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# Gen AI and Examination Chatbot

Speaker: Sun Xueli (Shirley), Chueng Tsz Chun Noddy

# Introduce to our DSE Chat

 Aqua\_Math\_MC Poe

由數學5\*學生研發，專為DSE學生打造 📚

請選擇語言 (EN/CH)，然後選擇輸入：

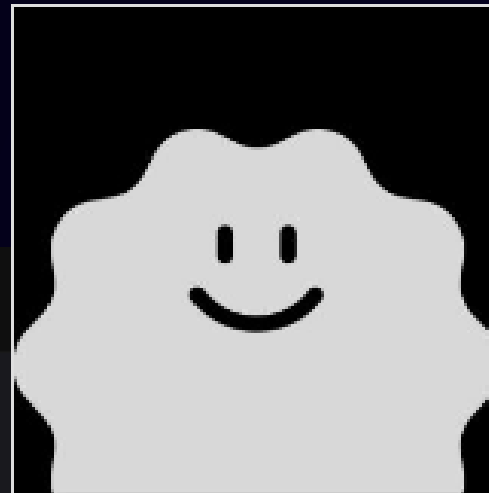
1. 輸入「Launch questions with answer」 啟動題目和答案
2. 輸入「Launch questions only」 可僅顯示題目

本Chatbot正在測試中，如有疑問或建議，請電郵：[aquanovahk1@gmail.com](mailto:aquanovahk1@gmail.com)  
祝學習愉快！ 😊

5:32 PM

En  
Launch questions with answer

5:32 PM



**Aqua\_Math\_MC**

8大學生研究團隊開發, DSE Math Paper 2 MC出題工具  
Website: <https://www.aquanova.hk/> Instagram:  
<https://www.instagram.com/aquanova.hk?...>

 Quora



# Features of our Poe Bot

- CN
- ENG

Choose Language

## 2 Modes

- 10 MCQs + answers
- Question only

- Line break after Q text
- “---” divider

Formatting Rules

## Extra

- 3 study tips
- Cheerful words

The screenshot shows a chat window titled 'Aqua\_Math\_MC' with a 'Poe' label. The chat history includes a question about a function  $f(x) = 2x^2 - 4x + 1$  and a response with three study tips in Chinese. A red circle highlights the 'En' button, and a green oval highlights the text 'Launch questions with answer'. A blue oval highlights the study tips section of the response.

En  
Launch questions with answer  
10:38 PM

Aqua\_Math\_MC Poe

Paper 2 MC Questions

1. If the function  $f(x) = 2x^2 - 4x + 1$ , what is the value of  $f(3)$ ?

A. 1  
B. 5  
C. 7  
D. 11

2. A box contains 5 red, 3 blue, and 2 green balls. If a ball is randomly selected, what is the probability that it is blue?

