# ChatBot For National Consumer Helpline

A PROJECT REPORT
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# CERTIFICATE

This is to certify that this is the Bonafide record of the mini-project entitled "Chatbot for the National Consumer Helpline Using Python and Machine Learning" submitted by Shubhanshu Mohan (2300290140180), Vishal Yadav (2300290140206), and Sumit Singh (2300290140187) of MCA, in the partial fulfilment of the requirements for the degree of Master of Computer Applications (MCA) during the academic year 2023-2024. The results embodied in this mini-project report have not been submitted to any other university or institute for the award of any degree or diploma.

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# DECLARATION

We, hereby declare that the results embodied in this dissertation entitled “ChatBot for National Consumer Helpline” are carried out by us during the academic year 2023-2024 in partial fulfilment of the requirements for the award of the Master of Computer Applications from KIET Group of Institutions, Ghaziabad.

This work is an authentic record of our efforts undertaken under the guidance of Ms. Shweta Singh, Assistant Professor, Department of Computer Applications.

We affirm that the work contained herein is original and has not been submitted to any other university or organization for the award of any other degree.

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# ABSTRACT

In an era of increasing consumer demands and expectations for timely assistance, the need for scalable and efficient customer support solutions is critical. This paper details the design, implementation, and evaluation of a chatbot for the National Consumer Helpline (NCH), specifically tailored to handle consumer inquiries, facilitate complaint registration, and streamline the support process. By leveraging Natural Language Processing (NLP) and Machine Learning (ML), the chatbot provides consistent, accurate, and prompt responses to users, enhancing both consumer satisfaction and operational efficiency. Initial testing has demonstrated notable improvements in resolution times, user engagement, and satisfaction rates, supporting the case for chatbot deployment in public consumer support services.

With the rise of digital transformation, consumers expect immediate, accessible support for their concerns and complaints. The National Consumer Helpline (NCH) in India faces challenges due to high query volumes and the need for accurate, timely responses. This paper explores the development and implementation of an AI-driven chatbot tailored to handle consumer queries, guide complaint registration, and streamline resolution processes. Leveraging Natural Language Processing (NLP) and Machine Learning (ML) technologies, the chatbot is designed to recognize consumer needs, provide relevant information, and escalate complex issues when necessary. A hybrid model combining rule-based logic and machine learning allows the chatbot to deliver fast, consistent, and accurate responses to a wide range of consumer inquiries. Early testing has shown significant improvements in response times, consumer satisfaction, and workload management for NCH agents. This study demonstrates the value of chatbot integration within public helplines and lays the groundwork for future advancements, including multilingual support, continuous learning through user feedback, and sentiment-based escalation. The results underscore the chatbot’s potential to transform consumer support services, making them more efficient, accessible, and consumer-friendly.

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# INTRODUCTION

Technology has transformed industries and our daily lives, streamlined complex tasks and enhanced productivity. Among recent innovations, **Artificial Intelligence (AI)** has captivated the public imagination, particularly through applications like AI-powered chatbots. These virtual assistants simulate human interactions, providing efficient, round-the-clock support, and are increasingly integrated into domains like customer service, healthcare, and consumer helplines.

A **Chatbot** is a software program designed to converse with users, interpreting and responding to queries in natural language. Leveraging advancements in **machine learning (ML)** and **natural language processing (NLP)**, chatbots have evolved into reliable tools capable of delivering personalized and accurate assistance. This project, a **Chatbot for the National Consumer Helpline (NCH)**, aims to harness these technologies to address consumer grievances and inquiries effectively.

## 1.1 Machine Learning

Machine learning is an application of artificial intelligence (AI) that provides system the ability to automatically learn and improve from experience without being explicitly programmed. The primary aim of machine learning is to allow the computers learn automatically without human intervention and adjust actions accordingly. Machine Learning algorithms are classified as:

### 1.1.1 Supervised Machine Learning Algorithms

The algorithm is applied to the learned data (past data) to the new where machines are trained using well labelled data to predict the output values. The system provide targets for any new input after sufficient training. The learning algorithm can also compare its output with the correct, intended output and find errors in order to modify the model. The aim of a supervised learning algorithm is to find a mapping function to map the input variable(x) with the output variable(y)[1]. In the real-world, supervised learning can be used for Risk Assessment, Image classification, Fraud Detection, spam filtering, etc.

### 1.1.2 Unsupervised Machine Learning Algorithms

Unsupervised machine learning algorithms are used when the information used to train it is neither classified nor labelled. The algorithms describe hidden patterns in data without the need for human. Unsupervised learning models are used for three main tasks: clustering, association and dimensionality reduction. using this method improve learning accuracy.

Semi-supervised machine learning algorithm uses the combination of labelled and un labelled data and it falls in between supervised and unsupervised learning. It uses a small amount of labelled data and a large amount of un labelled data. The systems using this method improve learning accuracy[1]. Usually, semi-supervised learning is chosen when the acquired labelled data requires skilled and relevant resources in order to train it or learn from it. It is a learning method that interacts with environment by producing actions and discovers errors to make sequence of decisions. Trial and error search and delayed reward are characteristics of reinforcement learning. The method allows machines and software agents to automatically determine the ideal behavior within a specific context in order to maximize its performance.

### 1.1.2 Natural Language Processing

Natural language processing (NLP) is the ability of a computer program to understand human language. As it is spoken and written so it is referred to as natural language. It is a component of artificial intelligence. It has a variety of real-world applications in a number of fields, including medical research, search engines and business intelligence. NLP enables computers to understand natural language as humans understand. There are two main phases to natural language processing: data preprocessing and algorithm development[1].

- **Naive Bayes Theorem**

Naïve Bayes algorithm is a supervised learning algorithm, which is based on Bayes theorem and used for solving classification problems. Therefore, not all customers will get the answers they are searching for. The chatbot using Python are programmed to take in the information you provide it and then analyze it with the help of complex

AI algorithms, and provide us with a written or verbal response.

It is called naïve bayes because it comprises of two words Naïve and Bayes.

**Naive**: It is called Naïve because it assumes that the occurrence of a certain feature is independent of the occurrence of other features.

