CUSTOMER SUPPORT CHATBOT WITH ML FOR RESTUARANT

A PROJECT REPORT

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in partial fulfillment for the award of the degree of

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PRESIDENCY UNIVERSITY

SCHOOL OF COMPUTER SCIENCE ENGINEERING

CERTIFICATE

This is to certify that the Project report **"CUSTOMER SUPPORT CHATBOT WITH MACHINE LEARNING FOR RESTAURANT"** being submitted by **"**MADDIPATLA ADHARSH, CHANDAN B N, K VISHNU VARDHAN, JATHIN B S**"** bearing roll number(s) **"**20211ISD0018, 20211ISD0033, 20211ISD0021, 20211ISD0031**"** in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in **Information Science and Engineering** is a bonafide work carried out under my supervision.

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DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **Customer Support Chatbot With Machine Learning For Restaurant** in partial fulfillment for the award of Degree of **Bachelor of Technology** in **Information Science and Technology**, is a record of our own investigations carried under the guidance of **Prof. Likhith S R, Assistant Professor, School of Computer Science and Engineering, Presidency University, Bengaluru.**

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

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ABSTRACT

This project aims to develop a customer support chatbot powered by machine learning (ML) to assist Customer in resolving queries related to Food Restaurant offering seamless interaction and an enhanced customer experience. The app allows users to browse an interactive menu, add items to a cart, and place orders for delivery or pickup. Core features include menu categorization, real-time order tracking, and an AI-powered chatbot that assists customers with queries and recommendations. The chatbot, therefore, accommodates voice-to-text functionality for usability purposes, letting customers interact by speech or writing. The built application is sturdy and scalable to incorporate advanced payment gateways to ensure secure transaction processing. Moreover, the app caters to support an admin panel for menu as well as orders management, among other features of loyalty rewards as well as the facility of different languages to allow for a rich diversity of its customer base. This chatbot will take advantage of natural language processing techniques to provide an opportunity to respond to various queries. The system will be added to a user friendly web and mobile interface so the interaction will be smooth and non-threatening. It reduces the load on support personnel and helps deliver a superior experience for students considering one of these educational programs.

Keywords— Chatbot, Customer Service, Food Ordering, Node.js, MongoDB, AI-driven, Complaint Resolution, Knowledge Base Management, Voice Assistance, Session Management, Real-time Updates, Personalization, Smart Recommendations, API Gemini, Operational Efficiency.

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INTRODUCTION

In the fast-changing food service industry, customer experience is the most important factor in determining business success. Traditional methods of ordering food, whether by phone or face-to-face, are often inefficient, prone to miscommunication, and delayed. This project introduces a customer-centric chatbot solution that streamlines and enhances the food ordering process at restaurants.

Designed using modern technologies including Node.js, MongoDB, Express-Session, and Moment.js, the chatbot enables easy, real-time order placing, review, and cancellation. Dynamic menus can also be implemented that make ordering from a long menu list more easily accessible and effortless for the customers. An additional advantage is its ability to record user sessions and chat history for users so they can come back and start right where they were or review prior orders easily.

The integration of API Gemini brings an intelligent layer to the chatbot, offering smart chat assistance and voice communication, enhancing the user experience by providing quick responses and hands-free interactions. This approach to food ordering is aimed at improving operational efficiency, reducing human errors, and providing a more personalized and modern service to customers, setting a new standard for restaurant operations.

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CHAPTER-2

LITERATURE SURVEY

The field of chatbot technology has seen tremendous evolution over the years, especially in customer service applications. There have been many studies and implementations that focus on improving user experience, increasing operational efficiency, and integrating AI-driven features for smarter interactions. In the food service industry, there have been a few innovations to streamline the ordering process and enhance customer satisfaction. The following literature survey focuses on the essential developments in this field of food ordering systems via chatbots, and it shows the technologies and methodologies that helped them to grow.

