The Chandra Project

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Purpose and Goal Statements

- Purpose: to allow students to leverage AI technology as part of their learning process, not to replace it.
- Goal Statements:
  - Develop a multimodal AI assistant that processes diverse inputs and generates context-aware responses.
  - Enhance student interaction with information through flexible, AI-driven responses across academic and personal contexts.
  - Enable accessible, practical learning by leveraging the NVIDIA Jetson AI Kit for real-time, multimodal interactions.

Members and Advisors

- Members:
  - Cat Luong - Computer Science ‘25
  - Phan Anh Duong - Computer Science ‘26
- Advisor:
  - Justin Zhan - Department Head, Department of Computer Science
  - Arnav Komaragiri - Solution Architect, NVIDIA

Abstract

This project combines both hardware and software to develop a multimodal model designed to process diverse inputs, such as images and audio, and generate outputs in various formats, including text, images, or audio responses. Leveraging the NVIDIA Jetson AI Development Kit, our goal is to create a flexible tool that enhances students' abilities to interact with information in both academic and personal settings through advanced AI-driven features. This model functions as a virtual assistant, capable of receiving requests and providing contextually appropriate responses. By enabling innovative applications, this approach empowers users to harness intelligent systems in practical, accessible ways, supporting enhanced learning and interaction with information.

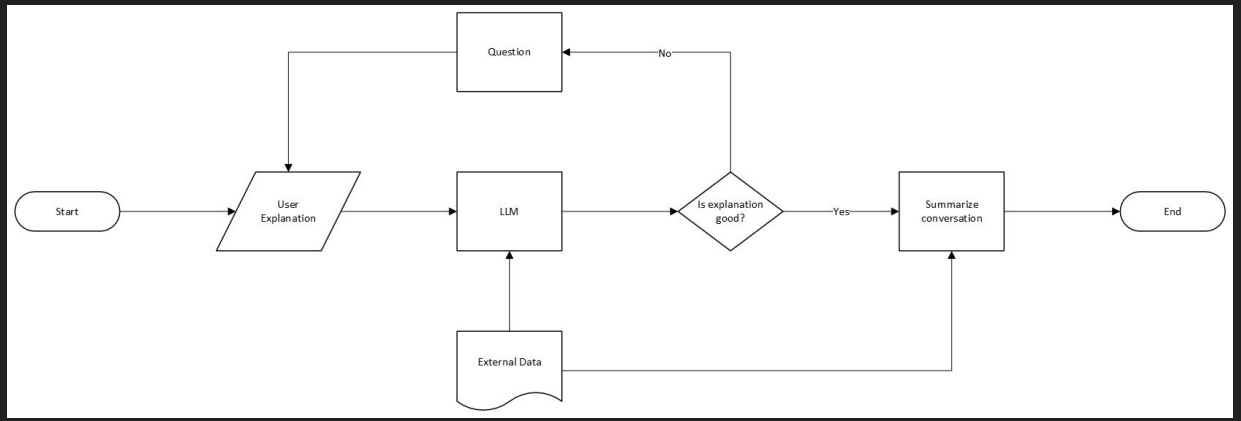
User Stories

- As a computer science undergraduate student, I want to explain complex programming concepts to an LLM persona, so that I can reinforce my understanding and identify knowledge gaps in my coding skills.
- As a high school science teacher, I want to customize the LLM persona and difficulty level, so that I can create engaging learning experiences for students with different learning styles and abilities.
- As a self-taught data analyst, I want the LLM to ask me pointed questions when it doesn't understand, so that I can clarify and refine my explanations of statistical concepts.
- As a technical writer for a software company, I want to receive a summary and interesting artifact from the LLM after our conversation, so that I can use it as a basis for creating user-friendly documentation.
- As a cybersecurity specialist, I want to upload relevant documents to inform the LLM's knowledge base, so that I can ensure accurate and context-specific explanations of network security protocols.

