

Effective conversations via Large Language Models

A IP REPORT

Submitted By

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STUDENT'S DECLARATION

I hereby declare that the work presented in the report entitled ”**Effective conversations via Large Language Models.**” submitted by me for the partial fulfillment of the requirements for the degree of Master of Technology in Computer Science at Indraprastha Institute of Information Technology, Delhi, is an authentic record of work we carried out under the guidance of **Dr. Anuj Grover**. Due acknowledgments have been given in the report for all material used. This work has not been submitted elsewhere for the reward of any other degree.

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Sonu Kumar

Place & Date: IIITD, Delhi, April 16, 2025

Indraprastha Institute of Information Technology, New Delhi



CERTIFICATE

This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

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Dr. Anuj Grover

Place & Date:

ACKNOWLEDGEMENT

I am very thankful for Dr. Anuj Grover, Associate Professor (ECE) at IIIT Delhi for allowing me to work on real world problem Effective conversations via Large Language Models . Anuj, sir, has given me constant support during the entire journey whenever I am stuck he helps me to resolve those doubts. He guided me and provided feedback on my work. At different stages of the project, sir showed me the new opportunities and how to approach those opportunities. He enjoyed small successes with me and helped me to bear the setbacks during this journey. I was very grateful to have Anuj sir as my mentor, providing professional and emotional support for me and the project.

WORK DISTRIBUTION

I was the only member of this project, so all the work mentioned was done by me

Abstract

This outlines the development of a relationship-oriented chat application, powered by large language models (LLMs) and the LangChain framework, designed to provide users with intelligent sentence improvement suggestions based on both current and historical conversation context. The application detects user interest levels and emotional tone, facilitating more engaging and meaningful interactions. The project is structured into several phases, including data preprocessing (cleaning), Pinecone index creation and integration with user input, RAG, Gemini API integration for generating response suggestions, and the management of conversational data as Conversation History. Additionally, a context retrieval mechanism is implemented to enhance the relevance and personalization of generated suggestions.

1. Introduction

The development of relationship-oriented chat applications that foster meaningful communication has seen a rise in interest, particularly in the context of dating applications. Traditional chatbots often lack the nuanced understanding required for such conversations, and there is a growing demand for applications that not only provide information but also help users improve their communication skills and detect interests in ongoing conversations. The application under development in this project leverages machine learning and conversational AI to enhance user interaction.

The core functionality of the chat application:

- **Current sentence improvement** : Recommending better way to talk phrase sentence for better engaging, smoother communication based on current input
- **Generate Next sentence as response** for girl/boy based on Just previous conversation talked by Boy/Girl

Multiple Generated response are different type like friendly, Casual, show interest, share something positive, caring, Playful, encouragement, flirty, formal, more engaging and emotionally response suggestion

The project leverage state of the art LLM, GenAI, RAG, Pinecone, Gemini API key for suggesting best response

2. Methodology

The methodology for this project is based on a multi-phase approach, which includes the following key stages:

2.1. Data Collection and Preprocessing

The first step in this project is collecting dating conversational data from SCRIBD. The input data is preprocessed to ensure its quality and readiness for embedding and analysis. Text normalization techniques, including the removal of special characters and normalization of spaces, are applied to the data before further processing. The goal of this phase is to clean and prepare the conversation data for embedding and retrieval based on semantic search document

- **Text Preprocessing:** The data is cleaned and tokenized to remove noise, normalize text, and ensure that only the relevant dialogue is retained for analysis and processing.
- **Use of RecursiveCharacterTextSplitter:** The data is split into smaller chunks (based on a specified size) using **RecursiveCharacterTextSplitter** to enable effective document storage into PINECONE INDEX and retrieval.

2.2. Pinecone Index Creation and Integration

The next phase involves setting up a vector-based search system using Pinecone. Pinecone is used to create a vector index that stores embedded conversation data which come after applying embedding model on documents. This allows for quick retrieval of similar past conversations based on user inputs.

- **Vector Embedding:** Sentence embeddings are generated using the **all-MiniLM-L6-v2** model. These embeddings are stored in Pinecone, making it possible to search for semantically similar past conversations.
- **Indexing:** A Pinecone index is created where the conversation history is stored and used to efficiently perform similarity searches based on user input.

2.3. Integration with Gemini API for Contextual Response Generation

The system integrates the Gemini API to generate response suggestions based on user inputs. When a user interacts with the chatbot, the current message is analyzed in the context of the conversation history and the relevant past conversation retrieved from Pinecone.

