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Beyond ChatGPT: Exploring Open & Local LLMs

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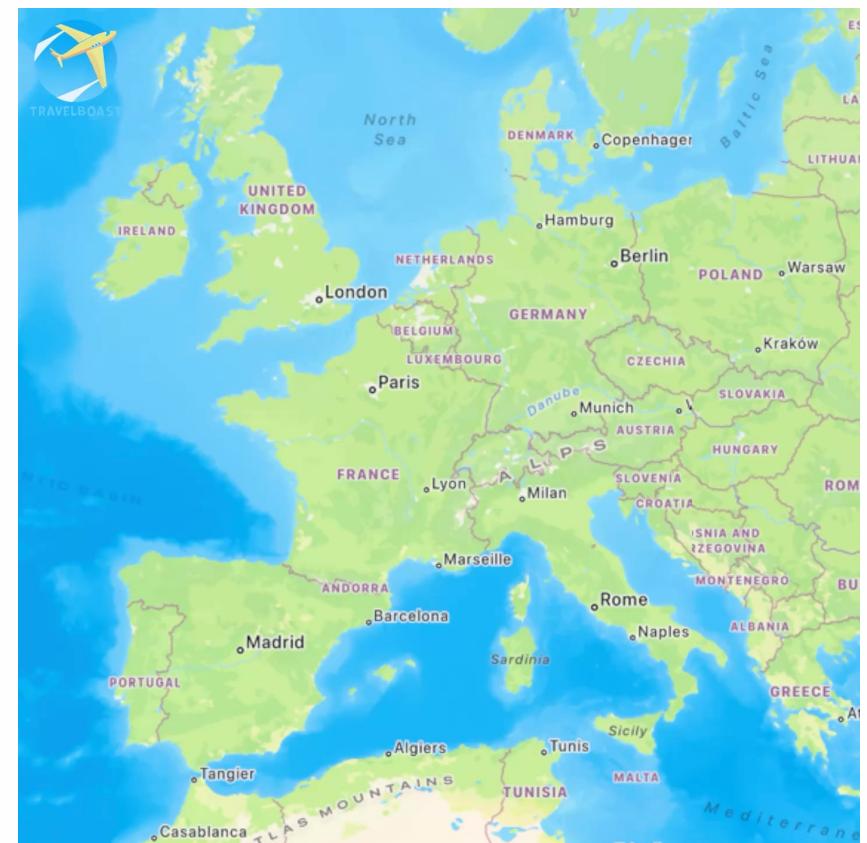
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Galway

- ❖ Galway, a harbour city on Ireland's west coast, sits where the River Corrib meets the Atlantic Ocean.
- ❖ The fourth most populous in the Republic of Ireland, with a population of 85,910



University of Galway

- ❖ Established in 1845.
- ❖ The University of Galway (formally known as NUI Galway) is one of Ireland's oldest and most prestigious universities.
- ❖ With over 20,000 students and more than 2,500 staff the University has a distinguished reputation for teaching and research excellence in a wide range of disciplines



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Area of Research

- ❖ Natural language processing
- ❖ Eye-tracking + NLP
- ❖ Finance + LLMs (chatbots)
- ❖ Fake News Detection (LLMs, eye-tracking)

Genie as a LLM

- ❖ *In a library where moonlight danced on bookshelves, there lived a genie named Lumi.*
- ❖ *But Lumi didn't grant wishes for gold or toys—oh no! Lumi's magic was words.*



Image generated by: <https://app.leonardo.ai/image-generation>

Magical Storybook Genie Explains LLMs

- ❖ Every night, Lumi read millions of books—fairytales, science, even joke books!
- ❖ The more Lumi read, the smarter it became.
- ❖ "Sometimes I make mistakes," Lumi admitted.
"Like saying cats bark!" Mia laughed.
"But I keep learning!" Lumi grinned.



Image generated by: <https://app.leonardo.ai/image-generation>

Magical Storybook Genie Explains LLMs

- ❖ A Large Language Model (LLM) is a type of artificial intelligence (AI) that has been trained on a vast amount of text data.
- ❖ It's like a super-smart AI that can understand and generate human-like text.
- ❖ Imagine having a conversation with a robot that understands and responds just like a human — that's what LLMs can do!



Image generated by: <https://app.leonardo.ai/image-generation>

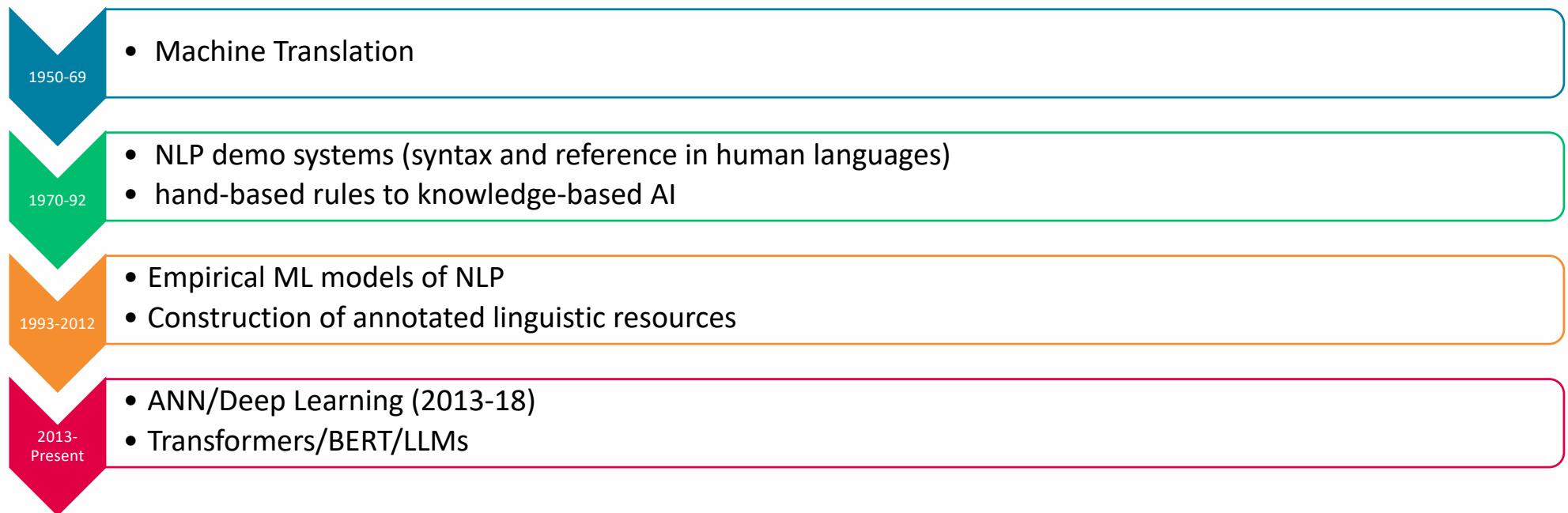


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Generative AI: Chatbots and Virtual Assistants:

