

ADTA 5900/5770.501: Applied Natural Language Processing

Thuan L Nguyen, PhD

Assignment 2

1. Overview: Large Language Models

In modern artificial intelligence, there is a fascinating breed of technology: large language models, commonly known as LLMs, a machine that not only grasps the intricacies of human language but also wields it like a seasoned writer, effortlessly crafting text, translating between tongues, and even summarizing lengthy passages. LLMs are magically created from a unique blend of massive datasets and advanced learning techniques.

One key secret to their prowess lies in "unsupervised learning," where LLMs feast on voluminous amounts of text, books, articles, and even informal chats to learn the nuances of human expression. Through this data-driven alchemy, they make their own understanding of language, able to generate contextually aware and surprisingly coherent prose.

The benefits of LLMs are as diverse as their abilities. They promise to boost our efficiency by automating tedious tasks like content creation and translation, freeing us to pursue more creative endeavors. Chatbots powered by LLMs can offer natural-feeling interactions, enhancing our user experience with technology. These models might even unlock new avenues for artistic expression, composing original music or crafting stories in the future.

Yet, with such power comes responsibility. Biases lurking within the data they consume can be unwittingly replicated by LLMs, necessitating careful vigilance against unfair prejudices. Factual errors can crop up in their creations, reminding us to approach their outputs with a discerning eye. The ethical implications of this powerful technology demand thoughtful consideration, ensuring its responsible use and minimizing potential negative impacts.

In summary, LLMs offer a glimpse into a future where language transcends its traditional boundaries, where machines and humans dance together in a captivating duet of understanding and expression. With responsible development and mindful application, They have the potential to reshape the landscape of technology, communication, and perhaps even creativity itself. As we peer into this exciting future, it is clear that the story of large language models is just beginning, brimming with possibilities yet to be explored.

2. Overview: Prompt Engineering

LLMs are marvels of machine learning thanks to being trained on mountains of text to mimic human-like language. However, they are prone to drifting off course, generating outputs that miss the mark without precise instructions. That is why we need prompt engineering to take the wheel, crafting clear and specific "whisperings" that guide LLMs toward the desired destination.

For example, a captain at the helm of a powerful ship is sailing in the vast ocean of language. The trusty vessel is a large language model (LLM) capable of producing stunning prose and insightful answers. Like any ship, an LLM needs directions guided by the art of prompt engineering so that it can get to the expected destinations successfully and not get lost.

Also, let's think of using an LLM like writing a musical score. A musician would not expect a symphony orchestra to produce harmonious music without meticulously guiding each instrument. Similarly, prompt engineering crafts the "score" for the LLM, influencing its every "note" to form a coherent and pleasing output.

Effective prompts go beyond simple keywords. They need narratives that set the scene, introduce characters, and hint at the desired story direction. They also require questions that frame the inquiry, provide context and guiding the LLM's reasoning. Furthermore, they even need examples and constraints to shape the creative style and ensure the generated text aligns with expectations.

Prompt engineering often requires iterations. The user gets the LLM's initial response, analyzes its strengths and weaknesses, and maybe needs to refine the prompt, like sharpening a pencil. The tasks may require adjusting the tone, introducing new information, or tweaking the question to elicit a more precise answer.

Prompt engineering requires a delicate interplay between human intention and machine capability, which can unlock the true potential of LLMs. It enables us to tackle complex tasks like language translation, text summarization, and even creative writing with an unprecedented level of finesse.

The possibilities are as boundless as the human imagination. With the artistry of prompt engineering, the user can transform LLMs from powerful but directionless engines into tools of remarkable versatility and creativity, ready to chart new courses in the vast ocean of language and push the boundaries of what is possible.

3. PART I: LangChain: Research and an Overview (20 Points)

TO-DO

- **Access the LangChain website** at the link: <https://www.langchain.com/>
- **Read more web articles** about the LangChain platform.
- **Write documentation** that provides an overview of the LangChain platform focusing on the following topics:
 - What is LangChain?
 - How can the LangChain platform (software libraries, services, ...) be used to perform generative AI tasks and create generative AI applications?
 - What LangChain libraries or services are the most well-known and widely used due to their popularity in AI development? Provide some facts to support your selection.

SUBMISSION REQUIREMENT PART I:

--> Submit the documentation

4. PART II: Hugging Face: Research and an Overview (20 Points)

TO-DO

- **Access the Hugging Face website** at the link: <https://huggingface.co/>
- **Read more web articles** about the Hugging Face platform.
- **Write documentation** that provides an overview of the Hugging Face platform focusing on the following topics:
 - What is Hugging Face?
 - How can the Hugging Face platform (software libraries, services, ...) be used in AI research and developing generative AI applications?
 - What Hugging Face libraries or services are the most well-known and widely used due to their popularity in AI development? Provide some facts to support your selection.

SUBMISSION REQUIREMENT PART II:

--> Submit the documentation

5. PART III: Assigned Prompts and Responses from an LLM (60 Points)

IMPORTANT NOTES:

--> The student **must use** the **template** posted on Canvas to submit his/her work on **HW 2: PART III**.

--> The template file name: **ADTA_5770_prompts_responses_analysis_template_HW_2_PART_III.docx**

--> The student must **rename** the file by **replacing** the text of "ADTA_5760" with the student's name and remove "template."

- **For example:** John Smith_prompts_responses_analysis_HW_2_PART_III.docx

IMPORTANT NOTES:

--) *Prompts must be closely relevant to the student's selected domain expertise field.*

--) The LLM must be **Google Gemini 2.0 Flash Thinking Experimental**.

- *For the consistency and accuracy of the prompt response evaluation done in HW 3, the student **must use one LLM**, Google Gemini 2.0 Flash Thinking Experimental, for all the prompts.*

5.1 Prompt and Collect Responses

TO-DO

- Use the LLM: **Google 2.0 Flash Thinking Experimental**
- Design and create **10 prompts**: Each prompt asks the LLM about some **topics relevant** to the student's selected **domain expertise field**.
- Use each created prompt to prompt the LLM and get a response.
- Download and rename the *Word document template properly*.
- Document each prompt and its response using the template.

SUBMISSION REQUIREMENT PART III:

--) Submit the required documents

6. HOWTO Submit

The student is required to submit all the sections, i.e., submission requirements, in two Microsoft Word documents that are sent to the instructor (Thuan.Nguyen@unt.edu) as attachments to a UNT email.

--) **1: An MS Word document for PART I and II**

--) **2: An MS Word document for PART III** (the renamed template)

The subject of the email must be:

- **“ADTA 5770: Assignment 2 – Submission.”**

Due date & time: 11:00 PM – Wednesday 02/19/2025