BandUP

YouTube QA Bot for IELTS Videos

AI-Powered, Transcript-Only Question Answering for Language Learners

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🌍 Problem Statement

IELTS learners and teachers face key challenges:

📽️ Extracting key information from lengthy YouTube IELTS prep videos is time-consuming

🔍 Finding specific information takes too much time

🤖 Most AI chatbots often hallucinate or use external knowledge

➡ Learners need a tool that gives fast, accurate answers based only on the video content.

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Goal and Objectives

⭐ Main Goal

Empower IELTS learners and educators to extract key information and clarify doubts from YouTube videos instantly, using a reliable, transcript-only AI chatbot.

🎯 Project Objectives

- Automate YouTube transcript extraction
- Build a searchable knowledge base from transcripts.
- Guarantee answers are 100% transcript-based.
- Support natural, context-aware conversations.

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Solution Overview

BandUP is an AI chatbot that:

1. Takes a YouTube link to an IELTS video.
2. Automatically extracts or transcribes English subtitles
3. Builds a searchable knowledge base from the transcript.
4. Answers questions strictly using video content-no external knowledge.
5. Enables quick, reliable review for language learners and teachers.

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System Approach

1. **Strict Source Answers for Accuracy:**
   - Answers are always grounded in the video transcript, never from external data.

2. **Reliability & Transparency:**
   - Modular, robust pipeline with clear traceability.

3. **Scalability:**
   - Efficient retrieval for large video libraries.

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Architecture

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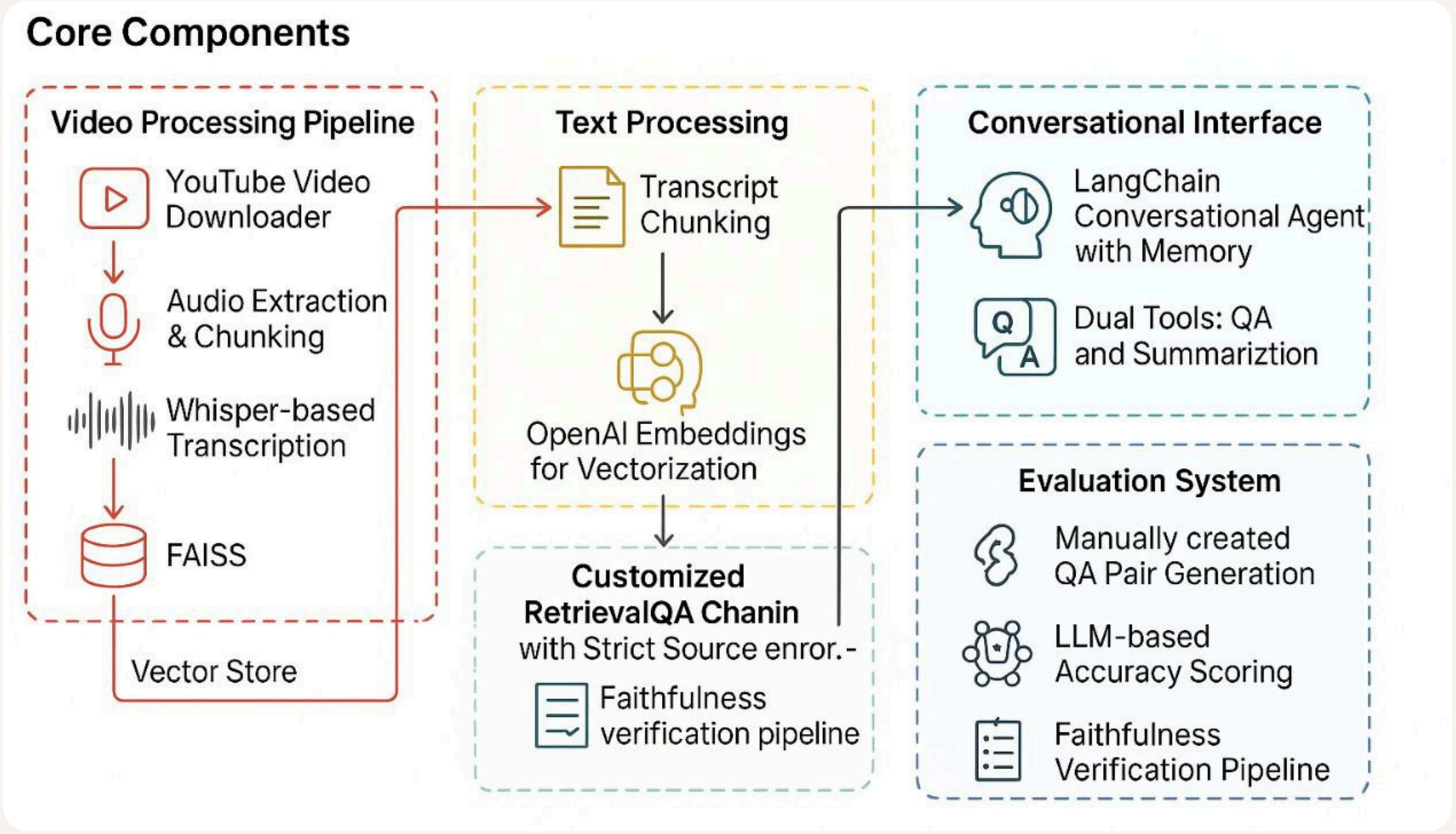
Architecture Overview