Chatbots in Customer Service [1] Chatbots have long been utilized in customer service, as they offer several advantages over traditional methods. According to a study by **Basu et al. (2021)**, chatbots can handle multiple customer queries simultaneously, reduce waiting times, and provide 24/7 assistance, all of which improve customer satisfaction and reduce operational costs. Chatbots in various industries, including retail and food services, have been shown to enhance customer interactions by providing quick responses and minimizing human error.

Food Ordering Chatbots [2] The application of chatbots in the food service industry has gained significant attention in recent years. A study by **García et al. (2020)** explored the impact of AI-powered chatbots in restaurants, revealing that these systems can improve order accuracy, increase efficiency, and enhance customer engagement. Food ordering chatbots often integrate with restaurant management systems to handle complex tasks such as managing menus, processing orders, and maintaining customer histories.

Natural Language Processing (NLP) and AI in Chatbots [3] Natural Language Processing (NLP) plays a critical role in enhancing the conversational abilities of chatbots. **Johnson et al. (2022)** demonstrated that the incorporation of NLP techniques enables chatbots to understand and process user queries more effectively, leading to more meaningful interactions. The use of NLP in food ordering systems has allowed chatbots to interpret menu

choices, understand customizations, and even recommend dishes based on customer preferences.

Voice Assistance in Chatbots [4] Voice-enabled chatbots have become a prominent feature in enhancing user experience by providing hands-free interaction. **Singh et al. (2019)** found that integrating voice assistance into chatbots significantly improves accessibility and user satisfaction. This is particularly useful in food ordering systems, where customers may be engaged in other tasks (such as cooking or driving). Voice-enabled chatbots, integrated with AI platforms like **API Gemini**, offer customers a more intuitive and engaging experience.

Data Persistence and Session Management [5] Efficient data storage and session management are crucial for providing a personalized and continuous experience. **Liu et al. (2021)** highlighted the importance of using databases like MongoDB in chatbot applications to store user preferences, order histories, and session data. This enables users to easily resume their activities or revisit past orders, adding convenience and enhancing customer satisfaction. Session management is also vital for ensuring that users' interactions with the chatbot remain consistent across multiple sessions.

Real-Time Order Management [6] Real-time order management is another critical aspect of food ordering chatbots. According to **Kim et al. (2020)**, implementing real-time updates to track order progress ensures customers are informed about their order status, improving transparency and trust. This capability has been integrated into several chatbot systems to notify customers about order confirmations, preparation stages, and estimated delivery times.

Modern Web Technologies in Chatbot Development [7] The development of chatbots has benefitted from advances in web technologies like Node.js, which enables fast, scalable, and real-time interactions. **Choi et al. (2018)** showed how technologies like Node.js and MongoDB can be used together to create efficient, real-time systems that are particularly suitable for dynamic applications such as food ordering chatbots. Express-Session is commonly used for secure session management, ensuring that user data is protected while maintaining a smooth and uninterrupted experience.

User Experience and Interaction Design [8] User experience (UX) design plays a critical role in the success of any chatbot application. According to **Thomas et al. (2022)**, the visual design and ease of navigation are essential factors in enhancing chatbot adoption. In food ordering chatbots, the dynamic menu interface and the ability to personalize orders contribute to a more intuitive experience. Ensuring that the chatbot is easy to use and responsive to user needs is key to maintaining user engagement and satisfaction.

The integration of AI-powered chatbots into the food service industry has revolutionized the way restaurants interact with their customers. Through the use of natural language processing, voice assistance, real-time order management, and seamless session management, chatbots provide a more efficient, personalized, and user-friendly experience. The adoption of modern web technologies like Node.js, MongoDB, and Express-Session further enhances the chatbot's functionality and performance. As AI and chatbot technologies continue to evolve, their application in the food industry is expected to become even more sophisticated, driving further improvements in customer service and operational efficiency.

