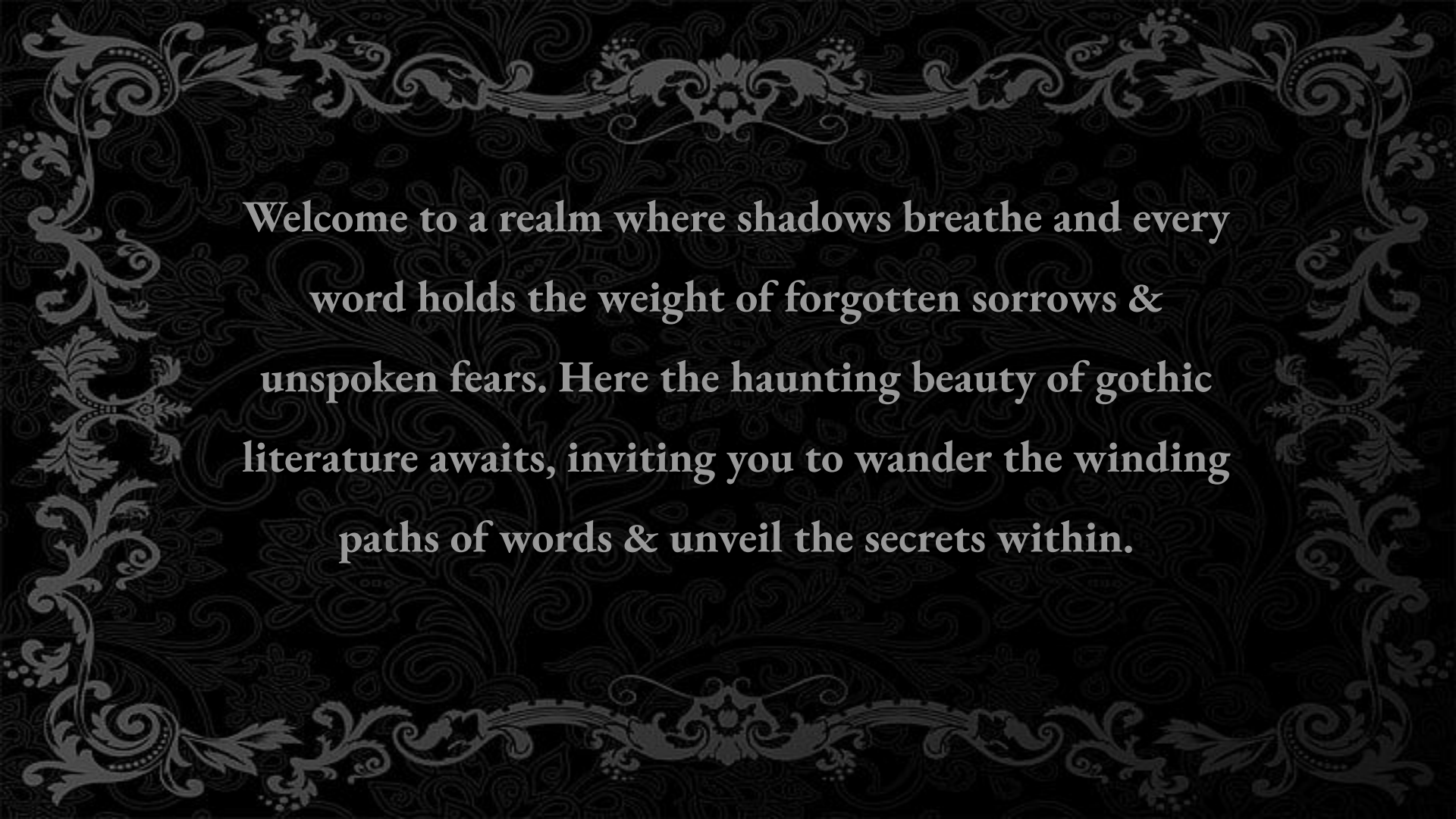


The background of the slide is a dark, textured surface with a repeating floral pattern. A prominent, ornate border in a lighter shade of gray frames the central text. The border features intricate scrollwork, leaves, and floral motifs, creating a classic, decorative frame.

# **Project 4: Building a Multimodal AI Chatbot**

**Saiqa Mehdi**

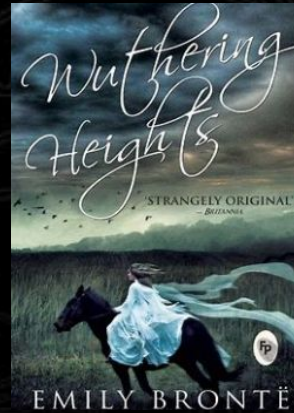


Welcome to a realm where shadows breathe and every  
word holds the weight of forgotten sorrows &  
unspoken fears. Here the haunting beauty of gothic  
literature awaits, inviting you to wander the winding  
paths of words & unveil the secrets within.

