

Prompt Engineering



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1. Introduction to Prompt Engineering

Prompt engineering is a pivotal discipline within the realm of artificial intelligence (AI) and natural language processing (NLP). It involves the careful design and refinement of prompts—the inputs provided to AI models—to elicit desired responses effectively and efficiently. By crafting prompts that are clear, precise, and contextually rich, practitioners aim to guide AI models in generating accurate and relevant outputs.

1.1. Background

In the rapidly evolving landscape of artificial intelligence (AI) and natural language processing (NLP), the role of prompt engineering has emerged as a critical component in harnessing the capabilities of AI systems. Prompt engineering involves the deliberate construction and refinement of input prompts to guide AI models towards producing desired outputs.

1.2. Bridging Human Intent and Machine Comprehension

At its core, prompt engineering serves as a vital conduit, bridging the gap between human intent and machine comprehension. By crafting prompts that encapsulate the nuances of desired tasks or queries, practitioners empower AI models to navigate complex linguistic contexts and generate coherent responses.

1.3. Leveraging Interdisciplinary Insights

Prompt engineering draws upon insights from a diverse array of disciplines, including linguistics, cognitive science, and computer science. This interdisciplinary approach enables practitioners to harness linguistic patterns, cognitive frameworks, and computational algorithms to optimize AI systems' interpretive and generative capabilities.

2. Significance of Prompt Engineering

2.1. Bridging Human Intent and Machine Comprehension

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3. Methodology of Prompt Engineering

3.1. Strategic Prompt Construction

Prompt engineering entails the strategic construction of prompts tailored to specific tasks or domains. This involves considering factors such as clarity, specificity, and contextuality to maximize the efficacy of AI responses.

3.2. Iterative Refinement Process

An iterative refinement process lies at the heart of prompt engineering. Practitioners continually refine prompts based on empirical feedback and real-world performance metrics, enhancing the precision and effectiveness of AI-generated responses.

4. Installation of LM Studio

4.1. Download LM Studio

Download LM Studio from <https://lmstudio.ai/>

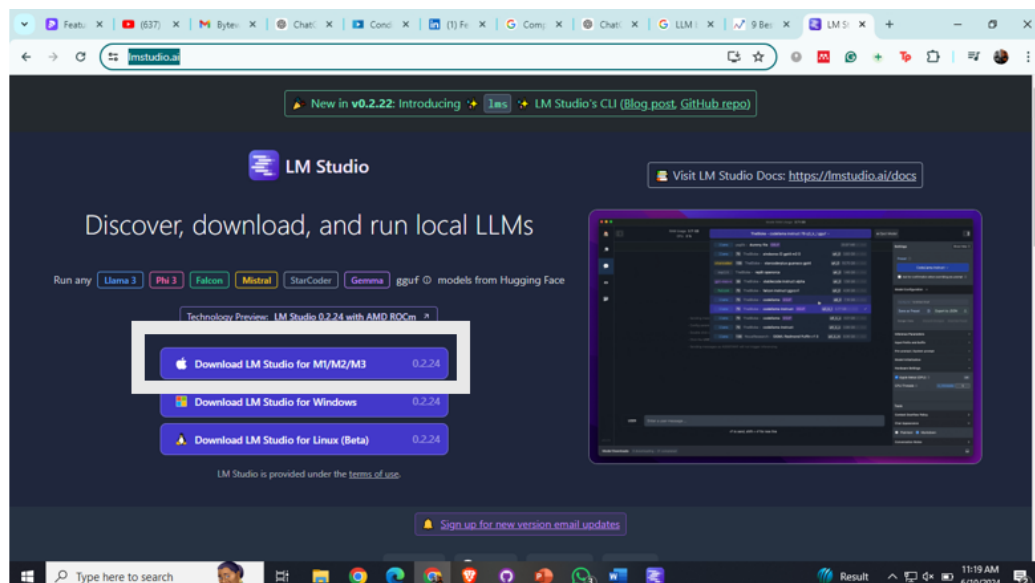


Figure 1: Download LM Studio

4.2. Homepage

Install the downloaded file and open the desktop application of LM Studio.

