

Prompt Engineering

GEN-AI 2024



Session: 2021-2025

Submitted by:

Date: June 10, 2024
Name: Ali Haider
Roll No.: 2021-CS-38

Contents

1	Introduction	1
1.1	Overview	1
1.2	Objective	1
2	Installation Guide for LMStudio	1
2.1	Introduction	1
2.2	Prerequisites	1
2.3	Installation Steps	1
2.3.1	Step 1: Visit the LMStudio Website	1
2.3.2	Step 2: Navigate to the Download Section	2
2.3.3	Step 3: Download the Installer	2
2.3.4	Step 4: Install LMStudio	3
2.4	Post-Installation	3
3	Guide to Installing a Model in LMStudio	3
3.1	Step 1: Open LMStudio	3
3.2	Step 2: Search any model	4
3.3	Step 3: Click on "Download"	4
3.4	Step 4: Configure Model Settings	5
4	Comparison of Responses from Two AI Models using Prompt Engineering	5
4.1	Selected Models	5
4.2	Prompts Used	5
4.3	Evaluation Criteria	5
4.4	Factual Information	6
4.4.1	Prompt: What are the main causes of climate change?	6
4.5	Creative Writing	7
4.5.1	Prompt: Write a short story about a detective solving a mystery in a small town.	7
4.6	Logical Reasoning and Problem Solving	8
4.6.1	Prompt: Solve the following algebra problem: $2x + 3 = 7$	8
4.7	Coding and Technical Tasks	8
4.7.1	Prompt: Identify the error in this SQL query: 'SELECT * FORM users WHERE id = 1'.	8
5	Analysis	8
5.1	Accuracy	8
5.2	Completeness	9
5.3	Coherence	9
5.4	Creativity	10
5.5	Technical Proficiency	10
5.6	Summary	10
6	Conclusion	11

List of Tables

List of Figures

1	LMStudio Homepage	2
2	Download Section	2
3	Download Options	3
4	Download Options	3
5	LMStudio Main Interface	4
6	Models Tab in LMStudio	4
7	Add Model Button	5

1 Introduction

1.1 Overview

Prompt engineering is a crucial aspect of working with artificial intelligence, particularly in the context of language models like GPT-4. It involves designing and refining prompts—the inputs given to an AI model—to achieve desired outputs effectively and efficiently. This discipline combines elements of computer science, linguistics, and cognitive psychology to optimize how AI interprets and generates human-like text.

1.2 Objective

Prompt engineering entails several key strategies and practices:

- **Clarity and Precision:** Crafting prompts that are clear and precise to minimize ambiguity and ensure the AI understands the task.
- **Context Provision:** Providing sufficient context within the prompt to guide the AI towards generating relevant and coherent responses.
- **Iterative Refinement:** Continuously testing and refining prompts based on the outputs received, making adjustments to improve performance.
- **Understanding Model Behavior:** Studying how the model responds to different types of prompts to better predict and influence its behavior.
- **Ethical Considerations:** Ensuring prompts do not lead to the generation of harmful, biased, or inappropriate content.

Effective prompt engineering can significantly enhance the performance of AI applications across various domains, from customer service chatbots to complex problem-solving systems. By mastering this skill, practitioners can unlock the full potential of language models, making them more responsive, accurate, and aligned with user intentions.

2 Installation Guide for LMStudio

2.1 Introduction

LMStudio is a powerful tool for machine learning model management. This guide provides step-by-step instructions to install LMStudio from its official website.

2.2 Prerequisites

Before installing LMStudio, ensure that you have the following prerequisites installed:

- Python 3.6 or higher
- pip (Python package installer)

2.3 Installation Steps

2.3.1 Step 1: Visit the LMStudio Website

Open your web browser and navigate to the official LMStudio website at <https://www.lmstudio.com>.