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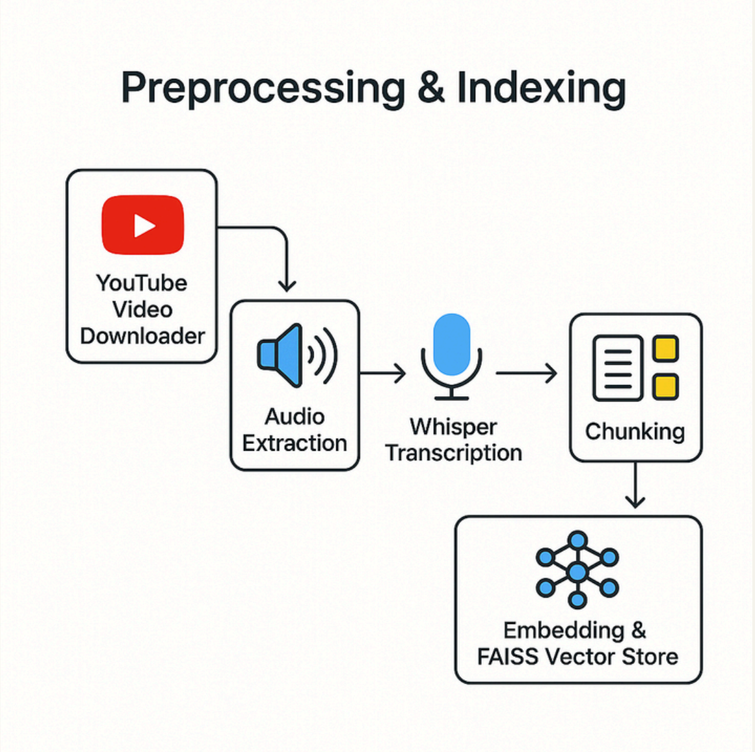
Pipeline Walkthrough

1. Preprocessing & Indexing

- **YouTube Video Downloader:** Fetches the video file.
- **Audio Extraction:** Extracts the audio track from the video.
- **Whisper Transcription:** Converts audio segments into text.
- **Chunking:** Splits the full transcript into manageable chunks
- **Embedding & FAISS Store:** Generates OpenAI embeddings for each chunk and stores them in a FAISS vector index.



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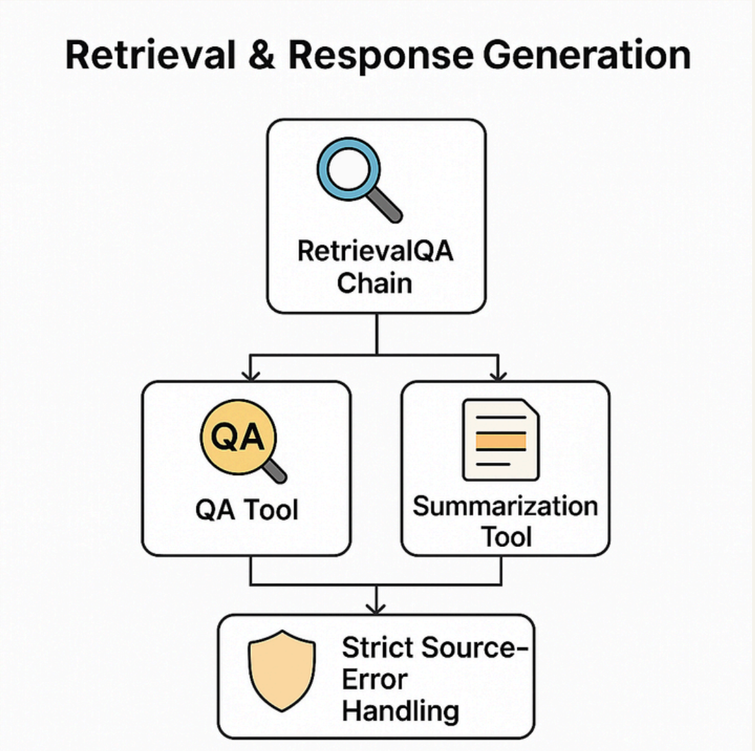
Pipeline Walkthrough

