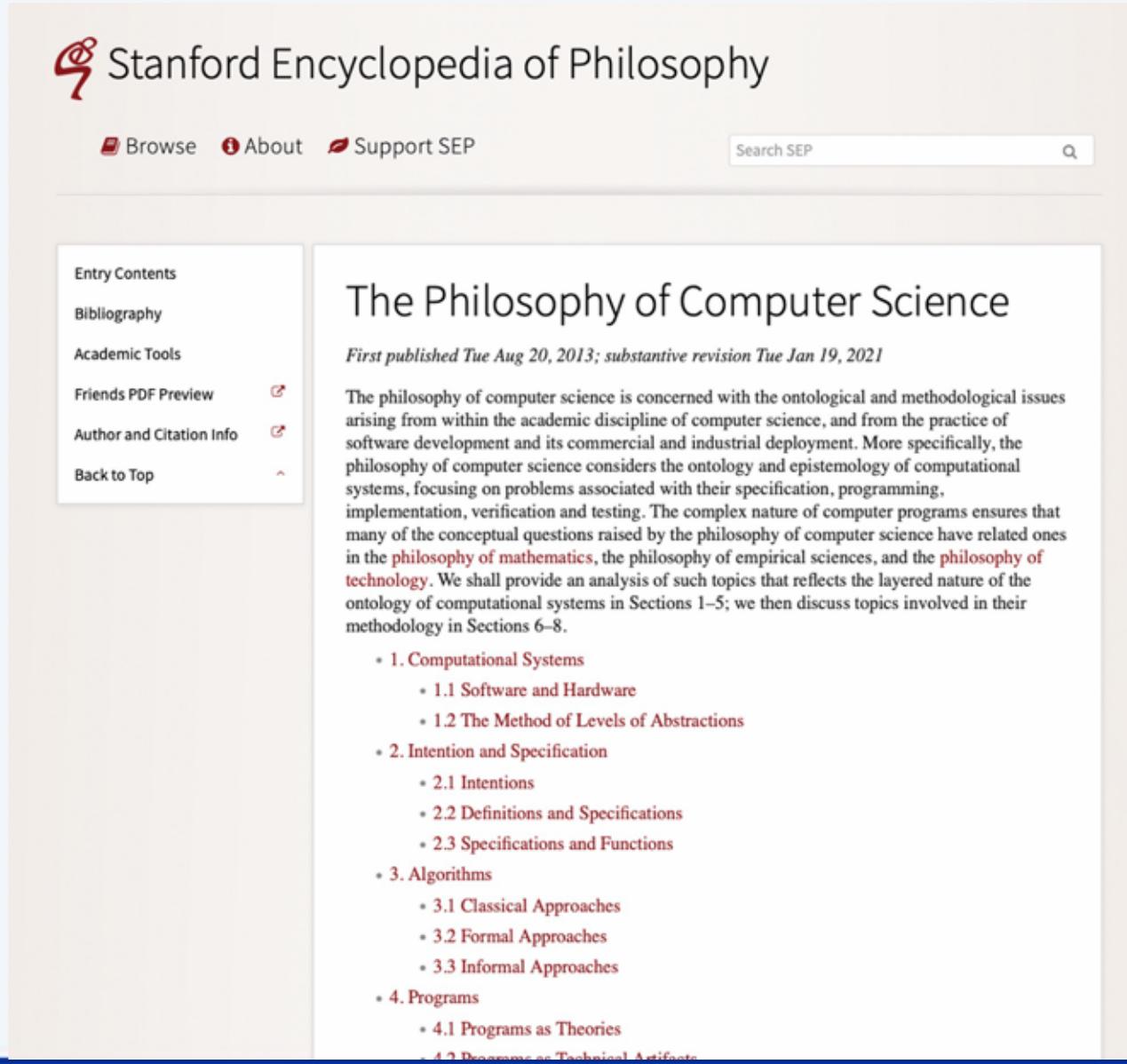
ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Explain Fermi's paradox in a way that a ten year old can understand

ChatGPT Mar 23 Version. ChatGPT may produce inaccurate information about people, places, or facts.

# Summarising Content



The screenshot shows the Stanford Encyclopedia of Philosophy website. The main page header includes the logo and name. Below it are navigation links for 'Browse', 'About', and 'Support SEP', along with a search bar. On the left, a sidebar contains links for 'Entry Contents', 'Bibliography', 'Academic Tools', 'Friends PDF Preview', 'Author and Citation Info', and 'Back to Top'. The main content area features a large title 'The Philosophy of Computer Science' with a subtitle indicating it was first published on Aug 20, 2013, and last revised on Jan 19, 2021. The text discusses the philosophy of computer science, mentioning its focus on computational systems, ontology, and epistemology. It also highlights its relationship with other fields like mathematics and technology. A detailed table of contents follows, listing sections from 1. Computational Systems to 4. Programs.

**Stanford Encyclopedia of Philosophy**

Browse About Support SEP Search SEP

Entry Contents  
Bibliography  
Academic Tools  
Friends PDF Preview  
Author and Citation Info  
Back to Top

## The Philosophy of Computer Science

*First published Tue Aug 20, 2013; substantive revision Tue Jan 19, 2021*

The philosophy of computer science is concerned with the ontological and methodological issues arising from within the academic discipline of computer science, and from the practice of software development and its commercial and industrial deployment. More specifically, the philosophy of computer science considers the ontology and epistemology of computational systems, focusing on problems associated with their specification, programming, implementation, verification and testing. The complex nature of computer programs ensures that many of the conceptual questions raised by the philosophy of computer science have related ones in the [philosophy of mathematics](#), the philosophy of empirical sciences, and the [philosophy of technology](#). We shall provide an analysis of such topics that reflects the layered nature of the ontology of computational systems in Sections 1–5; we then discuss topics involved in their methodology in Sections 6–8.

- 1. Computational Systems
  - 1.1 Software and Hardware
  - 1.2 The Method of Levels of Abstractions
- 2. Intention and Specification
  - 2.1 Intentions
  - 2.2 Definitions and Specifications
  - 2.3 Specifications and Functions
- 3. Algorithms
  - 3.1 Classical Approaches
  - 3.2 Formal Approaches
  - 3.3 Informal Approaches
- 4. Programs
  - 4.1 Programs as Theories
  - 4.2 Programs as Technical Artifacts

Given some long-form content that contains a lot to go through ...

# Summarising Content

Model  
GPT-4

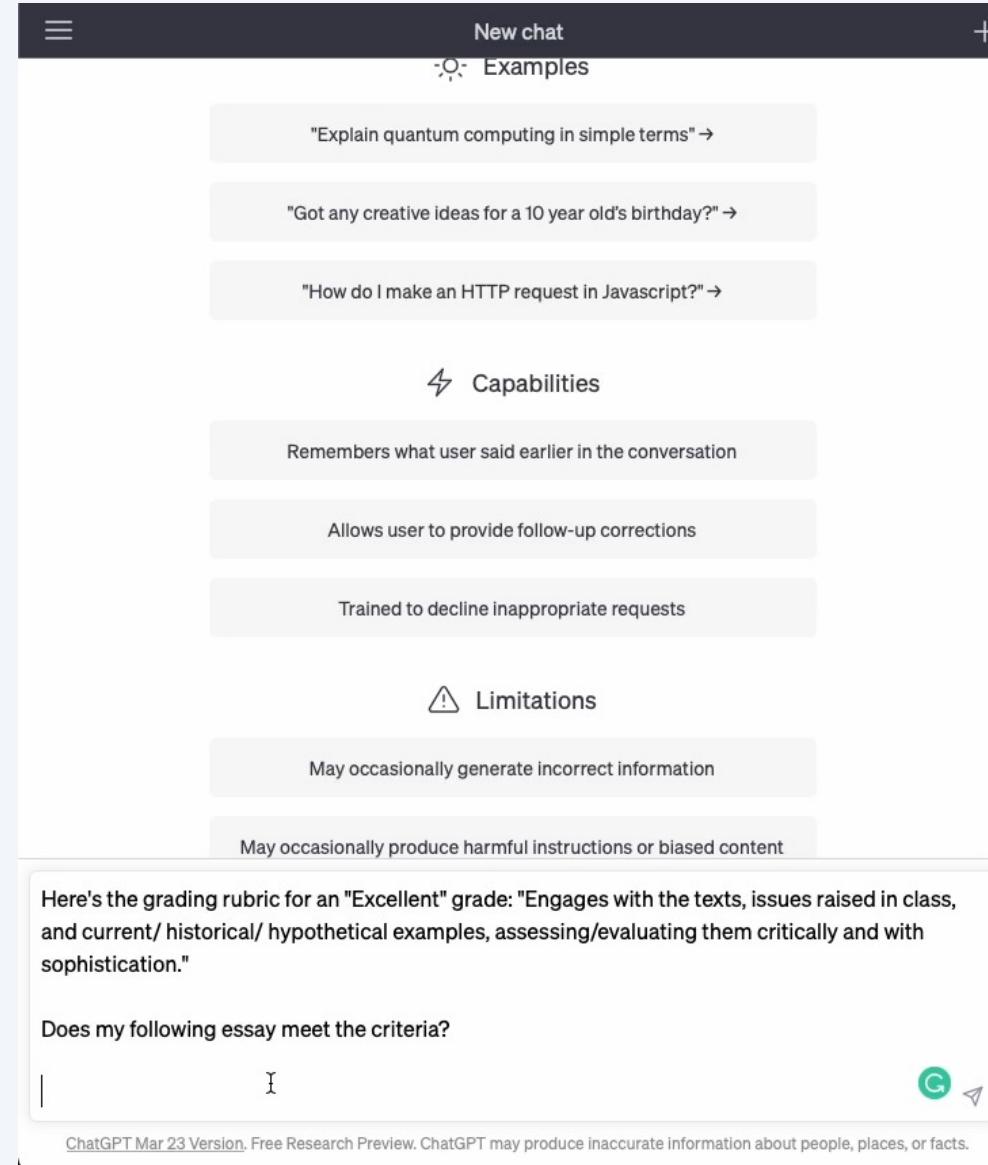
ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Send a message...

ChatGPT Mar 23 Version. ChatGPT may produce inaccurate information about people, places, or facts.

# Peer Review + Feedback



The image shows a screenshot of the ChatGPT interface. At the top, there's a dark header bar with a menu icon (three horizontal lines), the text "New chat", and a plus sign icon. Below the header, there's a section titled "-O- Examples" which contains three user inputs: "Explain quantum computing in simple terms" →, "Got any creative ideas for a 10 year old's birthday?" →, and "How do I make an HTTP request in Javascript?" →. Underneath this, there's a section titled "⚡ Capabilities" with three items: "Remembers what user said earlier in the conversation", "Allows user to provide follow-up corrections", and "Trained to decline inappropriate requests". Below that is a section titled "⚠ Limitations" with two items: "May occasionally generate incorrect information" and "May occasionally produce harmful instructions or biased content". At the bottom of the interface, there's a text input field containing the question "Does my following essay meet the criteria?", followed by a small text area for the user's essay, a green "G" button, and a blue "Send" arrow button. A note at the bottom states "ChatGPT Mar 23 Version. Free Research Preview. ChatGPT may produce inaccurate information about people, places, or facts."

# Peer Review + Feedback



Please edit the following machine learning paper to make it clearer: "In this section, we propose a model for shifting seasonal matrix factorization. A tensor we consider consists of a timestamped series of  $(m \times n)$  matrices  $X(1), \dots, X(r)$ , which can be sparse, until the current time point  $r$ . We incrementally observe a new matrix  $X(r+1)$  and  $r$  evolves ( $r = r + 1$ ).

Our goal is to forecast  $X(t)$  where  $r < t$  by uncovering important factors in the flow of data, whose characteristics can change over time. As we discussed the effectiveness of handling seasonal patterns, we incorporate seasonal factors into a switching model that can adaptively recognize recent patterns in forecasting."



"In this section, we propose a new model for analyzing data that changes over time and is affected by seasonal patterns. Our model considers a series of matrices,  $X(1), X(2), \dots, X(r)$ , that are labeled with a time stamp and may have missing information. As new matrices,  $X(r+1)$ , come in, we update our analysis. Our goal is to predict future matrices,  $X(t)$ , where  $t$  is a time after  $r$ , by finding key patterns in the data that change over time and taking into account patterns that repeat in certain seasons. We use a flexible model that adapts to recent patterns to improve our predictions."

# Peer Review + Feedback

## ChatGPT



### Examples

"Explain quantum computing in simple terms" →



### Capabilities

Remembers what user said earlier in the conversation



### Limitations

May occasionally generate incorrect information

"Got any creative ideas for a 10 year old's birthday?" →

Allows user to provide follow-up corrections

May occasionally produce harmful instructions or biased content

"How do I make an HTTP request in Javascript?" →

Trained to decline inappropriate requests

Limited knowledge of world and events after 2021

Here is my resume. Create a cover letter based on my background for a Student Researcher role that highlights my skills. I'm applying for an internship at Google AI for summer 2023.



