PSCS64-Customer Support Chatbot With ML

Batch Number:CSE-G27

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Introduction

➢ In customer support, chatbot by using machine learning customer can converse by a chatbot and acquire the query intent information.

➢ With the enhancement of globalization and industrialization, it becomes a problem for enterprises to interact with the customer and listen to their difficulties to a big extent.

➢ Chatbots make ease the pain that the industries nowadays facing.

➢ The aim of this chatbot is to support and reply to the client by giving him/her the relevant intent depending on the query request from the customers.

Literature Review

Sl.no	Title/Author/publisher	Advantages	limitations
1.	Choudhury, S. D. G., & Rahman, M. A. H. B, Customer Support Chatbot: A Survey, International Journal of Computer Applications-2019	Comprehensive overview of existing chatbot architectures. Identifies various machine learning techniques for natural language processing.	Limited focus on specific implementation challenges. Lacks empirical data on user satisfaction.
2.	Ali, A. D. S. A. Z., & Al-Harbi, Artificial Intelligence in Customer Service: A Study of Chatbot, Journal of Business Research -2021	Highlights the efficiency improvements in customer service . Discusses various AI techniques enhancing customer satisfaction.	Primarily theoretical with limited case studies . May not cover all industry-specific applications.

Literature Review

Sl.no	Title/Author/publisher	Advantages	limitations
3.	Hu, J. P., & Chen, C. T, Design and Implementation of a Customer Support Chatbot Using Machine Learning , IEEE Access-2020	Provides a practical implementation framework , Compares performance metrics with traditional systems.	Focus on a single implementation context may limit generalizability, Potential scalability issues not fully addressed.
4.	Asad, M. A. O., & Ali, Enhancing Customer Experience with Chatbot Systems: A Machine Learning Perspective, Journal of Customer Service-2022	Explores user experience improvements through ML-driven chatbots , Includes empirical case studies with quantitative results.	Limited by the sample size of case studies , May not address multilingual or culturally specific challenges.
5.	Sharma, T. R. S. S. J. A., & Gupta, R. K, A Comparative Study of Chatbot Systems for Customer Support, Computers in Human Behavior-2023	Provides a comparative analysis of various chatbot systems . Evaluates effectiveness based on user queries and responses.	Comparisons may be influenced by varying evaluation criteria . Focused on a narrow range of chatbot technologies.

Existing method Drawback

- Limited Understanding: Chatbots are a handy tool to help with easy queries, but with more complex tasks, there may be the need for human intervention.

- Maintenance and Updates: Chatbots require ongoing maintenance and updates to remain effective and up-to-date.

- Predefined Scripts: Many chatbots have predefined scripts or decision trees, limiting their flexibility and adaptability, so if the query lies outside of this, there may be the need for a customer service assistant to help. Nevertheless, there are some tools to help widen conversations so that they aren't as stringent, and this will improve as technology does.

Objectives

- Automate Customer Interactions
- Improve Response Accuracy
- Enhance User Experience
- Learn from Interactions
- Scalability
- User Feedback Loop

Methodology/Modules

The Proposed method consists of the following steps:

- Step-1: Customer Query/Request: Customer types the phrase in the chatbox.
- Step-2: Chatbot: It packs the data and responds to the customer and the phrase sent to ML-NLP engine (ML-NLP).
- Step-3: Machine Learning NLP engine (ML-NLP): Extracted user intent and entities sent back to chatbot.
- Step-4: Data Query Search Engine: Chatbot based on intent call upon services using entity information to find data from database. And data is returned to the chatbot

