ADTA 5770.501: Generative AI with Large Language Models

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Midterm Assessment: PART III

1. Overview

The midterm covers all the topics that have been discussed in the first half of the course. The materials in any format, including in-class discussion, should be considered and used for the midterm. Additionally, the student can use any other source of information that they can gather, providing it is relevant and supports the student's answers.

The student must create an MS Word document named "**ADTA5770_midterm_PART_III.docx**" for all their work on the **MIDTERM: PART III**, except for the Python coding.

IMPORTANT NOTES:
--) The student should present his/her work for each section using text and images.
--) The sources can be from class lectures, assignments, or other sources
--) One picture is worth 1000 words. Adding one or more images along with the text would be much more convincing. However, an image with text explaining what it is and what it is for is considered complete.
--) Images can include the screenshots the student has taken while working on the classwork.

IMPORTANT NOTES:
--) When discussing a topic or answering a question, the student is expected to provide adequate explanation and supporting details to his/her presentation.

IMPORTANT NOTES:
*--) If MS Docx is the document format required for submission, the student must submit the contents as MS Docx files, **not** submit PDF documents.*

IMPORTANT NOTES:
*--) If Jupyter Notebook documents are required in a Submission Requirement, the student must submit the Jupyter Notebook documents, i.e., ***.ipynb documents**, **not** python programs, i.e., **not** *.py programs.*

IMPORTANT NOTES:
*--) For the Python code, the student must write the **code of each step** in **one cell** of the Jupyter Notebook document, as shown in the lectures. Then, the student is required to **run the code of each cell** to **show the results of each step** in each submitted Jupyter Notebook document.*

2. PART I: Generative AI: LLMs: Prompt Engineering: Prompts (30 Points)

Please refer to the file: MIDTERM_ADTA_5770_501_assignment_2025_SPRING.docx

3. PART II: Prompt Engineering: Evaluate Prompt Responses (40 Points)

Please refer to the file: MIDTERM_ADTA_5770_501_assignment_2025_SPRING.docx

4. PART III: Discuss Topics on the Transformer Neural Network (30 Points)

IMPORTANT NOTES:
--) The student can answer the questions using the lectures, notes, and in-class discussion contents.
--) The student can use the materials published on the Internet to answer the following questions.
*--) The student **cannot use** any materials produced by **any Generative AI chatbots** like ChatGPT, Claude, or Gemini in his/her submitted work.*

IMPORTANT NOTES:
--) When writing an essay, no matter how short it is, the student must include an introduction, an essay body, and a conclusion.

4.1 Question 1: The Transformer – An Overview (5 Points)

Write an essay:

- To present an overview of the Transformer neural network.
- The overview should include some history of its advent, general information about its AI-related technology and its applications

4.2 Question 2: The Transformer – The Neural Network Architecture (10 Points)

Write an essay:

- To present an overview of the architecture of the Transformer neural network.
- To describe in detail each operational block of the architecture, including how each block works
- To provide a complete, simple example – end to end: from inputs to outputs – to demonstrate the overall operation process of the Transformer, including the role of each block of the architecture.

4.3 Question 3: The Transformer – A Revolutionary Achievement in AI NLP (15 Points)

Write an essay:

- To present the revolutionary features of the Transformer's architecture that made it a disruptive technology leap in the NLP field.
- To discuss in detail how Transformer-based LLMs like OpenAI's GPT, Anthropic's Claude, or Alphabet/Google's Gemini can have significant impacts on human life **with respect to** the student's **selected domain expertise field**.

5. HOWTO Submit (PART III: In-Person, In-Class)

Due date & time: 7:50 PM – Wednesday 03/03/2025

The student is required to submit the MIDTERM: PART III in a Microsoft Word document as an attachment to a UNT email sent to the instructor (Thuan.Nguyen@unt.edu).

The email subject must be: "ADTA 5770: Midterm PART III – Submission."