# ChatGPT for Students

- LLM technology will only get better from here on
- Students **should** *can* learn how to operate these tools
- While LLMs can improve productivity, it's not the be-all-end-all

AI tools lower the activation energy to get started!!!



# But ... shortcomings?

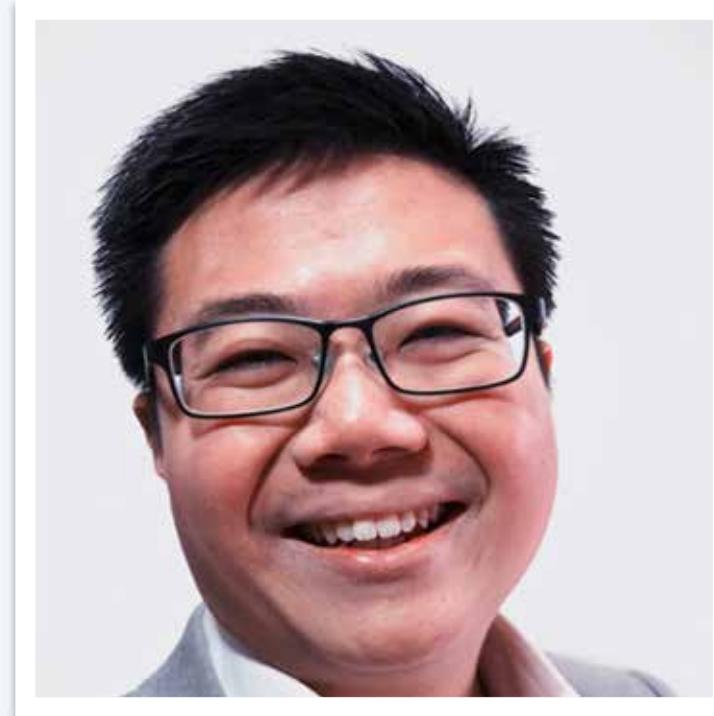
Stay for our panels!



## **Hands-on Demonstration of ChatGPT: Uses for Working Professionals**

**Speaker: Jonathan Y. H. Sim**

**What can teachers, researchers, and working professionals do with ChatGPT? In this hands-on demonstration, we will show you a variety of ways that you can use AI tools like ChatGPT in teaching and learning, and for other professional purposes!**



A photograph of a grand, traditional library. The space is filled with floor-to-ceiling bookshelves on both sides, packed with books. In the center, there is a large, dark wooden desk or reading area with several chairs around it. Above the desk is a large, arched stained-glass window. The ceiling is high and features a decorative chandelier and recessed lighting. The overall atmosphere is one of quiet study and historical elegance.

For Educators  
and Researchers

# Generate lesson plans!



Model

GPT-4



ChatGPT 

GPT-4 currently has a cap of 25 messages every 3 hours.

Produce a 12-week introductory lesson plan on adolescent psychology for university students.



ChatGPT Mar 23 Version. ChatGPT may produce inaccurate information about people, places, or facts.

Model

GPT-4



ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Produce a 12-week introductory lesson plan on adolescent psychology for university students that is specific to the context of Singapore. Also provide sample ideas for assignment questions



# Highlight key points in papers

 Stanford Encyclopedia of Philosophy[Browse](#) [About](#) [Support SEP](#)Search SEP [Entry Contents](#)[Bibliography](#)[Academic Tools](#)[Friends PDF Preview](#) [Author and Citation Info](#) [Back to Top](#) 

# The Philosophy of Computer Science

*First published Tue Aug 20, 2013; substantive revision Tue Jan 19, 2021*

The philosophy of computer science is concerned with the ontological and methodological issues arising from within the academic discipline of computer science, and from the practice of software development and its commercial and industrial deployment. More specifically, the philosophy of computer science considers the ontology and epistemology of computational systems, focusing on problems associated with their specification, programming, implementation, verification and testing. The complex nature of computer programs ensures that many of the conceptual questions raised by the philosophy of computer science have related ones in the [philosophy of mathematics](#), the philosophy of empirical sciences, and the [philosophy of technology](#). We shall provide an analysis of such topics that reflects the layered nature of the ontology of computational systems in Sections 1–5; we then discuss topics involved in their methodology in Sections 6–8.

- 1. Computational Systems
  - 1.1 Software and Hardware
  - 1.2 The Method of Levels of Abstractions
- 2. Intention and Specification
  - 2.1 Intentions
  - 2.2 Definitions and Specifications
  - 2.3 Specifications and Functions
- 3. Algorithms
  - 3.1 Classical Approaches
  - 3.2 Formal Approaches
  - 3.3 Informal Approaches
- 4. Programs
  - 4.1 Programs as Theories
  - 4.2 Programs as Technical Artifacts

Model

GPT-4



ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Send a message...



# Generate MCQs based on a passage

- Suber (1988) claims that hardware is a kind of software, as physical objects display patterns that can be read and executed.
- Colburn (1999, 2000) suggests that software has a dual nature, being both abstract and concrete, and refers to it as a "concrete abstraction."
- Irmak (2012) criticizes Colburn's dual nature of software, defining it as an abstract artifact with temporal properties but no spatial properties.
- Duncan (2011, 2017) proposes a finer ontology by focusing on Turner's (2011) notion of specification and defining software as a set of instructions encoded in some programming language, while hardware is an artifact that carries out the specified computation.

2. The Method of Levels of Abstractions (LoA):

- The distinction between software and hardware is not sharp, and a different ontological approach focuses on the role of abstraction.
- Abstraction is a crucial element in computer science, and it takes many different forms such as procedural abstraction, typing, and object-oriented design patterns.
- Computational systems depend on the existence of an implementation, and computational abstractions preserve both an abstract guise and an implementation.
- Primiero (2016) devises a full formulation of LoAs for the ontology of digital computational systems, including Intention, Specification, Algorithm, High-level programming language instructions, Assembly/machine code operations, and Execution.

In summary, the passage examines the ontology of computational systems, exploring the software-hardware distinction and the levels of abstraction. While the software-hardware distinction has some pragmatic value, it is not sufficient for an ontological analysis. The method of levels of abstraction offers a more comprehensive understanding of computational systems, emphasizing the interdependence of various abstraction layers.

 Regenerate response

Send a message...



# Generate essay questions based on a passage

- B. Software cannot have spatial properties
- C. The concept of "concrete abstraction" is self-contradictory
- D. Software should be considered solely as a physical object
- E. Software should be considered solely as an abstract object

Answer: C. The concept of "concrete abstraction" is self-contradictory

Elaboration: Irmak (2012) criticizes Colburn's (1999, 2000) concept of software as a "concrete abstraction" because it implies that software has contradictory properties. According to Irmak, an abstract entity lacks spatio-temporal properties, while a concrete entity has these properties. He argues that defining software as a concrete abstraction would imply that software possesses both abstract and concrete properties, which is contradictory.

Question 3: According to Primiero (2016), which of the following is NOT one of the Levels of Abstraction (LoA) for the ontology of digital computational systems?

- A. Intention
- B. Specification
- C. Algorithm
- D. High-level programming language instructions
- E. Database management

Answer: E. Database management

Elaboration: Primiero (2016) provides a full formulation of LoAs for the ontology of digital computational systems, which includes Intention, Specification, Algorithm, High-level programming language instructions, Assembly/machine code operations, and Execution. Database management is not included in this hierarchy, as it is a specific aspect of software development and not a level of abstraction in the ontology of computational systems.

 Regenerate response

Send a message...



**It can be difficult for us to  
come up with negative  
examples as an exercise  
for learning**

## Commentary

## Commentary: I am a teacher and I let my students use ChatGPT

NUS lecturer Jonathan Sim not only allows his students to use AI tools such as ChatGPT in his classroom, he actively encourages it.



File photo: Students have celebrated the arrival of AI tools like ChatGPT with excitement as they discover how useful

Jonathan Sim

21 Feb 2023 06:08AM  
(Updated: 23 Feb 2023 11:04PM)



## Commentary

### Commentary: I am a teacher and I let my students use ChatGPT

SINGAPORE: OpenAI's [ChatGPT](#), Google's [Bard](#), and very soon, Baidu's [Ernie](#). These artificial intelligence (AI) platforms are the first of many more to come. They have been sensational, and they are rapidly changing the way people learn and work.

In academia and education, reception to such AI platforms has stretched across a spectrum: Students celebrated its arrival with excitement as they discovered how useful it is to [aid them in their learning](#), whereas the initial reaction from educators was concern over issues such as the originality of work and even [cheating in exams](#).

ADVERTISEMENT

This contrast led me to question: As educators, we often ask if our students are ready for the future, but how often do we ask ourselves if we educators are ready for the future?

While plagiarism and cheating are valid and important concerns, perhaps we educators are distracting ourselves from bigger issues: [Do AI tools like ChatGPT really pose a risk](#) to how much and how well students can learn and perform? And more importantly, do these same tools pose as much of a risk to us educators, on how well we can learn and adapt to effectively embrace the winds of change?

It is unrealistic for us to think that we can effectively nurture our students and prepare them to be [ready for the future of work](#) if we ourselves are unable to lead by example and adapt well to such technological changes. Especially when most, if not all of these AI platforms, will be here to stay and even evolve to become smarter and better over time.

For those of us who may be self-professed late adopters of technology – is now the time to catch up and keep up?

Model  
GPT-4



ChatGPT **PLUS**

GPT-4 currently has a cap of 25 messages every 3 hours.

Rewrite the following passage in the style of a native Chinese speaker struggling with the English language:

|



# Using ChatGPT to generate negative examples for learning

## Original

This contrast led me to question: As educators, we often ask if our students are ready for the future, but how often do we ask ourselves if we educators are ready for the future?

## ChatGPT

This make me ask question: As teachers, we ask if students ready for future, but we ask ourselves if we teachers ready for future?

# Generate feedback and guidance for students to learn

With student help, we make two kinds learning activities to improve learning with AI.

First, students find AI limits, see where need human help. Students make draft with ChatGPT, then graded on comments and suggestions to make AI work better.

Second way, treat AI like learning friend. AI can be "tutor", give feedback on student work for improve before final submit. Or AI be like "student", talk with students for new ideas or understand better. No matter role, AI give quick useful feedback for students.

These activities help weaker students. Learn with AI, they not afraid ask questions, can understand basic things better. AI help build confidence, give quick feedback anytime. Before, not possible with only human teachers.

#### STILL NEED HUMAN TEACHERS?

In the end, AI platforms keep changing education.

But lucky, one thing always same: Learning is with people.

So, teacher value give students chance share ideas and best ways with friends, including how use AI best. As teachers, we still help students learn better than AI, make them think deep and responsible about AI use.

We cannot do alone. Teachers must work together with students, partners in learning. If not accept new learning, ideas, technology with students, we lose connection with future generations.

Technology keep moving, be part of our life more and more. If we want classroom be like real life, prepare for future, we need use platforms like ChatGPT with our students.

So, are we really ready for future?

 Regenerate response

Come up with an elaborate set of guidance with examples to help a native Chinese speaker struggling with English to be able to understand and identify the grammatical errors in what you wrote above. 

## 3 Ways to Respond to AI in Education

**1. AI-resistant assessments**

**2. AI-enhanced assessments**

**3. AI-collaborative assessments**

## 3 Ways to Respond to AI in Education

### 1. AI-resistant assessments

- Increasingly harder to implement as AI gets more sophisticated

### 2. AI-enhanced assessments

### 3. AI-collaborative assessments

## 3 Ways to Respond to AI in Education

### 1. AI-resistant assessments

- Increasingly harder to implement as AI gets more sophisticated

### 2. AI-enhanced assessments

- Treat AI as a “peer” reviewer

### 3. AI-collaborative assessments

## 3 Ways to Respond to AI in Education

### 1. AI-resistant assessments

- Increasingly harder to implement as AI gets more sophisticated

### 2. AI-enhanced assessments

- Treat AI as a “peer” reviewer

### 3. AI-collaborative assessments

- Treat AI as a “tutor” or “student”

# Examples of Collaborative Learning with AI

**Vote on which demonstration  
you'd like to see:**

- (1) AI role playing as a confused student
- (2) Debating with an AI
- (3) Socratic dialogue between AI and human



<https://pollev.com/chatongpt>

# 1. AI as confused classmate

I want you to pretend that you are confused about <discipline>. You have partial knowledge of <topic> and it makes very little sense to you. As I teach you, I want you to ask me clarification questions to help you gain a better understanding. Tell me if my explanation makes sense to you or not, and if it doesn't, explain why it wasn't helpful to you. You should start by asking me a question about <topic>.

OP

I want you to pretend that you are confused about philosophy. You have partial knowledge of ethics and it makes very little sense to you. As I teach you, I want you to ask me clarification questions to help you gain a better understanding. Tell me if my explanation makes sense to you or not, and if it doesn't, explain why it wasn't helpful to you. You should start by asking me a question about utilitarianism.



Sure! I would love to learn more about philosophy and ethics. Can you explain what utilitarianism is to me?

