Samvad.ai Senior Project Proposal

CIS4914: Senior Design Project

Jordyn Addesso: Front End Developer

Nicholas Famiglietti: Front End Developer

Anthony Long: Back End Developer & Data Scientist

Aiden Zepp: Back End Developer & Data Scientist

Advisor Name: Ashish Aggarwal

Advisor Email: ashishjuit@ufl.edu

September 8, 2024

I. Abstract

This proposal aims to demonstrate the motivation for Samvad.ai, an AI powered tool which offers a document-translation environment for users to discuss, question, and analyze text. It will also include previous research and supporting information about AI translation, and the plan of technologies that will be utilized to build Samvad.ai with set milestones. By integrating advanced language models, Samvad.ai will transform standard translation tools into a more interactive platform. This is vital in making it easier for users to understand and collaborate across language barriers.

II. Table of Contents

III. Introduction and Motivation for the Project

In the academic field, particularly in studies exploring ancient texts, scholars and students face challenges working with documents written in languages that are no longer widely spoken, such as Sanskrit. These challenges include the difficulty of accurately translating these texts and the limited ability to interact with the content in a meaningful way. Traditional translation methods are costly and time consuming, thus preventing easy accessibility to the texts. Likewise, these texts are often difficult to traverse in-depth. A tool that not only translates documents but also allows users to engage with the content through conversation with an advanced language model could fill a significant gap in the educational technology landscape. This project proposes the development of a web application that serves as a unified platform for translating documents from ancient or less commonly spoken languages into English. The application will also enable users to interact with a large language model (LLM) that has full knowledge of the document's content. Users will be able to ask questions, explore specific sections, and gain deeper insights into the translated text in a manner similar to interacting with the LLM on its native platform. This pipeline and its ease of use will enhance learning experiences by providing a dynamic and instructive environment for students and scholars alike.

IV. Literature Survey

In the rapidly growing field of AI, translation algorithms are able to decipher ancient texts. German researchers used AI to translate ancient mesopotamian cuneiform inscriptions on tablets and utilized LLMs to help uncover patterns in these forgotten languages (Brodsky). A goal in Samvad.ai is to be able to query and summarize sections of the inputted document. This will require usage of a large language model as they have demonstrated better performance across languages for translating and sentiment analysis (Elkins). Utilizing the GPT4o API will be beneficial once the document is translated into a digital form. This way, once the document is in a readable form, the tool will be able to analyze it and answer any questions the user may have regarding it. Artificial intelligence has been shown to have real, long term usage cases for

translating due to its speed and scalability (Moneus). Samvad.ai aims to utilize these advantages to allow users to translate and query in a multitude of different languages.

V. Proposed Work

The goal of this project is to develop Samvad.ai, an interactive document-translation application designed to enhance research and analysis of text that is ancient or less commonly known. Not only will Samvad.ai translate documents into English, but also provide users with the ability to engage with the document itself though an LLM. The project targets students and researchers in the academic field, with a primary focus on those studying ancient or less commonly spoken languages. The tool aims to increase efficiency and transparency when conducting research on old documents containing outdated text. By using Samvad.ai, there would no longer be a heavy reliance on translators and would significantly reduce the complexity in studying ancient texts.

To achieve a successful platform, this project will begin by first focusing on research and development aspects. Figuring out which architectural design to implement is key as it will define the overall system structure. The front end will be built using JavaScript, HTML, and CSS, while also implementing React to ensure a user-friendly experience. On the back end, Python's Flask or Django frameworks will be used to create a robust server side application that will integrate with the LLM. Pytorch and Tensorflow will support natural language processing and machine learning models for accurate translation and user engagement. MongoDB will be set up for efficient data storage and management, and Git will be utilized for version control. Lastly, our project group will use Notion for project management ensuring that we complete our sprints on time and efficiently.

