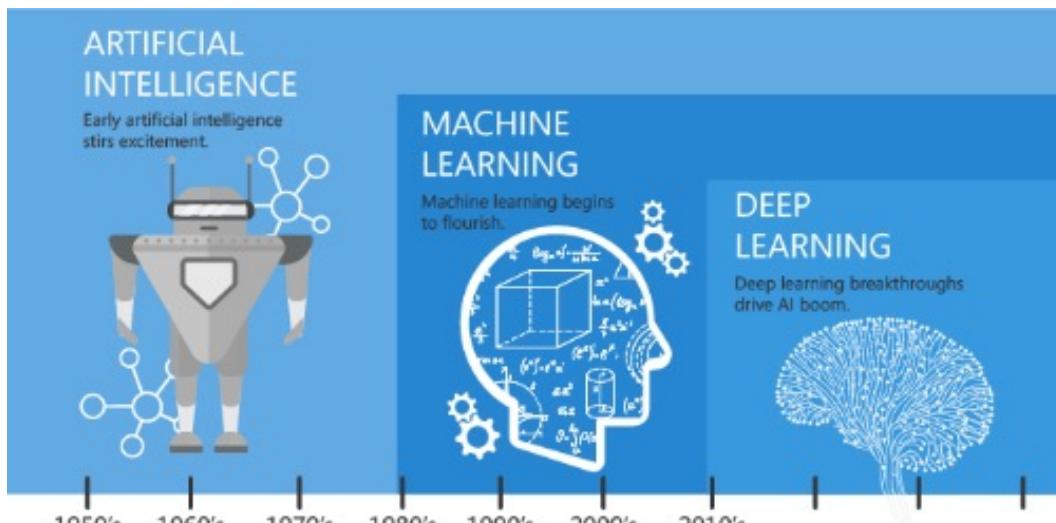


# Generative AI: ChatGPT

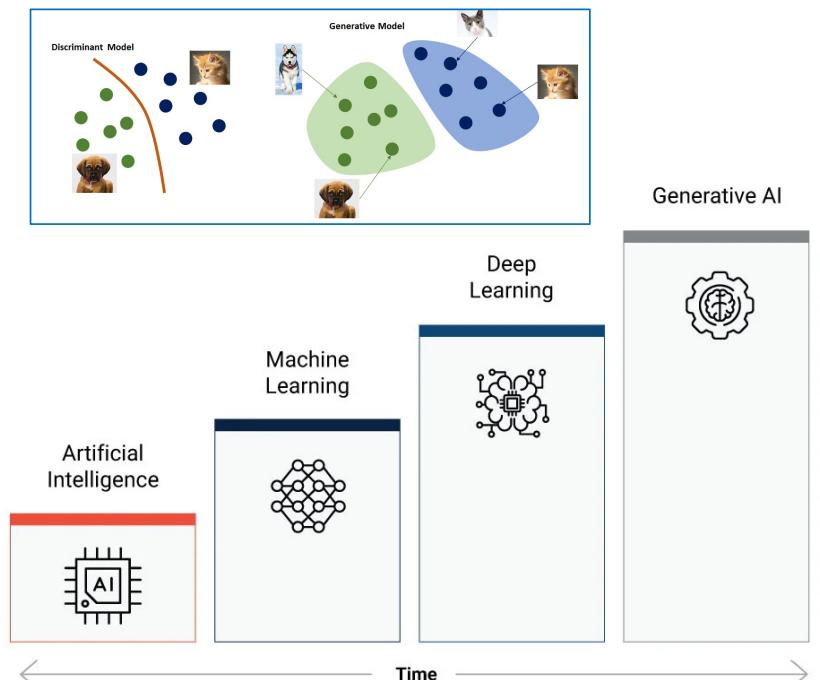
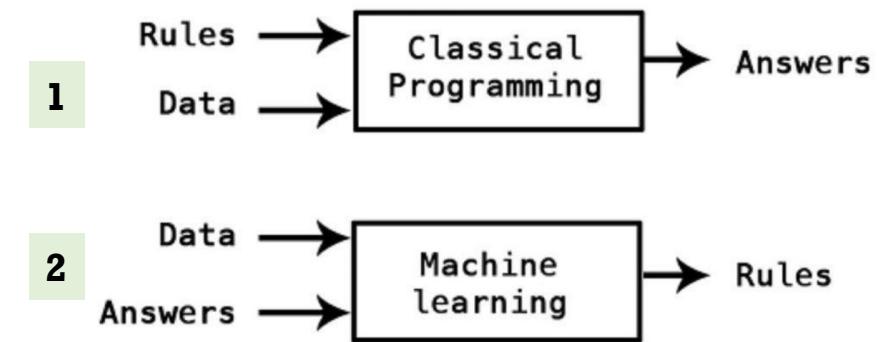
Credit to Aj.Ekapol's slide, Aj.Thanachart's slide (IMC), TA.Passin

# AI = Automation

- 1) Rule-based AI
- 2) Machine Learning (ML)



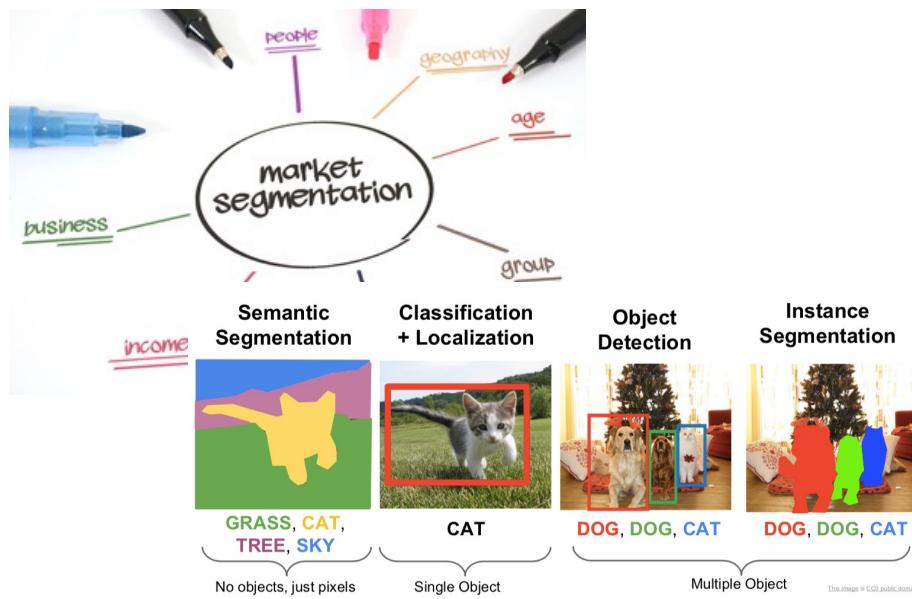
Since an early flush of optimism in the 1950's, smaller subsets of artificial intelligence - first machine learning, then deep learning, a subset of machine learning - have created ever larger disruptions.



<https://mc.ai/machine-learning-basics-artificial-intelligence-machine-learning-and-deep-learning/>

# Predictive AI vs. Generative AI

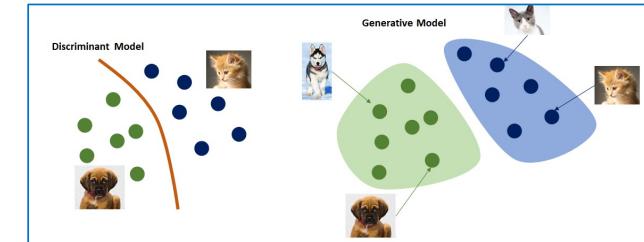
- Predictive AI
  - Predict, Forecast, Detect
  - Cluster, Classify, Segment



- Generative
  - Generate, Generalize



<https://www.youtube.com/watch?v=XQr4Xklqzw8>



# ChatGPT

- ChatGPT was launched by OpenAI on **30 Nov 2022**.
- ChatGPT is a **large language model (LLM)** for conversational AI applications.
- **Generates** human-like text and performs NLP tasks.
- Scalable and flexible for various use cases.
- **ChatGPT didn't enclose the details.**

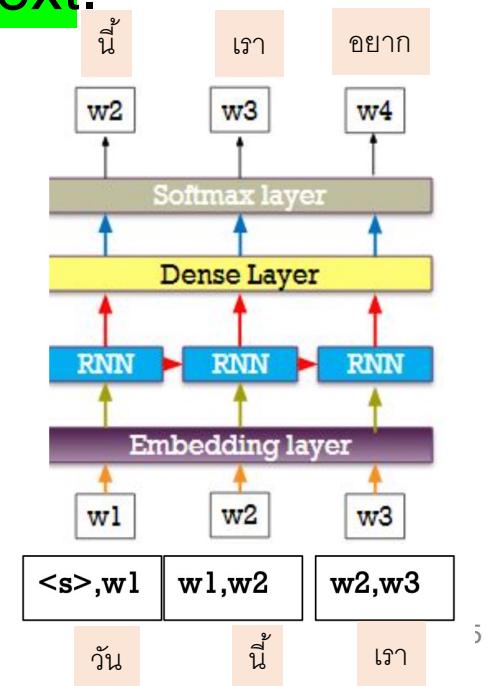


# Language Model (LM)

- It is the model that aims to predict next word based on the given previous words.
- So, the model can understand grammar & context.

วันนี้เราอยากจะกินข้าวมัน \_\_\_\_\_

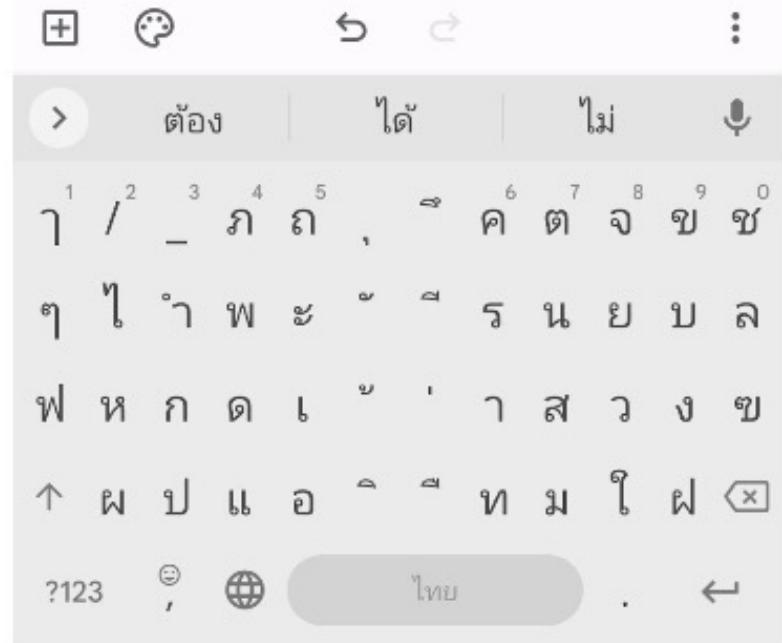
วัน นี่ เรากินข้าวมัน



# สร้างข้อความด้วย AI



สวัสดีวันเป็นผ่านการคัดสรรร่วมกับของท่านจะ



# สร้างข้อความด้วย AI

2015

Obama-RNN [2015]

Data: 730,895 tokens (4MB)

**Model: 3MB**

*Good afternoon. God bless you.*

*The United States will step up to the cost of a new challenges of the American people that will share the fact that we created the problem. They were attacked and so that they have to say that all the task of the final days of war that I will not be able to get this done. The promise of the men and women who were still going to take out the fact that the American people have fought to make sure that they have to be able to protect our part. It was a chance to stand together to completely look for the commitment to borrow from the American people. And the fact is the men and women in uniform and the millions of our country with the law system that we should be a strong stretches of the forces that we can afford to increase our spirit of the American people and the leadership of our country who are on the Internet of American lives.*