OP

Utilitarianism is a moral theory that argues that the right moral action is one that maximises utility, or fosters happiness or pleasure.



I see, so utilitarianism is all about maximizing happiness and pleasure. Can you give me an example of how this theory would be applied in a real-life situation?

OP

Maybe I have to decide whether or not to save this cat stuck up on a tree or use the time to play games on my phone. Utilitarianism will guide me to decide that saving the cat is the right action in this situation.



I understand, so utilitarianism would say that saving the cat is the right choice because it results in more happiness or pleasure. But what if saving the cat would cause harm or distress to someone else? How does utilitarianism take that into account?

## 2. Debating with AI

I want to engage with you in a debate on a controversial issue within the area of <topic>. You must take a stand on the issue and begin by stating a view from your stance in one sentence (begin by saying "They say...."). Thereafter, I will reply you with my own objection. And you will subsequently respond to my objection with your own objection in one sentence (again, begin by saying "They say...", do not ask questions). We will continue to have this back-and-forth conversation with each other until I say stop.

OP

I want to engage with you in a debate on a controversial issue within the area of moral relativism. You must take a stand on the issue and begin by stating a view from your stance in one sentence (begin by saying "They say...."). Thereafter, I will reply you with my own objection. And you will subsequently respond to my objection with your own objection in one sentence (again, begin by saying "They say...", do not ask questions). We will continue to have this back-and-forth conversation with each other until I say stop.



They say that moral relativism is the idea that what is considered moral or ethical varies from person to person, culture to culture, and time to time, and there is no objective right or wrong.

OP

I say that there is such a thing as objective moral truths that can be discovered through reason.



They say that while reason can help us determine what is likely to be moral in a given situation, it cannot provide us with a universal set of moral rules that apply to all people in all circumstances.

OP

I say that the rules for determining what is moral in a given situation are precisely objective moral rules.



They say that the rules for determining what is moral in a given situation are not universal or objective, but instead depend on the specific context and cultural norms, which can vary greatly across different societies and time periods.

### 3. Socratic Dialogue (Human as Questioner)

I would like to engage with you in a Socratic dialogue. I will be the teacher, and you will be the student. I will ask a question about <topic>, and you will respond pretending as if you are a beginner. I will critique your response with further questions, and you will continue to respond to my questions as a beginner. This should continue until I ask you to stop.

OP

I would like to engage with you in a Socratic dialogue. I will be the teacher, and you will be the student. I will ask a question about morality, and you will respond pretending as if you are a beginner. I will critique your response with further questions, and you will continue to respond to my questions as a beginner. This should continue until I ask you to stop.



I understand. I'm ready to engage in the Socratic dialogue. Please ask your first question.

OP

What makes an action good?



As a beginner, I would say that an action is considered good if it results in a positive outcome, such as happiness or pleasure, for the people involved.

OP

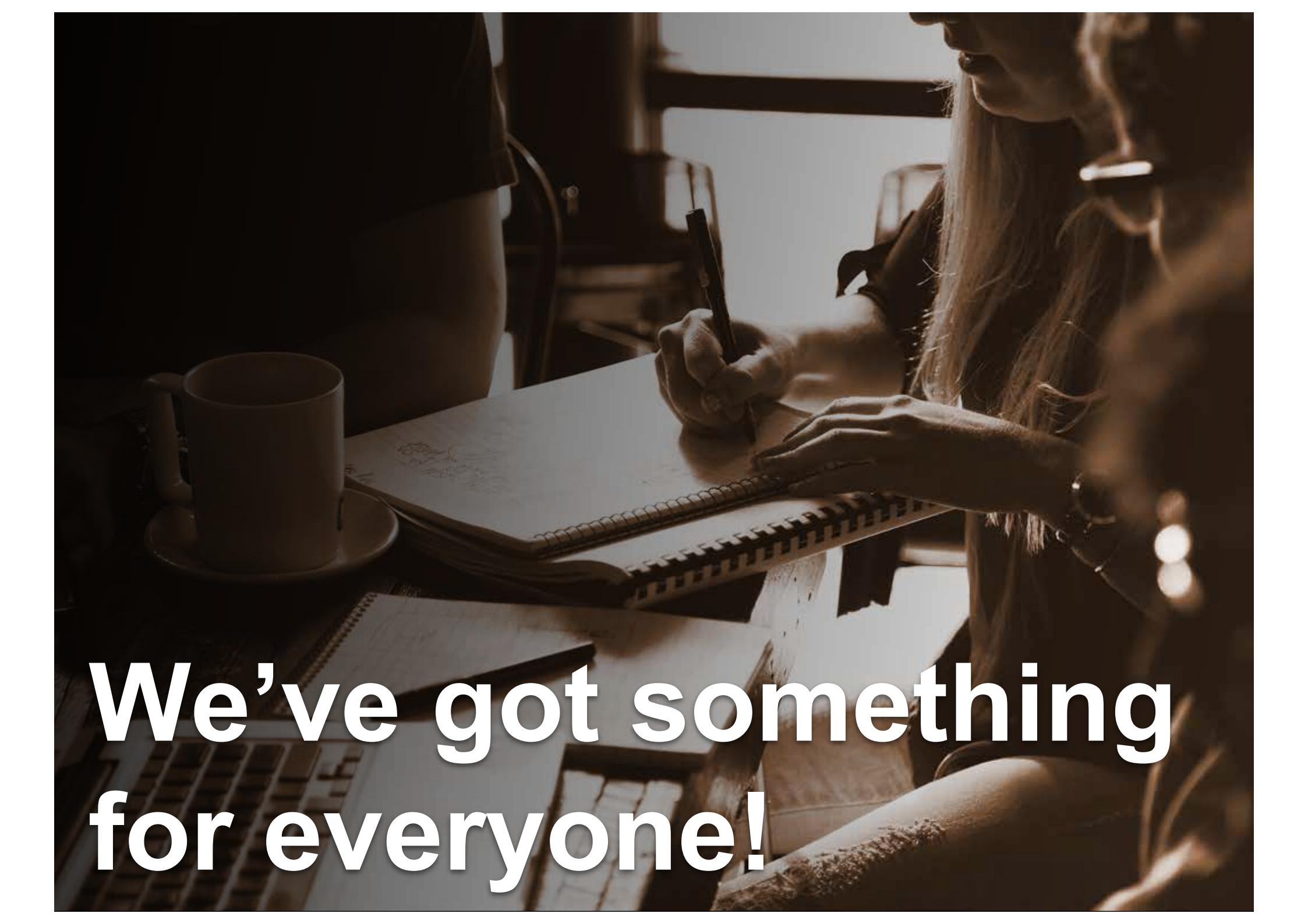
Would you say that lying is a good action if it makes everyone happy?



As a beginner, I might say that lying can sometimes be a good action if it leads to a positive outcome and makes everyone happy, but I can also understand how lying can have negative consequences and harm trust in relationships. So, it might not always be the best choice.

# The Key to Success with Teaching & Learning with AI

It's vital to collaborate with  
students to understand their  
perspectives in AI use

A woman with long blonde hair is sitting at a wooden desk, focused on her work. She is wearing a dark t-shirt and a necklace. On the desk in front of her is a spiral-bound notebook and a small cup of coffee. Behind her, several books are stacked on a shelf. The lighting is warm and focused on her hands and the notebook.

We've got something  
for everyone!

# Draft E-mail Replies



Model

GPT-4

ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Help me write an e-mail reply to a student wrote the following e-mail to me:

|

X



# Level Up!

# Teach it to write in your style!

Model

GPT-4



## ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

I want you to learn my writing style so that you can write in my style for the subsequent prompt. Show a smiley emoji to indicate that you understand. Here's the sample for you to learn:

|



# Improve Expression

***OR***

# Rewrite for a different purpose

Model

GPT-4

## ChatGPT PLUS

GPT-4 currently has a cap of 25 messages every 3 hours.

Write a compelling synopsis a talk to a general audience. The title of the talk is "The Role of the Humanities and Social Sciences in Humanising Technological Disruptions." Here are the points that should go into the talk. You may expand on them and reorganise them in a way that is more coherent:

In a rapidly evolving digital landscape, technological advancements such as artificial intelligence, automation, big data, robotics, and social media are transforming the world as we know it. These disruptions have far-reaching implications, and they are already impacting jobs, relationships, culture, and how we interact with the people around us. Many are anxiously wondering what the

# Ethical Issues of AI Use

## What would you do if...

- ChatGPT produces a good idea that you didn't consider previously?
- ChatGPT can do something better than you?



## Invited Talks:

# AI Tools, Here and Now — Implications and Policies



# Enhancing Productivity and Creativity with AI: Introducing ChatGPT, Tome, and Midjourney

Speaker: [Charina Ong](#)

Discover the benefits of AI tools such as ChatGPT, Tome, and Midjourney in enhancing productivity and creativity. Learn how ChatGPT assists with text-based queries, Tome generates high-quality slides, and Midjourney creates high-quality images and visualizations, providing practical examples for various roles. Improve efficiency and quality of work with these AI tools.



# Outline

## Introduction (2 mins)

- Recap the hands-on demo of ChatGPT
- Preview the two AI tools to discuss: Tome and Midjourney

## TOME (6 mins)

- What is Tome and its capabilities for generating high-quality slides, story, and outline
- Practical examples

## Midjourney (6 mins)

- What is Midjourney and its capabilities for generating high-quality images and visualizations
- Practical examples

## Summary (1 min)

# CHATGPT

<https://chat.openai.com/auth/login>

# ChatGPT Review: Prompt Structure

Role

Output

Audience

Additional conditions

**As a teacher, create a syllabus for History for first year university students.**

*Other Examples:*

E-learning designer	Module on WorkPlace Safety	All staff members
Marketing Manager	Marketing Plan for XYZ Product	25-30 year-old gamers
CEO	Inspiring Email	Employees who have served the company for at least 10 years

# TOME

<https://beta.tome.app>

# Create Stunning Multimedia Content with TOME

- App for creating and sharing multimedia content
- Has customizable templates and layouts, as well as a built-in image library with thousands of royalty-free images
- No design or programming experience required to use

New chat Chat on GPT + Google Slides Tome • Tome The AI-powered sticky notes Channel content - YouTube Tome • Google Search

[tome.app/innov8te-lab?tab=recent](https://tome.app/innov8te-lab?tab=recent)

Charina chia.ong@gmail.com

Recently viewed

Upgrade Create

Notifications

Recent

Personal

Shared with me

Innov8te Lab

Deleted

Invite teammates

Layouts

Getting Started Guide

The Tome Blog

Introducing layouts in Tome

Tome • Edited 7 months ago

Tome Getting Started Guide

Tome • Edited 1 week ago

The Tome Blog

Tome • Edited 1 week ago

Design Thinking: Unlocking Your Creative Potential

Introducing AirWallet: AltcoinX's new crypto wallet

Tome Example: New Feature Announcem...

Design Thinking: Unlocking Your Creative...

Angelo Anthony A... • Edited 1 month ago

Tome Example: New Feature Announcem...

Tome • Edited 8 months ago

+ 242 credits Refer & earn

f0b62131198e1b2...png

Type here to search

29°C Partly sunny 11:16 am 17/4/2023 ENG

# Basic Usage

## Topic

TOME app explainer video

## Output

Presentation | Story | Outline

## Other media

Images/no images  
Audio narration  
Video  
Other web



# Title

Add Add text tile

-  Add DALL-E tile
-  Create page about...
-  Document to presentation... BETA
-  Create presentation about...



What would you like to do?