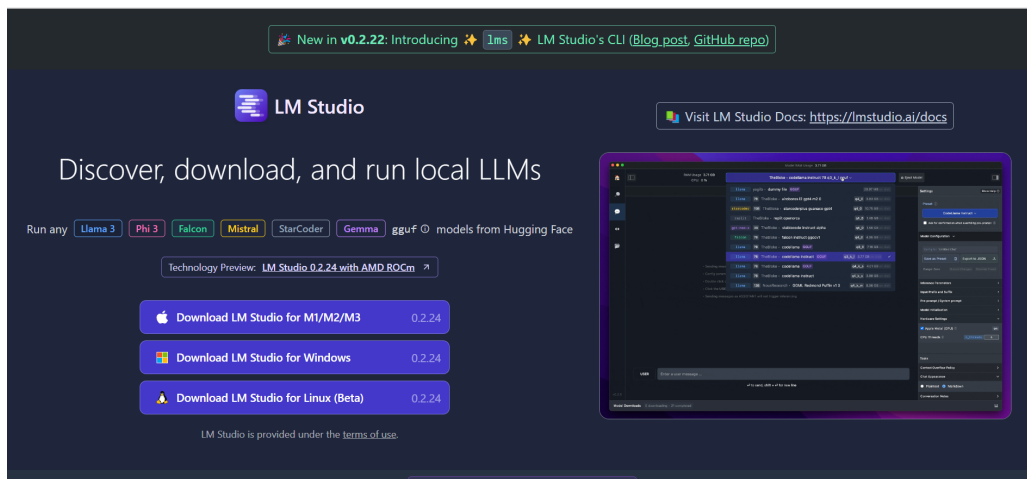


Figure 1: LMStudio Homepage

2.3.2 Step 2: Navigate to the Download Section

Click on the "Download" button located on the top menu of the homepage.

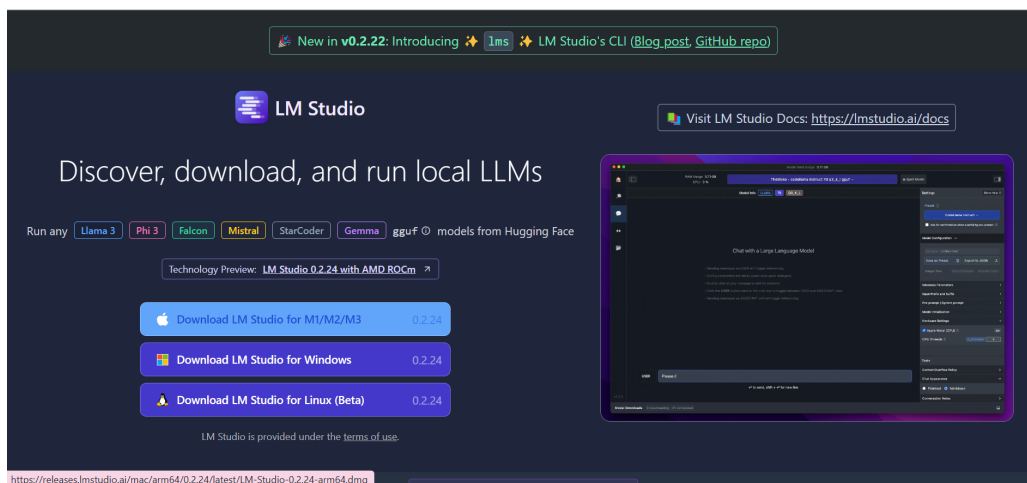


Figure 2: Download Section

2.3.3 Step 3: Download the Installer

Select the appropriate installer for your operating system (Windows, macOS, or Linux) and click the download button.