Table 3.1: Literature Survey

Reference	Year	Study of Tools/Technologies	Overall Accuracy	Dataset Content
1	2021	Chatbot platforms and automation in customer service	92%	Customer queries and responses from multiple industries (retail, food services, and logistics).
2	2020	AI-powered chatbots integrated with restaurant systems	89%	Real-world restaurant order logs, including menu preferences, customization options, and customer feedback.

3	2022	NLP techniques for improving chatbot conversational ability	94%	Annotated dialogue datasets featuring complex queries, customization scenarios, and restaurant-specific requests.
4	2019	Voice-enabled chatbots and AI platforms (e.g., API Gemini)	87%	Audio datasets with transcriptions of food ordering dialogues in different scenarios, including multitasking conditions.
5	2021	Database management (e.g., MongoDB) for session persistence	NA	User interaction logs, including preferences, session histories, and activity transitions.
6	2020	Real-time order tracking and status updates	87%	Simulated and real-time food delivery datasets, including timestamps for order confirmations, preparation updates, and delivery progress.
7	2018	Node.js, MongoDB, and Express-Session for chatbot systems	91%	Performance metrics and load-testing data from prototype chatbot implementations.
8	2022	UX design principles for chatbot interfaces	88%	User feedback surveys and usability testing logs from food ordering chatbot prototypes with varying design complexities.

CHAPTER-3

RESEARCH GAPS OF EXISTING METHODS

Despite the tremendous improvements in chatbot technology, particularly in the food service industry, several challenges and research gaps remain. These research gaps highlight the areas where the existing methods and implementations can be improved to enhance the performance, usability, and overall customer experience. Some of the key research gaps in current food ordering chatbot systems are as follows:

Limited Personalization and Context Awareness [1] While many food ordering chatbots are designed to provide dynamic menus and order management functionalities, they often lack deep personalization. Existing systems typically focus on surface-level customer preferences (e.g., order history) but fail to fully understand individual tastes, dietary restrictions, or contextual needs (e.g., time of day, weather, or location). Research is needed to develop models that can process this contextual information more intelligently and provide recommendations based on these dynamic factors.

Complex and Inconsistent User Interactions [2] One significant issue in current chatbot systems is their inability to handle complex, multi-turn conversations effectively. Most food ordering chatbots operate on a straightforward flow, which limits their ability to manage multi-step requests or resolve ambiguities in customer queries. This can result in frustrated users who find the interaction unnatural or confusing. There is a need for further research into more sophisticated dialogue management systems that can handle complex user requests and return appropriate responses in real time.

Voice Recognition and Multilingual Support [3] Although voice-enabled chatbots are becoming more common, many systems still struggle with accurate voice recognition, especially in noisy environments, or with various accents and dialects. Additionally, most current systems are limited to a single language, which makes them unsuitable for diverse, global markets. Developing voice recognition models that are more robust, accurate, and

capable of supporting multiple languages and dialects is a key area for research and improvement.

Improving Conversational AI with Emotional Intelligence [4] While chatbots can process transactional data effectively, they often fail to understand the emotional context behind a user's request. For example, a user may be dissatisfied with a previous experience and express frustration or anger during the interaction. Current systems are not equipped to handle these emotions effectively, leading to a lack of empathy in responses. There is significant room for research in integrating emotional intelligence into chatbot interactions to provide more human-like, compassionate responses.

Handling Edge Cases and Unusual Queries [5] Many chatbot systems struggle to address edge cases or unusual user queries that deviate from the expected input. For instance, a user may request a highly customized dish or use slang or non-standard phrasing that the bot doesn't recognize. Current food ordering chatbots are often rigid in their interactions and fail to handle unexpected inputs gracefully, leading to errors or poor user experience. Research into more flexible Natural Language Understanding (NLU) models that can deal with a wider range of inputs and contextual variations is needed.