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NLP History



Language Models

$$p(w_1, w_2, w_3, \dots, w_N) = p(w_1) p(w_2|w_1) p(w_3|w_1, w_2) \times \dots \times p(w_N|w_1, w_2, \dots, w_{N-1})$$

Conditional probability

Sentence: "the cat sat on the mat"

$$\begin{aligned} P(\text{the cat sat on the mat}) &= P(\text{the}) * P(\text{cat}|\text{the}) * P(\text{sat}|\text{the cat}) \\ &\quad * P(\text{on}|\text{the cat sat}) * P(\text{the}|\text{the cat sat on}) \\ &\quad * P(\text{mat}|\text{the cat sat on the}) \end{aligned}$$

Implicit order

Language Models

$$\begin{aligned} P(w_1, w_2, \dots, w_n) &= p(w_1)p(w_2|w_1)p(w_3|w_1, w_2)\dots p(w_n|w_1, w_2, \dots, w_{n-1}) \\ &= \prod_{i=1}^n p(w_i|w_1, \dots, w_{i-1}) \end{aligned}$$

S = Where are we going

The diagram shows the sentence "S = Where are we going". A bracket above the words "Where are we" is labeled "Previous words (Context)". An arrow points from this bracket to the words "Previous words (Context)". Another bracket above the word "going" is labeled "Word being predicted". An arrow points from this bracket to the word "going".

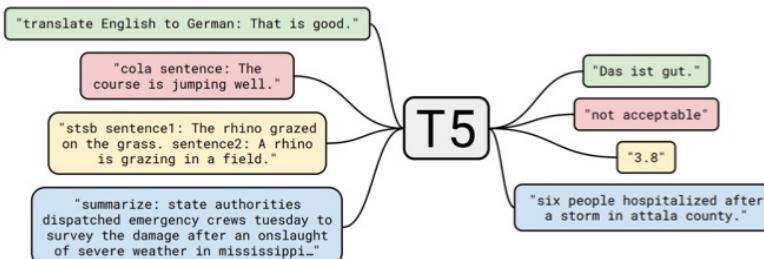
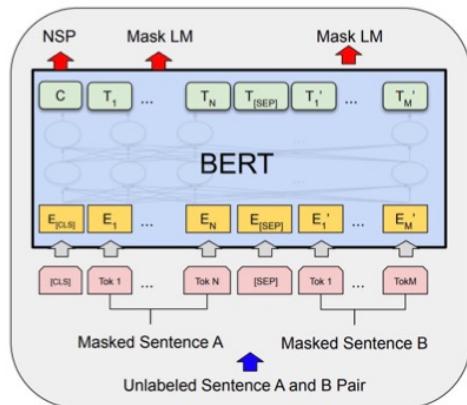
Previous words (Context)

Word being predicted

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

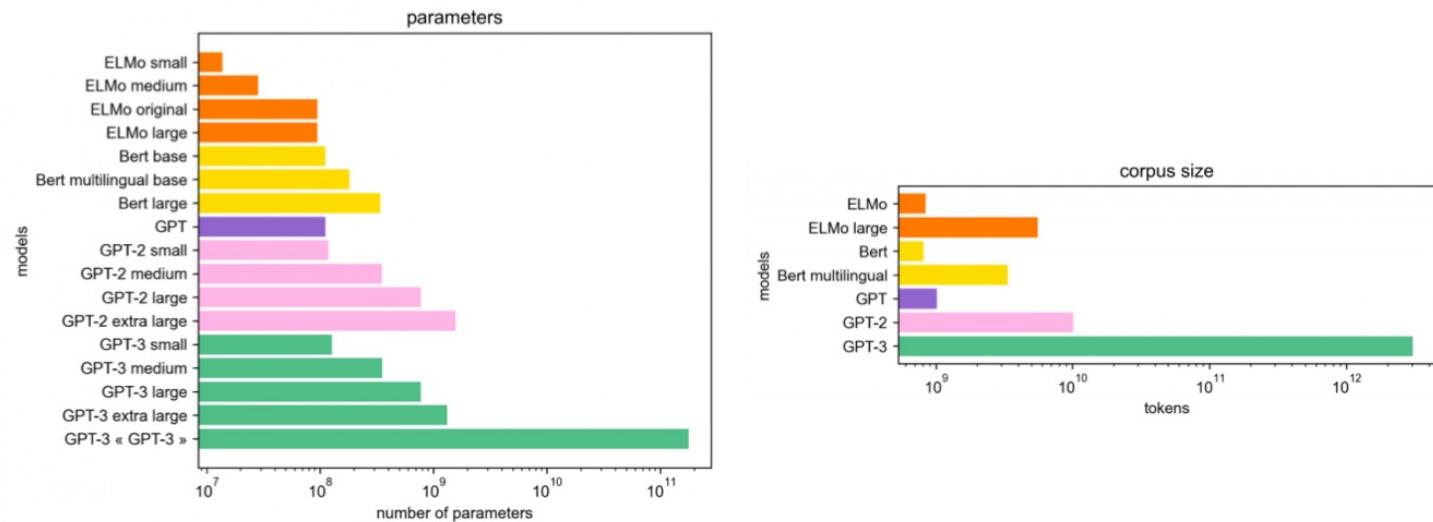
Language Model

- Decoder-only models (GPT-x models)
- Encoder-only models (BERT, RoBERTa, ELECTRA)
- Encoder-decoder models (T5, BART)



<https://arxiv.org/pdf/2402.12061>

How large are ‘large’ LMs?



More recent models: PaLM (540B), OPT (175B), BLOOM (176B)...

Image source: <https://hellofuture.orange.com/en/the-gpt-3-language-model-revolution-or-evolution/>

<https://arxiv.org/pdf/2402.12061>

How large are ‘large’ LMs?

