

Summer Training TR-103 Prompt Engineering

Day 2 Report

The second day of the training focused on introducing the world of “Generative AI” and its significance. Various models and their applications were explored, along with practical tasks designed to help participants learn how to craft prompts that leverage generative capabilities with clarity, specificity, and effectiveness.

Introduction to Generative AI

Generative AI (Gen AI) is a type of AI that can create new content such as text, images, audio, videos, and code by learning from existing data. Unlike earlier AI focused on prediction, Gen AI marks a shift toward generation, driven by Machine Learning Models like Large Language Models (LLMs) and diffusion models.

- The ultimate goal of prompt engineering with Gen AI is to create effective inputs that result in better AI-generated content, enabling seamless integration into tools and workflows.

- **Significance of Generative AI in Prompt Engineering:**

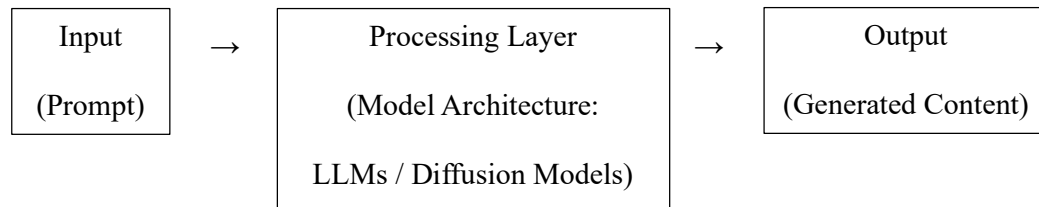
- Enables creation of diverse content types (text, images, etc.).
- Shifts focus from prediction to generation.
- Utilizes advanced models like LLMs and diffusion models.
- Essential for innovative AI applications.

- **Real-World Use Cases:**

1. **Education:** Generate learning materials with Claude 3.
2. **Research:** Support projects with Llama 3.
3. **Coding:** Enhance productivity with Copilot and Codex.
4. **Creative:** Produce images with DALL·E.
5. **Interactive:** Integrate into games with real-time outputs.

- **Architecture:**

Generative AI systems operate on a structured pipeline represented as a flow-based architecture:



This workflow highlights how the prompt serves as the primary input signal, the model performs computational reasoning and pattern generation, and the system ultimately produces text, images, code, or other forms of AI-generated output.

- **Shift from Prediction to Generation:**

Traditional AI systems were primarily designed for prediction-based tasks such as classification or forecasting. Generative AI marks a major shift by focusing on generation—producing new text, images, audio, or code rather than merely predicting outcomes.

- **Different Models:**

- i. **Generative AI Models:**

Generative AI systems are built to create new content by learning from large datasets.

Unlike predictive models, they synthesize original outputs based on patterns and context.

- ii. **Diffusion Models (for Images):**

Image-generation tools like DALL·E and Stable Diffusion use diffusion models, which gradually transform random noise into coherent images through multiple refinement steps.

Generative AI Models

Generative AI models are specialized systems designed to create new content across modalities such as text, images, audio, video, and code. They rely on large datasets and advanced

architectures—primarily transformer-based LLMs and diffusion models—to generate coherent, high-quality outputs. Gen AI is powered by Machine Learning architectures, with LLMs playing a major role in text-based generation.

- **Popular Models and Applications:**

Generative AI includes a wide range of models serving different purposes.

- **ChatGPT:** Based on the Generative Pre-trained Transformer (GPT) architecture, ChatGPT is an advanced language model designed for text generation, reasoning, summarization, and conversational tasks.
- **DALL·E:** A diffusion-based generative model that generates images from textual descriptions, enabling high-quality visual content generation.
- **Copilot:** An AI-powered coding assistant that generates code suggestions, accelerates development, and supports a wide range of programming languages.
- **Codex:** A specialized model used for code generation, debugging assistance, and logic refinement.
- **Future Trends:** The industry is moving toward multimodal models by OpenAI and Google, capable of processing text, images, audio, and video within a unified architecture.

- **Which model of ChatGPT is used?**

ChatGPT currently uses the GPT-5 model, with the free tier offering access but with certain usage limitations such as reduced message limits and restricted capacity during high-traffic periods.