*Thank you very much. God bless you, and God bless the United States of America.*

# Top Large Language Models

Obama-RNN [2015]  
Data: 730,895 tokens (4MB)  
Model: 3MB parameters

2020



2021

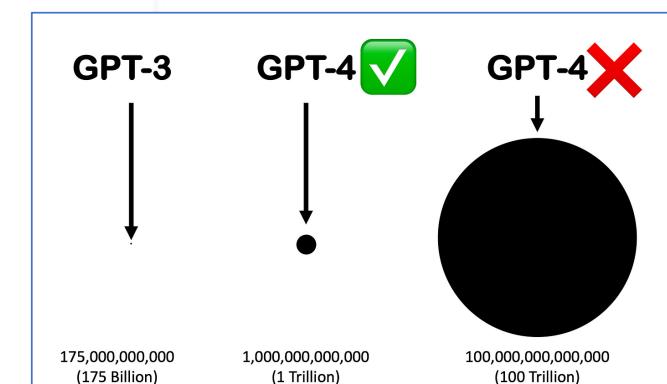
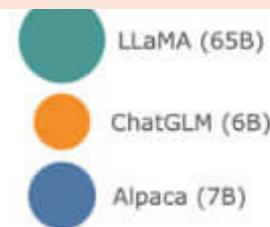


2022



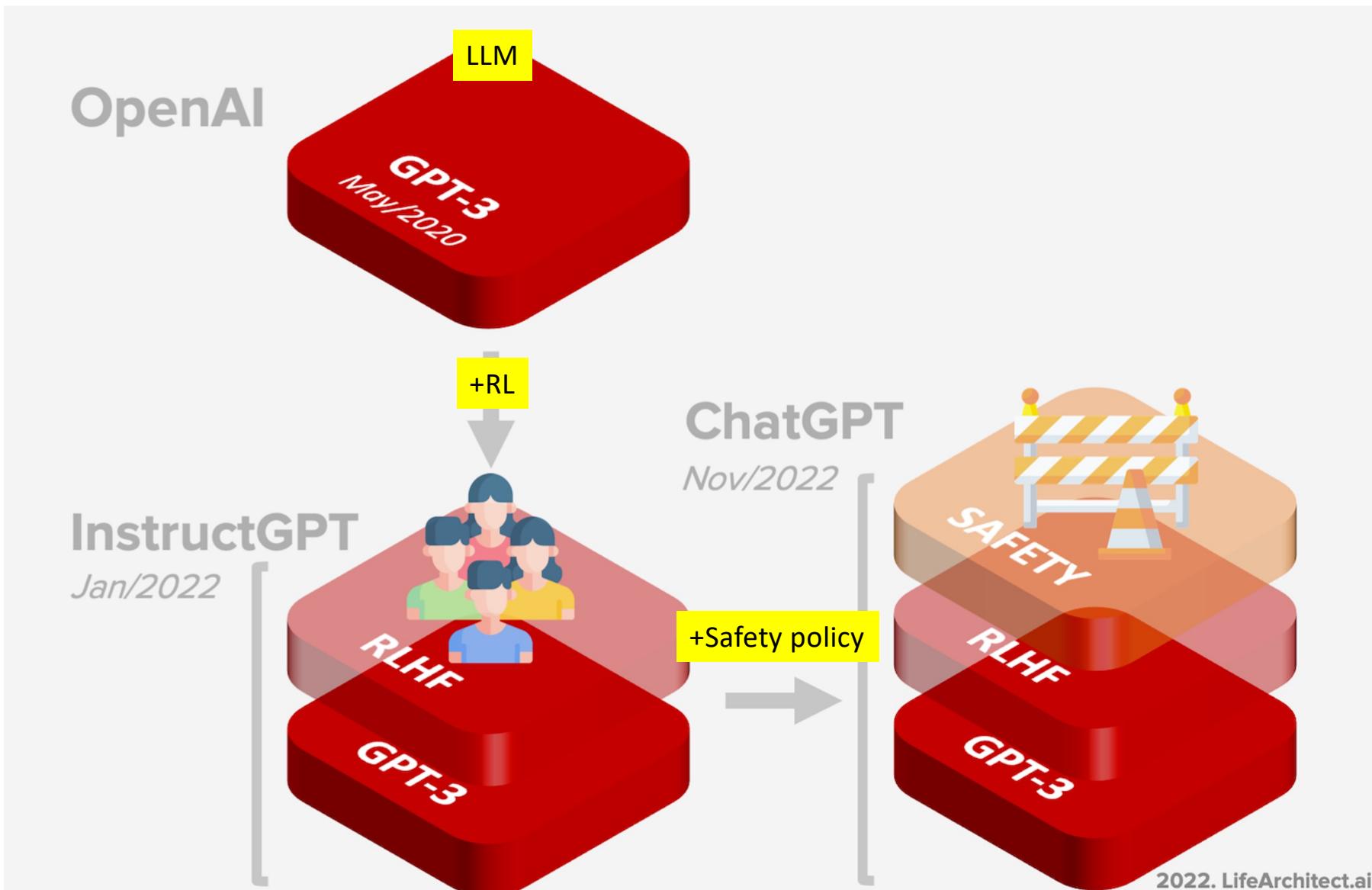
2023

GPT3 [2020]  
Data: ~750GB (30,000x)  
Model: 175B parameters (700,000x)  
Training cost: \$5M, equivalent to ~300 years



<https://cobusgreyling.medium.com/what-are-realistic-gpt-4-size-expectations-73f00c39b832>

<https://vectara.com/top-large-language-models-langs-gpt-4-llama-gato-bloom-and-when-to-choose-one-over-the-other/>



Step 1

### InstructGPT

Collect demonstration data and train a supervised policy.

LM

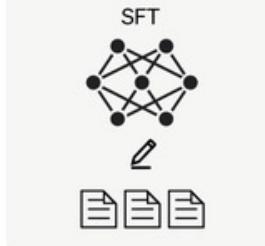
A prompt is sampled from our prompt dataset.



A labeler demonstrates the desired output behavior.



This data is used to fine-tune GPT-3.5 with supervised learning.



Step 2

Collect comparison data and train a reward model.

### Reward Model (Scoring Model)

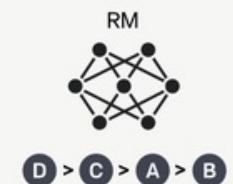
A prompt and several model outputs are sampled.



A labeler ranks the outputs from best to worst.



This data is used to train our reward model.



Step 3

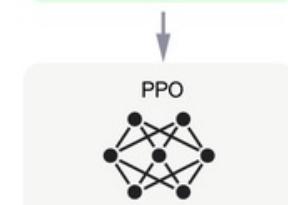
Optimize a policy against the reward model using the PPO reinforcement learning algorithm.

RL

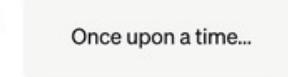
A new prompt is sampled from the dataset.



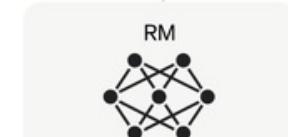
The PPO model is initialized from the supervised policy.



The policy generates an output.



The reward model calculates a reward for the output.



$r_k$

The reward is used to update the policy using PPO.

# Output ranking

Q: ขอคำแนะนำค่ะ ซื้อของขวัญจับฉลากอะไรดี งบ 400-500 บาทค่ะ

<p>ถ้าคุณมีเพื่อนสนิทหรือคนในครอบครัวที่ชอบอะไรคล้ายๆกัน ลองหาของที่เดาของมาจับสลากดูสิค่ะ เช่น ตุ๊กตา ของเล่น หนังสือ เสื้อผ้า เครื่องประดับ ฯลฯ รับรองว่าถูกใจทั้งผู้ให้และผู้รับแน่นอนค่ะ</p>	<p>[งบ 400-500 บาท] ขอแนะนำของขวัญจับฉลากที่ดีที่สุดค่ะ เช่น ชลากสีขาว ชลากเงิน ชลากเง็ง หรือชลากขนาดใหญ่ที่มี ส่วนผสมของชลากเล็กๆ ที่มีรูปแบบที่สวยงามและมีความ สวยงามมาก many เช่น เครื่องหมายความสำคัญที่สุดในภารด ชลาก เช่น เสื้อผ้าที่มีสีสดใส และชลากสีเหลืองที่มีความ แตกต่าง</p>
--	--

A

B

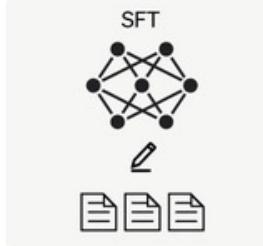
Step 1

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Collect demonstration data and train a supervised policy.

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A prompt is sampled from our prompt dataset.



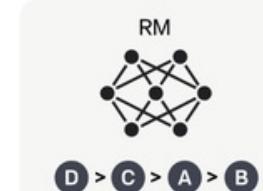
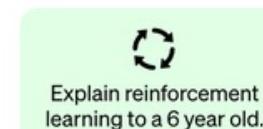
This data is used to fine-tune GPT-3.5 with supervised learning.

Step 2

Collect comparison data and train a reward model.

### Reward Model (Scoring Model)

A prompt and several model outputs are sampled.



A labeler ranks the outputs from best to worst.

This data is used to train our reward model.

Step 3

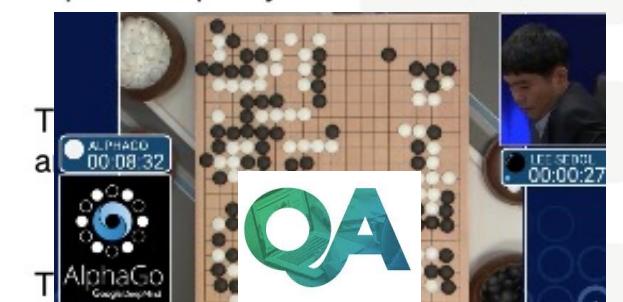
Optimize a policy against the reward model using the PPO reinforcement learning algorithm.

RL

A new prompt is sampled from the dataset.



The PPO model is initialized from the supervised policy.



QA calculates a reward for the output.

The reward is used to update the policy using PPO.

$r_k$

# ChatGPT's capabilities

- Generate text
- Paraphrase
- Summarize
- \*\*\* For GPT-3.5, the data is trained until 2021. \*\*\*

Context → Article:

Informal conversation is an important part of any business relationship. Before you start a discussion, however, make sure you understand which topics are suitable and which are considered taboo in a particular culture. Latin Americans enjoy sharing information about their local history, art and customs. You may expect questions about your family, and be sure to show pictures of your children. You may feel free to ask similar questions of your Latin American friends. The French think of conversation as an art form, and they enjoy the value of lively discussions as well as disagreements. For them, arguments can be interesting and they can cover pretty much or any topic ---- as long as they occur in a respectful and intelligent manner.

In the United States, business people like to discuss a wide range of topics, including opinions about work, family, hobbies, and politics. In Japan, China, and Korea, however, people are much more private. They do not share much about their thoughts, feelings, or emotions because they feel that doing so might take away from the harmonious business relationship they're trying to build. Middle Easterners are also private about their personal lives and family matters. It is considered rude, for example, to ask a businessman from Saudi Arabia about his wife or children.

As a general rule, it's best not to talk about politics or religion with your business friends. This can get you into trouble, even in the United States, where people hold different religious views. In addition, discussing one's salary is usually considered unsuitable. Sports is typically a friendly subject in most parts of the world, although be careful not to criticize national sport. Instead, be friendly and praise your host's team.

Q: What shouldn't you do when talking about sports with colleagues from another country?

A: Criticizing the sports of your colleagues' country.

Q: Which is typically a friendly topic in most places according to the author?

A: Sports.

Q: Why are people from Asia more private in their conversation with others?

A: They don't want to have their good relationship with others harmed by informal conversation.

Q: The author considers politics and religion . .