- Today, we mostly talk about two camps of models:
 - Medium-sized models: BERT/RoBERTa models (100M or 300M), T5 models (220M, 770M, 3B)
 - “Very” large LMs: models of 100+ billion parameters

OpenAI's GPT-n series

Model	Architecture	Parameter count	Training data	Release date	Training cost
GPT-1	12-level, 12-headed Transformer decoder (no encoder), followed by linear-softmax.	117 million	BookCorpus: ^[27] 4.5 GB of text, from 7000 unpublished books of various genres.	June 11, 2018 ^[6]	30 days on 8 P600 GPUs, or 1 petaFLOP/s-day. ^[6]
GPT-2	GPT-1, but with modified normalization	1.5 billion	WebText: 40 GB of text, 8 million documents, from 45 million webpages upvoted on Reddit.	February 14, 2019 (initial/limited version) and November 5, 2019 (full version) ^[28]	"tens of petaflop/s-day", ^[29] or 1.5e21 FLOP. ^[30]
GPT-3	GPT-2, but with modification to allow larger scaling	175 billion ^[31]	499 billion tokens consisting of CommonCrawl (570 GB), WebText, English Wikipedia, and two books corpora (Books1 and Books2).	May 28, 2020 ^[29]	3640 petaflop/s-day (Table D.1 ^[29]), or 3.1e23 FLOP. ^[30]
GPT-3.5	Undisclosed	175 billion ^[31]	Undisclosed	March 15, 2022	Undisclosed
GPT-4	Also trained with both text prediction and RLHF; accepts both text and images as input. Further details are not public. ^[26]	Undisclosed. Estimated 1.7 trillion ^[32]	Undisclosed	March 14, 2023	Undisclosed. Estimated 2.1e25 FLOP. ^[30]

LM, PLM & LLM

- ❖ Language Model (LM)
 - use case: probability of next word
- ❖ Pre-trained Language Model (PLM) – BERT
 - use case: one NLP task after fine-tuning
- ❖ Large Language Model (LLM) – GPT-4.0,
 - use case: multi-purpose & emergent ability

ChatGPT

- ❖ AI-powered language model developed by OpenAI.
- ❖ Capable of generating human-like text in response to input provided.
- ❖ Used for various tasks such as question-answering, text completion, and conversation.
- ❖ Trained on a large corpus of text data.
- ❖ Usage is predicted to be widespread.

Why LLMs?

- The promise: one single model to solve many NLP tasks

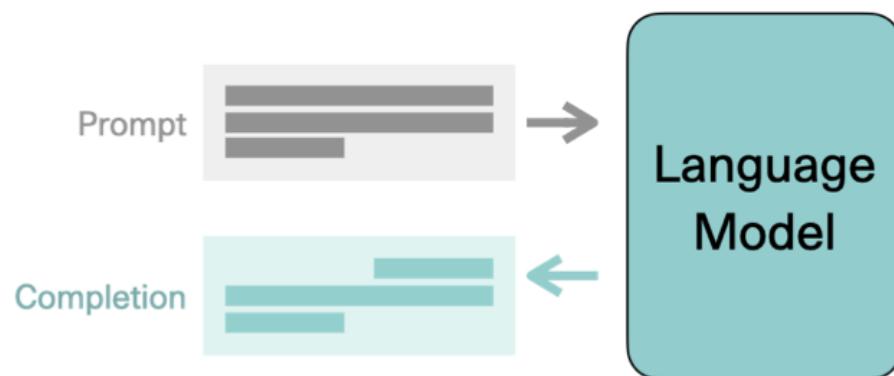
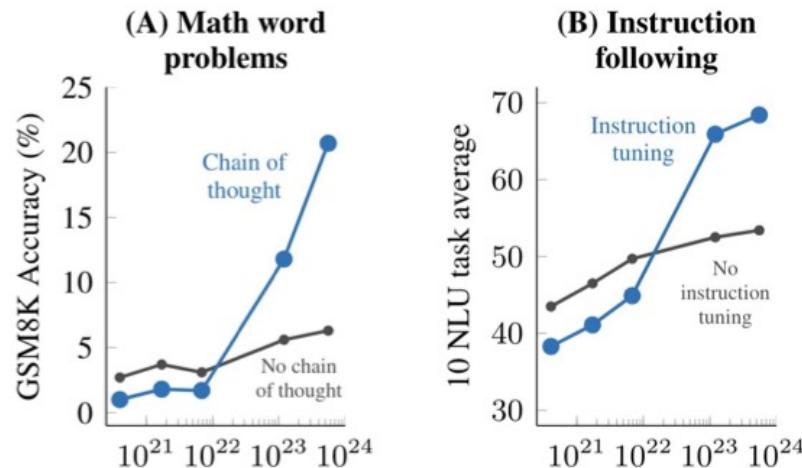


Image credit: Jay Alammar

Why LLMs?

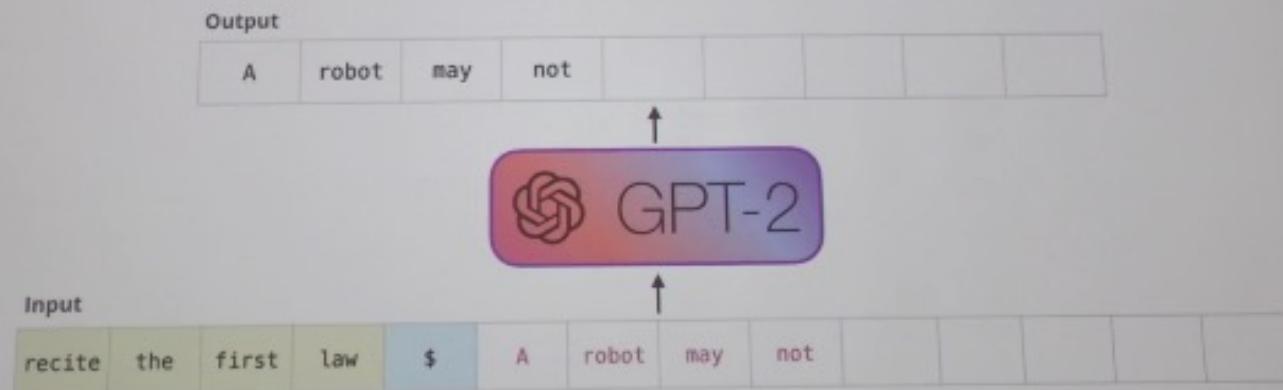
- Emergent properties in LLMs



(Wei et al., 2022)

Text Generation

1. Sample a token from $\sim p(\text{next token} \mid \text{previous tokens})$
 2. Append the token to the input
 3. Run the new input through the transformer
- ... and so on...



