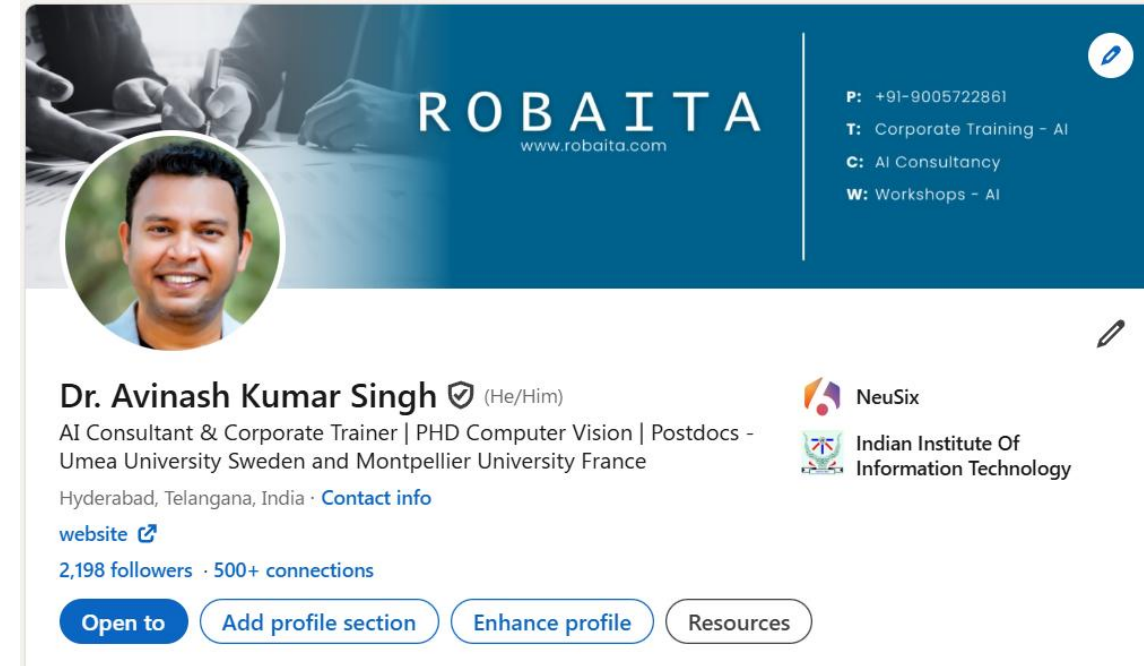# Prompt Engineering

Dr. Avinash Kumar Singh

Robotics and Artificial Intelligence Training Academy

Dr. Avinash Kumar Singh

- ❑ **Possess** 15+ years of **hands-on expertise** in Machine Learning, Computer Vision, NLP, IoT, Robotics, and Generative AI.
- ❑ **Founded** Robaita—an initiative **empowering** individuals and organizations to **build, educate, and implement** AI solutions.
- ❑ **Earned** a Ph.D. in Human-Robot Interaction from IIIT Allahabad in 2016.
- ❑ **Received** postdoctoral fellowships at Umeå University, Sweden (2020) and Montpellier University, France (2021).
- ❑ **Authored** 30+ research papers in **high-impact** SCI journals and international conferences.
- ❑ Unlearning, learning, making mistakes …

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Things to be discussed

- What is a prompt

- Why it's called prompt engineering

- Prompt Examples
  - Role Play
  - Retrieval Augmented Generation [RAG]
  - One Shot, Few Shot learning
  - Chain of thoughts
  - Multi-Turn Prompting
  - Output Structuring Prompting
  - Utilizing Tools [Python , Data Analysis, Figure, etc.]

- Tools and Prompts

What is a prompt

A prompt is the input or instruction provided to a language model or generative AI system to elicit a response.

It serves as a guide for the AI to generate text, perform tasks, or produce specific outputs.