Architecture
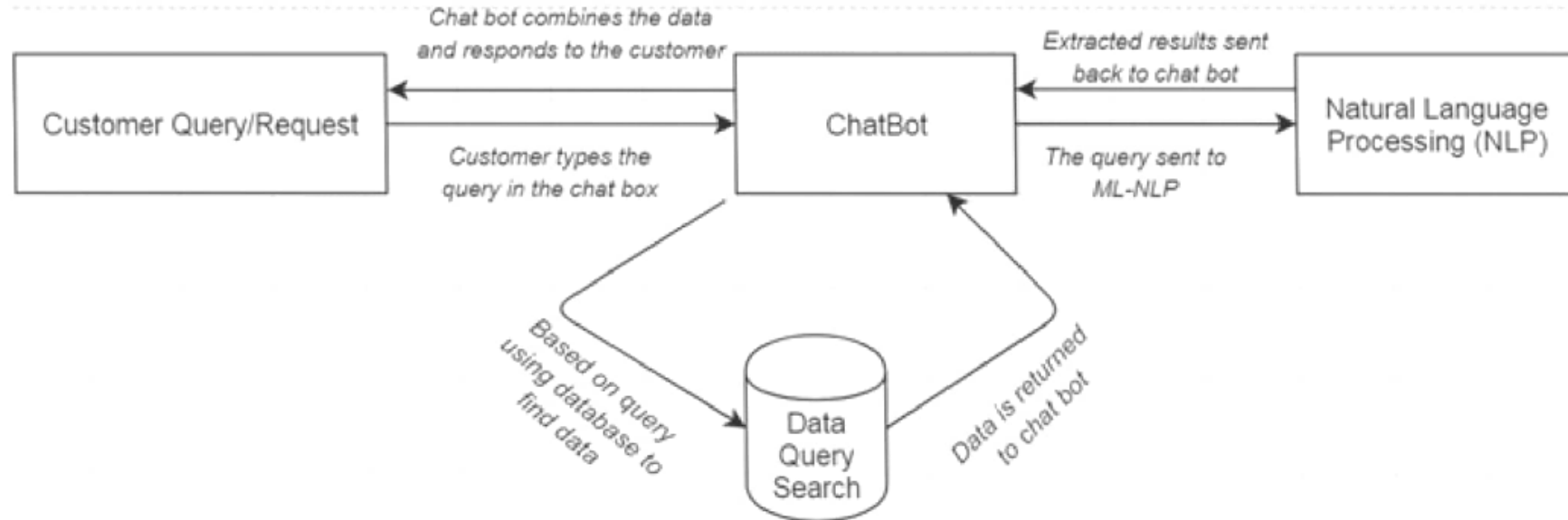
Hardware/software components

- Windows OS, Visual Studio, Html, CSS, Java Script for fronted.
- Python ML Algorithms-NLP for backend.
- SQL Database for storing the Queries.
- Central Processing Unit (CPU), RAM (Memory), Storage (SSD), Network
  Interface Card (NIC)

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Flask Application for Chatbot Query Management

Initialize Flask Application

Import necessary modules (Flask, sqlite3, etc.).

Create an app instance.

Database Setup

Define DB_PATH for the database file.

Create helper functions:

get_db_connection: Opens a SQLite connection with row factory for easier data manipulation.

query_db: Executes queries with optional arguments and commits changes.

Routes and Functionality

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Homepage (/)

Render the index.html template.

Get Chatbot Response (/get-response)

Accepts a user query (POST request, JSON format).

Searches the database table Solutions for an answer matching the query.

If match found:

Return the answer as a JSON response.

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If no match found:

Log the query to the Queries table with status Pending.

Return a generic "Your query has been logged" message.

View Pending Queries (/view-pending-queries)
Fetches all queries with Pending status from the Queries table.

If pending queries exist:

Return them as a JSON list of dictionaries (e.g., id, query).

If no queries are found:

Return a message saying "No pending queries."

Respond to a Query (/respond-to-query)

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Accepts query ID and response as JSON input (POST request).

Validations: Ensure both query_id and response are provided.

Updates the Queries table:
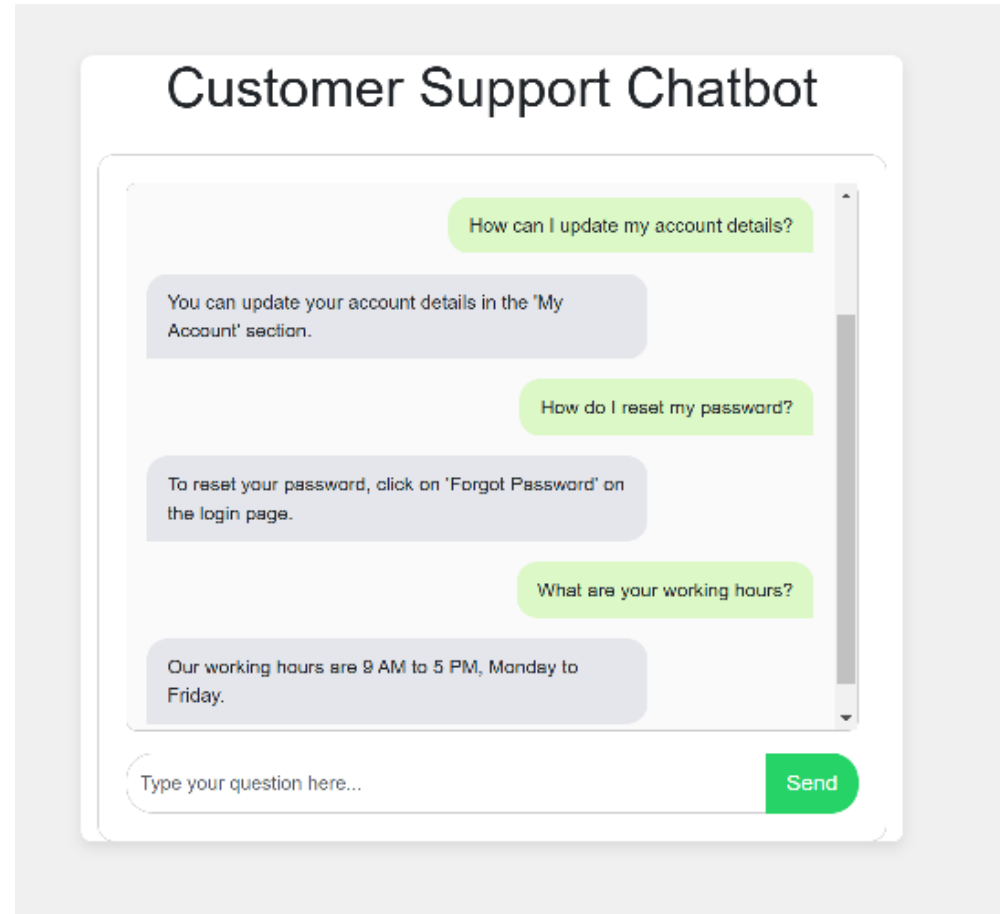
Set status to Answered.