2. Retrieval & Response Generation

- **RetrievalQA Chain:** Searches the FAISS index for the most relevant chunks given a user query.
- **Dual Tools:**
  - **QA Tool:** Produces direct answers based on retrieved text.
  - **Summarization Tool:** Generates concise summaries of selected chunks.
- **Strict Source-Error Handling:** Applies a filter to ensure outputs strictly match source content (avoiding hallucinations).



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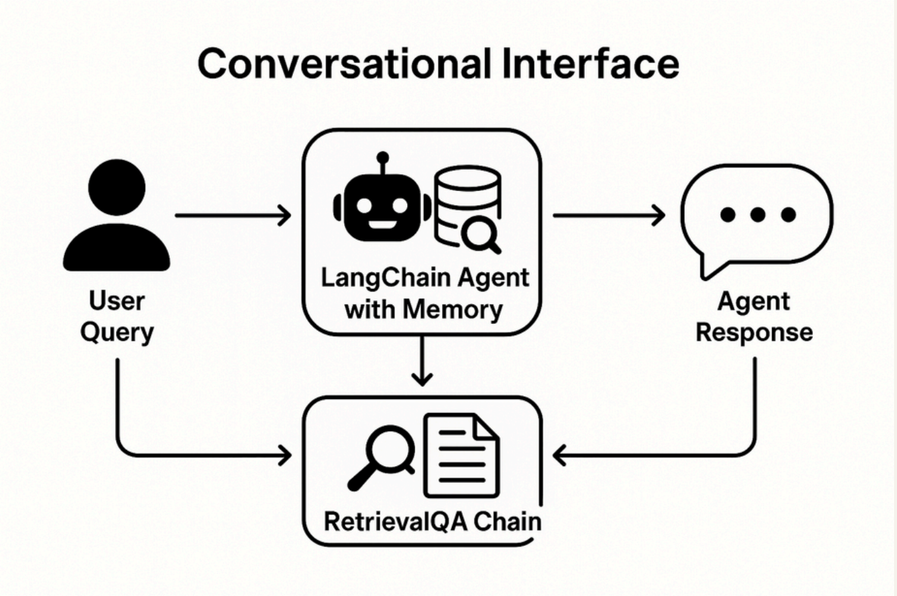
Pipeline Walkthrough

3. Conversational Interface

- **LangChain Agent with Memory:** Maintains dialogue context and handles user interactions.
- **User questions are routed through the RetrievalQA chain and the agent returns answers or summaries within the conversation flow.**



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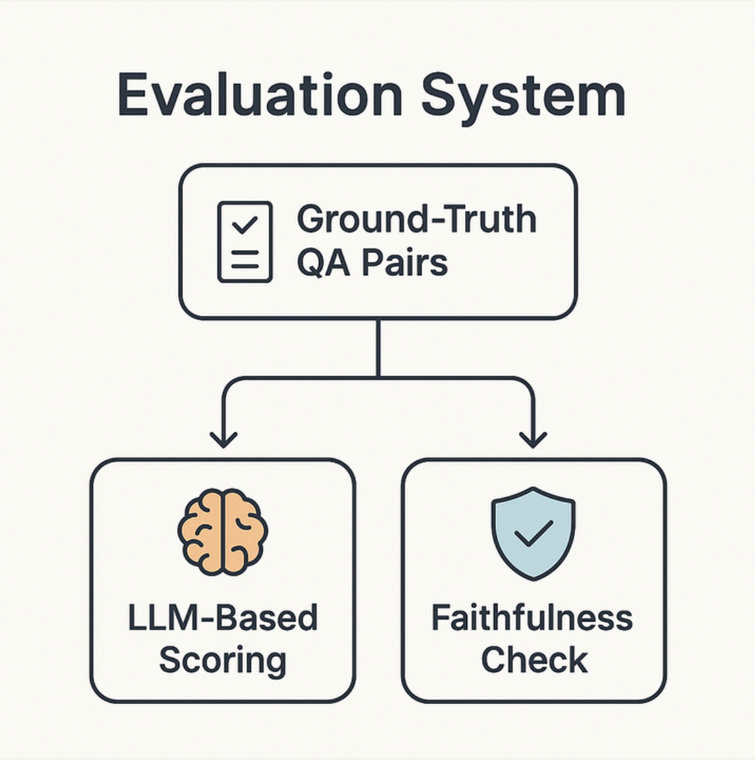
Pipeline Walkthrough