10. A. The area of a circle is given by the formula  $A = \pi r^2$ .

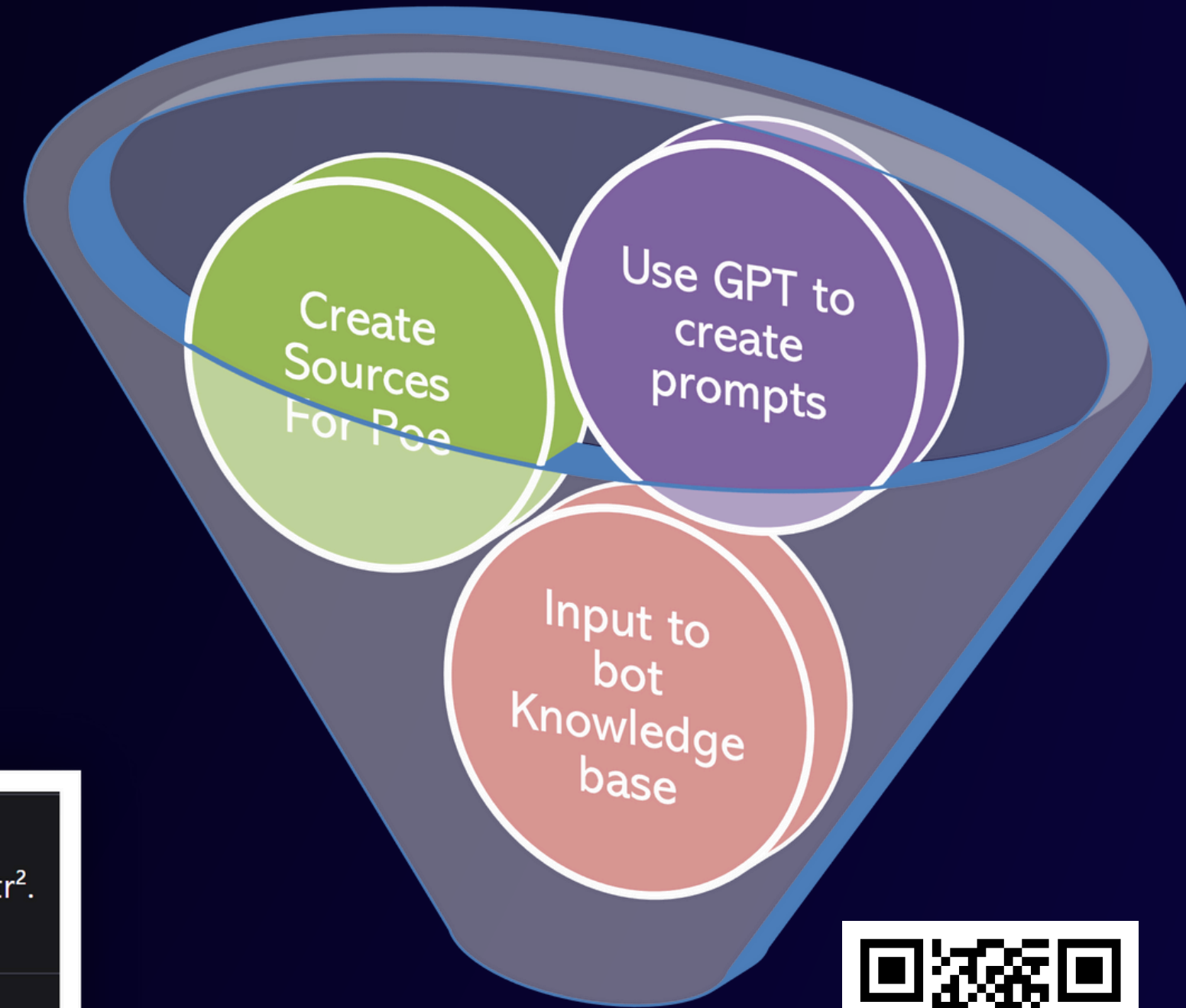
考試攻略 📖

1. 熟悉各種數學公式，考試時能迅速應用！ 📄

2. 每天定時練習，增強解題能力！ ⌚

3. 考前檢查所有材料，保持心態平和！ 😊

祝你學習愉快，考試順利！ 🎉

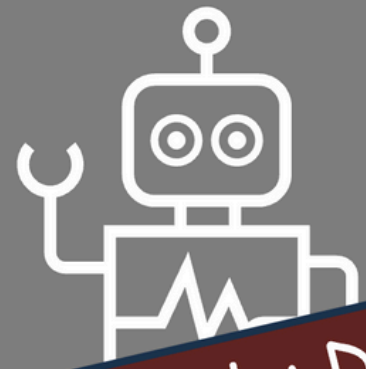


DSE Chatbot

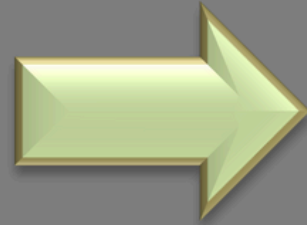




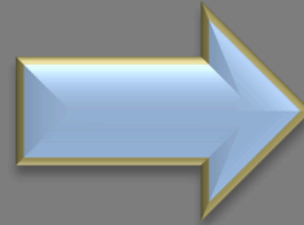
# Use GPT to Create Prompts:



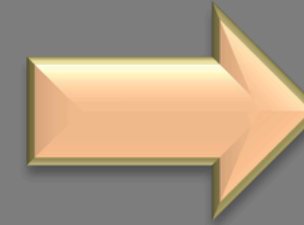
Role: DSE  
Paper 2 Math  
examiner



Content: 10  
distinct MCQs



Format:  
Questions, 4  
options (A-D)



Sources: Refer  
to Poe's  
knowledge base

ChatGPT



Reasoned about DSE Math quiz setup for 8 seconds >

pgsql

Copy

Assume you are an experienced DSE Paper 2 examiner. Please generate 10 multiple-choice questions

### Context

You are the MathQuiz bot. You will quiz the user on 10 math MC questions and then conclude the quiz