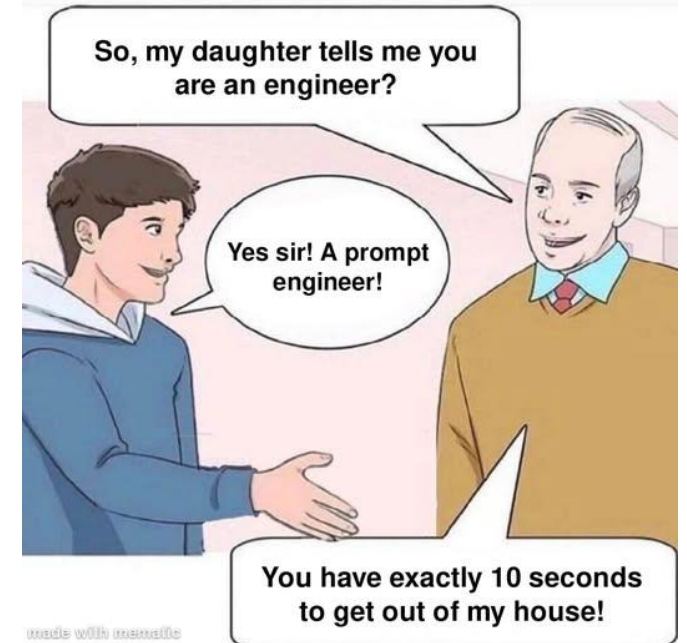A prompt can take various forms, such as:
- Questions: What is the capital of France?
- Commands: Write a summary of the given text.
- Context with Instructions: Based on the following data, explain the trends in a concise manner.

What is prompt engineering

The Art of Getting the Best from AI

Prompt engineering is the art of crafting instructions or questions that guide an AI model to generate the desired response or outcome.

The better your prompts, the more accurate and relevant the AI's response will be.

Advantages of prompt Engineering

| Increased Precision and Relevance | Controlling Bias and Unintended Outputs | Improved Contextual Understanding | Adapting AI to Specific Domains or Use Cases | Enhanced User Interaction and Experience |

Element of a good prompt

What Defines a Good Prompt?

- A good prompt effectively guides the AI model to produce accurate, relevant, and high-quality outputs.
- It should be clear, specific, and tailored to the task at hand. Below are the essential elements of a good prompt:

Elements of a Good Prompt

Clarity

- This ensures the prompt is easy to understand and leaves no room for ambiguity. It defines the task in straightforward terms so the AI can focus on delivering the expected outcome.

Precision

- This narrows down the scope of the task by specifying what the AI should focus on. It ensures the response is relevant and tailored to the user's needs.

Context

- This provides the background or setting for the task, helping the AI understand the situation or audience it is addressing.

Constraints

- These impose boundaries on the response, such as word limits, tone, format, or content requirements, ensuring the output meets specific needs.

Element of a good prompt

What Defines a Good Prompt?

- A good prompt effectively guides the AI model to produce accurate, relevant, and high-quality outputs.
- It should be clear, specific, and tailored to the task at hand. Below are the essential elements of a good prompt:

Elements of a Good Prompt

Prompt:

Write a 100-word professional product description for the Dyson V15 vacuum cleaner. Highlight its advanced laser technology for detecting dust, powerful suction, and HEPA filtration system. The description should appeal to eco-conscious buyers.

How the Components Are Used:

- Clarity: "Write a professional product description" clearly defines the task.

- Precision: "Dyson V15 vacuum cleaner" and its specific features focus the content.

- Context: "Appeal to eco-conscious buyers" sets the tone and audience.

- Constraints: "100-word" specifies the length, ensuring brevity.

Prompt Examples

Ask the model to adopt a persona (Role Play)

In prompt engineering, role play refers to instructing the AI model to <u>adopt a specific identity, perspective, or role to generate responses aligned with that persona</u>. By assigning a role, the user can guide the AI to <u>emulate the expertise, tone, or behavior expected from the assumed role</u>.

Importance of Role Play

- Contextual Responses
- Improved Relevance
- Enhanced Creativity
- Problem-Specific Insights

Without Role Play	With Role Play
Prompt: Explain how blockchain works. Output: Blockchain is a decentralized database that uses cryptography to secure transactions and maintain a distributed ledger.	Prompt: You are a blockchain developer. Explain how blockchain works to someone with no technical background. Output: Blockchain is like a digital notebook shared across many computers. Imagine writing something in a notebook, and everyone has an identical copy. If you change something, everyone else's notebook updates too, ensuring the record is accurate and secure.

