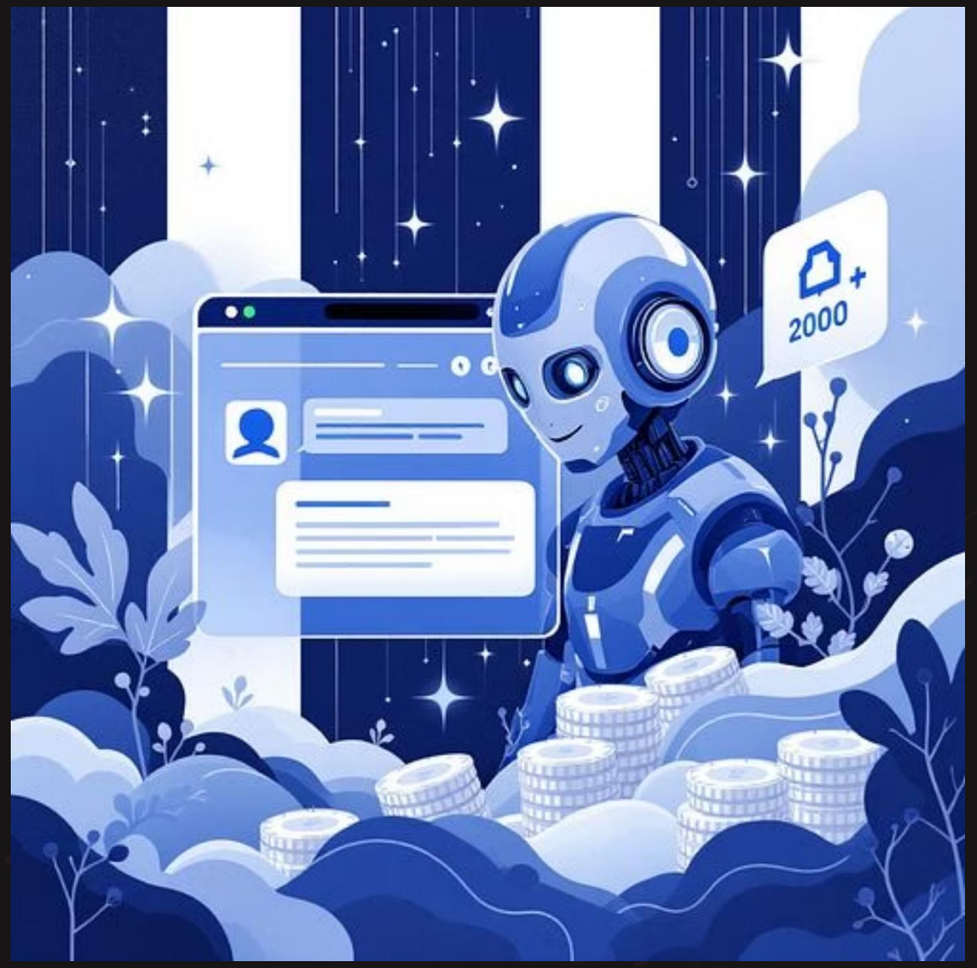


AI CHATBOT IN BANKING

The **AI Chatbot in Banking** is an intelligent virtual assistant designed to provide fast and secure banking services. It helps users with tasks such as **account enquiries, balance checks, money transfers, and transaction details** through natural language interaction.

By using **AI and Natural Language Processing (NLP)**, the chatbot understands user queries and delivers accurate responses in real time. This system enhances **customer experience**, reduces manual workload, and ensures **24/7 banking support**.

Presented by : Kokkonda Nithyashre

Milestone 1: NLU Pipeline - Step-by-Step

Intent Data Collection

User intents and example sentences are meticulously collected and stored in a structured `intents.json` file. Each entry represents a distinct banking operation, forming the foundation of our NLU.

Intent Training

Text data is transformed into numerical features using **TF-IDF (1-2 grams)**. This data then trains a **Multinomial Naive Bayes** model. The trained model and vectorizer are persistently saved using `joblib` for future use.

Intent Inference

User queries are intelligently split to handle **multiple intents**. TF-IDF vectors are passed to the trained model, and probabilities are normalised to derive precise intent confidence scores.

Entity Extraction

A robust **rule-based extraction** mechanism, powered by **Regex**, identifies critical entities such as amounts, account numbers, card numbers, and transaction IDs from user queries.

User Interface

The **Streamlit**-powered UI facilitates an intuitive interaction, allowing for intent editing, inference testing, visualisation of intents and entities, and efficient model retraining.