AI Models

- **Multimodal Models (Futuristic Models – Text & Images):**

Advanced models capable of processing and generating content across multiple modalities such as text, images, audio, and video. Current multimodal systems by OpenAI and Google represent the next generation of AI interaction.

- **LLM-Based Models (Large Language Models):**

LLMs form the backbone of modern AI systems, with nearly 90% of AI tools relying on LLM-based architectures for text generation, reasoning, summarization, and conversational tasks.

- **GPT-3 / GPT-4 (OpenAI):** Versatile models used widely for text generation and natural language tasks.
 - **GPT-4.5 (OpenAI):** Primarily used for research and available in tiers such as Plus, Pro, Premium, and Team.
 - **Gemini 1.5 (Google):** Provides highly advanced language processing and multimodal capabilities.
 - **Claude 3 (Anthropic):** Effective for educational support, structured writing, and safe reasoning.
 - **Llama 3 (Meta):** Optimized for research-based projects and open-source experimentation.
 - **Whisper & Google Speech:** Speech-recognition models for converting audio to text with high accuracy.
 - **Codex:** Specialized model for coding assistance, debugging, and refining logic.
- **APIs:** APIs enable developers to integrate AI functionalities into applications and workflows.
 - OpenAI & ChatGPT → OpenAI API
 - Gemini Models → Gemini API

- **Different tools that work on LLM Models:**

- **ChatGPT:** A conversational LLM used for text generation, reasoning, summarization, and interactive tasks.
- **Gemini:** Google's multimodal LLM designed for advanced language, reasoning, and media-based tasks.
- **Claude:** An Anthropic model widely used in education, writing assistance, and safe reasoning workflows.
- **Llama:** Meta's open-source LLM, commonly used for research, experimentation, and custom model development.
- **Codex (OpenAI):** A code-focused model used for generating, completing, and debugging programming logic.
- **Copilot:** An AI coding assistant powered by LLMs, offering real-time code suggestions across languages.
- **DALL·E (OpenAI):** A diffusion-based model for generating images from text prompts.
- **Whisper (OpenAI):** A speech-recognition model that converts voice/audio into text; requires installation via the OpenAI library and API configuration.

Task – Real-Time Implementation

The session included discussions on real-time implementation of these models with good prompts.

Hands-On Examples

- **Claude 3 (for Education purpose):**

Prompt: “You are a programmer. Teach me the basics of Python for beginners with step-by-step explanations, proper comments, and correct indentation.”

- **DALL·E AI:**

Prompt: “You are an artist, create a beautiful and realistic image with the vibrant colours of a girl wearing a pink frock, blowing the petals of the rose flower looking at the sky, sitting near the seaside and smiling. The overall weather is Rainy.”

- **Copilot:**

Prompt: “You are an expert cpp programmer, kindly provide me the code for the generation of scientific calculator using cpp programming. Also include proper indentation & proper comments and explain me the entire code step by step.”

- **Codex:**

Prompt: “You are an advanced programmer, provide me the code for tic tac toe game in python with proper user interface, firstly the user will select whether they want cross or zero, then number of grids 3, 6 or 9, then level of difficulty easy, medium and difficult. After this the game will begin and if the user will win then points will be added to that.”

- **Llama 3 (Research):**

Used for research-oriented tasks and information retrieval, developed by Meta AI.

- **Interactive Element (Activity):** A Gen AI-based game where users earned points upon successful task completion.

Conclusion

The second day of training provided a comprehensive introduction to Generative AI, highlighting its shift from traditional prediction-based systems to powerful content-generation capabilities. Participants explored the architecture of Gen AI, understood the role of LLMs, diffusion models, and emerging multimodal systems, and examined widely used tools such as ChatGPT, Gemini, Claude, Llama, Codex, Copilot, DALL·E, and Whisper. Real-world use cases across education, research, coding, creativity, and interactive applications further demonstrated the versatility of these models. Hands-on tasks, including practical prompts and real-time implementation

exercises, strengthened participants' understanding of how effective inputs influence AI-generated outputs. Overall, the session established a strong foundation for working with Generative AI, preparing participants to apply these models confidently across diverse domains.