**Bayes**: It is called Bayes because it depends on the principle of Bayes' Theorem.

## 1.2 About Chatbot

Artificial Intelligence (AI) has revolutionized how humans and bots interact, particularly through conversational platforms. Chatbots simulate human-like interactions via text or voice, gaining immense popularity in applications like customer support, virtual assistance, and consumer helplines. Platforms like Facebook Messenger, Slack, Telegram, and others have fuelled this growth by integrating chatbot functionalities, offering seamless communication experiences.

The National Consumer Helpline Chatbot leverages AI to efficiently address consumer grievances, streamline queries, and provide real-time assistance. By reducing dependency on human agents, this chatbot ensures 24/7 support, enhancing customer satisfaction and operational efficiency.

## 1.3 Existing System

Chatbots are used in many organizations instead of humans when this is possible. Most of the time systems like that are based on the ways ELIZA communicates.

### ELIZA:

- The first chat bot developed was ELIZA. It was developed by Joseph Weinbaum using a keyword matching technique.
- The idea was to read the user input and search for certain keywords, if a keyword was found then the answer was retrieved.
- If a keyword was not present then ELIZA would try, according to specified rules, to get more information from the user to keep the conversation going.
- Consider the following example,
- **User**: How can I get in touch with my mother?

- Then the chatbot would identify the keyword mother and would find a connection between mother and family and it would respond with a question.

## Disadvantages:

1) Chatbots sound too Mechanical: Chatbots are not human and so obviously it cannot interact as a human with customers. It sound's too mechanical and can only give answers to problems that they have been programmed with. It cannot answer a customer according to the context.

2) **Chatbots Can Only Handle Basic Questions:** Chatbots are still a basic Artificial Intelligence technology and so it can only answer the basic questions of customers and provide general information that is already available to it.

3) **Chatbots Are Difficult to Create:** Chatbots are created using Natural Language Processing which is extremely popular for customer support.

4) **Chatbots Require Constant Maintenance:** Companies cannot just create a chatbot and then leave it hoping that it will correctly answer.

## 1.4 Proposed System:

Creating a chatbot using twitch as an online platform that provides a chatbot platform to the online clients. Using chatbots may provide faster customer service overall, but these aren't perfect. Simple ones may have only limited responses for customers. Therefore, not all customers will get the answers they are searching for. The chatbot using Python are programmed to take in the information you provide it and then analyze it with the help of complex AI algorithms, and provide us with a written or verbal response. It also helps, if the user wants to have any query or he wants to enquire about something[2].

## Advantages Of Proposed System:

1) **Chatbots Have 24/7 Availability:** Chatbots can be available to solve customer problems 24/7. chatbots can answer customer queries whenever customers have queries that help in increasing customer loyalty.

2) **Chatbots Provide Long Term Financial Savings:** Companies that have human customer support teams have to pay a very large amount of money as salaries to their employees. Using chatbots can reduce expenditure.

3) **Chatbots Cause An Increase In Sales:** Customers can get quick support and solutions for the problems using chatbots.

## 1.5 Problem Definition

The National Consumer Helpline (NCH) serves as a vital platform for addressing consumer grievances and queries. However, the current system faces significant challenges in providing efficient and timely support. Traditional methods, such as relying on human agents or email-based communication, often result in delays, particularly during peak hours or outside working hours. This leads to consumer dissatisfaction due to prolonged response times, limited scalability, and high operational costs associated with maintaining a large customer support team.

The need for a more efficient and scalable solution is evident. An Intelligent ChatBot powered by Artificial Intelligence (AI) and Natural Language Processing (NLP) technology can address these challenges by offering real-time support to consumers. This chatbot will be capable of understanding and responding to queries in natural language, providing personalized assistance based on the context of each conversation. By automating repetitive tasks and offering 24/7 availability, the chatbot will enhance the efficiency of the helpline, reduce operational costs, and significantly improve consumer satisfaction[2].

The proposed Intelligent ChatBot aims to bridge the gap between NCH and its consumers by providing an interactive, reliable, and scalable solution that ensures quick and accurate resolution of queries while minimizing the dependency on human intervention. This innovation will establish a new standard for consumer support, aligning with the advancements in digital communication and AI technology.

## 1.6 Objectives of Project

The **National Consumer Helpline Chatbot** is an AI-driven solution designed to facilitate seamless communication between consumers and service providers by resolving grievances and addressing queries efficiently. It leverages cutting-edge Natural Language Processing (NLP) and Machine Learning (ML) techniques to mimic human interactions effectively.

**Key Objectives:**

1. **Enhancing User Experience**

   - Enable consumers to interact in natural language, ensuring a human-like and intuitive user experience.
   - Provide real-time assistance to users with common consumer queries.

2. **Automation of Query Resolution**

   - Automate the process of resolving grievances, reducing human intervention.
   - Address frequently asked questions (FAQs) using predefined patterns for efficient responses.

3. **Categorization of Chatbots**

   - **Rule-Based Chatbots**
     These bots are trained using predefined rules, enabling them to respond to structured queries.
     - **Advantages**: Handle simple, repetitive queries effectively.
     - **Limitations**: Struggle with complex or nuanced requests.
   - **Self-Learning Chatbots**
     These bots utilize advanced AI and ML technologies to adapt and learn from user interactions.
     - **Advantages**: Learn and improve over time, providing more accurate responses.
     - **Limitations**: Require extensive training data and computational resources.

4. **Implementation of Chatbot Models**

- **Retrieval-Based Chatbots**
  - Functionality: Operate on pre-defined input patterns and corresponding responses.
  - Application: Goal-oriented tasks like tracking complaint status, providing contact details, or suggesting consumer rights.
  - Benefits: Customized flow and tone for better customer satisfaction.
- **Generative Chatbots**
  - **Functionality**: Use sequence-to-sequence (seq2seq) neural networks to create contextually relevant responses.
  - **Application**: Engage in deeper, open-ended conversations that require understanding and generating new information.
  - **Benefits**: Can respond dynamically, without relying solely on pre-written responses.