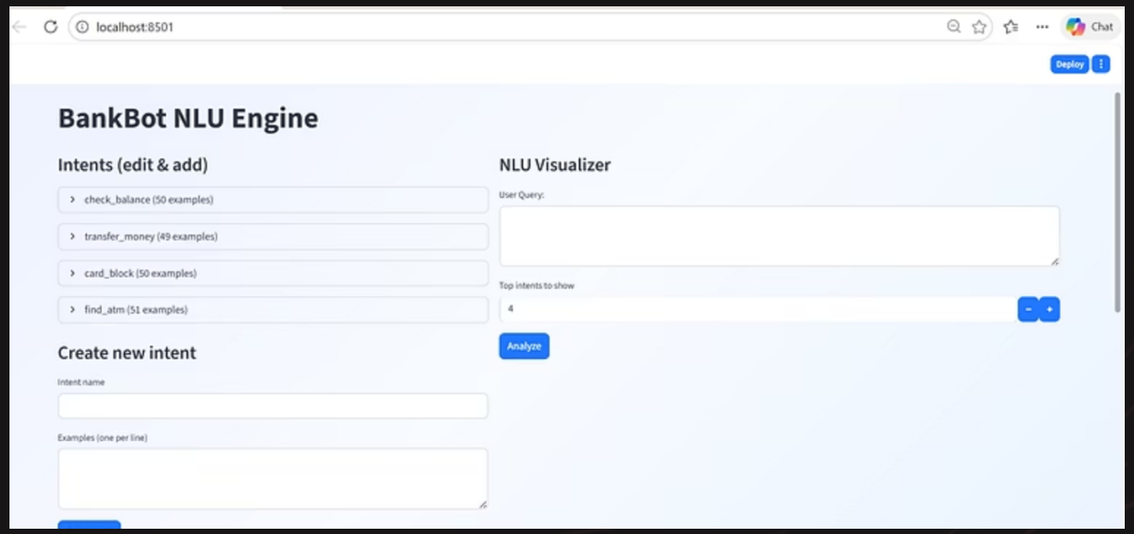
Milestone 1: Technologies & Key Highlights

Technologies Used

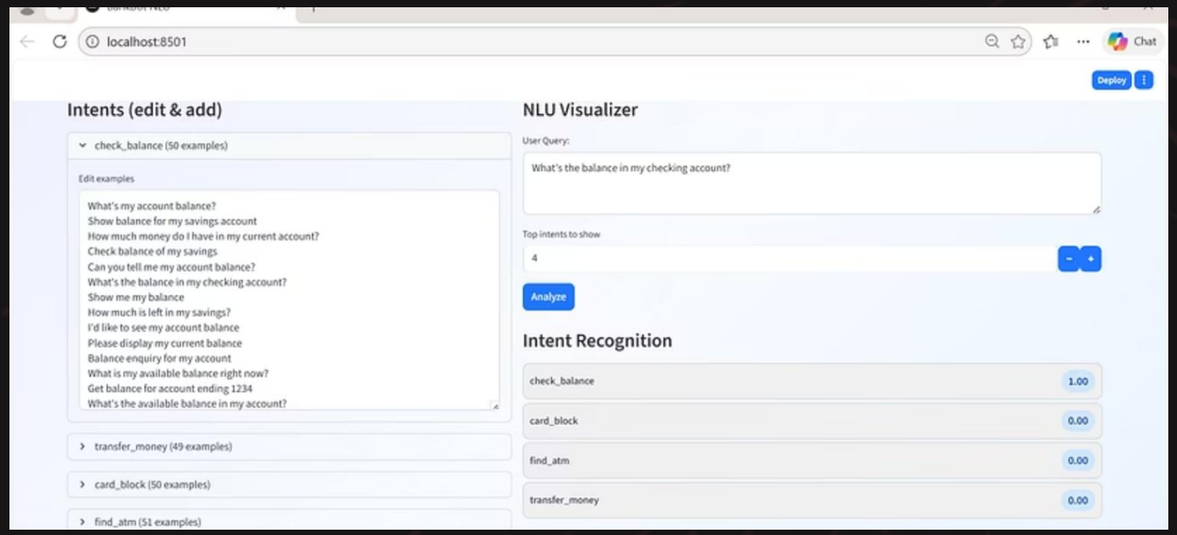
Machine Learning	Scikit-learn	Python
NLP	TF-IDF Vectorizer	Python
Classification Model	Multinomial Naive Bayes	Python
Entity Recognition	Regex (Rule-based)	Python
Model Storage	Joblib	Python
UI Framework	Streamlit	Python

