Customer Support Chat bot with ML

A PROJECT REPORT

Submitted by,

Ms. Siri H G - 20211CAI0065
Mr. Pavan S Reddy - 20211CAI0147
Ms. E Bhavani - 20211CAI0076
Ms. S Sanjana - 20211CAI0064
Ms. Moulya H M - 20211CAI0175

Under the guidance of,

Dr. Swati Sharma

in partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING (Artificial Intelligence and Machine Learning)
At

PRESIDENCY UNIVERSITY

BENGALURU

DECEMBER 2024

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"Customer Support Chat Bot with ML"** being submitted by "Siri H G, Pavan S Reddy, E Bhavani, S Sanjana, Moulya H M" bearing roll number(s) "20211CAI0065, 20211CAI0147, 20211CAI0076, 20211CAI0064, 20211CAI0175" in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science and Engineering is a bonafide work carried out under my supervision.

Dr. Swati Sharma
Associate Professor - Selection Grade
School of CSE
Presidency University

Dr. Zafar Ali Khan N
Associate Professor - Selection Grade & HOD
School of CSE & IS
Presidency University

Dr. L. SHAKKEERA
Associate Dean
School of CSE
Presidency University

Dr. MYDHILI NAIR
Associate Dean
School of CSE
Presidency University

Dr. SAMEERUDDIN KHAN
Pro-Vc School of Engineering
Dean -School of CSE & IS
Presidency University

PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **Customer Support Chat bot with ML** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Computer Science and Engineering(Artificial Intelligence and Machine Learning)**, is a record of our own investigations carried under the guidance of **DR. Swati Sharma, Associate Professor - Selection Grade, School of Computer Science Engineering & Information Science, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

Name(s), Roll No(s) and Signature(s)
of the Students

ABSTRACT

Conversation automation has been revolutionized by the rapid advancements in Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP). One notable invention in this regard is chatbots. These systems, which provide scalable, affordable solutions to improve user engagement and streamline operations, have found appeal in a variety of industries, including social networking, e-commerce, healthcare, and customer service.

From conventional rule-based systems to cutting-edge deep learning and transfer learning models, this paper examines the developments in chatbot creation. The ability of chatbots to analyze natural language inputs, comprehend human emotions, and offer contextually relevant responses has improved thanks to techniques like sentiment analysis, sarcasm identification, and intent recognition. Building efficient systems still requires overcoming obstacles like creating meaningful, sympathetic, and fluid conversations.

With the use of advanced techniques like neural networks, transformers, and Natural Language Understanding (NLU), chatbots are becoming more and more able to provide tailored and flexible interactions. By incorporating external information sources like databases, customer history, and frequently asked questions, response capabilities are further enhanced and reliance on human interaction for routine inquiries is decreased. Nonetheless, intricate and subtle discussions continue to draw attention to chatbot autonomy's shortcomings.

Beyond automating repetitive tasks, chatbots can also be used to improve customer satisfaction. Research indicates that when chatbots are used in addition to traditional help channels, user satisfaction, efficiency, and response all increase. Notwithstanding progress, there are still large gaps in conversational complexity, sarcasm comprehension, and processing confusing inputs, suggesting that there is still much need for further study and development.

Insights into the revolutionary effects of chatbot technology across industries are provided by this paper's thorough examination of existing trends, technological difficulties, and potential. Future chatbots have the potential to transform how people and businesses communicate in the digital age by bridging the gap between human-like conversational capabilities and current limits.

ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Pro-VC, School of Engineering and Dean, School of Computer Science Engineering & Information Science, Presidency University for getting us permission to undergo the project.

We express our heartfelt gratitude to our beloved Associate Deans **Dr. Shakkeera L and Dr. Mydhili Nair,** School of Computer Science Engineering & Information Science, Presidency University, and Dr. Zafar Ali Khan N, Head of the Department, School of Computer Science Engineering & Information Science, Presidency University, for rendering timely help in completing this project successfully.

We are greatly indebted to our guide **Dr. Swati Sharma, Associate Professor-Selection Grade** and Reviewer **Dr.Murali Parameswaran, Professor**, School of Computer Science Engineering & Information Science, Presidency University for his/her inspirational guidance, and valuable suggestions and for providing us a chance to express our technical capabilities in every respect for the completion of the project work.

We would like to convey our gratitude and heartfelt thanks to the PIP2001 Capstone Project Coordinators **Dr. Sampath A K, Dr. Abdul Khadar A and Mr. Md Zia Ur Rahman,** department Project Coordinators **Dr. Afroz Pasha** and Git hub coordinator **Mr. Muthuraj.**

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

Siri H G(1)

Pavan S Reddy(2)

E Bhavani (3)

Moulya H M (4)

S Sanjana (5)

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CHAPTER-1
INTRODUCTION

Chatbots are now widely used in customer care systems due to the rapid improvements in Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP). These AI-powered technologies provide scalable, effective, and economical solutions that lower operating expenses while simultaneously enhancing client interaction. Chatbots are able to comprehend consumer inquiries, respond right away, and learn from exchanges to give increasingly individualized experiences over time. Chatbots are becoming more and more recognized as vital tools for improving customer service across a range of businesses as customer expectations for prompt, personalized service continue to rise [1][8].The need for intelligent, responsive support systems has resulted in the growing adoption of AI-based chatbots in a number of industries, including e-commerce, healthcare, and customer service, as customer expectations shift towards more seamless, real-time interactions [5].

1.1. The Development of NLP, ML, and AI in Customer Service

Modern chatbot technology now relies heavily on AI, ML, and NLP to parse natural language, comprehend human intent, and produce insightful responses. Machine learning enables chatbots to modify and enhance their responses over time in reaction to past interactions, making help more effective and individualized.These technologies enable chatbots to respond to increasingly sophisticated queries and offer quicker, more accurate advice [1][8].

1.1.1 NLP for Language Understanding: NLP makes chatbots more adaptable by enabling them to analyze and comprehend a variety of user inputs, such as complicated sentences, mistakes, and slang [1].

1.1.2 Personalization with Machine Learning: Machine learning (ML) allows chatbots to identify user preferences and tailor interactions based on previous exchanges, enhancing the overall customer experience.

1.2. From Rule-Based Frameworks to Complex Machine Learning Frameworks

Rule-based systems that adhered to pre-written scripts and decision trees served as the foundation for early chatbots. These systems were straightforward and easy to set up, but they were rigid and had trouble handling more complicated inquiries. On the other hand, contemporary chatbots now use deep learning models, such as neural networks and transformers, which enable them to comprehend context, adjust to various conversational flows, and deliver more dynamic and pertinent answers. Chatbots are now much smarter and able to have meaningful, context-sensitive conversations thanks to the transition from rule-based systems to sophisticated machine learning models [2][4].