# Advanced Usage

Role	Role	Output	Other conditions
Output	Pretend you are [NAME]  Examples: Gene Luen Yang	A comic book that explains about the future of AI in education.	Write the presentation /book/outline in [LANGUAGE].
Other conditions			



[TOME PROMPT GUIDE](#)

# Advanced Usage

Role

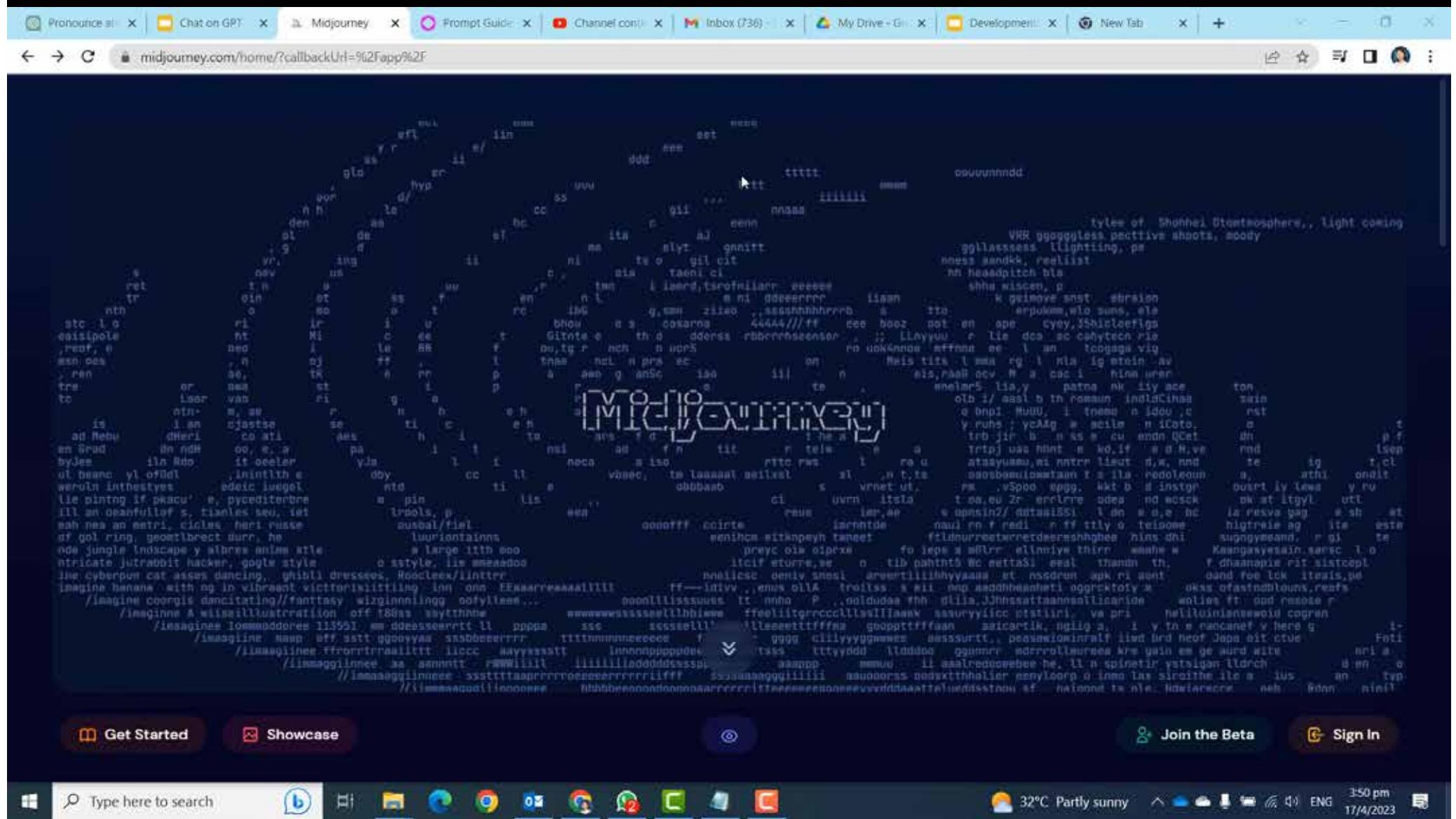
Output

Other conditions

Pretend you are Gene Luen Yang. Create a comic book to explain about the future of AI in education. Write the story in [Chinese] language.

# MIDJOURNEY

<https://www.midjourney.com>



# Copyright Considerations

TOME	MIDJOURNEY
Avoid infringing on someone else's copyright if you use external sources.	Ensure that text, images, audio, and video used are original or properly licensed for use.
Proper attribution is important when using external sources.	Properly attribute external sources using a recognized citation style.
Have the legal right to use any images in your content.	Use media from built-in media library or obtain appropriate permissions and licenses for external media.
Modifying an image can create a derivative work that has its own copyright implications.	Understand and apply fair use principles correctly.
Understand and comply with copyright law and best practices for attribution and licensing.	Provide guidelines for user-generated content to avoid copyright infringement.

## Takeaways

1. Think about how we can best make use of these tools in our own context.
2. Consider how we can safeguard the proper use of these tools.



# From Learning Companion to Learning Threat: Examining ChatGPT's Trustworthiness in the Classroom

Speaker: [Prof Lek Hsiang Hui](#)

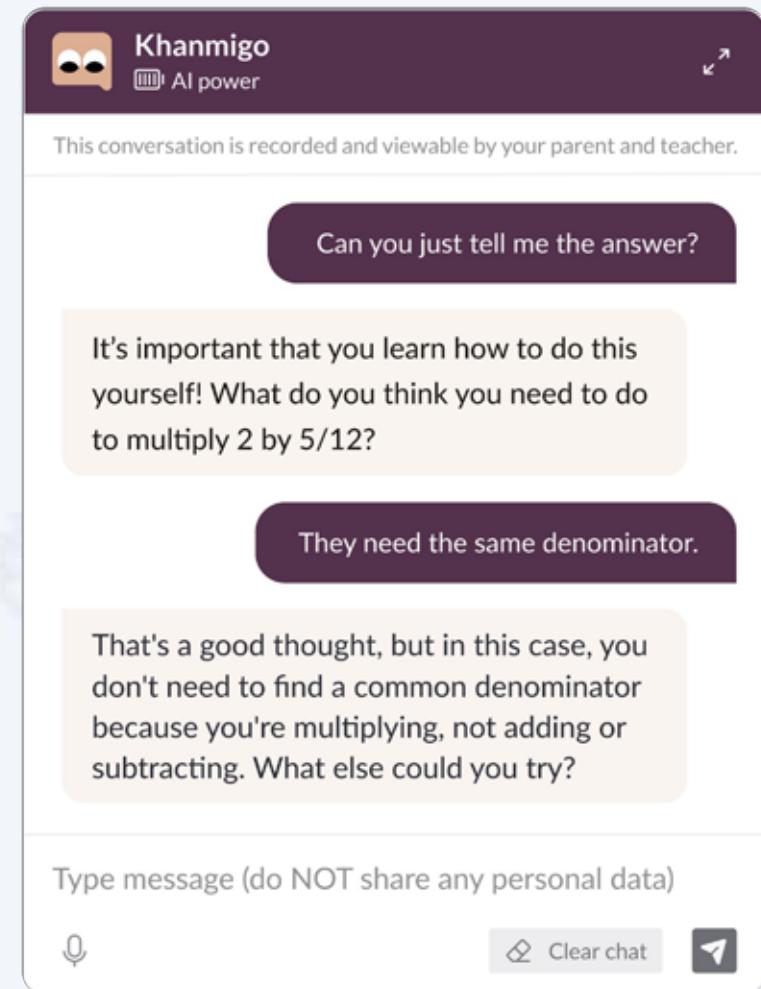
This talk will highlight some concerns with the trustworthiness of AI tools and discuss how it impacts student's learning.



# Age Of AI-Assisted Education

## Applications of AI in Education

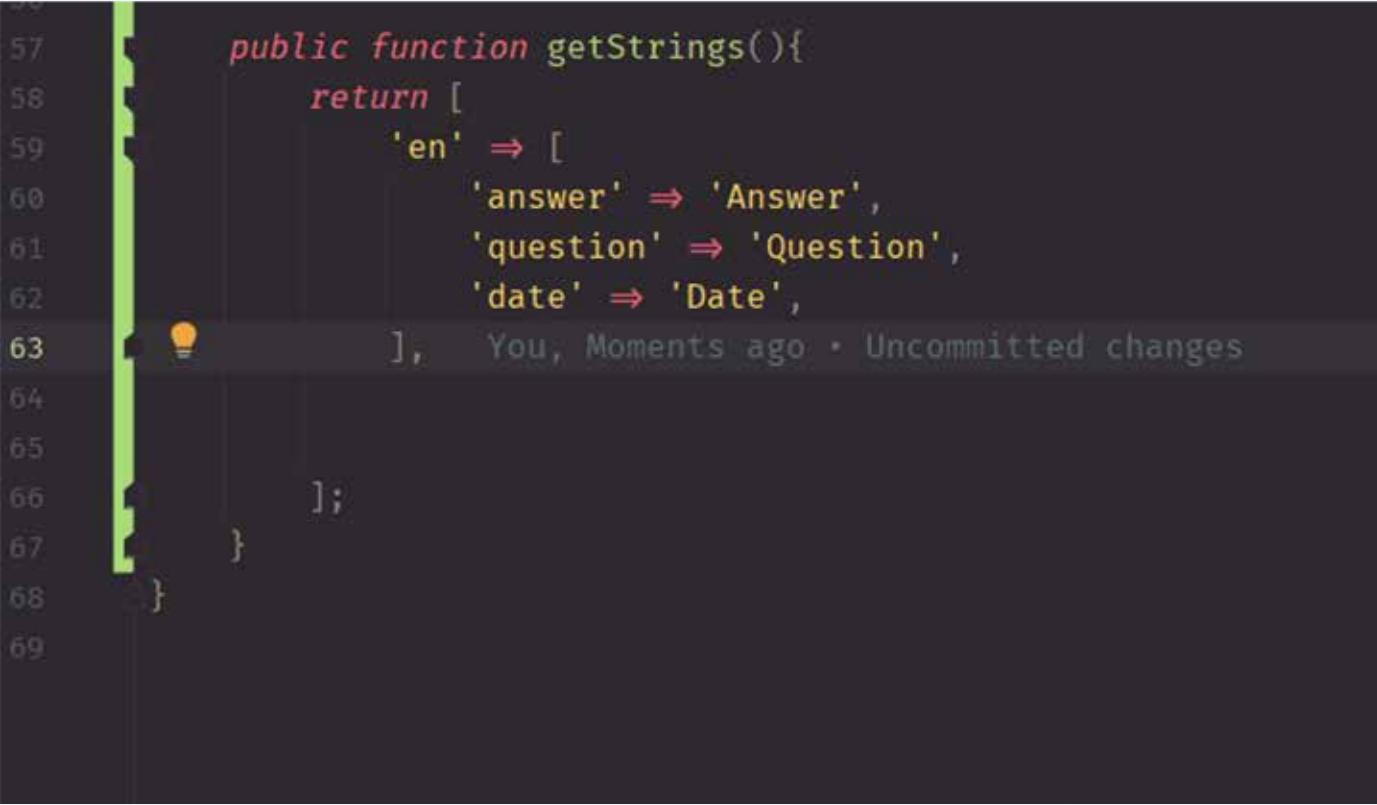
- Personalised / Adaptive Learning – AI Tutor (Khan Academy)



# Age Of AI-Assisted Education

## Applications of AI in Education

- AI Pair Programmer  
(Github Copilot)



```
57     public function getStrings(){
58         return [
59             'en' => [
60                 'answer' => 'Answer',
61                 'question' => 'Question',
62                 'date' => 'Date',
63             ],
64             You, Moments ago • Uncommitted changes
65         ];
66     }
67 }
68 }
69 }
```

# Age Of AI-Assisted Education

## Applications of AI in Education

- Idea Generation



can you give me an outline of a presentation on trustworthiness of chatgpt



Sure, here is an outline for a presentation on the trustworthiness of ChatGPT:



### I. Introduction

- Brief overview of ChatGPT
- Importance of trustworthiness in artificial intelligence

### II. Development and training of ChatGPT

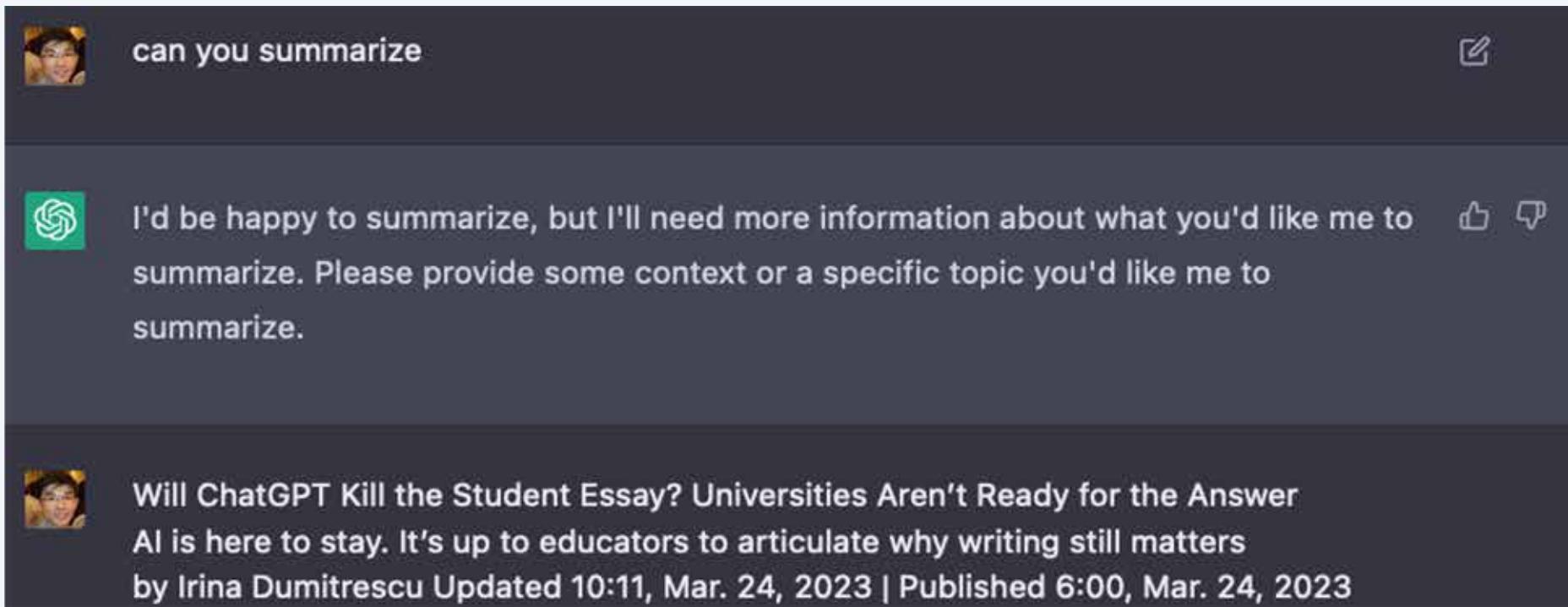
- Overview of the development process
- Description of the training data
- Discussion of the training process

### III. ChatGPT's abilities and limitations

# Age Of AI-Assisted Education

## Applications of AI in Education

- Summarisation / Digest information much faster



A screenshot of a ChatGPT conversation. The user asks, "can you summarize". ChatGPT responds, "I'd be happy to summarize, but I'll need more information about what you'd like me to summarize. Please provide some context or a specific topic you'd like me to summarize." Below this, there is a news article summary from The Conversation by Irina Dumitrescu.

can you summarize

I'd be happy to summarize, but I'll need more information about what you'd like me to summarize. Please provide some context or a specific topic you'd like me to summarize.