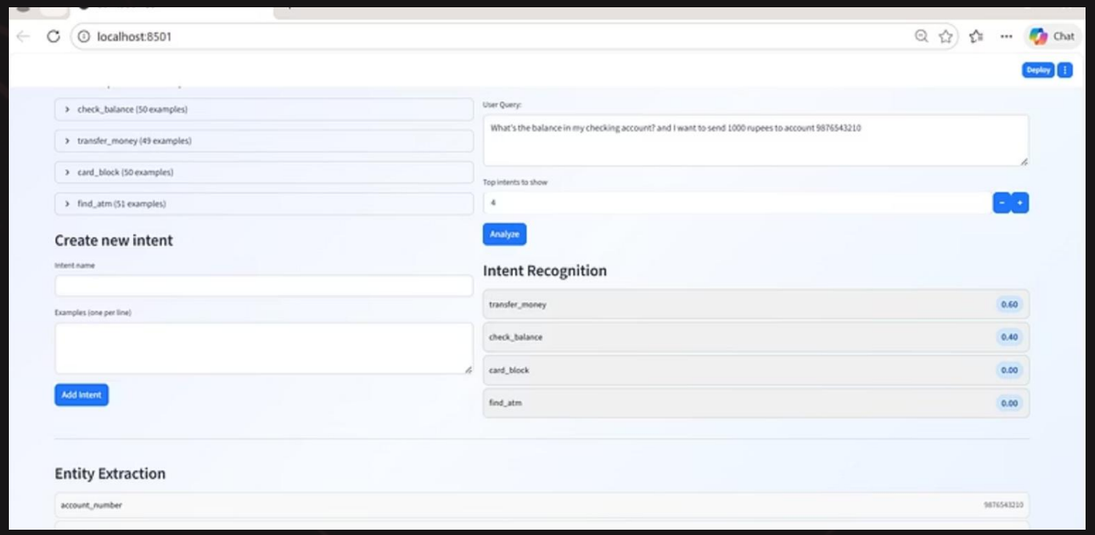
Key Highlights

The BankBot NLU Engine successfully demonstrates how classical machine learning techniques can be effectively used to build a production-ready chatbot NLU system. By combining TF-IDF + Naive Bayes for intent detection and regex-based entity extraction, the system achieves high accuracy, transparency, and speed. The Streamlit interface further enhances usability by enabling interactive testing, intent management, and retraining, making this project a strong foundation for scalable conversational AI systems.


localhost:8501
Chat
Deploy
BankBot NLU Engine
Intents (edit & add)
check_balance (50 examples)
transfer_money (49 examples)
card_block (50 examples)
find_atm (51 examples)
Create new intent
Intent name
Examples (one per line)
NLU Visualizer
User Query:
Top intents to show
4
Analyze


localhost:8501
Chat
Deploy
Entity Extraction
No entities found.
Train Model
Epochs
3
Batch size
8
Learning rate
0.00002
Trained model found
Start Training


localhost:8501
Chat
Deploy
Intents (edit & add)
check_balance (50 examples)
Edit examples
What's my account balance?
Show balance for my savings account
How much money do I have in my current account?
Check balance of my savings
Can you tell me my account balance?
What's the balance in my checking account?
Show me my balance
How much is left in my savings?
I'd like to see my account balance
Please display my current balance
Balance enquiry for my account
What is my available balance right now?
Get balance for account ending 1234
What's the available balance in my account?
transfer_money (49 examples)
card_block (50 examples)
find_atm (51 examples)
NLU Visualizer
User Query:
What's the balance in my checking account?
Top intents to show
4
Analyze
Intent Recognition
check_balance 1.00
card_block 0.00
find_atm 0.00
transfer_money 0.00


localhost:8501
Chat
Deploy
check_balance (50 examples)
transfer_money (49 examples)
card_block (50 examples)
find_atm (51 examples)
Create new intent
Intent name
Examples (one per line)
Add intent
User Query:
What's the balance in my checking account? and I want to send 1000 rupees to account 9876543210
Top intents to show
4
Analyze
Intent Recognition
transfer_money 0.60
check_balance 0.40
card_block 0.00
find_atm 0.00
Entity Extraction
account_number 9876543210

Milestone 2: AI Banking Chatbot – Workflow

This milestone focuses on the holistic workflow of the AI Banking Chatbot, showcasing the interaction between various modules and the flow of information from user query to database action.

1

User Interface (Streamlit)

Users create accounts, log in, and interact with the chatbot by typing queries. Chat messages are presented as intuitive chat bubbles.

2

Dialogue Manager

Receives user messages from the UI and skillfully controls the conversation flow for various operations (e.g., balance check, transfer, card block). It also manages temporary session data.

3

NLU Module

This module, developed in Milestone 1, is responsible for accurately identifying user intent (e.g., "Check Balance", "Transfer Money", "Block Card") and extracting all necessary details.

4

Business Logic Layer

Performs actual banking operations based on the identified intent. This layer rigorously validates account details, passwords, and available balances to ensure secure transactions.

5

Database (SQLite)

Securely stores all user, account, and transaction data. It handles real-time updates to balances and maintains a comprehensive history of all transactions.

Milestone 2: Key Functionalities & Security

Supported Banking operation

- Create Account
- Secure Login
- Check Account Balance
- Money Transfer
- Card Blocking
- View Database Records

Security Features

- Password Encryption

  Passwords are robustly encrypted using hashing algorithms for maximum security.

- Password Verification

  Strict password verification is mandated before any sensitive banking actions are executed.

- User Session Validation

  User sessions are thoroughly validated to ensure authorised access to the chatbot.