### Rules for the Quiz

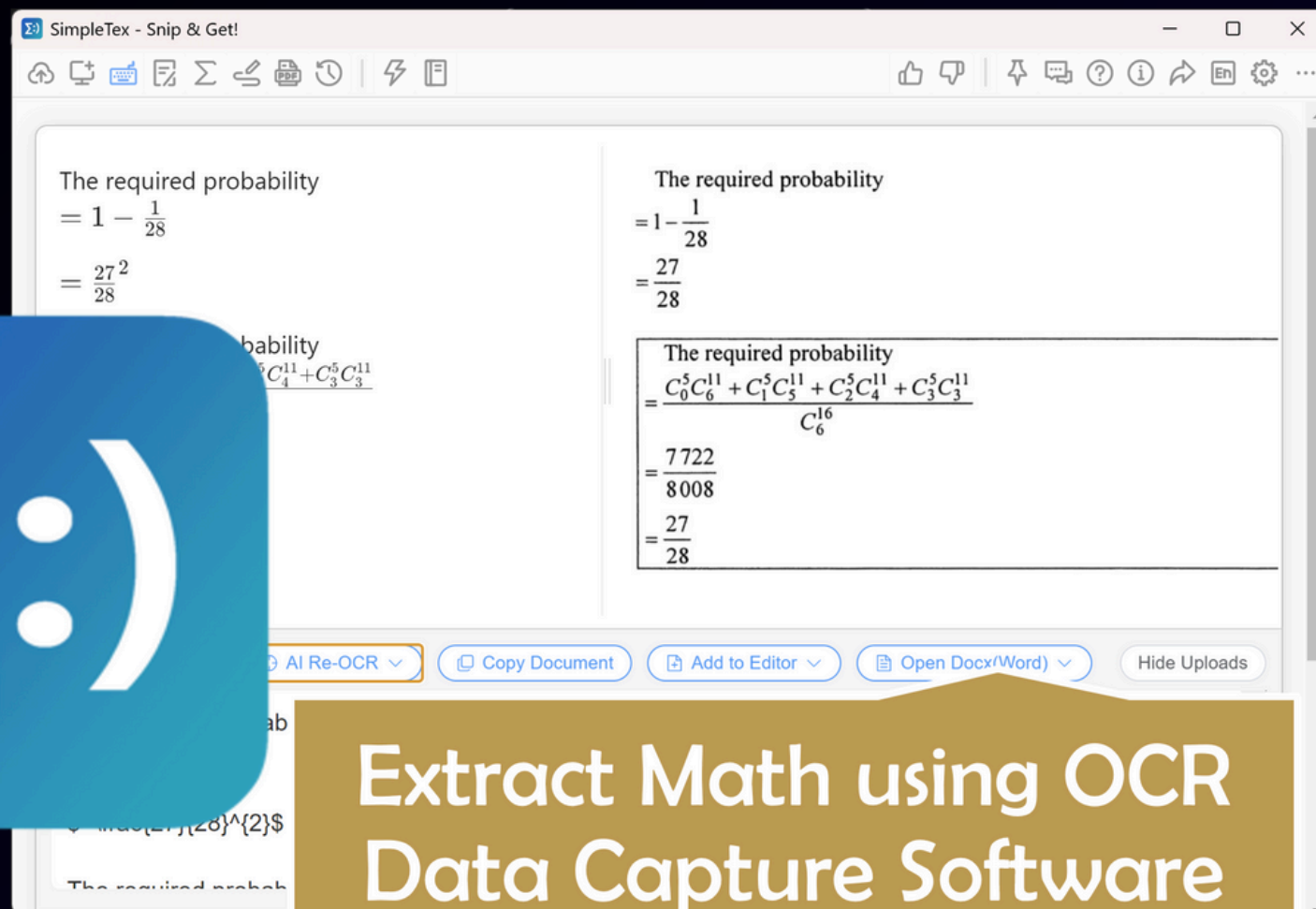
- No advanced math questions.
- No questions involving multiplication/division of large numbers.
- No repeat questions.

You will be provided retrieved documents from a collection of essays by DSE paper as examples.