5. **Cost and Time Efficiency**
   - Minimize operational costs associated with human customer support teams.
   - Provide instant solutions, saving consumers time and improving satisfaction.
6. **Scalability and Accessibility**
   - Support a large number of users simultaneously.
   - Ensure 24/7 availability for resolving consumer grievances.
7. **Integration with National Consumer Helpline Services**
   - Seamlessly integrate with the existing infrastructure of the National Consumer Helpline, enhancing its capabilities.

By achieving these objectives, the chatbot ensures effective, scalable, and consumer-friendly assistance while supporting the broader mission of empowering consumers.

## 1.7 Chapter Conclusion

The National Consumer Helpline Chatbot is a transformative application of Artificial Intelligence and Natural Language Processing, designed to streamline the resolution of consumer grievances and inquiries. By automating repetitive and time-consuming processes, it significantly reduces response times, ensuring prompt and accurate assistance to users around the clock. This 24/7 availability enhances consumer satisfaction and trust while alleviating the challenges posed by traditional human-operated systems, such as limited scalability and high operational costs.

Through the integration of advanced chatbot models, including rule-based and self-learning systems, the chatbot is capable of addressing both structured and complex queries. Its ability to adapt and improve over time ensures that consumer interactions remain efficient, personalized, and contextually relevant. Furthermore, the chatbot's seamless incorporation into the existing infrastructure of the National Consumer Helpline augments its capabilities, offering a unified platform that caters to a diverse range of consumer concerns across multiple sectors.

# CHAPTER – 2

# REQUIREMENT ANALYSIS

Software requirements deal with software and hardware requirements deal with resources that need to be installed on a server that provides optimal functioning for the application. These software and hardware requirements need to be installed before the packages are installed. These are the most common set of requirements defined by any operating system. These software and hardware requirements provide compatible support to the operating system in developing an application.

## 2.1 Software Requirements

- **Operating system**: Windows 10
- **Coding Language**: Python
- **Libraries:** NumPy, scikit-learn, TensorFlow
- **IDE:** Jupiter Notebook

## Python

Python is an interpreted, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991. It supports multiple programming paradigms, including structured (particularly, procedural), object oriented, and functional programming. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse[3]. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed.

### 2.1.1 Python scientific libraries and tools

**Pandas:** Pandas is a library for data manipulation and analysis. The library provides data structures and operations for manipulating numerical tables and time series.

**Matplotlib:** Matplotlib is a python 2D plotting library which produces publication quality figures in a variety of hardcopy formats and interactive environments across platforms. Matplotlib allows you to generate plots, histograms, power spectra, bar charts, error charts, scatterplots, and more.

**NumPy:** NumPy is the fundamental package for scientific computing with Python, adding support for large, multi-dimensional arrays and matrices, along with a large library of high-level mathematical functions to operate on these arrays.

**Scikit-learn:** Scikit-learn is a machine learning library. It features various classification, regression and clustering algorithms including support vector machines, random forests, gradient boosting, k-means and DBSCAN, and is designed to interoperate with the Python numerical and scientific libraries NumPy and SciPy.

Supported languages to start developing in Python with Jupiter Notebook first step is to download and install Python from python.org depending on respective platform.

Jupiter Notebook supports the following versions of Python:

- Python 2: version 2.7
- Python 3: from the version 3.6 up to the version 3.11

Besides, in the Professional edition, one can develop Django, Flask, and Pyramid applications. Also, it fully supports HTML (including HTML5), CSS, JavaScript, and XML, these languages are bundled in the IDE via plugins and are switched on for by default.

## 2.2 Software Requirements Objectives

### Complex dialogues

In addition to understanding and interacting within conversations, an outstanding chatbot software has NLP functions (Natural Language Processing) to analyze the context of a conversation.

It can identify the intent of a question to provide an accurate answer and suggest options to confirm or resolve the issue.

The best chatbots have advanced conversation features and can proactively search for information and ask clarifying questions even if the conversation is not linear.

### Flexible data connections

By using Knowledge Graphs, data can be structured and modelled, which in turn helps to generate new knowledge.

Moreover, the integration of company data or external data sources extends the functions of chatbot software enormously.

The chatbot can capture, read and process large amounts of data to gain insights from relevant data and to quickly solve customer problems.

### Multi-channel capability

A great chatbot communicates across multiple channels such as websites, apps, messenger, phone systems or voice assistants such as Google Assistant or Amazon Alexa.

For a seamless experience, data and context can be stored over several channels. If a customer shares order, email address or other information with the bot, it can use this input for further actions on other channels. Also interesting Thing is it Improves Customer Experience With The Help Of Voice Assistants[3].

## Fast onboarding

Even if chatbots often build on multi-layered and technologically complex software, this does not mean that getting started should be an equally complex process. It's definitely an advantage if a chatbot can be launched quickly.

Plug & Talk solutions that make a chatbot ready to go in 2-4 weeks are therefore very beneficial for companies.

## Easy handling

Well-designed user interfaces and experiences (UI / UX), both on the company and customer side, are essential.

It has to be possible to edit corporate identity settings, change and add content quickly, send notifications to employees and have a clear and structured overview of conversations.

In addition, the chatbot software has to be able to handle the huge amount of data without any problems and GDPR settings have to be taken into account.

## Ongoing Optimization

Every single customer interaction represents a way of learning for artificial intelligence (AI). The more often a chatbot is used, the better it gets because it can access more and more data with continuous use. Therefore, a chatbot software should continuously expand its own knowledge base by analyzing conversations.

## Analytics & Reporting

An outstanding chatbot is an excellent source of data and customer information. However, if you cannot extract it and use it to increase your knowledge, it will be of little use. Choose a chatbot provider that provides in-depth chatbot analytics and analysis of customer information, responses and requests, and gives you the information you need to tailor your products and services to your customers expectations.

## 2.3 Chapter Conclusion

The National Consumer Helpline Chatbot is built upon robust software and hardware requirements, leveraging Python and its powerful scientific libraries like NumPy, Pandas, Matplotlib, and Scikit-learn to enable seamless development, efficient data processing, and advanced machine learning capabilities. These tools ensure the chatbot can analyze and resolve consumer grievances effectively. Its advanced features, including complex dialogue handling, flexible data connections, multi-channel communication, and ongoing optimization, provide a dynamic, responsive, and user-friendly experience tailored to consumer needs.