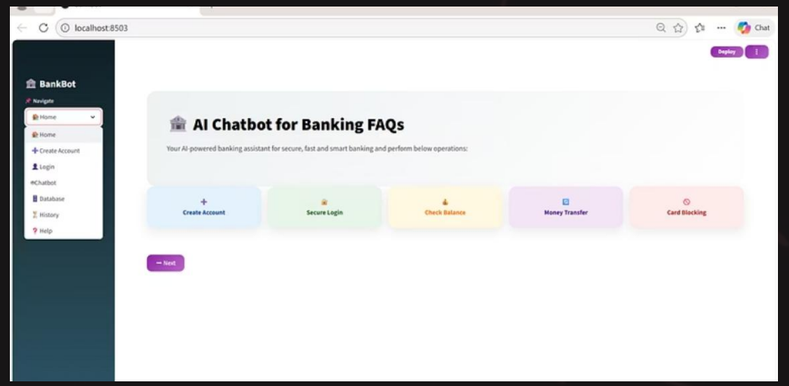
Technical Features

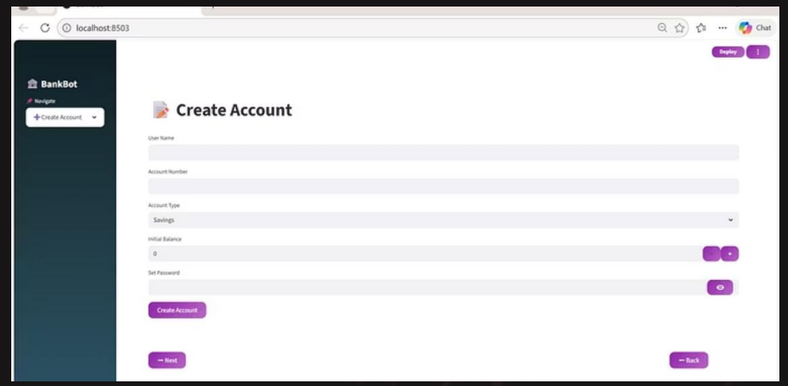
- Multi-step Conversation
- Context-based Flow Control
- Real-time Database Updates
- Modular & Scalable Architecture

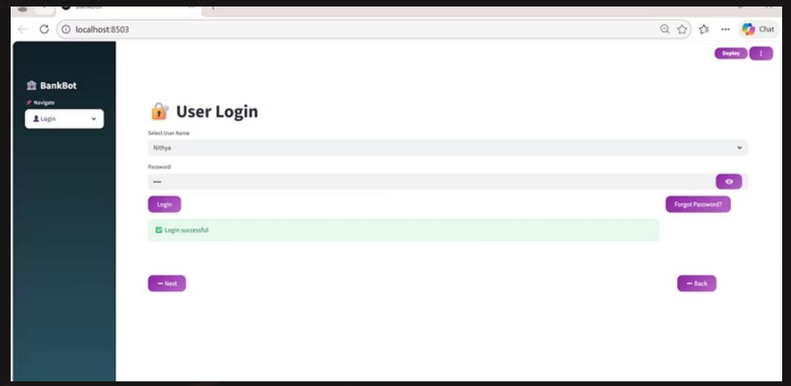
Milestone 2: Conclusion

We have successfully developed a secure and interactive AI-based banking chatbot. This system implements structured conversation flows for real banking tasks, ensuring a seamless user experience. Data security is paramount, achieved through encrypted passwords and robust authentication mechanisms. The modular design, integrating UI, business logic, and database, forms a scalable foundation for future enhancements.

This project stands as a testament to the practical implementation of AI concepts in automating banking services.

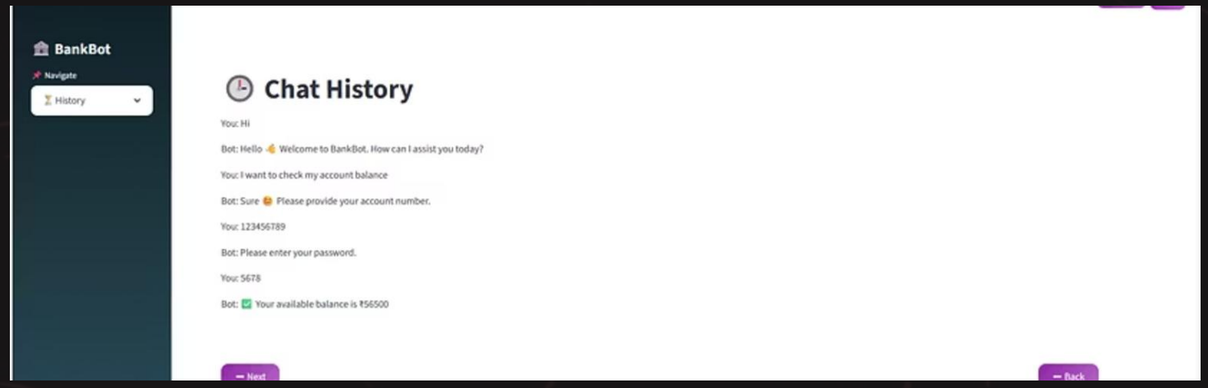

BankBot
AI Chatbot for Banking FAQs
Create Account
Secure Login
Check Balance
Money Transfer
Card Blocking