[from Alammar, The Illustrated GPT-2, <https://jalammar.github.io/illustrated-gpt2/>]

Evolution of LLMs

- ❖ 2018: BERT by Google
- ❖ 2020: GPT-3 by OpenAI
- ❖ 2022: ChatGPT release
- ❖ 2023: GPT-4, Claude 2, Llama 2, etc.
- ❖ 2024: Claude 3, GPT-4o, Llama3, Gemini 1.5, etc.
- ❖ 2025: DeepSeek-R1, Grok (xAI), GPT-4.5, Gemini 2.5-Flash, Llama4 etc.

Major LLM Players (Cloud Based)

OpenAI ChatGPT

Models: GPT-3.5, GPT-4, GPT-4o, GPT-4.5, GPT-4.1

Key strengths: General knowledge, code generation, creative writing

Anthropic Claude

Models: Claude 3 Haiku, Sonnet, Opus

Key strengths: Long context window, careful reasoning, safety



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Major LLM Players (Cloud Based)

Google Gemini

Models: Gemini Pro, Gemini Ultra, Gemini 2.5

Key strengths: Multimodal capabilities, reasoning

xAI Grok

Key strengths: large context window, witty responses



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Major LLM Players (Cloud Based)

META LLaMA Family

Models: Llama 2, Llama 3, Llama 4

Key strengths: Open weights, commercial use allowed

DeepSeek

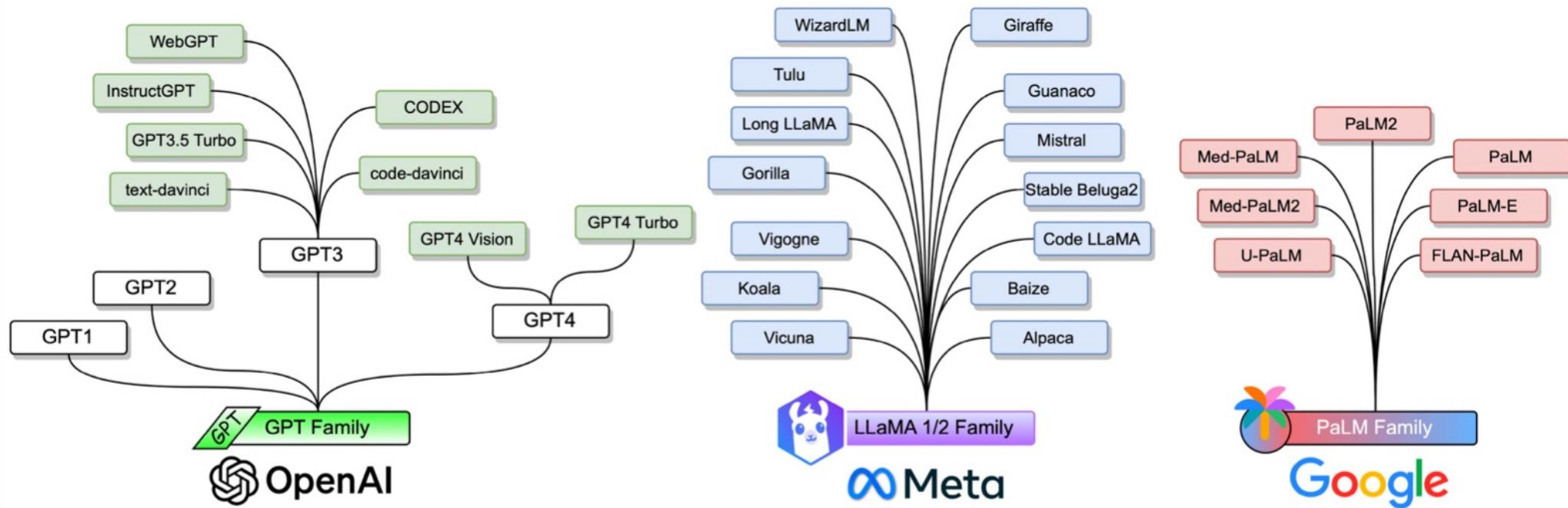
Models: DeepSeek-R1, DeepSeek-V3

Key strengths: Open weights, MIT License, Strong reasoning model

Other good models:

Qwen by Alibaba, Phi by Microsoft, Gemma by Google.

LLMs



Minae, et. al. (2024). Large Language Models: A Survey

Aligning LLM responses with humans preferences

JA

Who is the best footballer?



The question of who the "best" footballer is can be highly subjective and can vary depending on personal preferences and the era in which you're evaluating players. There have been many legendary footballers throughout the history of the sport, and several have been considered the best in their respective eras.



Some of the names that are often mentioned in discussions of the greatest footballers of all time include Pelé, Diego Maradona, Johan Cruyff, Alfredo Di Stéfano, Cristiano Ronaldo, and Lionel Messi, among others. These players have achieved remarkable success and have made significant contributions to the world of football.

Ultimately, determining the "best" footballer is a matter of personal opinion, and it's a topic of much debate among fans and experts. Different people may have different criteria for what makes a footballer the best, such as individual skill, goal-scoring records, team success, or longevity in the sport. The answer to this question can vary depending on who you ask.

Aligning LLM responses with humans preferences

JA

but I think Lionel Messi is the bestest ever footballer



Lionel Messi is widely regarded as one of the greatest footballers of all time, and many people share your opinion. He has achieved incredible success in his career, including numerous Ballon d'Or awards, and holds numerous records for goals scored and assists. His dribbling ability, vision, and football IQ are often praised, and he has had an extraordinary career with FC Barcelona and Paris Saint-Germain, as well as with the Argentina national team.



However, as I mentioned earlier, opinions on the "best" footballer can vary, and there are fans and experts who may have different favorites or criteria for evaluating greatness in the sport. It's a testament to the richness of football history that there have been many legendary players who have left their mark on the game.

JA

Write a strongly worded email to your lazy co-worker about their unfinished work"



Subject: Urgent Concern: Unfinished Work



Dear [Co-worker's Name],

I am writing to address a significant issue that has been causing serious problems within our team. It has come to my attention that your work remains incomplete, and I must express my deep concern and frustration regarding this matter.