The chatbot's ability to integrate knowledge graphs and external data sources extends its functionality, allowing it to proactively solve customer issues with precision. With fast onboarding, intuitive interfaces, and comprehensive analytics, the platform simplifies deployment and operational management while delivering actionable insights to improve services. By continuously learning from user interactions, the chatbot enhances its performance over time, ensuring scalability, reliability, and alignment with modern digital communication standards. This innovative solution sets a new benchmark in leveraging AI-driven technologies to deliver efficient, accessible, and customer-centric support, revolutionizing consumer grievance redressal.

# CHAPTER – 3

# SYSTEM DESIGN

Systems design is the process or art of defining the architecture, components, less interfaces, and data for a system to satisfy specified requirements. One could see it as a application of systems theory to product development. There is some overlap and synergy with the disciplines of systems analysis, systems architecture and systems engineering[3].

## System Design Document Overview

The System Design Document describes the system requirements, operating environment, stem and subsystem architecture, files and database design, input formats, output layouts, human-machine interfaces, detailed design, processing logic, and external interfaces.

## 3.1 Architecture

In this section, describe the system and/or subsystem(s) architecture for the project. References to external entities should be minimal.

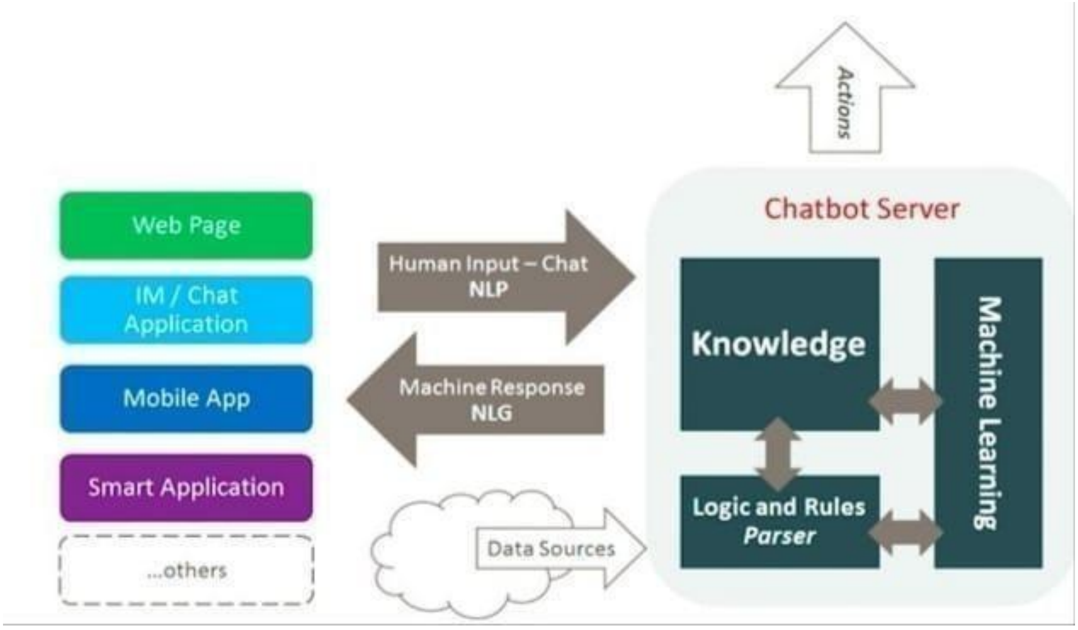


*Figure 3.1: Architecture of Chatbot*

The architecture of the chatbot, as shown in **Figure 3.1**, consists of various input sources such as web pages, chat applications, mobile apps, and smart applications. User input is processed using Natural Language Processing (NLP) to understand queries, while responses are generated using Natural Language Generation (NLG). The chatbot server comprises a knowledge base, machine learning modules for continuous improvement, and logic/rule parsers for accurate interpretation. External data sources provide additional information, and the system performs appropriate actions based on user input and server logic.

## System Software Architecture

System software and organization, Include a list of software modules (this could include functions, subroutines, or classes), computer languages, and programming computer-aided software engineering tools (with a brief description of the function of each item). Use structured organization diagrams/ object-oriented diagrams that show the various segmentation levels down to the lowest level. All features on the diagrams should have reference numbers and names.

## 3.2 Sequence Diagram

The sequence diagram represents the flow of messages in the system and is also termed as an event diagram. It helps in envisioning several dynamic scenarios. It portrays the communication between any two lifelines as a time-ordered sequence of events, such that these lifelines took part at the run time. In UML, the lifeline is represented by a vertical bar, whereas the message flow is represented by a vertical dotted line that extends across the bottom of the page. It incorporates 16 iterations as well as branching.

- A sequence diagram in Unified Modeling Language (UML) is the most commonly used interaction diagram.

- A sequence diagram simply depicts interaction between objects in a sequential order i.e., the order in which these interactions take place.

- The steps for volume control is been represented using Figure 4 which consists of five steps such as video stream, share image, hand detection, gesture recognition and then finally volume control.

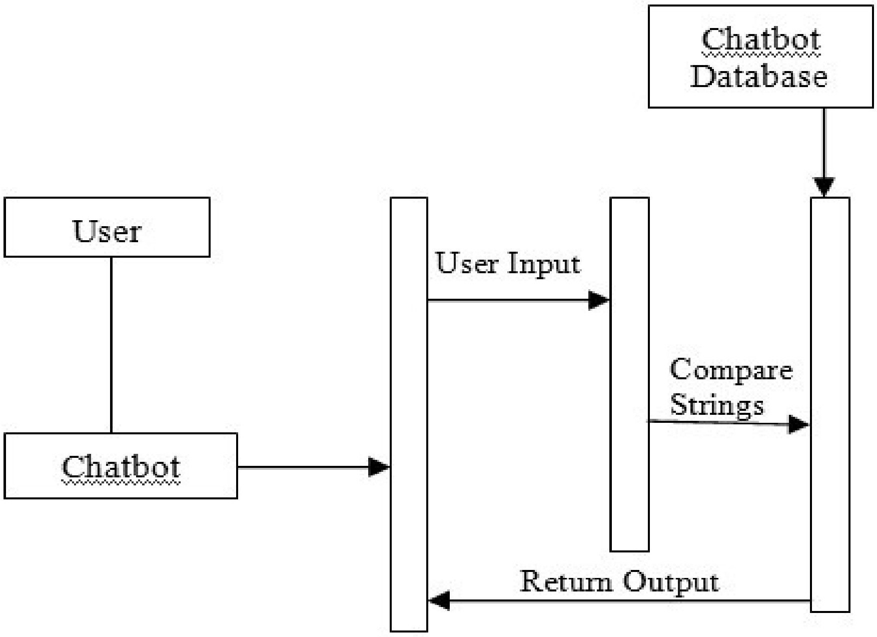


*Figure 3.2: Sequence Diagram*

The **Figure 3.2** sequence diagram illustrates the interaction between the user, chatbot, and chatbot database.