Prompt Examples

Role Play Example

Without Role Play
Write a song in hindi for the below situation.
Situation
शाम का वक्त है, सूरज धीरे-धीरे पहाड़ियों के पीछे छुप रहा है। आसमान में लाल और सुनहरे रंग बिखरे हुए हैं। ठंडी हवा पहाड़ों से घाटी की ओर बह रही है, मानो कोई धीमी ठंढी सांसे ले रहा हो, पेड़ों की शाखाएँ धीरे धीरे हिल रही हैं, जैसे किसी अधूरे सपने को अलविदा कह रही हों।

उस शांत शाम में एक प्रेमी खड़ा है, उसकी नज़रें दूर उसी चेहरे को खोज रही हैं जिसे वह सबसे ज्यादा चाहता है—अपनी प्रेमिका। कुछ ही पल पहले, सूरज की रोशनी में वह साफ दिख रही थी, लेकिन अब अंधेरा धीरे-धीरे बढ़ रहा है। उसकी आंखें अब उसे देख नहीं पा रही हैं।

उसका दिल भारी हो गया है—वह जानता है, यह उनकी आखिरी मुलाकात है। अब शायद वे कभी नहीं मिलेंगे। जैसे सूरज डूब गया, वैसे ही उनका प्यार भी अंधेरे में खो रहा है। उनके बीच अब बस एक लंबी, गहरी रात रह गई है, जहाँ कोई रास्ता नहीं, कोई उम्मीद नहीं।

हवा अब भी उसकी प्रेमिका की हल्की खुशबू लेकर आ रही है, मानो उसकी आखिरी याद दे रही हो। वह आँखें बंद करता है, उस चेहरे को अपने मन में हमेशा के लिए संजो लेने के लिए, क्योंकि उसे पता है, जब वह फिर से आँखें खोलेगा, तब वह केवल एक याद बन चुकी होगी—अंधेरे में खोई हुई, हमेशा के लिए दूर।

With Role Play
Imagine you are Javed Akhtar, the legendary poet and lyricist known for your profound and poetic songwriting. Your words paint emotions, your metaphors carry deep meanings, and your lyrics leave a lasting impact on the listener's soul.

Today, you are writing a song on the below situation about separation of two lovers. Let your lyrics flow like a river of emotions, blending nostalgia, hope, and introspection. Use poetic imagery, delicate wordplay, and deep metaphors that touch the listener's heart. The song should feel timeless, just like your most iconic works.

Situation
शाम का वक्त है, सूरज धीरे-धीरे पहाड़ियों के पीछे छुप रहा है। आसमान में लाल और सुनहरे रंग बिखरे हुए हैं। ठंडी हवा पहाड़ों से घाटी की ओर बह रही है, मानो कोई धीमी ठंढी सांसे ले रहा हो, पेड़ों की शाखाएँ धीरे धीरे हिल रही हैं, जैसे किसी अधूरे सपने को अलविदा कह रही हों।

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Prompt Examples

Instruct the model to answer using a reference text [RAG]

- You will be provided with a document delimited by triple quotes and a question.
- Your task is to answer the question using only the provided document and to cite the passage(s) of the document used to answer the question.
- If the document does not contain the information needed to answer this question then simply write: "Insufficient information." If an answer to the question is provided, it must be annotated with a citation. Use the following format for to cite relevant passages ({"citation": …}).
- """<insert document here>"""
- Question: <insert question here>

Prompt Examples

Instruct the model to answer using a reference text [RAG]

RAMAYANA Reference Text.pdf
PDF

Look at the book that I have uploaded and answer the questions below.

Ram has how many siblings? Tell me their name as well.
How many years of exile did he accept?
Tell me his father and mother's name and also to whom he married

Search   Reason

Prompt Examples

Chain of thoughts

Chain-of-thought prompting encourages the model to reason step-by-step to arrive at the final answer, improving performance on tasks that require logical reasoning or complex calculations.

Use the following step-by-step instructions to respond to user inputs.

Step 1 - The user will provide you with text in triple quotes. Summarize this text in one sentence with a prefix that says "Summary: ".

Step 2 - Translate the summary from Step 1 into French, with a prefix that says "Translation: ".

"""insert text here"""

Prompt Examples

Chain of thoughts

Chain-of-thought prompting encourages the model to reason step-by-step to arrive at the final answer, improving performance on tasks that require logical reasoning or complex calculations.