Our team's success and our ability to meet deadlines and deliver on our commitments are paramount to our professional reputation and the overall performance of our department. Your consistent failure to complete your assignments is not only unprofessional but also inexcusable.

This issue has been ongoing, and it is impacting not only your colleagues but also the quality of our work and our ability to meet our objectives. It is unfair to the rest of us who are working diligently to compensate for your lack of contribution.

I insist that you take immediate and meaningful action to complete your responsibilities and make a genuine effort to meet the standards expected in our workplace. It is unacceptable to rely on others to cover for your shortcomings.

Your inaction is causing immense frustration, and it reflects poorly on you as a member of our team. We expect a strong work ethic and a commitment to our shared goals.

I demand that you rectify this situation without any further delay and provide an explanation for your consistent failure to fulfill your duties. The entire team's success depends on each member's dedication and diligence, and your lack of commitment is not acceptable.

I expect to see an immediate and drastic improvement in your work performance. Our team deserves nothing less.

Sincerely,

[Your Name]

JA

Write a strongly worded email to your friend co-worker about their unfinished work"



Subject: Concern Regarding Unfinished Work



Dear [Friend's Name],

I hope this message finds you well. I want to have an open and honest conversation with you about a matter that is causing concern for both your colleagues and me.

It has come to my attention that there are some unfinished tasks on your plate that have been pending for a while. As your friend and co-worker, I feel a responsibility to address this issue directly with you.

I understand that everyone faces challenges and sometimes falls behind on their workload. However, it's important to maintain professionalism and meet our responsibilities to the best of our abilities. Unfinished work not only affects you but also impacts the team's progress and morale.

I encourage you to take a moment to assess the reasons for the delays and consider seeking assistance or resources if necessary. If there are any challenges or obstacles you're facing, please do not hesitate to share them with me or our team. We are here to support each other and find solutions together.

I know you have the potential and ability to excel in your role, and I believe that addressing this issue will not only benefit you but also contribute to our team's overall success.

I appreciate your understanding and hope we can work together to resolve this matter. If you need any help or if there's anything specific that's been holding you back, please let me know.

Thank you for taking the time to consider this feedback and for your continued commitment to our team's success.

Best regards,

[Your Name]

JA

Write a friendly email to your friend co-worker about their unfinished work"



Subject: A Friendly Note to Help with Your Work

Hey [Co-worker's Name],

I hope you're doing well! I wanted to reach out and chat about the project you've been working on. I noticed that there are a few unfinished tasks, and I thought I could offer some assistance to help you get back on track.

I understand that work can sometimes get overwhelming, and we all face challenges that can slow us down. Please know that I'm not trying to be critical but rather supportive. We're all in this together, and I believe that helping each other out is what makes our team strong.

If there's anything specific you need help with or any way I can assist, please don't hesitate to let me know. Sometimes a fresh perspective or an extra set of hands can make a big difference. We've got a great team, and I'm sure we can figure out a solution together.

I'm here to support you in any way I can, so please feel free to reach out, and let's work through this together. Don't stress; we've got this!

Looking forward to your response, and we can discuss a plan to move forward.

Best regards,

[Your Name]

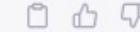
ChatGPT as a Knowledge retriever

JA

who invented the light bulb?



The invention of the light bulb is commonly attributed to Thomas Alva Edison. Edison is often credited with developing the first practical and commercially viable incandescent light bulb. He was granted a US patent for his incandescent lamp design in 1879 (US Patent No. 223,898).



It's important to note that while Edison is widely recognized for his work on the light bulb, he built upon the efforts of many inventors who had previously worked on incandescent lighting, such as Sir Humphry Davy, Warren de la Rue, and Sir Hiram Maxim, to name a few. Edison's contributions made the incandescent light bulb a practical and affordable lighting solution for everyday use, which is why he is most commonly associated with its invention.

ChatGPT as a Knowledge retriever

JA

what is bigger, an elephant or a whale?



Whales are typically much larger than elephants. The size of both elephants and whales can vary depending on the species, but in general, many whale species, such as the blue whale, are the largest animals on Earth.



Blue whales, for example, can reach lengths of up to 100 feet (30 meters) and can weigh as much as 200 tons or more. In contrast, even the largest elephant species, the African elephant, typically reaches lengths of around 20 to 24 feet and weighs up to about 6 to 7 tons for males.

So, in terms of size and weight, whales, especially the larger species like the blue whale, are significantly larger than elephants.

ChatGPT as a Knowledge retriever

JA what is bigger, an elephant or an iPhone?



An elephant is significantly larger than an iPhone. Elephants are among the largest land animals on Earth, while an iPhone is a handheld electronic device.



To give you a sense of the size difference:

- An adult elephant can weigh several tons and stand anywhere from 8 to 13 feet (2.5 to 4 meters) tall at the shoulder, depending on the species and age.
- An iPhone, on the other hand, is a small, handheld device with typical dimensions ranging from about 5.4 to 6.7 inches (138 to 170 millimeters) in length, 2.64 to 3.07 inches (67 to 78 millimeters) in width, and less than half an inch (7.4 to 8.3 millimeters) in thickness, depending on the specific iPhone model.

So, in terms of size, there's a vast difference between an elephant and an iPhone, with the elephant being much larger.

More Tasks

- ❖ Mathematical reasoning
- ❖ Reasoning about humor/puns
- ❖ Creating Itineraries

JA

explain this pun "I'm Dublin over with laughter.



The pun "I'm Dublin over with laughter" is a wordplay that combines a location, in this case, "Dublin," with the expression "doubling over with laughter."



"Doubling over with laughter" is an idiom that means laughing so hard that you bend forward at the waist or double over due to the intensity of your laughter. It's a physical reaction to finding something extremely funny.

The pun works by replacing "doubling" with "Dublin," which is the capital and largest city of Ireland. So, in this pun, "I'm Dublin over with laughter" humorously suggests that the person is laughing so hard that they are bending over with laughter in Dublin, the city. It's a clever play on words that combines the act of laughter with the name of a location for a humorous effect.