1.2.1. Rule-Based Chatbots' Drawbacks: Early chatbots could not handle dynamic discussions since they could only respond with simple, pre-programmed responses [2].

1.2.2. Deep Learning in Chatbots: Neural networks and transformer models enable chatbots to analyze intricate linguistic patterns, comprehend conversational context, and deliver more coherent responses [4].

1.3 Enhancing User Experience with Advanced ML Techniques

The user experience with chatbots has significantly enhanced with the integration of sentiment analysis and context recognition. Chatbots can identify emotional indicators in a customer's communication, like dissatisfaction or contentment, thanks to sentiment analysis. They can then modify their responses to offer more pertinent and sympathetic assistance. Chatbots can track ongoing discussions and retain coherence over numerous contacts thanks to context recognition, which is very helpful for managing lengthy customer service issues or multi-step assistance requests. These features improve the chatbot's capacity to have more organic, human-like discussions [5][10].

1.3.1. Sentiment Analysis for Empathy: Chatbots that have sentiment analysis capabilities are able to identify the emotional tone of a consumer and modify their responses to increase satisfaction [5].

1.3.2. Context Awareness: By understanding and remembering the context of a conversation, chatbots can offer more accurate and timely responses, enhancing the overall support experience [3].

CHAPTER-2
LITERATURE SURVEY

From basic rule-based systems to more complex conversational models, chatbots have experienced substantial progress. This change has made it possible for chatbots to converse with users in a more meaningful and context-sensitive manner. Understanding chatbot features, taxonomy, NLP communication, system development, training, maintenance, and guaranteeing strong security are only a few of the crucial elements involved in the design, development, and ongoing enhancement of chatbots.

2.1. Chatbot characteristics

Compared to older systems, chatbots nowadays are far smarter and can provide more context-sensitive, tailored conversations. Among their traits are:

2.1.1. Context Awareness: By preserving context throughout discussions, contemporary chatbots can make interactions seem organic and cohesive [2][6].

2.1.2. Personalization: More sophisticated chatbots can provide more individualized responses by adjusting to users' preferences and past exchanges [3][5].

2.1.3. Multimodal Communication: To improve user interactions, many chatbots are built to process inputs other than text, such as voice and graphics [4][7].

These capabilities are made possible by the combination of machine learning models and natural language processing (NLP), which aid chatbots in comprehending and correctly answering user inquiries

.2.2. Chatbot Taxonomy

Based on how they work, chatbots can be divided into a number of categories:

2.2.1. Task-oriented chatbots: These bots are made to perform particular activities, including scheduling appointments, offering customer service, or responding to factual inquiries. In order to comprehend users' needs, they are frequently based on intent recognition technologies[1][6].

2.2.2. Conversational Chatbots: These chatbots can carry on meaningful conversations and participate in more open-ended discussions. To generate contextually relevant replies,

they frequently rely on generative models [4][5].

2.2.3.General-Purpose v/s Domain-Specific Chatbots: While general-purpose chatbots may handle a variety of topics and are more adaptable in processing different requests, domain-specific chatbots are designed for particular businesses, such as healthcare or finance [3] [7].

2.3. Interaction Making Use of Chatbots and NLP

For chatbots to comprehend and process human conversation, natural language processing, or NLP, is essential. The following are the main NLP strategies that facilitate chatbot functionality:

2.3.1.Intent recognition : By classifying user input into predetermined categories, intent recognition enables the chatbot to comprehend the user's intentions. Models of supervised learning are frequently used to do this[2][6].

2.3.2. Entity Recognition: To enable the chatbot to provide accurate responses, natural language processing (NLP) models assist in extracting relevant entities (such as dates, locations, and goods) from user input [3][5].

2.3.3.Dialogue Management: By controlling context and ensuring consistent interactions throughout the conversation, effective dialogue management guarantees that the chatbot can manage multi-turn conversations [5][7].

2.4. Development of Chatbot Systems

2.4.1. Data collection: Huge user interaction datasets are necessary for efficient chatbot training. These datasets assist chatbots in identifying user behavior patterns and enhancing response generation [1][3].

2.4.2. Model Selection: When developing a chatbot, the model selection is crucial. More complex generative models, such as transformer models, are frequently needed for sophisticated chatbots, whereas simple models could be adequate for simple task-oriented bots. [2][6].

2.4.3. Training and Evaluation: To assist chatbot models in identifying intentions and producing pertinent responses, labeled datasets are supplied to them during the training phase. The performance of the chatbot is evaluated using criteria like accuracy and precision [4][5].

2.5. Training and Maintenance

For chatbots to remain useful and relevant, training and ongoing development are crucial. Training for chatbots can be divided into:

2.5.1. Supervised Learning: Input-output pairings are used to educate the system how to identify user intent and respond appropriately during the initial training phase of a chatbot, which is based on labeled data[2][5].

2.5.2. Reinforcement Learning: After deployment, chatbots can keep getting better by using user input and interactions to learn how to respond best [6][7].

2.5.3. Retraining: Consistently retraining chatbots with fresh data keeps them abreast of new developments or changes in user behavior, preserving their precision and applicability over time [3].[5].

2.5.4.Personalization: By learning from user history and preferences, chatbots can also adjust over time to provide more individualized experiences [4][6].

2.6. Security in the Creation of Chatbots

Since chatbots handle sensitive data, security is a major consideration in their development. To guarantee secure chatbot systems, several techniques are used:

2.6.1. Anomaly Detection: By examining trends, machine learning algorithms can assist in identifying odd behavior or security breaches, such spam or fraudulent activities by analyzing patterns in user interactions [6][7].

2.6.2. Phishing and Fraud Prevention: By seeing questionable language or actions suggestive of frauds, chatbots can be trained to identify and warn phishing attempts. [4][6].

2.6.3. Data privacy: It is essential to make sure that users' private information is safeguarded. Sensitive information is kept secret and complies with data protection laws thanks to advanced security measures including encryption and secure transfer [5].[7].

2.6.4. Authentication: To guarantee that only authorized users can access sensitive data, certain chatbots employ behavioral or biometric authentication techniques, such speech recognition [3].[6].

CHAPTER-3
RESEARCH GAPS OF EXISTING METHOD

Even while chatbots are now an essential tool for automating consumer interactions, there are still a number of issues with current systems. These gaps show the obstacles that must be overcome in order to develop a successful machine learning-powered customer support chatbot.

