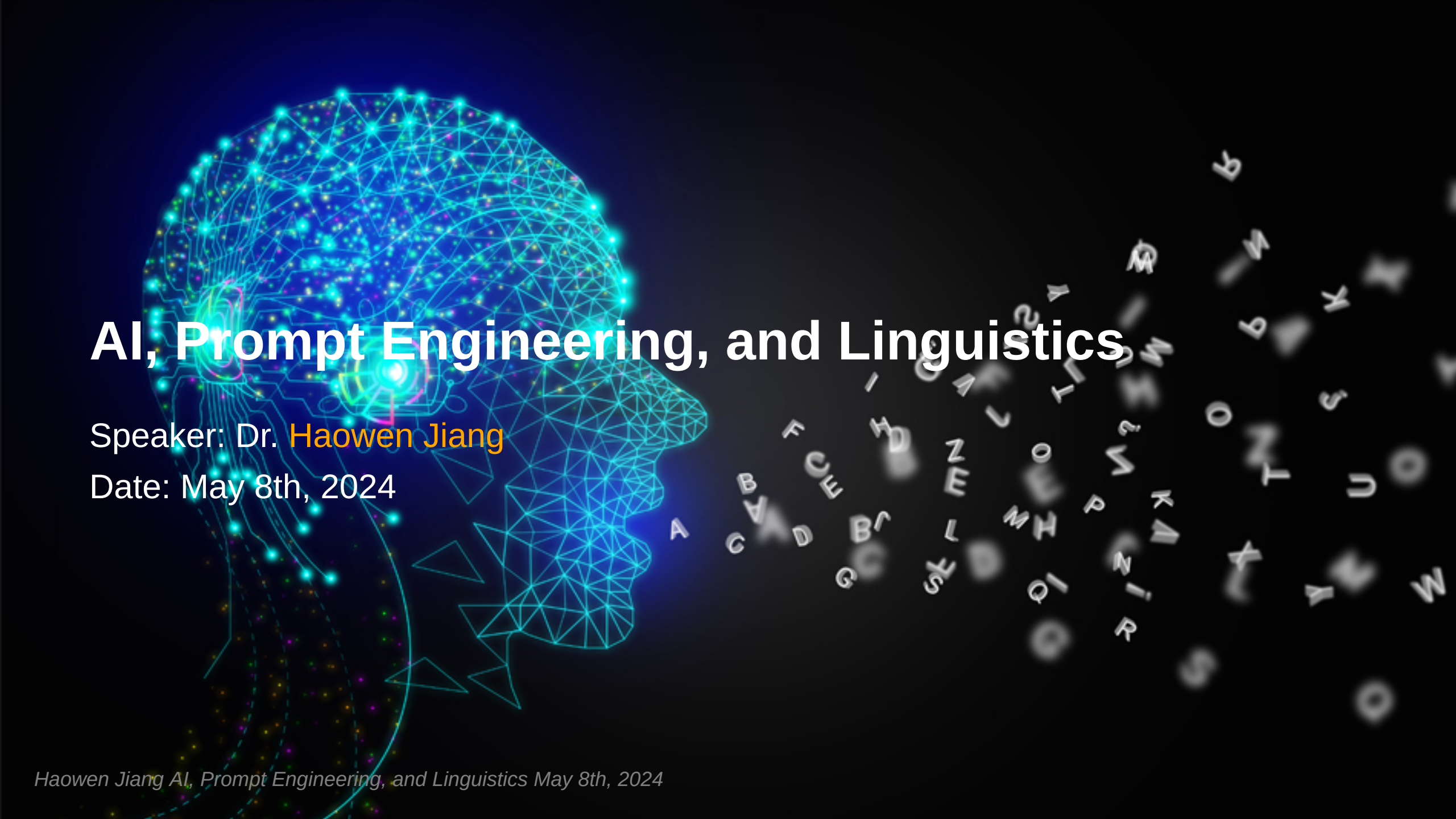


AI, Prompt Engineering, and Linguistics

Speaker: Dr. Haowen Jiang

Date: May 8th, 2024

Outline

- My background
- Intro to AI
- Large Language Models
- Prompt Engineering & Linguisitcs
- Diffit: an AI tool for teaching
- Q & A

My background

Education

Nat'l Taiwan University

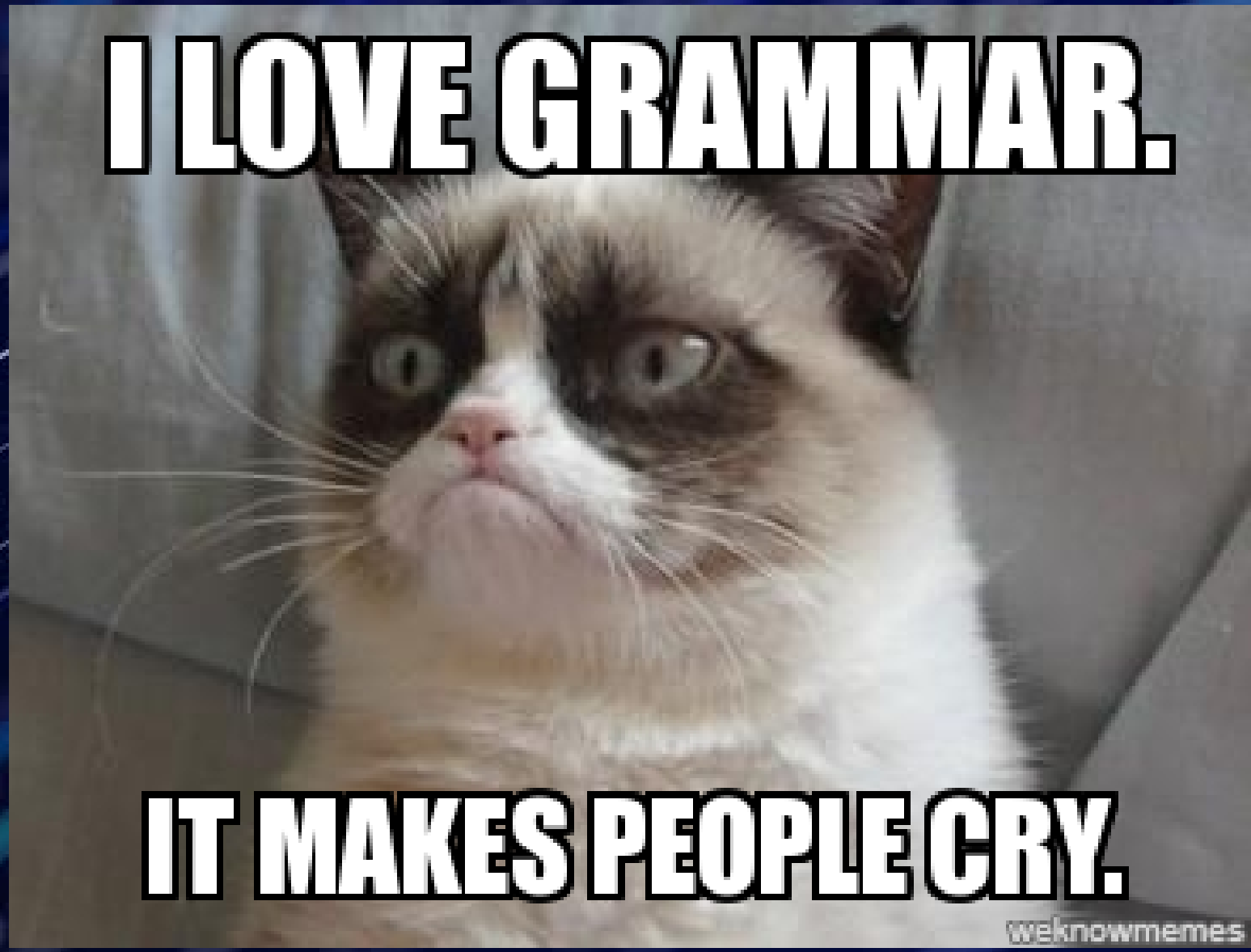
MA, Linguistics
BA, Foreign Languages

Rice University

PhD, Linguistics
MA, Linguistics

Experience

- **English lecturer**
  - at Nat'l Taipei U of Technology



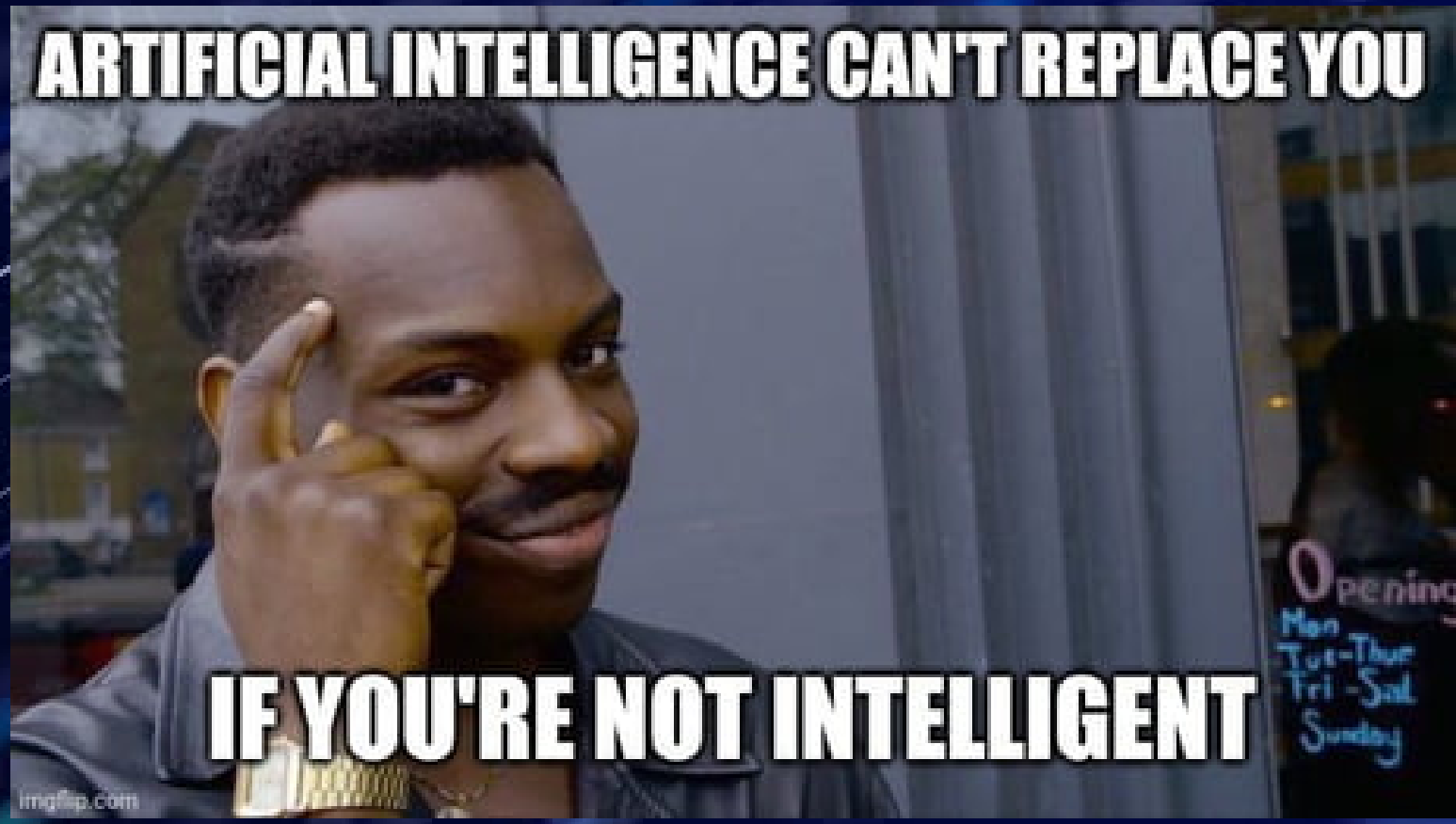
Experience

- 👨‍🔬 **Postdoc researcher**
  - at Peking U

Experience

👨‍💻 **AI engineer**

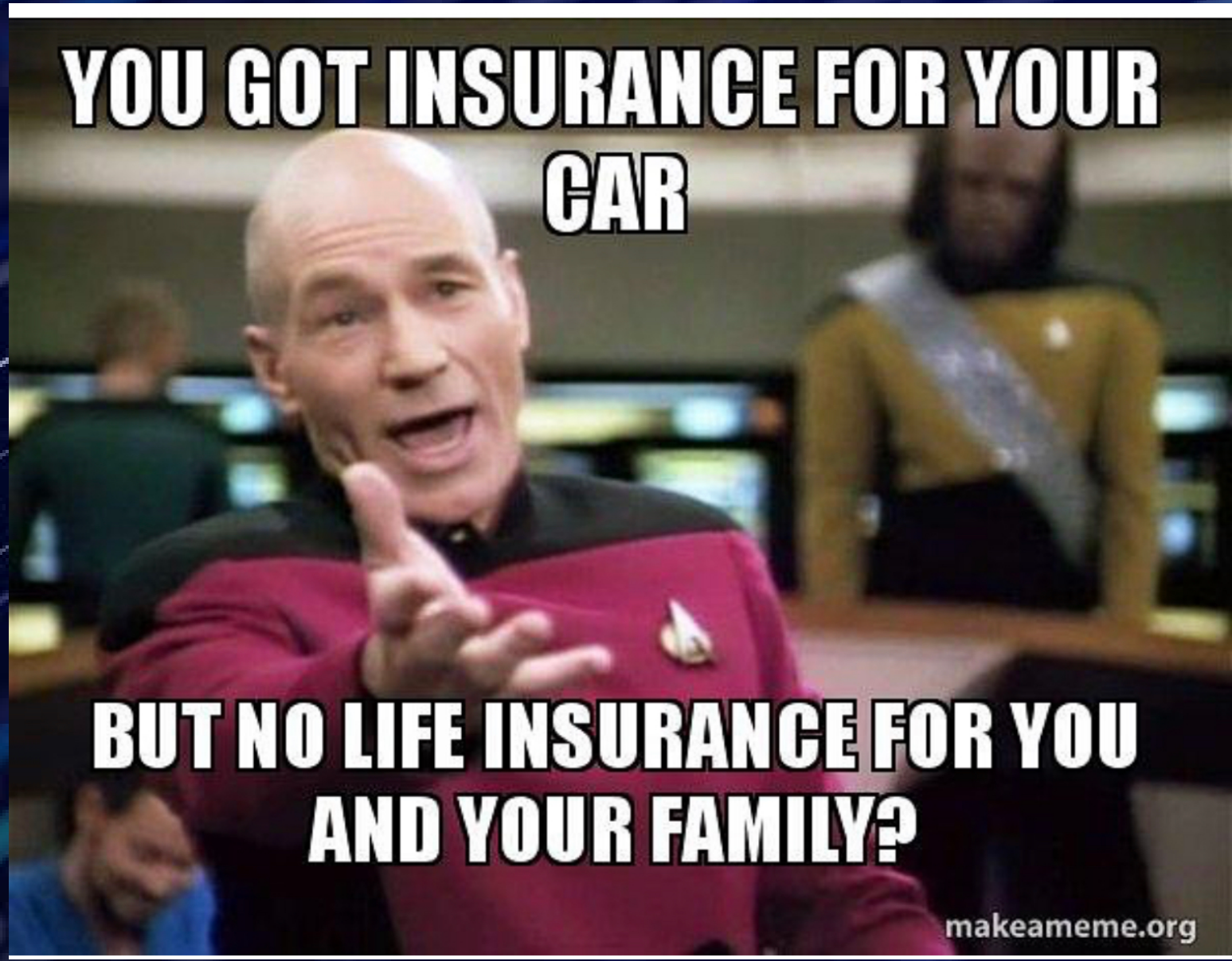
- at Hamastar Tech
- at Wisers Information Limited