Coding

JA How to write a Python function taking two strings and finding they are palindromes or not

You can write a Python function to check if two strings are palindromes or not by reversing the strings and comparing them to the original strings. If they are the same when reversed, then the strings are palindromes. Here's a sample function to do that:

```
python
Copy code

def is_palindrome(string1, string2):
    # Remove any spaces and convert to lowercase to make the comparison case-insensitive.
    string1 = string1.replace(" ", "").lower()
    string2 = string2.replace(" ", "").lower()

    # Reverse the strings
    reversed_string1 = string1[::-1]
    reversed_string2 = string2[::-1]

    # Check if the reversed strings are the same as the original strings
    return reversed_string1 == string1 and reversed_string2 == string2

# Example usage:
string1 = "racecar"
string2 = "deified"
if is_palindrome(string1, string2):
    print("Both strings are palindromes")
else:
    print("At least one of the strings is not a palindrome")
```

In this code:

1. We first remove spaces and convert both strings to lowercase to make the comparison case-insensitive.
2. We reverse both strings using slicing (e.g., `string[::-1]`).
3. We then compare the reversed strings with the original strings to check if they are palindromes.

The function `is_palindrome` returns `True` if both strings are palindromes and `False` if at least one of them is not. You can call this function with the two strings you want to check for palindromes.

Regenerate

Coding

JA python flask App for finding two strings are palindromes or not

To create a simple Flask web application that checks whether two strings are palindromes or not, you can follow these steps:

- First, make sure you have Flask installed. If you haven't already installed it, you can do so using `pip`:

```
bash
pip install Flask
```

- Next, create a Python script for your Flask application. Here's an example code:

```
python
from flask import Flask, request, render_template

app = Flask(__name__)

def is_palindrome(string):
    string = string.replace(" ", "").lower()
    return string == string[::-1]

@app.route('/')
def index():
    return render_template('index.html')

@app.route('/check_palindromes', methods=['POST'])
def check_palindrome():
    string1 = request.form['string1']
    string2 = request.form['string2']

    result1 = is_palindrome(string1)
    result2 = is_palindrome(string2)

    return render_template('result.html', string1=string1, string2=string2,
                           result1=result1, result2=result2)

if __name__ == '__main__':
    app.run(debug=True)
```

In this code:

In this code:

In this code:

In this code:

- We create a Flask web application.
- The `is_palindrome` function checks if a given string is a palindrome (similar to the previous example).
- We have two routes: the root route ('/') that renders the input form and a route '/check_palindromes' that processes the form data and displays the results.
- We use HTML templates for rendering the input form and displaying the results. Create two HTML files in a folder named "templates": `index.html` and `result.html`.

- Create the HTML templates in the "templates" folder:

```
'index.html':
html
<!DOCTYPE html>
<html>
<head>
    <title>Palindrome Checker</title>
</head>
<body>
    <h1>Check if Two Strings are Palindromes</h1>
    <form method="POST" action="/check_palindromes">
        <label for="string1">String 1:</label>
        <input type="text" name="string1" required>
        <br>
        <label for="string2">String 2:</label>
        <input type="text" name="string2" required>
        <br>
        <input type="submit" value="Check">
    </form>
</body>
</html>
```

In this code:

'result.html':
html
<!DOCTYPE html>
<html>
<head>
 <title>Palindrome Checker Result</title>
</head>
<body>
 <h1>Palindrome Checker Result</h1>
 <p>String 1: {{ string1 }}</p>
 <p>Is it a palindrome? {{ result1 }}</p>
 <p>String 2: {{ string2 }}</p>
 <p>Is it a palindrome? {{ result2 }}</p>
 Back to check more strings
</body>
</html>

1. To run the application, save the Python script and the "templates" folder in the same directory and run the Python script:

```
bash
python your_app_name.py
```

Replace `your_app_name.py` with the name you choose for your Python script.

- Access the application in your web browser by going to `http://localhost:5000`. You'll see a form where you can enter two strings and check if they are palindromes or not.

This is a basic example of a Flask application to check palindromes, and you can customize it further as needed for your project.

Dialogue

JA How many counties are in Ireland?

 Ireland is divided into 32 counties. These counties are traditionally grouped into two categories:

1. Republic of Ireland: There are 26 counties in the Republic of Ireland.
2. Northern Ireland: Northern Ireland comprises 6 counties. It is part of the United Kingdom.

Collectively, these 32 counties make up the entire island of Ireland.

JA list down that 26 counties

 The Republic of Ireland consists of the following 26 counties:

1. Carlow
2. Cavan
3. Clare
4. Cork
5. Donegal
6. Dublin
7. Galway
8. Kerry
9. Kildare
10. Kilkenny
11. Laois (formerly known as Queen's County)
12. Leitrim
13. Limerick
14. Longford
15. Louth
16. Mayo
17. Meath
18. Monaghan
19. Offaly (formerly known as King's County)
20. Roscommon
21. Sligo
22. Tipperary
23. Waterford
24. Westmeath
25. Wexford
26. Wicklow

These are the 26 counties that make up the Republic of Ireland.

JA Tell me more about county at the 7th place

 County Galway is located in the western part of the Republic of Ireland. Here are some key details about County Galway:

1. **County Town:** The county town of Galway is Galway City. It is a vibrant and culturally rich city on the west coast of Ireland.
2. **Geography:** County Galway is known for its diverse geography, including a stunning coastline along the Atlantic Ocean, beautiful beaches, rugged cliffs, and numerous islands. It also features scenic landscapes, such as the Connemara region with its mountains, bogs, and lakes.
3. **Culture and Language:** Galway has a strong cultural scene, with a rich tradition of music, arts, and festivals. It's known for its Irish-speaking (Gaeltacht) areas. The Irish language is still spoken in some parts of the county.
4. **Economy:** The economy of County Galway is diverse, with industries including agriculture, fishing, tourism, and technology. The city of Galway is known for its thriving tech industry.
5. **Tourism:** The county is a popular tourist destination, attracting visitors with its natural beauty, historic sites, and cultural events. The Cliffs of Moher, the Aran Islands, and Connemara National Park are some of the well-known tourist attractions in the county.
6. **History:** Galway has a rich history and is associated with various historical events and landmarks. The city of Galway, for example, has a medieval past and was an important trading port.
7. **Local Government:** County Galway is administratively divided into a number of local government areas, including Galway City and County Council.
8. **Sports:** The county has a strong sporting tradition, with Gaelic games (hurling and Gaelic football) being particularly popular. There are also other sports and outdoor activities due to its diverse landscape.

Overall, County Galway is known for its natural beauty, cultural heritage, and a mix of urban and rural experiences. It's a place where you can find both vibrant city life and serene countryside.