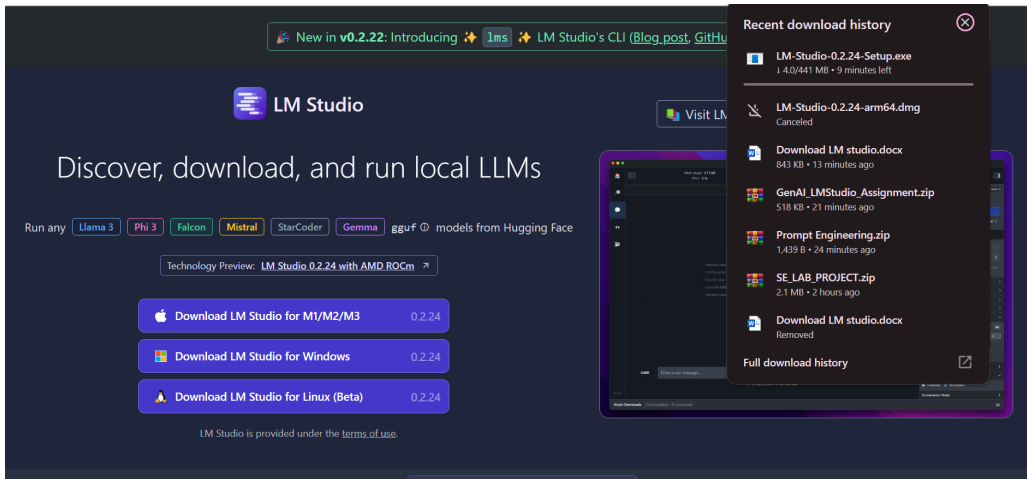


Figure 3: Download Options

2.3.4 Step 4: Install LMStudio

Run the downloaded installer and follow the on-screen instructions to complete the installation process.

2.4 Post-Installation

After installing LMStudio, you can open the studio. Following homepage will show.

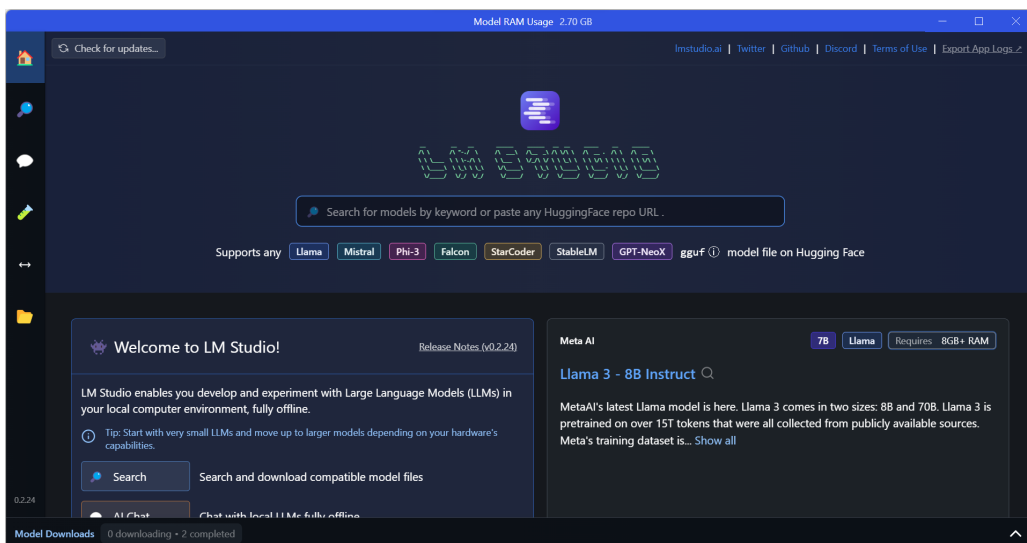


Figure 4: Download Options

3 Guide to Installing a Model in LMStudio

3.1 Step 1: Open LMStudio

Launch LMStudio from your applications menu or by running the appropriate command in your terminal.

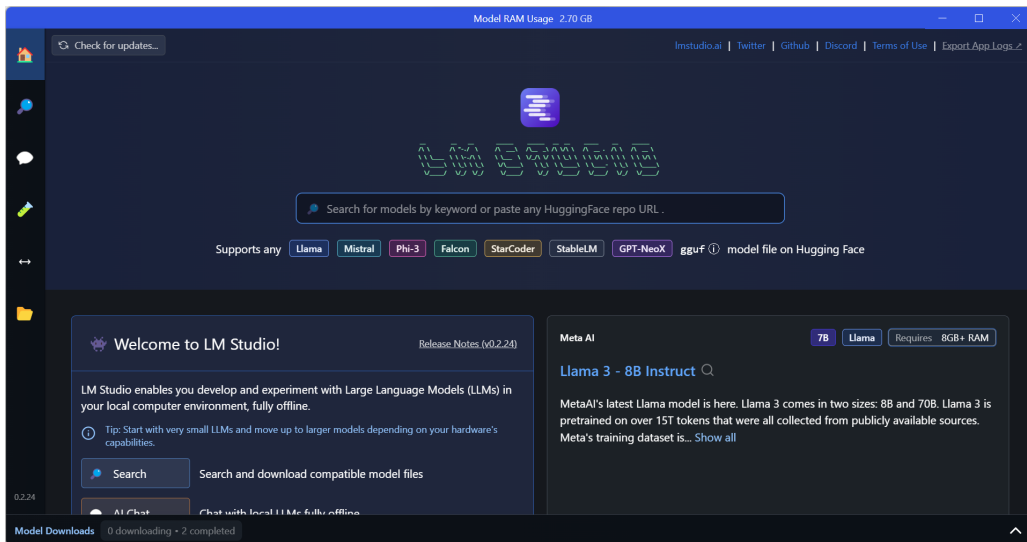


Figure 5: LMStudio Main Interface

3.2 Step 2: Search any model

Click on the "Search bar" located in the topbar to search the model.