Experience

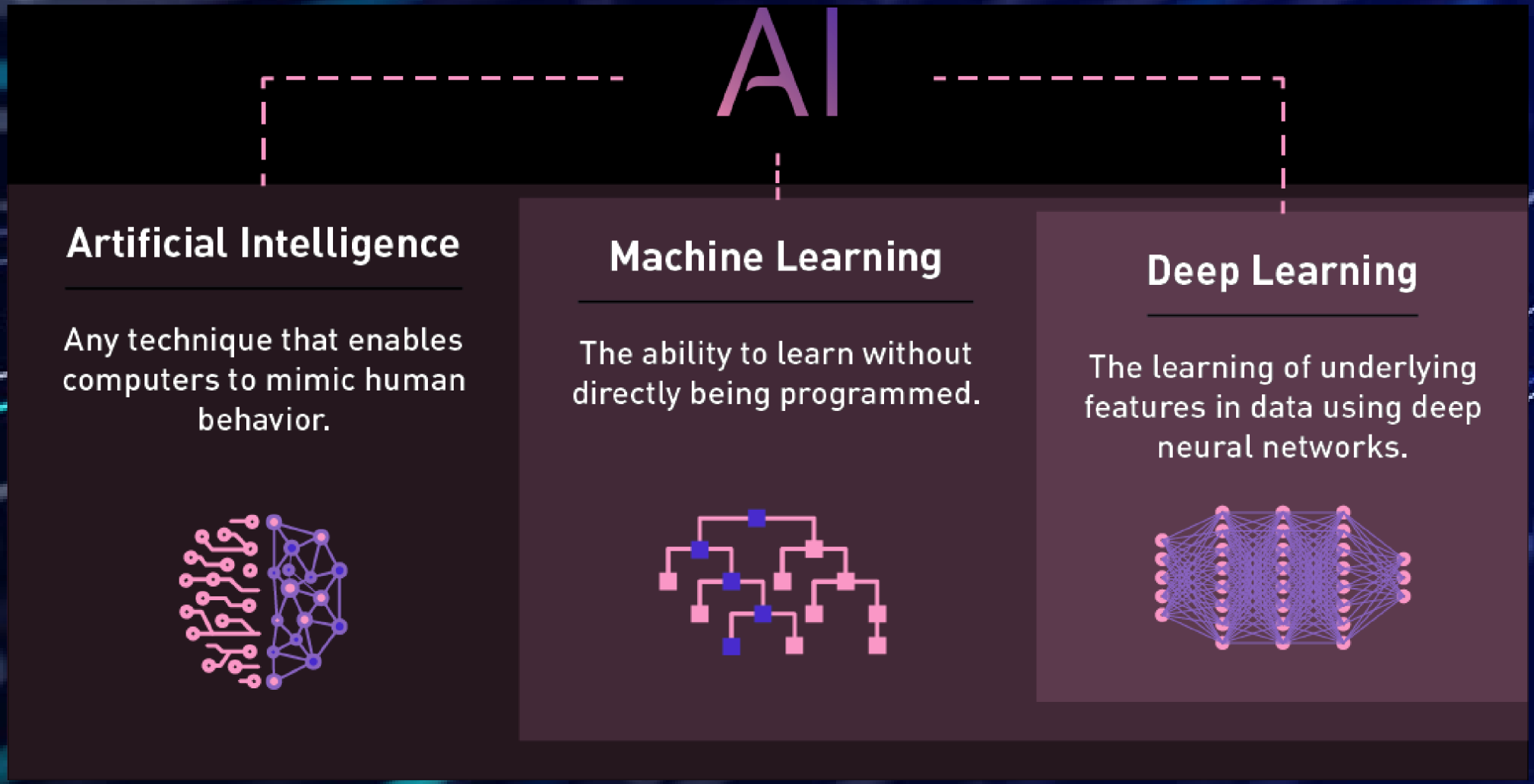
👨‍💼 **Assistant manager of data analysis**

- at Shin Kong Life



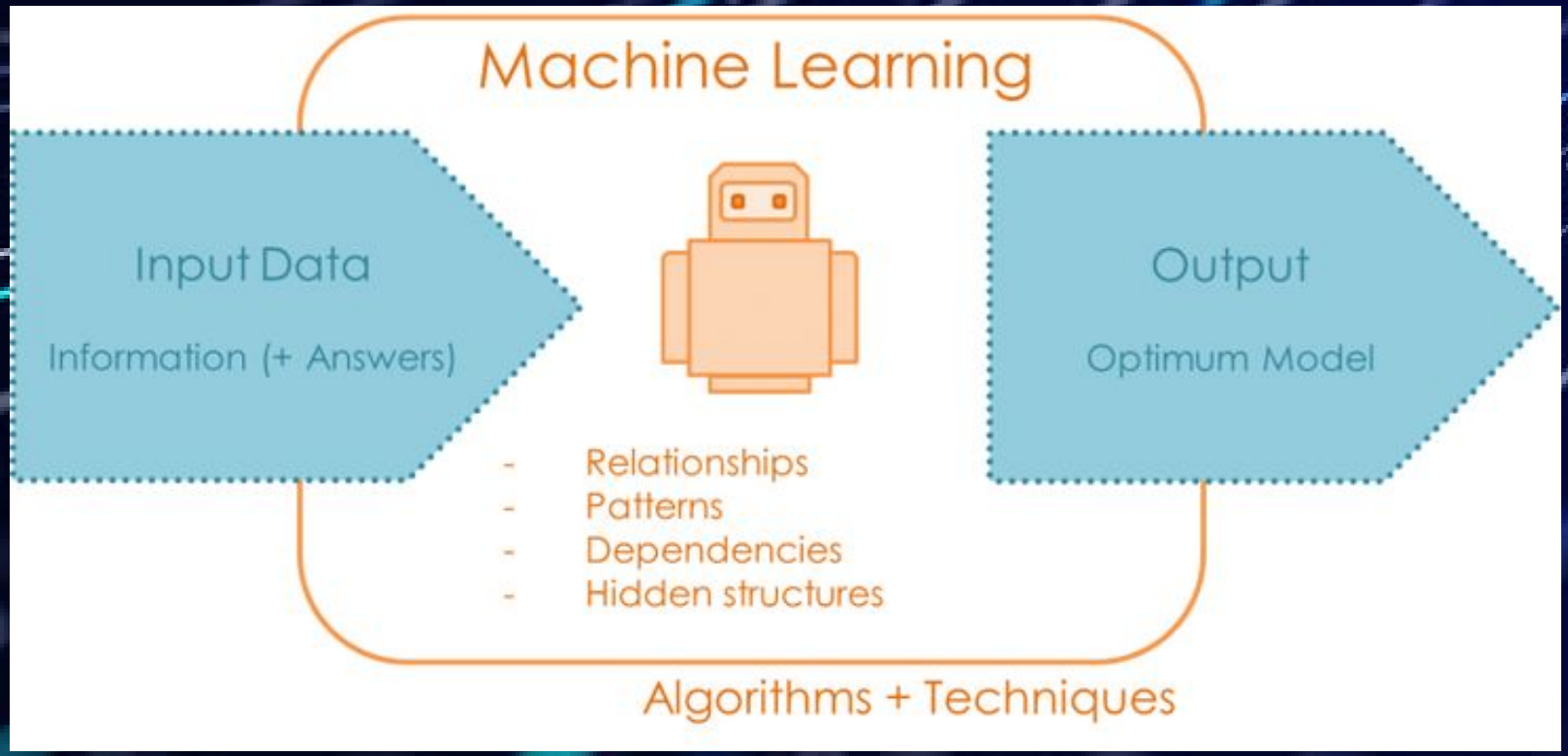
Intro to AI

AI and its other names



Searching for a function

The goal of ML/DL is to search for a *function* that takes some input and then produces some output in a way that humans would normally do.



Function

Linguistics

LIKE(I, languages)

Programming

```
def like(subj, obj):
    print(f"{subj} like {obj}.")

like("I", "languages")
```

Try it out here!

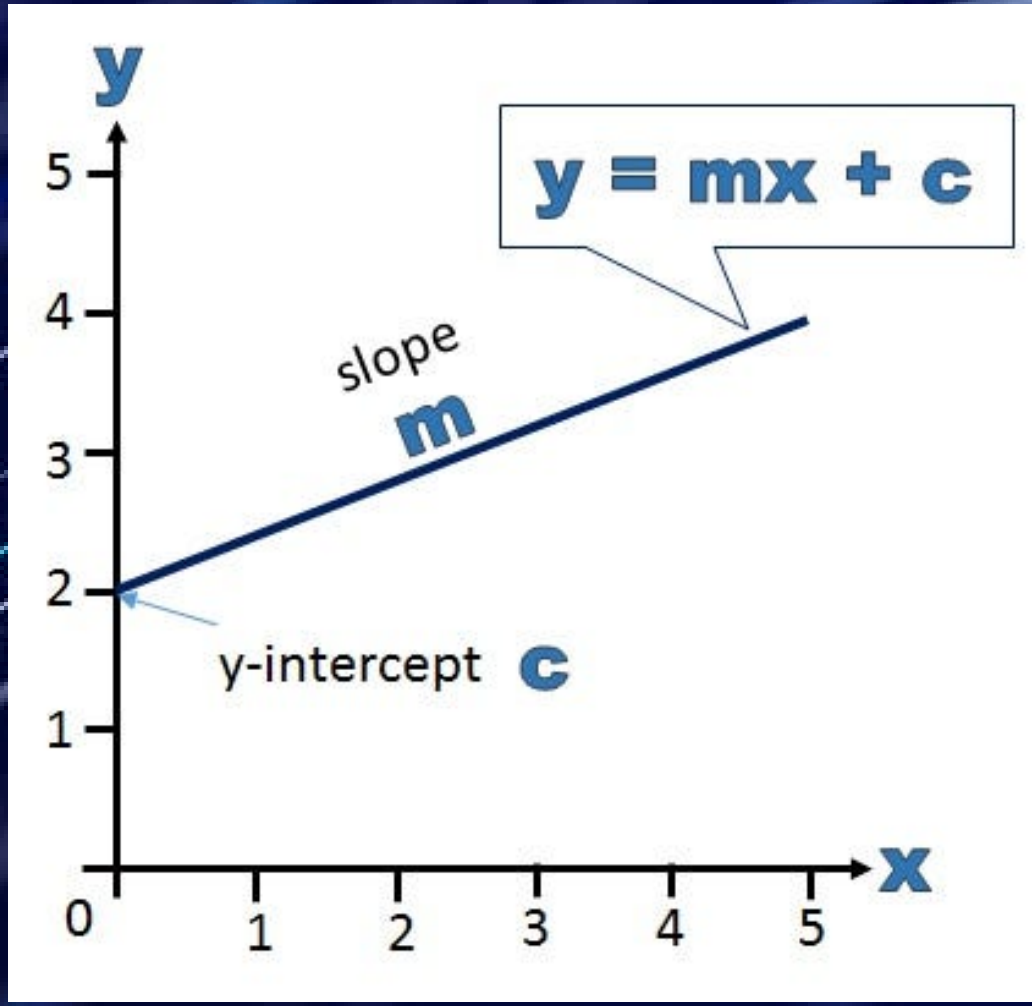
Data-driven AI

A data-driven model

is trained on data points instead of being coded upfront.

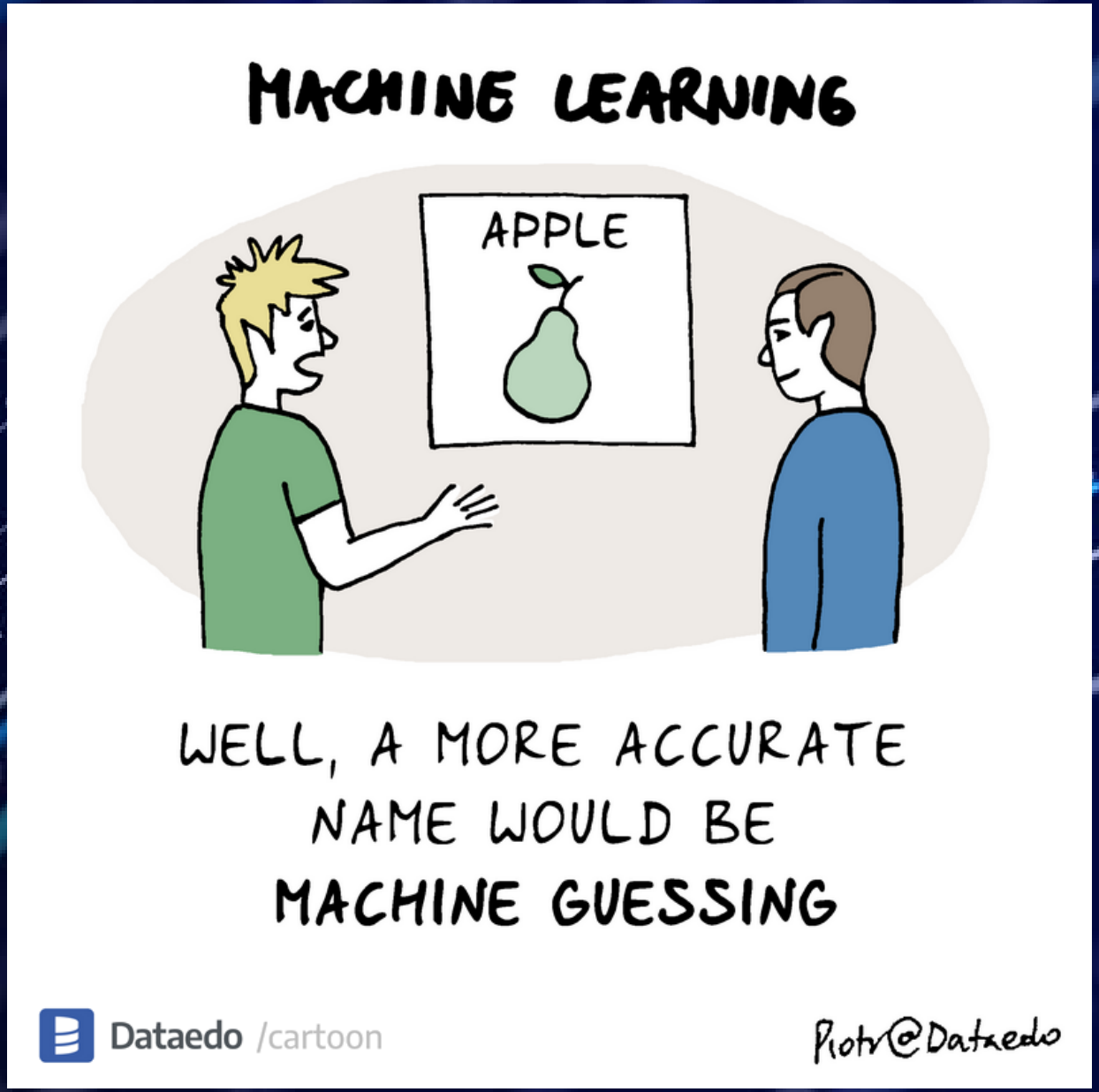
```
inputs = [2, 3, 4] # the x variable
outputs = [12, 17, 22] # the y variable
```

$$Random : y = 0.1x + 5$$
$$Trained : y = 5x + 2$$



How do machines learn?

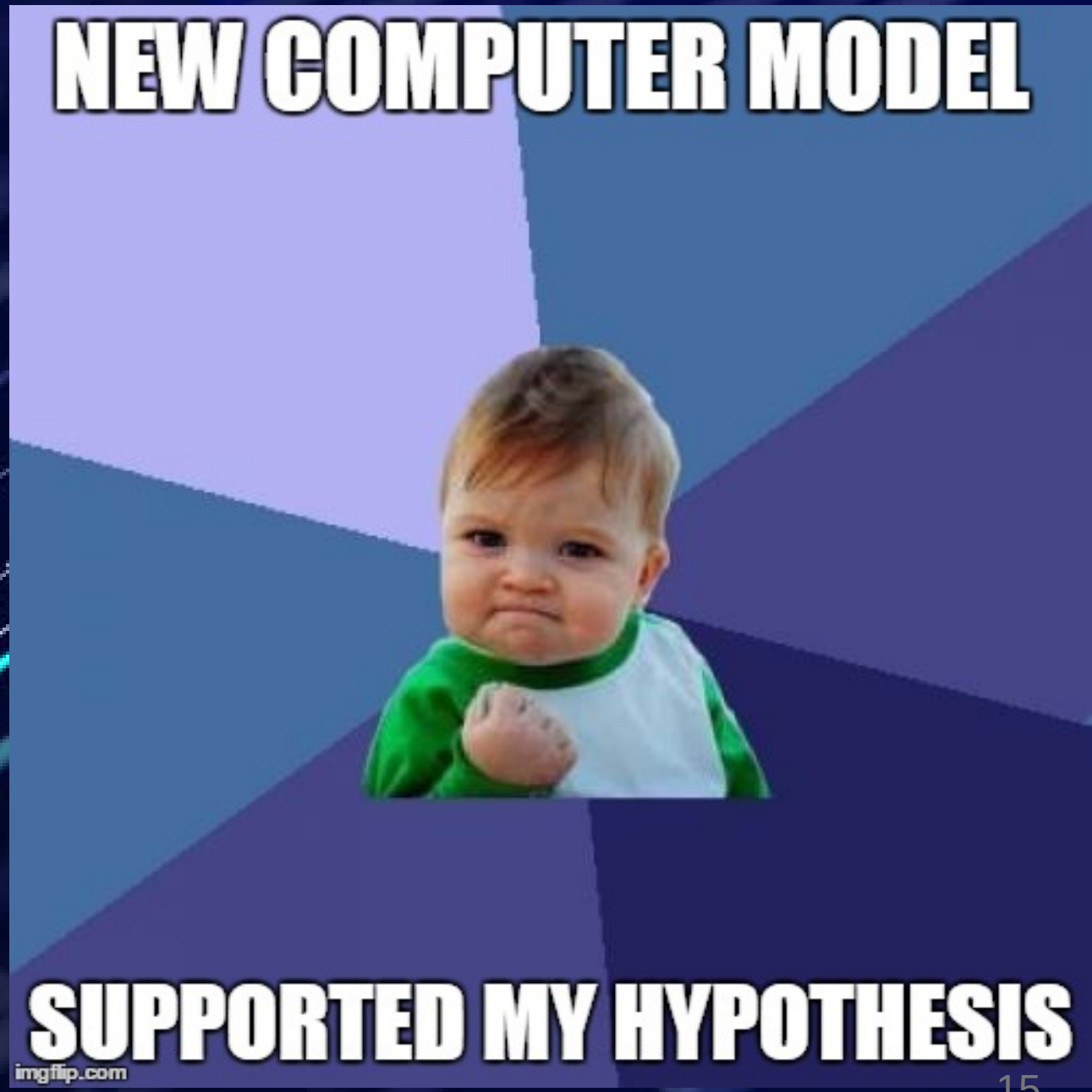
> Machines learn
>
> by trial and error,
>
> just as humans do.