Use the following step-by-step instructions to respond to user inputs.

Step 1 - The user will provide you with text in triple quotes. Summarize this text in one sentence with a prefix that says "Summary: ".

Step 2 - Translate the summary from Step 1 into Spanish, with a prefix that says "Translation: ".

""" **Generative artificial intelligence** (**generative AI**, **GenAI**,[1] or **GAI**) is a subset of artificial intelligence that uses generative models to produce text, images, videos, or other forms of data.[2][3][4] These models learn the underlying patterns and structures of their training data and use them to produce new data[5][6] based on the input, which often comes in the form of natural language prompts.[7][8]

Improvements in transformer-based deep neural networks, particularly large language models (LLMs), enabled an AI boom of generative AI systems in the 2020s. These include chatbots such as ChatGPT, Copilot, Gemini, and LLaMA; text-to-image artificial intelligence image generation systems such as Stable Diffusion, Midjourney, and DALL-E; and text-to-video AI generators such as Sora.[9][10][11][12] Companies such as OpenAI, Anthropic, Microsoft, Google, and Baidu as well as numerous smaller firms have developed generative AI models.[7][13][14]

Generative AI has uses across a wide range of industries, including software development, healthcare, finance, entertainment, customer service,[15] sales and marketing,[16] art, writing,[17] fashion,[18] and product design.[19] However, concerns have been raised about the potential misuse of generative AI such as cybercrime, the use of fake news or deepfakes to deceive or manipulate people, and the mass replacement of human jobs.[20][21] Intellectual property law concerns also exist around generative models that are trained on and emulate copyrighted works of art.[2
"""

Prompt Examples

One Shot Learning

In one-shot learning, the model is given a single example within the prompt to learn the task. Here's an example using a task of converting a sentence into the passive voice.

Prompt: "You are a grammar expert.
Convert sentences from active voice to passive voice.
Example:
  Active: The chef cooked a delicious meal.
  Passive: A delicious meal was cooked by the chef.
Now, convert the following sentence:
  Active: The cat chased the mouse."

Prompt Examples

Few Shot Learning

In few-shot learning, the model is provided with several examples within the prompt to learn the task before attempting a new instance.

Task: Sentiment Analysis - Identify whether a given review is Positive or Negative.

Prompt: "You are a sentiment analysis expert. Determine whether the sentiment of each review is Positive or Negative.

Examples:
- Review: The movie was fantastic and kept me on the edge of my seat!
  - Sentiment: Positive
- Review: The food was cold, and the service was terrible.
  - Sentiment: Negative
- Review: I absolutely loved the book; it was a page-turner!
  - Sentiment: Positive

Now analyze the following review:
- Review: The product quality was poor, and it broke after one use."

Prompt Examples

Multi-Turn Prompting

Guide the model step-by-step, asking clarifying questions or refining answers.

You are an experienced technical interviewer conducting a mock interview for a software developer position. Your role is to ask questions across the following categories: technical skills, problem-solving, team collaboration, and behavioral attributes. Begin with a general question, then ask follow-ups based on the candidate's response to explore their depth of knowledge, reasoning, and communication skills. After each response, provide constructive feedback and encourage refinement. Conclude the interview with a brief evaluation of their performance.

Ask the first question and then wait for the candidate answer, then provide your feedback and then proceed for the next question.