BankBot
Create Account
Create Account
Create Account


BankBot
User Login
Login
Forgot Password?
Login successful


BankBot
BankBot – AI Banking Assistant
Hi
Hello Welcome to BankBot. How can I assist you today?
I want to check my account balance
Sure Please provide your account number.
123456789
Please enter your password.
5678
Your available balance is ₹56500


BankBot
Database Management
Account Number
User Name
098765
Nithya
123456789
Prasanna
567890
Sri Nithya
34567
Sahitya
Next
Back


BankBot
Chat History
You: Hi
Bot: Hello Welcome to BankBot. How can I assist you today?
You: I want to check my account balance
Bot: Sure Please provide your account number.
You: 123456789
Bot: Please enter your password.
You: 5678
Bot: Your available balance is ₹56500


BankBot
Help & Support
General Guidance
How to create an account?
How to login?
How to check balance and transaction history?
How to transfer money?
Security Tips
How to keep my account safe?
Troubleshooting
What if login fails?

Milestone 3: LLM Integration Overview

✨ Objective

- Integrate a Large Language Model (LLM) into the chatbot.
- Handle non-banking queries intelligently.

📚 Why LLM Integration?

General Question Answering

Enables the chatbot to respond to a broader spectrum of user queries beyond core banking operations.

Improved Conversational Capability

Enhances the naturalness and fluidity of interactions, leading to a more engaging user experience.

Intent Fallback Mechanism

Acts as a robust fallback when the primary NLU module fails to recognise a specific banking intent, preventing conversational dead ends.

🔷 Technologies Used

- LangChain
- Groq API
- LLaMA 3.1 (8B)
- Python

Milestone 3: Hybrid Chatbot Workflow

🔄 Processing Flow

01

User Query

The user initiates interaction by entering a query into the chatbot interface.

02

Intent Recognition

The query is first directed to the **Intent Recognition Module** (from Milestone 1) for initial analysis.

03

Banking-related Intent?

If the detected intent is banking-related, the query is handled by **rule-based logic**, ensuring secure and precise database operations.

04

Non-banking Intent?

If the intent is identified as non-banking, the query is seamlessly forwarded to the **LLM (Groq-hosted LLaMA)** for a more general response.

Milestone 3: LLM Invocation & Response

LLM Invocation

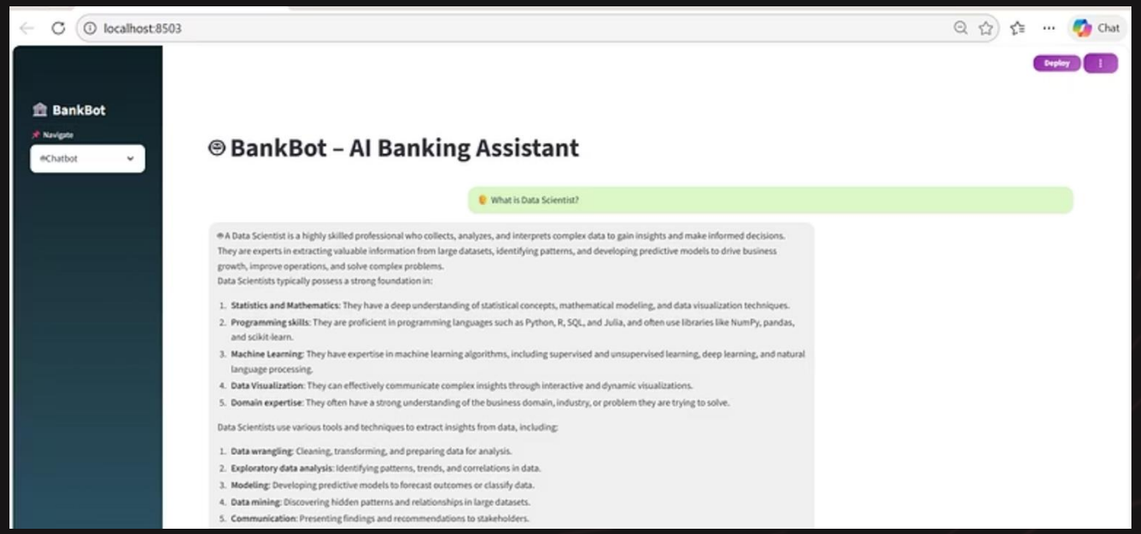
SystemMessage: Used to meticulously control the LLM's behaviour and define its role within the conversational context, ensuring appropriate responses.