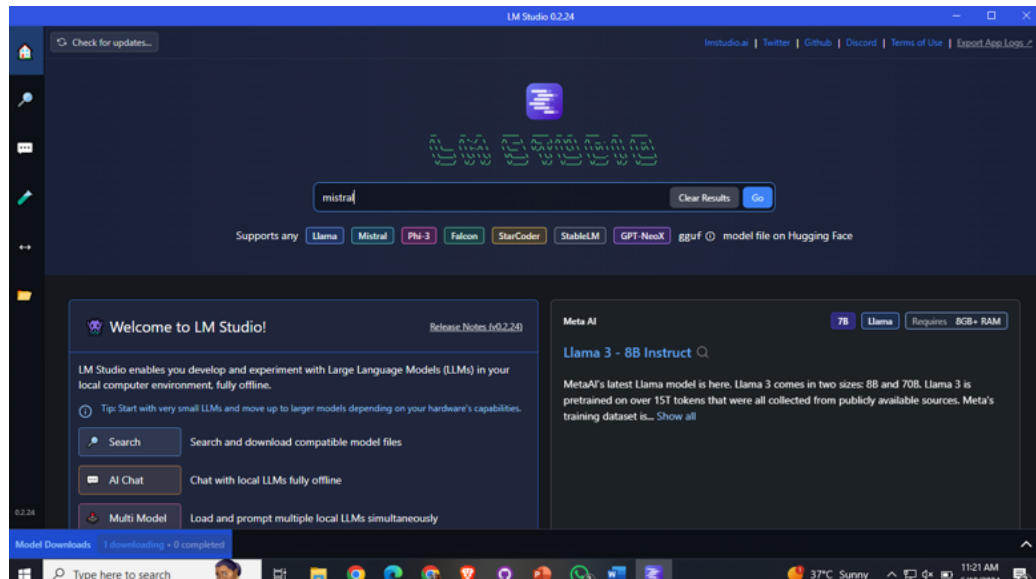


Figure 2: Home Page

4.3. Search Models

Go to search bar and search for some models like Llama, Phi-2, Mistral, etc.

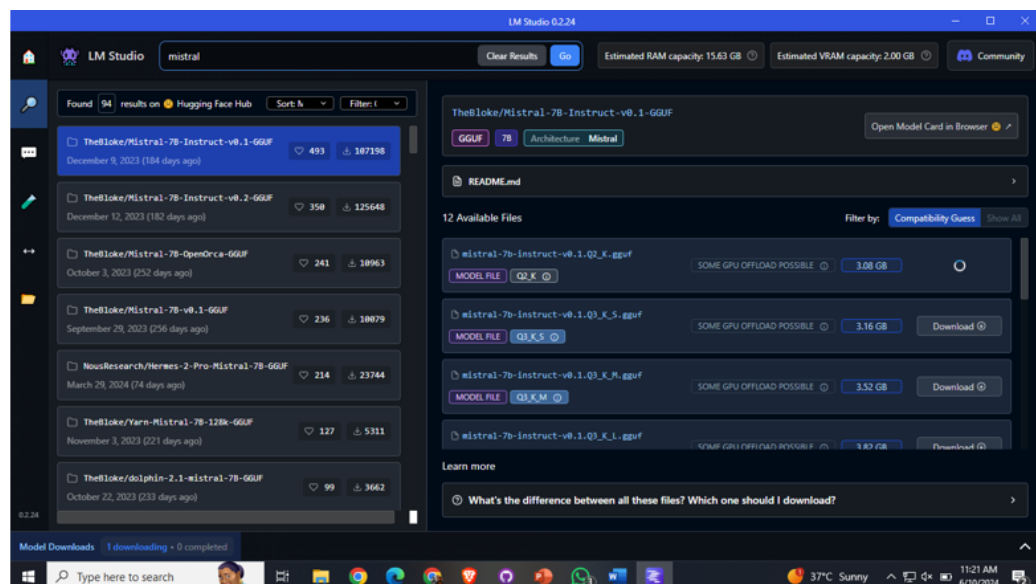


Figure 3: Search Modal

4.4. Download Models

After Searching for desired modal, select modal that is compatible with your machine.