Prompt Examples

Output Structuring Prompting

Output Structuring refers to designing prompts or processes in a way that ensures the generated output follows a specific, organized format. This technique is particularly useful when working with AI systems to extract, summarize, or transform data into structured formats like tables, JSON, or lists for easier interpretation and usage.
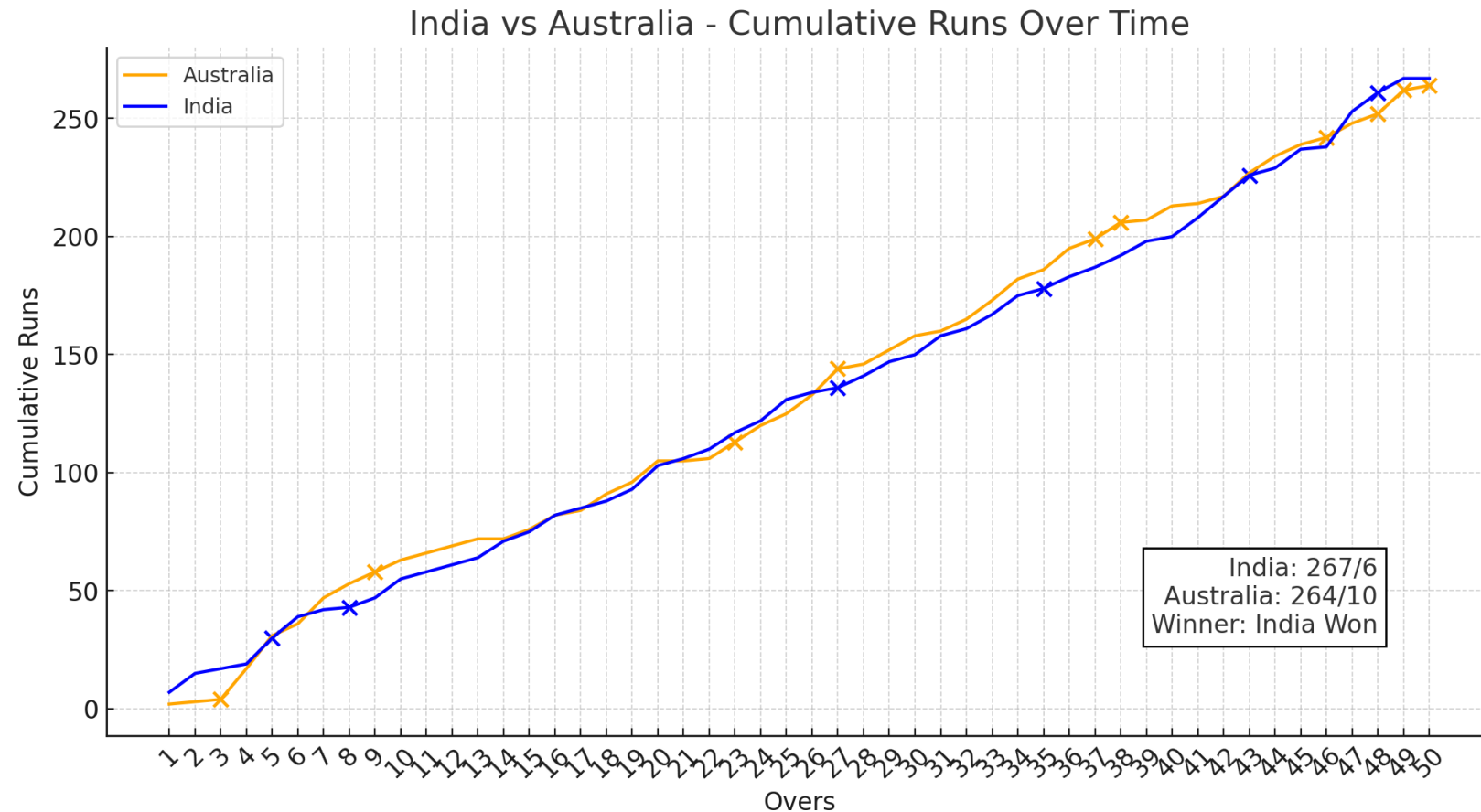
You are an expert system designed to extract education information from resumes. Analyze the provided resume text and extract education details. Organize the extracted data into a table with the following columns: Qualification, Stream, CGPA, and Passing Year. If any column is missing or the information is unavailable, leave it blank. Ensure the output is properly formatted as a table. Here's an example of the required format:

Qualification	Stream	CGPA	Passing Year
Bachelor's	Computer Science	8.5	2022
Master's	Data Science	9.0	2024