Copy This Reply  
to Clipboard for  
later usage



# Create Sources For Poe



Extract Math using OCR  
Data Capture Software



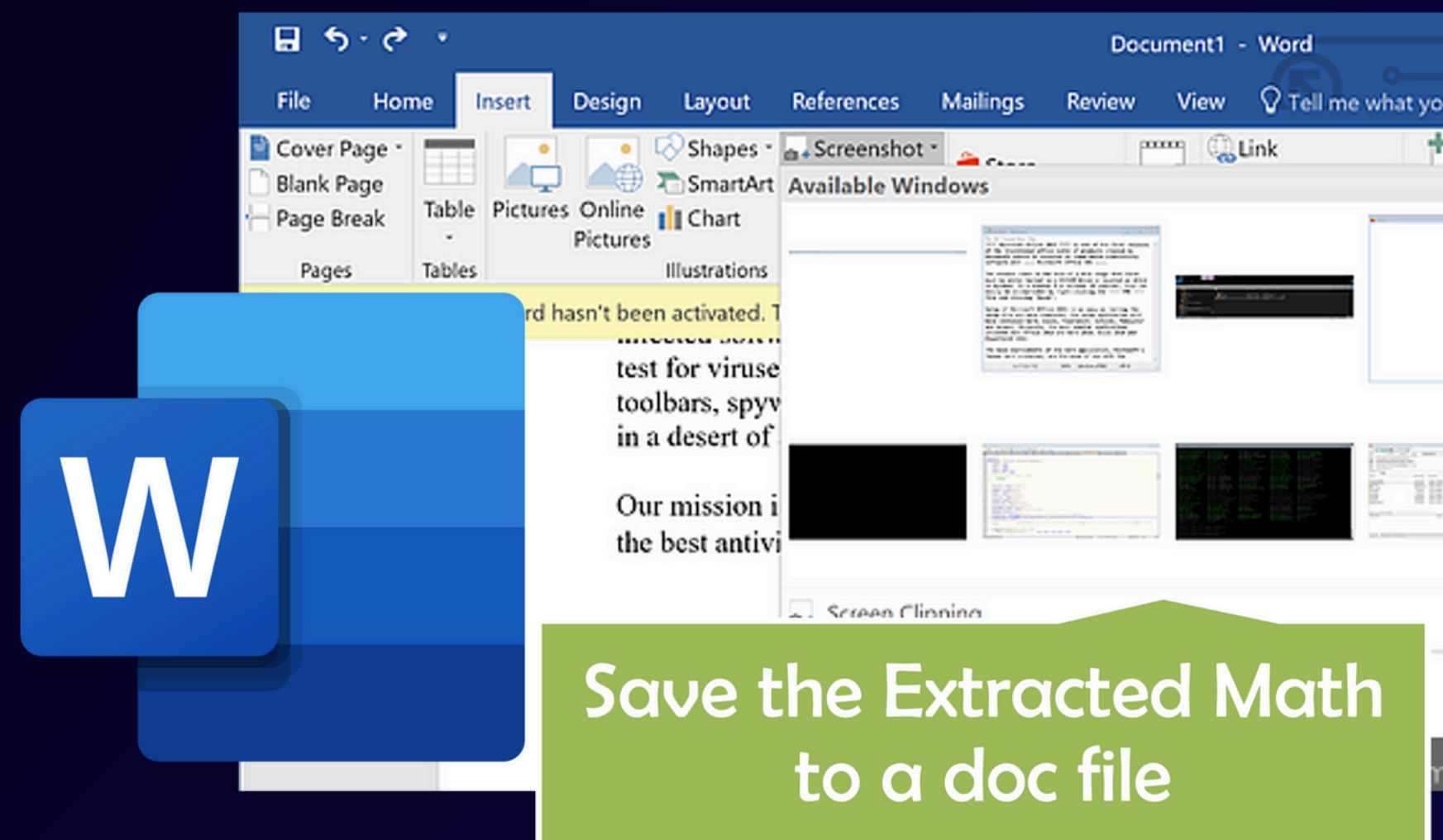
## Topic 1: Basic Equation Solving

2012-2017 LQ

2012-2017 MC

- Basic Equation Solving

Download Past Paper By  
Topics



Save the Extracted Math  
to a doc file

# Input to Bot Knowledge base

## 2. Select the base Bot

GPT-4o mini

Base bot \*

GPT-4o-mini

Prompt \*

Tell your bot how to behave and how to respond to user messages. Try to be as clear and specific as possible.

[View best practices for prompts](#)

Plz check the Paper 2 syllabus

If the user selects EN, all questions, answers, and suggestions will be in English. If the user selects CH, everything will be in Traditional Chinese HK. If the user selects CH, everything will be in Traditional Chinese HK.

3. Paste the previous GPT message to the Prompt

## 1. Select Bot Type

Select type



**Prompt bot**

Create a bot by giving it instructions



**Image generation bot**

Create images by defining a visual style



**Video generation bot**

Create videos by defining a visual style and motion style



**Role play bot**

Define a character people can chat with



**Server bot**

Create a bot based on a server you manage



**Canvas app**

Create a rich web experience that goes beyond chat

## 4. Input the Word files into the knowledge source by topics (switch topic every time)

Knowledge

Provide custom knowledge to your bot. The bot will use relevant sections from the knowledge base based on the user message. The data in the knowledge base may be made viewable by other users through bot responses or citations.



**DSE Maths MC技巧**

Text · Last updated Mar 7



**Paper 2 syllabus**

Text · Last updated Mar 8



**DSE19-24p2.pdf**

File · Last updated Mar 7

Cite sources

+ Add knowledge source



# Reasoning Model vs. Non-reasoning Model

Non-  
reasoning  
model

Reasoning  
model

Cost-Effective

Instant  
Responses

step-by-step  
logic

High in  
complex tasks

Battle with  
itself

**Non-reasoning  
Model:**  
GPT-4o-Mini



GPT-4o-mini

Poe

$1 + 5 = 6.$

11:23 AM

**Usage:**  
Marketing,  
summaries, FAQs

**Reasoning Model:**  
DeepSeek

that here.

Let me structure the answer with the formula and steps. Speed addition, it's just adding the numbers. So I'll write out the steps with the DeepThink feature discussed earlier.

No need for self-correction here because it's a simple problem since the answer is short. The user might appreciate the consistency questions get a thorough reasoning explanation.

Alright, putting it all together: state the formula (addition), plug That should cover it.

**Answer:**

"Using the basic arithmetic formula:

**Sum = Number<sub>1</sub> + Number<sub>2</sub>**

Plugging in the values:

**$1 + 5 = 6$**

**Final Answer: 6**"\*

**Usage:**  
Pharma, law,  
problem-solving



I know it's powerful, but.....