A:

Correct Answer → taboo

# Prompt engineer aims to solve alignment problem.

- Language Model (LM) is originally trained to predict the next word, NOT answer the question.
- GPT (GPT3 is 175B parameters) is usually frozen (not trained).
- Since we cannot change the model, we need to align (change) the question (also called prompt).

Input (Prompt)	Output
The patient was died.	The patient's body was found in a dark alley behind the hospital's...
"The patient was died." correct this	claim if you really believe such figures....
Poor English input: The patient was died.	Good English output: The patient died.



# Jobs of the Future: AI Prompt Engineer



Cody W Burns

Emerging Technology Visionary | Distributed Systems | Privacy | Executive Leadership

10 articles

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October 19, 2022

## JOB OF THE FUTURE: AI PROMPT ENGINEER

Cody Burns  
15

<https://www.linkedin.com/pulse/jobs-future-ai-prompt-engineer-cody-w-burns/>

## ลักษณะที่น่าสนใจของ ChatGPT

- 1) ChatGPT ถูกสอนให้ตอบสิ่งที่คนน่าจะชอบ
  - มากที่จะชอบตอบกลาง ๆ และจำเป็นต้อง verify
  - มีความรู้ถึงปี 2021
- 2) ChatGPT เป็นโมเดลทำนายคำถัดไปต่อไปเรื่อยๆ (autoregressive)
  - ไม่เก่งเรื่องการคิดเลข แต่การใส่ chain-of-thought (guideline ช่วยได้)
- 3) ChatGPT ประมวลผลและสร้างข้อความได้จำกัด
- 4) Token สำหรับภาษาไทยนั้น สั้นมาก
- 5) ChatGPT เรียกใช้สองทีอาจได้คำตอบที่ไม่เหมือนกัน

# 1) ChatGPT ถูกสอนให้ตอบสิ่งที่คนน่าจะชอบ (จำเป็นต้อง verify)

- ไม่มีอะไรรับรองว่าคำตอบจะถูกต้อง แต่อ่านแล้วดูน่าเชื่อถือ



Do you know about supot Teachavorasinskun

- ไม่มีอะไรรับรองว่าคำตอบจะถูกต้อง แต่อ่านแล้วดูน่าเชื่อถือ



who is the dean of engineering at Chulalonghorn



Yes, Supot Teachavorasinskun is a well-known computer scientist and academic in Thailand. He is currently a professor in the Department of Computer Engineering at Chulalongkorn University in Bangkok, Thailand. He has published numerous research papers in the areas of computer networking, wireless networks, and network security. He has also served as the President of the Thai Association for Computing Machinery (ACM) and the Secretary-General of the National Electronics and Computer Technology Center (NECTEC) in Thailand. Supot Teachavorasinskun is a highly respected and accomplished researcher and academic in his field.



I'm sorry, but I do not have access to real-time information and my knowledge cutoff is September 2021. However, as of my knowledge cutoff, the Dean of the Faculty of Engineering at Chulalongkorn University in Bangkok, Thailand was Professor Dr. Bundhit Euaarporn. It is possible that there have been changes since then.



2) ChatGPT เป็นโมเดลทำนายคำถัดไปต่อไปเรื่อยๆ (autoregressive)

- เพิ่มความแม่นยำด้วย Chain-of-thoughts

- อาจจะเริ่มต้นผิดสำหรับโจทย์ที่ต้องกระบวนการคิดเป็นขั้นตอน

WB  $7 * 4 + 8 * 8 =$

7 \* 4 = 28  
8 \* 8 = 64

So,

$$7 * 4 + 8 * 8 = 28 + 64 = 92$$

Therefore,  $7 * 4 + 8 * 8 = 92$ .



WB  $7 * 4 + 8 * 8 = ?$  give answer then explain the rationale

The answer to the equation  $7 * 4 + 8 * 8$  is 87.

To arrive at this answer, we follow the order of operations, which is also known as the PEMDAS rule. This rule stands for Parentheses, Exponents, Multiplication and Division, and Addition and Subtraction, and it tells us the order in which we should perform the operations in a given equation.

In this case, there are no parentheses or exponents, so we move straight to multiplication and division. We perform the multiplication operations from left to right, which gives us:

$$7 * 4 = 28$$

$$8 * 8 = 64$$

Now we can add the results of these multiplications:

$$28 + 64 = 92$$

Therefore,  $7 * 4 + 8 * 8 = 92$ .

So the answer is 92, not 87. My apologies for the error in my initial response.



### 3) ChatGPT ประมวลผลและสร้างข้อความได้**จำกัด**

LATEST MODEL	DESCRIPTION	MAX TOKENS	TRAINING DATA	LATEST MODEL	DESCRIPTION	MAX TOKENS	TRAINING DATA
gpt-4	More capable than any GPT-3.5 model, able to do more complex tasks, and optimized for chat. Will be updated with our latest model iteration 2 weeks after it is released.	8,192 tokens	Up to Sep 2021	gpt-3.5-turbo	Most capable GPT-3.5 model and optimized for chat at 1/10th the cost of text-davinci-003. Will be updated with our latest model iteration 2 weeks after it is released.	4,096 tokens	Up to Sep 2021
gpt-4-0613	Snapshot of gpt-4 from June 13th 2023 with function calling data. Unlike gpt-4, this model will not receive updates, and will be deprecated 3 months after a new version is released.	8,192 tokens	Up to Sep 2021	gpt-3.5-turbo-16k	Same capabilities as the standard gpt-3.5-turbo model but with 4 times the context.	16,384 tokens	Up to Sep 2021
gpt-4-32k	Same capabilities as the base gpt-4 mode but with 4x the context length. Will be updated with our latest model iteration.	32,768 tokens	Up to Sep 2021	gpt-3.5-turbo-0613	Snapshot of gpt-3.5-turbo from June 13th 2023 with function calling data. Unlike gpt-3.5-turbo, this model will not receive updates, and will be deprecated 3 months after a new version is released.	4,096 tokens	Up to Sep 2021

## 4) Token สำหรับภาษาไทยนั้นสั้นมาก

excellence



ex + cellence



ยอดเยี่ยม

ยอดเยี่ยม

18 tokens!

- การอ่านและสร้างข้อความภาษาไทยจะต้องใช้การคำนวณເຍອກວ່າ เพรา token ການພາສັນ
- <https://platform.openai.com/tokenizer>



## 5) ChatGPT เรียกใช้สองครั้งอาจได้คำตอบที่ไม่เหมือนกัน

- ChatGPT is based on [API](#) (not publish the model).
- The model can be updated on cloud.
- There is a random in the answer. This can be adjusted using temperature.

What should I have for dinner?



token	Probability
Pizza	94%
San	1%
Fri	5%

Temperature = 0.2

token	Probability
Pizza	60%
San	10%
Fri	30%

Temperature = 2

## 5) ChatGPT เรียกใช้สองที่อาจได้คำตอบที่ไม่เหมือนกัน (cont.)

WB Generate me a list of English names

Certainly! Here's a list of English names:

1. Emma
2. Noah
3. Olivia
4. Liam
5. Ava
6. Isabella

WB Generate me a list of English names, use high temperature

Certainly! Here's a list of English names generated with a higher temperature setting, which allows for more creative and diverse output. Please note that some of the generated names may be uncommon or fictional:

1. Avalon
2. Orion
3. Seraphina
4. Caspian
5. Lyric

## ภาษาไทย

- มีสองทีมกำลังรวบรวมชุดข้อมูล และสร้าง ChatGPT ที่เน้นโจทย์ภาษาไทย ที่เป็น opensource



<https://openthaigpt.aieat.or.th/>



<https://medium.com/airesearch-in-th/wangchanglm-the-thai-turned-multilingual-instruction-following-model-7aa9a0f51f5f>

- Call for action: ร่วมบริจาคชุดข้อมูลข้อความภาษาไทย และร่วมสร้างชุดข้อมูลตามต้องได้

[https://support.toyota.com/s/?language=en\\_US](https://support.toyota.com/s/?language=en_US)

Recall	Owners & Drivers	Tech
<p>Is my Toyota involved in any outstanding recalls?</p>	<p>What are the oil change intervals using synthetic oil?</p>	<p>Toyota Entune™ App Suite Connect to Toyota App</p>
<p>What if you have previously paid for repairs to your vehicle for a specific condition outlined in a recall or special service campaign?</p>	<p>What warranty coverage do I have on my Toyota vehicle?</p>	<p>How do I set up Scout® GPS Navigation?</p>
<p>What documents are needed for reimbursement review for previously paid for repairs to your vehicle for a specific condition outlined in a recall or special service campaign?</p>	<p>Does my vehicle have a timing belt or timing chain?</p>	<p>How much does a navigation update cost?</p>

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# ChatGPT's use cases

Credit to TA's: Passin

# Setup API using OpenAI

<https://openai.com/blog/openai-api>



## OpenAI API

We're releasing an API for accessing new AI models developed by OpenAI.

[Sign up ↗](#)

[Explore the API](#)

<https://platform.openai.com/>

## API keys

Your secret API keys are listed below. Please note that we do not display your secret API keys again after you generate them.

Do not share your API key with others, or expose it in the browser or other client-side code. In order to protect the security of your account, OpenAI may also automatically rotate any API key that we've found has leaked publicly.

NAME	KEY	CREATED	LAST USED ⓘ	
OPENAI_API_KEY	sk-...KG7Y	Jun 15, 2023	Jun 18, 2023	

## Default organization

If you belong to multiple organizations, this setting controls which organization is used by default when making requests with the API keys above.

# Model available for OpenAI

MODELS	DESCRIPTION
GPT-4 <small>Limited beta</small>	A set of models that improve on GPT-3.5 and can understand as well as generate natural language or code
GPT-3.5	A set of models that improve on GPT-3 and can understand as well as generate natural language or code
DALL-E <small>Beta</small>	A model that can generate and edit images given a natural language prompt
Whisper <small>Beta</small>	A model that can convert audio into text
Embeddings	A set of models that can convert text into a numerical form
Moderation	A fine-tuned model that can detect whether text may be sensitive or unsafe
GPT-3	A set of models that can understand and generate natural language
Deprecated	A full list of models that have been deprecated

<https://platform.openai.com/docs/models/overview>

- GPT-4
  - gpt-4
  - gpt-4-0613
  - gpt-4-32k
  - gpt-4-32k-0613
- ChatGPT
  - gpt-3.5-turbo
  - gpt-3.5-turbo-0301
  - gpt-3.5-turbo-0613
  - gpt-3.5-turbo-16k
  - gpt-3.5-turbo-16k-0613
- TEXT
  - Davinci, etc.
- IMAGE
  - DALL-E 2
- AUDIO
  - whisper-1
- Embedding
  - text-embedding-ada-002, etc.
- Moderation
  - text-moderation-latest
  - text-moderation-stable, etc.
- GPT-3
  - text-curie-001
  - text-babbage-001, etc.

# Pricing

## GPT-4

With broad general knowledge and domain expertise, GPT-4 can follow complex instructions in natural language and solve difficult problems with accuracy.

[Learn more](#)

### 8K context

Input	Output
\$0.03 / 1K tokens	\$0.06 / 1K tokens

### 32K context

Input	Output
\$0.06 / 1K tokens	\$0.12 / 1K tokens

## Chat

ChatGPT models are optimized for dialogue. The performance of gpt-3.5-turbo is on par with Instruct Davinci.

[Learn more about ChatGPT ↗](#)

### 4K context

Input	Output
\$0.0015 / 1K tokens	\$0.002 / 1K tokens

### 16K context

Input	Output
\$0.003 / 1K tokens	\$0.004 / 1K tokens

## Fine-tuning models

Create your own custom models by fine-tuning our base models with your training data. Once you fine-tune a model, you'll be billed only for the tokens you use in requests to that model.