1. User Interaction: The user provides input to the chatbot through a conversational interface.
2. Processing Input: The chatbot receives the user's input and sends it to the processing system, where the input string is compared with stored data in the chatbot database.
3. Database Lookup: The chatbot database is queried to find a matching response based on the user's input.
4. Response Generation: After comparing the strings, the chatbot retrieves the appropriate response from the database and returns it to the user.

## 3.3 Use case Diagram

In the Unified Modeling Language (UML), a use case diagram can summarize the details of system's users (also known as actors) and their interactions with the system as shown in Figure. This chart contains the course of action of use cases, performing pros and their relationship.

In Figure it can observed the interaction between user, system and server. To build one, set of specialized symbols and connectors are used. An effective use case diagram can help team discuss and represent:

- Scenarios in which the system or application interacts with people, organizations, or external systems.
- The scope of the system.

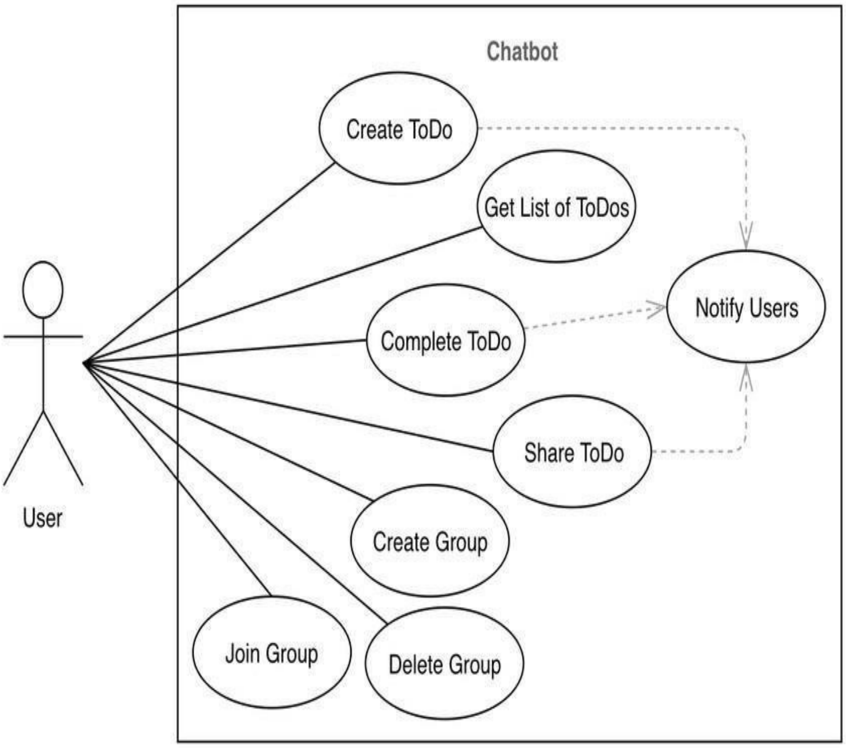


***Figure 3.3: Use case Diagram***

A use case diagram doesn't go into a lot of detail—for example, don't expect it to model the order in which steps are performed. Instead, a proper use case diagram depicts a high-level overview of the relationship between use cases, actors, and systems. Experts recommend that use case diagrams be used to supplement a more descriptive textual use case.

## 3.4 Chapter Conclusion

The system design of the National Consumer Helpline Chatbot focuses on creating a well-structured architecture and seamless interaction flow to meet the defined requirements effectively. The System Design Document outlines all aspects, including system requirements, operating environment, architecture, database design, input/output formats, and human-machine interfaces. The system's architecture is designed to ensure scalability, reliability, and seamless integration of all components, with clear documentation of software modules, programming languages, and tools used.

The sequence diagram illustrates the dynamic flow of communication between system components in a time-ordered manner, ensuring clarity in event progression and interaction at runtime. It provides a comprehensive view of message exchanges and iterations, enabling better visualization of system behavior during operations.

The use case diagram, as part of the Unified Modeling Language (UML), offers a high-level overview of user interactions with the chatbot system. It highlights the relationships between actors (users), use cases, and the system, effectively demonstrating the scope of functionalities and interactions. By visually mapping out user-system engagements, it fosters better collaboration, understanding, and refinement of system requirements.

Together, these design elements establish a robust foundation for the chatbot, ensuring a well-organized, efficient, and user-centric solution capable of addressing consumer grievances with precision and ease.

# CHAPTER – 4

# IMPLEMENTATION

## 4.1 Building the Bot

### Pre-Requisites

Hands-On knowledge of **scikit** library and **NLTK** is assumed.

### NLTK (Natural Language Toolkit)

It is a leading platform for building Python programs to work with human language data. It provides easy-to-use interfaces to over 50 corpora and lexical resources such as WordNet, along with a suite of text processing libraries for classification, tokenization, stemming, tagging, parsing, and semantic reasoning, wrappers for industrial-strength NLP libraries. NLTK has been called "a wonderful tool for teaching and working in computational linguistics using Python" and "an amazing library to play with natural language[6]."

### Natural Language Processing with Python

It provides a practical introduction to programming for language processing. I highly recommend this book to people beginning in NLP with Python.

### a) Downloading and installing NLTK

1. Install NLTK: run pip install NLTK
2. Test installation: run python then type import nltk
3. For platform-specific instructions, read here.