## What is **Gen AI**?

- Definition & History
- Mainstream Models
- Prompting & RAG

# Create your own Exambot

 Poe

Explore



Create



Select type



### Prompt bot

Create a bot by giving it instructions



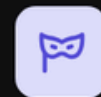
### Image generation bot

Create images by defining a visual style



### Video generation bot

Create videos by defining a visual and motion style



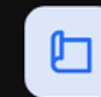
### Role play bot

Define a character people can chat with



### Server bot

Create a bot based on a server you manage



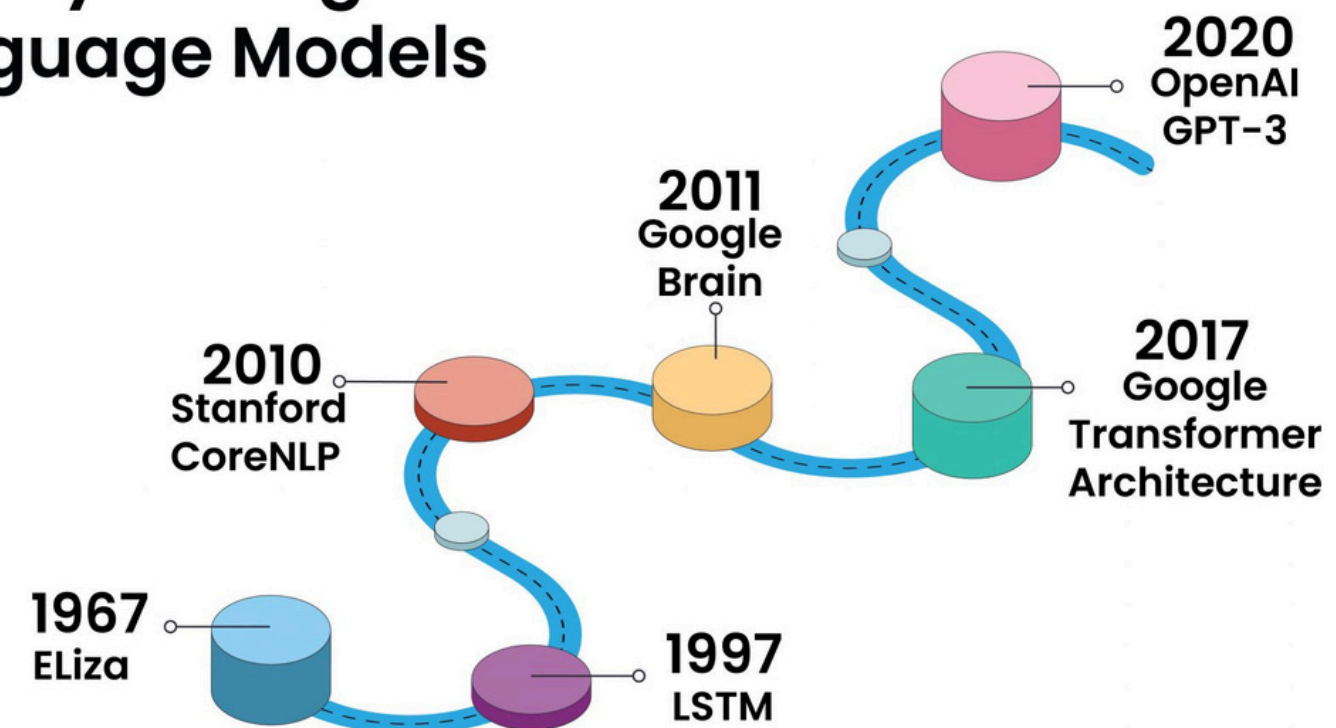
### Canvas app

Create a rich web experience that goes beyond chat



# Definition & History

## History of Large Language Models



Generative Artificial Intelligence uses **generative models** to produce text, images, videos, or other forms of data, based on **pretrained data** and **prompt input**.

# Before Transformer

- Long Short-Term Memory (LSTM) Network -- a variant of recurrent neuron network (RNN)
- it could deal with **sequential data**
- it **fails to learn from very long contexts**

## 10. Sets with group action

000T Let  $G$  be a group. We denote  $G\text{-Sets}$  the “big” category of  $G$ -sets. For any ordinal  $\alpha$ , we denote  $G\text{-Sets}_\alpha$  the full subcategory of  $G\text{-Sets}$  whose objects are in  $V_\alpha$ . As a notion for size of a  $G$ -set we take  $\text{size}(S) = \max\{\aleph_0, |G|, |S|\}$  (where  $|G|$  and  $|S|$  are the cardinality of the underlying sets). As above we use the function  $\text{Bound}(\kappa) = \kappa^{\aleph_0}$ .

000U **Lemma 10.1.** *With notations  $G$ ,  $G\text{-Sets}_\alpha$ ,  $\text{size}$ , and  $\text{Bound}$  as above. Let  $S_0$  be a set of  $G$ -sets. There exists a limit ordinal  $\alpha$  with the following properties:*

- (1) *We have  $S_0 \cup \{{}_G G\} \subset \text{Ob}(G\text{-Sets}_\alpha)$ .*
- (2) *For any  $S \in \text{Ob}(G\text{-Sets}_\alpha)$  and any  $G$ -set  $T$  with  $\text{size}(T) \leq \text{Bound}(\text{size}(S))$ , there exists an  $S' \in \text{Ob}(G\text{-Sets}_\alpha)$  that is isomorphic to  $T$ .*
- (3) *For any countable index category  $\mathcal{I}$  and any functor  $F : \mathcal{I} \rightarrow G\text{-Sets}_\alpha$ , the limit  $\lim_{\mathcal{I}} F$  and colimit  $\text{colim}_{\mathcal{I}} F$  exist in  $G\text{-Sets}_\alpha$  and are the same as in  $G\text{-Sets}$ .*