Will ChatGPT Kill the Student Essay? Universities Aren't Ready for the Answer  
AI is here to stay. It's up to educators to articulate why writing still matters  
by Irina Dumitrescu Updated 10:11, Mar. 24, 2023 | Published 6:00, Mar. 24, 2023

# Age Of AI-Assisted Education



can I say that AI has led to the fastest evolution in education since chatgpt?



Yes, you can say that AI has led to the fastest evolution in education since ChatGPT. However, it is important to note that there are other AI-based educational technologies that have also contributed to this evolution. ChatGPT is just one example of how AI is transforming the education landscape. It is also worth noting that the pace of innovation and evolution in education will likely continue to accelerate as AI technology continues to advance and be integrated into new and innovative educational tools and platforms.

## When There Was No AI ...

**Students need to understand how things are done**

- Understand what is right/wrong.
- Instructors need to ensure that this learning objective is fulfilled.

**Process of learning is painful, tedious, and time-consuming**

- Process is not efficient, learning often happens through failure.

# How AI Has Changed Learning?

## Made us more productive in learning

- AI (e.g. ChatGPT) as a highly informed assistant that has learned *all* the information from the web.

## Always available assistant

- Learning companion that is not restricted to the classroom.
- Do not have to wait for a human teacher.

## Students Getting Excited About AI...

*“Take a look at what ChatGPT has produced...”*

*Oh wow! We have never seen something like this before...*

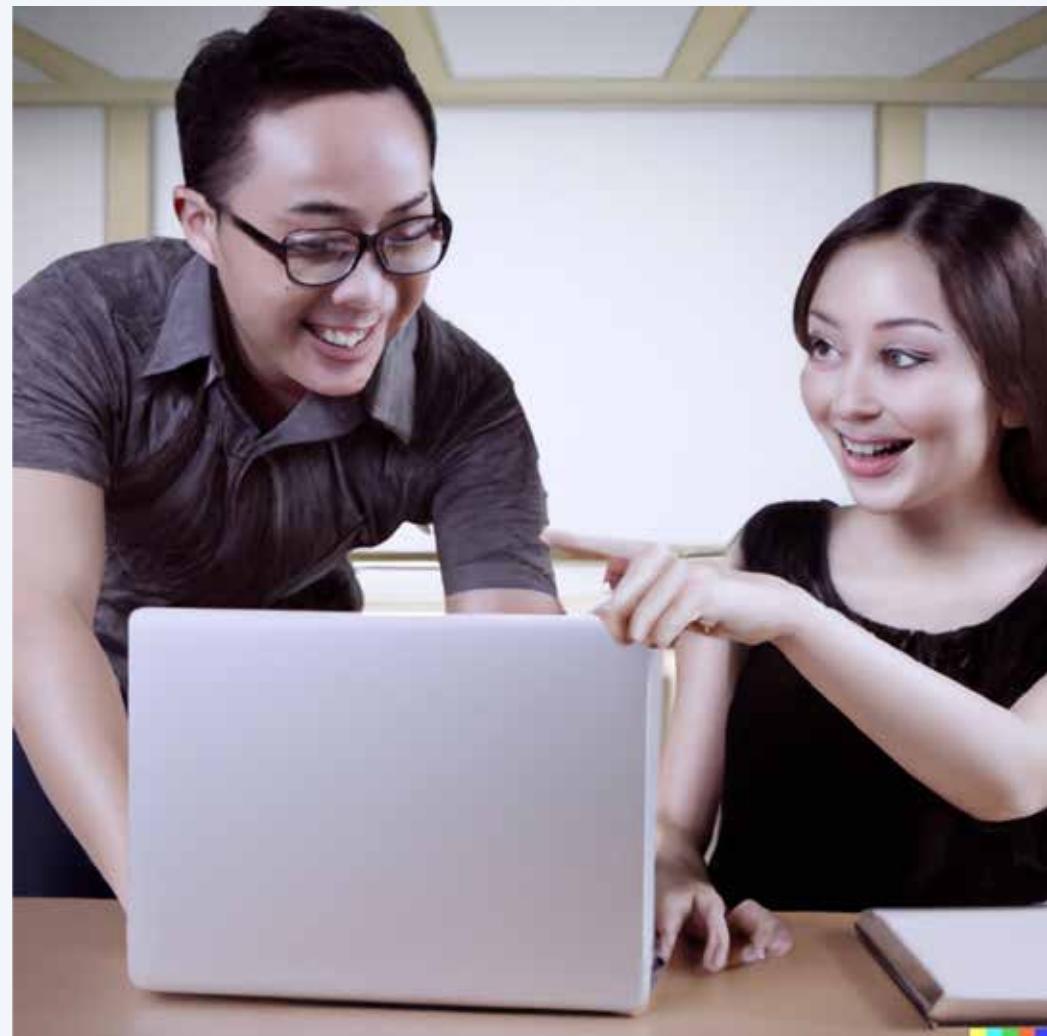
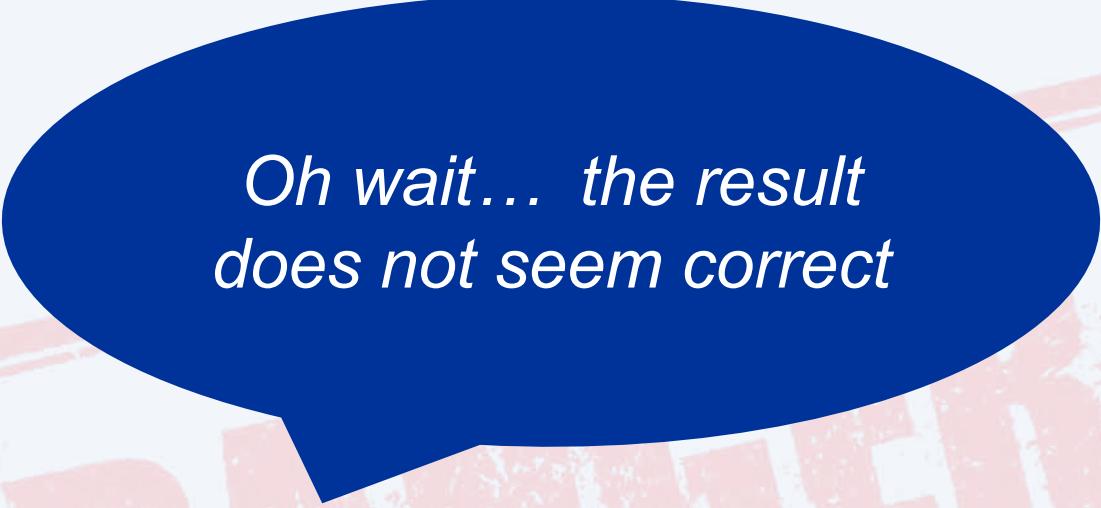


Image generated using DALL-E  
(AI image generation service)

# Gotcha?!



*Oh wait... the result  
does not seem correct*

## Danger of “learning” the wrong thing

- Students learning for the first time would not be able to differentiate between what is correct or wrong.
- Issue exacerbated because most of the results of ChatGPT are good.
- Students get the wrong impression that the output is always correct since it is doing a good job most of the time.

## Learning Threat?

**Regardless of correct/wrong output, students might not appreciate what type of training they need**

- We often learn better through failures.
- While AI seems to be a shortcut to learning but is it really helping students to learn?

**Are we training students to be expert users of AI tools or are we teaching them to be problem solvers?**

**Has the skills of workers shifted to be about “*Prompt Engineering*” instead?**

## Food For Thoughts

**What is the objective of education, classroom learning, assessments, projects, etc?**

- Sometimes it is the process that matters rather than the final output.

**If we are not trained to tackle the tasks on our own and AI were to take care of this problem-solving, does it justify our value?**

- How are we protecting ourselves to be replaced by AI?

## Food For Thoughts

**Is the focus of education about being skillful AI tools users?**

- Any YouTuber with hours of ChatGPT usage can become an expert user of ChatGPT!
- Letting AI automate things so that learners can take the backseat feels like we are going backwards in learning.
- What is there to stop someone who graduated earlier (in the era without AI) to take up these tools to turbo boost their productivity further?

## Realistically What Then Is The Role Of AI In Education?

✓ Good for ideation

✗ Not ideal to be used wholesale as the final form

✓ Learning companion

✗ Teacher replacement

🤔 Definition of right/wrong might not be the same  
when we talk about humanities/ethics-related topics

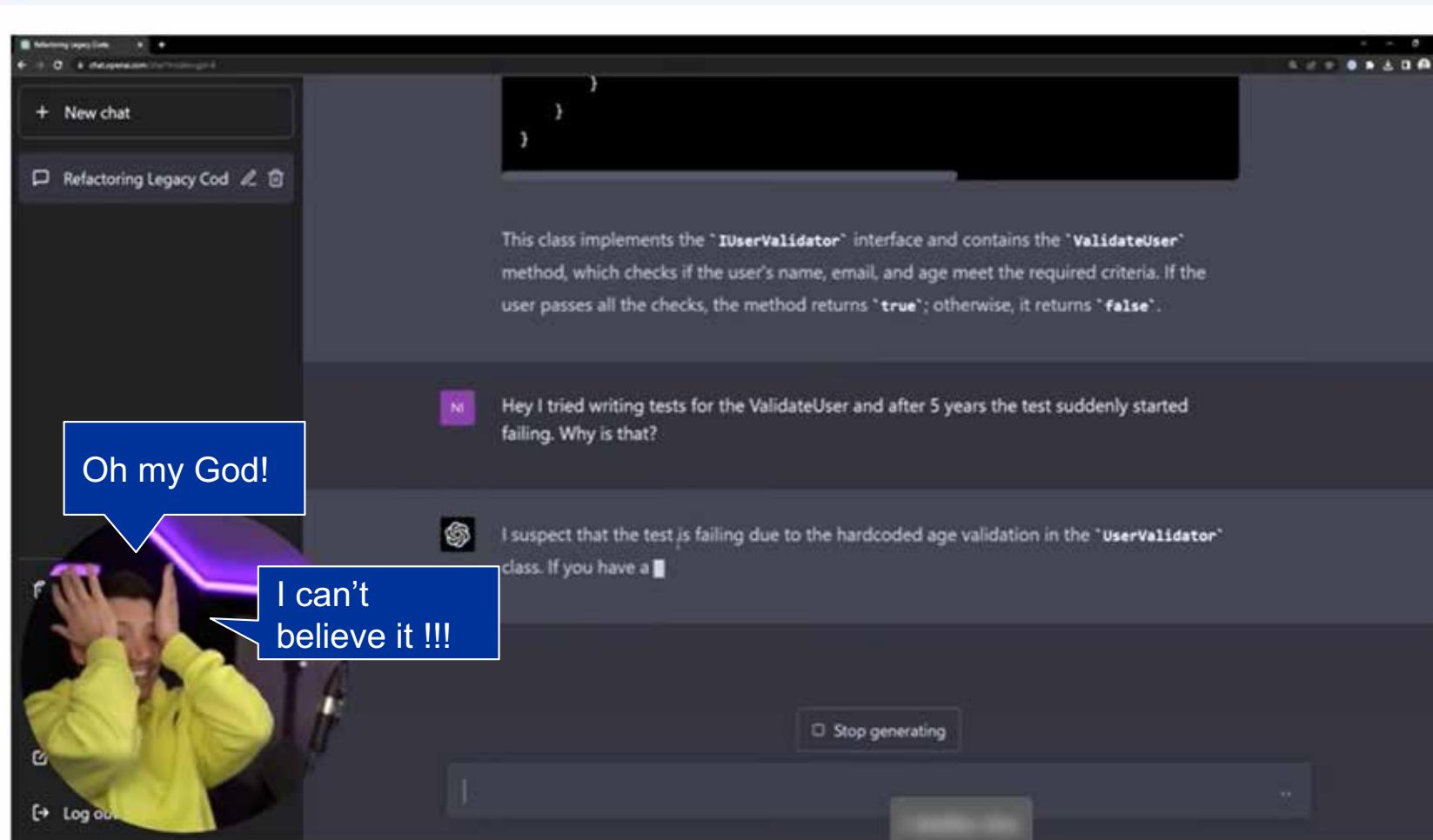
- AI models are data-driven (*learned from data*).
- Real-world decision making might be based on principles (“*what defines being human?*”).

