International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 12 | Dec 2023 www.irjet.net p-ISSN: 2395-0072

CUSTOMER SUPPORT CHATBOT WITH MACHINE LEARNING

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Abstract

This project creates a modern customer service chatbot with a unique "speak aloud" feature that makes it different from other chatbots that only interact with users through text. Our chatbot, driven by machine learning, answers the world's problems with customer engagement by efficiently translating spoken inquiries. In addition to text messaging, the UI is enhanced with several features in one chatbot, such as a microphone for voice input, an image-to-text converter, and a quick copy feature. This novel approach seeks to provide fast, easy, and adaptable answers to consumer questions, changing how customer service is provided by taking a thorough and formally organized approach.

Keywords Chatbot · Query · Machine learning · Natural language processing · Artificial intelligence · Flask · Mistral

1 Introduction

1.1 Chatbot

Chatbots are software programs created explicitly for textual or spoken conversation. These apps frequently act as virtual assistants or companions by trying to mimic human behavior. Although passing the Turing test has always been the goal, reaching this level of sophistication in 2023 will still be difficult.

Chatbots are helpful in dialogue systems, especially for customer service and information retrieval. Many use Natural Language Processing (NLP) methods; however, more basic versions frequently rely on pattern recognition or keyword matching in the input data.

Three main categories arise in chatbot development:

1. Rule-based chatbots
2. Retrieval-based chatbots
3. Autonomous and self-learning chatbots:

Each kind, present and future, extends the variety of conversational agents on the market in 2023 by adding new features and functionalities.

1.2 Machine Learning

Machine learning is a subfield of AI concerned with creating models and algorithms that computers may use to learn from data and improve at a particular task without human intervention. One of the main goals of machine learning is to teach computers to learn from their own experiences and make predictions and behavioral adaptations accordingly.

Machine learning is categorized as follows:

1. **Supervised Learning:** Algorithms acquire knowledge through labeled data, similar to students learning from responses. (For instance, detecting if an email is a spam or not)
2. **Unsupervised Learning:** The algorithm finds patterns in the unlabeled data, much like they would while exploring a forest. (Grouping clients according to their buying patterns, for example)

3. **Reinforcement Learning:** Algorithms use feedback and rewards to create decisions, much like when learning to play a game. (For instance, teaching AI to play chess)

Machine Learning's Powerful Branches:

- **Natural language processing:** NLP enables chatbots, virtual assistants, and translation services by helping machines comprehend and produce human language.
- **Computer vision:** Gives machines the tools they need to comprehend and evaluate visual data, transform facial and image recognition, and operate autonomous cars.

1.3 Large Language Model (LLM)

Large language models (LLMs) are cutting-edge AI programs, making technologies more exciting. These models, trained on enormous volumes of text, are capable of data analysis, creative content generation, language translation, and natural language understanding. Consider being able to ask questions, compose poetry, and assist with code with a virtual assistant. LLMs have a lot of potential, but they are still in their youth. They promise to completely transform how we engage with technology, acquire knowledge, and engage in creative expression.

Mistral is an incredible open-source LLM that shatters expectations with its 7-billion-parameter capability. It is a flexible tool for many applications due to its remarkable performance, fluid code generation and translation, and skill at managing complex information. Mistral unleashes individuals' and organizations' creative, innovative, and problem-solving capabilities by combining user-friendly features like pre-built infrastructure and customizability. Accept Mistral and discover the revolutionary potential of human-computer interaction.

2 Related works

The most broadly utilized chatbots in logical talk are those from Point and Facebook; since their commencement, various visit applications have been created to banter with clients. Repel, which was made in 1972, is the most renowned model. It filled the role of a guide in 1966.

Various chatbots have been made utilizing different stages and thoughts. Albeit conversational specialists are turning out to be increasingly well known, their usefulness actually should be gotten to the next level. With regards to the client assistance situation, my chatbot is critical. It is accessible for work area and PC use and offers UIs for addressing purchaser questions associated with our chatbot. Most chatbots follow three execution systems. The first chatbot at any point utilized a standard based framework; it asks clients inquiries in view of if and else explanations and gives a bunch of replies. The up and coming age of chatbots utilizes recovery based methods, in which a dataset is given as passages or purposes, and normal language handling (NLP) is used to understand the client's inquiries. The third kind is a self-learning bot, which utilizes profoundly progressed calculations, man-made intelligence, ML approaches, and client contribution to gain from clients' inquiries and give important answers. A couple of examples of self-learning bots are Watson, Cortana, Alexa, Natasha, and Siri. The essential disadvantage of rule-based models is their outrageous vestige, unsatisfactoriness for client assistance assignments, and improved probability of not getting the ideal reaction to your inquiry. Since self-learning bots, like information researchers and experts, require a high expertise level, and their improvement requires years, they are just at times utilized in client support situations.