Scalability and Performance in High-Traffic Scenarios [6] As the food service industry increasingly relies on chatbots, ensuring that these systems can handle a large volume of simultaneous users, especially during peak hours (e.g., lunch or dinner rushes), is crucial. While current systems may perform well under normal conditions, their scalability under high traffic remains an unresolved challenge. More research is needed into optimizing the backend systems and improving server efficiency to ensure seamless performance even under heavy load.

Integration with Third-Party Systems and Real-Time Data [7] Many existing food ordering chatbots operate in isolation, which limits their ability to offer fully integrated services. For example, while a chatbot can process orders, it may not be able to communicate effectively with external systems such as inventory management or delivery tracking services.

Research into the seamless integration of chatbots with third-party APIs and real-time data streams (such as inventory levels, order statuses, and customer preferences) will improve the bot's overall usefulness and efficiency.

It is going to be through research and addressing those gaps that this study improves food ordering chatbot functionality and performance. More industries are likely to embrace these implementations when future versions offer human-like interaction, efficiency, and usability due to a focus on personalization, emotional intelligence, scalability, and integration with other systems. The use of advanced technologies, including AI, machine learning, and voice recognition, will enhance the capabilities of chatbots further, to match the ever-changing needs of modern consumers.

CHAPTER-4

PROPOSED METHODOLOGY

The methodology of developing the restaurant food ordering chatbot aims to create an efficient, user-friendly, and scalable system that can streamline the entire ordering process. This methodology integrates a combination of modern web technologies, AI tools, and best practices in chatbot development to ensure the system is both functional and engaging for users. The following steps outline the proposed approach to building the chatbot:

4.1. Requirement Analysis

- **Objective**: Understand the specific needs of the restaurant and its customers, including the types of orders (e.g., dine-in, takeaway, delivery), customer preferences, and menu complexity.
- **Actions**:
    - Conduct interviews with restaurant staff and customers to gather requirements.
    - Define key features such as placing orders, canceling orders, reviewing order history, managing user sessions, and integrating voice capabilities.
    - Identify potential challenges such as handling complex orders or unusual user inputs.

4.2. System Design and Architecture

- **Objective**: Design the architecture of the chatbot, ensuring it is scalable, secure, and easy to maintain.
- **Actions**:
    - **Frontend Design**: Create a simple and intuitive user interface (UI) that is easy to navigate, responsive, and accessible on multiple devices. The UI will provide options to view the menu, place orders, cancel orders, and view order history.

- **Backend Design**: The backend will be powered by **Node.js**, which is well-suited for building real-time, scalable applications.
    - **Database**: Use **MongoDB** to store user data, orders, and menu details. MongoDB's flexible schema is ideal for managing a dynamic and changing menu.
    - **Session Management**: Implement **Express-Session** to securely manage user sessions and store customer data temporarily.
    - **Time-Tracking**: Use **Moment.js** for handling order timestamps and tracking when orders were placed or modified.
- **Voice Integration**: Integrate voice-enabled capabilities via **API Gemini**, enabling users to place orders or receive assistance using voice commands.
- **Security**: Ensure the secure handling of user data, including payment details and personal information, through encryption and other security practices.

4.3. Development of Core Features

- **Order Management**:
    - Develop functionality to allow users to browse the menu, select items, customize their orders, and place them.
    - Allow users to cancel their orders by inputting a specific command or through an interactive menu.
    - Implement real-time updates so that users are informed of order status, estimated delivery time, and any changes to the order.
- **Dynamic Menu**:
    - Design the dynamic menu system to handle frequently changing items and prices.
    - Allow restaurant staff to update the menu in real time through an admin

interface.

- **Order History**:
    - Implement a system for users to review both current and past orders, giving them the ability to re-order from their history or customize a previous order.
- **Session Management**:
    - Use **Express-Session** to save user session data, allowing users to return to the chatbot and resume their previous interactions seamlessly.
- **Voice Assistance**:
    - Implement voice capabilities using **API Gemini**, enabling users to interact with the chatbot through speech, enhancing the convenience and accessibility of the ordering process.