Moving into the implementation phase of our project, the focus will shift to developing and integrating the core translation functionality component. As a group we will need to ensure that it provides accurate and relevant translations. Real-time, interactive features will be added to allow users to ask questions, explore specific sections of a document, and conduct further research through an LLM interface. Many tests will need to be run to ensure that our platform is reliable and accurate. As we are pulling translations from

ancient text, reliability and accuracy are the most important factors that will determine user satisfaction. Finally, as we near the end of the implementation phase, we will continuously look for improvements based on the test results we get back to ensure that our platform performs as intended.

VI. PROJECT PLAN

- ❖ **September 1st to September 7th**: Initial setup of project details.
    - ➢ Establish each member's role(s).
    - ➢ Set up the GitHub repository.
    - ➢ Finalize the tech-stack to be used.
    - ➢ Accumulate research on translation services for ancient or uncommon languages and artificial intelligence models (e.g., GPT4o).
- ❖ **September 8th to September 15th:** Determining foundational details.
    - ➢ Create mock layouts for the user interface, and determine core features of the user experience design.
    - ➢ Formulate and prototype database schemas and relationships.
    - ➢ Begin implementation of the chosen character recognition tool (e.g., Google OCR).
- ❖ **September 15th to October 5th:** Milestone 1.
    - ➢ **Front End:**
        - ■ Finalize a layout and implementation for users to upload documents.
        - ■ Provide an interface for users to interact with or view the translated text.
    - ➢ **Back End:**
        - ■ Provide an API (Application Programming Interface) for the front end to upload documents and request text translations.
        - ■ Offer user authentication and authorization services.
    - ➢ **Natural Language Processing & Machine Learning:**

- Utilize character recognition services and translation services to provide basic document translation functionality.

❖ **October 6th:** Presentation 1; Showcase the project's concept and design.

❖ **October 7th to November 2nd:** Milestone 2.

  ➢ **Front End:**

  - Allow the user to highlight text in the interactive, LLM (Large Language Model; e.g., GPT4o) chat interface and in the documents.

  ➢ **Back End:**

  - Complete API endpoints for querying and storing data with regard to a user's highlighted text.

  ➢ **Natural Language Processing & Machine Learning:**

  - Summarize large documents.

  - Implement the ability to analyze or query specific sections of documents.

❖ **November 3rd:** Presentation 2; Walkthrough the project and test plan.

❖ **November 4th to November 29th:** Milestone 3.

  ➢ **Front End:**

  - Ensure that the web application is responsive, user friendly, and functions as expected.

  ➢ **Back End:**

  - Complete any remaining back-end functionality.

  - Ensure access to the API is secure and unavailable to outsiders.

  ➢ **Natural Language Processing & Machine Learning:**

  - Add more languages where possible.

  - Improve the LLM models' context and ruleset(s).

❖ **November 30th to December 2nd:** End to end testing.

  ➢ Complete bug fixes and optimize performance of the entire application.

➢ Finalize the project documentation.

❖ **December 3rd:** Project submission and final presentation.

❖ **December 4th:** Project showcase.

VII. CONCLUSION

By leveraging the power of computer vision technologies and large language models, Samvad.ai aims to create an interactive and accessible platform for translating, summarizing, and engaging with texts in ancient languages that may be difficult to translate accurately using traditional methods. Utilizing character recognition tools such as Google OCR and integrating GPT4o for language processing enhances the accuracy and interactivity of analysis and translation in Samvad.ai. The continued development and refinement of this project will be crucial in ensuring that both ancient and modern languages are represented in the digital age.

VIII. REFERENCES

[1] Brodsky, S. (2023, February 8). *How AI Translation Is Helping Scientists Understand Ancient Languages*. Lifewire

[2] Elkins, K. (2024). *In search of a translator: using AI to evaluate what's lost in translation*. Frontiers in Computer Science

[3] Moneus, A. M., & Sahari, Y. (2024). Artificial intelligence and human translation: A contrastive study based on legal texts.