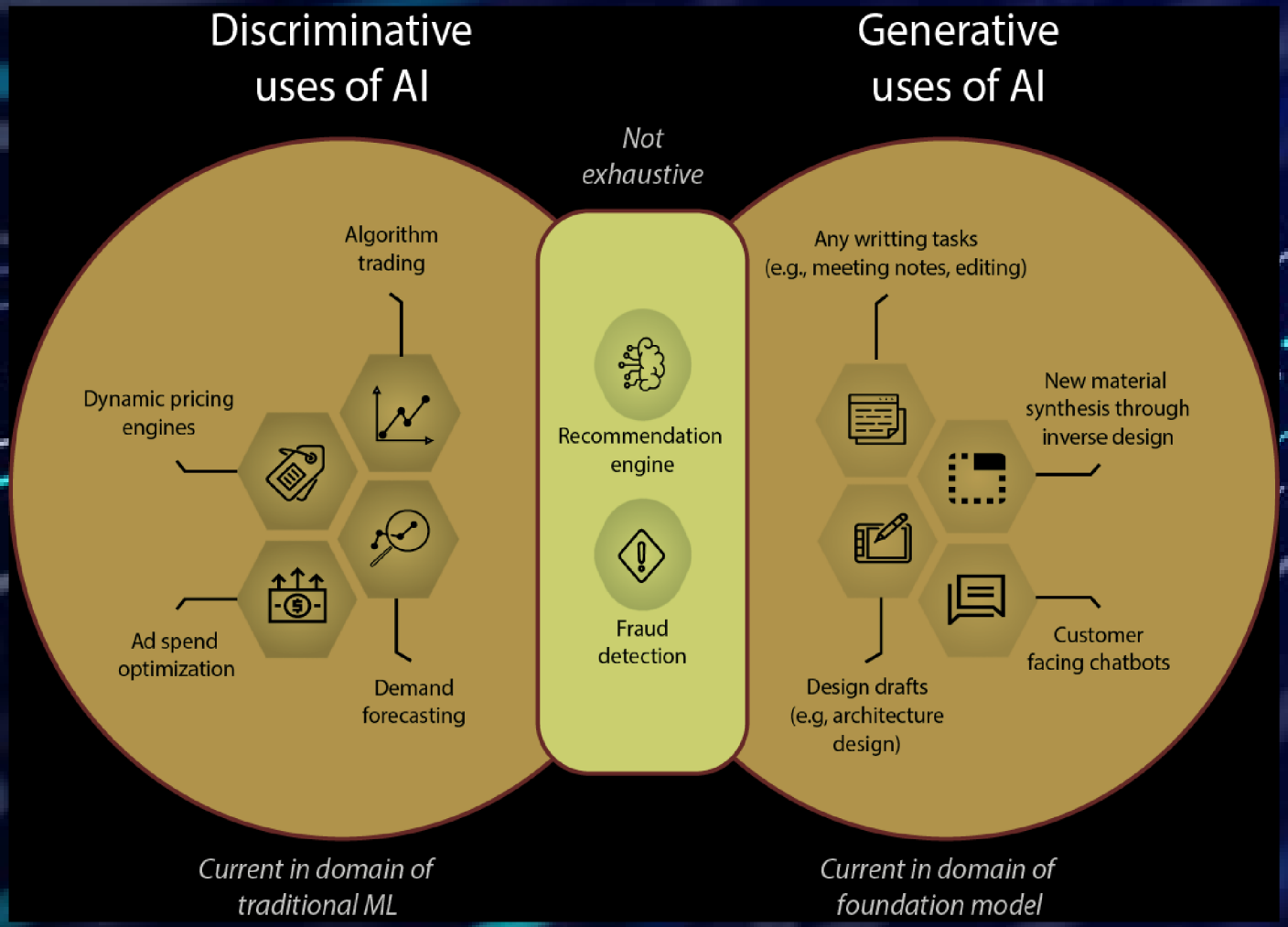
Why is machine learning powerful?

True power of ML/DL

- humans only need to provide input and output
- computers are in charge of figuring out the right process (i.e. a model)



2 types of AI


Discriminative uses of AI
Generative uses of AI
Not exhaustive
Algorithm trading
Dynamic pricing engines
Ad spend optimization
Demand forecasting
Recommendation engine
Fraud detection
Any writting tasks (e.g., meeting notes, editing)
New material synthesis through inverse design
Customer facing chatbots
Design drafts (e.g, architecture design)
Current in domain of traditional ML
Current in domain of foundation model

2 types of discriminative models

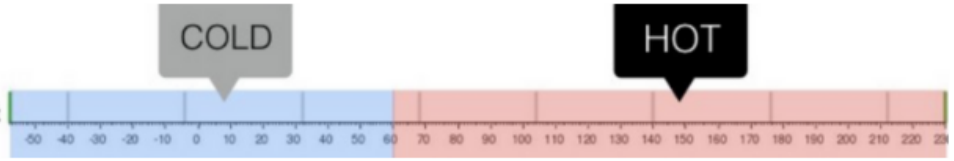
Regression

What will be the temperature tomorrow?

Fahrenheit

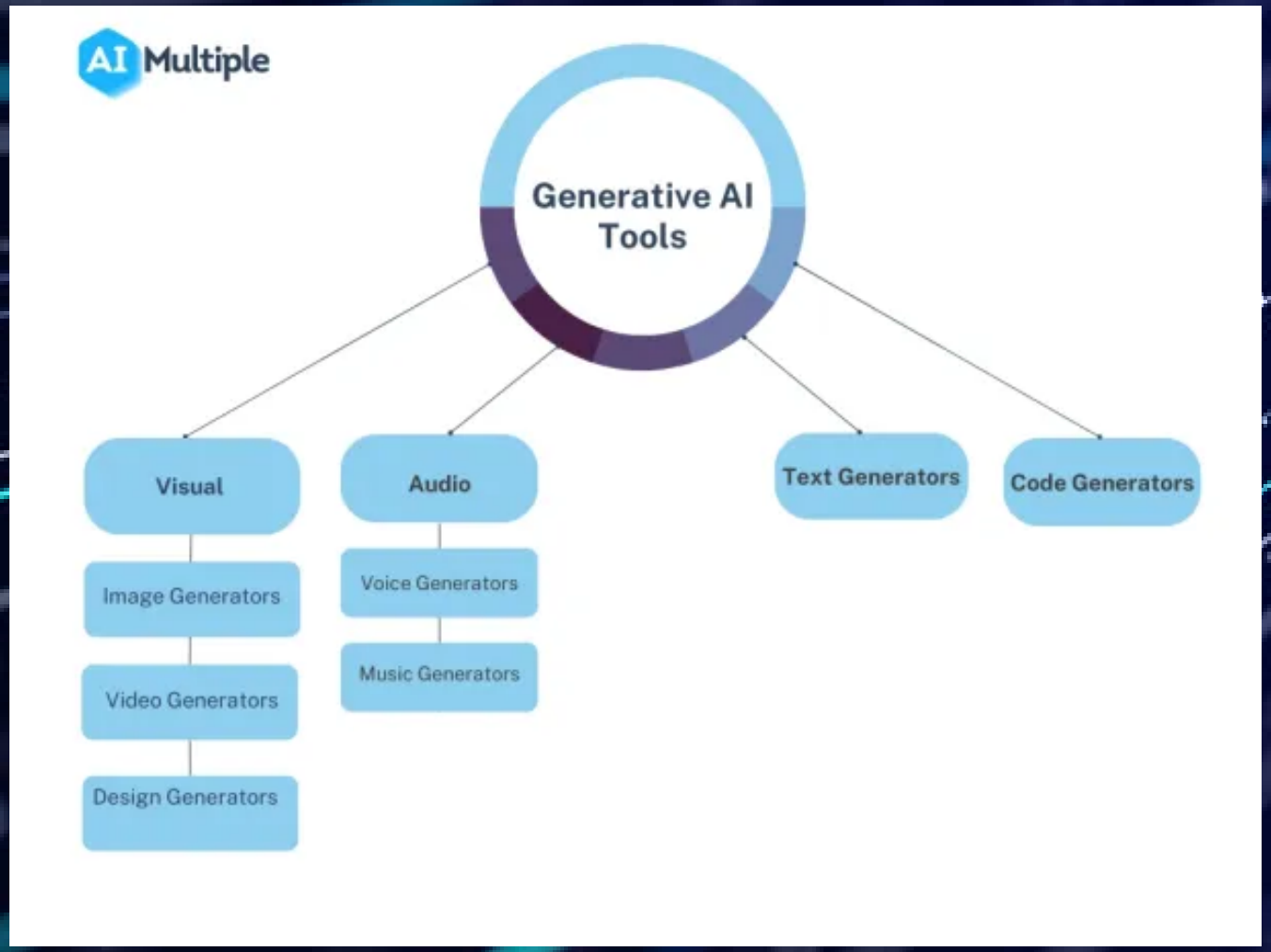
Classification

Will it be hot or cold tomorrow?