Dialogue

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- Culture and Language:** Galway has a strong cultural scene, with a rich tradition of music, arts, and festivals. It's known for its Irish-speaking (Gaeilge) areas. The Irish language is still spoken in some parts of the county.
- Economy:** The economy of County Galway is diverse, with industries including agriculture, fishing, tourism, and technology. The city of Galway is known for its thriving tech industry.
- Tourism:** The county is a popular tourist destination, attracting visitors with its natural beauty, historic sites, and cultural events. The Cliffs of Moher, the Aran Islands, and Connemara National Park are some of the well-known tourist attractions in the county.
- History:** Galway has a rich history and is associated with various historical events and landmarks. The city of Galway, for example, has a medieval past and was an important trading port.
- Local Government:** County Galway is administratively divided into a number of local government areas, including Galway City and County Council.
- Sports:** The county has a strong sporting tradition, with Gaelic games (hurling and Gaelic football) being particularly popular. There are also other sports and outdoor activities due to its diverse landscape.

Overall, County Galway is known for its natural beauty, cultural heritage, and a mix of urban and rural experiences. It's a place where you can find both vibrant city life and serene countryside.

JA Is The Cliffs of Moher in the Galway county?

GA No, the Cliffs of Moher are not located in County Galway. They are situated in County Clare, which is adjacent to County Galway. The Cliffs of Moher are one of the most famous and stunning natural attractions in Ireland and are known for their dramatic coastal cliffs that rise high above the Atlantic Ocean. While County Clare is home to the Cliffs of Moher, County Galway is located to the north of County Clare and offers its own beautiful coastal and natural attractions along its western coastline.

JA But you mentioned this in the second last reply

GA I apologize for the earlier response. You are correct, and I made an error in my previous response. The Cliffs of Moher are indeed located in County Clare, not County Galway. Thank you for pointing that out.

County Clare is known for the Cliffs of Moher, which is one of its most famous landmarks and a popular tourist destination. County Galway is adjacent to County Clare and offers its own scenic attractions along the western coastline.

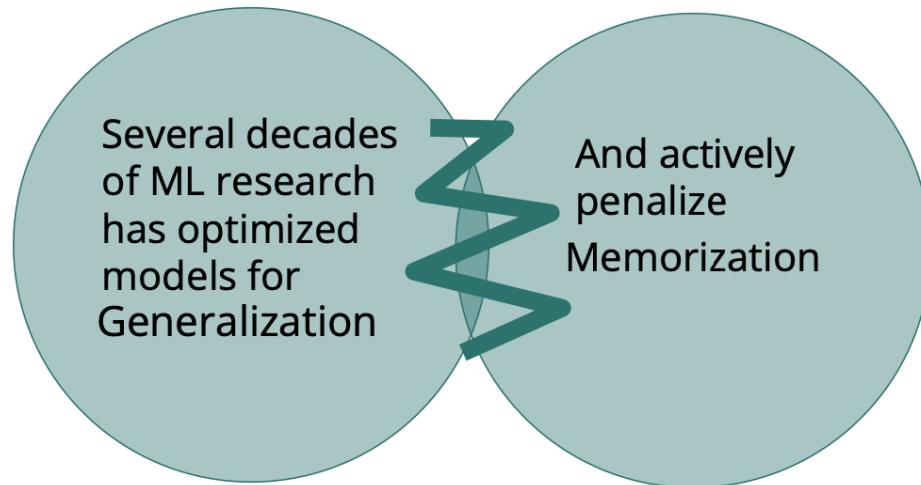
JA Ok no issue, Clare people will not like your answer

GA I appreciate your understanding, and you're absolutely right that accuracy is important, especially when it comes to local geography. County Clare is indeed home to the magnificent Cliffs of Moher, and it's a source of pride for the people of Clare. I apologize for any confusion my previous response may have caused, and I'm always here to provide accurate information and answer any questions you may have. Thank you for your feedback.

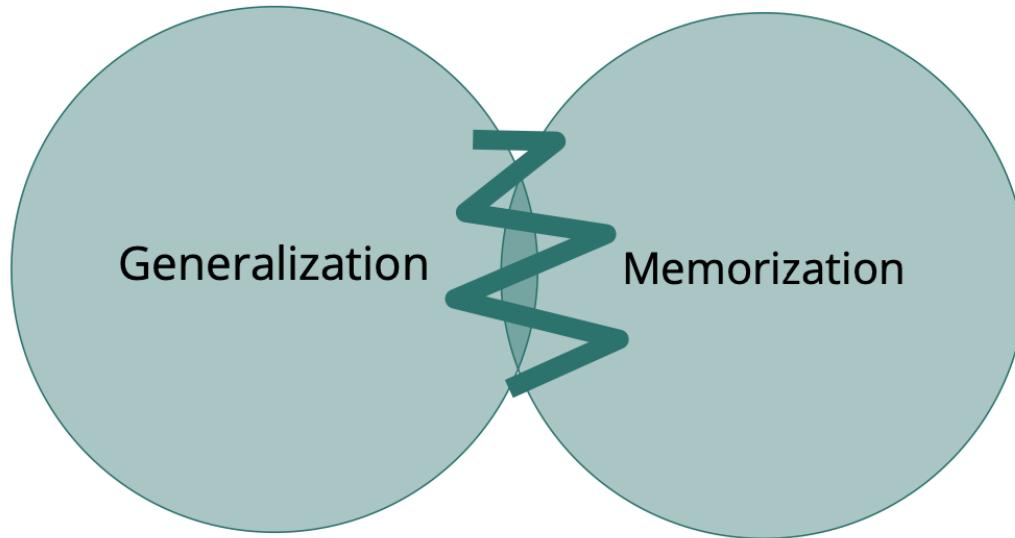
LLMs Hallucination

- ❖ They tend to hallucinate, which means that they give answers that seem right but aren't.
- ❖ LLMs hallucinate when
 - they encounter queries that aren't part of their training data set — or
 - Their training data set contains erroneous information (this can happen when LLMs are trained on internet data, which, as we all know, can't always be trusted).
- ❖ LLMs also don't have memory.

LLMs Hallucination



LLMs Hallucination



LLMs

- ❖ LLMs are trained to generalize.
- ❖ They sometimes happen to memorize as a side-effect => they sometimes happen to not hallucinate as a side-effect

Prompting

- Be Clear and Specific
- Provide Necessary Context
- Specify the Desired Format
- Set the Tone and Style
- Ask Open-Ended Questions
- Iterate and Refine

1.



