AI Chatbot – Project Report

Project Details

Project Title: Artificial intelligence Chatbot

Technologies: Java, JavaFX, NLP, Maven

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GitHub Repository: https://github.com/aryansengar007/CodeAlpha_AIChatbot

Introduction

This project is a smart AI Chatbot built using JavaFX for the graphical user interface and Natural Language Processing (NLP) for understanding and responding to user inputs. The chatbot is capable of interacting in real-time and answering user queries across a wide range of domains. It is backed by a large set of FAQ data and optionally integrates with OpenAI GPT for more dynamic responses.

Problem Statement

To design and implement a Java-based AI Chatbot with an interactive GUI that can:

- Understand user input using NLP

- Respond intelligently using trained FAQs

- Support dynamic responses using external APIs (e.g., GPT)

- Provide a smooth and intuitive user experience through a modern UI

Key Observations

- Many chatbot projects lack a functional GUI or strong NLP logic.

- Combining JavaFX with NLP gives a powerful desktop chatbot.

- OpenAI GPT can enhance intelligence, but local NLP ensures offline usability.

- A large, structured FAQ base significantly improves relevance.

Challenges / Doubts

- Parsing FXML and loading JavaFX resources correctly

- Handling image/resource paths during runtime

- Debugging Maven errors related to plugin configuration

- Designing a readable and scalable faqs.json dataset

- Integrating GPT while keeping fallback logic intact

Libraries Used

- JavaFX: For GUI design (FXML, CSS)

- json-simple: To parse and read faqs.json

- Apache Maven: Build automation and dependency management

- OpenAI API (optional): For GPT-based responses

- Custom NLP: TF-IDF & cosine similarity for matching user queries

Functions Explained

- ChatBotEngine.java: Core NLP logic; loads FAQs and finds best match

- NLPProcessor.java: Tokenizes input, builds TF maps, and computes similarity

- GPTService.java: Connects to OpenAI API using system environment key

- ChatController.java: Handles GUI events and message flow logic

- App.java: JavaFX application entry point

Main Components

- User Interface: JavaFX GUI with modern layout and theme styling

- FXML Layout: Defined in chatbot.fxml

- FAQ Dataset: 1200+ entries in faqs.json across 12+ topics

- NLP Engine: Uses term frequency and similarity to find the best answer

- GPT Integration: Adds smart fallback if an API key is present

Future Improvements

- Add voice input and speech synthesis

- Integrate with a database instead of static JSON

- Create a web-based version using Spring Boot + React

- Implement learning from user feedback

- Add real-time sentiment analysis

Conclusion

This project demonstrates a fully functional AI chatbot with GUI and NLP integration. It is designed to be modular, expandable, and developer-friendly. The combination of a clean interface, rule-based logic, and optional GPT integration makes it ideal for personal, educational, or professional use cases. The project is hosted on GitHub and can be run locally or extended as needed.