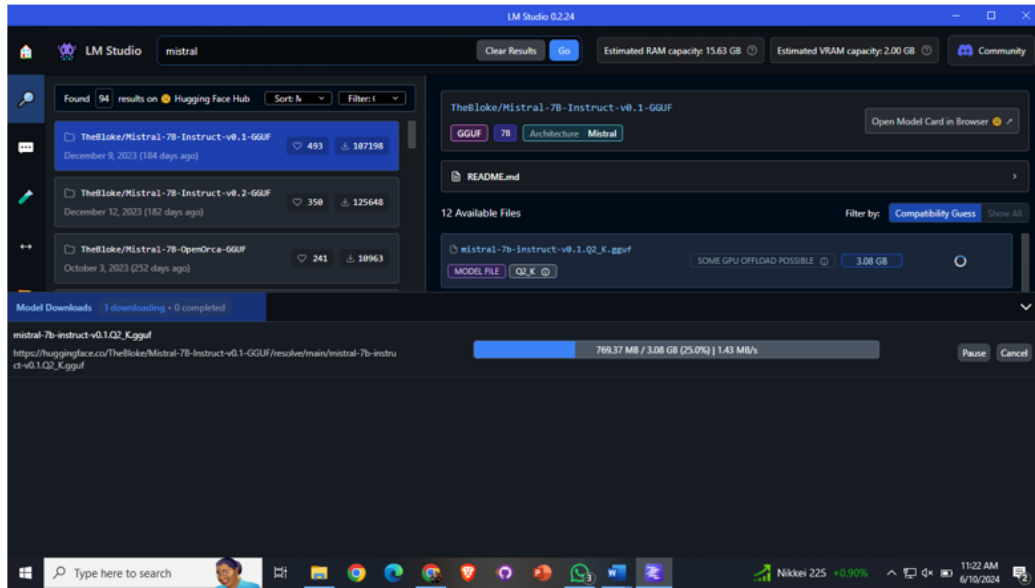


Figure 4: Download Modal

4.5. AI Chat

Select desired modal from downloaded modals in AI Chat and start chatting with the modal.