Fahrenheit

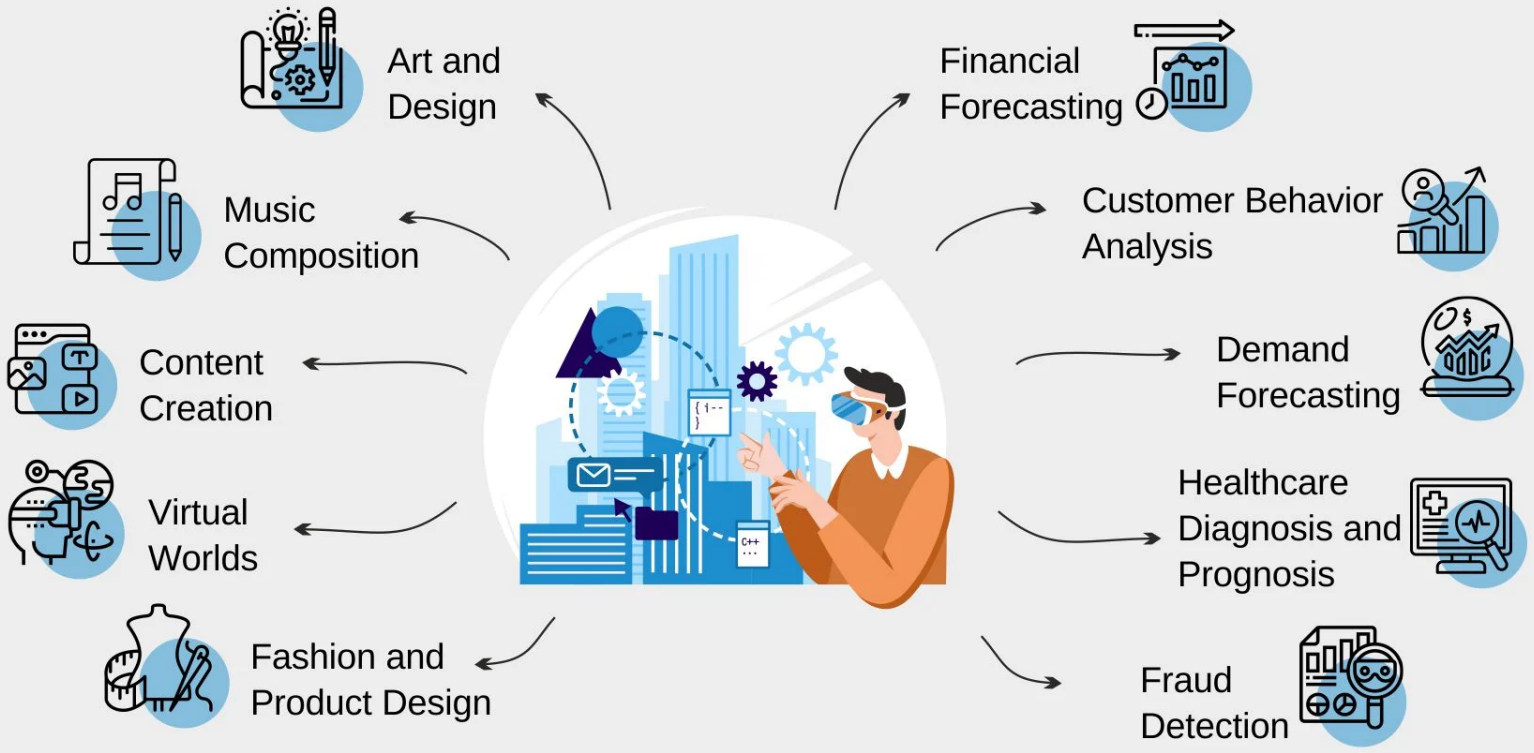
4 types of generative models



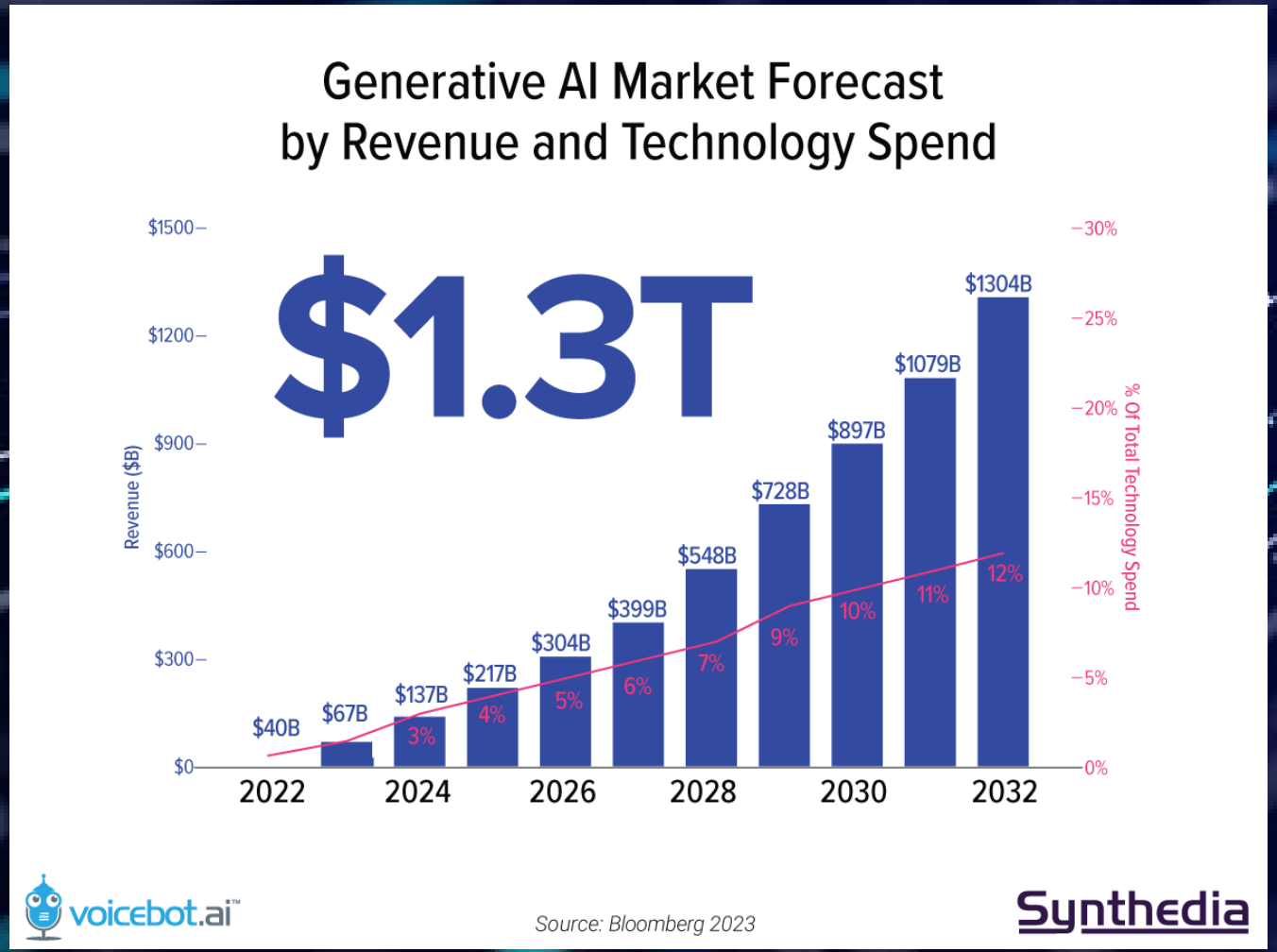
Use cases of GenAI

Generative AI Applications

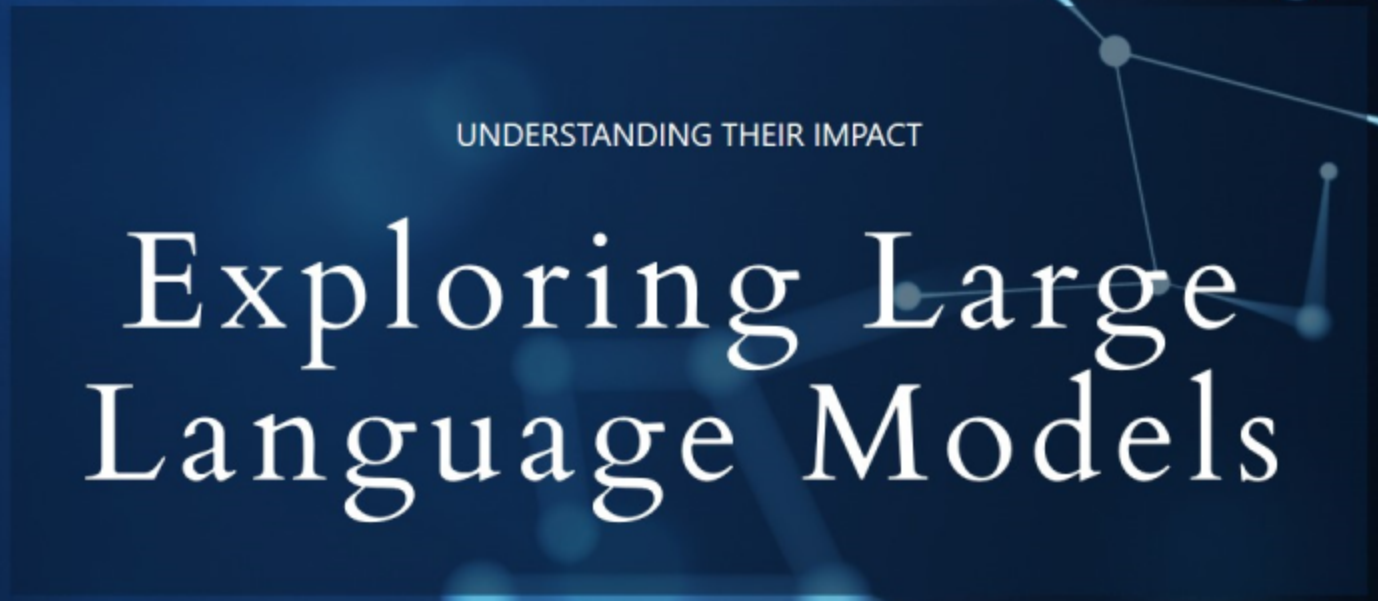
Neebal Technologies
www.neebal.com



Revenue forcast of GenAI



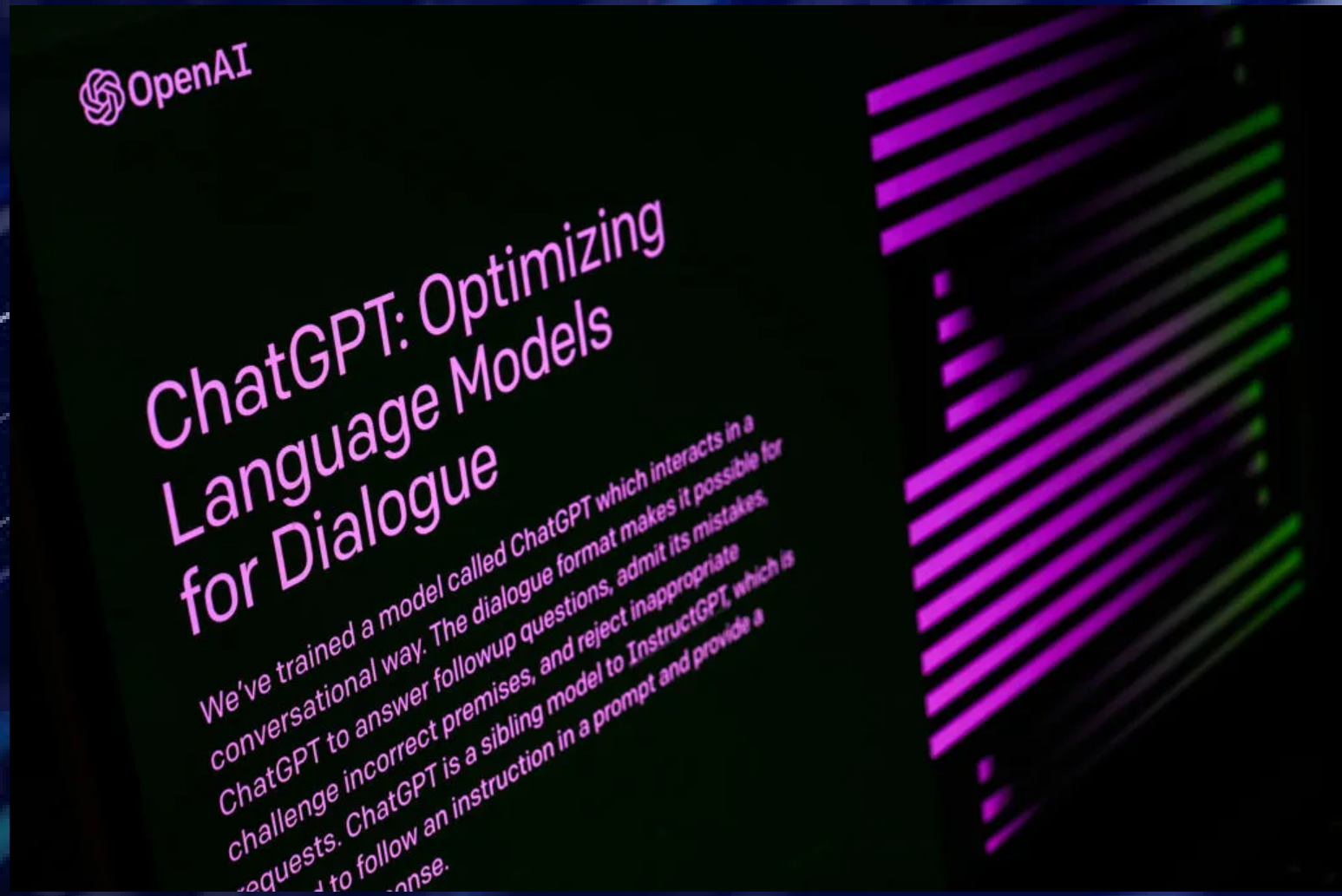
Large Language Models



ChatGPT's status

The New York Times

The best artificial intelligence chatbot ever released to the general public.



ChatGPT's significance

TechGoing

ChatGPT’s history is as significant as the birth of the PC or the Internet

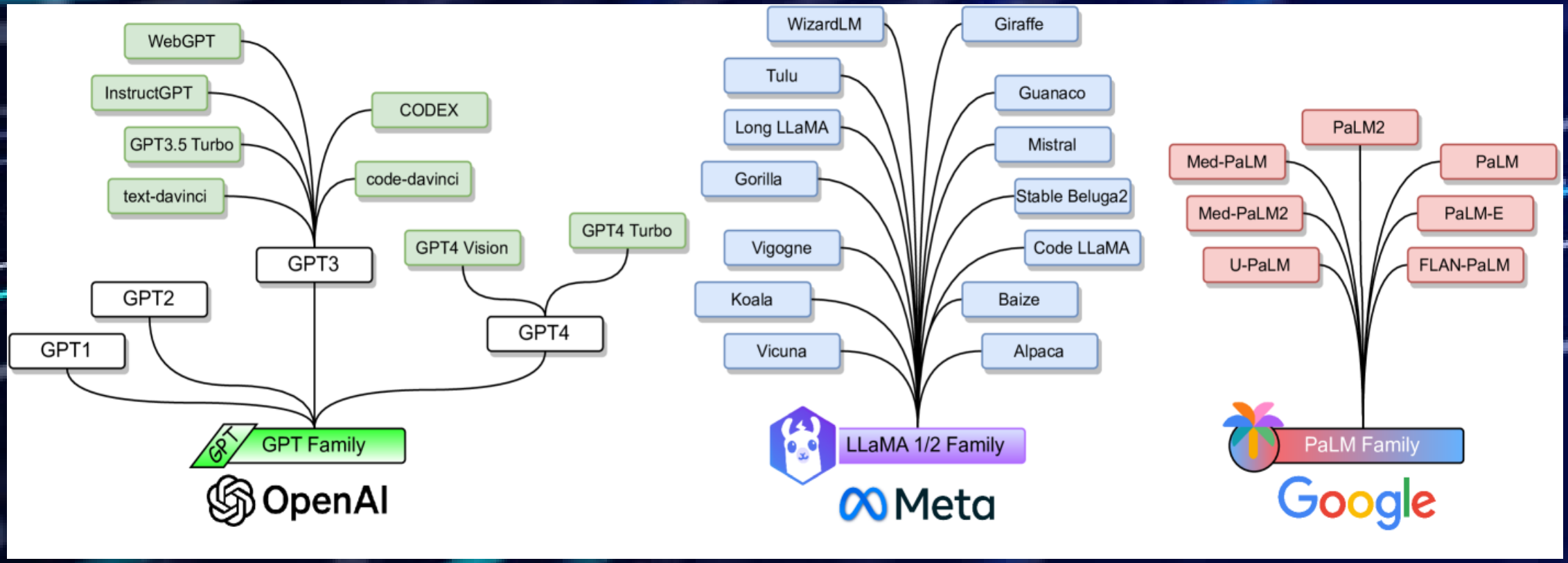
~ Bill Gates

ChatGPT's model

ChatGPT

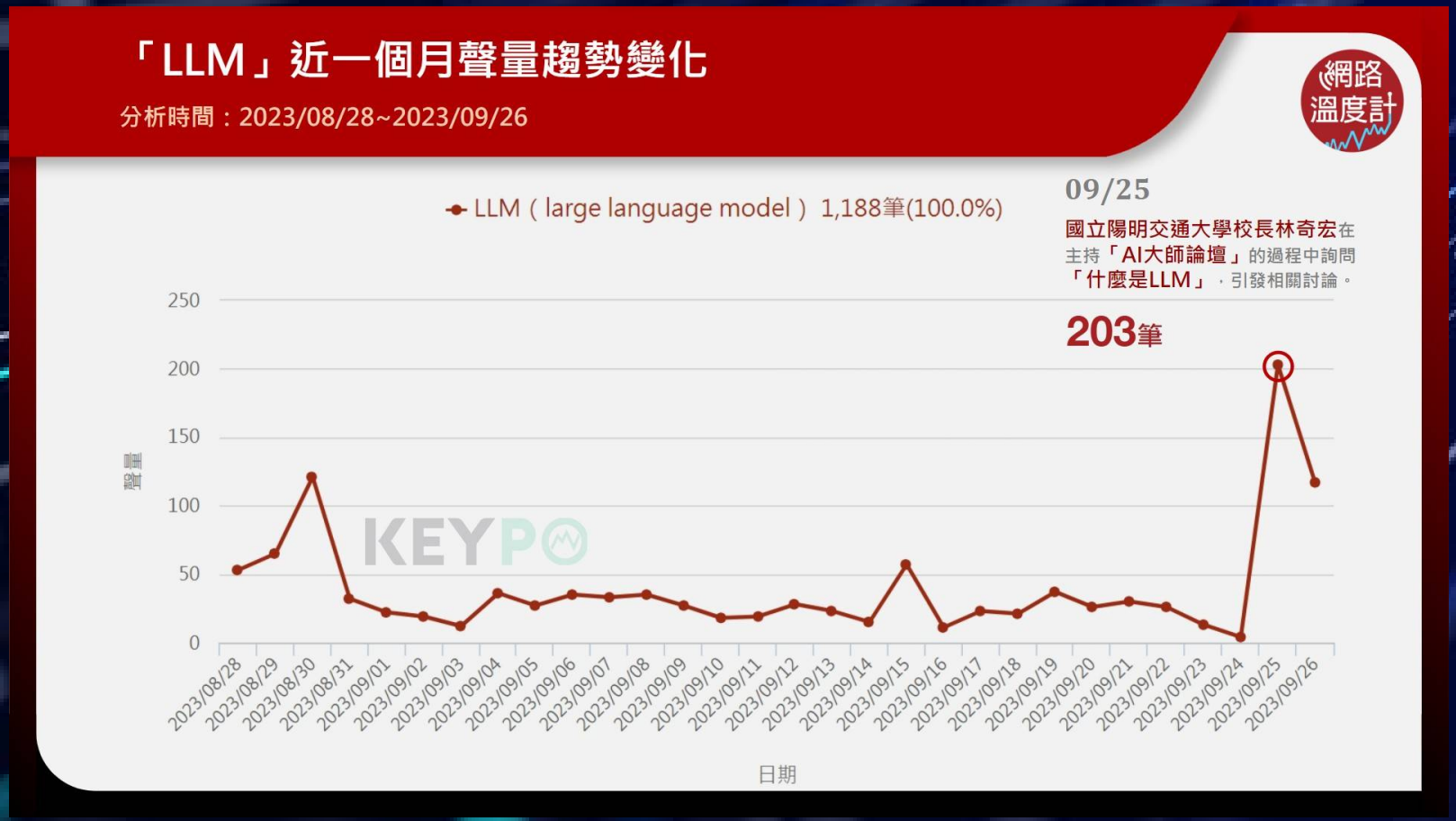
is powered by a large language model (LLM) called Generative Pre-trained Transformer (GPT).

The LLM family



Trends of LLM

LLM became a popular term in Taiwan around Sep, 2023.