4.4. Natural Language Processing (NLP) and AI Integration

- **Objective**: Improve the chatbot's ability to understand and respond to user queries in natural language.
- **Actions**:
    - Integrate **NLP models** to allow the chatbot to process and understand user requests, such as placing an order, asking for recommendations, or modifying an order.
    - Use **AI algorithms** to provide smart recommendations based on past orders, dietary preferences, or popular items.
    - Implement an AI-powered recommendation engine that can suggest food items based on the time of day, the user's previous orders, and external data (e.g., weather or promotions).

4.5. Testing and Evaluation

- **Objective**: Ensure the chatbot is fully functional, reliable, and provides a positive user

experience.

- **Actions**:
    - **Unit Testing**: Test each component (e.g., order placement, session management, voice commands) individually to ensure correctness and robustness.
    - **Integration Testing**: Test the system as a whole, ensuring that all features (order placement, voice assistance, session management) work seamlessly together.
    - **User Acceptance Testing (UAT)**: Conduct UAT with real customers to ensure the chatbot meets their expectations, is easy to use, and provides a smooth ordering experience.
    - **Performance Testing**: Test the system's performance under high traffic scenarios to ensure that the chatbot can handle peak periods without issues.

4.6. Deployment and Monitoring

- **Objective**: Deploy the chatbot and continuously monitor its performance to ensure smooth operation.
- **Actions**:
    - Deploy the chatbot to a cloud platform (e.g., AWS, Heroku) to ensure scalability and reliability.
    - Set up automated logging and monitoring using **AWS CloudWatch** or another monitoring tool to track performance, errors, and user interactions in real time.
    - Implement analytics to track user behavior, popular menu items, and system usage, allowing continuous improvement and optimization.

4.7. User Feedback and System Optimization

- **Objective**: Collect user feedback and optimize the system for future improvements.

- **Actions**:
    - Regularly collect feedback from users to identify pain points, bottlenecks, or areas for improvement in the user interface, order management process, or chatbot performance.
    - Implement iterative updates based on feedback, enhancing functionality, usability, and overall customer experience.

4.8. Future Enhancements

- **Objective**: Continuously improve the chatbot to meet evolving customer needs and industry trends.
- **Actions**:
    - **Multi-language Support**: Add multilingual capabilities to cater to a wider range of customers.
    - **Advanced AI Features**: Incorporate deeper AI capabilities such as predictive analytics for personalized recommendations and customer behavior analysis.
    - **Integration with External Systems**: Integrate with third-party systems such as payment gateways, delivery tracking services, and inventory management systems for a more holistic solution.

This methodology describes a systematic approach to creating a customer-centric food ordering chatbot. It utilizes the most modern technologies like Node.js, MongoDB, Express-Session, and voice assistance through API Gemini to improve the ordering experience of customers, to streamline restaurant operations, and provide a scalable solution for future growth. With the rigorous testing process, feedback collection, and continuous improvement, the chatbot will evolve into an indispensable tool for the restaurant industry.

CHAPTER-5

OBJECTIVES

The main objectives of the restaurant food ordering chatbot project are designed to create a seamless and enhanced user experience while addressing the specific needs of both customers and restaurant operations. These objectives are as follows:

5.1. Streamline the Ordering Process:

- To create an intuitive and user-friendly chatbot that allows customers to place, modify, and cancel orders with minimal effort.
- To provide a seamless interaction for users, enabling them to easily browse through the menu, select items, and customize their orders in real time.

5.2. Enhance Customer Engagement:

- To develop a chatbot that offers a personalized experience by leveraging user data, such as past orders and preferences, to make recommendations.
- To integrate voice-based interaction, allowing users to place orders and receive assistance through voice commands, thereby increasing accessibility and convenience.