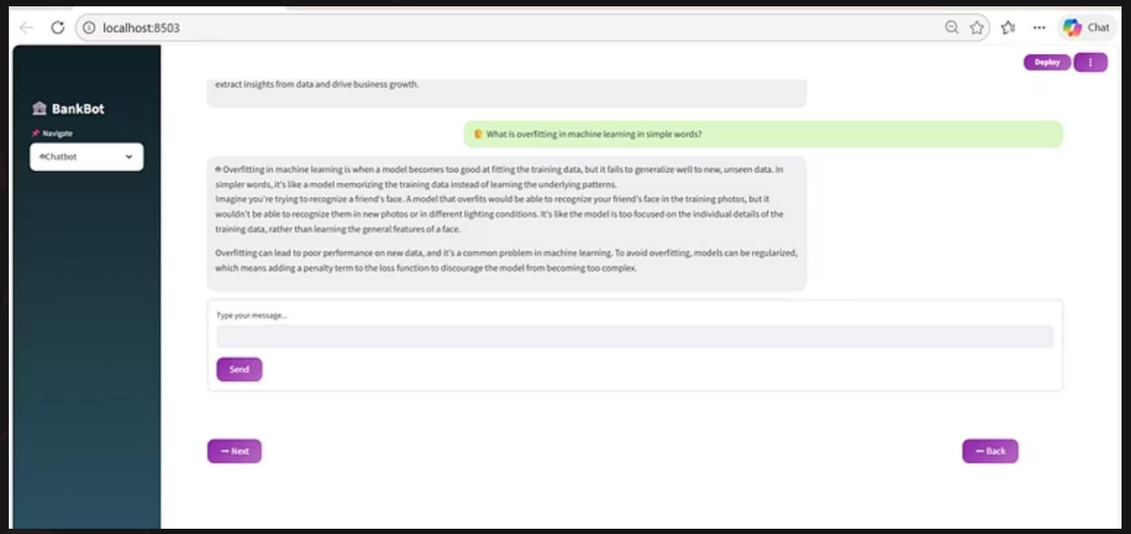
HumanMessage: Carries the actual user input, allowing the LLM to process and understand the user's specific query or statement.

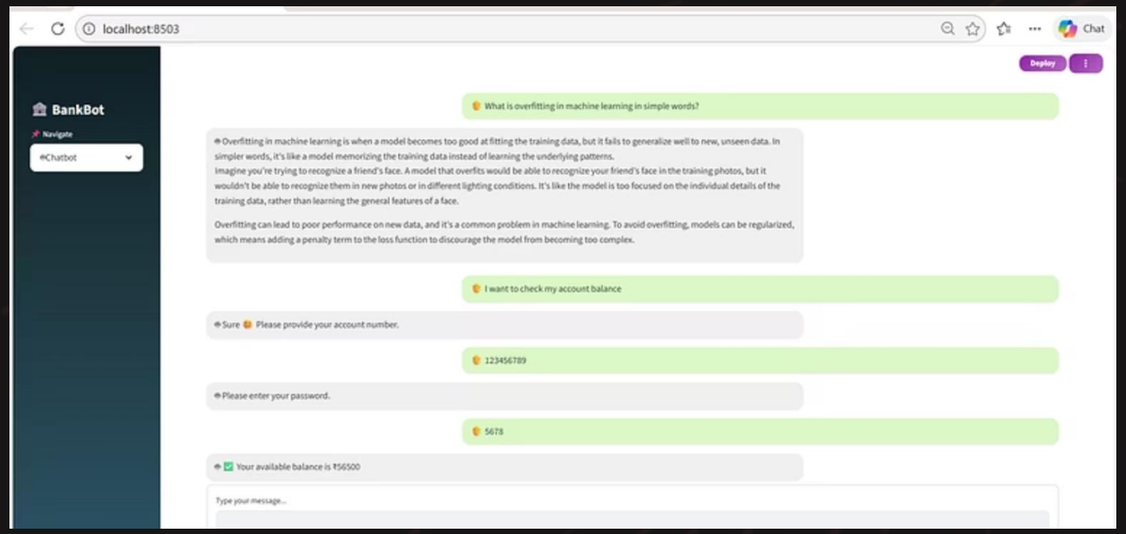
Natural Language Response: The LLM leverages its advanced capabilities to generate coherent, contextually relevant, and natural language responses.

Conclusion

> We have successfully integrated an LLM as a robust fallback mechanism within our BankBot. User queries are initially processed by an intent recognition module. If a banking operation is detected, the request is securely handled by rule-based logic connected to the database. Conversely, if no predefined banking intent matches, the query is intelligently routed to a Groq-hosted LLaMA model to generate a natural language response. This hybrid approach ensures comprehensive and intelligent conversational capabilities for our banking chatbot.


localhost:8503
Chat
Deploy
BankBot
Navigate
Chatbot
BankBot – AI Banking Assistant
What is Data Scientist?
A Data Scientist is a highly skilled professional who collects, analyzes, and interprets complex data to gain insights and make informed decisions. They are experts in extracting valuable information from large datasets, identifying patterns, and developing predictive models to drive business growth, improve operations, and solve complex problems.
Data Scientists typically possess a strong foundation in:
1. Statistics and Mathematics: They have a deep understanding of statistical concepts, mathematical modeling, and data visualization techniques.
2. Programming skills: They are proficient in programming languages such as Python, R, SQL, and Julia, and often use libraries like NumPy, pandas, and scikit-learn.
3. Machine Learning: They have expertise in machine learning algorithms, including supervised and unsupervised learning, deep learning, and natural language processing.
4. Data Visualization: They can effectively communicate complex insights through interactive and dynamic visualizations.
5. Domain expertise: They often have a strong understanding of the business domain, industry, or problem they are trying to solve.
Data Scientists use various tools and techniques to extract insights from data, including:
1. Data wrangling: Cleaning, transforming, and preparing data for analysis.
2. Exploratory data analysis: Identifying patterns, trends, and correlations in data.
3. Modeling: Developing predictive models to forecast outcomes or classify data.
4. Data mining: Discovering hidden patterns and relationships in large datasets.
5. Communication: Presenting findings and recommendations to stakeholders.