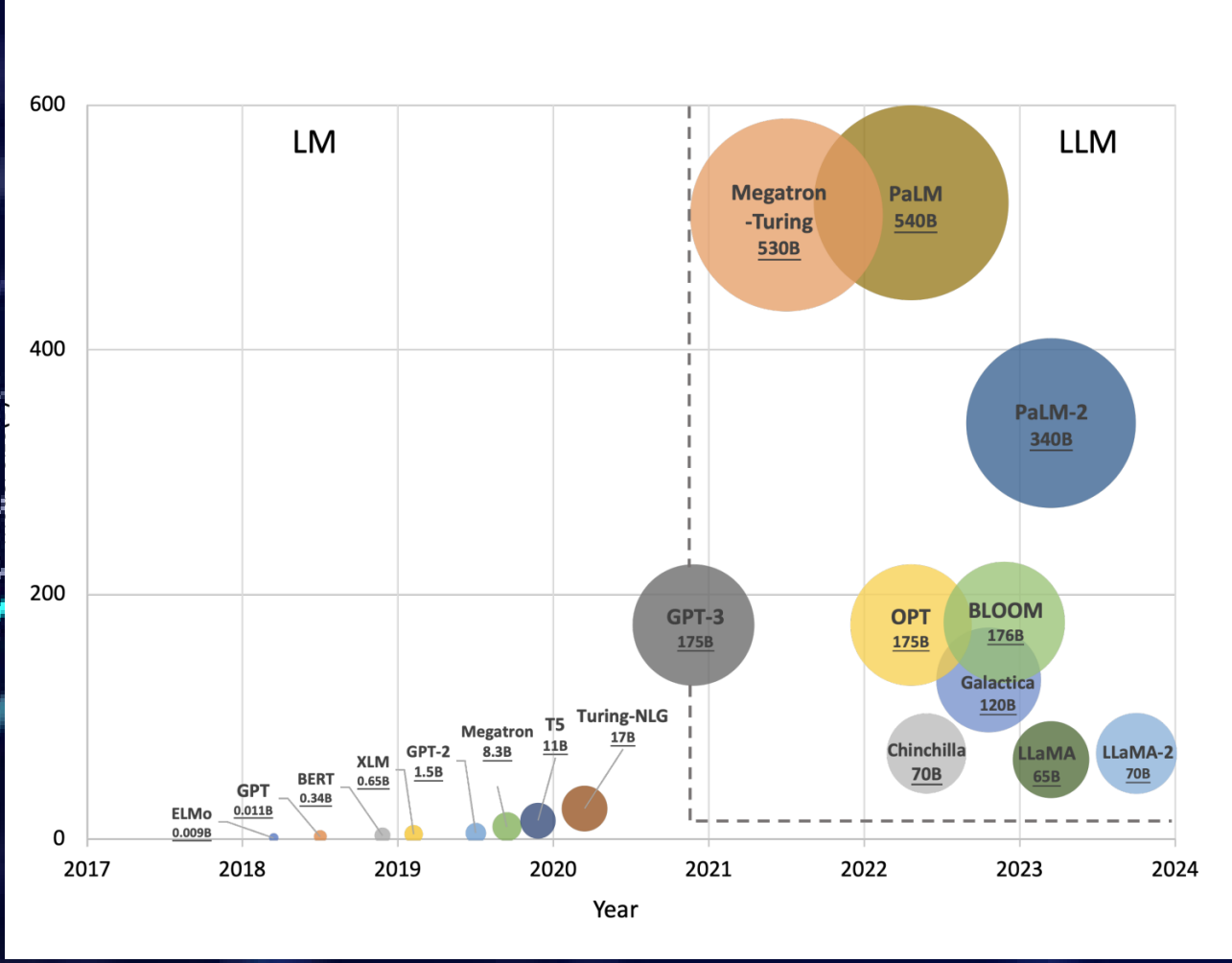


What makes LLM large?

LLM

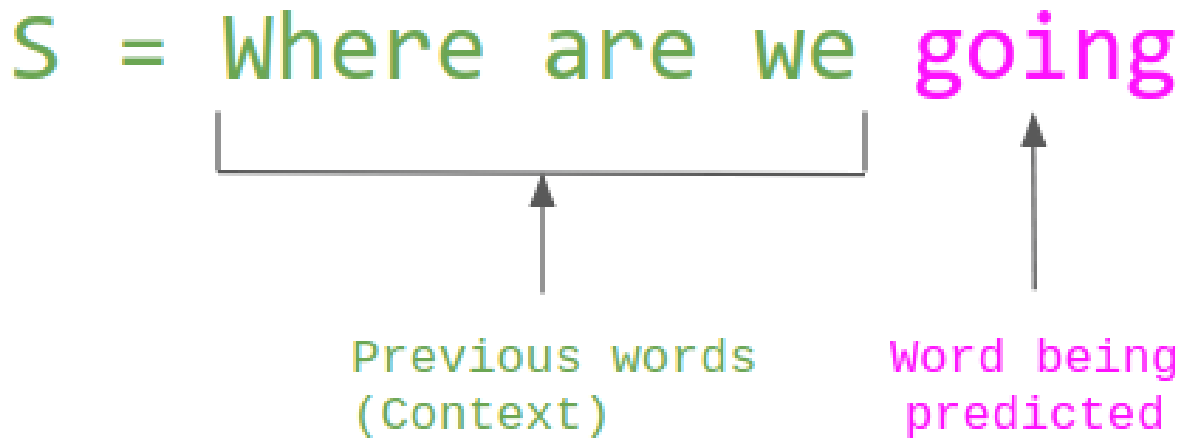
- is large because of the size of its parameters.

- Recall that $y = 0.1x + 5$ has one parameter.



What is a language model?

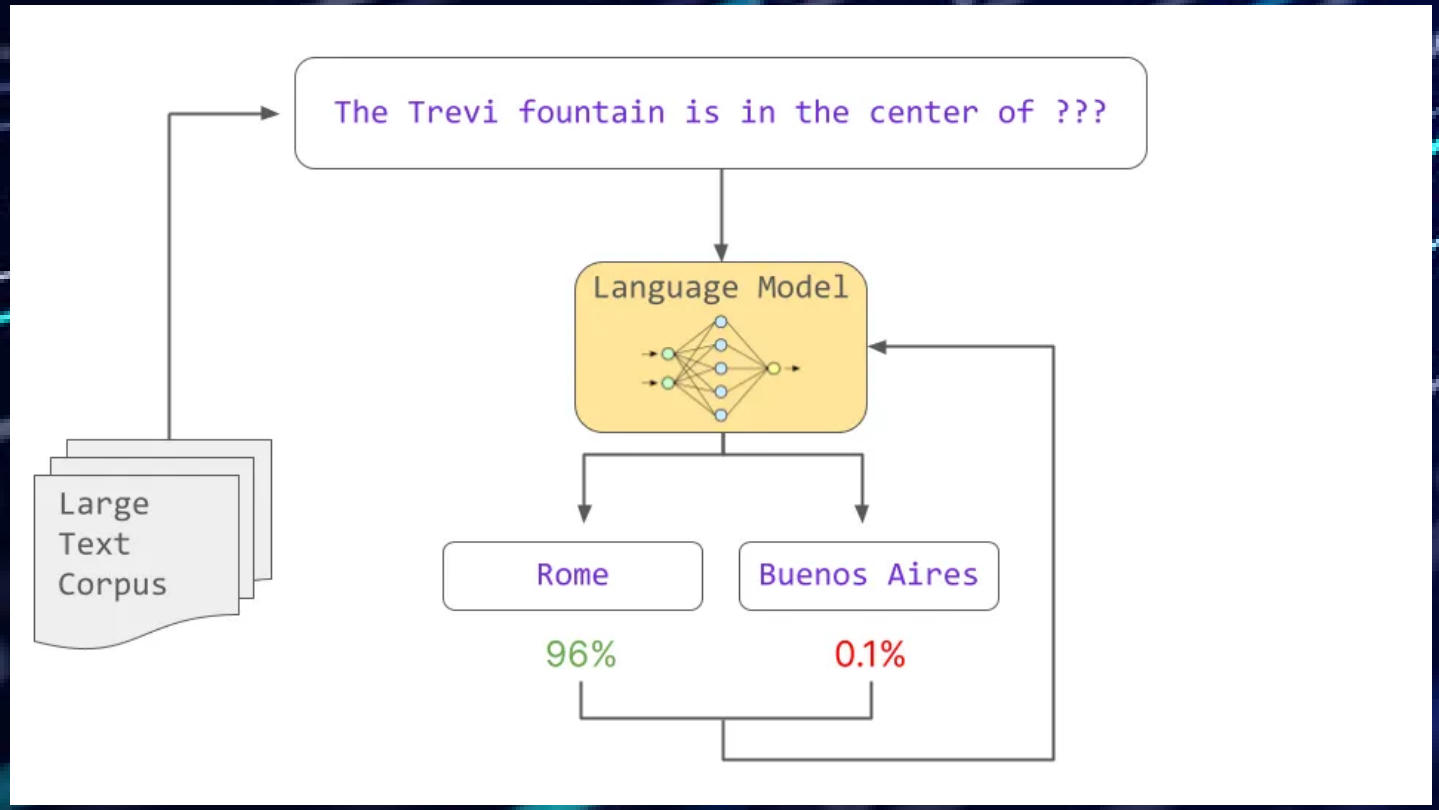
A language model predicts the next word based on conditional probability.



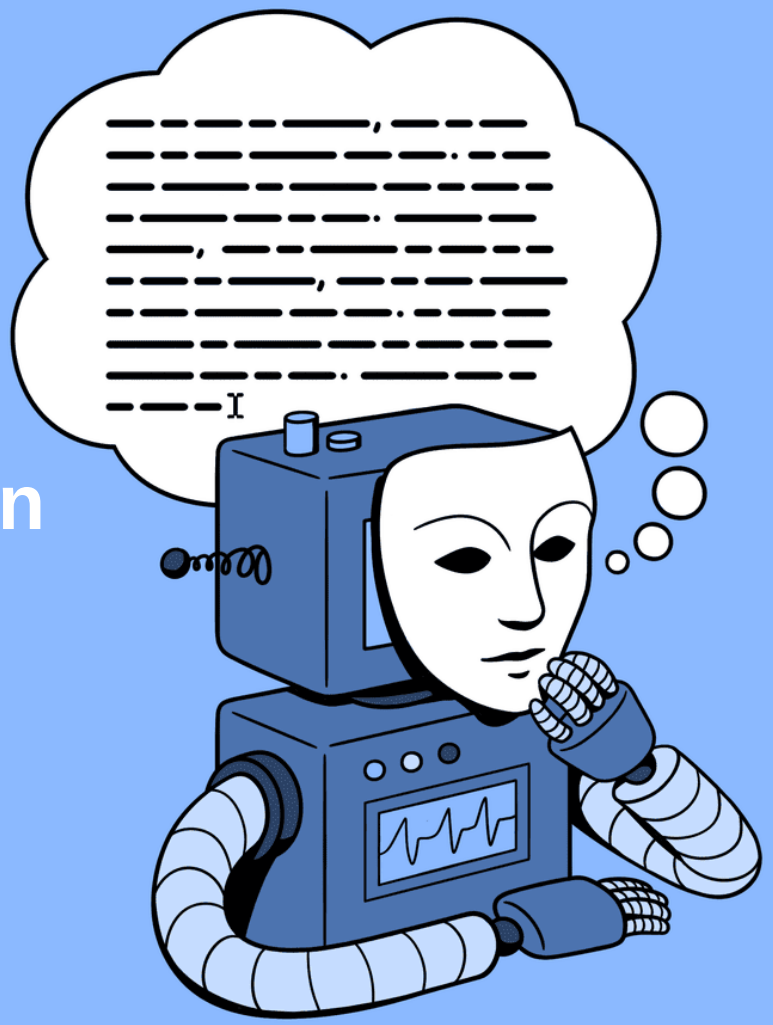
$$P(S) = P(\text{Where}) \times P(\text{are} \mid \text{Where}) \times P(\text{we} \mid \text{Where are}) \times P(\text{going} \mid \text{Where are we})$$

A language model has some world knowledge.

Given a huge corpus of texts, a language model can acquire some basic world knowledge.



Definition



Large Language Model (LLM)

['lärj 'laŋ-gwij 'mä-dᵊl]

A deep learning algorithm that's equipped to summarize, translate, predict, and generate human-sounding text to convey ideas and concepts.

Investopedia

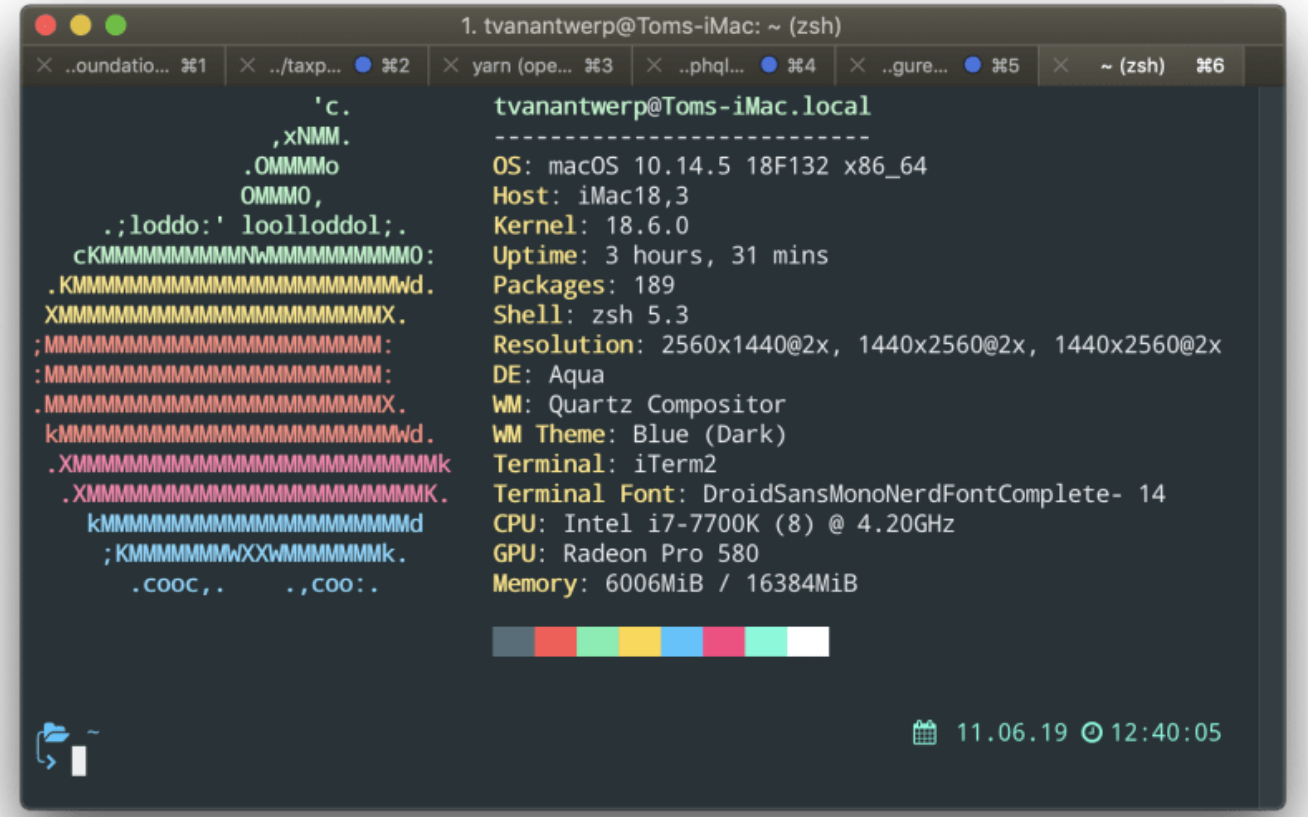
Top AI chatbos in 2024 powered by LLM

	ChatGPT	Google Bard	Claude AI	Bing Chat	OORT AI
Release date	Nov. 2022	Mar. 2023	Mar. 2023	Mar. 2023	Sept. 2023
Key feature	Creativity and human-like conversation	Google ecosystem assistant	Safety and ethics response	Web-based contextual response	Privacy and customization
Language model	GPT-3.4/GPT-4	Gemini (successor to LaMDA and PaLM)	Claude	GPT-4	Enhanced vicuna
Information access	Offline knowledge data	Online internet data	Offline knowledge data	Online internet data	Offline knowledge data
Customer data storage	Centralized	Centralized	Centralized	Centralized	Decentralized
Integration API	Available	Not available	Available	Not available	Available