- **Contextual Understanding:** Many chatbots have trouble keeping context and having multi-turn discussions, which results in responses that are either irrelevant or erroneous [2][4]. While most models perform well with pre-formulated queries, they are not adaptable enough for dynamic, open-ended interactions.

- **Multilingual handle:** Because existing chatbots frequently only speak a single language, it might be challenging to handle a wide range of international audiences. [3] [5].

- **Managing Ambiguity:** Frequently, current models are unable to adequately handle ambiguous or confusing inputs, which results in irritation or generic replies. [1] [7].

- **Dependency on Predefined Data:** The long-term efficacy of many chatbots is limited by their reliance on static data and regular retraining to adjust to new information [6][8].

- **Security Issues:** Many systems lack strong security mechanisms to preserve privacy and stop data breaches, making handling sensitive user data a crucial problem[1] [8].

- **Emotional Intelligence:** The majority of chatbots lack the capacity to recognize and react to human emotions, which is crucial for providing sympathetic customer service [3][9].

- **Scalability Problems:** Many existing systems are unable to handle large quantities of simultaneous interactions, which might impair performance during periods of high

usage [7][10].

- **Domain Expertise:** Rather of offering specialized, expert support, chatbots frequently provide generic responses since they lack in-depth understanding of particular fields [4][9].

In order to develop more effective and user-friendly customer service chatbots, these gaps underscore the necessity for advancements in contextual awareness, adaptability, security, and emotional understanding.

CHAPTER-4

PROPOSED METHODOLOGY

This methodology serves as a roadmap, guiding each phase of the project from start to finish. It encompasses all necessary steps required to design, develop, test, and deploy the chatbot, ensuring that all project objectives are met.

- **Data Collection:** In this step, information pertinent to customer service interactions is gathered. Customer inquiries, customer support representatives' answers, comments, and other conversational data sources may be included.
- **Data preprocessing :** Data preprocessing is necessary because raw data is typically untidy. Preprocessing procedures are required, such as eliminating superfluous material, fixing mistakes, and transforming the text into a format that machine learning algorithms can comprehend.
- **Model Selection and Training:** This stage involves choosing and training machine learning models (such as sequence-to-sequence or classification models) using the prepared data. Teaching the model to identify consumer intents and provide pertinent responses is known as training.
- **NLP:** Human language is processed and understood through the application of natural language processing (NLP) tools. This can include activities that enable the chatbot to comprehend the structure and meaning of the user's input, such as named entity recognition, tokenization, and part-of-speech tagging.
- **Intent Recognition:** The user's question must be understood by the chatbot. Usually, machine learning techniques are used for this, training the model to categorize queries into various groups or "intents" (such as account inquiries or password resets).
- **Response Generation:** The chatbot produces the relevant response after identifying the purpose. This could entail employing a dialogue management system to generate dynamic answers or retrieve predetermined responses.
- **Testing and Evaluation:** To make sure the chatbot can deliver precise and insightful answers, it is tested on real-world queries after it has been constructed. Optimizing the system to increase performance may also be part of this step.
- **Deployment and Monitoring:** The chatbot needs to be continuously monitored in order to adjust to new user behaviors and inquiries. Over time, it learns and provides better responses ,frequent updates and enhancements depending on user interactions.

CHAPTER-5

OBJECTIVES

5.1 Using ML to automate query resolution with accurate results

The chatbot system uses Natural Language Processing (NLP) and Machine Learning (ML) models, such as refined BERT, to accurately evaluate client complaints and inquiries, guaranteeing accurate intent classification and reducing misunderstandings. It looks up the best answers on its own using an organized TSV-based knowledge store, and it can handle a variety of questions thanks to fallback mechanisms like Scikit-learn classifiers. The chatbot utilizes generative AI models to produce pertinent responses dynamically in situations where established solutions are not accessible, ensuring smooth interactions. The system reduces the need for human interaction by automating query resolution, which greatly increases response time, precision, and client satisfaction. In order to facilitate the chatbot's ongoing adaptation and improvement, commonly asked inquiries and answered queries are also categorized and saved for quicker future retrieval. By combining automation, structured information management, and generative capabilities, the entire customer service process is streamlined, and the workload for human agents is decreased while consistent, real-time help is guaranteed.

5.2 Regular enhancement through scaling and feedback

By learning from unanswered questions, the self-improving mechanism built into the chatbot system increases its scalability and versatility. To guarantee prompt resolutions for clients, the chatbot forwards questions it is unable to answer to a human assistance representative. After resolving the issue, the chatbot records the exchange, adds the updated solution to the knowledge base, and gains the ability to handle related questions on its own in the future. The system can continuously adapt to user needs and inquiry trends thanks to this feedback loop. To make sure the knowledge base is complete and current, newly recorded solutions are verified and added to it after interaction logs are examined to find knowledge gaps. The accuracy and contextual comprehension of the chatbot are further improved via periodic modifications, such as upgrading the BERT model with labeled data and improving the Generative AI components. Over time, the chatbot's automation of this learning process lessens its dependency on human agents, leading to cost savings, better query resolution, and an improved customer experience.

CHAPTER-6

SYSTEM DESIGN & IMPLEMENTATION

By analyzing customer inquiries, using a knowledge base or generative AI to handle them, and elevating unsolved issues to human agents, the Customer Support Chatbot with Machine Learning is intended to offer users intelligent, scalable, and continually learning assistance. This system uses cutting-edge technology, such as Generative AI models, Scikit-learn classifiers, and BERT for fine-tuning, in addition to an organized knowledge repository in TSV format for effective data management. The system architecture and implementation are explained in full below.

6.1 An overview of architecture

The modular design of the chatbot combines multiple elements to provide reliable question processing, flexibility, and ongoing development:

- Interface for the front end:a chatbot interface that is easy to use and lets users communicate by texting or speaking commands.The interface manages the fundamentals of discussion and shows real-time responses.
- Backend Framework:BERT powers the Natural Language Processing (NLP) engine, which is in charge of comprehending consumer inquiries, determining intents, and deriving context.
- Knowledge Base: The main source of information for responding to questions is a structured TSV file that contains prepared query-response pairs.A refined transformer model is used by the generative AI component to provide dynamic answers to questions that are not addressed in the knowledge base.
- Fallback Mechanism: In situations where BERT's predictions are unclear, lightweight machine learning models built with Scikit-learn serve as a backup classifier.
- Escalation System: To guarantee that difficult situations are handled efficiently, unanswered questions are recorded and sent to human agents.
- Feedback and the Loop of Continuous Learning:Unresolved queries and other interaction logs are utilized to retrain models, refresh the knowledge base, and gradually increase answer accuracy.