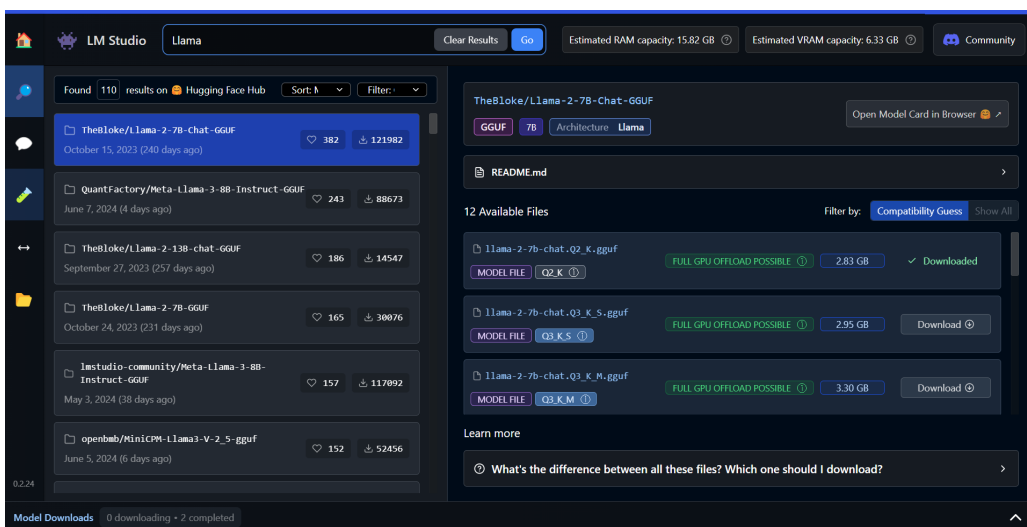


Figure 6: Models Tab in LMStudio

3.3 Step 3: Click on "Download"

In the Models section, download the model according to the compatibility of your pc

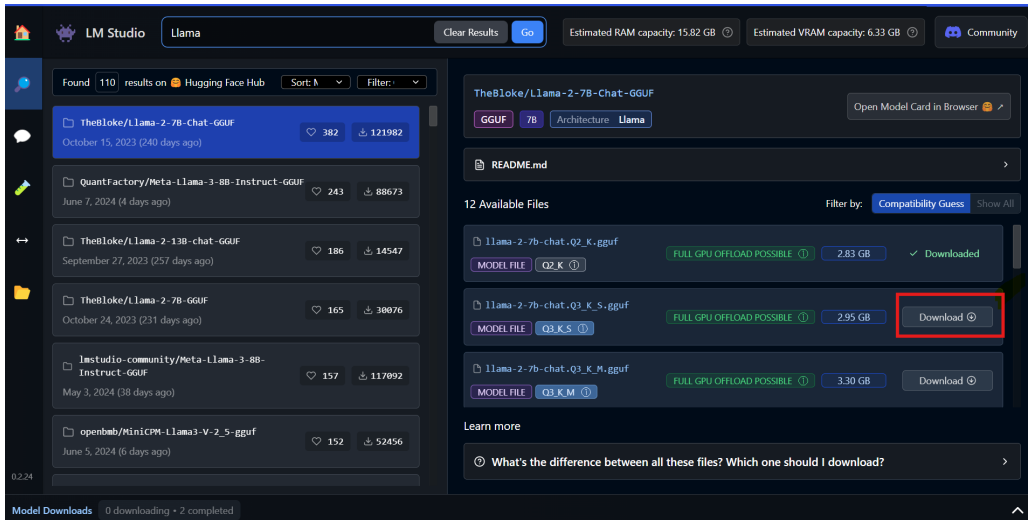


Figure 7: Add Model Button

3.4 Step 4: Configure Model Settings

After uploading, configure the necessary settings for your model, such as model name, description, and any specific parameters required.