4. Evaluation System

- **Ground-Truth QA Pairs:** Manually created question-answer pairs used as benchmarks.
- **LLM-Based Scoring**: An external LLM evaluates the accuracy of the system's responses.
- **Faithfulness Check:** Compares generated outputs against the source text to verify factual alignment.



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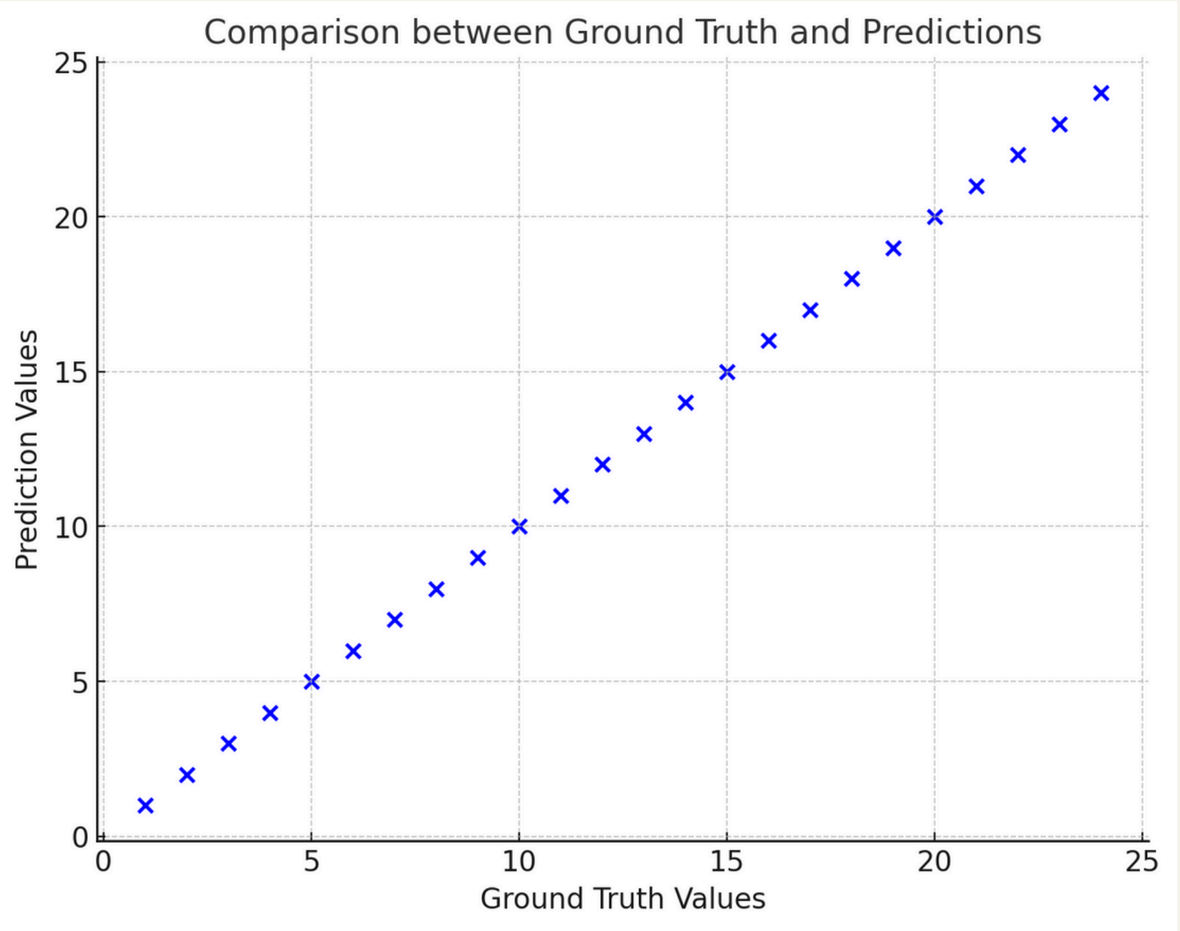
Evaluation Results

LLM-Based Scoring

The scatter points lie almost exactly on the y = x diagonal, showing a near-perfect one-to-one match between predictions and ground truth.