6.2 Functional Components

- NLP Engine: Interprets the semantic value and intent of customer inquiries using a refined BERT model. provides a contextualized vector illustration of the query together with a confidence score for categorizing it into specified intents.

- Knowledge Base: A TSV file that has columns for intents, samples of queries, answers, and metadata (such as the frequency of queries) serves as a quick-access database for commonly asked questions and the answers to them.
- Generative AI: Responds to new or unstructured questions by producing contextually appropriate answers based on past exchanges between the customer and the agent. Dynamic and adaptable conversational skills are made possible by refined transformer models, like GPT.
- Human Escalation: A smooth procedure in which unanswered questions are recorded and sent to support personnel together with all pertinent background information following validation, human replies are added to the knowledge base.
- Feedback Mechanism: Encompasses a process of feedback to examine interaction logs, find problems, and improve the chatbot's functionality.

6.3 Implementation

Several complex components must cooperate in order to construct the Customer Support Chatbot using Machine Learning. Before being fed into a refined BERT model to determine intent and context, client inquiries first go through preprocessing, which includes text normalization and tokenization. Efficient matching to an organized TSV-based knowledge base is made possible by the BERT model, which distinguishes searches into intents with ratings of confidence after having been trained on specific to the domain labeled data. In order to provide prompt answers to often requested queries, this knowledge base saves metadata and predefined query-response pairings.

A Generative AI model uses conversational data to dynamically produce answers for unidentified inquiries, guaranteeing contextual relevance. Fallback Scikit-learn classifiers offer extra levels of classification accuracy when intent predictions are made with low confidence.

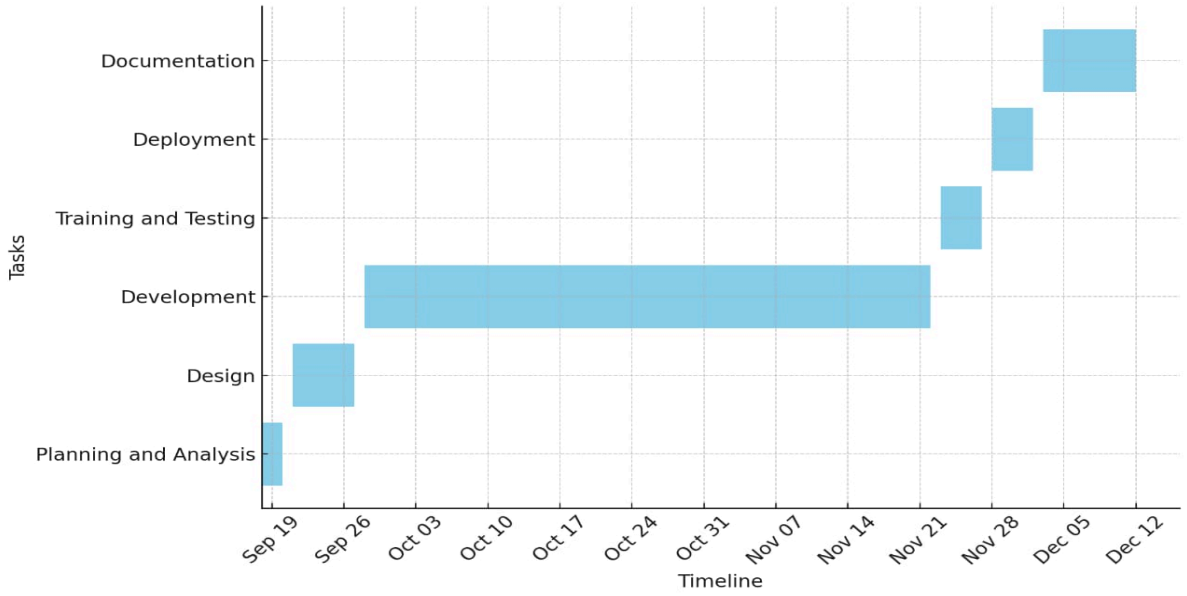
Unresolved questions are forwarded to human agents for resolution in order to improve adaptability, and the answers are recorded for incorporation into the knowledge base. Through model retraining, knowledge base extension, and interaction log analysis, continuous learning is accomplished, guaranteeing that the chatbot adapts to user demands. This solid implementation creates a clever and flexible customer assistance solution by

fusing scalable data management, sophisticated machine learning techniques, and a feedback mechanism. High accuracy, scalability, and an ever-improving ability to handle a variety of consumer queries are achieved by the chatbot through the integration of BERT, generative AI, and structured fallback mechanisms.

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)



CHAPTER-8

OUTCOMES

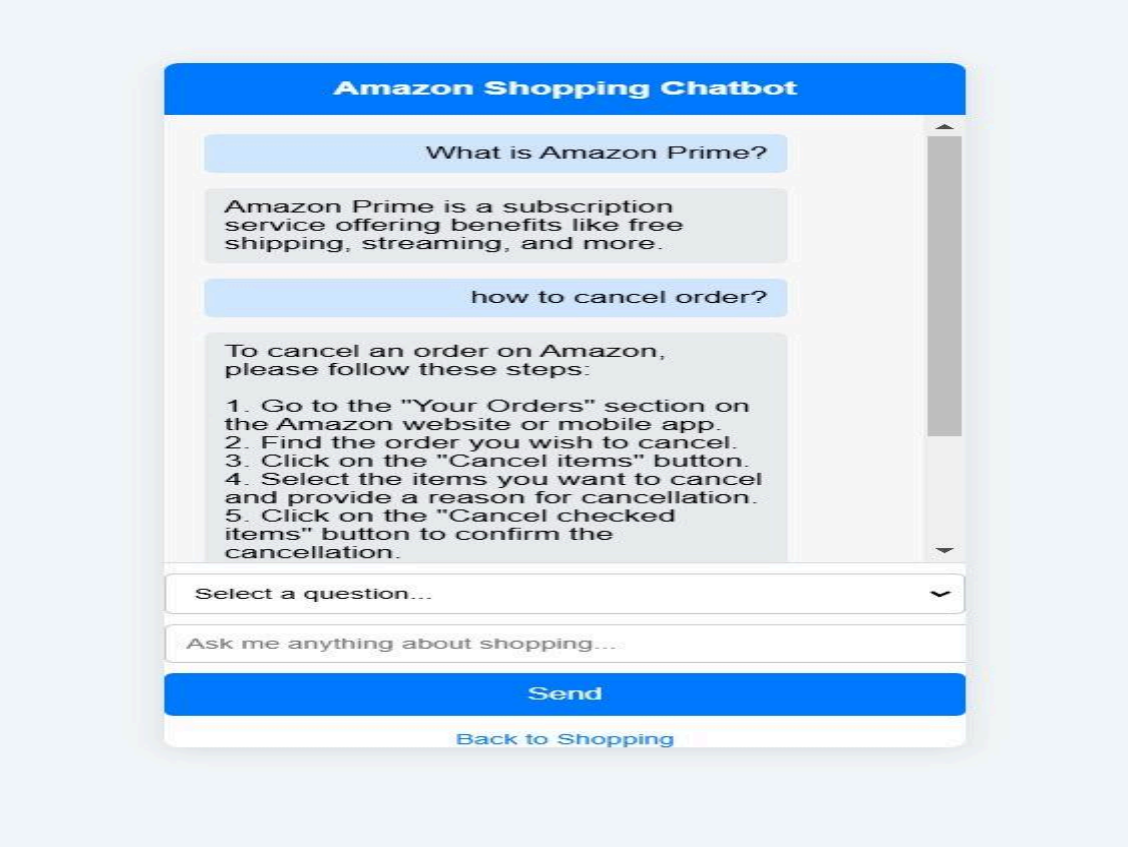
8.1 Automatic Answering of Queries with Excellent Precision