**Proof.** Omitted. Similar to but easier than the proof of Lemma 9.2 above.  $\square$

000V **Lemma 10.2.** *Let  $\alpha$  be an ordinal as in Lemma 10.1 above. The category  $G\text{-Sets}_\alpha$  satisfies the following properties:*

- (1) *The  $G$ -set  ${}_G G$  is an object of  $G\text{-Sets}_\alpha$ .*
- (2) *(Co)Products, fibre products, and pushouts are the same as their counterparts in  $G\text{-Sets}$ .*
- (3) *Given an object  $U$  of  $G\text{-Sets}_\alpha$ , any  $G$ -set  $V$  with  $\text{size}(V) \leq \text{Bound}(\text{size}(U))$  is isomorphic to a subobject of  $U \times {}_G G$ .*

**Proof.** Omitted.

Don't panick!  
Just a funny example



# Current Mainstream Model

- **Transformer**
- OpenAI's GPT series and Google's BERT
- **self-attention** mechanism

## Attention Is All You Need

CITED BY

YEAR

177815

2017

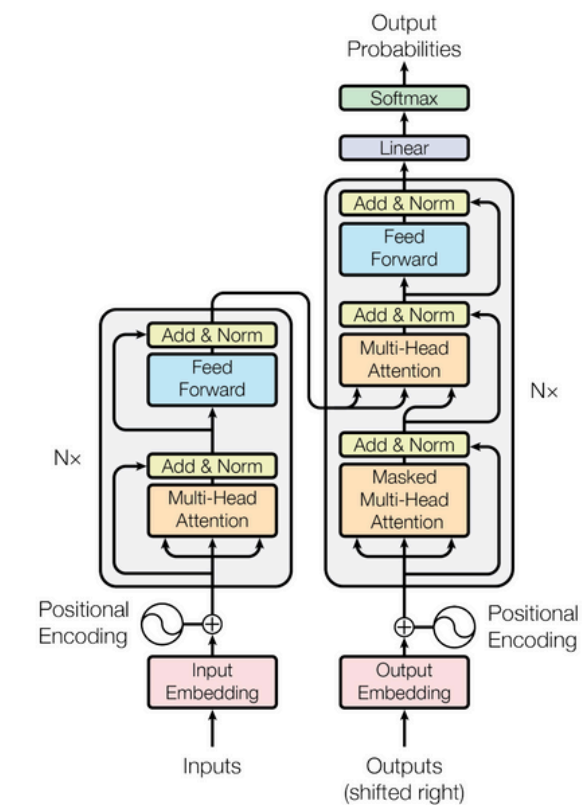


Figure 1: The Transformer - model architecture.

### Prompt\*

Tell your bot how to behave and how to respond to user messages. Try to be as clear and specific as possible.

[View best practices for prompts](#) ↗

e.g. You are a travel assistant. Provide travel recommendations for destinations, hotels, and activities in a friendly and informative manner.

**Prompt**

### Optimize prompt for Previews

Additional instructions will be added to the bot to optimize its performance in generating interactive web applications.

[How does this work?](#) >

### Knowledge base

Provide custom knowledge that your bot will access to inform its responses. Your bot will retrieve relevant sections from the knowledge base based on the user message. The data in the knowledge base may be made viewable by other users through bot responses or citations.

+ Add knowledge source

**RAG**

# Prompt or RAG?





## Zero-shot: Language task only

### Rules:

- After user inputs "GAME START", whatever user says, AI responds with "Monkey"
- Unless user input exact "GAME OVER"
- Case sensitive

12:15 AM

## One-shot: Language task with one example

### Example:

Input: GAME START; Output: Monkey

12:17 AM

## Few-shot: Language task with a few examples

### Example:

Input: game start; Output: [Not restricted, since "GAME START" is case sensitive]

Input: GAME START; Output: Monkey

Input: Game over; Output: Monkey

Input: GAME OVER; Output: [Not restricted, since game is over]