Just huge organizations like Google, Amazon, Apple, Adobe, IBM, etc use them for every one of the reasons referenced previously. We require a client care chatbot that can be used by medium-sized and little associations the same.

3 Proposed methodology

It is the most common way of carrying out the proposed approach for the chatbot. It additionally shows the way things are carried out and obtains the normal results of the model. In this cycle, we see the application's handling pathways and the progression of course of data sources, results, and handling bearings of the application.

Implementation Steps:

1. User Engagement: The customer begins the interaction by typing a question or message into the text interface of the chatbot or by speaking their inquiry out loud. The input can also be provided in the form of images with text.

2. Intent Recognition: Using a Naive Bayes technique, a machine learning engine trained on a dataset of customer service encounters user questions, extracts key phrases to detect their purpose, and tags them into predefined groupings.

3. Response Generation: After determining the user's intent, the chatbot uses a fine-tuned Ollama model built on the Mistral framework to create a natural and informative response that addresses the individual query and user demands.

4. Data Retrieval (Optional): The chatbot seamlessly interacts with a connected database if the generated response requires specific information not immediately available within the model's knowledge base. Utilizing keywords and parameters extracted from the user's query, it retrieves relevant data from the appropriate source, ensuring a comprehensive and informative response. For instance, an order inquiry might trigger the retrieval of specific order details based on the provided order number, enhancing the user's experience and addressing their needs efficiently.

5. Response Delivery: The chatbot seamlessly merges the generated response with any retrieved data. It presents it clearly and concisely within the chat interface, ensuring a comprehensive and informative response that effectively addresses the user's initial query.

6. Continuous Learning: The chatbot empowers users to share feedback through ratings, reports, or suggestions, which forms the foundation for continuous improvement. Analyzed feedback fuels refining the ML model's training data, adjusting response generation parameters, and optimizing data retrieval processes, ultimately enhancing the chatbot's effectiveness and ensuring user satisfaction.

The idea of the chatbot is shown in this figure:

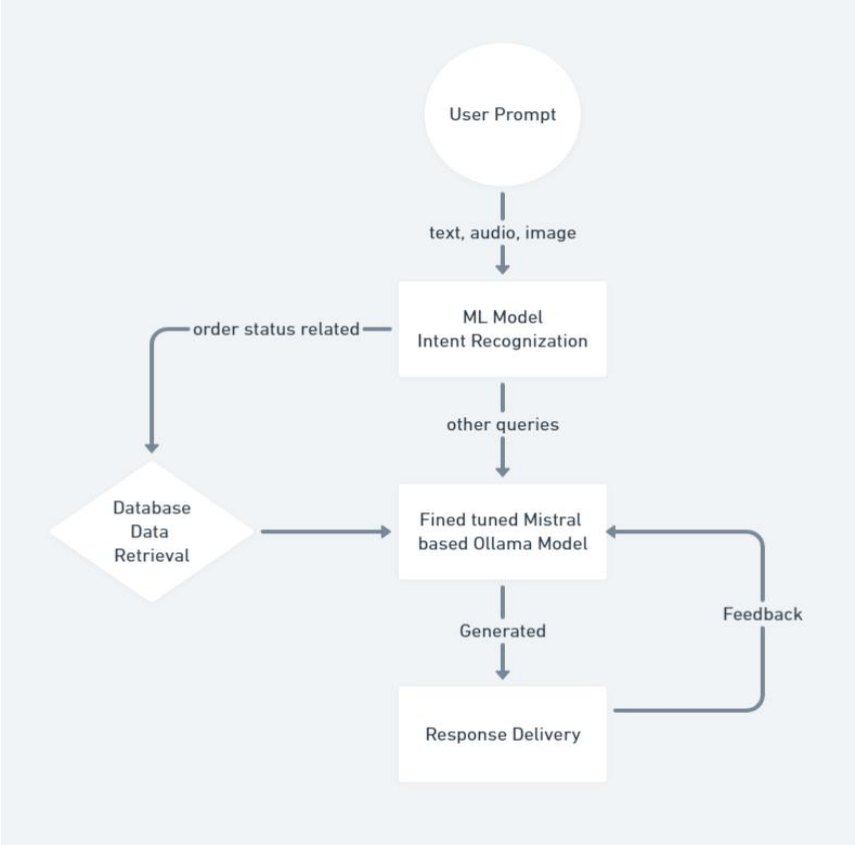

Fig.1 Proposed idea/approach

4 Prototype

Machine Learning Algoritm

```
from sklearn.naive_bayes import MultinomialNB
from sklearn.pipeline import Pipeline
from sklearn.feature_extraction.text import TfidfVectorizer, ENGLISH_STOP_WORDS

model = Pipeline(steps=[('tfidf', TfidfVectorizer(
                                max_features=1000,
stop_words=list(ENGLISH_STOP_WORDS),
                                preprocessor=str.lower)),
                ('model', MultinomialNB())])

model.fit(X_train, y_train)
y_pred = model.predict(X_test_tfidf)

print("Accuracy:", accuracy_score(y_test, y_pred))
new_query = ["How do I cancel my order?"]
prediction = model.predict(new_query_tfidf)
print("Predicted Intent:", prediction)
```

LLM (Finetuned Mistral Model)

```
import requests
import json

message = "message here"
body = {
  "model": "ThinkBot",
  "prompt": message,
  "stream": False
}

json_body = json.dumps(body)
url = "https://ollamalocalhost:port/api/generate"
headers = {"Content-Type": "application/json"}
res = requests.post(url, headers=headers, data=json_body)

decoded_response = res.json()
response_content = decoded_response
print(response_content)
```

The prototype for the login page is shown in Fig. 2.

