

SynthesisTalk Report

Conversation

User: Project.pdf

User: Summarize key points

Assistant: ■ ****Key Points from Project.pdf:****

Let's think step by step.

Summary of Key Points from "Project.pdf"

Overview

- ****Course****: CSAI 422: Advanced Topics in Generative AI
- ****Project Name****: SynthesisTalk - Collaborative Research Assistant
- ****Objective****: Build a sophisticated LLM-powered application for interactive research assistance.
- ****Context****: Combines document analysis, web search capabilities, and customizable outputs.

Learning Objectives

1. Implement conversational agency concepts including tool usage and reasoning techniques.
2. Design and build effective LLM workflows for complex tasks.
3. Create a responsive frontend that effectively communicates with LLM-powered backends.
4. Develop practical experience with modern AI application development.
5. Apply collaborative software development practices in an AI context.

Project Requirements

****Core Features****

1. ****Contextual Research Conversation****:
 - Multi-turn conversations maintaining context about research topics.
 - Document uploads (PDFs, text files) with content extraction and analysis.
 - Web search integration for supplementary user knowledge.
 - Maintaining coherent conversation across multiple information sources.
2. ****Intelligent Synthesis Engine****:
 - Extract key information from documents and web searches.
 - Connect related concepts across different sources.
 - Generate insights based on patterns in collected information.
 - Implement advanced reasoning techniques (Chain of Thought or ReAct).
3. ****Flexible Output Generation****:
 - Generate structured summaries in at least two formats.
 - Create simple visualizations based on research findings.
 - Support exporting findings in standard document formats.
4. ****Tool-Enhanced Experience****:
 - Document analysis tools (extraction, summarization).
 - Web search tools for fact-finding and verification.
 - Note-taking and organization tools.
 - Explanation and clarification tools.

****Technical Requirements****

1. ****Frontend****:

- React-based web application with responsive design.
- Chat interface supporting text and document uploads.
- Components for displaying research insights and visualizations.
- Context management UI showing current research topics and sources.
- Real-time feedback for lengthy operations.

2. **Backend**:

- FastAPI or Flask backend serving LLM integration.
- Tool management system for handling different LLM tool calls.
- Document processing pipeline for extracting and indexing content.
- Conversation history management system.
- Implementation of advanced reasoning techniques (Chain of Thought, ReAct).

3. **LLM Integration**:

- Integrate with an LLM API (Gemini, Groq, NGU LLM).
- Define and implement tools for various research functions.
- Create a workflow that effectively orchestrates multiple tools.
- Implement self-correction mechanism.

Team Structure and Roles

- **Frontend Development and UX Design**
- **Backend API and Tool Integration**
- **LLM Workflows and Reasoning Implementation**

Development Approach

- Encouraged to use Aider (or similar AI-assisted development tools).
- Hands-on experience with building AI systems and using AI tools in the development process.

Deliverables

1. **Working Prototype**: Functional SynthesisTalk application.
2. **Source Code**: Well-organized GitHub repository, regular commits, README, comments.
3. **Technical Report (5-8 pages)**: System architecture, implementation details, tool integration, challenges.
4. **Presentation**: 15-minute team presentation with live demonstration and reflection on development process.

Evaluation Criteria

- Functionality (40%)
- Usability (20%)
- Scalability (15%)
- Efficiency (10%)
- Creativity (15%)

The Answer is:

The SynthesisTalk project requires teams of three students to build an intelligent research assistant using