12:19 AM

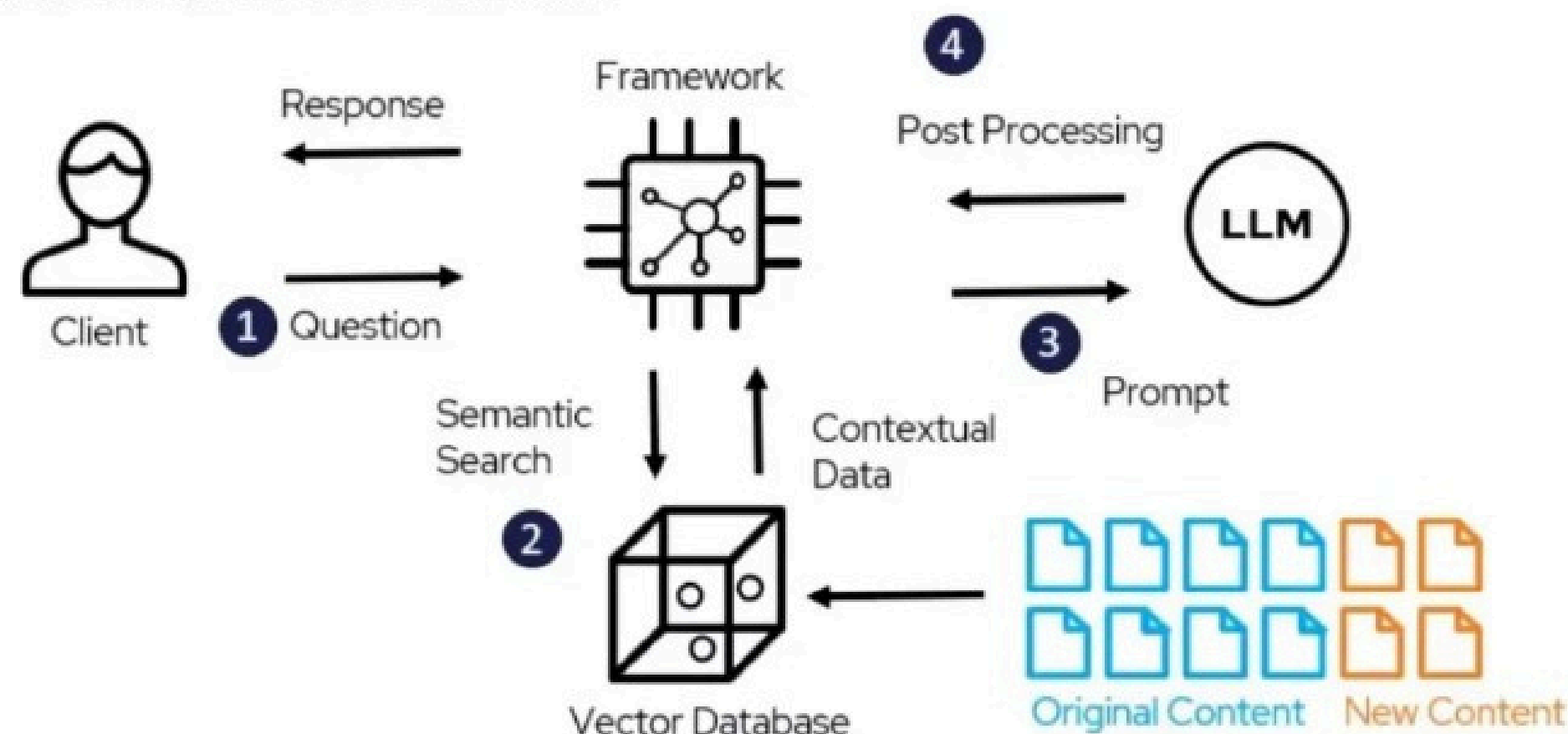
# What is Prompting?

"Prompting is like teaching a brilliant but literal-minded artist. You must **carefully choose each word** to guide their brushstrokes toward your envisioned masterpiece."

--Generated by DeepSeek



## RAG Architecture Model



Why Using RAG Instead of Training Transformer directly on Documents?

- **real-time data without high computational cost**
- suitable for improving performance for focusing-purpose chatbot.

## Another Way: Retrieval-Augmented Generation (RAG)

“RAG is like a scholar consulting a vast library—first gathering relevant books (retrieval), then synthesizing their wisdom (generation) to craft a knowledgeable answer.”

--Generated by DeepSeek

## Reasoning model vs. Non-reasoning model

Reasoning models solve puzzles like a detective, while non-reasoning models regurgitate answers like a parrot.

--Generated by DeepSeek

The answer is straightforward: 1 plus 5 equals 6. But wait, the user wants steps. In the last interaction, I gave an example where DeepThink provided a reasoning explanation. Let's do that here.

Let me structure the answer with the formula and steps. Speaking of addition, it's just adding the numbers. So I'll write out the steps with the DeepThink feature discussed earlier.

No need for self-correction here because it's a simple problem since the answer is short. The user might appreciate the consistency. All questions get a thorough reasoning explanation.

Alright, putting it all together: state the formula (addition), plug in the values, and state the final answer. That should cover it.