# The Potential Impact of GPT-like Tools on Computing Education and Career Opportunities

Speaker: [Prof Damith Rajapakse](#)

**Abstract:** This talk explores three important questions related to the impact of GPT-like AI tools on computing professionals. Firstly, to what extent can these tools automate the work of computing professionals? Secondly, how will the increasing use of such tools affect the career prospects of computing professionals? And finally, how can teaching and learning computing degree programs be adapted to keep pace with these changes?





## I Asked GPT-4 To Refactor My Legacy Codebase



Nick Chapsas 190K subscribers

5.9K



Share

Download

...

# The Potential Impact of GPT-like Tools on Computing Education and Career Opportunities

**Scope: Software Engineering (SWE) Careers**

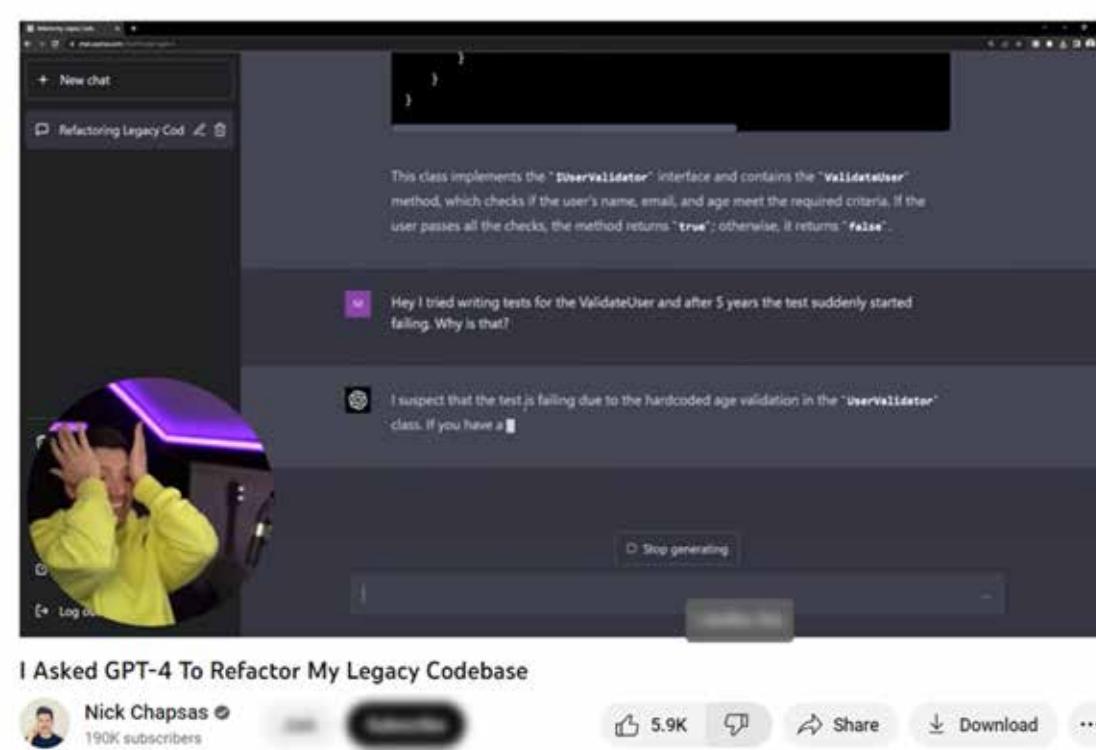
**[1] How much of the SWE's work can AI do?**

**[2] How will it affect SWE career prospects?**

**[3] How to prepare for AI-assisted SWE careers?**

## [1] How much of the SWE's work can AI do?

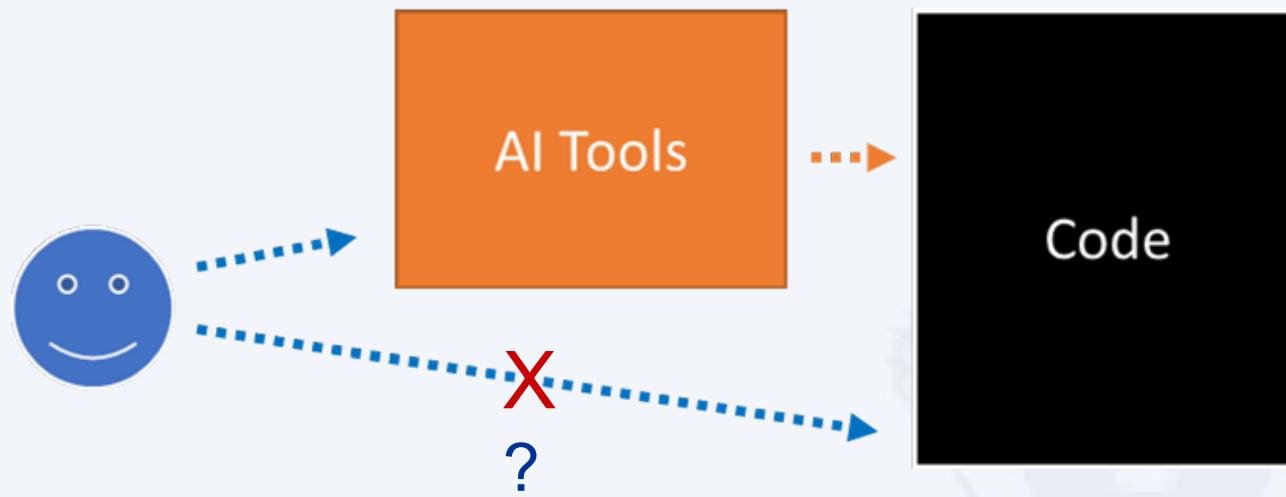
What AI can do seems ‘amazing’  
-- possibly because of the sudden jump in capabilities.



Capable of small/medium tasks now, but the **capabilities are likely to grow**.

## [1] How much of the SWE's work can AI do?

Will we be able to treat code as a black box?



Unlikely for now.

We still need to monitor, fine-tune, troubleshoot, etc.

**Which requires *evaluative judgment* of expert SWEs.**

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**[1] How much of the SWE's work can AI do?**

**AI can do a significant portion of the work, but not all.**

**[2] How will it affect SWE career prospects?**

**[3] How to prepare for AI-assisted SWE careers?**

## [2] How will it affect SWE career prospects?

**Some work will be a lot faster** (e.g., coding)

**Some work will be a bit slower** (e.g., troubleshooting)

Why? It's harder to make evaluative judgements about code that we didn't write ourselves.

**But there will be a net productivity gain.**

## [2] How will it affect SWE career prospects?

With that productivity gain ...

- **Some job opportunities will disappear.**  
Why? Fewer SWEs can do the same amount of work.
- **Some new opportunities will appear.**  
More ‘commoditisation’ of software development  
→ more public demand for it

**Job profiles will change for most jobs.**

- Current: high demand for SWEs, high salaries,  
high workload, high stress, gender imbalanced, ...
- Future: ???

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not necessarily for the worse.

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## [3] How to prepare for AI-assisted SWE careers?

**Need to develop *evaluative judgment* faster!**

Normally, developing EJ takes a lot of time and experience  
e.g., students rely on instructors' EJ at first.

**Need to learn fundamentals but emphasis might change**  
e.g., less of *writing* code, more of *reading* code.

**Need to learn how to make use of AI tools too.**

That's **even more things to learn** than before!

Yes, but **AI can improve learning productivity** too.

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Learn the fundamentals,  
supplemented with AI skills,  
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## ThatGPTeacher and Cerebral Classmate

Speaker: [Prof. CHEN Zhi Xiong](#)  
NUS Medicine

**Abstract:** In my talk, I will highlight features of NUS interim policy on AI in education through the lens of a fellow educator and student. We will explore its relevance in the context of healthcare and humanity's strengths needed to steer AI.





- Can you ban a classmate who is smarter than you?
- Can you ban a teacher who is more knowledgeable than you?



- If you copy from your smarter classmate, should you ban your classmate?

So, how do you interact with this classmate?



LEARN



COLLABORATE

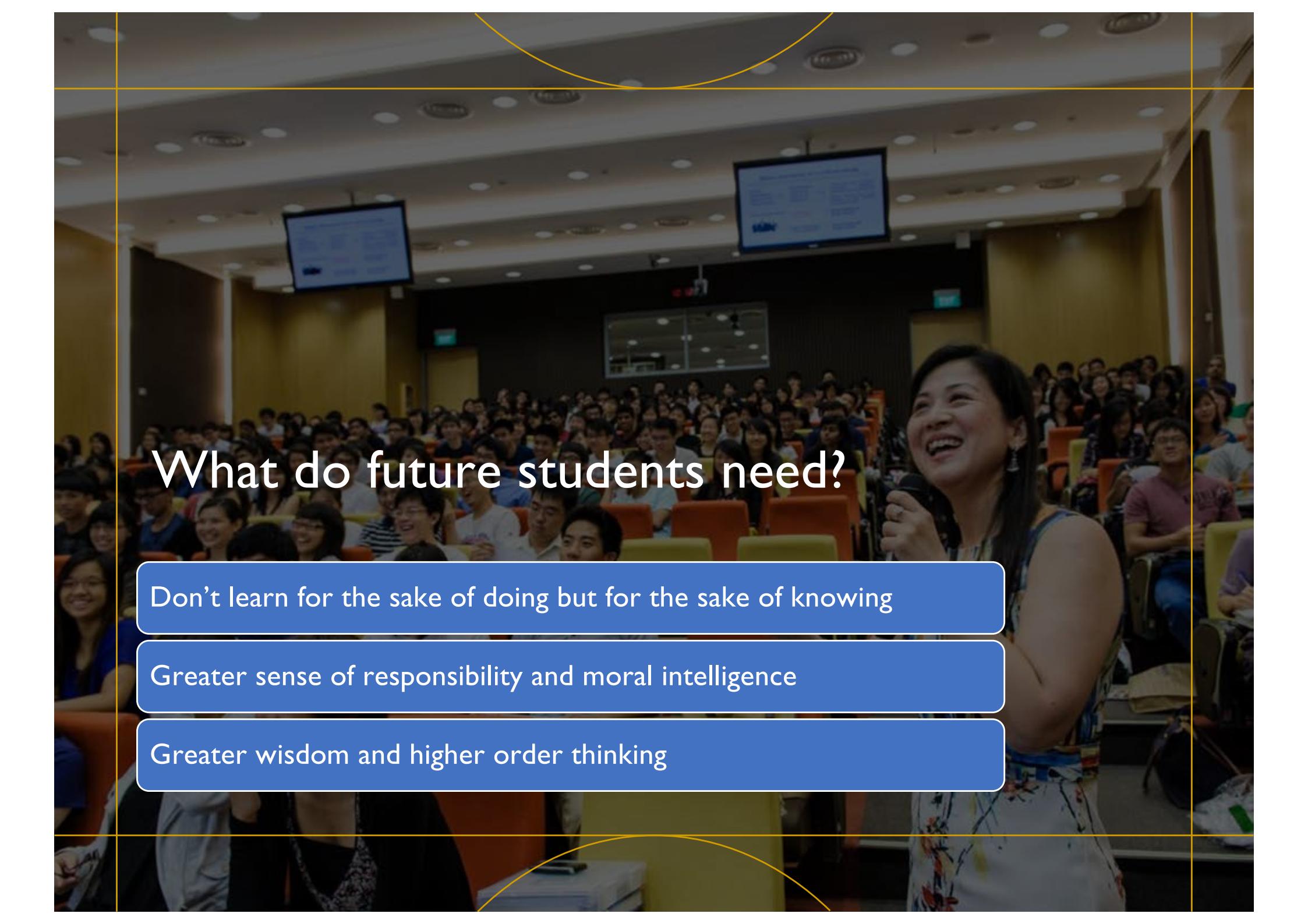


CHALLENGE

# How should you **NOT** interact with this classmate?

**Plagiarize**  
(Even if AI does not own the work)

**Over-rely**  
(Do not surrender your gifts and autonomy)

A photograph of a large lecture hall filled with students. A woman in the foreground, wearing a floral dress, is smiling and speaking into a microphone. Two large screens are visible on the ceiling. The background shows rows of students seated in orange and green chairs.