### b) Installing NLTK Packages

Import NLTK and run nltkdownload (). This will open the NLTK downloader from where you can choose the corpora and models to download. You can also download all packages at once.

### c) Text Pre- Processing with NLTK

The main issue with text data is that it is all in text format (strings). However, Machine learning algorithms need some sort of numerical feature vector to perform the task. So, before we start with any NLP project, we need to pre- process it to make it ideal for work. Basic text pre-processing includes:

- Converting the entire text into uppercase or lowercase so that the algorithm does not treat the same words in different cases as different.
- Tokenization: Tokenization is just the term used to describe the process of converting the normal text strings into a list of tokens, i.e., words that we want. A sentence tokenizer can be used to find the list of sentences, and a Word tokenizer can be used to find the list of words in strings.

The NLTK data package includes a pre-trained Punkt tokenizer for English.

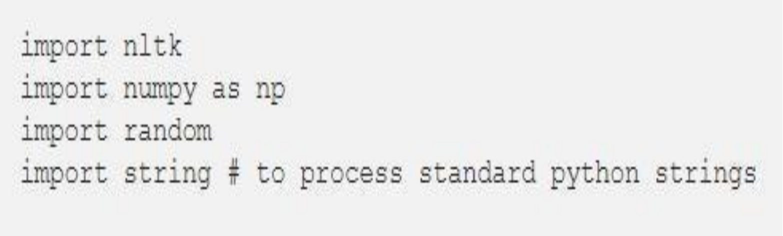
**Removing Noise:** i.e., everything that isn’t in a standard number or letter are removed.

**Removing Stop words:** Sometimes, some extremely common words that appear to be of little value in helping select documents matching a user need are excluded from the vocabulary entirely. These words are called stop words.

**Stemming**: Stemming is the process of reducing inflected (or sometimes derived) words to their stem, base, or root form — generally a written word form. For example, if we were to stem the following words: “Stems,” “Stemming,” “Stemmed,” “and Stigmatization,” the result would be a single word, “stem.”

**Lemmatization**: A slight variant of stemming is lemmatization. The major difference between these is that stemming can often create non-existent words, whereas lemmas are actual words. So, your root stem, meaning the word you end up with, is not something you can look up in a dictionary, but you can look up a lemma. Examples of Lemmatization are that "run" is a base form for words like "running" or "ran" or that the word "better" and "good" are in the same lemma, so they are considered the same.

## A) Importing the necessary libraries



```
import nltk
import numpy as np
import random
import string # to process standard python strings
```

*Figure 4.1: Importing Libraries*

- **Corpus**

  Using the Wikipedia page for chatbots as our corpus. Copy the contents from the page and place them in a text file named 'chatbot.txt'.

## B) Reading in the data

The corpus.txt file and convert the entire corpus into a list of sentences and a list of words for further pre-processing.

## C) Pre-processing the raw text

- **Keyword Matching**

  Define a function called Lem Tokens which will take as input the tokens and return normalized tokens. Next, define a function for a greeting by the bot, i.e., if a user's input is a greeting, the bot shall return a greeting response. ELIZA uses a simple keyword matching for greetings.

- **Generating Response**

  To generate a response from our bot for input questions, the concept of document similarity will be used. So, we begin by importing the necessary modules.

## 4.2 Technical Implications

### Enhanced Consumer Support

The ChatBot serves as an automated assistant for handling consumer queries, reducing dependency on human agents. It ensures 24/7 availability, enabling users to access information and lodge complaints at their convenience.

### Efficient Query Handling

By using Python and the Flask framework, the chatbot can process consumer queries effectively. It categorizes and prioritizes queries using natural language processing (NLP) techniques, enhancing resolution efficiency.

### Improved Data Management

The system can be integrated with a robust database to store user queries, complaints, and resolutions securely. This data can be utilized for generating insights and improving service quality.

### Real-Time Analytics

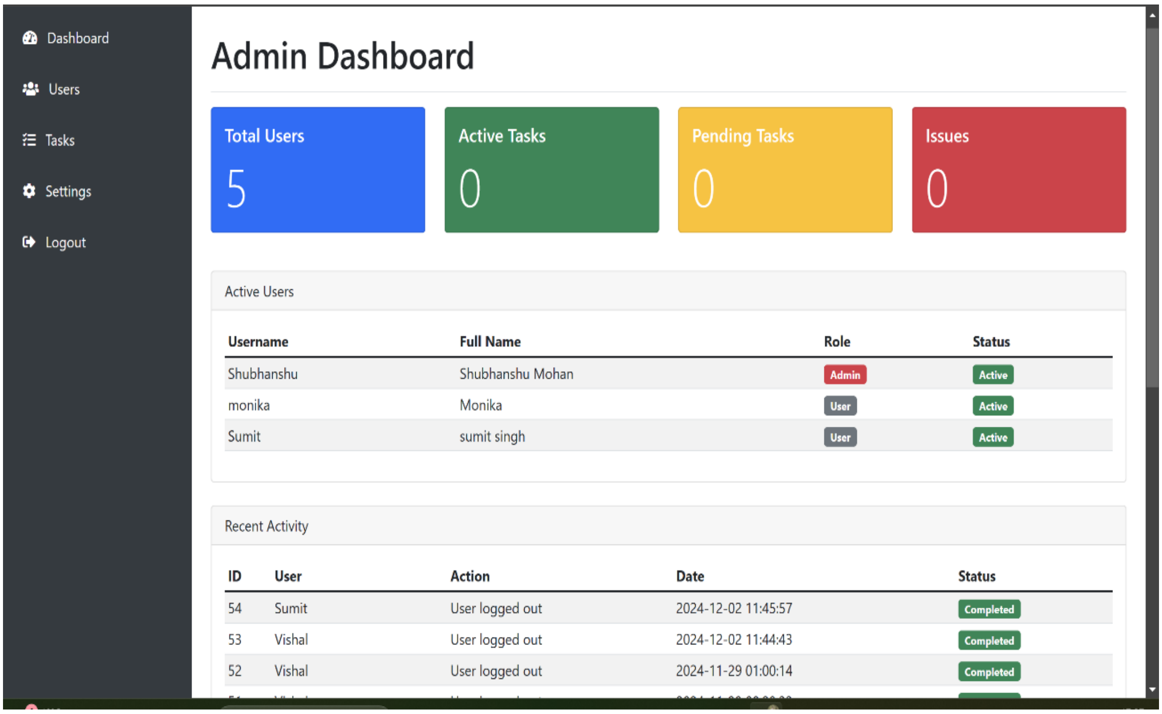
The ChatBot can collect and analyze user interactions to provide real-time analytics. These insights help the National Consumer Helpline optimize services, identify common issues, and predict trends in consumer grievances.