# Concept & Overview

A website for students or anyone passionate about gothic literature

- Discussion forum / book reviews
- Literary analysis of books & comparison
- Interaction with Characters





The collage displays five screenshots from the 'Gothic Novels' website, illustrating its design and content:

- Top Left:** The 'Comparing Gothic Novels' page features a large, ornate header with a gothic archway and a full moon. Below the header, there's a 'Thematic Analysis' section with a list of themes and a 'Compare Themes' button.
- Top Right:** The 'Choose Book' interface shows a central area with a book cover and a sidebar titled 'The others' with a list of books. The main area has a large, atmospheric image of a gothic interior.
- Middle Left:** A grid of book covers under the 'THEMES' and 'VIDEOS' sections. The covers are arranged in a grid, with some having a 'GOthic NOVELS' label.
- Middle Right:** The 'Compare Themes in gothic books' interface shows a 'Love Book' and 'Lain' selected. It includes a 'Compare Themes' button and a 'Results' section.
- Bottom Right:** The 'Love, Loss' page features a 'Pain on Pain' section with a list of books and a 'Compare Themes' button.





# Technical Summary

## Architecture

The solution is a multimodal AI chatbot designed to answer questions about *Wuthering Heights* based on YouTube video reviews.

- **Agents:** LangChain's Retrieval-Augmented Generation (RAG) agents are used for retrieving context and generating responses.
- **LLMs: Vector Database (Pinecone)**
- **Gradio Interface:**

## Tools Used

- **LangChain:** Manages the text chunking, retrieval, and response generation processes.
- **Pinecone:** Stores vector embeddings for efficient retrieval.
- **OpenAI (GPT-4):** Provides natural language responses based on retrieved content.
- **Whisper:** Transcribes audio input for the chatbot to process voice-based questions.
- **Gradio:** Used to create the user interface for both text and audio interactions.



Section	Component	Description
User Interaction	User (Top layer)	Two methods of interaction with chatbot: <b>Text Input</b> and <b>Audio Input</b> .
	Text Input	Directly connects to <b>Retrieval Agent</b> .
	Audio Input	Connects to <b>Whisper</b> for transcription, then sends the output to <b>Retrieval Agent</b> .
Text Processing	Retrieval Agent	Retrieves relevant text chunks from <b>Pinecone</b> based on the query.
	Retrieval Tool (retrieve_docs)	Fetches top-matching text chunks from <b>Pinecone</b> .
	Pinecone	Vector database for storing and retrieving relevant embeddings.
Q&A Agent	Conversation Buffer Memory	Stores user questions and generated answers to maintain conversational context.
	Save Conversation Tool	Saves the conversation history to <b>Memory</b> upon user command.
	Summarize Tool (optional)	Summarizes retrieved context if needed to fit within token limits.
	GPT-4	Generates answers based on the context retrieved from Pinecone.
Output Layer	Generated Text Answer	Arrows from <b>Q&amp;A Agent</b> go to <b>Text Output</b> for displaying the answer.
	Text-to-Speech (TTS)	Converts the generated text answer to <b>Audio Output</b> with a haunting effect.
Gradio Interface	Gradio Box	Encloses <b>Text Input</b> , <b>Audio Input</b> , <b>Text Output</b> , and <b>Audio Output</b> to signify the user interface layer for all interactions.

# Dataset

- Used the `yt_dlp` library to download audio directly from YouTube URLs
- FFmpeg issues
- OpenAI's Whisper model to transcribe audio
- Preprocessing



Q&A Agent (42 slides)

## Agents

**Retrieval Agent:** This is used to fetch relevant document chunks based on user questions.

**Q&A Agent:** Initialized with LangChain to answer questions based on retrieved content, and is responsible for generating responses using GPT-4.

# Tools

**Transcribe\_audio:** -Whisper ASR model.

**generate\_haunting\_audio:** Converts text responses into haunting audio using gTTS and pydub.

**retrieve\_docs:** Retrieves relevant text chunks based on the user's question by querying Pinecone.

**save\_conversation:** Saves the conversation history to a file.

**summarize\_context (Optional):** Summarizes long contexts to fit within token limits. This was set up in an earlier version of the code but may not be actively used in this Gradio code.