# What do future students need?

Don't learn for the sake of doing but for the sake of knowing

Greater sense of responsibility and moral intelligence

Greater wisdom and higher order thinking

# What should future educators do?

Design

- assessment in the context of AI

Instill

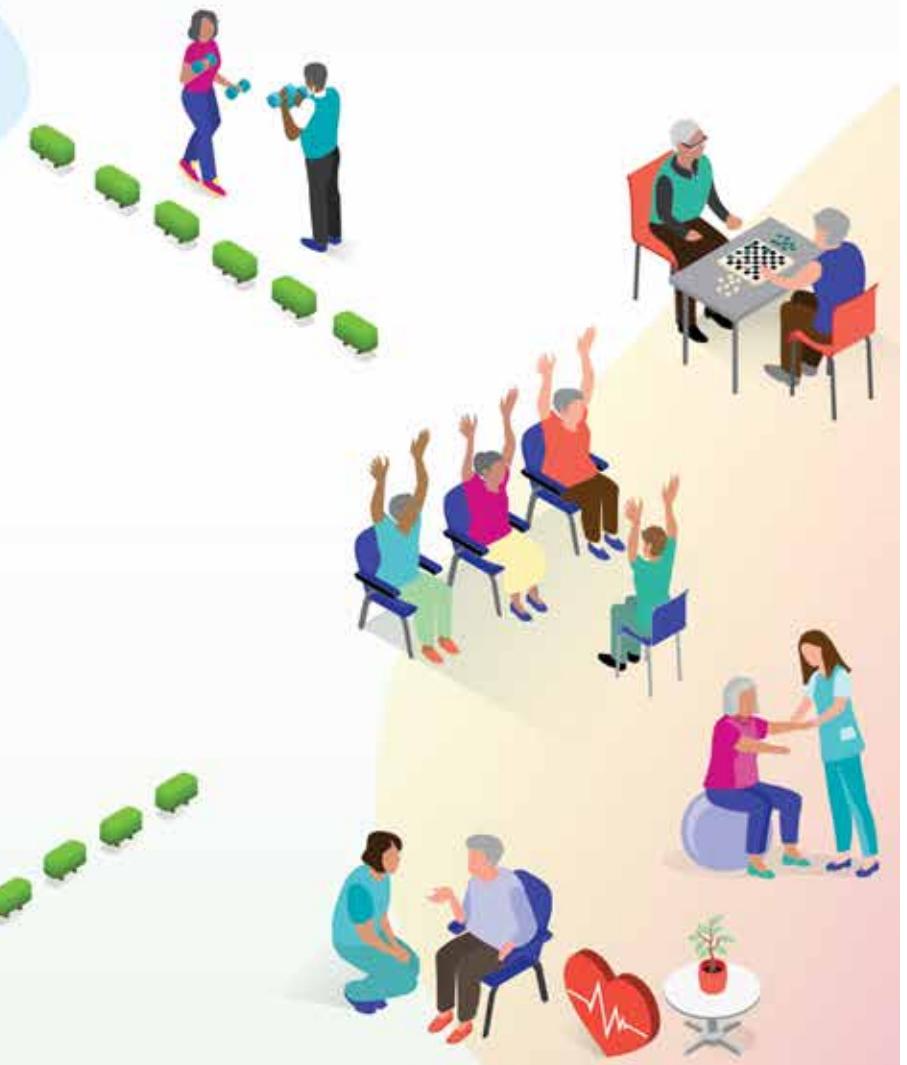
- stronger values and higher order thinking

Differentiate

- work generated by students with and without AI

and by creating an environment that fosters such values,

# TOWARDS A HEALTHIER SINGAPORE



# Virtual Doctor? Not quite...

Z

I am a 15 year old boy with Type 1 diabetes. For the past 2-3 days, I had a stomach upset and vomited again and again. I stopped taking insulin injections as I wasn't able to eat. Do you think I'll be ok?

I went to the A&E yesterday as I was still vomiting. The doctor said everything was ok and I didn't have this thing called diabetic ketoacidosis. He said there was nothing seriously wrong with me. He gave some anti-vomiting medication and asked me to go home. He told me to start injecting myself with insulin once the vomiting stops.

Is this advice ok?



As an AI language model, I am not qualified to provide medical advice. However, I strongly recommend that you follow the advice of the medical professional who assessed you in the A&E. They are the most qualified person to provide medical advice and treatment for your condition.

It is crucial to take insulin regularly and maintain stable blood sugar levels to manage Type 1 diabetes effectively. When you are sick and vomiting, your body may have difficulty absorbing the insulin you take, which can increase your risk of diabetic ketoacidosis. It is also possible that your vomiting may be a symptom of diabetic ketoacidosis, which requires immediate medical attention.

Please follow the doctor's advice to take the anti-vomiting medication and restart your insulin injections once the vomiting stops. It is also important to monitor your blood sugar levels closely and seek medical attention if your condition worsens or if you experience any unusual symptoms.

# Virtual Doctor? Not quite... but can be trained.

Z

A 15 year old boy was a known case of Type I diabetes mellitus. For the previous 2-3 days, he developed a gastrointestinal upset which caused repeated vomiting. He decided to stop giving himself insulin injections, reasoning that without food intake it would be dangerous to do so. A day later, he went to the A&E department of a neighbourhood hospital when the problem persisted. At the hospital, the attending physician decided to assess the acid-base status of this patient, fearing that diabetic ketoacidosis might have set in.

The laboratory results were as follows:

Plasma pH 7.39 (normal 7.35-7.45)

Plasma bicarbonate 25 mmol/L (normal 20-32)

Plasma pCO<sub>2</sub> 41 mmHg (normal 35-45)

The A&E doctor reassured the boy that there was nothing seriously wrong and sent him home with medications to stop the vomiting and instructing him to re-start the insulin once vomiting stops.

Discuss the approach of the A&E doctor.



The approach of the A&E doctor in assessing the acid-base status of the 15-year-old boy with Type 1 diabetes and gastrointestinal upset is appropriate. The doctor recognized the possibility of diabetic ketoacidosis, a life-threatening complication of uncontrolled diabetes characterized by high blood sugar, high ketone levels, and metabolic acidosis. In diabetic ketoacidosis, the body produces high levels of ketones, which can lower blood pH and cause metabolic acidosis.

The laboratory results provided show that the boy's plasma pH is within the normal range (7.35-7.45), and his plasma bicarbonate level is also within the normal range (20-32 mmol/L), indicating that he does not have metabolic acidosis. The plasma pCO<sub>2</sub> level (41 mmHg) is slightly elevated but still within the normal range (35-45 mmHg), suggesting that the boy is not experiencing respiratory acidosis.

Based on these results, the A&E doctor made the correct decision to reassure the boy that there was nothing seriously wrong and to provide medications to stop the vomiting. The doctor also instructed the boy to restart insulin once the vomiting stops, which is crucial to prevent high blood sugar levels and the risk of diabetic ketoacidosis.

Overall, the A&E doctor's approach in assessing the boy's acid-base status, considering the possibility of diabetic ketoacidosis, and providing appropriate treatment is in line with standard medical practice. It is essential to closely monitor the boy's condition and follow up with further medical care as needed.

A photograph showing four individuals in a domestic setting. On the left, a young woman in a white polo shirt is smiling. Next to her, another woman in a dark top and a stethoscope around her neck is also smiling. In the center, an elderly woman wearing a grey hijab and a green patterned top is smiling. To her right, an elderly man with grey hair and a red and white patterned shirt is smiling. They appear to be in a kitchen or dining area with shelves and a window in the background.

# Future healthcare providers will need to

Provide

Work

Be

More human touch  
because

- Anthropomorphic ≠ Human

More closely together  
because

- There will be more 'expert patients'

More interdisciplinary  
because

- Contexts will be increasingly important in differentiating AI vs human practice

# Education

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- Can be used to differentiate learning
  - Foundational learners can benefit from basic knowledge
  - Intermediate learners can critique output to advance their learning

Z

An elderly man developed congestive heart failure. Before treatment was initiated, he was found to have a plasma sodium concentration of 129mmol/L (normal 135-145). Explain the low plasma sodium concentration seen in this patient.



The low plasma sodium concentration in the elderly man with congestive heart failure is likely due to a condition called hyponatremia. Hyponatremia is a common electrolyte disorder in which the concentration of sodium in the blood is lower than normal, typically below 135 mmol/L.

In congestive heart failure, the heart's ability to pump blood is weakened, leading to a decrease in blood flow to vital organs such as the kidneys. This can cause the kidneys to retain more water than necessary, leading to dilution of sodium in the blood and resulting in hyponatremia.

Additionally, some medications commonly used to treat congestive heart failure, such as diuretics, can also contribute to hyponatremia by increasing urinary sodium excretion and further reducing sodium levels in the blood.

Hyponatremia can cause a variety of symptoms, including nausea, headache, confusion, seizures, and in severe cases, coma and death. Treatment of hyponatremia involves addressing the underlying cause, such as reducing fluid intake, adjusting medication doses, or treating the underlying heart failure. In severe cases, intravenous fluids or medications may be needed to raise sodium levels in the blood.

# Education

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Educators will shift from information providers to information discerners.

**From:** XXX

**Date:** Thursday, 23 February 2023 at 10:38 AM

**To:** Chen Zhi Xiong <zhixiong\_chen@nus.edu.sg>

**Subject:** Question regarding hyper/hypocalcemia

Dear Prof Chen,

I am XXX from M1! I realised that I didn't really catch what you mentioned about whether high pH will lead to hyper or hypocalcemia and so I tried to google and ChatGPT and got very different answers 😅 I recall that H<sup>+</sup> competitively binds to albumin and hence so high pH would mean more Ca<sup>2+</sup> binding and hypocalcemia. However ChatGPT says that metabolic alkalosis can also increase the sensitivity of the parathyroid glands to calcium levels, leading to an even greater secretion of PTH and a further increase in blood calcium levels (along with compensatory increase in Ca<sup>2+</sup>) which leads to hypercalcemia. My friend's attempt at ChatGPT even said that Ca<sup>2+</sup> binds with H<sup>+</sup>? Google also said something about high pH leading to Ca<sup>2+</sup> precipitating out with PO<sub>4</sub><sup>3-</sup> at lower amounts? I'm just very confused which answer and explanation is correct 😅

Thank you so much in advance! 😊

Sincerely,

XXX



# Research

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- Generate ideas and directions
- Able to customize with right prompts
- Informs what have been done or are known

## **But may be:**

- Biased
- General
- Outdated
- Inaccurate

# Research

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Z

I have milk, sake, yoghurt, cheese and chocolate in my fridge. What should I make for dinner?



With the ingredients you have, you could make a delicious and unique dish: Sake and Cheese Fondue with Chocolate-Dipped Fruit for dessert.

Here's how to make it:

Sake and Cheese Fondue:

Ingredients:

- 1 cup sake
- 1 cup shredded cheese (such as Gruyere, Emmental, or Fontina)
- 1/4 cup plain yogurt
- Salt and pepper, to taste
- Bread or vegetables, for dipping

Instructions:

1. In a small saucepan, heat the sake over medium heat until it comes to a simmer.
2. Add the shredded cheese and stir until it is melted and smooth.
3. Stir in the yogurt and continue to cook until the fondue is heated through and smooth.
4. Season with salt and pepper to taste.
5. Transfer the fondue to a fondue pot or serving dish and serve with bread or vegetables for dipping.