localhost:8503
Chat
Deploy
BankBot
Navigate
Chatbot
extract insights from data and drive business growth.
What is overfitting in machine learning in simple words?
Overfitting in machine learning is when a model becomes too good at fitting the training data, but it fails to generalize well to new, unseen data. In simpler words, it's like a model memorizing the training data instead of learning the underlying patterns.
Imagine you're trying to recognize a friend's face. A model that overfits would be able to recognize your friend's face in the training photos, but it wouldn't be able to recognize them in new photos or in different lighting conditions. It's like the model is too focused on the individual details of the training data, rather than learning the general features of a face.
Overfitting can lead to poor performance on new data, and it's a common problem in machine learning. To avoid overfitting, models can be regularized, which means adding a penalty term to the loss function to discourage the model from becoming too complex.
Type your message...
Send
Next
Back


localhost:8503
Chat
Deploy
BankBot
Navigate
Chatbot
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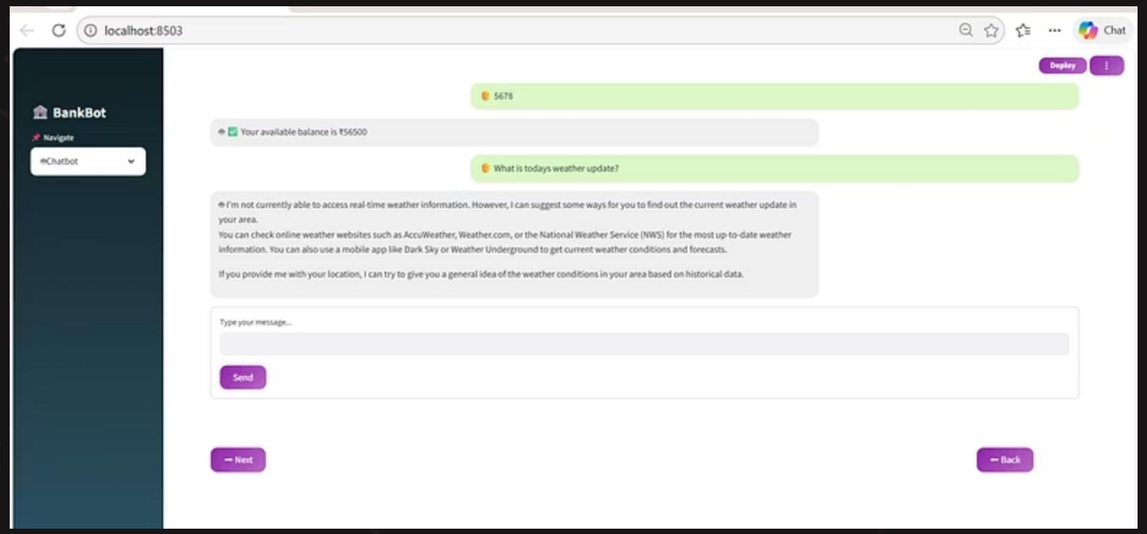
Overfitting can lead to poor performance on new data, and it's a common problem in machine learning. To avoid overfitting, models can be regularized, which means adding a penalty term to the loss function to discourage the model from becoming too complex.
I want to check my account balance
Sure Please provide your account number.
123456789
Please enter your password.
5678
Your available balance is ₹56500
Type your message...


localhost:8503
Chat
Deploy
BankBot
Navigate
Chatbot
5678
Your available balance is ₹56500
What is todays weather update?
I'm not currently able to access real time weather information. However, I can suggest some ways for you to find out the current weather update in your area.
You can check online weather websites such as AccuWeather, Weather.com, or the National Weather Service (NWS) for the most up-to-date weather information. You can also use a mobile app like Dark Sky or Weather Underground to get current weather conditions and forecasts.
If you provide me with your location, I can try to give you a general idea of the weather conditions in your area based on historical data.
Type your message...
Send
Next
Back

Milestone 4: Admin Dashboard – System Control Panel

The Admin Dashboard acts as the central control system for BankBot. It provides real-time monitoring, analytics, and management tools for user queries, chat logs, knowledge base (FAQs), and NLU model performance. Only admins can access this dashboard to ensure security and control.

📊 Dashboard Features

- User queries monitoring
- Chat logs tracking
- Knowledge base (FAQs) management
- NLU model performance analytics

❓ Dashboard Tools

- Interactive cards
- Visual charts
- Filtered data views

🎯 Purpose

To monitor chatbot performance, improve accuracy, and manage system data efficiently.