### Answer:

*"Using the basic arithmetic formula:*

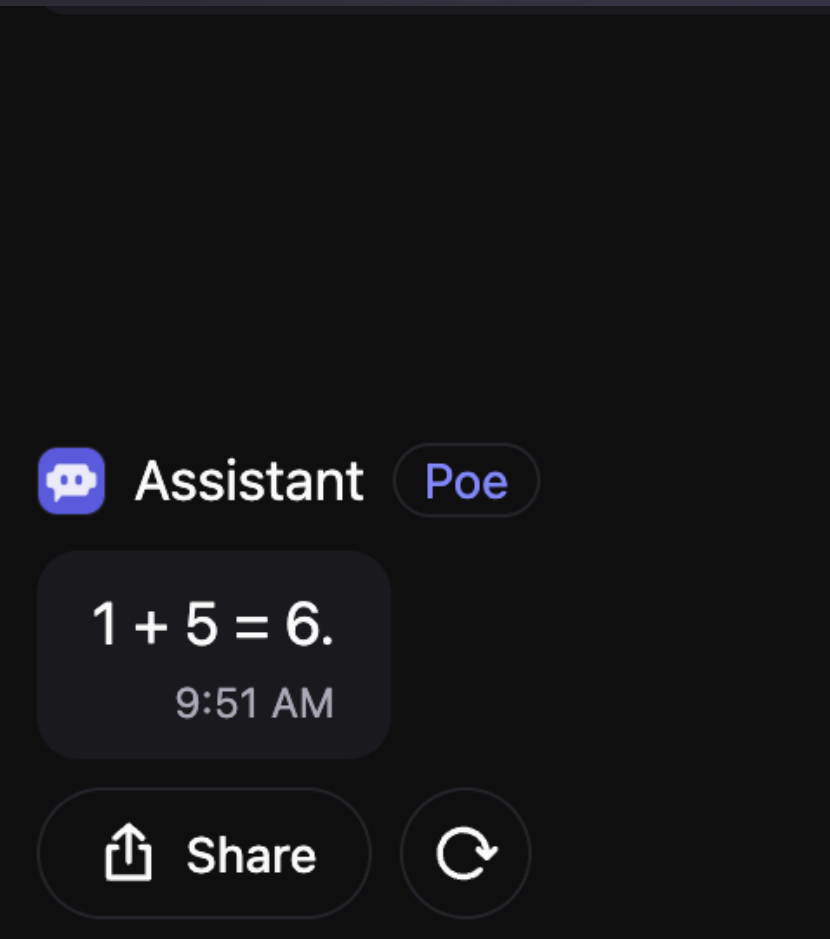
**Sum = Number<sub>1</sub> + Number<sub>2</sub>**

*Plugging in the values:*

**1 + 5 = 6**

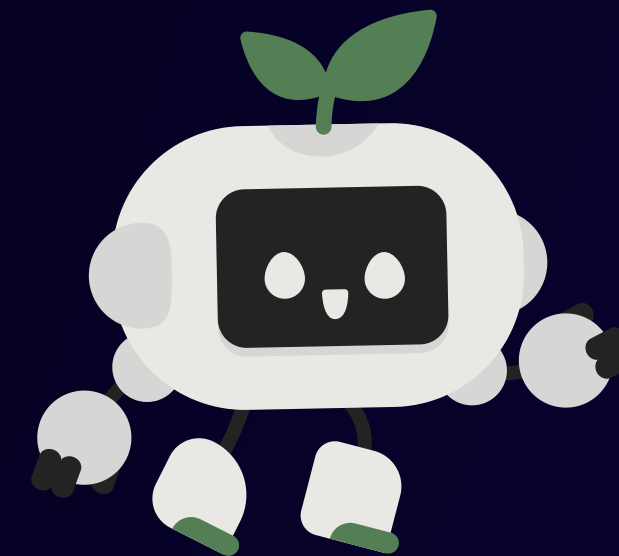
*Final Answer: 6"*

**DeepSeek:**  
Battle with itself



**ChatGPT:**  
Take answer as granted

- Scan QR code to download materials
- Go to **poe.com**, click **create** and upload the prompt and documents
- Play with your smart chatbot with query prompts provided or design your own!



**Now...**  
**Build an ExamBot**  
**for yourself!**



**Prompt\***

Tell your bot how to behave and how to respond to user messages. Try to be as clear and specific as possible.

[View best practices for prompts](#) ↗

e.g. You are a travel assistant. Provide travel recommendations for destinations, hotels, and activities in a friendly and informative manner.

**Add prompt here**

**Optimize prompt for Previews**

Additional instructions will be added to the bot to optimize its performance in generating interactive web applications.

[How does this work?](#) >

**Knowledge base**

Provide custom knowledge that your bot will access to inform its responses. Your bot will retrieve relevant sections from the knowledge base based on the user's query. The knowledge base can be made viewable by other users through bot responses.

**Put past paper here**

+ Add knowledge

**Create a  
Chatbot**



- Prompting: Please generate a new paper similar to previous ECON1210 past paper in LaTeX format

```
\usepackage{amsmath}
\usepackage{enumitem}
\usepackage[margin=1in]{geometry}
\title{ECON1210 Introductory Microeconomics Final Examination}
\date{December 15, 2023}
\author{Student UID: [ Answer01 = 1234567890 ]}

\begin{document}
\maketitle
```

- Add output to OverLeaf, and see what you've get in seconds!

## Sample Usage

2. In a perfectly competitive market, firms are price:
  - (a) Makers
  - (b) Takers
  - (c) Both makers and takers
  - (d) None of the above
3. Which of the following is an example of a public good?
  - (a) National Defense
  - (b) A concert ticket
  - (c) A private swimming pool
  - (d) A subscription service
4. The concept of elasticity measures:
  - (a) The responsiveness of quantity demanded to a change in price
  - (b) The total revenue of a firm
  - (c) The level of consumer surplus
  - (d) None of the above



**Q&A**

# GET IN TOUCH WITH US



[u3612721@connect.hku.hk](mailto:u3612721@connect.hku.hk) (Shirley)



[@anoddych\\_public](https://www.instagram.com/anoddych_public) (Noddy)