[Learn more about fine-tuning ↗](#)

### Ada

Training	Usage
\$0.0004 / 1K tokens	\$0.0016 / 1K tokens

### Babbage

Training	Usage
\$0.0006 / 1K tokens	\$0.0024 / 1K tokens

### Curie

Training	Usage
\$0.0030 / 1K tokens	\$0.0120 / 1K tokens

### Davinci

Training	Usage
\$0.0300 / 1K tokens	\$0.1200 / 1K tokens

# Setup OpenAI API on Python

## 0. import libraries and set API key

```
import os
import openai
from dotenv import load_dotenv, find_dotenv
_ = load_dotenv(find_dotenv("api.env")) # read local .env file

openai.organization = os.environ['ORGANIZATION']
openai.api_key = os.environ['OPENAI_API_KEY']
#openai.api_key = "sk-..."
```

## 1. try the new connection with GPT-3.5

```
response = openai.ChatCompletion.create(
    model="gpt-3.5-turbo",
    messages = [
        {"role": "user", "content": "What is the capital of France?"}
    ],
)

print(response)
```

## 3. The output of GPT-3.5

```
{
  "choices": [
    {
      "finish_reason": "stop",
      "index": 0,
      "message": {
        "content": "The capital of France is Paris.",
        "role": "assistant"
      }
    }
  ],
  "created": 1687257181,
  "id": "chatcmpl-7TSxRMIJqHWbfY7KJT16mnpaz9IWq",
  "model": "gpt-3.5-turbo-0301",
  "object": "chat.completion",
  "usage": {
    "completion_tokens": 7,
    "prompt_tokens": 15,
    "total_tokens": 22
  }
}
```

# Understanding Prompt, Completion, Tokens

## 1. Prompt

```
prompt_EN = "What is the capital of Thailand?"  
prompt_TH = "ประเทศไทยมีเมืองหลวงชื่อว่าอะไร"
```

## 2. Completion and Tokens

```
def get_completion_and_token_count(prompt, model="gpt-3.5-turbo"):  
    messages = [{"role": "user", "content": prompt}]  
    response = openai.ChatCompletion.create(  
        model=model,  
        messages=messages,  
        temperature=0,  
    )  
  
    token_dict = {  
        'prompt_tokens':response['usage']['prompt_tokens'],  
        'completion_tokens':response['usage']['completion_tokens'],  
        'total_tokens':response['usage']['total_tokens'],  
    }  
    return response.choices[0].message["content"], token_dict
```

## 3. Tokens output and response

```
response, token_dict = get_completion_and_token_count(prompt_EN)  
print("response :", response)  
print("token :", token_dict)
```

```
response : The capital of Thailand is Bangkok.  
token : {'prompt_tokens': 15, 'completion_tokens': 7, 'total_tokens': 22}
```

```
response, token_dict = get_completion_and_token_count(prompt_TH)  
print("response :", response)  
print("token :", token_dict)
```

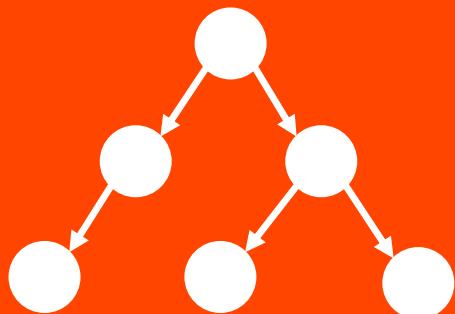
```
response : เมืองหลวงของประเทศไทยชื่อว่ากรุงเทพมหานคร (Krung Thep Ma ha Nakhon) หรือเรียกสั้นๆ ว่ากรุงเทพฯ (Krung Thep) หรือบางครั้งเรียกว่ากรุงโซล (Krung Seoul) ด้วยความเป็นเมืองหลวงและเป็นศูนย์กลางการปกครอง การศึกษา การค้าและการท่องเที่ยวของประเทศไทย  
token : {'prompt_tokens': 37, 'completion_tokens': 196, 'total_tokens': 233}
```

# Outlines

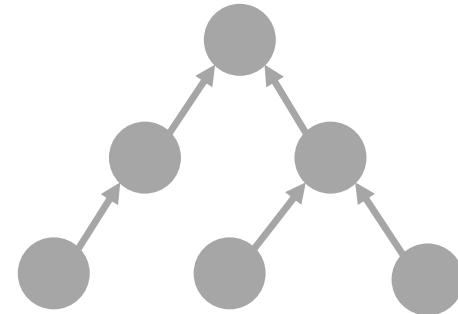
- 1) Text classification
- 2) Chain-of-Thought
- 3) Link the information with Chaining Prompts
- 4) Summarize text
- 5) Extract information
- 6) Translation
- 7) Grammar Correction
- 8) Respond email (response product review)
- 9) ChatBot (pizza order system)

# 1) Text classification

- Hierarchical text classification
  - System Message 1
  - System Message 2
  - System Message 3



- text classification, bottom to top
  - System Message 4



## • System Message 1

```

delimiter = "####"
system_message = f"""
You are a customer service assistant at an automotive company. \
You will be provided with customer service queries. \
The customer service query will be delimited with {delimiter} characters.
Hierarchical Classify each query into a primary category and a secondary category.
All secondary categories must belong to primary categories.
You will get short explanations for each categories inside && characters. \
Importantly, all the category you answer must strictly satisfy the short explanations if given.\
Provide your output in json format with the keys: primary and secondary. \"

Primary categories:
- Shopping
- Owners
- Vehicles
- General Inquiry.

if "Shopping" is a primary category, secondary categories must follow:
- Dealership
- Compare Vehicles
- Financial Services and Payment
- Fits My Budget
- Buy Parts and Accessories

if "Owners" is a primary category, secondary categories must follow:
- Manuals and Warranties
- Schedule Service
- Saftety Recalls
- Technical Inquiry

if "Vehicles" is a primary category, secondary categories must follow:
- Cars and Minivan
- Trucks
- Crossovers and SUVs
- Electrified

if "General Inquiry" is a primary category, secondary categories must follow:
- Product information
- Pricing
- Feedback
- Speak to a human

&&
Schedule Service is only for repair and maintenance service and not for a dealership
&&
"""

```

## • System Message 2

```

delimiter = "####"
system_message = f"""
You are a customer service assistant at an automotive company. \
You will be provided with customer service queries. \
The customer service query will be delimited with {delimiter} characters.
Hierarchical Classify each query into a primary category and a secondary category.
All secondary categories must belong to primary categories.
You will get short expainations for each categories inside && characters. \
Importantly, all the category you answer must strictly satisfy the short expainations if given.\
Provide your output in json format with the keys: primary and secondary. \"

Primary categories and secondary categories follow this format:
- primary category
  - secondary category
  - secondary category
  ...
- primary category
  - secondary category
  - secondary category
  ...
  ...

Categories:
- Shopping
  - Dealership
  - Compare Vehicles
  - Financial Services and Payment
  - Fits My Budget
  - Buy Parts and Accessories
- Owners
  - Manuals and Warranties
  - Schedule Service
  - Saftety Recalls
  - Technical Inquiry
- Vehicles
  - Cars and Minivan
  - Trucks
  - Crossovers and SUVs
  - Electrified
- General Inquiry.
  - Product information
  - Pricing
  - Feedback
  - Speak to a human

&&
Schedule Service is only for repair and maintenance service and not for a dealership
&&
"""

```

- System Message 3

```

delimiter = "####"
system_message = f"""
You are a customer service assistant at an automotive company. \
You will be provided with customer service queries. \
The customer service query will be delimited with {delimiter} characters.
Classify each query into a primary category and a secondary category as following:
    Step1: Classify a secondary category
    Step2: Determine a primary category using a secondary category
    Step3: Provide your output in json format with the keys: primary and secondary

Classification Note:
You will get short explanations for each categories inside && characters. \
Importantly, all the category you answer must strictly satisfy the short explanations if given.\ 
In your output, all secondary categories must strictly be in primary categories.

Primary categories and secondary categories follow this format:
1 primary category
    1.1 secondary category
    1.2 secondary category
    ...
2 primary category
    2.1 secondary category
    2.2 secondary category
    ...
Categories:
1 Shopping
    1.1 Dealership
    1.2 Compare Vehicles
    1.3 Financial Services and Payment
    1.4 Fits My Budget
    1.5 Buy Parts and Accessories
2 Owners
    2.1 Manuals and Warranties
    2.2 Schedule Service
    2.3 Safety Recalls
    2.4 Technical Inquiry
3 Vehicles
    3.1 Cars and Minivan
    3.2 Trucks
    3.3 Crossovers and SUVs
    3.4 Electrified
4 General Inquiry.
    4.1 Feedback
    4.2 Speak to a human

&&&
Schedule Service is only for repair and maintenance service and not for a dealership.
Vehicles is focus only in product information, specification and price.
&&
"""

```

- System Message 4 (bottom to top)

```

delimiter = "####"
system_message = f"""
You are a customer service assistant at an automotive company. \
You will be provided with customer service queries. \
The customer service query will be delimited with {delimiter} characters.
Perform as following:
    Step1: Classify a secondary category
    Step2: Determine a primary category using a secondary category
    Step3: Provide your output in json format with the keys: primary and secondary

Classification Note:
You will get short explanations for each categories inside && characters. \
Importantly, all the category you answer must strictly satisfy the short explanations if given.\

Secondary categories:
- Dealership
- Compare Vehicles
- Financial Services and Payment
- Fits My Budget
- Buy Parts and Accessories
- Manuals and Warranties
- Schedule Service
- Safety Recalls
- Technical Inquiry
- Cars and Minivan
- Trucks
- Crossovers and SUVs
- Electrified
- Feedback
- Speak to a human

Primary categories:
- Shopping if Secondary category is "Dealership", "Compare Vehicles", \
"Financial Services and Payment", "Fits My Budget" or "Buy Parts and Accessories".
- Owners if Secondary category is "Manuals and Warranties", "Schedule Service", \
"Safety Recalls" or "Technical Inquiry".
- Vehicles if Secondary category is "Cars and Minivan", "Trucks", \
"Crossovers and SUVs" or "Electrified".
- General Inquiry if Secondary category is "Feedback" or "Speak to a human"

&&&
Schedule Service is only for repair and maintenance service and not for a dealership.
Vehicles is focus only in product information, specification and price.
Fits My Budget is a program that can suggest products given a customer's budget.
&&
"""

```

# Text classification

## 1. User Messages (14 items)

```
user_messages = [
    "Can I schedule a dealership appointment online?",
    "How can I view my ToyotaCare benefits for my vehicle?",
    "Can a supercharger be installed on my vehicle?",
    "I want to seek information about the sedan. Do you have any suggestions?",
    "Can you suggest any SUV that costs no more than 2 million baht?",
    "Can you suggest any car that costs no more than 2 million baht?",
    "Can Toyota Service Care be repurchased?",
    "How can I locate my nearest Toyota dealership?",
    "How do I make a payment to Toyota?",
    "How do I obtain an older model year brochure for a Toyota vehicle?",
    "I would like to add an aftermarket accessory or part to my vehicle. Will this impact my warranty?",
    "I would like to add an accessory or part to my vehicle.",
    """I purchased a part from an authorized Toyota dealership and installed it myself.\nWhat warranty coverage do I have for this part?""",
    "Can I purchase a part from an authorized Toyota dealership and installed it myself",
]
```

## 3. Answer the queries by GPT3.5

```
def answer_queries(user_message, system_message):
    messages = [
        {'role': 'system',
         'content': system_message},
        {'role': 'user',
         'content': f"{delimiter}{user_message}{delimiter}"},
    ]
    response, token_dict = get_completion_and_token_count(messages)
    print("user query :", user_message)
    print("output :", response)
    print("token :", token_dict)
```

## 2. System Message

- System Message 1
- System Message 2
- System Message 3
- System Message 4 (bottom to top)