### Reduced Resolution Time

Automating initial responses and guiding consumers to the right channels reduces the time taken to resolve complaints, enhancing overall consumer satisfaction.

### Security

With sensitive consumer information being processed, the system can implement encryption protocols and secure API endpoints to ensure data protection and privacy compliance.



Admin Dashboard

Total Users 5

Active Tasks 0

Pending Tasks 0

Issues 0

Active Users

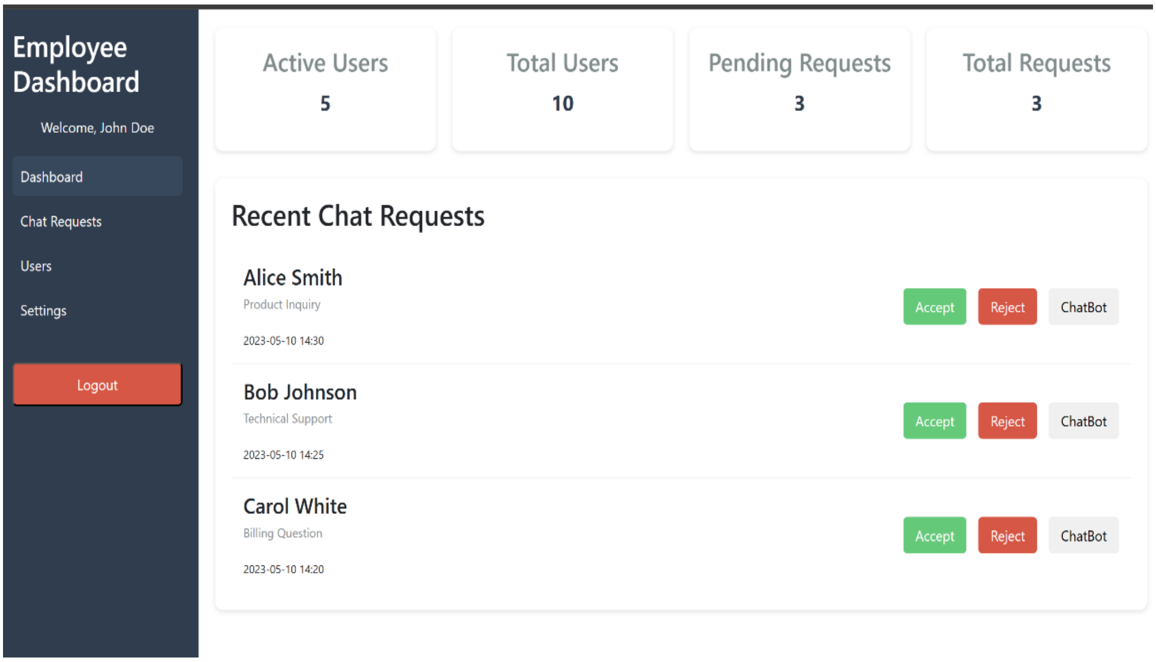
| Username | Full Name | Role | Status |
|---|---|---|---|
| Shubhanshu | Shubhanshu Mohan | Admin | Active |
| monika | Monika | User | Active |
| Sumit | sumit singh | User | Active |

Recent Activity

| ID | User | Action | Date | Status |
|---|---|---|---|---|
| 54 | Sumit | User logged out | 2024-12-02 11:45:57 | Completed |
| 53 | Vishal | User logged out | 2024-12-02 11:44:43 | Completed |
| 52 | Vishal | User logged out | 2024-11-29 01:00:14 | Completed |

**Figure 4.2 Admin Dashboard**

**Figure 4.2** illustrates an Admin Dashboard interface designed to provide a comprehensive overview of system activity and user management. At the top, it displays key metrics in visually distinct colored cards, summarizing the total number of users (5), active tasks (0), pending tasks (0), and reported issues (0). Below this, the dashboard features an "Active Users" table, listing details such as usernames, full names, roles (e.g., Admin or User), and their current status (e.g., Active). Additionally, a "Recent Activity" table is included, which logs recent user actions, such as logging out, along with timestamps and their status (e.g., Completed). On the left side, a navigation panel provides quick access to various sections, including Dashboard, Users, Tasks, Settings, and Logout. This layout offers an intuitive and organized way to monitor and manage system activities effectively.



Employee Dashboard

Welcome, John Doe

| Active Users | Total Users | Pending Requests | Total Requests |
|---|---|---|---|
| 5 | 10 | 3 | 3 |

Recent Chat Requests

Alice Smith
Product Inquiry
2023-05-10 14:30

Bob Johnson
Technical Support
2023-05-10 14:25

Carol White
Billing Question
2023-05-10 14:20

**Figure 4.3 Employee Dashboard**

**Figure 4.3** illustrates the "Employee Dashboard" interface for the chatbot project. It includes key metrics such as active users, total users, pending requests, and total requests displayed at the top. Below, the "Recent Chat Requests" section lists incoming user inquiries, including details such as the user's name, request type, and timestamp. Each request features options for employees to accept, reject, or assign the request to a chatbot for handling. The sidebar provides navigation to other sections, including "Dashboard," "Chat Requests," "Users," and "Settings," along with a logout button for secure session termination.