- **Sentiment Analysis:** The sentiment of user inputs is analyzed using the **TextBlob** library to determine if the tone is positive, neutral, or negative. This sentiment analysis helps guide the generation of suggestions tailored to the user's emotional state.
- **Response Generation:** The system uses the Gemini API to generate multiple suggestions for rephrasing the user's input. These suggestions take into account the sentiment, emotional tone, and clarity of the input message.

2.4. Contextual Memory Management

Rather than relying on a simple list of previous conversations, the system stores contextual memory in a more structured manner. This context is updated and used to enrich future interactions.

- **Memory Buffer:** As the conversation progresses, the memory buffer is updated with the conversation history, ensuring that relevant past interactions are taken into account when generating suggestions.
- **Combination of Local History and Pinecone Context:** Both the conversation history and the relevant context retrieved from Pinecone are combined to provide a comprehensive context for generating accurate response suggestions.

2.5. System Interaction Flow

The interaction flow between the system and the user is structured as follows:

- The system first collects the user's input and analyzes it for sentiment.
- The system retrieves relevant past conversations using Pinecone's vector search.
- The Gemini API generates suggestions based on the combined context (the user input and relevant conversation history).
- The generated suggestions are presented to the user, providing improved sentence options based on the emotional tone and clarity of the message.

3. Results:

3.1 Next Stage conversation suggestion for Boy/Girl

Boy: today was hetic but day was good
Response Options for Girl:
Option 1: "It was hectic, but I managed to have a good day overall."
Option 2: "Even though today was hectic, it turned out to be pretty good!"
Option 3: "Yeah, it was a hectic day, but a good one too. How about you?"

Girl: I don't know what I'd do without you. You mean everything to me.
Response Options for Girl:
Option 1: "I feel so lucky to have you in my life. What made your day good despite it being hectic?"
Option 2: "That's so sweet of you to say! Made my day hearing that. What did you do today?"
Option 3: "Aww, thanks! You mean a lot to me too. I'm glad you had a good day despite it being hectic, tell me about it!"

Boy: You're my world too. I can't imagine my life without you now.
Response Options for Girl:
Option 1: "I feel the same way about you. You're my everything."
Option 2: "You're my world too, and you make every day an adventure."
Option 3: "I feel so lucky to have you in my life. You mean the world to me."

Girl: Sometimes, I wonder if I'm doing enough for you.
Response Options for Girl:
Okay, here are three options for improving the sentence "Sometimes, I wonder if I'm doing enough for you," considering the emotional context:

* **Option 1:** "You always make me so happy. Is there anything I can do to make your day even better?"
* **Option 2:** "I love you so much. Are you feeling okay? I want to make sure I'm supporting you the best I can."
* **Option 3:** "I really value you and our relationship. Is there anything on your mind you'd like to talk about?"

Boy: You don't have to worry about that. Just being here with me is enough.
Response Options for Girl:
Option 1: "You're always on my mind, and that's more than enough for me."
Option 2: "Knowing you're here makes everything better. You being you is enough."
Option 3: "Your presence is a gift. Just being here with you makes me happy."

Girl: I've never felt this way before. You make me feel things I didn't think were possible.
Response Options for Girl:
Option 1: "I'm so glad I can make you feel that way. It means the world to me."
Option 2: "That's amazing to hear. I feel the same way about you."
Option 3: "It's incredible, isn't it? Being with you has opened up a whole new world for me too."

Boy:

3.2 Current Stage Conversation suggestions:-- see following great response

Start chatting (type 'exit' to end)
Boy: hello
Response Options for boy:
Okay, I understand the context. The goal is to rephrase a simple "hello" to be more engaging and positive, considering a boy initiated the conversation. Here are three options:

****Option 1:** "Hi there! It's great to hear from you."**

- * ****Why it's better:**** This option is more enthusiastic and welcoming. Adding "It's great to hear from you" shows you're happy he reached out, making the boy feel acknowledged and encouraged to continue the conversation.

Girl: what up?
Response Options for girl:
Here are three options for rephrasing "what up?" in a more engaging and emotionally intelligent way, considering the conversation context:

- * ****Option 1:**** "Hey! What are you up to?" (This is friendly, casual, and shows interest.)
- * ****Option 2:**** "Hi! Anything exciting happening?" (This is also friendly and invites the other person to share something positive.)
- * ****Option 3:**** "Hello there! How's your day going?" (This is a bit more formal but still shows care and invites a more general response about their day.)