# Correct answer

No	user query – expect answer	SM 1		SM 2		SM 3		SM 4	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd
1	Can I schedule a dealership appointment online? – {Shopping, Dealership}								
2	How can I view my ToyotaCare benefits for my vehicle? – {Owners, Manuals and Warranties}								
3	Can a supercharger be installed on my vehicle? – {Owners, Technical Inquiry}	orange		orange		orange		orange	
4	I want to seek information about the sedan. Do you have any suggestions? – {Vehicles, Cars and Minivan}	teal		orange	orange	teal		teal	
5	Can you suggest any SUV that costs no more than 2 million baht? – {Shopping, Fits My Budget}	orange	orange	teal	orange	teal	orange	teal	orange
6	Can you suggest any car that costs no more than 2 million baht? – {Shopping, Fits My Budget}	teal	orange	teal	teal	teal	teal	teal	teal
7	Can Toyota Service Care be repurchased? – {Owners, Manuals and Warranties}	orange							
8	How can I locate my nearest Toyota dealership? – {Shopping, Dealership}	teal		teal	teal	teal	teal	teal	
9	How do I make a payment to Toyota? - {Shopping, Financial Services and Payment}	teal		teal	teal	teal	teal	teal	
10	How do I obtain an older model year brochure for a Toyota vehicle? - {Owners, Manuals and Warranties}	orange		orange	orange	orange	orange	orange	
11	I would like to add an aftermarket accessory or part to my vehicle. Will this impact my warranty? - {Owners, Manuals and Warranties}	orange		orange	orange	orange	orange	teal	
12	I would like to add an accessory or part to my vehicle. - {Shopping, Buy Parts and Accessories}	teal		teal	teal	teal	teal	teal	
13	I purchased a part from an authorized Toyota dealership and installed it myself. What warranty coverage do I have for this part? – {Owners, Manuals and Warranties}	orange	orange	teal	teal	teal	teal	teal	
14	Can I purchase a part from an authorized Toyota dealership and installed it myself - {Shopping, Buy Parts and Accessories}	orange	orange	teal	orange	teal	orange	teal	

# Best Response - text classification

- System Message 4 (bottom to top)

```
query: 1
user query : Can I schedule a dealership appointment online?
output : {
    "primary": "Shopping",
    "secondary": "Dealership"
}
token : {'prompt_tokens': 402, 'completion_tokens': 18, 'total_tokens': 420}
-----
query: 2
user query : How can I view my ToyotaCare benefits for my vehicle?
output : {
    "primary": "Owners",
    "secondary": "Manuals and Warranties"
}
token : {'prompt_tokens': 406, 'completion_tokens': 21, 'total_tokens': 427}
-----
query: 3
user query : Can a supercharger be installed on my vehicle?
output : {
    "primary": "Vehicles",
    "secondary": "Technical Inquiry"
}
token : {'prompt_tokens': 404, 'completion_tokens': 18, 'total_tokens': 422}
-----
query: 4
user query : I want to seek information about the sedan. Do you have any suggestions?
output : {
    "primary": "Vehicles",
    "secondary": "3.1 Cars and Minivan"
}
token : {'prompt_tokens': 409, 'completion_tokens': 23, 'total_tokens': 432}
-----
query: 5
user query : Can you suggest any SUV that costs no more than 2 million baht?
output : {
    "primary": "Shopping",
    "secondary": "Compare Vehicles"
}
token : {'prompt_tokens': 410, 'completion_tokens': 17, 'total_tokens': 427}
```

```
query: 6
user query : Can you suggest any car that costs no more than 2 million baht?
output : {
    "primary": "Shopping",
    "secondary": "Fits My Budget"
}
token : {'prompt_tokens': 410, 'completion_tokens': 19, 'total_tokens': 429}
-----
query: 7
user query : Can Toyota Service Care be repurchased?
output : {
    "primary": "Owners",
    "secondary": "Schedule Service"
}
token : {'prompt_tokens': 402, 'completion_tokens': 17, 'total_tokens': 419}
-----
query: 8
user query : How can I locate my nearest Toyota dealership?
output : {
    "primary": "Shopping",
    "secondary": "Dealership"
}
token : {'prompt_tokens': 403, 'completion_tokens': 18, 'total_tokens': 421}
-----
query: 9
user query : How do I make a payment to Toyota?
output : {
    "primary": "Shopping",
    "secondary": "Financial Services and Payment"
}
token : {'prompt_tokens': 403, 'completion_tokens': 19, 'total_tokens': 422}
-----
query: 10
user query : How do I obtain an older model year brochure for a Toyota vehicle?
output : {
    "primary": "Shopping",
    "secondary": "Buy Parts and Accessories"
}
token : {'prompt_tokens': 408, 'completion_tokens': 19, 'total_tokens': 427}
```

# Best Response - text classification (cont.)

- System Message 4 (bottom to top)

```
query: 11
user query : I would like to add an aftermarket accessory or part to my vehicle. Will this impact my warranty?
output : {
    "primary": "Shopping",
    "secondary": "Buy Parts and Accessories"
}
token : {'prompt_tokens': 414, 'completion_tokens': 19, 'total_tokens': 433}
-----
query: 12
user query : I would like to add an accessory or part to my vehicle.
output : {
    "primary": "Shopping",
    "secondary": "Buy Parts and Accessories"
}
token : {'prompt_tokens': 407, 'completion_tokens': 19, 'total_tokens': 426}
-----
query: 13
user query : I purchased a part from an authorized Toyota dealership and installed it myself.      What warranty coverage do I have for this part?
output : {
    "primary": "Owners",
    "secondary": "Manuals and Warranties"
}
token : {'prompt_tokens': 419, 'completion_tokens': 21, 'total_tokens': 440}
-----
query: 14
user query : Can I purchase a part from an authorized Toyota dealership and install it myself
output : {
    "primary": "Shopping",
    "secondary": "Dealership"
}
token : {'prompt_tokens': 409, 'completion_tokens': 18, 'total_tokens': 427}
```

# 2) Chain-of-Thought

## 1. System Messages

```
delimiter = "###"
system_message = f"""
Follow these steps to answer the customer queries.
The customer query will be delimited with four hashtags, \
i.e. {delimiter}.

Step 1:{delimiter} First decide whether the user is \
asking a question about a specific product or products. \
Product category doesn't count.

Step 2:{delimiter} If the user is asking about \
specific products, identify whether \
the products are in the following list.
All available products:
1. Product: Toyota Crown
Category: Cars
Brand: Toyota
Model Number: 2023 TOYOTA CROWN XLE
Basic Warranty: 36 months or 36,000 miles
Features: Horsepower 236 hp, 2.4-Liter, 4-Cylinder DOHC 16-Valve, 5 Seating capacity
Description: Toyota Crown is a distinctly crafted sedan unlike anything you've seen before.
Price: $39,950.00

2. Product: Prius Prime
Category: Cars
Brand: Toyota
Model Number: 2023 Prius Prime SE
Basic Warranty: 36 months/36,000 miles
Features: Horsepower 220 hp, 2.0-Liter, 4-cylinder DOHC 16-valve, 5 Seating capacity
Description: Similarly to a standard Prius, but has an all-electric driving range
Price: $32,350.00

3. Product: Highlander
Category: SUVs
Brand: Toyota
Model Number: 2023 Highlander Hybrid LE
Basic Warranty: 36 months/36,000 miles
Features: Horsepower 243 hp, 2.5-Liter, 4-cylinder DOHC 16-valve, 5 Seating capacity
Description: With advanced capabilities and a confident drive, Highlander puts you \
and your crew in position to upgrade your adventures.
Price: $42,220.00

4. Product: bZ4X
Category: SUVs
Brand: Toyota
Model Number: 2023 bZ4X XLE
Basic Warranty: 36 months/36,000 miles
Features: Horsepower 201 hp, AC synchronous electric generator, 8 Seating capacity
Description: an all-electric SUV that's available in two trim levels: XLE and Limited.
Price: $42,000.00
```

```
5. Product: Tacoma
Category: Trucks
Brand: Toyota
Model Number: 2023 Tacoma SR
Basic Warranty: 36 months/36,000 miles
Features: Horsepower 278 hp, 3.5-Liter, 6-cylinder direct-injection Atkinson-cycle engine \
, 5 Seating capacity
Description: The Tacoma is a mid-size pickup truck with a choice of two cabs and seating \
for up to five
Price: $34,515.00
```

Step 3:{delimiter} If the message contains products \
in the list above, list any assumptions that the \
user is making in their \
message e.g. that product X is bigger than \
product Y, or that product Z has a 36 months warranty.

Step 4:{delimiter}: If the user made any assumptions, \
figure out whether the assumption is true based on your \
product information.

Step 5:{delimiter}: First, politely correct the \
customer's incorrect assumptions if applicable. \
Only mention or reference products in the list of \
5 available products, as these are the only 5 \
products that the store sells. \
Answer the customer in a friendly tone.

Use the following format:
Step 1:{delimiter} <step 1 reasoning>
Step 2:{delimiter} <step 2 reasoning>
Step 3:{delimiter} <step 3 reasoning>
Step 4:{delimiter} <step 4 reasoning>
Response to user:{delimiter} <response to customer>

Make sure to include {delimiter} to separate every step.
"""

# Chain-of-Thought

## 2. User Messages and Responses

- User Messages and Responses (1)

```
1 user_message = f"""
2 by how much is the 2023 Tacoma SR more expensive than the 2023 Highlander Hybrid LE"""
3
4 messages = [
5 {'role': 'system',
6   'content': system_message},
7 {'role': 'user',
8   'content': f"{delimiter}{user_message}{delimiter}"},  
9 ]
10
11 response, token_dict = get_completion_and_token_count(messages)
12 print(response)
13 print(token_dict)
```

👤 Step 1:#### The user is asking about the price difference between the 2023 Tacoma SR and the 2023 Highlander Hybrid LE.

Step 2:#### Both the 2023 Tacoma SR and the 2023 Highlander Hybrid LE are available products.

Step 3:#### The user assumes that the 2023 Tacoma SR is more expensive than the 2023 Highlander Hybrid LE.

Step 4:#### Based on the product information, the assumption is incorrect. The price of the 2023 Tacoma SR is \$34,515.00, while the price of the 2023 Highlander Hybrid LE is \$34,515.00.

Response to user:#### The 2023 Tacoma SR is actually less expensive than the 2023 Highlander Hybrid LE. The price of the 2023 Tacoma SR is \$34,515.00, while the price of the 2023 Highlander Hybrid LE is \$34,515.00.

# Chain-of-Thought

## 2. User Messages and Responses

- User Messages and Responses (2)

```
1 user_message = f"""
2 by how much is the 2023 Highlander Hybrid LE more horsepower than the 2023 Prius Prime SE"""
3
4 messages = [
5 {'role':'system',
6 'content': system_message},
7 {'role':'user',
8 'content': f"(delimiter){user_message}(delimiter)"},  
9 ]
10
11 response, token_dict = get_completion_and_token_count(messages)
12 print(response)
13 print(token_dict)
```

Step 1:#### The user is asking a question about a specific product, comparing the horsepower of the 2023 Highlander Hybrid LE and the 2023 Prius Prime SE.

Step 2:#### Both the 2023 Highlander Hybrid LE and the 2023 Prius Prime SE are available products.

Step 3:#### The user assumes that the 2023 Highlander Hybrid LE has more horsepower than the 2023 Prius Prime SE.