Analytics and Monitoring Modules

Top Queries Analytics

- Displays most frequent user queries
- Shows intent distribution and query count
- Calculates average confidence score of intent prediction

Intent Confidence Analysis

- Measures how accurately the NLU model predicts intents
- Visualized using:
  - Confidence cards
  - Pie / donut charts

Chat Logs Viewer

- Displays complete user–bot conversations
- Includes query, intent, confidence score, and timestamp
- Allows exporting chat logs for analysis

Benefit

Helps admin identify weak intents, analyze user behavior, and improve chatbot reliability.

Knowledge Base Management & Model Training

Knowledge Base Management

- Add, edit, delete FAQs
- Organize FAQs by categories
- Improves chatbot responses without changing code

NLU Model Retraining

- Add new training examples to existing intents
- Create new intents dynamically
- Retrain the model from the dashboard itself

NLU Testing Panel

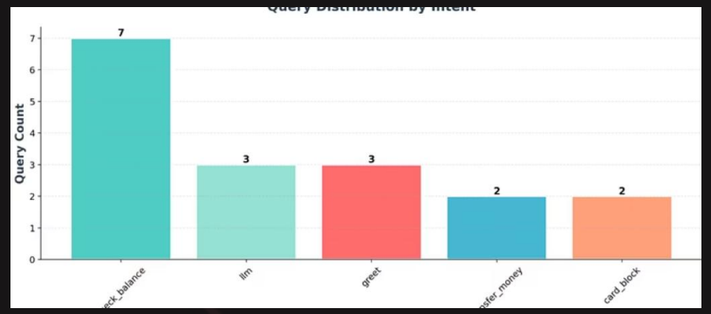
- Test intent recognition and entity extraction
- Displays predicted intent, confidence score, and extracted entities

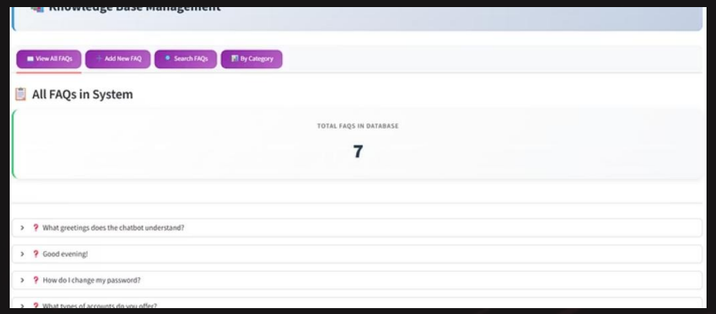
Outcome

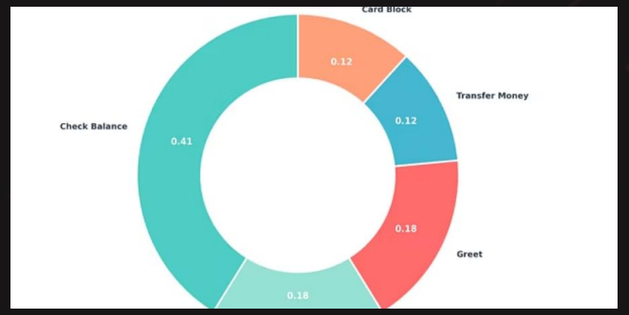
Ensures the chatbot learns continuously, adapts to new queries, and maintains high accuracy.

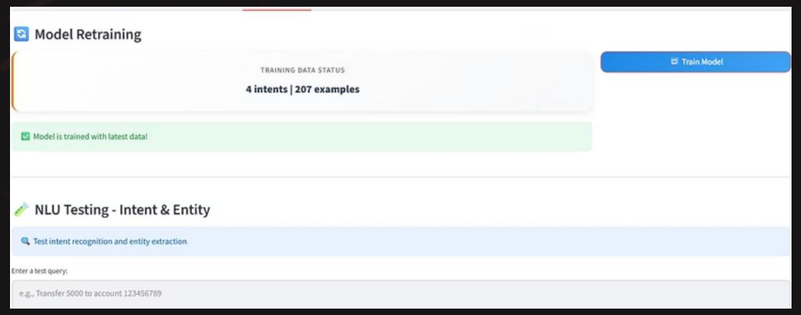
Conclusion

> This comprehensive set of features enables continuous learning and improvement of the chatbot system, ensuring it remains accurate and responsive to evolving user needs.









6	Nithya	Hi	greet	1	2026-01-08T18:44:50.145013
7	guest	Thank you	greet	0	2026-01-03T16:35:42.319869
8	guest	check balance	check_balance	1	2026-01-03T16:35:22.081608
9	guest	What is overfitting in machine learning	llm	1	2026-01-03T16:35:12.727872
10	guest	What is LLM?	llm	1	2026-01-03T16:34:47.211046
11	guest	I want to block my card	card_block	1	2026-01-03T16:34:20.370497
12	guest	I want to check my savings account balance	check_balance	1	2026-01-03T16:33:49.155003
13	guest	I want to check balance	check_balance	1	2026-01-03T16:33:19.780239
14	guest	I want to transfer money from current account to savings account	transfer_money	1	2026-01-03T16:32:35.496539

Thank You