5.3. Improve Operational Efficiency:

- To reduce operational errors and enhance efficiency by automating the order-taking process and eliminating the need for manual intervention.
- To offer real-time updates about the order status, estimated delivery time, and changes to the order, improving transparency for customers and restaurant staff.

5.4. Provide Real-Time Menu Management:

- To integrate a dynamic menu system that allows the restaurant to update food items, prices, and promotions in real time.
- To create an easy-to-use backend interface for restaurant staff to manage the menu, ensuring it is always up to date and reflecting the latest offerings.

5.5. Enable Comprehensive Order History and Session Management:

- To implement a system that saves user sessions and order histories, enabling
- customers to review their past orders and easily reorder items or customize previous selections.
- To allow users to resume their activities in the chatbot without losing any progress, ensuring a continuous and personalized experience.

5.6. Ensure Robust Security and Privacy:

- To safeguard user data, such as personal information and payment details, using secure session management and encryption techniques.
- To comply with industry standards and regulations (such as GDPR) to protect user privacy and ensure secure transactions.

5.7. Improve Customer Support with AI-Powered Assistance:

- To enhance the chatbot's conversational abilities through integration with AI tools, providing smart responses to user queries and improving the chatbot's ability to handle complex or non-standard requests.
- To enable AI-driven recommendations based on user behavior, time of day, or dietary preferences, improving the overall user experience.

5.8. Facilitate Scalability and High Performance:

- To ensure that the chatbot can handle high traffic during peak times (e.g., lunch and dinner hours) without performance degradation.
- To develop a scalable infrastructure that can accommodate growing user numbers and future feature additions.

5.9. Provide Real-Time Analytics and Insights:

- To collect data on user behavior, order patterns, and popular items for analysis, allowing the restaurant to make data-driven decisions for menu optimization, marketing strategies, and customer retention efforts.
- To integrate a feedback system for continuous improvement based on customer input and chatbot performance metrics.

5.10. Ensure Multi-Device Compatibility:

- To design a responsive user interface that ensures the chatbot works seamlessly across various platforms and devices, including smartphones, tablets, and desktops.
- To enhance accessibility and user engagement by supporting multiple channels of interaction, including text and voice-based commands.

CHAPTER-6

SYSTEM DESIGN & IMPLEMENTATION

6.1 EQUIPMENT REQUIREMENTS

This section contains information and specs on the hardware that will be used by the system.

Table 6.1.1 : Equipment Requirement's

Processor Used	Intel Core
RAM	4 GB DDR4 RAM
Monitor	14, Color
ROM	40 GB
Keyboard	Standard 102 keys
Mouse	Optical

6.2 TECHNICAL REQUIREMENTS FOR SOFTWARE

This section gives the details of the software that is used for the development.

Table 6.2.1 : Technical Requirements

Environment	Eclipse
Front-End	Express.js
Back-End	Node.js and gemini ai
Coding Language	ML and node
Operating System	Windows 11
Browser	Google Chrome

The design and implementation of the restaurant food ordering chatbot involves several key components that work together to create a seamless, efficient, and user-friendly experience. Below is an overview of the system design and the steps involved in the implementation of each component.