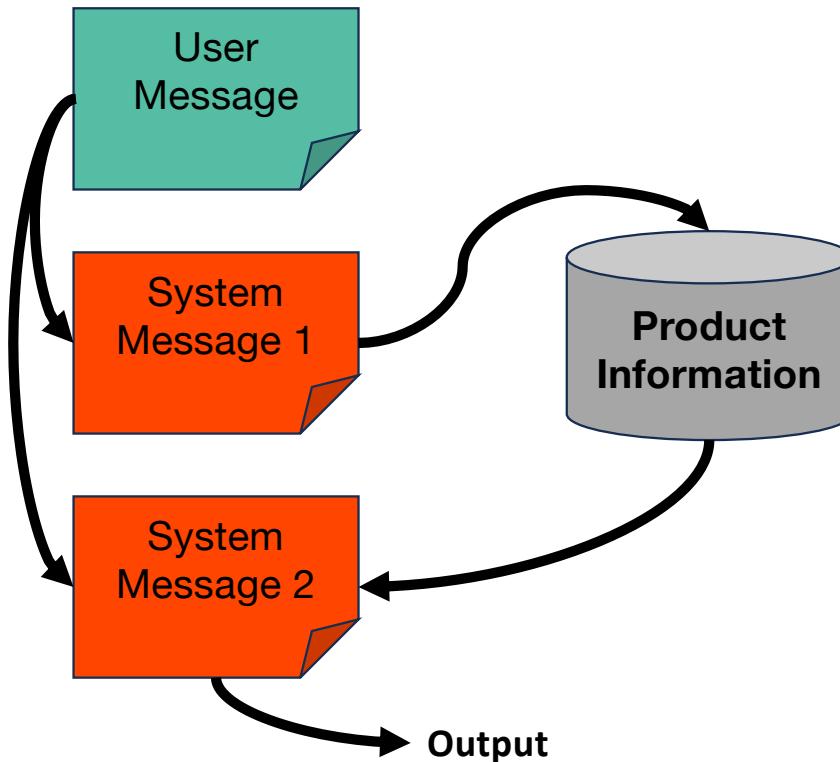
Step 4:#### Based on the product information, the 2023 Highlander Hybrid LE has 243 horsepower, while the 2023 Prius Prime SE has 220 horsepower. Therefore, the 2023 LE has 23 more horsepower than the 2023 Prius Prime SE.

Response to user:#### The 2023 Highlander Hybrid LE has 23 more horsepower than the 2023 Prius Prime SE.  
{'prompt\_tokens': 842, 'completion\_tokens': 180, 'total\_tokens': 1022}

# 3) Link the information with Chaining Prompts

## 1. Product Information

```
# product information
products = {
    "Toyota Crown": {
        "name": "Toyota Crown",
        "category": "Cars",
        "brand": "Toyota",
        "model_number": "2023 TOYOTA CROWN XLE",
        "warranty": "36 months or 36,000 miles",
        "features": ["Horsepower 236 hp", "2.4-Liter, 4-Cylinder DOHC 16-Valve", "5 Seating capacity"],
        "description": "Toyota Crown is a distinctly crafted sedan unlike anything you've seen before.",
        "price": 39950.00
    },
    "Prius Prime": {
        "name": "Prius Prime",
        "category": "Cars",
        "brand": "Toyota",
        "model_number": "2023 Prius Prime SE",
        "warranty": "36 months or 36,000 miles",
        "features": ["Horsepower 220 hp", "2.0-Liter, 4-Cylinder DOHC 16-Valve", "5 Seating capacity"],
        "description": "Similarly to a standard Prius, but has an all-electric driving range.",
        "price": 32350.00
    },
    "Highlander": {
        "name": "Highlander",
        "category": "SUVs",
        "brand": "Toyota",
        "model_number": "2023 Highlander Hybrid LE",
        "warranty": "36 months or 36,000 miles",
        "features": ["Horsepower 243 hp", "2.5-Liter, 4-Cylinder DOHC 16-Valve", "5 Seating capacity"],
        "description": "With advanced capabilities and a confident drive, Highlander puts you and your crew in position",
        "price": 42220.00
    },
    "bZ4X": {
        "name": "bZ4X",
        "category": "SUVs",
        "brand": "Toyota",
        "model_number": "2023 bZ4X XLE",
        "warranty": "36 months or 36,000 miles",
        "features": ["Horsepower 201 hp", "AC synchronous electric generator", "8 Seating capacity"],
        "description": "An all-electric SUV that's available in two trim levels: XLE and Limited.",
        "price": 42000.00
    },
    "Tacoma": {
        "name": "Tacoma",
        "category": "Trucks",
        "brand": "Toyota",
        "model_number": "2023 Tacoma SR",
        "warranty": "36 months or 36,000 miles",
        "features": ["Horsepower 278 hp", "3.5-Liter, 6-cylinder direct-injection Atkinson-cycle engine", "5 Seating capacity"],
        "description": "The Tacoma is a mid-size pickup truck with a choice of two cabs and seating for up to five.",
        "price": 34515.00
    }
}
```



## 2. System Message

- System Message (1)

```
delimiter = "####"
system_message_1 = f"""
You will be provided with customer service queries. \
The customer service query will be delimited with \
{delimiter} characters.
Output a python list of objects, where each object has \
the following format:
    'category': <one of Computers and Laptops, \
Smartphones and Accessories, \
Televisions and Home Theater Systems, \
Gaming Consoles and Accessories, \
Audio Equipment, Cameras and Camcorders>,
OR
    'products': <a list of products that must \
be found in the allowed products below>

Where the categories and products must be found in \
the customer service query.
If a product is mentioned, it must be associated with \
the correct category in the allowed products list below.
If no products or categories are found, output an \
empty list.

Allowed products:

Cars category:
Toyota Crown
Prius Prime

SUVs category:
Highlander
bZ4X

Trucks category:
Tacoma

Only output the list of objects, with nothing else.
"""
```

- System Message (2)

```
system_message_2 = f"""
You are a customer service assistant for a automobile showroom. \
Respond in a friendly and helpful tone, \
with very concise answers. \
Make sure to ask the user relevant follow up questions.
"""
```

## 3. User Message

- tell me about the Toyota Crown and Highlander. What is different?

```
45 user_message = f"""tell me about the Toyota Crown XLE and the Highlander Hybrid LE. What is different?"""
```

## 4. Chaining Prompts

```
messages = [
    {'role': 'system',
     'content': system_message_1},
    {'role': 'user',
     'content': f'{delimiter}{user_message}{delimiter}'},
]
category_and_product_response, token_dict_1 = get_completion_and_token_count(messages)
category_and_product_list = read_string_to_list(category_and_product_response)
product_information_for_user_message = generate_output_string(category_and_product_list)

messages = [
    {'role': 'system',
     'content': system_message_2},
    {'role': 'user',
     'content': user_message},
    {'role': 'assistant',
     'content': f"""Relevant product information:\n\
{product_information_for_user_message}"""},
]
final_response, token_dict_2 = get_completion_and_token_count(messages)
print(final_response)
print(token_dict_1)
print(token_dict_2)
```

## 5. Background Code for database

```
import json

def get_product_by_name(name):
    return products.get(name, None)

def get_products_by_category(category):
    return [product for product in products.values() if product["category"] == category]

def read_string_to_list(input_string):
    if input_string is None:
        return None

    try:
        input_string = input_string.replace("'", "\\"") # Replace single quotes with double quotes for valid JSON
        data = json.loads(input_string)
        return data
    except json.JSONDecodeError:
        print("Error: Invalid JSON string")
        return None

def generate_output_string(data_list):
    output_string = ""

    if data_list is None:
        return output_string

    for data in data_list:
        try:
            if "products" in data:
                products_list = data["products"]
                for product_name in products_list:
                    product = get_product_by_name(product_name)
                    if product:
                        output_string += json.dumps(product, indent=4) + "\n"
                    else:
                        print(f"Error: Product '{product_name}' not found")
            elif "category" in data:
                category_name = data["category"]
                category_products = get_products_by_category(category_name)
                for product in category_products:
                    output_string += json.dumps(product, indent=4) + "\n"
            else:
                print("Error: Invalid object format")
        except Exception as e:
            print(f"Error: {e}")

    return output_string
```

## 6. Response

- The Toyota Crown XLE is a sedan with a 2.4-Liter, 4-Cylinder engine and 236 horsepower. It has a seating capacity of 5 and comes with a warranty of 36 months or 36,000 miles. The Highlander Hybrid LE is an SUV with a 2.5-Liter, 4-Cylinder engine and 243 horsepower. It also has a seating capacity of 5 and comes with the same warranty.
- The main difference is that the Crown XLE is a sedan while the Highlander Hybrid LE is an SUV. Is there anything specific you would like to know about these models?
- {'prompt\_tokens': 224, 'completion\_tokens': 26, 'total\_tokens': 250}
- {'prompt\_tokens': 334, 'completion\_tokens': 127, 'total\_tokens': 461}

## 4) Summarize text

```
text = f"""
Step 1:#### The user is asking about a specific product, Toyota Crown.
Step 2:#### Toyota Crown is a car, not an SUV. It has 236 horsepower and seats 5 people.
Step 3:#### The user assumes that Toyota Crown is an SUV and has the most horsepower and seats.
Step 4:#### Toyota Crown is not an SUV, it is a sedan. It has 236 horsepower and seats 5 people,\nwhich is not the most horsepower or seating capacity among the available products.
Response to user:#### Thank you for your interest in Toyota Crown. However, I would like to \
clarify that Toyota Crown is a sedan, not an SUV. It has 236 horsepower and seats 5 people. \
If you are interested in an SUV, we have Highlander and bZ4X available.
"""

prompt = f"""
Summarize the text delimited by triple backticks \
into a single sentence.
```{text}```
"""

messages = [
    {'role': 'user', 'content': prompt}
]
response, token_dict = get_completion_and_token_count(messages)
print(response)
print(token_dict)
```

The user inquires about the Toyota Crown, assuming it is an SUV with the most horsepower and seating capacity, but is informed that it is actually a sedan with 236 horsepower and seating for 5 people, and is offered alternative SUV options.

```
{'prompt_tokens': 198, 'completion_tokens': 49, 'total_tokens': 247}
```

# 4.1) Step instructions to a Paragraph

```
text_1 = """
Step 1 - Loosen the front tires slightly. This should be done with a tire iron or impact wrench. \
While on the ground the car's weight will keep the wheels from turning. This way you can safely loosen the lug nuts.
Step 2 - Raise the front end with a floor jack. Refer to your service manual for jacking points \
and jack up your car. Stabilize the vehicle with jack stands and chock the rear tires. It is not\
safe to leave the vehicle suspended on the jack alone.
Step 3 - Remove the wheel. Finish taking the lug nuts off of the wheel and remove it from the wheelbase. \
Slide the wheel under the car. This provides an extra safety measure in case the jack stands fail.
Step 4 - Locate the outer tie rod end. When you remove the wheel, you will be able to see the steering knuckle. \
There will be a shaft going through this knuckle with a castle nut on the bottom and a round head on top. \
This is the outer tie rod.
Step 5 - Locate the inner tie rod end. Cars often have an inner tie rod end as well. Start by locating the \
outer tie rod end. Follow the outer tie rod end underneath the car until it meets the inner tie rod end.
"""

prompt = f"""
You will be provided with text delimited by triple quotes.
If the instructions in the following format:

Step 1 - ...
Step 2 - ...
...
Step N - ...

re-write a sequence of instructions as single paragraph

\\"\\"\\\"{text_1}\\\"\\\"\\"
"""

messages = [
    {'role': 'user', 'content': prompt}
]
response_1, token_dict = get_completion_and_token_count(messages)
print("Completion for Text 1:")
print(response_1)
print(token_dict)

Completion for Text 1:
To replace the tie rod ends on your car, start by loosening the front tires slightly with a tire iron or impact wrench while the car is on the ground. Then, use a floor jack to raise the front end of the car and stabilize it with jack stands and chock the rear tires. Remove the wheel and slide it under the car for extra safety. Locate the outer tie rod end by finding the steering knuckle and identifying the shaft with a castle nut on the bottom and a round head on top. Additionally, locate the inner tie rod end by following the outer tie rod end underneath the car until it meets the inner tie rod end.
{'prompt_tokens': 315, 'completion_tokens': 130, 'total_tokens': 445}
```

## 4.2) Summarize text to step instructions

```
text_2 = response_1
prompt = f"""
You will be provided with text delimited by triple quotes.
If it contains a sequence of instructions, \
re-write those instructions in the following format:

Step 1 - ...
Step 2 - ...
...
Step N - ...