By combining cutting-edge Natural Language Processing (NLP) and Machine Learning (ML) technology, the chatbot is able to resolve queries accurately and automatically. By using improved BERT models, it correctly deciphers user intent, guaranteeing that consumer complaints and questions are assessed with the fewest possible misconceptions. The chatbot provides dependable answers quickly by retrieving answers on its own from an organized knowledge base based on TSV. While generative AI models generate accurate answers continuously for situations without established solutions, fallback mechanisms, such Scikit-learn classifiers, allow it to solve a variety of problems with flexibility. Because less human involvement is required, this automation greatly improves response time, accuracy, and customer happiness. To ensure the chatbot continuously adjusts and offers reliable, real-time support, commonly asked inquiries and answered queries are also categorized and saved for later retrieval. The integration of structured information management, automated query resolution, and constantly changing generation capabilities optimizes customer support procedures and lessens the workload for human agents.

8.2 Scalability and Ongoing Training via Feedback Loops

Scalability and adaptability are guaranteed by the self-improving mechanism of the chatbot, which learns from unanswered questions. When a question arises that it is unable to answer, it is forwarded to a human agent. Following the encounter, the chatbot logs it, adds the new solution to the knowledge base, and learns to handle similar questions on its own in the future. As user demands and query trends change, the system may adapt thanks to this feedback loop. In order to keep the knowledge base current and comprehensive, freshly recorded solutions are validated and added to it, while interaction logs are examined to find knowledge gaps. Frequent updates improve the chatbot's accuracy and contextual comprehension even more. These updates include upgrading the BERT model using labeled data and improving the Generative AI components. This learning cycle automation eventually lessens the need for human agents, which lowers costs, enhances query processing, and improves customer satisfaction.

CHAPTER-9
RESULTS AND DISCUSSIONS



The image shows a chatbot interface for customer service that uses machine learning to answer questions from customers about Amazon shopping. In a conversational approach, the chatbot allows customers to ask inquiries such "How to cancel order?" or "What is Amazon Prime?" Responses are specific, pertinent to the situation, and designed to walk consumers through each stage. The user interface is easy to use and offers choices for choosing pre-made inquiries or entering bespoke queries in a text box. The chatbot uses Generative AI to comprehend user inputs and provide precise answers, illustrating how artificial intelligence (AI) improves customer service effectiveness and accessibility in online sales.

Several crucial elements of machine learning-driven customer care solutions are highlighted by the creation of the customer assistance chatbot.

9.1 The concept of effectiveness of Contextual comprehending

Using a transformer-based model such as BERT made it possible to comprehend complicated, context-dependent inquiries with remarkable ease. High intent identification

accuracy was attained by the model through domain-specific fine-tuning, which greatly decreased the likelihood of misclassification. This efficiency highlights how useful contextual embeddings can be for customer service applications.

9.2 Enhanced Knowledge Management: It was both sensible and effective to use a small TSV file as the repository of knowledge. It is easy to modify and maintain, and its organized format makes it possible to retrieve responses in a straightforward manner. When query patterns and responses change over time in dynamic contexts, this method guarantees that the system will continue to be flexible and responsive to changes.

9.3 Human-in-the-Loop for Sturdiness

By including a human escalation mechanism, the chatbot system gained further dependability. This element allowed for ongoing development while successfully addressing open questions. The chatbot showed its capacity to learn and develop over time by recording and integrating resolutions into the system. This is essential for preserving performance and relevancy in real-world applications.

9.4 Effectiveness & Scalability

The system's scalability is demonstrated by its capacity to manage a large number of queries concurrently without experiencing latency problems. This functionality guarantees that the chatbot may be implemented in business settings where demand may vary greatly. Additionally, even in situations where the primary model encountered confusing circumstances, resilience was guaranteed by the fallback strategy, which was implemented utilizing a backup classifier.

9.5 Limitations and Difficulties

The system encountered difficulties processing questions that were extremely domain-specific or outside of its scope, despite achieving excellent accuracy and response rates. Even while the TSV file is economical, its static nature necessitates regular human changes to include novel ideas and solutions. Furthermore, human involvement was necessary in several edge circumstances, highlighting the need for additional improvements in autonomous settlement capabilities.

9.6 Future Directions

A number of areas for development and enhancement have been noted for next versions. When retrieval-augmented generation (RAG) models are integrated or big language models are investigated for dynamic response generation, the chatbot's capacity to manage intricate or multi-turn discussions can be improved. The system would be much more applicable if it were expanded to accept multimodal inputs, such speech and image inquiries. To make the system even more flexible and effective, implementing automated the knowledge base updating procedure with real-time insights may lessen the need for manual upgrades. For reliable and scalable customer support solutions, the system as a whole demonstrates the potential of integrating organized knowledge management, iterative learning, and sophisticated natural language processing techniques. Although this project's results could be improved, they provide a solid basis for future developments.