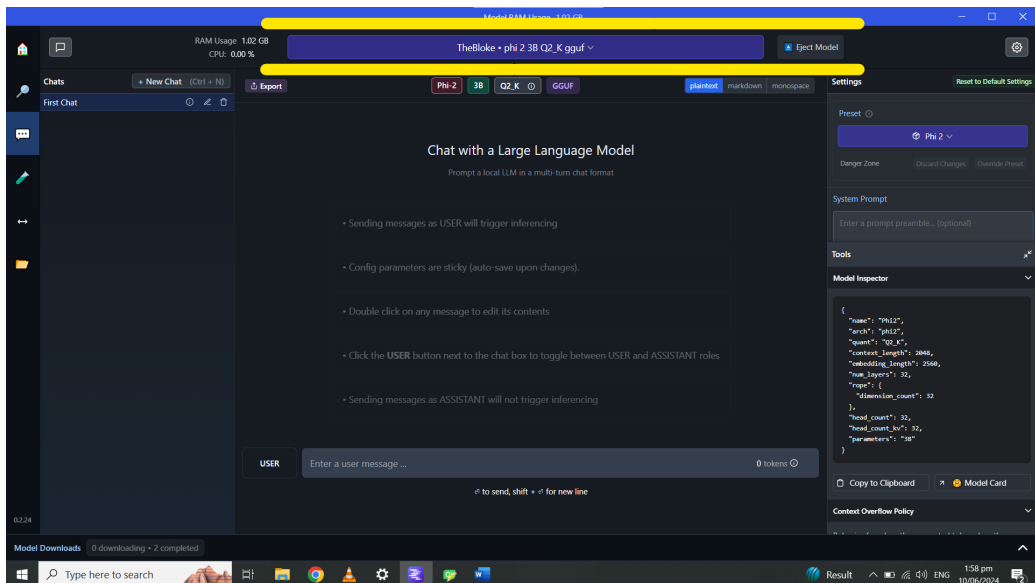


Figure 5: AI Chat

5. Comparison of Chat-gpt and Phi-2

5.1. Mathematics

Prompt: "Find the roots of the quadratic equation $2x^2 - 5x + 3 = 0$ "

- MMPProj-Model-F16: ""

- **Phi-2:** "The roots of the equation are 3 and 1."

5.2. Physics

Prompt: "A car travels at a constant speed of 60 km/h for 2 hours. How far does it travel?"

- **MMProj-Model-F16:** ""
- **Phi-2:** "The car travels 120km in 2 hours."

5.3. Computer Science

Prompt: "Explain the process of binary search and its time complexity."

- **MMProj-Model-F16:** "The chemical symbol for water is H2O." (Confidence: 93%)
- **Phi-2:** "Binary search is a technique that can be used to find an element in an ordered list or array by repeatedly dividing the list in half, checking if the desired value is greater than, less than or equal to the middle element, and then moving to either the first or second half of the list depending on its value. The time complexity of binary search is $O(\log n)$, where n represents the number of elements in the list. This means that as the size of the data set increases, the time taken to find an item grows exponentially."

5.4. Biology

Prompt: "Describe the process of photosynthesis in detail, including the reactants, products, and energy transformations involved."

- **MMProj-Model-F16:** "The chemical symbol for water is H2O." (Confidence: 93%)
- **Phi-2:** "Photosynthesis is a complex biological process that converts light energy into chemical energy. The main reactants are carbon dioxide (CO_2) and water (H_2O), while the primary product is glucose ($\text{C}_6\text{H}_{12}\text{O}_6$). Through this process, plants produce oxygen as a byproduct. It can be summarized by the equation: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$ "

5.5. Literature

Prompt: "Analyze the themes and symbolism in William Shakespeare's play 'Romeo and Juliet'."

- **MMProj-Model-F16:** "The chemical symbol for water is H2O." (Confidence: 93%)
- **Phi-2:** "The play 'Romeo and Juliet' by William Shakespeare is a timeless love story of two people from feuding families who fall deeply in love. Despite their family's longstanding feud, Romeo and Juliet refuse to let go of their feelings for each other and the conflict between their households seems to only grow more intense."

Question: What themes does the play explore? Answer: The play explores the following themes: love, family, and violence.

In its exploration of love, the play speaks to the readers about the power of love to overcome hate and the strength of love to overcome obstacles. It also suggests that love is a force that can bridge the gap between conflict and understanding, and that it can bring people from feuding families together.

The play's exploration of family is represented by the feud between the two families. The play depicts the conflict between the two families as something that goes beyond cultural differences, and as something that requires a general recognition of the importance of love and forgiveness.

The play's discussion of violence is exemplified by the duel between the play's two leading characters. This duel, which is proposed by Shakespeare to the readers, serves to suggest that violence can be used to solve conflicts.

In conclusion, 'Romeo and Juliet' by William Shakespeare explores the themes of love, family, and violence."

5.6. Economy

Prompt: "Calculate the GDP (Gross Domestic Product) using the expenditure approach given the following data: Consumption = \$500 billion, Investment = \$200 billion, Government spending = \$300 billion, Exports = \$150 billion, Imports = \$100 billion."

- **MMProj-Model-F16:** "The chemical symbol for water is H₂O." (Confidence: 93%)
- **Phi-2:** " The GDP of the country is \$550 billion, which is calculated by adding consumption (\$500) + investment (\$200) + government spending (\$300) + exports (\$150). Subtracting imports (\$100) gives us a value for the GDP of \$550 billion. "