If the text does not contain a sequence of instructions, \
then simply write \"No steps provided.\"

\"\"\"{text_2}
"""

messages = [
    {'role': 'user', 'content': prompt}
]
response, token_dict = get_completion_and_token_count(messages)
print("Completion for Text 1:")
print(response)
print(token_dict)

Completion for Text 1:
Step 1 - Loosen the front tires slightly with a tire iron or impact wrench while the car is on the ground.
Step 2 - Use a floor jack to raise the front end of the car and stabilize it with jack stands and chock the rear tire
s.
Step 3 - Remove the wheel and slide it under the car for extra safety.
Step 4 - Locate the outer tie rod end by finding the steering knuckle and identifying the shaft with a castle nut on
the bottom and a round head on top.
Step 5 - Additionally, locate the inner tie rod end by following the outer tie rod end underneath the car until it me
ets the inner tie rod end.
{'prompt_tokens': 208, 'completion_tokens': 136, 'total_tokens': 344}
```

# 5) Extract information

## 1. Text Information

```
text = f"""
We are proud to announce a significant enhancement to our Hybrid Battery Warranty.

Starting with the 2020 model year, every Toyota hybrid battery warranty is being \
increased from 8 years or 100,000 miles, to 10 years from date of first use, or \
150,000 miles whichever comes first. This enhancement serves as an indication of \
our confidence in the quality, dependability, and reliability of our products.

On top of our basic coverage, we offer:

- Hybrid-Related Component Coverage

    Hybrid-related components, including the HV battery, \
    battery control module, hybrid control module and inverter \
    with converter, are covered for 8 years/100,000 miles. \
    The HV battery may have longer coverage under emissions warranty. \
    Refer to applicable Warranty & Maintenance Guide for details.

- Powertrain Coverage

    60 months/60,000 miles (engine, transmission/transaxle, \
    front-wheel-drive system, rear-wheel drive, seatbelts and airbags).

- Rust-Through Coverage

    60 months/unlimited miles (corrosion perforation of sheet metal).

- Emissions Coverage

    Coverages vary under Federal and California regulations. \
    Refer to applicable Warranty & Maintenance Guide for details.

For Toyota hybrid vehicles beginning with model year 2020, \
the hybrid (HV) battery is covered for 10 years from original \
date of first use or 150,000 miles, whichever comes first. \
Coverage is subject to the terms and conditions of your \
New Vehicle Limited Warranty. See Owner's Warranty and \
Maintenance Guide for details.

"""


```

## 2. Prompting

```
prompt_1 = f"""
Perform the following actions:
Task 1 - Summarize the following text delimited by triple \
backticks with 1 sentence.
Task 2 - Extract information for each component and their coverage range following this format:

OVERVIEW
-
COVERAGE LIST
- <component 1>
- <component 2>
...
<component 1>
-
-
...
<component 2>
-
-
...
Here this example:
OVERVIEW
- Every Toyota vehicle is supported by \
a 36-month/36,000-mile limited warranty coverage. \
But it doesn't stop there.

COVERAGE LIST
- XYZ
- Powertrain

XYZ
- ABC component: 36 months/36,000 miles
- DFG component: 36 months/36,000 miles
- HIJ component: 24 months/24,000 miles

Powertrain
- engine: 60 months/60,000 miles
- transmission: 60 months/60,000 miles

Text:
```{text}```
"""
messages = [
    {'role': 'user', 'content': prompt_1}
]
response, token_dict = get_completion_and_token_count(messages)
print(response)
print(token_dict)
```

### **3. Response**

Toyota has increased their hybrid battery warranty to 10 years or 150,000 miles, and in addition to basic coverage, they offer hybrid-related component coverage, powertrain coverage, rust-through coverage, and emissions coverage.

#### **OVERVIEW**

- Toyota hybrid battery warranty increased to 10 years or 150,000 miles.
- Additional coverage includes hybrid-related component coverage, powertrain coverage, rust-through coverage, and emissions coverage.

#### **COVERAGE LIST**

- Hybrid-Related Component Coverage
- Powertrain Coverage
- Rust-Through Coverage
- Emissions Coverage

##### **Hybrid-Related Component Coverage**

- HV battery: 8 years/100,000 miles (may have longer coverage under emissions warranty)
- Battery control module: 8 years/100,000 miles
- Hybrid control module: 8 years/100,000 miles
- Inverter with converter: 8 years/100,000 miles

##### **Powertrain Coverage**

- Engine: 60 months/60,000 miles
- Transmission/transaxle: 60 months/60,000 miles
- Front-wheel-drive system: 60 months/60,000 miles
- Rear-wheel drive: 60 months/60,000 miles
- Seatbelts: 60 months/60,000 miles
- Airbags: 60 months/60,000 miles

##### **Rust-Through Coverage**

- 60 months/unlimited miles (corrosion perforation of sheet metal)

##### **Emissions Coverage**

- Coverages vary under Federal and California regulations. Refer to applicable Warranty & Maintenance Guide for details.

```
{'prompt_tokens': 540, 'completion_tokens': 318, 'total_tokens': 858}
```

# Extract information

## Extracted Text to Table data

### 1. Extracted Text Information

```
fact_sheet_chair = """
OVERVIEW
- Toyota hybrid battery warranty increased to 10 years or 150,000 miles.
- Additional coverage includes hybrid-related component coverage, powertrain coverage\
, rust-through coverage, and emissions coverage.

COVERAGE LIST
- Hybrid-Related Component Coverage
- Powertrain Coverage
- Rust-Through Coverage
- Emissions Coverage

Hybrid-Related Component Coverage
- HV battery: 8 years/100,000 miles (may have longer coverage under emissions warranty)
- Battery control module: 8 years/100,000 miles
- Hybrid control module: 8 years/100,000 miles
- Inverter with converter: 8 years/100,000 miles

Powertrain Coverage
- Engine: 60 months/60,000 miles
- Transmission/transaxle: 60 months/60,000 miles
- Front-wheel-drive system: 60 months/60,000 miles
- Rear-wheel drive: 60 months/60,000 miles
- Seatbelts: 60 months/60,000 miles
- Airbags: 60 months/60,000 miles

Rust-Through Coverage
- 60 months/unlimited miles (corrosion perforation of sheet metal)

Emissions Coverage
- Coverages vary under Federal and California regulations. Refer to \
applicable Warranty & Maintenance Guide for details.
"""
```

### 2. Prompting

```
prompt = f"""
Your task is to help a marketing team create a
description for a retail website of a product based
on a technical fact sheet.
```

Write a product description based on the information provided in the technical specifications delimited by triple backticks.

The description is intended for toyota dealership,  
so should be technical in nature and focus on the  
product warranty.

After the description, include a table that gives the  
component's warranty duration. The table should have tree columns.  
In the first column include the name of the component.  
In the second column include the coverage group.  
In the third column include the warranty duration in months and miles.

Give the table the title 'Product Warranty'.

Format everything as HTML that can be used in a website.  
Place the description in a <div> element.

```
Technical specifications: ```{fact_sheet_chair}```
"""

messages = [
    {'role': 'user', 'content': prompt}
]

response, token_dict = get_completion_and_token_count(messages)
print(response)
print(token_dict)
```

### 3. Response

```
<div>
  <h2>Toyota Hybrid Battery Warranty</h2>
  <p>Toyota is proud to offer an extended warranty on our hybrid batteries. With coverage up to 10 years or 150,000 miles, you can have peace of mind knowing that your vehicle is protected. In addition to the hybrid battery, we also offer coverage for other hybrid-related components, powertrain, rust-through, and emissions. See below for a breakdown of our coverage list.</p>

  <table>
    <caption>Product Warranty</caption>
    <thead>
      <tr>
        <th>Component</th>
        <th>Coverage Group</th>
        <th>Warranty Duration</th>
      </tr>
    </thead>
    <tbody>
      <tr>
        <td>HV battery</td>
        <td>Hybrid-Related Component Coverage</td>
        <td>8 years/100,000 miles (may have longer coverage under emissions warranty)</td>
      </tr>
      <tr>
        <td>Battery control module</td>
        <td>Hybrid-Related Component Coverage</td>
        <td>8 years/100,000 miles</td>
      </tr>
      <tr>
        <td>Hybrid control module</td>
        <td>Hybrid-Related Component Coverage</td>
        <td>8 years/100,000 miles</td>
      </tr>
      <tr>
        <td>Inverter with converter</td>
        <td>Hybrid-Related Component Coverage</td>
        <td>8 years/100,000 miles</td>
      </tr>
      <tr>
        <td>Engine</td>
        <td>Powertrain Coverage</td>
        <td>60 months/60,000 miles</td>
      </tr>
      <tr>
        <td>Transmission/transaxle</td>
        <td>Powertrain Coverage</td>
        <td>60 months/60,000 miles</td>
      </tr>
      <tr>
        <td>Front-wheel-drive system</td>
        <td>Powertrain Coverage</td>
        <td>60 months/60,000 miles</td>
      </tr>
      <tr>
        <td>Rear-wheel drive</td>
        <td>Powertrain Coverage</td>
        <td>
    {'prompt_tokens': 451, 'completion_tokens': 500, 'total_tokens': 951}
```

```
: from IPython.display import display, HTML
display(HTML(response))
```

### Toyota Hybrid Battery Warranty

Toyota is proud to offer an extended warranty on our hybrid batteries. With coverage up to 10 years or 150,000 miles, you can have peace of mind knowing that your vehicle is protected. In addition to the hybrid battery, we also offer coverage for other hybrid-related components, powertrain, rust-through, and emissions. See below for a breakdown of our coverage list.

#### Product Warranty

Component	Coverage Group	Warranty Duration
HV battery	Hybrid-Related Component Coverage	8 years/100,000 miles (may have longer coverage under emissions warranty)
Battery control module	Hybrid-Related Component Coverage	8 years/100,000 miles
Hybrid control module	Hybrid-Related Component Coverage	8 years/100,000 miles
Inverter with converter	Hybrid-Related Component Coverage	8 years/100,000 miles
Engine	Powertrain Coverage	60 months/60,000 miles
Transmission/transaxle	Powertrain Coverage	60 months/60,000 miles
Front-wheel-drive system	Powertrain Coverage	60 months/60,000 miles
Rear-wheel drive	Powertrain Coverage	

# 6) Translation

## 1. Text Information

```
text = f"""
We are proud to announce a significant enhancement to our Hybrid Battery Warranty.

Starting with the 2020 model year, every Toyota hybrid battery warranty is being \
increased from 8 years or 100,000 miles, to 10 years from date of first use, or \
150,000 miles whichever comes first. This enhancement serves as an indication of \
our confidence in the quality, dependability, and reliability of our products.

On top of our basic coverage, we offer:

- Hybrid-Related Component Coverage

    Hybrid-related components, including the HV battery, \
    battery control module, hybrid control module and inverter \
    with converter, are covered for 8 years/100,000 miles. \
    The HV battery may have longer coverage under emissions warranty.\
    Refer to applicable Warranty & Maintenance Guide for details.

- Powertrain Coverage

    60 months/60,000 miles (engine, transmission/transaxle, \
    front-wheel-drive system, rear-wheel drive, seatbelts and airbags).

- Rust-Through Coverage

    60 months/unlimited miles (corrosion perforation of sheet metal).

- Emissions Coverage

    Coverages vary under Federal and California regulations. \
    Refer to applicable Warranty & Maintenance Guide for details.

For Toyota hybrid vehicles beginning with model year 2020, \
the hybrid (HV) battery is covered for 10 years from original \
date of first use or 150,000 miles, whichever comes first. \
Coverage is subject to the terms and conditions of your \
New Vehicle Limited Warranty. See Owner's Warranty and \
Maintenance Guide for details.

"""
```