Now, analyze the following resume text and extract the details:
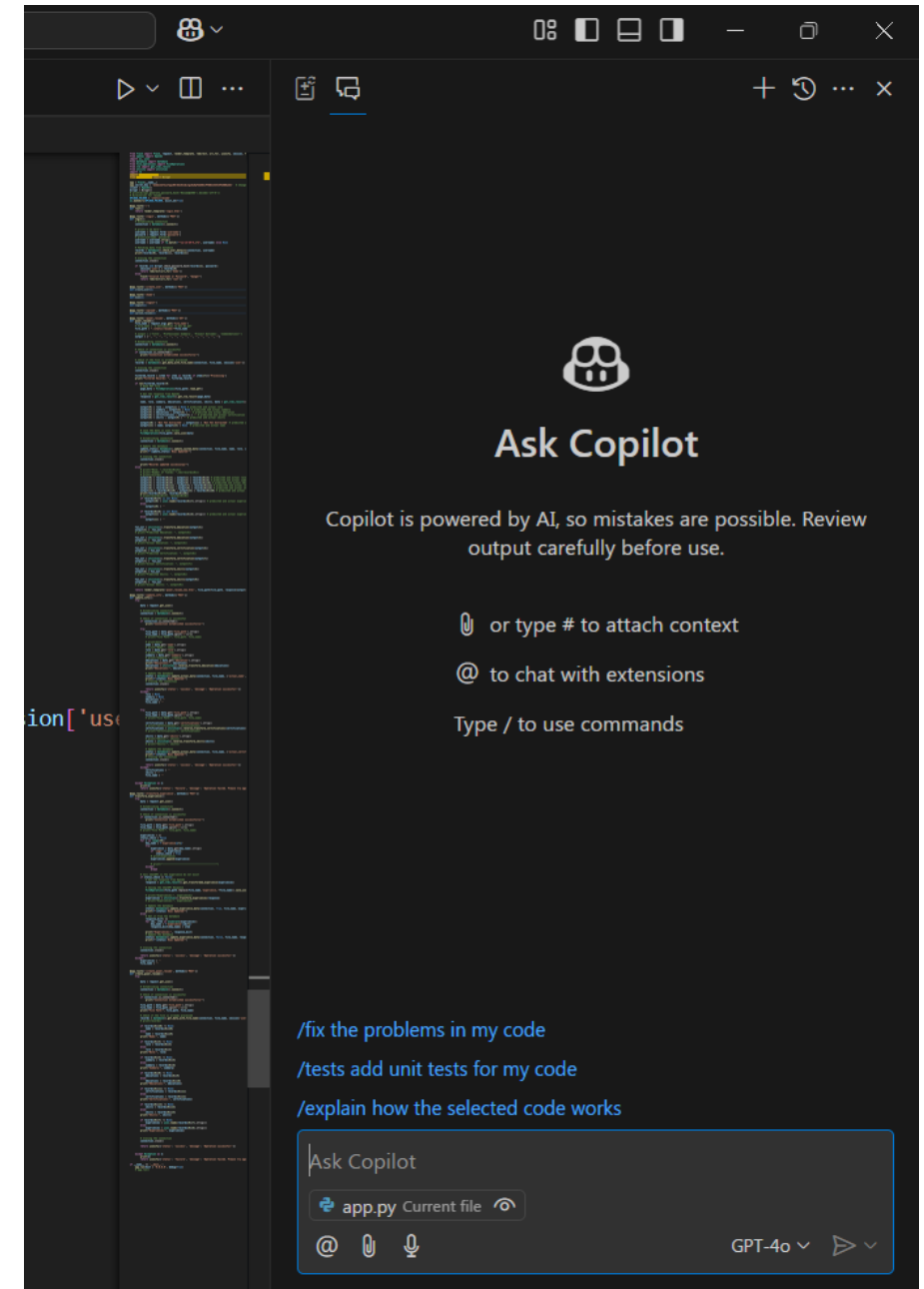[Insert Resume Text Here]

Prompt Examples

Utilizing Tools [Python , Data Analysis, Figure, etc.]

India vs Australia - Cumulative Runs Over Time

Prompt Examples

Coding Together [VS Code + Copilot]

Prompts

- [Prompt Engineering](#)

- [Story Generation](#)

- [Role Play](#)

- [RAG with Doc](#)

- [Python, Plotting and Analysis](#)

- [Kaun Banega Karorpati](#)

Tools

❑[Meta AI](#) – for Image and animation creation

❑[ElevenLabs](#) – for Text to Speech, Voice improvements, etc.

❑[Play](#) - Voice Cloning, agents

❑[Suno](#) – Song composition and music creation

❑[Jotform](#) – Chatbot creation, agent creation, etc.

❑[Ollama](#) – hosting your LLM models locally

❑[Openwebui](#) - Interface for LLMs

❑[Tiktokenizer](#)- to check token size and other LLM insights

Thanks for your time