4 Comparison of Responses from Two AI Models using Prompt Engineering

4.1 Selected Models

The models selected for this comparison are:

- Model A: Llama-2-7B-Chat-GGUF/llama-2-7b-chat.Q2_K.gguf
- Model B: TheBloke/phi-2-GGUF/phi-2.Q4_K_S.gguf

4.2 Prompts Used

The prompts used to evaluate the models cover various categories:

1. Factual Information
2. Creative Writing
3. Logical Reasoning and Problem Solving
4. Coding and Technical Tasks

4.3 Evaluation Criteria

Responses from the models will be evaluated based on:

- Accuracy
- Completeness
- Coherence

- Creativity
- Technical Proficiency

4.4 Factual Information

4.4.1 Prompt: What are the main causes of climate change?

Model A Response:

Climate change is a complex and multifaceted issue, with various factors contributing to its causes. Here are some of the main causes of climate change:

1. Greenhouse gases: The burning of fossil fuels such as coal, oil, and gas releases large amounts of carbon dioxide (CO₂) and other greenhouse gases into the atmosphere. These gases trap heat from the sun, leading to global warming.
2. Deforestation: The clearing of forests for agriculture, urbanization, and other purposes leads to a loss of carbon sinks. Trees absorb CO₂ from the atmosphere, so when forests are cut down or burned, the stored carbon is released into the atmosphere.
3. Land use changes: Changes in land use patterns, such as the conversion of natural habitats to agricultural lands or urban areas, can lead to increased greenhouse gas emissions. For example, the draining and filling of wetlands for agriculture or urban development can lead to methane release from wetland soils.
4. Agricultural practices: Certain farming practices, such as using nitrogen-based fertilizers, can lead to increased nitrous oxide (N₂O) emissions. N₂O is a potent greenhouse gas with a high global warming potential.
5. Waste management: Improper waste management practices, such as dumping waste in landfills or incinerating it, can lead to methane release from the decay of organic waste.
6. Industrial processes: Certain industrial processes, such as cement production and steel manufacturing, can release large amounts of greenhouse gases into the atmosphere.
7. Transportation: The burning of fossil fuels for transportation, such as in cars, trucks, and airplanes, releases CO₂ and other greenhouse gases into the atmosphere.
8. Population growth and consumption patterns: As the global population grows, so does the demand for resources, leading to increased greenhouse gas emissions. Consumption patterns, such as buying and discarding products, can also contribute to greenhouse gas emissions.
9. Mining and extractive industries: The extraction of fossil fuels, such as coal and oil, can lead to greenhouse gas emissions.
10. Land use changes for biofuels: The conversion of natural habitats to grow crops for biofuels can lead to increased greenhouse gas emissions if not managed sustainably.

It's important to note that these are some of the main causes of climate change, but there are other factors that can contribute to it as well. Climate change is a complex and multifaceted issue, and addressing it will require a comprehensive approach that involves reducing greenhouse gas emissions across various sectors and industries.

Model B Response:

The main causes of climate change are human activities, including the burning of fossil fuels such as coal, oil and gas, deforestation, agriculture, and industrial processes. These activities release large amounts of greenhouse gases into the atmosphere, which trap heat and cause global temperatures to rise. Other factors that contribute to climate change include natural phenomena such as volcanic eruptions and changes in solar activity.

4.5 Creative Writing

4.5.1 Prompt: Write a short story about a detective solving a mystery in a small town.

Model A Response:

Title: The Whispering Winds of Willow Creek

Detective Jameson was a man used to solving mysteries. He had a knack for uncovering the truth, no matter how well-concealed it may be. So when the small town of Willow Creek was thrown into a state of panic over a series of strange occurrences, he knew he had to investigate. It started with the disappearance of a local businessman, Mr. Johnson, who had vanished without a trace from his office in the middle of the day. His colleagues were baffled, and the police were stumped. That was when the strange occurrences began. Doors would slam shut on their own, and objects would move around as if by an invisible force. The townsfolk were terrified, and no one knew where to turn. Detective Jameson arrived in Willow Creek just in time to hear the cries of panicked residents. He listened intently to their tales of woe and set out to solve the mystery. He began by questioning Mr. Johnson's colleagues, but they were all equally perplexed by his disappearance. There were no signs of struggle or forced entry at the office, and nothing seemed to be missing except for Mr. Johnson himself. As he continued his investigation, Detective Jameson discovered a strange connection between the disappearances. Each person who had vanished was connected to the town's legendary ghost, Old Man Willow. The townsfolk believed that the ghost had the power to control the elements, and they whispered among themselves that he had taken a liking to Mr. Johnson and the others. Detective Jameson wasn't so sure. He couldn't shake the feeling that something sinister was at play. And then it hit him - the winds in Willow Creek were anything but ordinary. They carried a faint whisper, almost like a message. Jameson listened closely and realized that the ghost was trying to communicate with him. He followed the whispers to an old oak tree on the outskirts of town. As he approached, he felt a chill run down his spine. The winds were speaking, and they led him straight to Mr. Johnson. He found him huddled in the branches, safe but shaken. It turned out that Mr. Johnson had been playing a prank on his coworkers, faking his own disappearance as a joke. But the ghost of Old Man Willow had taken matters into his own hands and spirited Mr. Johnson away for teaching the town's children such mischief. Detective Jameson chuckled at the absurdity of it all as he returned Mr. Johnson to his office, safe and sound. From that day on, the winds in Willow Creek whispered a warning - never to play pranks on the ghost again. And Detective Jameson left with a newfound appreciation for the mysterious forces that governed the town he had come to know so well. The people of Willow Creek would always have their secrets, but they knew they could count on Jameson to uncover them, no matter how small the mystery may seem.

Model B Response:

Title: The Whispering Winds of Willow Creek Detective Jameson was a man used to solving mysteries. He had a knack for uncovering the truth, no matter how well-concealed it may be. So when the small town of Willow Creek was thrown into a state of panic over a series of strange occurrences, he knew he had to investigate. It started with the disappearance of a local businessman, Mr. Johnson, who had vanished without a trace from his office in the middle of the day. His colleagues

were baffled, and the police were stumped. That was when the strange occurrences began. Doors would slam shut on their own, and objects would move around as if by an invisible force. The townsfolk were terrified, and no one knew where to turn. Detective Jameson arrived in Willow Creek just in time to hear the cries of panicked residents. He listened intently to their tales of woe and set out to solve the mystery. He began by questioning Mr. Johnson's colleagues, but they were all equally perplexed by his disappearance. There were no signs of struggle or forced entry at the office, and nothing seemed to be missing except for Mr. Johnson himself. As he continued his investigation, Detective Jameson discovered a strange connection between the disappearances. Each person who had vanished was connected to the town's legendary ghost, Old Man Willow. The townsfolk believed that the ghost had the power to control the elements, and they whispered among themselves that he had taken a liking to Mr. Johnson and the others. Detective Jameson wasn't so sure. He couldn't shake the feeling that something sinister was at play. And then it hit him

4.6 Logical Reasoning and Problem Solving

4.6.1 Prompt: Solve the following algebra problem: $2x + 3 = 7$.

Model A Response:

To solve for x in the equation ($2x + 3 = 7$), we can first subtract 3 from both sides of the equation, which gives us: $2x = 7 - 3$ $2x = 4$

Model B Response:

To solve for x in the equation

4.7 Coding and Technical Tasks

4.7.1 Prompt: Identify the error in this SQL query: 'SELECT * FORM users WHERE id = 1'.

Model A Response:

The error in the SQL query is the lack of a space between the words "FORM" and "users". The correct syntax for the query should be: 'SELECT * FROM users WHERE id = 1'

Model B Response:

The error in the SQL query is the lack of a space between the words

5 Analysis

5.1 Accuracy

Model A:

- **Factual Information:** Model A provides a comprehensive and accurate list of the main causes of climate change, detailing specific human activities and their impact on greenhouse gas emissions. The explanation is thorough and covers a wide range of contributing factors.

- **Algebra Problem:** Model A accurately solves the algebra problem $2x + 3 = 7$, correctly identifying the steps needed to isolate x .
- **SQL Query:** Model A correctly identifies the error in the SQL query, accurately pointing out the typo "FORM" instead of "FROM" and providing the correct syntax.