Save the provided response.

Return success message upon completion.

Run the App

Launch the Flask application with debugging enabled.

FUTURE TRENDS IN CHATBOT TECHNOLOGY

- **Advancements in Natural Language Processing (NLP)**
  - **Contextual Understanding**: Future chatbots will better understand context over long conversations, interpreting nuances, tone, and intent more effectively.
  - **Multilingual Capabilities**: Chatbots will be able to converse fluently in multiple languages, making global customer support more seamless.
- **Emotion Detection and Sentiment Analysis**
  - **Empathetic Chatbots**: By detecting customer emotions through text or voice, chatbots will adapt their tone and responses, providing more personalized and empathetic interactions.
  - **Sentiment-Driven Responses**: Chatbots will adjust responses based on the detected sentiment (e.g., happy, frustrated, neutral) to improve user experience.
- **Voice-Activated Chatbots**
  - **Integration with Voice Assistants**: Voice-driven customer support is growing, and chatbots will increasingly be integrated with platforms like Alexa, Google Assistant, and Siri for hands-free interaction.
  - **Voice Recognition**: Voice-enabled chatbots will become more accurate in recognizing accents, dialects, and speech patterns for better customer interaction.

FUTURE TRENDS IN CHATBOT TECHNOLOGY

- **Self-Learning and Adaptive AI**
  - **Continuous Improvement**: Future chatbots will use reinforcement learning to autonomously improve over time, learning from interactions without requiring manual retraining.
  - **Dynamic Knowledge Bases**: Chatbots will be able to self-update their knowledge base from customer interactions, ensuring they stay relevant and accurate.
- **Augmented Reality (AR) Integration**
  - **Visual Assistance**: Chatbots integrated with AR will help customers visualize solutions or products, providing a more interactive and informative customer support experience.
  - **Virtual Support Agents**: Customers could interact with virtual avatars of support agents for more engaging assistance in troubleshooting or product guidance.
- **Proactive Chatbots**
  - **Predictive Assistance**: Future chatbots will proactively reach out to customers based on predictive models, such as reminding them about issues, offering solutions before customers ask, or notifying them of new offers/products.
  - **Proactive Customer Engagement**: Using historical data and patterns, chatbots could anticipate customer needs, enhancing overall satisfaction and reducing response times.

