Final Project: Designing an AI Product based on a Language Model (LLM)

1 Introduction

In this final project, you will be tasked with designing an AI product that utilizes a Language Model (LLM) to solve a real-world problem. The project will have a backend (call to LLM model API) and a front-end such as Gradio.io, Streamlit.io or Javascript in order to make it accessible and interactive. This project can be done in a group of up to three (3) people but you can also do it in a group of 2 or a

2 Requirements and Tasks

Your AI product should meet the following requirements:

1. **Problem Identification:** Clearly define the real-world problem that your AI product aims to solve. Explain why this problem is important and how AI can be beneficial in addressing it. Some possible problems are listed in the next section but please feel free to research about possible ideas.

2. **Language Model Selection:** Choose an appropriate LLM that aligns with the problem you identified. Justify your choice and discuss the characteristics of the selected model. You can choose any of the LLM models discussed in the course such as the family with ChatGPT or the many models available from Hugging Face. Remember that ChatGPT models are quite stable but they do charge per token. You can get a $5.00 credit with OpenAI when you sign up with a new account (you must have a new email AND a new phone number to get the credit).

3. **AI Product Design:** Design an AI product that utilizes the chosen LLM to provide a solution to the identified problem. This may involve building a chatbot, question-answering system, language translation tool, text generator, or any other creative AI application. Here you want to have some block diagrams showing the back-end (API call) and front-end.

4. **Front-end Application:** You must implement your AI product as an interactive front-end application. The application should allow users to input data or interact with the LLM and visualize the results. You can use third party visualizations apps such as Gradio.io or Streamlit.io to create an appealing and user-friendly interface or if you are up to it, make a custom front-end in Javascript. At this stage, you should have a mock-up of the front-end UI, it doesn't have to be fancy but this is always needed.

5. **Technical Explanation:** Provide a technical explanation of how your AI product works. Describe the data pre-processing steps (if any), the LLM's architecture, and any fine-tuning or adaptation you performed to make it suitable for the problem.

6. **Evaluation Metrics:** Define appropriate metrics to evaluate the performance of your AI product. We will go over some evaluation metrics in class (Week 12).

7. **Limitations and Ethical Considerations:** Identify any limitations of your AI product and discuss the ethical considerations associated with its use. Address potential biases and risks related to the LLM's behavior. This is an important topic and should be analyzed for any AI product.

8. **Documentation and Code:** Provide clear and organized documentation for your project, including instructions on how to run the Gradio.io application. Your code should be held in a Github repository implementing your AI product. Feel free to use Github Desktop and version control for implementing features but you do not have to do this, it is just recommmended.

9. **Presentation:** Prepare a concise and engaging presentation to showcase your AI product and demonstrate its functionality. Assume you are pitching the product to a possible investor.

3 Example AI Products

Here are some examples of AI products that you can consider for this project. These are just examples, feel free to come up with your own ideas.

1. **Medical Assistant:** Develop an AI-powered chatbot that can assist medical professionals in diagnosing diseases or suggesting treatment options based on patient symptoms and medical history.

2. **Language Translation Tool:** Create a language translation tool that can translate text between multiple languages, with the ability to handle complex sentence structures and maintain context.

3. **Automated Code Generator:** Design an AI application that takes a natural language description of a software requirement and generates the corresponding code snippet in a programming language.

4. **AI Storyteller:** Build an AI model that can generate creative and coherent short stories or poems based on user prompts.

5. **Customer Support Chatbot:** Develop an AI chatbot that can handle customer support queries and provide appropriate responses, reducing the load on human support agents. Note that these kinds of bots exist but you may think of a specific domain where the chatbot can be fine-tuned.

Remember that LLM models work best if done with some fine-tuning or even specific training (on top of the generic model). Hugging Face has models specific to a domain but these can futher be fine-tuned as well.

4 Submission

Submit your final project as a zip file containing the following:

1. A well-organized report detailing your AI product design, technical explanation, evaluation metrics, limitations, and ethical considerations.

2. A link to the GitHub repository containing your project code and documentation.

3. Your Gradio.io or Streamlit.io application's link, allowing the course instructor to interact with your AI product. Remember that you can host your apps for free on Gradio or Streamlit.

4. A video presentation of your product. Everyone in a group must present in your video presentation and clearly be talking about somethign substansive about the project. For example, you cannot have a group member just be "prseent" in the video (not saying anything) or a group member just introducing the topic and group members.

5 Group Criteria

- You do not need to work in a group if you do not want to.

- Be careful who you choose to be in your group. Often with groups, there is conflict when some group members are not contributing. The best remedy for this situation is not to be in a group with someone that you have not worked with or do not know well.

- If you do want to work in a group, everyone in the group must be in agreement in you joining the group, you cannot just join groups without permission.

- Deadline to join groups is posted on course shell, past this deadline groups cannot be formed. This is done to avoid last minute group changes.

- All individuals in the group must contribute to the project especially in the final video presentation.
- It's considered an academic misconduct if members in a group agree to have one or more group member not contribute to the project.

6 Grading

Your final project will be graded based on the following criteria:

- Problem Identification and Importance: 10%
- Language Model Selection and Justification: 10%
- AI Product Design and Functionality: 20%
- Application and User Interface: 15%
- Technical Explanation and Code Quality: 10%
- Evaluation Metrics and Performance: 5%
- Ethical Considerations and Limitations: 5%
- Final video presentation: 25%

7 Hints

- Adding your code to Github and makeing push, pull requests is easier than you think. It's a good idea to do in this project especially if working in a team
- Don't try to make a big product, start simple and then add more features if you have time