CHAPTER-10
CONCLUSION

The use of cutting-edge AI and ML technologies to improve and automate customer support operations has advanced significantly with the introduction of the Customer Support Chatbot with ML. This chatbot strikes a compromise between dependability and versatility by combining cutting-edge technologies like BERT for precise intent identification, Generative AI models for managing unique inquiries, and organized fallback mechanisms like Scikit-learn classifiers. In addition to effectively responding to routine client inquiries via a pre-established TSV-based knowledge base, the system is made to smoothly escalate complicated problems to human agents. In addition to maintaining a resolution-centric workflow, this strategy updates and improves the knowledge base for upcoming exchanges.

By recording, verifying, and incorporating successful escalations into the database, this system's feedback-driven learning mechanism guarantees ongoing progress. By managing changing customer needs, one of the primary shortcomings of older systems, the chatbot's flexibility enables it to respond to increasingly sophisticated queries while lowering dependency on human agents for repetitive activities. However, there are still issues with managing subtleties of speech, such as sarcasm and unclear inputs. Future iterations that improve capability through analysis of sentiment, emotion identification, and enhanced contextual awareness may be able to close the gap between human empathy and automated answers, resulting in a more natural user experience.

To sum up, this chatbot project demonstrates the revolutionary possibilities of incorporating AI and ML technology into customer support. It acknowledges the necessity for continued study to address current issues while highlighting the advancements made in automation. The chatbot offers a scalable, intelligent, and adaptable solution that revolutionizes how companies interact with their clientele by fusing cutting-edge technologies with a strong feedback and escalation structure. In addition to meeting current operational demands, this project lays the groundwork for next advancements in conversational AI, opening the door to a more streamlined and effective customer care ecosystem in today's digital world.

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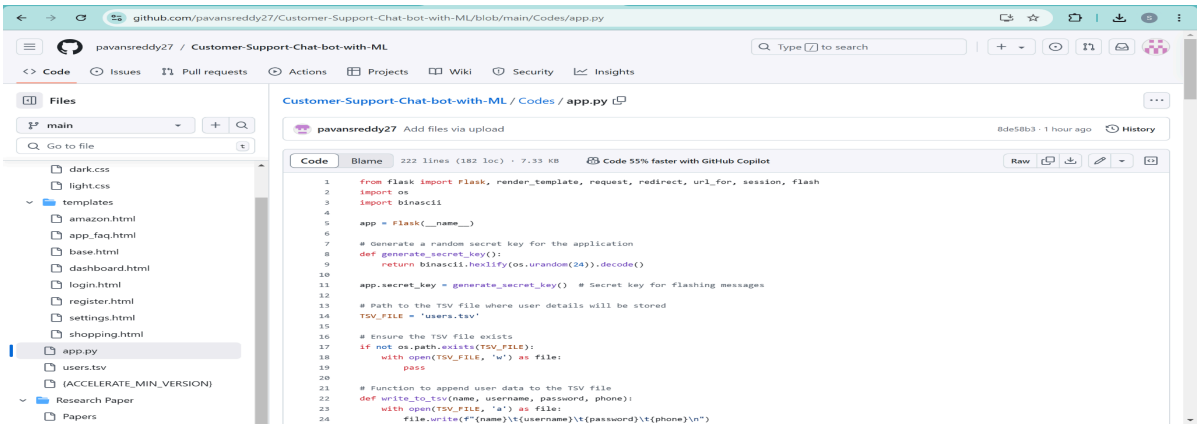
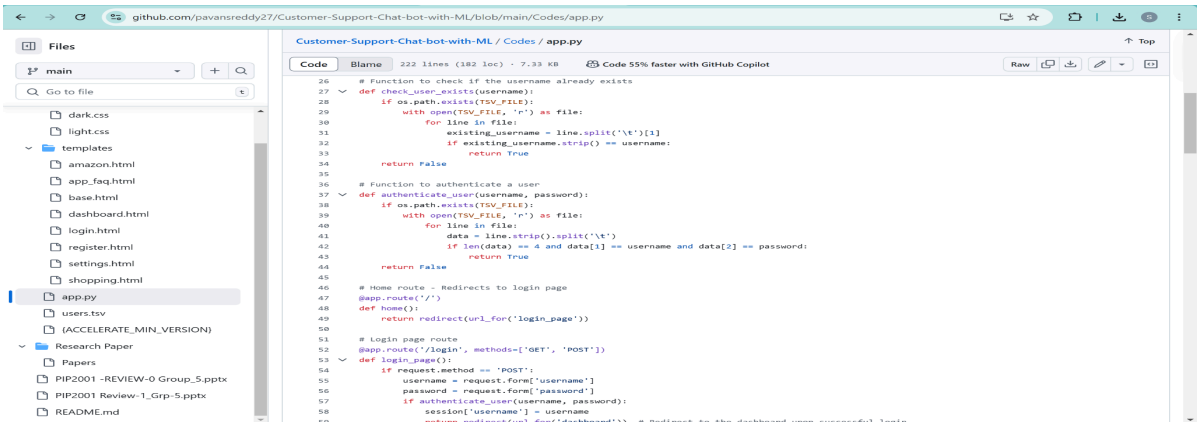
APPENDIX-A

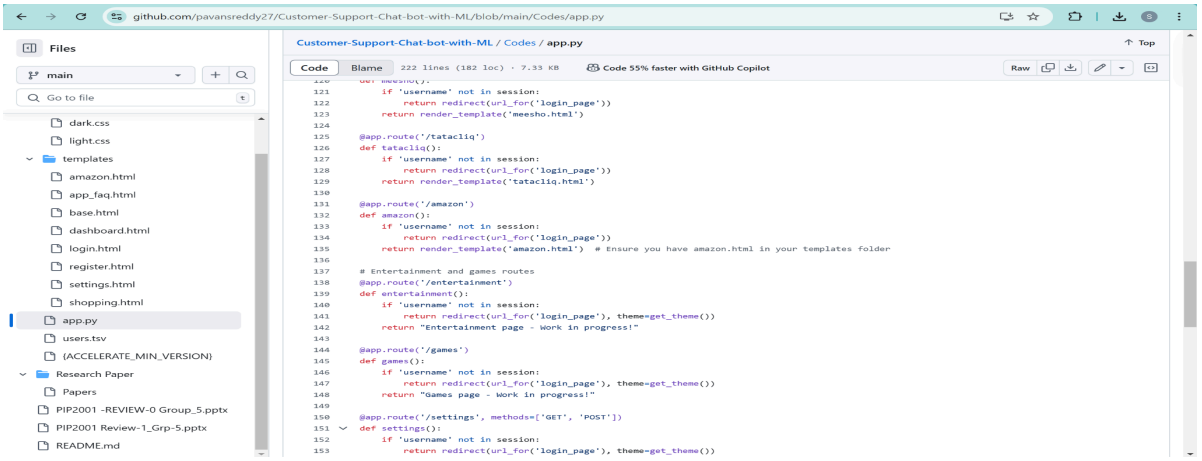
PSEUDOCODE



```
from flask import Flask, render_template, request, redirect, url_for, session, flash
import os
import binascii

app = Flask(__name__)

# Generate a random secret key for the application
def generate_secret_key():
    return binascii.hexlify(os.urandom(24)).decode()

app.secret_key = generate_secret_key()  # Secret key for flashing messages

# Path to the TSV file where user details will be stored
TSV_FILE = 'users.tsv'

# Ensure the TSV file exists
if not os.path.exists(TSV_FILE):
    with open(TSV_FILE, 'w') as file:
        pass

# Function to append user data to the TSV file
def write_to_tsv(name, username, password, phone):
    with open(TSV_FILE, 'a') as file:
        file.write(f"{name}\t{username}\t{password}\t{phone}\n")
```