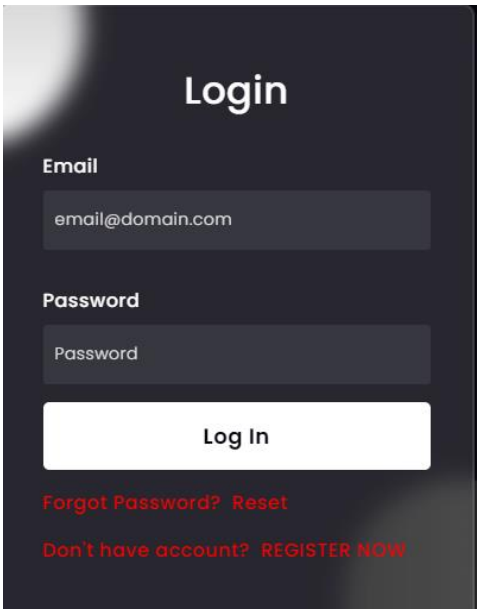

Fig.2 Prototype for Login

The prototype for the chatbot dashboard is shown in Fig. 2.

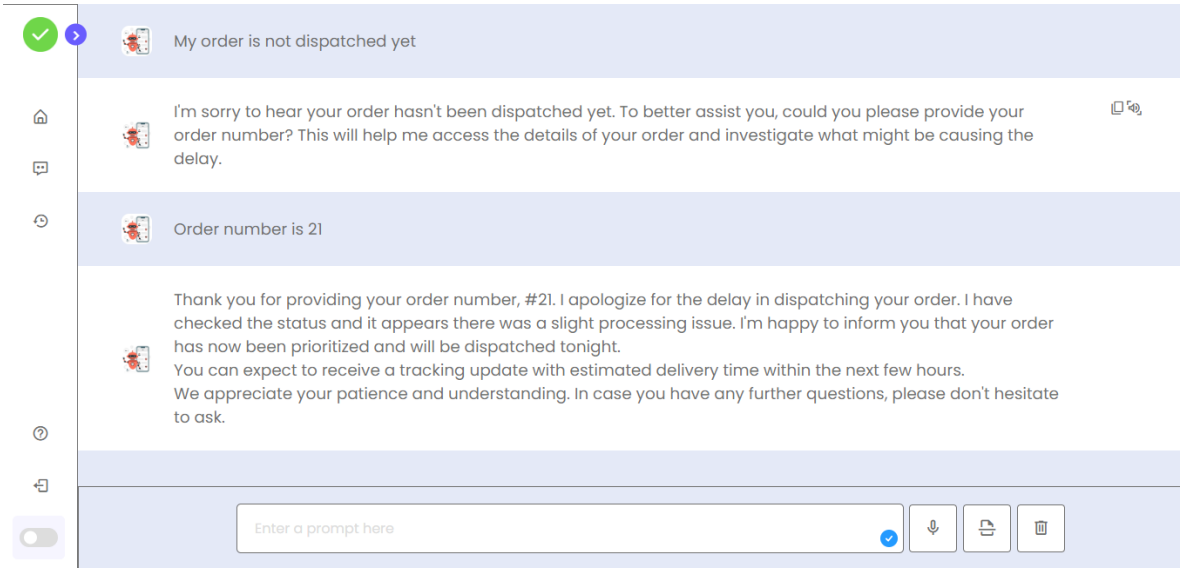

Fig.3 Prototype for Chat Dashboard

5 Conclusion and Future Work

In conclusion, our machine learning (ML) powered chatbot for customer service is an entirely new way to improve customer relationships. Our chatbot is unique because it includes a "speak aloud" capability that facilitates conversation through spoken queries. Combining Language Model (LM) methods with Machine Learning (ML)-based models guarantees a precise and flexible system that will understand a wide range of user inputs. The user interface is improved by integrating many input methods, such as speech and image, and a quick copy capability, which offers a thorough and effective solution. The use of an all-auth login mechanism further ensures security and individualized interactions. Additionally, future upgrades might center on making the ML models even more precise and enhancing the chatbot's functionality to incorporate more features and support for more languages. With the help of this project, customer service will enter a new era where cutting-edge technology will revolutionize the user experience.

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