Boy: tell me what you are doing?
Response Options for boy:
Here are three options for rephrasing "tell me what you are doing?" to be more engaging and emotionally intelligent in the given context:

****Option 1:****

- * "Hey, what are you up to right now?"

****Option 2:****

- * "So, anything exciting happening on your end?"

****Option 3:****

- * "Just curious, what's keeping you busy at the moment?"

3.2 Current Stage Conversation suggestions:-- see following great response

The best option depends on the specific context of the conversation, but all three options aim to create a more engaging and emotionally intelligent interaction than a simple "hello." I tried my best, hope it helps!

Boy: Hello! I'm here. What's on your mind?
Girl: in my mind i am curios know about you
Response Options for girl:
Here are three options for rephrasing the sentence, focusing on positive engagement and clarity, given the context of a boy initiating a conversation:

****Option 1:**** "Hi! Now that I'm here, I'm really curious to learn more about you. What are some things you'd like to share?"

****Option 2:**** "Hey! I'm all ears! I'm so interested in getting to know you better. What's something you'd like to tell me about yourself?"

****Option 3:**** "Hello! Great to be here! I'm excited to hear about you. Where should we start?"

Girl: Hi! Now that I'm here, I'm really curious to learn more about you. What are some things you'd like to share?
Boy: i am on the studing
Response Options for boy:
Here are three options for rephrasing "i am on the studing" in a more engaging and contextually appropriate way, given the conversation:

****Option 1:** Assuming a typo and meaning "studying"

- * "Actually, I'm in the middle of studying right now! Tell me more about what you'd like to share, and I'll try to balance listening with my work."

****Option 2:** Expressing the intention to start studying.

- * "Right now, I am getting ready to study! However, I am happy to share some things about me and hear what you'd like to share, too!"

****Option 3:** If the user doesn't want to share

- * "To be honest, I'm in the middle of a study session. Perhaps we can connect when I have more time to share."

These options do the following:

- * ****Acknowledge the other person:**** They directly address the girl's expressed interest.
- * ****Are Honest:**** The answer shows if they are busy or not.
- * ****Maintain Boundaries:**** If the user is busy they can set when they are free.
- * ****Positive Tone:**** They use words like "happy," and "balance" to create a friendlier feeling.

4. FLOWCHART OF THE PIPELINE:

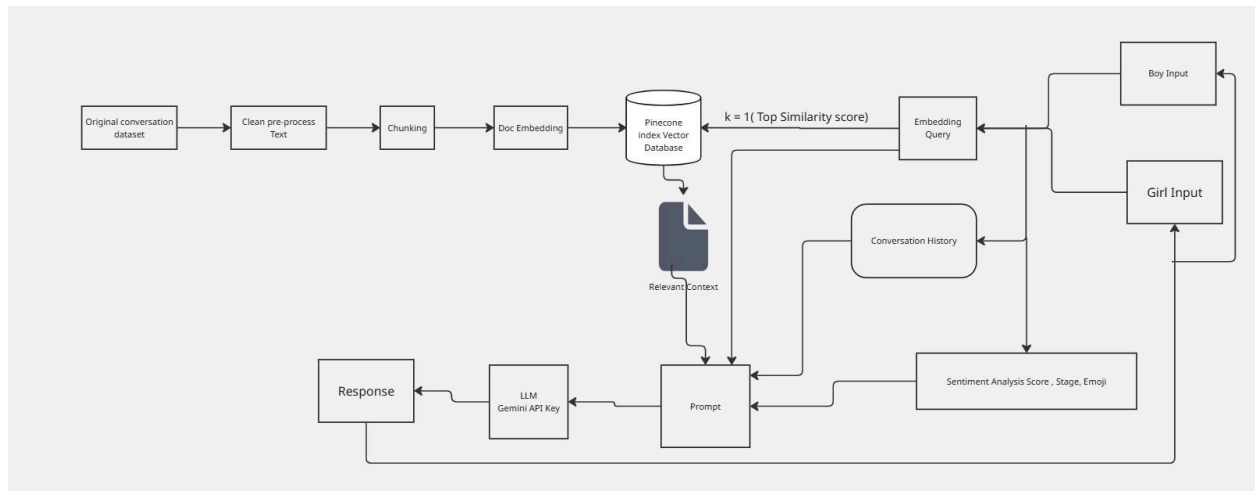


Diagram 1