Design Diagrams

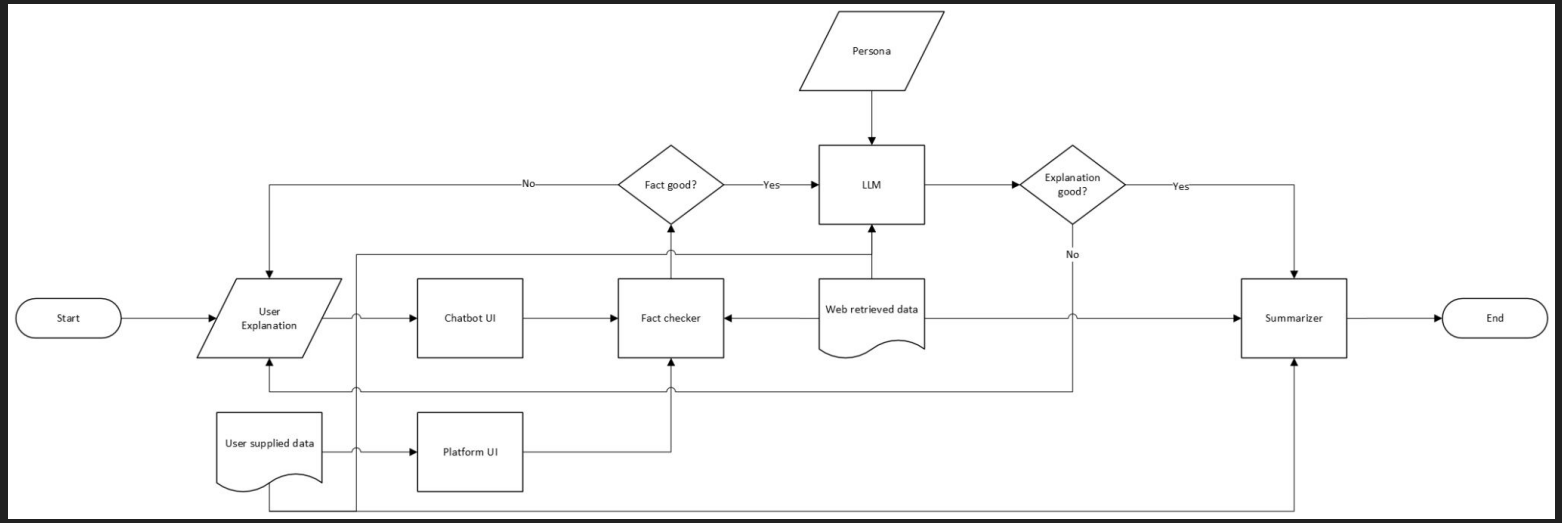
High-level Diagram:

Elaborated Diagram:



Design Diagrams

Detailed Diagram:



Project Constraints

- **Economic Constraint**: Limited funds necessitate reliance on open-source libraries and frameworks. To keep it accessible and free, we will use open-weight models that run locally, reserving larger models for optional API use.
- **Ethical Constraint**: LLMs have unpredictable and potentially unsafe outputs. To ensure user safety, we'll incorporate guardrails, safety filters, and toxicity controls for reliable, responsible engagement.
- **Social Constraint**: This non-profit, community-oriented project aims to enhance accessibility and public understanding of LLMs while fostering improved interpersonal communication through AI-generated suggestions.
- **Diversity and Cultural Constraint**: Recognizing varied communication styles across cultures, we strive to build an LLM that respects cultural differences, delivering unbiased, context-aware suggestions to ensure inclusivity.

Current Progress

- Acquiring Jetson AI hardware for development.
- Conducting research on suitable technology stack options.
- Identifying compatible LLMs for integration with the Jetson Dev Kit.
- Analyzing stakeholder needs to refine project goals.
- Exploring deployment options for optimal product delivery.

Expected Accomplishments

- **Core Model Development**: Built a multimodal model integrating NVIDIA Jetson, capable of processing and generating diverse input/output formats.
- **Virtual Assistant Prototype**: Developed a responsive virtual assistant with safety filters and API support for scaling with larger models.
- **Beta Launch and User Testing**: Deployed a beta version, gathered user feedback, and refined the model based on data.
- **Culturally Sensitive, User-Friendly Design**: Created an accessible, culturally adaptable interface to enhance inclusivity and engagement across diverse audiences.

Division of Work

Cat Luong	**Phan Anh Duong**
Define MVP and research Tech Stack	Design User Experience and Interface
Develop Core LLM Functionality	Implement Backend Infrastructure
Optimize System Performance	Enhance Data Retrieval and Processing
Launch Beta Version and Gather Data	Create Prototype and Conduct Initial Testing
Analyze Feedback and Iterate	Enhance User Experience

Expected Demo

- A physical Portable Virtual Assistant with multimodal functionality, that can input words, images and ideally sound.
- The device should be able to process inputs in real time and produce some kind of output, whether it’d be text on the screen or live audio.
- People can interact with the demo by asking inputting arbitrary data, and the device will be able to answer in a satisfying manner.