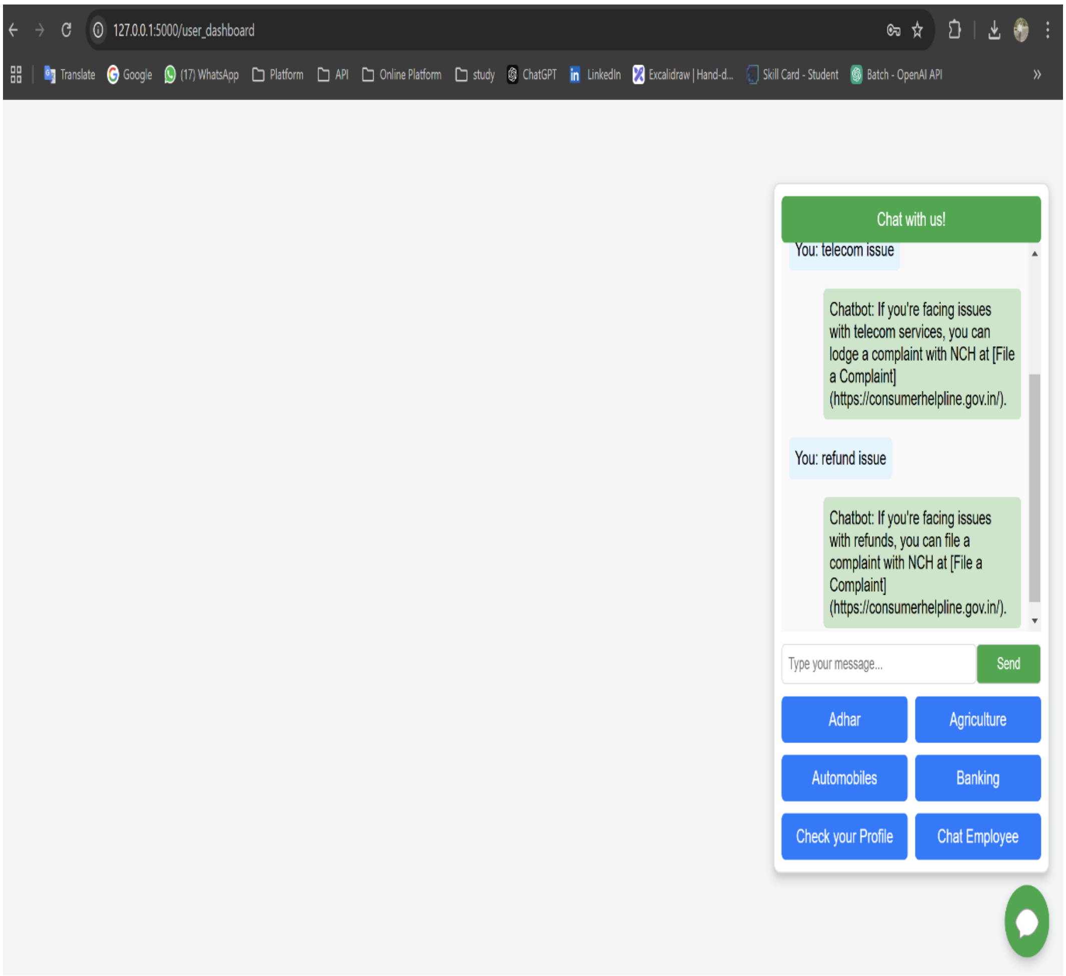
## 4.3 Chapter Conclusion

The implementation phase of the National Consumer Helpline Chatbot leverages NLTK and Python’s powerful capabilities to create an efficient, AI-driven solution for consumer support. By pre-processing text data with techniques like tokenization, stemming, and lemmatization, the chatbot ensures accurate and context-aware responses. Through keyword matching and document similarity, it generates relevant replies to user queries.

The chatbot offers enhanced consumer support with 24/7 availability, efficient query handling, real-time analytics, and secure data management. By reducing resolution times and improving scalability, it establishes a reliable and user-centric platform for addressing consumer grievances while ensuring privacy and compliance with security standards

# CHAPTER – 5

# RESULT



You: telecom issue

Chatbot: If you're facing issues with telecom services, you can lodge a complaint with NCH at [File a Complaint](https://consumerhelpline.gov.in/).

You: refund issue

Chatbot: If you're facing issues with refunds, you can file a complaint with NCH at [File a Complaint](https://consumerhelpline.gov.in/).

***Figure 5.1: Chatbot Result***

The **ChatBot** is a Python-based virtual assistant designed to provide consumers with quick and efficient support. Built using Flask, it guides users in resolving issues across various sectors like telecom, banking, agriculture, and more. The chatbot also offers direct links to file complaints on the official NCH platform, ensuring a seamless consumer experience.

# CHAPTER - 6

# CONCLUSION AND FUTURE SCOPE

## 6.1 Conclusion

The **National Consumer Helpline Chatbot** offers a cutting-edge solution for streamlining consumer support processes. By employing advanced Artificial Intelligence (AI) and Natural Language Processing (NLP) techniques, the chatbot ensures efficient query resolution, providing consumers with quick, accurate, and accessible assistance. This project highlights the significant potential of chatbot systems in transforming traditional public support services into responsive, scalable, and reliable frameworks.

The chatbot's integration into the National Consumer Helpline system addresses key challenges such as operational inefficiency and consumer dissatisfaction. It enables round-the-clock availability, automates routine queries, and reduces the workload on human agents, thereby allowing them to focus on complex issues. This results in better resource utilization and improved overall consumer satisfaction.

This initiative also represents a critical step in modernizing consumer support services in India, contributing to a digitally empowered society. It bridges the gap between consumers and service providers by facilitating seamless communication, promoting transparency, and enhancing the consumer protection ecosystem.

## 6.2 Future Enhancement

The potential for enhancing the chatbot system is vast, with several avenues for improvement and expansion, such as:

1. **Advanced AI Capabilities**
    - Integrating **machine learning models** to enable the chatbot to learn from interactions, thereby improving its accuracy and adaptability over time.
    - Incorporating **sentiment analysis** to understand consumer emotions and tailor responses accordingly.
2. **Multilingual Support**

- Expanding the chatbot's capabilities to support multiple regional languages to ensure inclusivity and accessibility for diverse user groups across India.

3. **Integration with Emerging Technologies**
   - Using **voice recognition** and **text-to-speech systems** for hands-free interaction, catering to a broader demographic, including the visually impaired.
   - Leveraging **blockchain technology** for secure and transparent handling of consumer grievances.

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