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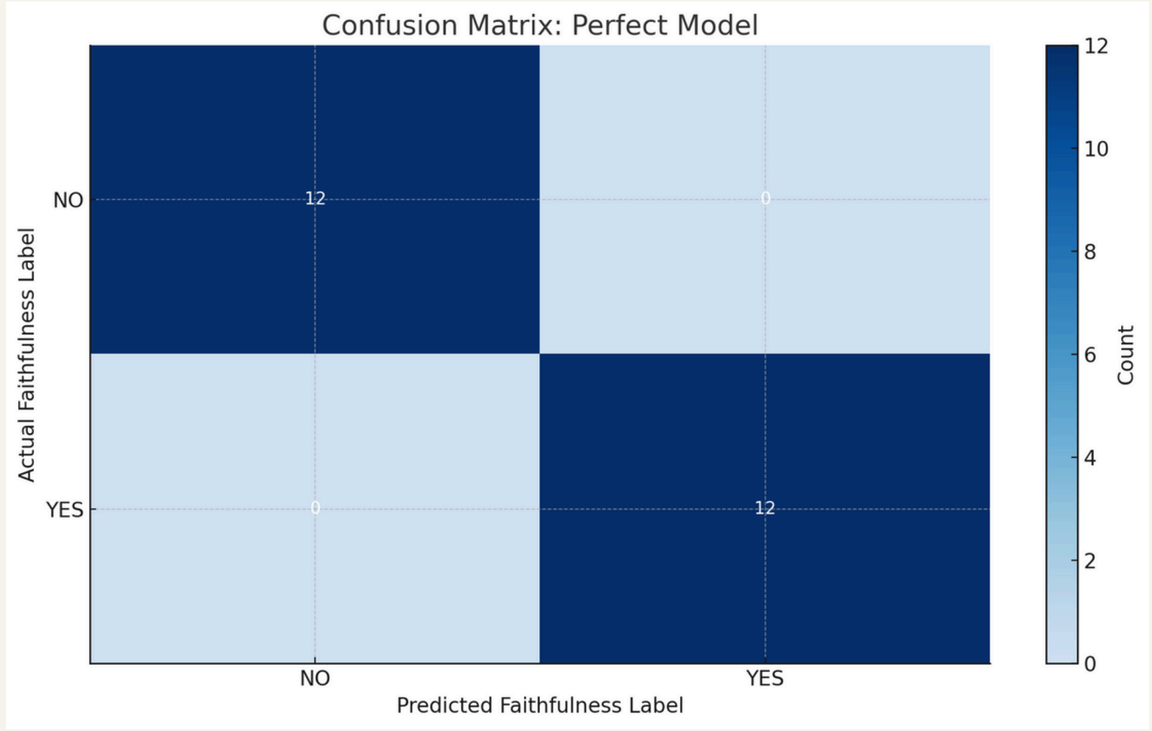
Evaluation Results

Faithfulness Check

This confusion matrix shows a perfect model:

- Actual NO was predicted as NO 12 times.
- Actual YES was predicted as YES 12 times.
- All off-diagonal cells are zero, meaning there were no false positives and no false negatives.

In other words, the model achieved 100% accuracy on these faithfulness labels.



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Challanges

1. Model selection and prompt tuning
2. Improving speed as the system grew
3. Debugging and observability of agent decisions
4. Balancing latency vs. thoroughness

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Future Directions

- **Multi-Language Support:**
  Integrate Whisper models for other languages or add translation.

- **Enhanced UI/UX:**
  Improve usability for learners and teachers.

- **Learning Tools:**
  Add practice questions, flashcards, and topic-based review.

- **Community Features:**
  Playlists, sharing, leaderboards, and gamified learning.!

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Thank you for listening

ANY QUISTIONS?

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DEMO Time!

Let's BandUp !

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