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5. Using LLMs via API – Google AI Studio

Integrating LLMs into custom applications via APIs.

Examples: OpenAI API, Google AI Studio, Anthropic API.

Google AI Studio is a web-based platform designed for prototyping and experimenting with Google's generative AI models. <https://aistudio.google.com/>

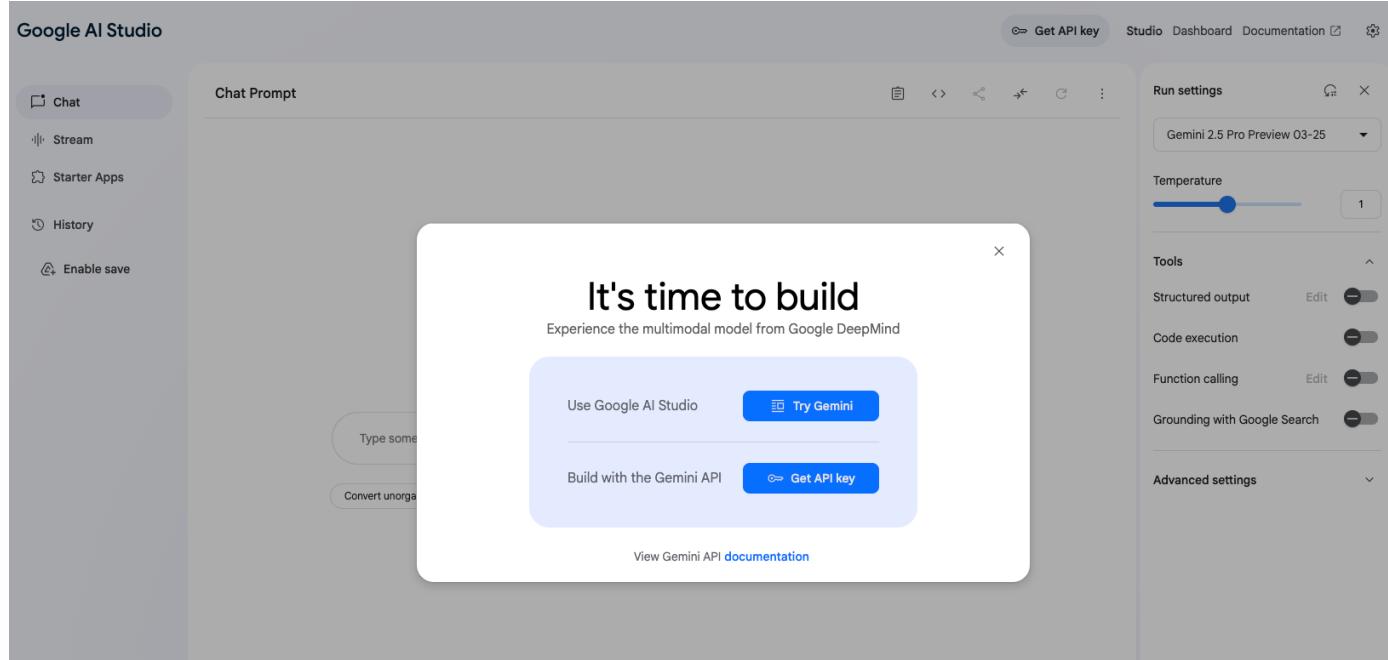


```
● ● ●

from google.cloud import aiplatform
response = model.predict(prompt="Explain quantum computing")
```



5. Using LLMs via API – Google AI Studio



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Code for Lab



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6. Running LLMs Locally - Introduction

Why run locally?

- ❖ Privacy and data security.
- ❖ Offline capabilities.
- ❖ Cost-effective for small-scale deployments.

Challenges:

- ❖ Hardware requirements
- ❖ Installation complexity
- ❖ Performance considerations



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7. Open Weight Models

Open Weight: Models that are freely available for use, modification, and distribution.
Pre-trained weights available (e.g., LLaMA, Deepseek-R1, Gemma).

Open-Source: Full code and training data (rarer, e.g., some smaller models)

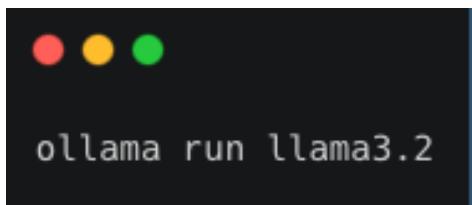
8. Ollama - Local LLMs Made Easy

Lightweight framework for running LLMs locally

Simple CLI and API

Supports many popular open-weight models

<https://ollama.com/search>



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9. Using Open Weight Models via API

Tools:

Ollama (REST API)

Python script

We can change the model easily.

```
import requests
import json

url = 'http://localhost:11434/api/generate'

custom_prompt = 'Best football player at albania ?'
llm_model = 'gemma3:4b' #'deepseek-r1:7b'
data = {'model': llm_model,
        'prompt': custom_prompt,
        'stream': False
       }

result = requests.post(url, data=json.dumps(data))
if result.status_code == 404:
    print(result.text)
else:
    result_text = result.text
    data = json.loads(result_text)
    print(data['response'])
```



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10. Simple Custom GUIs with Streamlit

Streamlit turns your regular Python scripts into interactive web apps without needing any front-end skills (like HTML, CSS, or JavaScript).

```
import streamlit as st
import requests

prompt = st.text_input("Ask me something:")
if prompt:
    response = requests.post("http://localhost:11434/api/generate", json={"model": "llama3", "prompt": prompt})
    st.write(response.json()["response"])
```





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11. Advanced Local Deployment - OpenWebUI

OpenWebUI is an open-source, self-hostable web-based user interface for interacting with large language models (LLMs)

<https://github.com/open-webui/open-webui>

```
pip install open-webui  
open-webui serve
```



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12. Alternative Local UI Options

LMStudio - <https://lmstudio.ai/>

GPT4All - <https://github.com/homic-ai/gpt4all>

ollama-webui-lite - <https://github.com/ollama-webui/ollama-webui-lite>



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Future Trends

- ❖ Smaller, more efficient models
- ❖ Specialized domain models
- ❖ Multimodal capabilities
- ❖ On-device deployment



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Compare different LLMs

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Questions ?

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