## Memory Management:

**ConversationBufferMemory:** Used to store the chat history, which allows for follow-up questions by maintaining the context across interactions.

# Giskard Evaluation

- Data and Embedding Setup
- Giskard Dataset and Model Wrapping
- Detector Execution and Errors : 7



# Conclusion

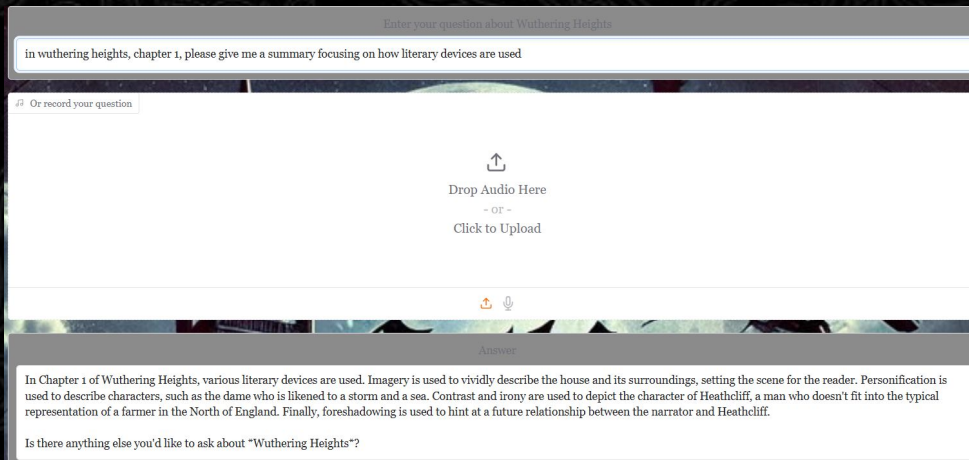
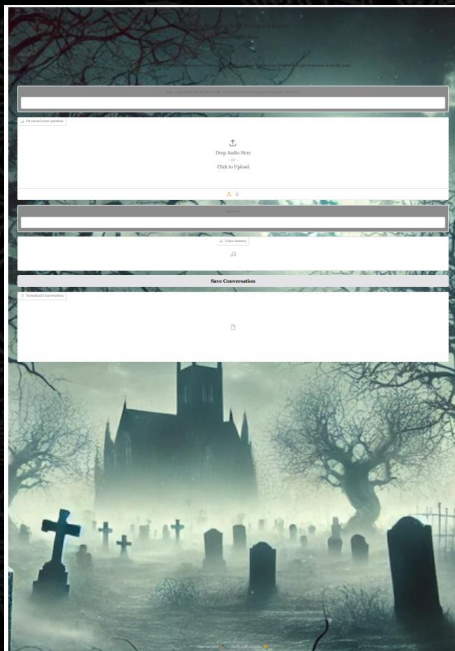
**Enhanced Metadata:** Adding timestamps or reviewer information for more targeted responses.

**Prompt Engineering:** Additional refinements to improve answer specificity and depth

**Fine-Tuning & More Testing**

**Improve conversational interaction**

# Demo: Gradio Interface



# Gradio Interface

Enter your question about Wuthering Heights

in wuthering heights, chapter 1 please explain how the mood and tone change

🎙️ Or record your question



Drop Audio Here

- or -

Click to Upload



Answer

The mood and tone in Chapter 1 of Wuthering Heights transition from gloomy and foreboding, as signaled by the harsh weather and isolated location of the house, to introspective within the living space, apprehensive with the introduction of Mr. Heathcliff, and finally to a moment of relief and surprise as a chaotic situation is suddenly quelled.

Is there anything else you'd like to ask about "Wuthering Heights"?