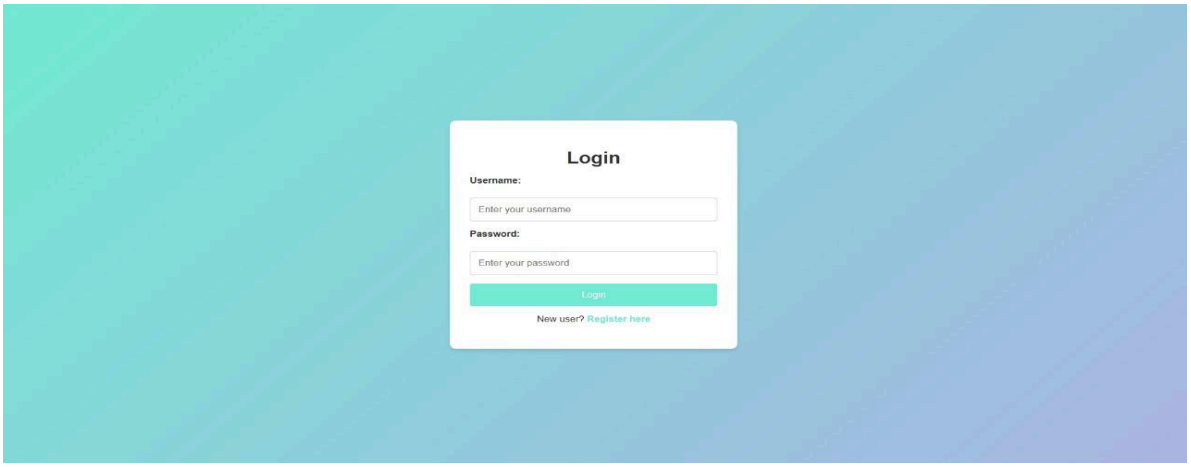
```
# Function to check if the username already exists
def check_user_exists(username):
    if os.path.exists(TSV_FILE):
        with open(TSV_FILE, 'r') as file:
            for line in file:
                existing_username = line.split('\t')[1]
                if existing_username.strip() == username:
                    return True
    return False

# Function to authenticate a user
def authenticate_user(username, password):
    if os.path.exists(TSV_FILE):
        with open(TSV_FILE, 'r') as file:
            for line in file:
                data = line.strip().split('\t')
                if len(data) == 4 and data[1] == username and data[2] == password:
                    return True
    return False

# Home route - Redirects to login page
@app.route('/')
def home():
    return redirect(url_for('login_page'))

# Login page route
@app.route('/login', methods=['GET', 'POST'])
def login_page():
    if request.method == 'POST':
        username = request.form['username']
        password = request.form['password']
        if authenticate_user(username, password):
            session['username'] = username
```