Timeline of Project
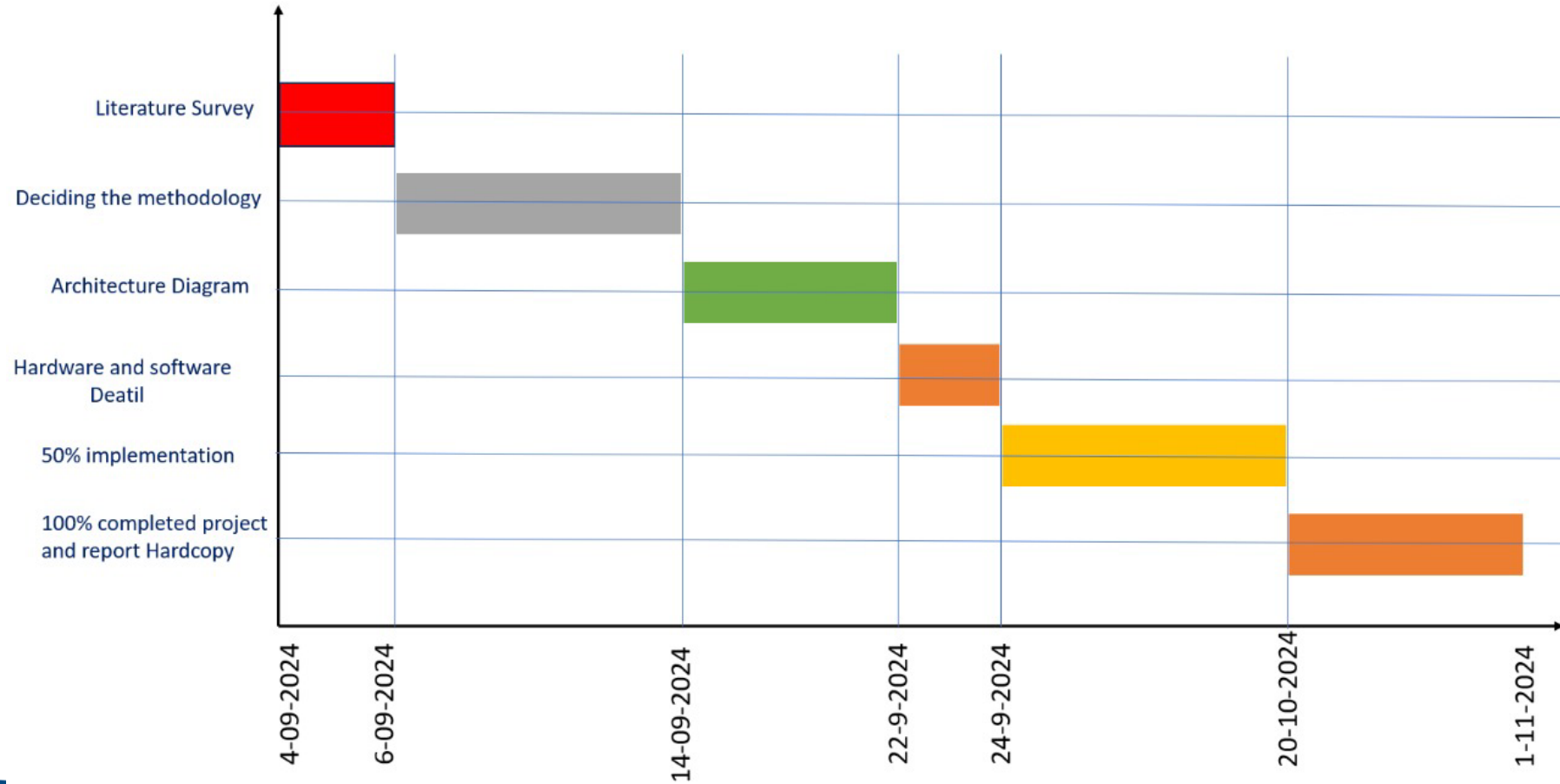
Expected Outcomes

- Efficient Automation of Customer Service

- Text inputs will be used by the chatbot to respond to queries.Smooth User Interface Accurate

- Comprehension of user inquiries is ensured by Natural Language Processing (NLP).Customer satisfaction is increased by prompt responses and effective data retrieval . Feedback-Based Continuous Improvement

- By gathering user input, the chatbot will guarantee frequent updates and increased precision . As new data becomes available, machine learning models will change over time . Greater Accessibility

- For small and medium-sized businesses, the chatbot will be an affordable option . Using text, speech, input will boost user engagement for a variety of people.

Conclusion

- The contribution is the development of a customer support chatbot using machine learning (ML) and natural language processing (NLP) in Python. While there are various chatbots available—both rule-based and self-learning—many are underutilized in the customer service domain. Rule-based chatbots tend to be rigid and struggle to comprehend the nuances of customer inquiries, such as context or slang. In contrast, self-learning chatbots utilize ML and NLP to understand and respond to diverse queries more effectively. This adaptability not only allows for immediate access to information but also enhances user satisfaction by providing personalized interactions. Moreover, these chatbots can operate around the clock, reducing wait times and freeing human agents to tackle more complex issues

Github Link

The Github link provided should have public access permission.

Github Link:

https://github.com/KIRAN0382/Chatbot.git

References

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Project work mapping with SDG

The Project work carried out here is mapped to SDG-9

industry,innovation and infrastructure:
A chatbot can enhance business operations
and customer service efficiency through innovation.

Analysis and Classification of Blood Cancer using Protein Sequences

The Project work carried out here is mapped to SDG-3 Good Health and Well-Being.

The project work carried here contributes to the well-being of the human society. This can be used for Analyzing and detecting blood cancer in the early stages so that the required medication can be started early to avoid further consequences which might result in mortality.

Thank You