 Source Article

Prompt Engineering & Linguistics

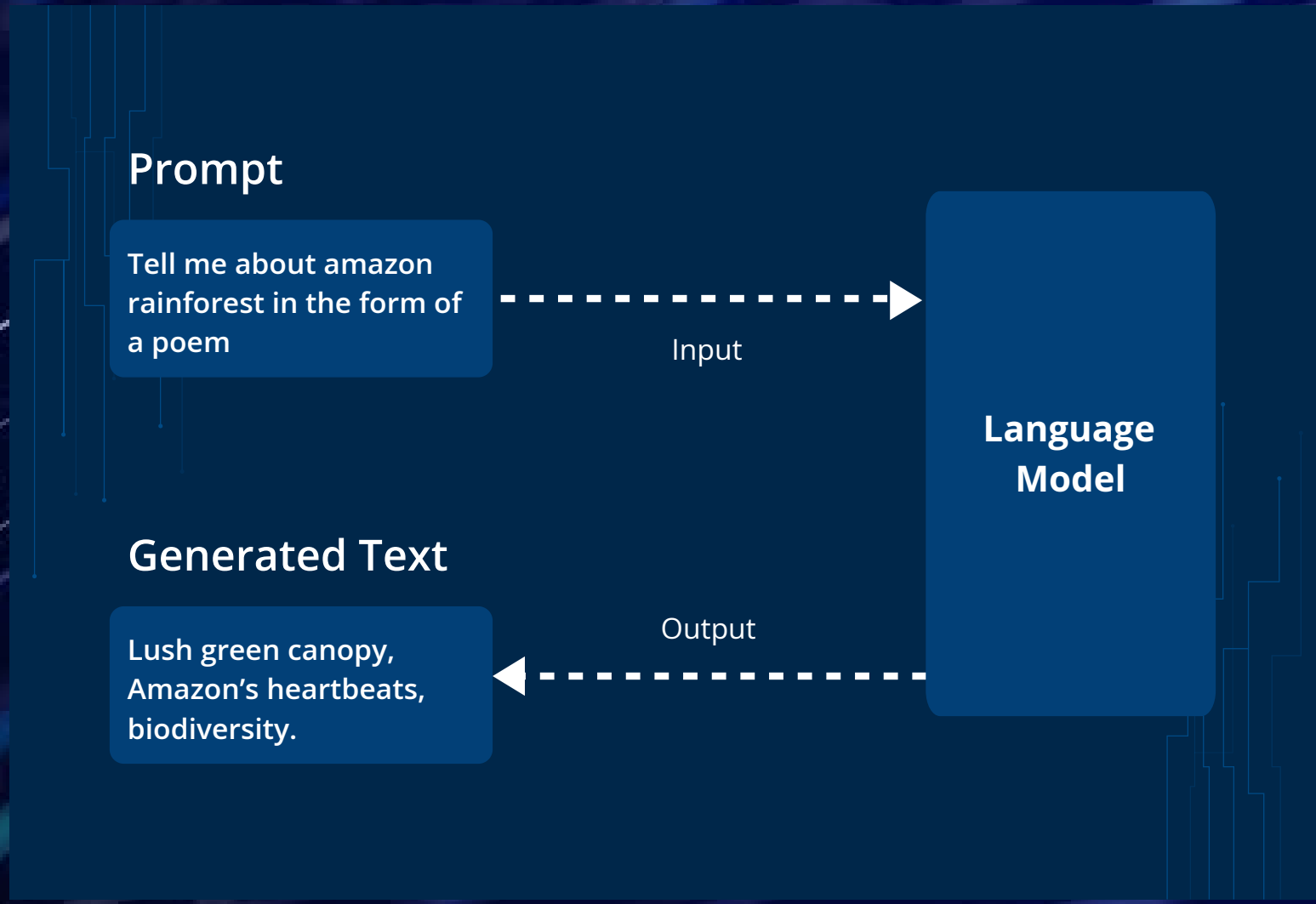
Prompt on the terminal



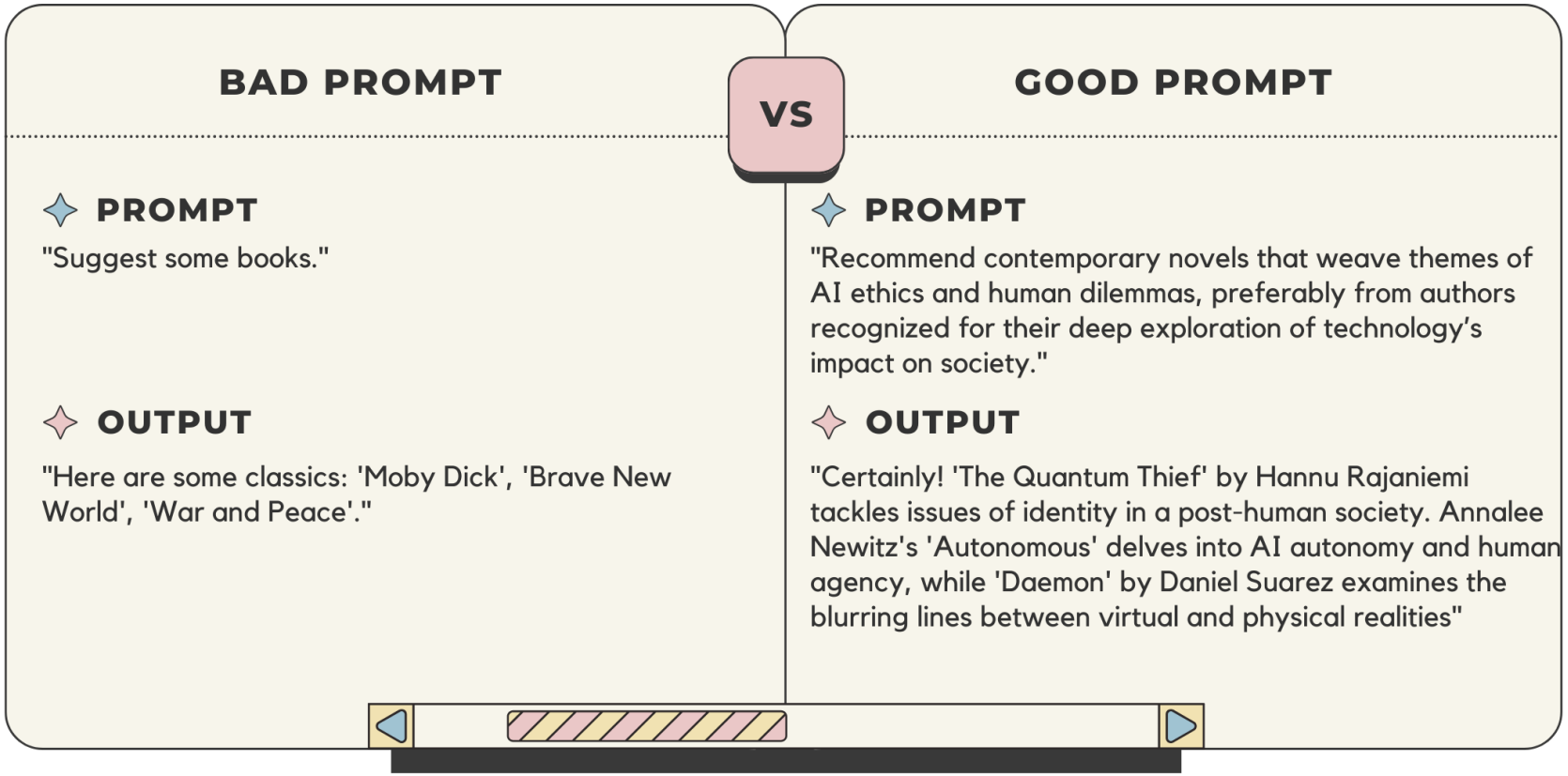
Prompt in GenAI

Prompt

In the context of GenAI, a prompt is a specific instruction or input given to the AI model to generate a desired output.



What makes a good prompt?

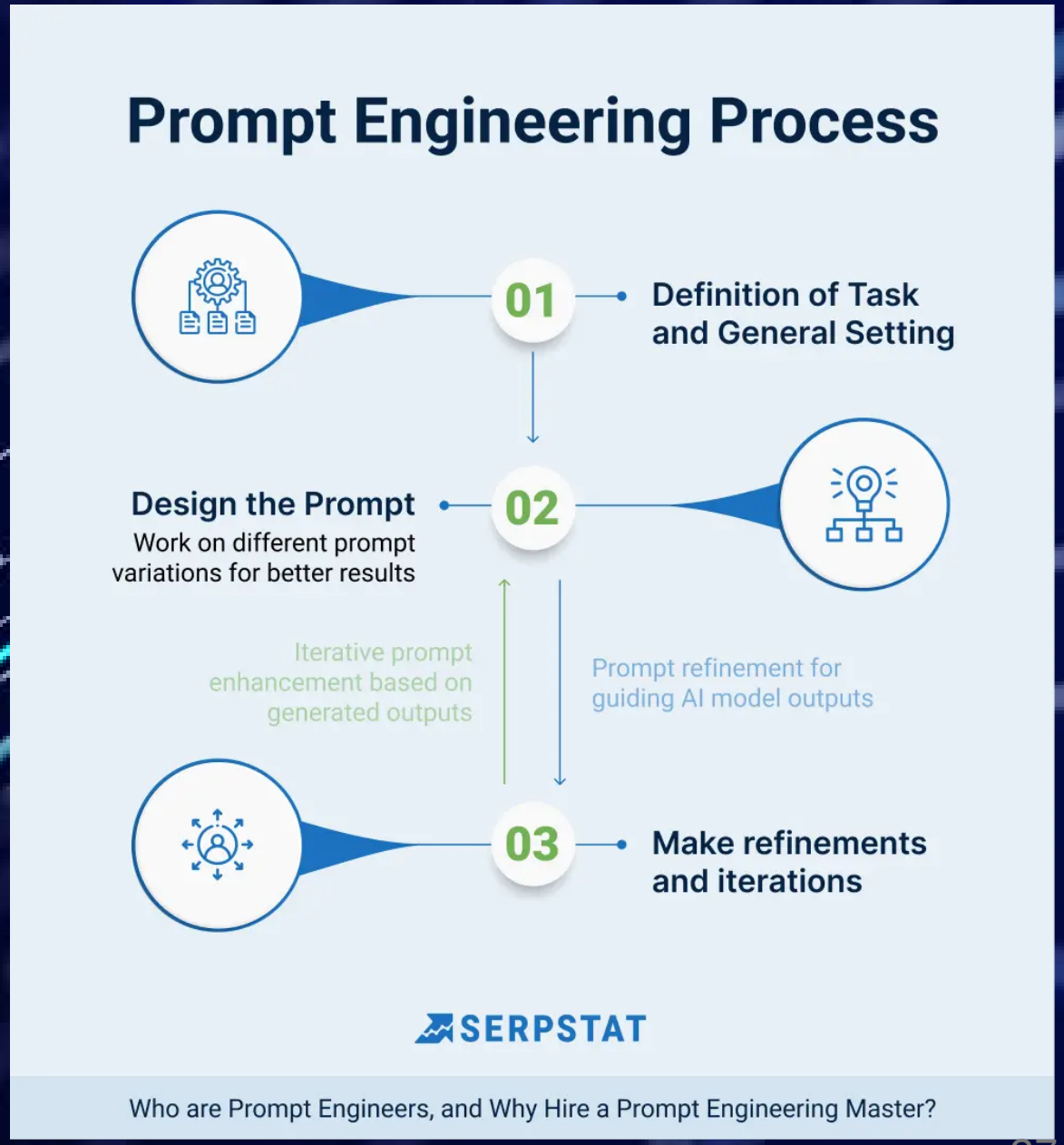


Elements of a good prompt

What is prompt engineering?

Prompt Engineering

is the process of designing, testing, and optimizing prompts that are used to instruct AI models to perform specific tasks.



About prompt engineers

Prompt Engineer

freelancermap

The Role

- Work with cross-functional teams to discuss product development
- Identify uses of AI tools
- Design, develop and refine AI-generated text prompts

Background

- Bachelor's degree in Computer Science or Machine Learning or a related field
- Additional certifications recommended

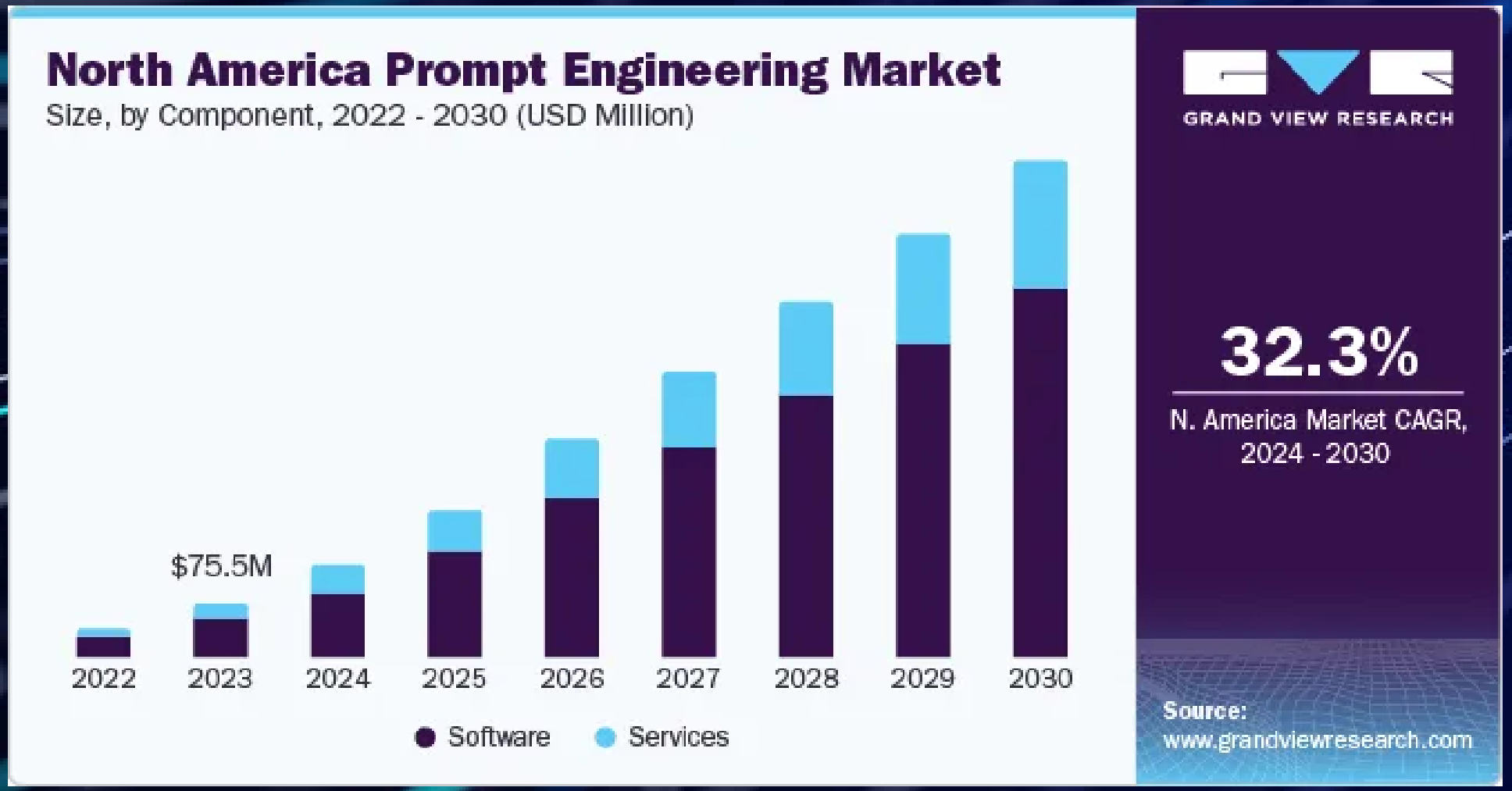
Skills

- Excellent knowledge of natural language processing
- Knowledge of machine learning
- Comprehensive knowledge of AI-generated content development

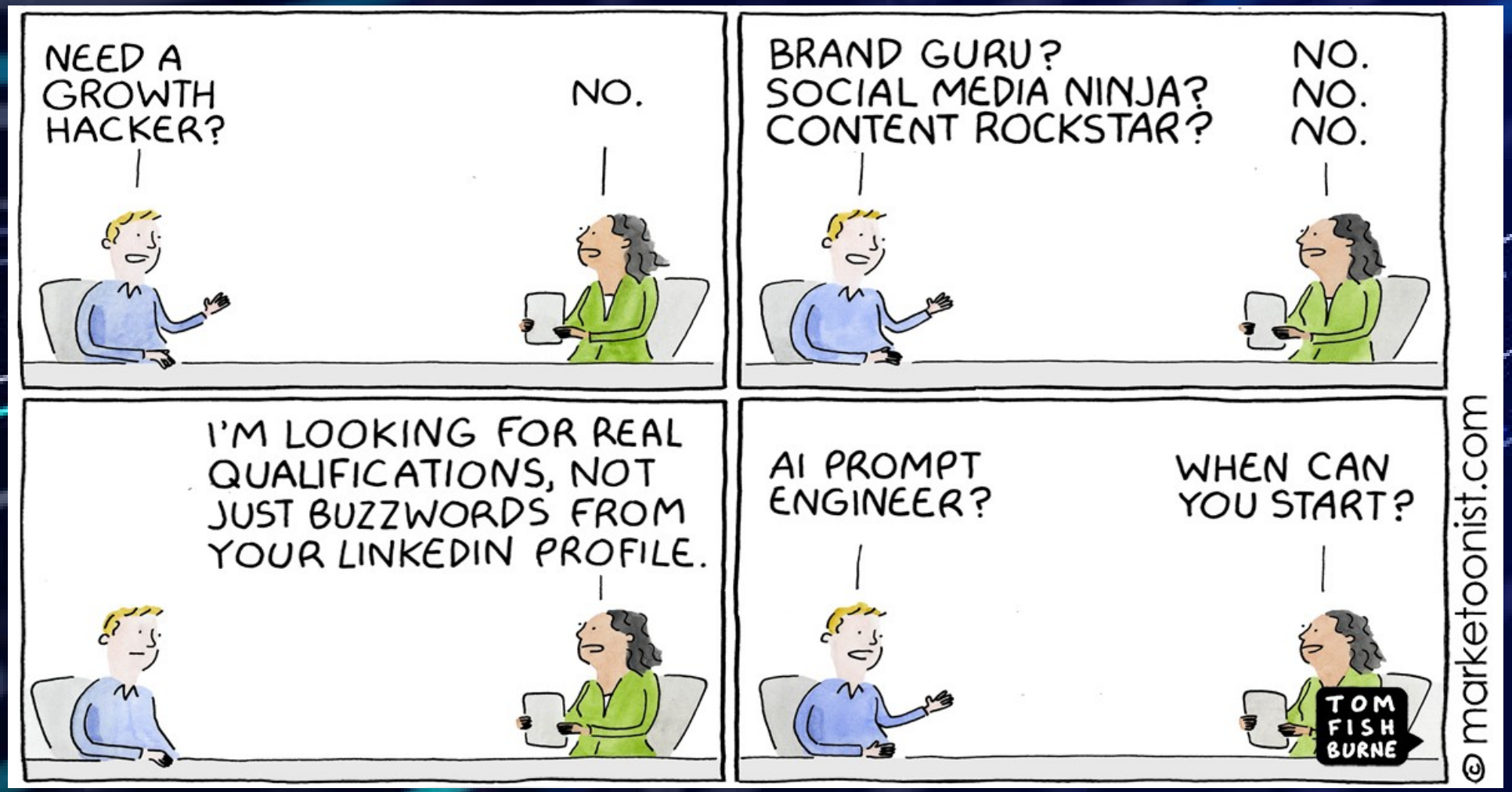
Salary

Junior:	$ 280,000
Average:	$ 327,000
Senior:	$ 375,000

Prompt engineers are highly valued.