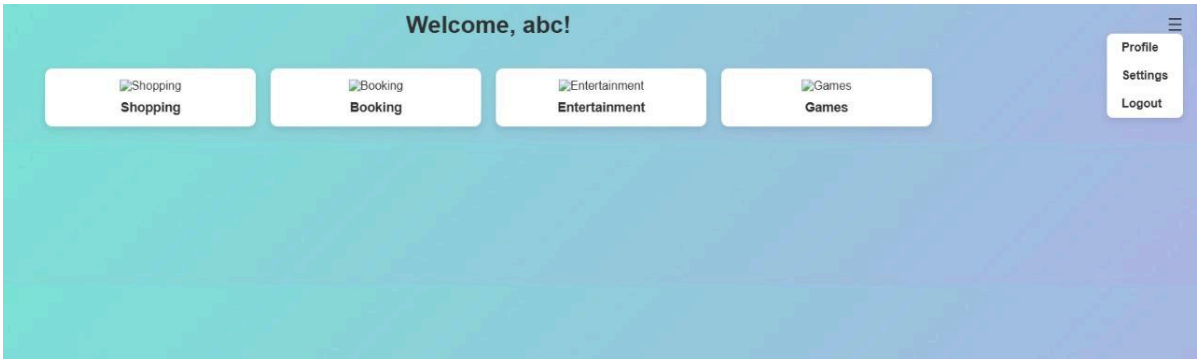


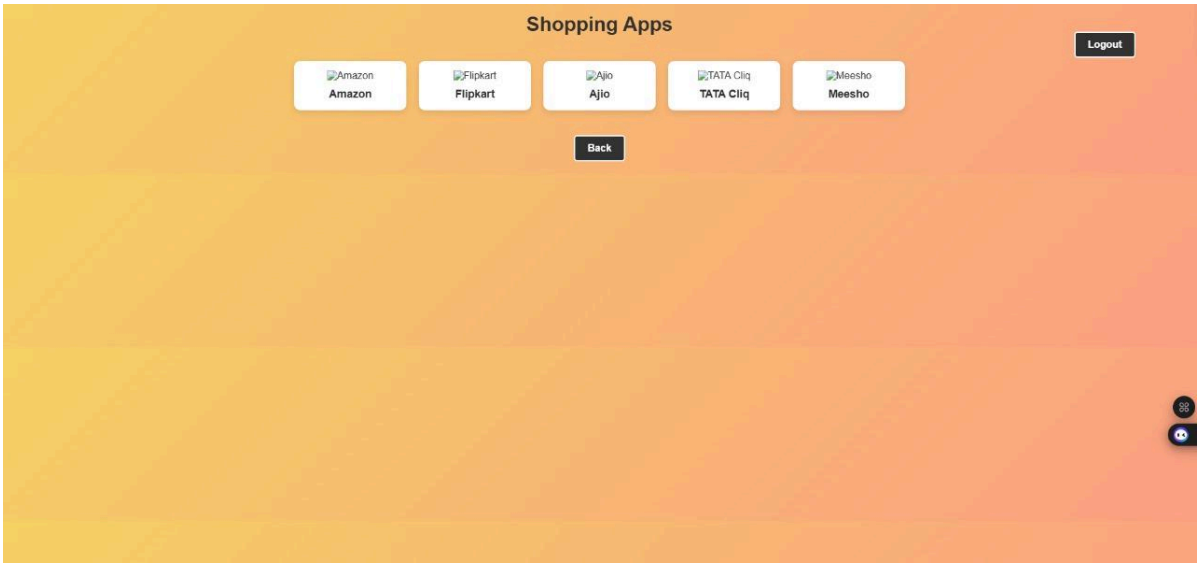
```
    if 'username' not in session:
        return redirect(url_for('login_page'))
    return render_template('meesho.html')

@app.route('/tatacliq')
def tatacliq():
    if 'username' not in session:
        return redirect(url_for('login_page'))
    return render_template('tatacliq.html')

@app.route('/amazon')
def amazon():
    if 'username' not in session:
        return redirect(url_for('login_page'))
    return render_template('amazon.html')  # Ensure you have amazon.html in your templates folder

# Entertainment and games routes
@app.route('/entertainment')
def entertainment():
    if 'username' not in session:
        return redirect(url_for('login_page'), theme=get_theme())
    return "Entertainment page - Work in progress!"

@app.route('/games')
def games():
    if 'username' not in session:
        return redirect(url_for('login_page'), theme=get_theme())
    return "Games page - Work in progress!"

@app.route('/settings', methods=['GET', 'POST'])
def settings():
    if 'username' not in session:
        return redirect(url_for('login_page'), theme=get_theme())
```

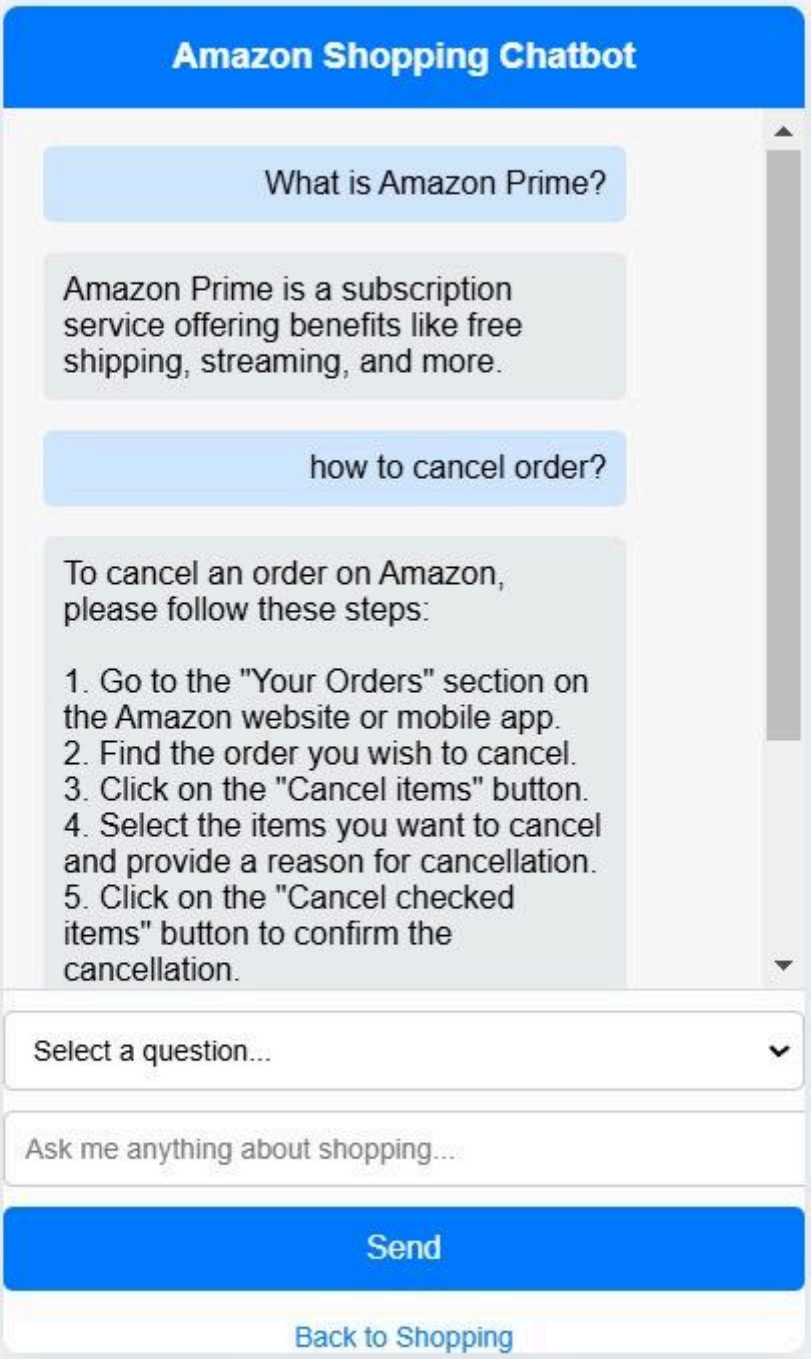
APPENDIX-B

SCREENSHOTS








Amazon Shopping Chatbot
What is Amazon Prime?
Amazon Prime is a subscription service offering benefits like free shipping, streaming, and more.
how to cancel order?
To cancel an order on Amazon, please follow these steps:
1. Go to the "Your Orders" section on the Amazon website or mobile app.
2. Find the order you wish to cancel.
3. Click on the "Cancel items" button.
4. Select the items you want to cancel and provide a reason for cancellation.
5. Click on the "Cancel checked items" button to confirm the cancellation.
Select a question...
Ask me anything about shopping...
Send
Back to Shopping

APPENDIX-C
ENCLOSURES

1. Journal publication/Conference Paper Presented Certificates of all students.

2. Include certificate(s) of any Achievement/Award won in any project-related event.

3. Similarity Index / Plagiarism Check report clearly showing the Percentage (%). No need for a page-wise explanation.

4. Details of mapping the project with the Sustainable Development Goals (SDGs).