Chocolate-Dipped Fruit:

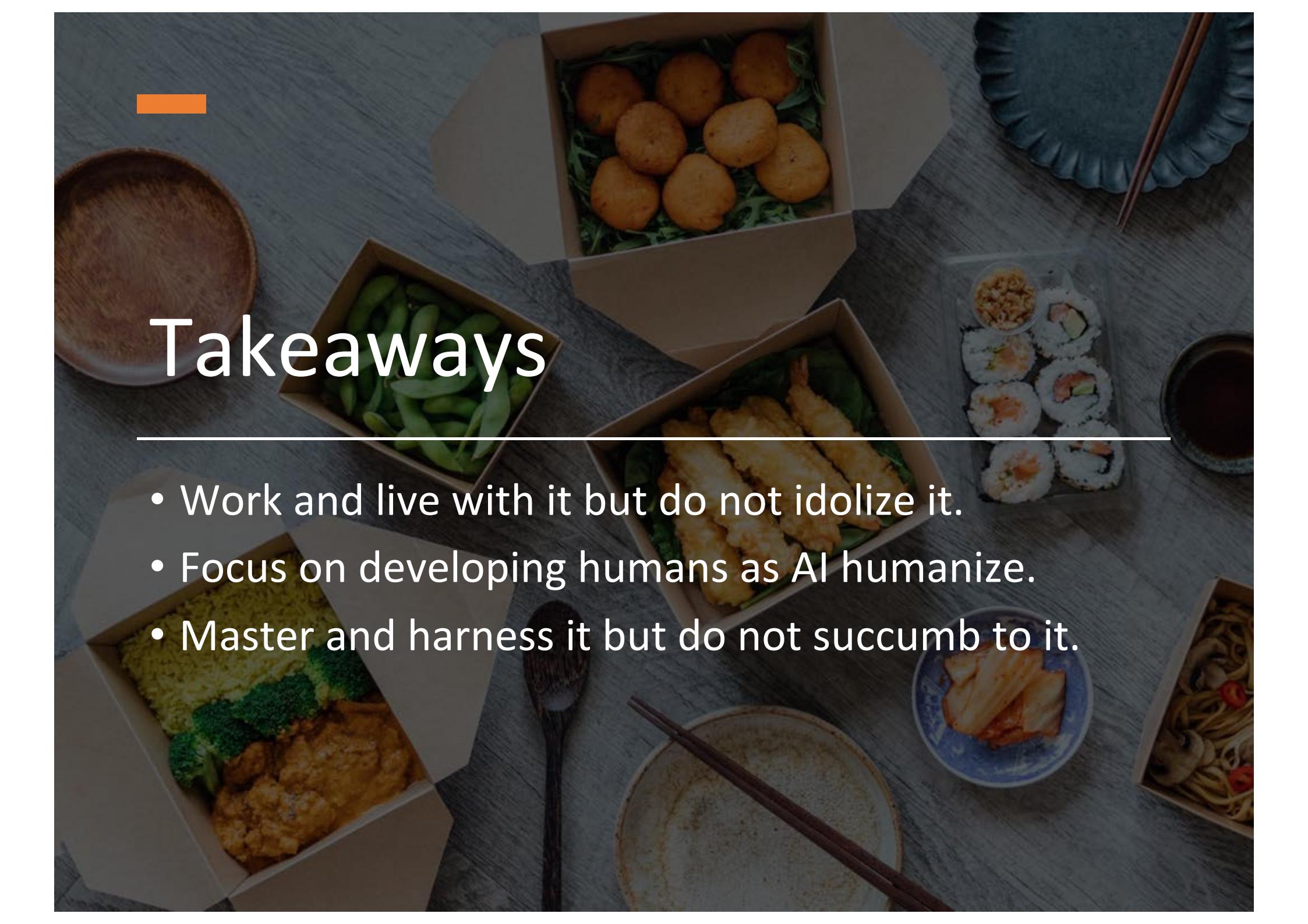
Ingredients:

- Assorted fruit (such as strawberries, bananas, or pineapple)
- 1/2 cup chopped chocolate (milk or dark)

Instructions:

1. Wash and dry the fruit, and cut it into bite-sized pieces.
2. Melt the chopped chocolate in a double boiler or in the microwave, stirring frequently.
3. Dip the fruit pieces in the melted chocolate and place them on a parchment-lined baking sheet.
4. Chill the chocolate-dipped fruit in the fridge until the chocolate is set.
5. Serve the chocolate-dipped fruit alongside the fondue for a delicious and unique dessert.

Enjoy your sake and cheese fondue with chocolate-dipped fruit for a fun and flavorful dinner!



# Takeaways

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- Work and live with it but do not idolize it.
- Focus on developing humans as AI humanize.
- Master and harness it but do not succumb to it.

# Panel Session:

# Future Forward with AI

NUS  
Computing  
**25<sup>th</sup>**  
Anniversary



Kiruthika  
Ragupathi



Loy Hui Chieh



Jungpil Hahn



Martin Henz

## Panel Discussion Interaction

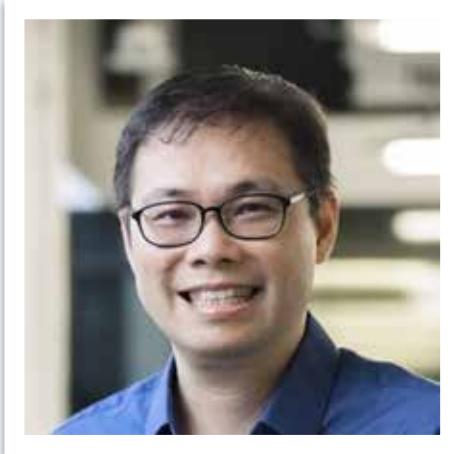
Please up/downvote existing questions or better, write your own, by accessing the Poll Everywhere link to the right.

We will try to get all of your questions answered, even if we can't get them all handled within this live session.



<http://pollev.com/chatongpt>

**Loy Hui Chieh**



**Jungpil Hahn**



**Kiruthika  
Ragupathi**



**Martin Henz**



## Kiruthika Ragupathi

Dr Kiruthika RAGUPATHI is Associate Director in the Centre for Development of Teaching and Learning (CDTL) at the National University of Singapore (NUS).

In her current role, she leads the foundational professional development programmes for early career academics, the course design institute, and oversees the centralised teaching quality instruments at NUS—student feedback and peer review. She designs and conducts training on various topics including technology enhanced learning, student engagement and assessment.

Kiruthika obtained her PhD in Higher Education: Research, Evaluation and Enhancement from Lancaster University, UK.



*“As an educational developer, I believe that AI will only make my job easier and not disrupt my job. My plan is to **use AI as a jetpack, not a crutch**. So, what do I plan to do—be it in my job or in my life—I will consider its use from two angles:*

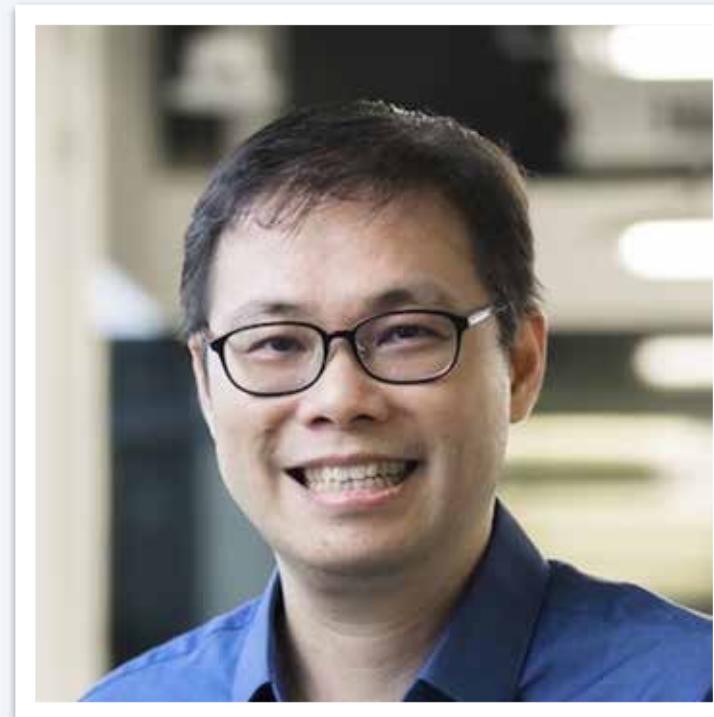
- **What can AI do for me within my current setup, context and structure?**
- **What can and will AI be able to do for me that I completely transform the structure itself?**

*Taking the example of the flipped learning approach that I employ in my courses, I will use AI for effective management and generation of content (e.g., multiple explanations/analogies to teach foundational/difficult/abstract concepts, varied examples that illustrate good practices, summaries of relevant information), which will give me more time to focus on meaningful higher-order needs of academic colleagues. Looking ahead, I plan to adopt an AI tutor that can provide personalized learning outside of class and tailor instruction to an individual's unique needs to enhance their preparedness and active participation during hands-on activities or discussions.”*

## Loy Hui Chieh

Prof LOY Hui Chieh is an Associate Professor in the Department of Philosophy in NUS. He is also the Vice Dean of Academic Affairs, and Master of Cinnamon Wing at NUS College.

He currently co-chairs the University Policy Workgroup for AI in Teaching and Learning for NUS. A/P Loy received his BA (Hons) and MA in Philosophy from NUS, and PhD in Philosophy from University of California, Berkeley.



*Modern AI of the form embodied in platforms drastically increases the capabilities accessible to ordinary people. **Modern AI, rightly used, is a powerful enabler and time-saver.** And all this extends to my work as an educator—imagine being able to generate a chatbot on the fly for students to interrogate a text I want them to learn from, on their own time, rather than read an FAQ. But the “rightly used qualification” is important though: it’s often the case that such tools are most useful and powerful amplifiers for those who already know the actual subject matter, much less so for those who are still learning. **If students only treat AI as a short cut to get to an end-product, they forget themselves and risk failing to learn** and thus make themselves potentially redundant as AI tools become more powerful.*

## Jungpil Hahn

Prof Jungpil HAHN is a Professor in the Department of Information Systems and Analytics at the School of Computing at the National University of Singapore (NUS). He is also serving as Deputy Director (AI Governance) at AI Singapore.

He has a Bachelor's and Master's degree in Business Administration from Yonsei University in Seoul Korea and he earned his Ph.D. in Information and Decision Sciences from the Carlson School of Management at The University of Minnesota.



We are **doomed!**

Technology has always had a **labor substitution** role as well as a **productivity enhancing** role. Job roles inevitably change with any technology advancement. The greatest challenge with AI is that the extents of labor substitution and productivity enhancement effects are much greater than any previous automation technology. The amount of work components substituted by AI should thus be replaced with higher-order work that cannot be substituted by AI. That means, jobs need to be redefined accordingly to what AI cannot do. But YOU must find ways in which you can create value. You cannot and should not use AI merely to enhance the productivity of your current job scope.

## Martin Henz

Prof Martin HENZ is an Associate Professor in the Department of Computer Science, National University of Singapore.

His current research and teaching revolves around the scalability of experiential learning. With his NUS colleagues, he has scaled the experiential course CS1101S (computer science introduction) from 48 students in 2012 to 670 students in 2021.

He obtained his M.Sc. from the University of Stony Brook in 1992 and his Dr.rer.nat. from the Saarland University in 1997.



*Large Language models are poised to significantly transform the way we work, play, learn, and teach. They emerge at a time when societies are still grappling with the prior disruptive shift brought about by the internet and the World Wide Web. Initially, social media platforms were celebrated for their ability to facilitate communication and foster virtual communities. However, the societal costs of these conveniences have become painfully apparent: fake news, echo chambers, anxiety, and more. As we struggle to address these issues, the next wave of innovation is upon us, **striking at the very core of humanity: language**. As a global society, we lack the mechanisms to deliberate on the application of such groundbreaking technological innovations, and any attempts to establish such mechanisms may be too late to mitigate the risks. In academia, the resource we can bring to this challenge is our community of teachers and learners. United, we can discover ways to harness these innovations for the betterment of humanity..*

# Panel Session:

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Martin Henz

# Closing Session

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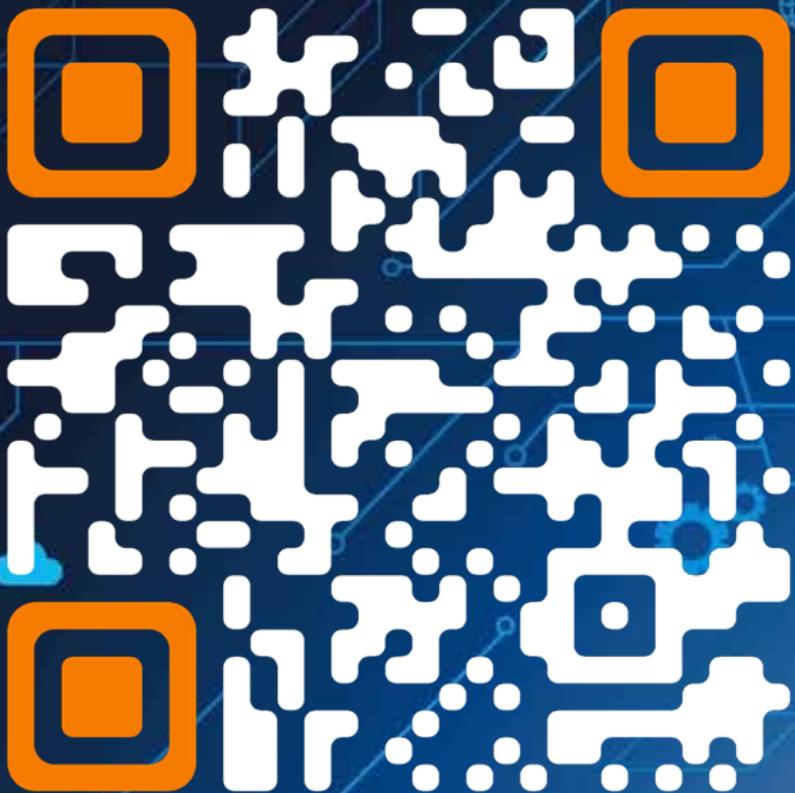


# Today's Slides

NUS  
Computing  
**25<sup>th</sup>**  
Anniversary

<https://bit.ly/chatongpt-slides>

# Thanks for your attendance today!



<https://bit.ly/chatongpt-feedback>

Please use the link on the left to tell us  
what you thought of today's session.

It'll just take 1–2 minutes.

Thank you!