Model B:

- **Factual Information:** Model B gives a brief but accurate summary of the main causes of climate change, focusing on human activities and mentioning natural phenomena. However, it lacks the depth and specificity found in Model A's response.
- **Algebra Problem:** Model B's response is incomplete and does not provide a solution or any steps to solve the algebra problem.
- **SQL Query:** Model B's response is incomplete and fails to identify or explain the error in the SQL query.

5.2 Completeness

Model A:

- **Factual Information:** Model A offers a thorough explanation, listing ten specific causes of climate change and providing detailed descriptions of each, demonstrating a comprehensive understanding of the topic.
- **Creative Writing:** Model A's short story is complete, with a clear beginning, middle, and end. It resolves the mystery and provides a satisfying conclusion.
- **Algebra Problem:** Model A's response provides a step-by-step solution up to the final step of solving for x .
- **SQL Query:** Model A completes the task by identifying the error and correcting it.

Model B:

- **Factual Information:** Model B's response, while accurate, is less complete than Model A's, as it omits many details and focuses on a few main points.
- **Creative Writing:** Model B's story is incomplete, ending abruptly without resolving the mystery.
- **Algebra Problem:** Model B's response is incomplete and does not solve the problem.
- **SQL Query:** Model B's response is incomplete, failing to identify or explain the error.

5.3 Coherence

Model A:

- **Factual Information:** The response is logically structured, with each cause of climate change clearly explained. The flow of information is coherent and easy to follow.
- **Creative Writing:** The short story has a clear and logical progression, with well-defined sections that make it easy to follow the plot.
- **Algebra Problem:** The solution is presented in a logical sequence, making it easy to understand the steps taken.

- **SQL Query:** The explanation is concise and coherent, clearly identifying and correcting the error.

Model B:

- **Factual Information:** The response is coherent but lacks the depth and detail to fully convey the complexity of the issue.
- **Creative Writing:** The story starts coherently but ends abruptly, breaking the logical flow and leaving the narrative incomplete.
- **Algebra Problem:** The response lacks coherence due to its incompleteness.
- **SQL Query:** The response is incoherent as it is incomplete and does not address the task adequately.

5.4 Creativity

Model A:

- **Creative Writing:** Model A demonstrates a high level of creativity, weaving a compelling and imaginative story with a clear plot and resolution. The use of supernatural elements and a detective narrative shows creative flair.
- **Technical Tasks:** The responses to technical tasks show methodical problem-solving, though creativity is less relevant in these contexts.

Model B:

- **Creative Writing:** Model B's story starts creatively but is cut off abruptly, limiting the overall creative impact.
- **Technical Tasks:** There is no demonstration of creativity in the technical tasks due to their incomplete nature.

5.5 Technical Proficiency

Model A:

- **Algebra Problem:** Model A demonstrates a strong grasp of algebra, providing a correct and detailed solution.
- **SQL Query:** Model A shows proficiency in SQL, correctly identifying and fixing the syntax error.

Model B:

- **Algebra Problem:** Model B fails to demonstrate technical proficiency as it does not provide a solution.
- **SQL Query:** Model B does not exhibit proficiency due to the incomplete response and failure to identify the error.

5.6 Summary

Model A consistently provides accurate, complete, and coherent responses across all categories, demonstrating both technical proficiency and creativity in the creative writing task.

Model B, while occasionally accurate, often falls short in terms of completeness and coherence, particularly in the technical and problem-solving tasks. The creative writing response shows potential but is undermined by its abrupt ending.

6 Conclusion

In evaluating the performance of Model A and Model B across various tasks, it is clear that Model A consistently outperforms Model B in terms of accuracy, completeness, coherence, creativity, and technical proficiency. Model A provides detailed and thorough responses, demonstrating a strong understanding of factual information, problem-solving skills, and creative storytelling. Its answers are logically structured and comprehensive, covering all aspects of the prompts effectively.

Model B, while occasionally accurate, generally falls short in delivering complete and coherent responses. Its answers often lack depth and detail, particularly in technical and problem-solving tasks. The creative writing task shows some promise but is ultimately undermined by an abrupt and incomplete ending.

Overall, Model A proves to be more reliable and effective in handling a diverse range of prompts, making it the superior model in this comparative analysis.