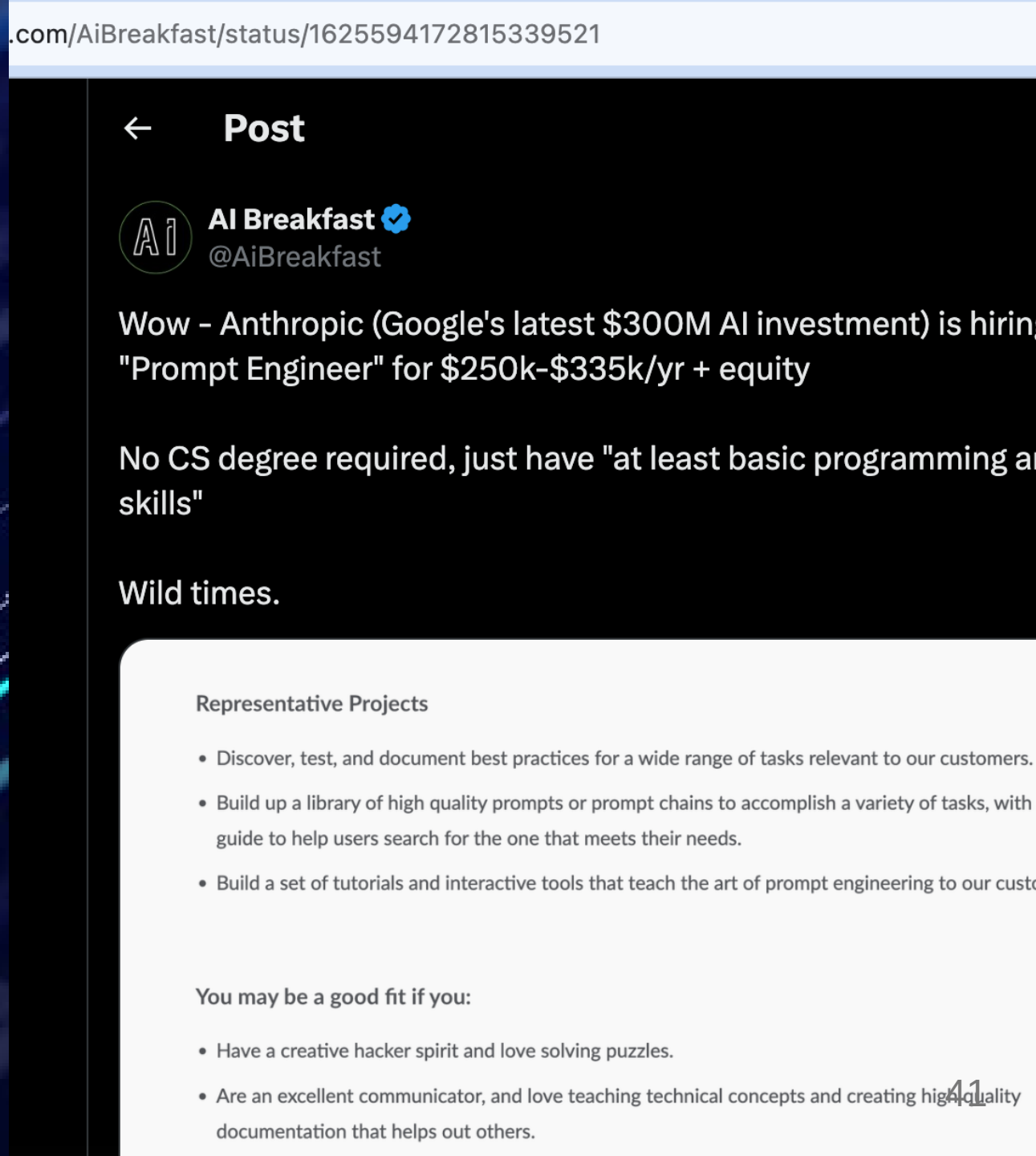


Prompt engineers are in high demand.

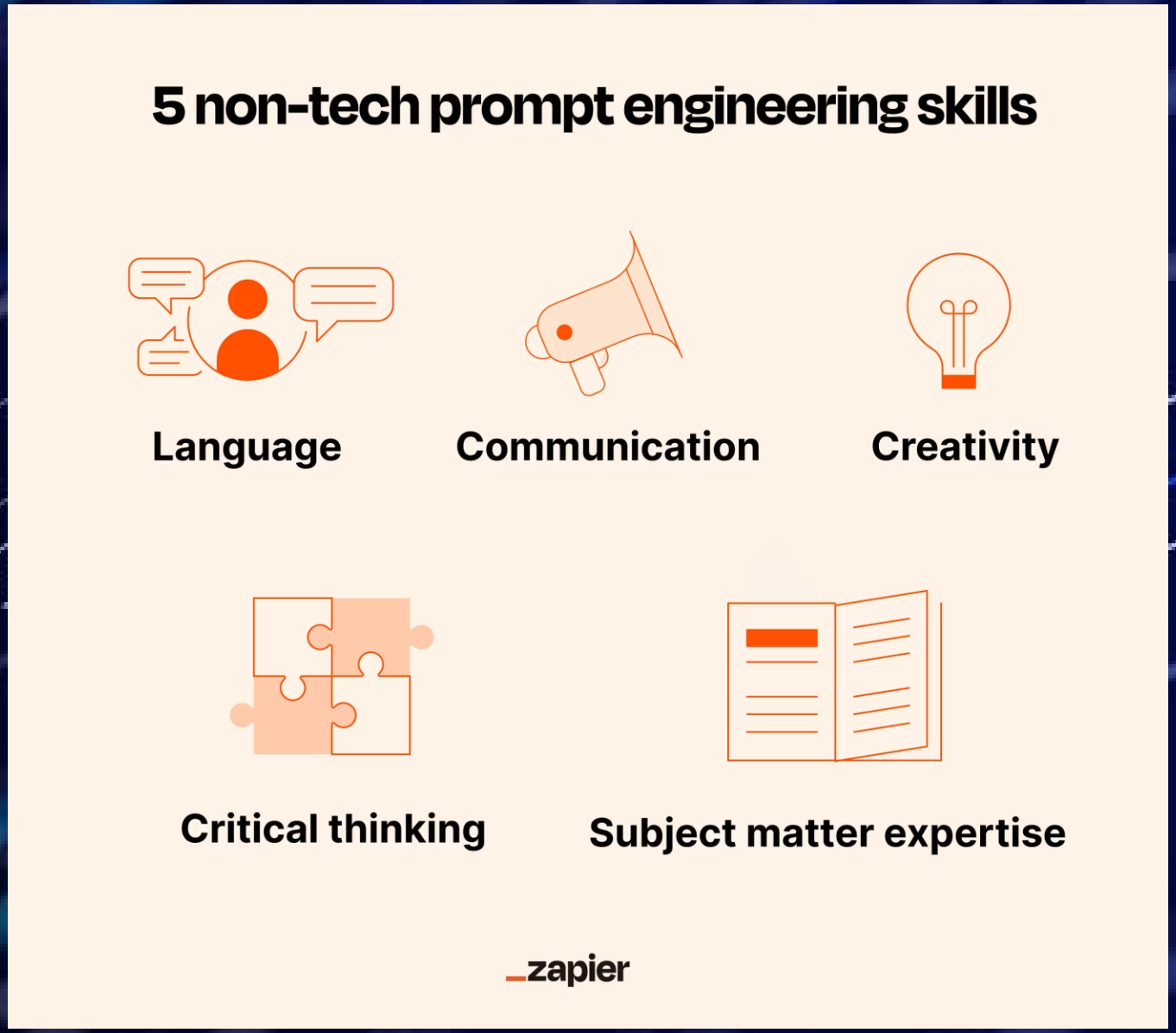


Benefits and requirements of prompt engineers

 Original post



Prompt engineering requires soft skills.



Prompt engineering skill - language

Linguistics,

the scientific study of language and its structure, plays a vital role in prompt engineering. It helps in:

1. **Understanding Language Structure**: Helps in designing effective prompts.
2. **Semantic Analysis**: Understanding the meaning of words, phrases, and sentences helps in creating more precise prompts.
3. **Pragmatics**: Understanding the context in which language is used can lead to the creation of more effective prompts.

Prompt engineering skill - language

ELEVATE X
Unleashing the power of freelancing

Prompt Engineering

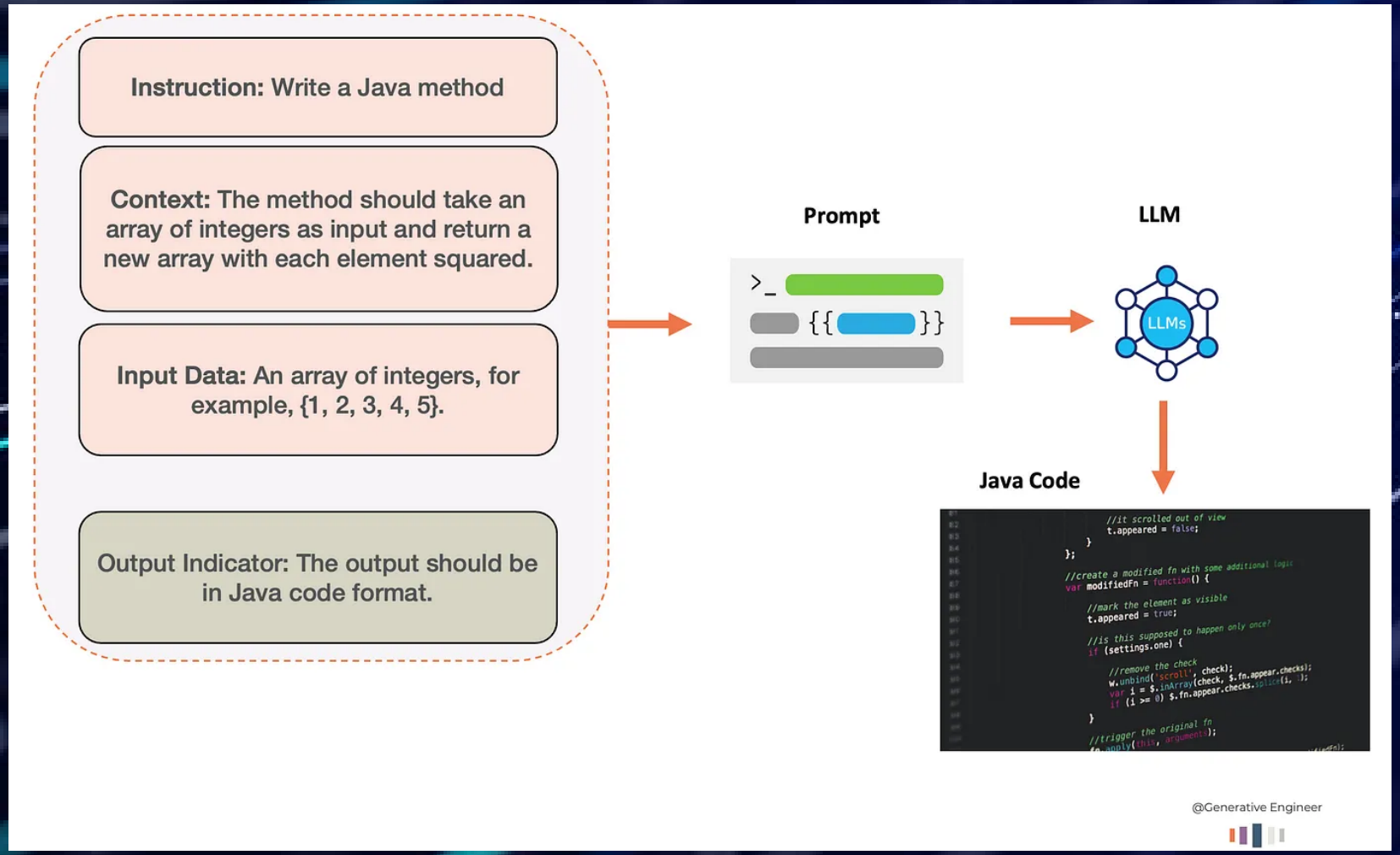
How to structure Prompts:

- Specify the scenario
- Use specific formulations
- Assign a role in the instruction
- Formulate the instructions clearly
- Provide the model with additional information

Prompt engineering skill - critical thinking

Prompting Approach	Description	Comparison to Human Thinking
Zero-shot Prompting	AI answers without prior examples, using its training	Like answering a question using only what you already know.
Few-shot Prompting	AI uses a few examples to understand how to respond.	Learning from a few examples before trying something new.
Chain-of-Thought Prompting	AI breaks down its process into steps before answering.	Thinking through steps to solve a problem, like in math.
Self-Consistency	AI generates multiple answers and picks the most consistent one.	Choosing the best solution after considering several options.
Generate Knowledge Prompting	AI creates new ideas or information.	Using imagination or knowledge to come up with new ideas.
Prompt Chaining	Sequential prompts guide AI through a process to a result.	Following steps in a plan to achieve a goal.
Active-Prompt	Prompts adjust based on AI's responses in real-time.	Adjusting conversation based on feedback, like in a dialogue.
Directional Stimulus Prompting	Prompts direct AI towards a desired outcome.	Organizing thoughts or information in a structured way.
Multimodal CoT	AI organizes information in graph structures for tasks.	Organizing thoughts or information in a structured way.

Prompt engineering skill - coding



English as the most powerful programming language

santiagof.medium.com/english-is-the-most-powerful-programing-language-even-for-data-s...