🎧 Haunting Voice Answer

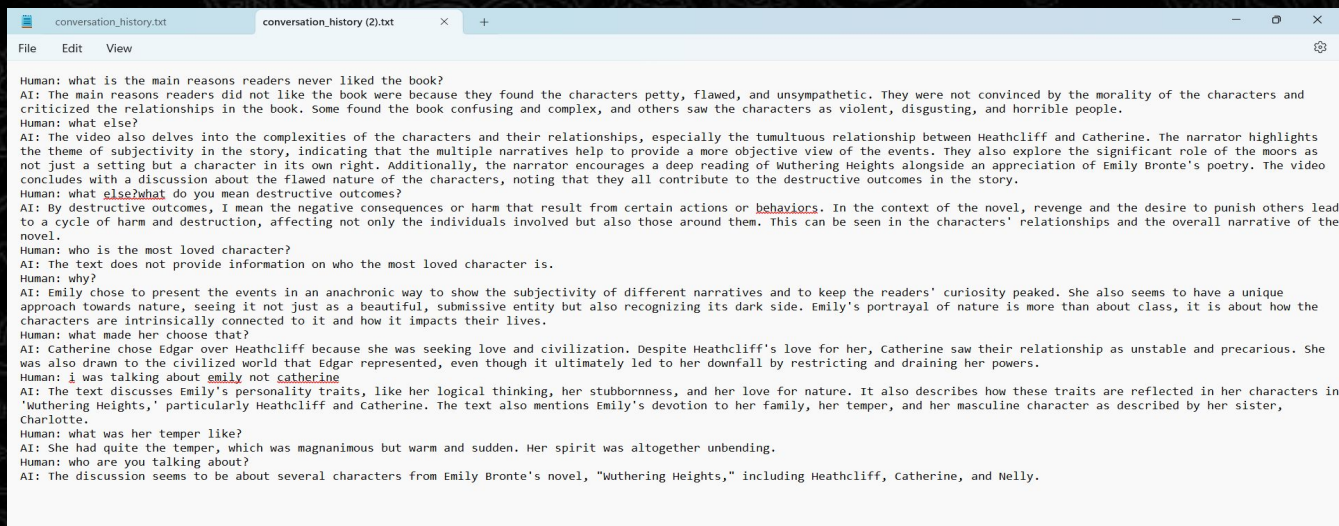


0:12

0:18



# Conversation Download



The screenshot shows a text editor window with two tabs: 'conversation\_history.txt' and 'conversation\_history (2).txt'. The 'conversation\_history.txt' tab is active. The text in the editor is a conversation between a Human and an AI, discussing the reasons readers did not like the book 'Wuthering Heights'. The conversation includes several paragraphs of text, with some words highlighted in red (e.g., 'else', 'behaviors', 'emily not catherine'). The text is as follows:

```
Human: what is the main reasons readers never liked the book?
AI: The main reasons readers did not like the book were because they found the characters petty, flawed, and unsympathetic. They were not convinced by the morality of the characters and criticized the relationships in the book. Some found the book confusing and complex, and others saw the characters as violent, disgusting, and horrible people.
Human: what else?
AI: The video also delves into the complexities of the characters and their relationships, especially the tumultuous relationship between Heathcliff and Catherine. The narrator highlights the theme of subjectivity in the story, indicating that the multiple narratives help to provide a more objective view of the events. They also explore the significant role of the moors as not just a setting but a character in its own right. Additionally, the narrator encourages a deep reading of Wuthering Heights alongside an appreciation of Emily Bronte's poetry. The video concludes with a discussion about the flawed nature of the characters, noting that they all contribute to the destructive outcomes in the story.
Human: what else? what do you mean destructive outcomes?
AI: By destructive outcomes, I mean the negative consequences or harm that result from certain actions or behaviors. In the context of the novel, revenge and the desire to punish others lead to a cycle of harm and destruction, affecting not only the individuals involved but also those around them. This can be seen in the characters' relationships and the overall narrative of the novel.
Human: who is the most loved character?
AI: The text does not provide information on who the most loved character is.
Human: why?
AI: Emily chose to present the events in an anachronic way to show the subjectivity of different narratives and to keep the readers' curiosity peaked. She also seems to have a unique approach towards nature, seeing it not just as a beautiful, submissive entity but also recognizing its dark side. Emily's portrayal of nature is more than about class, it is about how the characters are intrinsically connected to it and how it impacts their lives.
Human: what made her choose that?
AI: Catherine chose Edgar over Heathcliff because she was seeking love and civilization. Despite Heathcliff's love for her, Catherine saw their relationship as unstable and precarious. She was also drawn to the civilized world that Edgar represented, even though it ultimately led to her downfall by restricting and draining her powers.
Human: i was talking about emily not catherine
AI: The text discusses Emily's personality traits, like her logical thinking, her stubbornness, and her love for nature. It also describes how these traits are reflected in her characters in 'Wuthering Heights,' particularly Heathcliff and Catherine. The text also mentions Emily's devotion to her family, her temper, and her masculine character as described by her sister, Charlotte.
Human: what was her temper like?
AI: She had quite the temper, which was magnanimous but warm and sudden. Her spirit was altogether unbending.
Human: who are you talking about?
AI: The discussion seems to be about several characters from Emily Bronte's novel, "Wuthering Heights," including Heathcliff, Catherine, and Nelly.
```

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**Thank you for you time**

**Any questions?**