## 2. Prompting

```
prompt_1 = f"""
Perform the following actions:
Task 1 - Summarize the following text delimited by triple \
backticks with 1 sentence.
Task 2 - Translate the summary into Thai.
Task 3 - Translate the summary into Japanese.
Task 4 - Determine whether the original is formal or informal.
Task 5 - Convert the summary to informal.

Text:
```{text}```
"""

messages = [
    {'role': 'user', 'content': prompt_1}
]
response, token_dict = get_completion_and_token_count(messages)
print(response)
print(token_dict)
```

# Translation

## 3. Response

Toyota has increased their Hybrid Battery Warranty from 8 years or 100,000 miles to 10 years from date of first use, or 150,000 miles, indicating their confidence in the quality and reliability of their products.

โตโยต้าได้เพิ่มประกันแบตเตอรี่ไฮบริดของพวงเข้าจาก 8 ปีหรือ 100,000 ไมล์เป็น 10 ปีตั้งแต่วันที่ใช้งานครั้งแรกหรือ 150,000 ไมล์เพื่อแสดงถึงความมั่นใจในคุณภาพและความเชื่อถือได้ของผลิตภัณฑ์ของพวงเข้า

トヨタは、製品の品質と信頼性に対する彼らの信頼を示すために、8年または100,000マイルから、初回使用日から10年または150,000マイルにハイブリッドバッテリー保証を増加させました。

The original text is formal.

Yo, Toyota just upped their Hybrid Battery Warranty from 8 years or 100,000 miles to 10 years from date of first use, or 150,000 miles, showing they're super confident in their products.

```
{'prompt_tokens': 408, 'completion_tokens': 366, 'total_tokens': 774}
```

Perform the following actions:

Task 1 - Summarize the following text delimited by triple ` backticks with 1 sentence.

Task 2 - Translate the summary into Thai.

Task 3 - Translate the summary into Japanese.

Task 4 - Determine whether the original is formal or informal.

Task 5 - Convert the summary to informal.

# 7) Grammar Correction

```
text = f"""
Dear Valued Costumer,

Thanks you for taking the time to leave a reviw about are product. \
We are sorry to hear that you experience an increase in price and \
that the quality of the product did not meet your expectation. \
We apologize for any inconvience this may have caused you.

We would like to assure you that we takes all feedback seriously \
and we will be sure to pass your comment along to are team. \
If you have any further concern, please do not hesitate to reach out \
to are customer service team for assistance.

Thank you again for you're reviw and for choosing are product. \
We hope to have the opportunity to serve you better in the future.

Best regards,
customer agent
"""

prompt = f"proofread and correct this review: {text}"
messages = [
    {'role': 'user', 'content': prompt}
]
response, token_dict = get_completion_and_token_count(messages)
print(response)
print(token_dict)
```

```
from redlines import Redlines
from IPython.display import display, Markdown

diff = Redlines(text, response)
display(Markdown(diff.output_markdown))
```

Dear Valued ~~Costumer~~,Customer,

~~Thanks~~ Thank you for taking the time to leave a ~~reviw-review~~ about ~~are-our~~ product. We are sorry to hear that you ~~experience-experienced~~ an increase in price and that the quality of the product did not meet your ~~expectation-expectations~~. We apologize for any ~~inconvience~~ ~~inconvenience~~ this may have caused you.

We would like to assure you that we ~~takes-take~~ all feedback ~~seriously-seriously~~, and we will be sure to pass your ~~comment-comments~~ along to ~~are-our~~ team. If you have any further ~~coneern-concerns~~, please do not hesitate to reach out to ~~are-our~~ customer service team for assistance.

Thank you again for ~~you're-reviw-your review~~ and for choosing ~~are-our~~ product. We hope to have the opportunity to serve you better in the future.

Best regards,

~~customer-agent~~Customer Agent

{'prompt\_tokens': 158, 'completion\_tokens': 135, 'total\_tokens': 293}

## 8) Respond email (response product review)

```
# given the sentiment from the lesson on "inferring",
# and the original customer message, customize the email
sentiment = "negative"

# review for a blender
review = f"""
So, they still had the 17 piece system on seasonal \
sale for around $49 in the month of November, about \
half off, but for some reason (call it price gouging) \
around the second week of December the prices all went \
up to about anywhere from between $70-$89 for the same \
system. And the 11 piece system went up around $10 or \
so in price also from the earlier sale price of $29. \
So it looks okay, but if you look at the base, the part \
where the blade locks into place doesn't look as good \
as in previous editions from a few years ago, but I \
plan to be very gentle with it (example, I crush \
very hard items like beans, ice, rice, etc. in the \
blender first then pulverize them in the serving size \
I want in the blender then switch to the whipping \
blade for a finer flour, and use the cross cutting blade \
first when making smoothies, then use the flat blade \
if I need them finer/less pulpy). Special tip when making \
smoothies, finely cut and freeze the fruits and \
vegetables (if using spinach-lightly stew soften the \
spinach then freeze until ready for use-and if making \
sorbet, use a small to medium sized food processor) \
that you plan to use that way you can avoid adding so \
much ice if at all-when making your smoothie. \
After about a year, the motor was making a funny noise. \
I called customer service but the warranty expired \
already, so I had to buy another one. FYI: The overall \
quality has gone done in these types of products, so \
they are kind of counting on brand recognition and \
consumer loyalty to maintain sales. Got it in about \
two days.
"""


```

```
prompt = f"""
You are a customer service AI assistant.
Your task is to send an email reply to a valued customer.
Given the customer email delimited by ` ```, \
Generate a reply to thank the customer for their review.
If the sentiment is positive or neutral, thank them for \
their review.
If the sentiment is negative, apologize and suggest that \
they can reach out to customer service.
Make sure to use specific details from the review.
Write in a concise and professional tone.
Sign the email as `AI customer agent`.
Customer review: ```{review}```
Review sentiment: {sentiment}
"""
messages = [
    {'role': 'user', 'content': prompt}
]
response, token_dict = get_completion_and_token_count(messages)
print(response)
```

Dear Valued Customer,

Thank you for taking the time to leave a review about our product. We are sorry to hear that you experienced an increase in price and that the quality of the product did not meet your expectations. We apologize for any inconvenience this may have caused you.

We would like to assure you that we take all feedback seriously and we will be sure to pass your comments along to our team. If you have any further concerns, please do not hesitate to reach out to our customer service team for assistance.

Thank you again for your review and for choosing our product. We hope to have the opportunity to serve you better in the future.

Best regards,

AI customer agent

# 9) ChatBot (pizza order system)

- 1. Coding

```
def get_completion(prompt, model="gpt-3.5-turbo"):
    messages = [{"role": "user", "content": prompt}]
    response = openai.ChatCompletion.create(
        model=model,
        messages=messages,
        temperature=0, # this is the degree of randomness of the model's output
    )
    return response.choices[0].message["content"]

def get_completion_from_messages(messages, model="gpt-3.5-turbo", temperature=0):
    response = openai.ChatCompletion.create(
        model=model,
        messages=messages,
        temperature=temperature, # this is the degree of randomness of the model's output
    )
#    print(str(response.choices[0].message))
    return response.choices[0].message["content"]

def collect_messages(_):
    prompt = inp.value_input
    inp.value = ''
    context.append({'role':'user', 'content':f'{prompt}'})
    response = get_completion_from_messages(context)
    context.append({'role':'assistant', 'content':f'{response}'})
    panels.append(
        pn.Row('User:', pn.pane.Markdown(prompt, width=600)))
    panels.append(
        pn.Row('Assistant:', pn.pane.Markdown(response, width=600, style={'background-color': '#F6F6F6'})))
    return pn.Column(*panels)
```

# ChatBot

- 2. Prompting

```
import panel as pn # GUI
pn.extension()

panels = [] # collect display

context = [ {'role':'system', 'content':"""
You are OrderBot, an automated service to collect orders for a pizza restaurant. \
You first greet the customer, then collects the order, \
and then asks if it's a pickup or delivery. \
You wait to collect the entire order, then summarize it and check for a final \
time if the customer wants to add anything else. \
If it's a delivery, you ask for an address. \
Finally you collect the payment.\
Make sure to clarify all options, extras and sizes to uniquely \
identify the item from the menu.\
You respond in a short, very conversational friendly style. \
The menu includes \
pepperoni pizza 12.95, 10.00, 7.00 \
cheese pizza 10.95, 9.25, 6.50 \
eggplant pizza 11.95, 9.75, 6.75 \
fries 4.50, 3.50 \
greek salad 7.25 \
Toppings: \
extra cheese 2.00, \
mushrooms 1.50 \
sausage 3.00 \
canadian bacon 3.50 \
AI sauce 1.50 \
peppers 1.00 \
Drinks: \
coke 3.00, 2.00, 1.00 \
sprite 3.00, 2.00, 1.00 \
bottled water 5.00 \
"""} ] # accumulate messages
```

- 3. Run GUI

```
inp = pn.widgets.TextInput(value="Hi", placeholder='Enter text here...')
button_conversation = pn.widgets.Button(name="Chat!")

interactive_conversation = pn.bind(collect_messages, button_conversation)

dashboard = pn.Column(
    inp,
    pn.Row(button_conversation),
    pn.panel(interactive_conversation, loading_indicator=True, height=300),
)
dashboard
```

# Chat with bot

Assistant: Hello! Welcome to our pizza restaurant. What can I get for you today?

User: I would like to order pizza, menu, please!

Assistant: Sure thing! We have pepperoni pizza, cheese pizza, and eggplant pizza. Which one would you like?

User: Ahh, pepperoni pizza is fine.

Assistant: Great choice! Would you like a small, medium, or large pepperoni pizza?

User: small one

Assistant: Got it! Would you like to add any toppings to your pepperoni pizza? We have extra cheese, mushrooms, sausage, Canadian bacon, AI sauce, and peppers.

User: Please add extra cheese and peppers, and ... do you have fried chicken?

Assistant: I'm sorry, but we don't have fried chicken on our menu. Is there anything else you would like to add to your order?

User: Could you review my order?

Assistant: Of course! So far, you have ordered a small pepperoni pizza with extra cheese and peppers. Is there anything else you would like to add to your order?

User: A bottle of water, please.

Assistant: Sure thing! Would you like to pick up your order or have it delivered?

User: I prefer delivered. Is there any additional cost?

Assistant: Yes, there is a delivery fee of \$3.50. May I have your delivery address, please?

User: OK. 1234 Howard Street Oswego NY 13126 USA

Assistant: Thank you for providing your delivery address. Your total comes to \$24.95, which includes the small pepperoni pizza with extra cheese and peppers, and a bottle of water, as well as the \$3.50 delivery fee. Would you like to proceed with this order?

User: Yes, please.

Assistant: Great! May I have your payment information, please? We accept all major credit cards.

User: That's great; I would like to make a payment using my credit card.

Assistant: Sure thing! Please provide me with your credit card number, expiration date, and security code.

User: 1234 5678 9012 3456

Assistant: Thank you! And what is the expiration date and security code?

User: 12/26

Assistant: And the security code?

# Chat with bot

Assistant: And the security code?

User: 555

Assistant: Thank you! Your payment has been processed successfully. Your order of a small pepperoni pizza with extra cheese and peppers, a bottle of water, and the delivery fee will be delivered to 1234 Howard Street Oswego NY 13126 USA. Thank you for choosing our pizza restaurant!

User: That's it

Assistant: Thank you for your order! If you have any further questions or concerns, please don't hesitate to contact us. Have a great day!

**Thank you very much  
& Any questions**

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