Member-only story

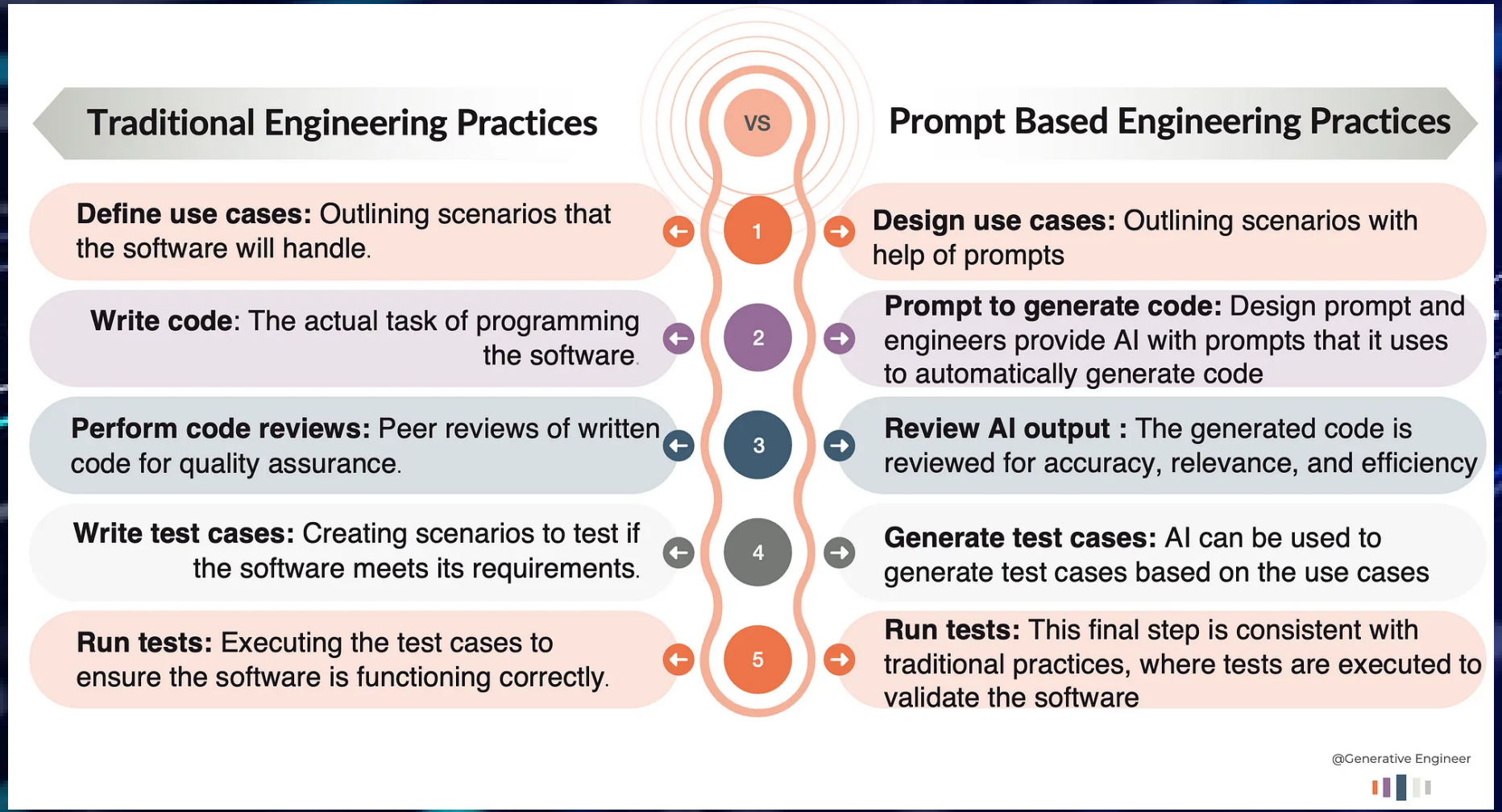
English is the most powerful programing language — even for data science: Introduction to prompt engineering

What prompt engineering is, which are the steps involved in it, and how it changes the way we solve problems with ML.

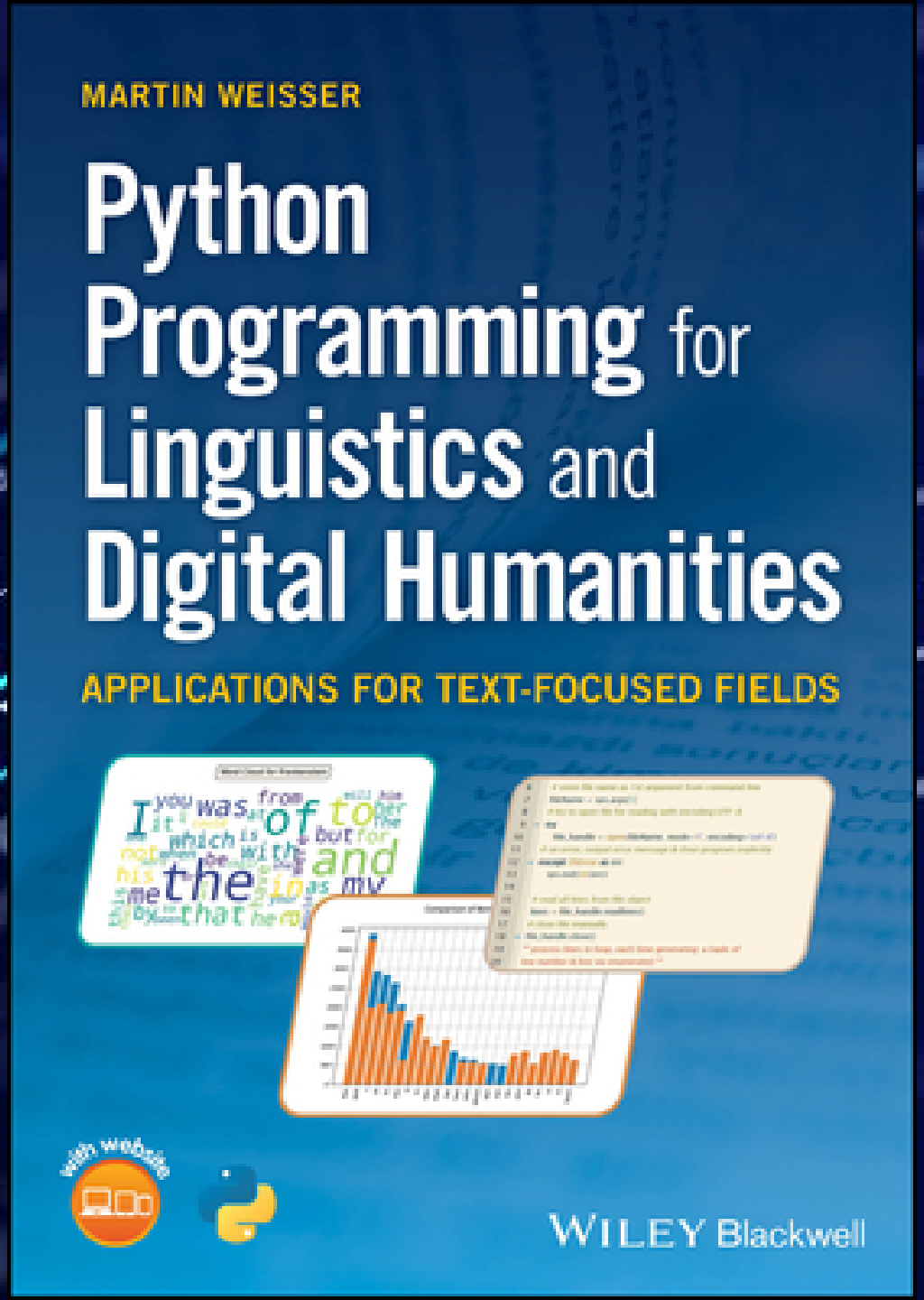
Facundo Santiago · Follow

10 min read · May 9, 2023

GenAI creates engineering paradigm shift.



Start with Python if you wanna try programming.



Example: extracting ordered items from a text

> Online order
>
> Hey there! I’d like to make an order for pick-up. Could I get one large fries, two fish fillet sandwiches, three cheeseburgers with no onions, and four vanilla milkshakes? Oh, and could you also add five apple pies to that order? Thanks a lot!

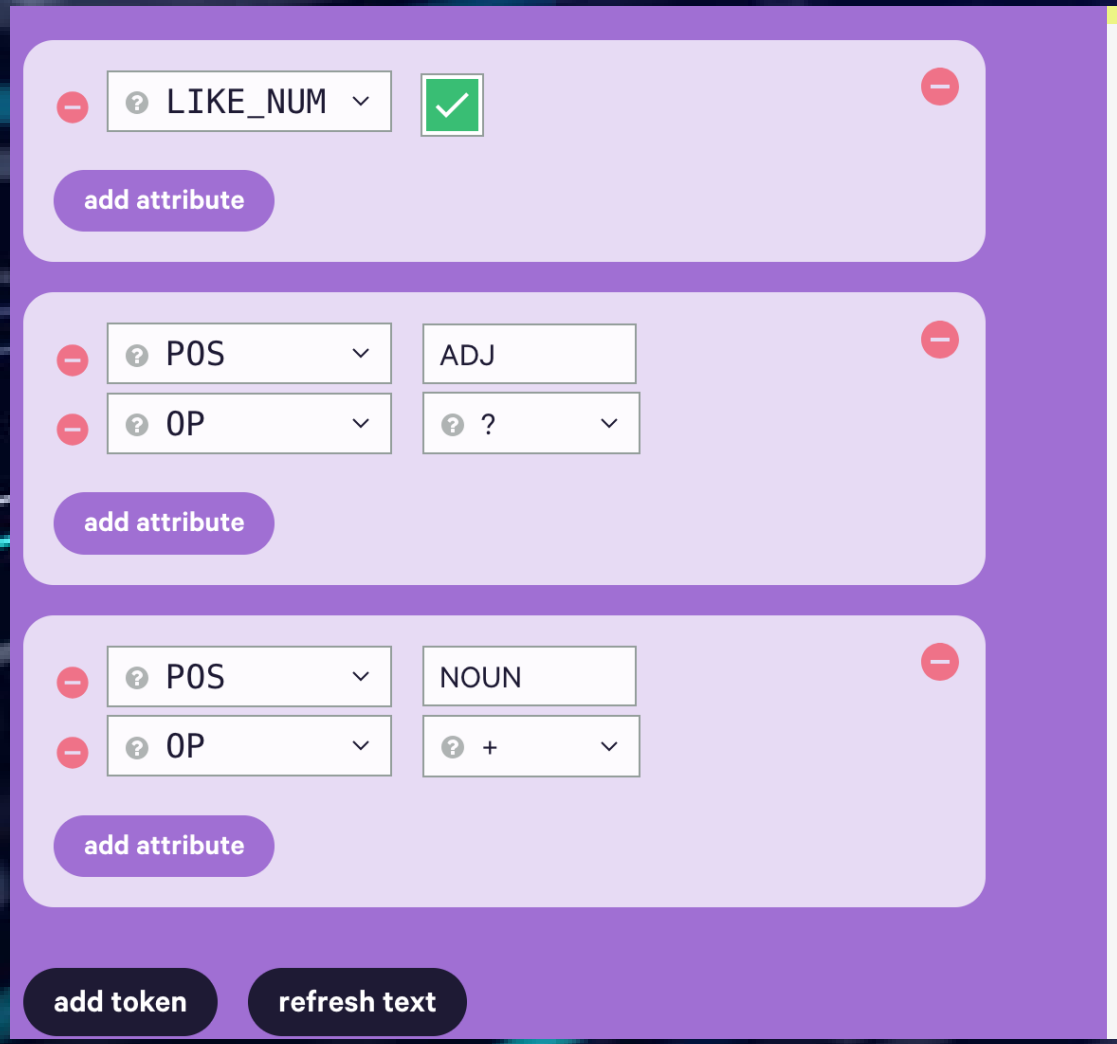
Example: extracting ordered items from a text

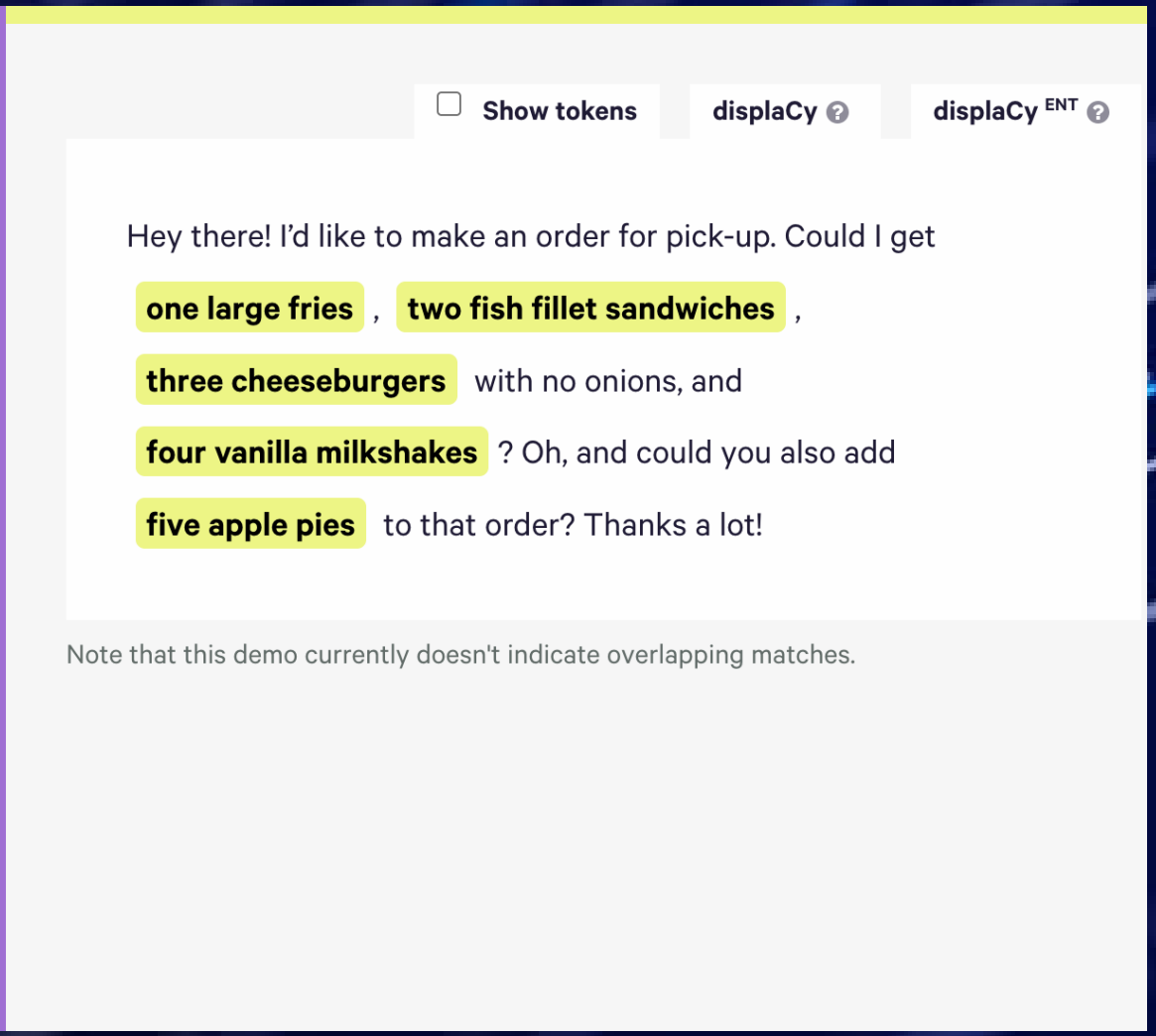
> Using knowledge of linguistics and common sense

```
[
{'LIKE_NUM': True},
{'POS': 'ADJ', 'OP': '?'},
{'POS': 'NOUN', 'OP': '+'}
]
```

Try it out here!

Outcome of the extraction





Example: extracting ordered items from a text

Using a prompt

You work at a fast food restaurant and are good at summarizing what a customer orders from a text. Extract ordered items from the following text. Use the json format, with two keys, quantity and item.

Text:
<Hey there! I'd like to make an order for pick-up. Could I get one large fries, two fish fillet sandwiches, three cheeseburgers with no onions, and four vanilla milkshakes? Oh, and could you also add five apple pies to that order? Thanks a lot!>

Outcome of the extraction

```
[
    {"quantity": 1, "item": "large fries"},
    {"quantity": 2, "item": "fish fillet sandwiches"},
    {"quantity": 3, "item": "cheeseburgers with no onions"},
    {"quantity": 4, "item": "vanilla milkshakes"},
    {"quantity": 5, "item": "apple pies"}
]
```

See the conversation on Bing Chat!

Take-away messages

3 points

- **Interdisciplinary integration**: Generative AI and prompt engineering are not just for tech enthusiasts or computer science majors. They can be incredibly useful tools for humanities majors as well.
- **Creativity amplified**: Generative AI can be seen as a tool to amplify human creativity, not replace it. Remember, the AI is just a tool, the real creativity comes from you.
- **Words as action**: The field of generative AI heavily relies on understanding and manipulating language. This is where knowledge of linguistics comes in. Understanding how language works can help you better utilize and even improve these tools.

Any questions ?

How to reach me

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- Webpage https://howard-haowen.rohan.tw