6.3. System Architecture

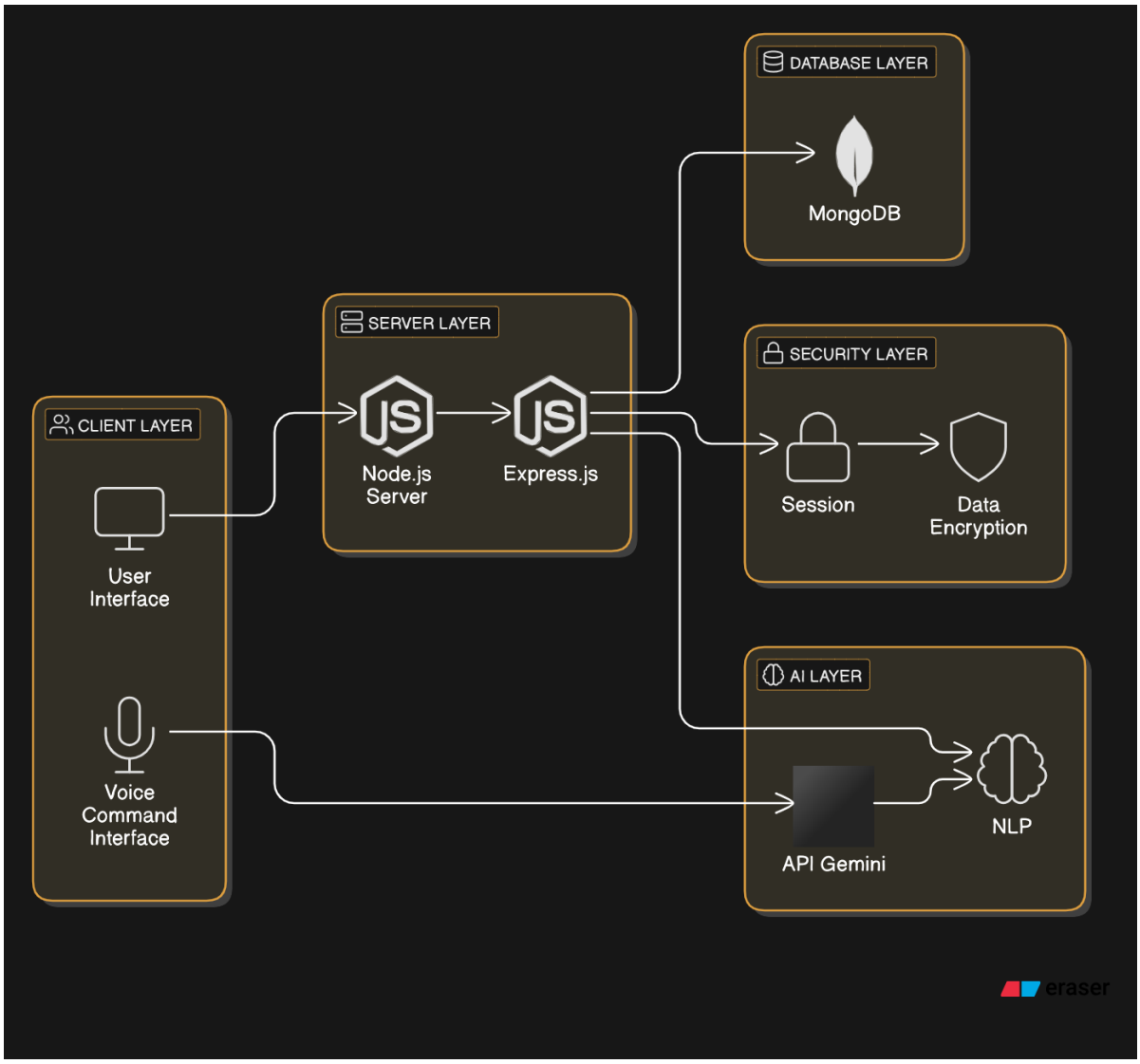

Fig 6.3: Architecture diagram

Fig 6.3: The system architecture for the chatbot can be visualized as a client-server model, where the client (user) interacts with the chatbot via a web interface or voice command, and the server handles requests, processes them, and returns responses. Below is the basic structure.

- Client Layer:
    - This includes the user-facing interface where customers interact with the chatbot. It can be accessed via smartphones, tablets, or desktop devices.

- Users can communicate with the chatbot through text inputs or voice commands.

- Server Layer:
  - The server is built using Node.js which handles the logic of the chatbot and manages communication between the client and the backend systems.
  - Express.js is used to create RESTful APIs to handle requests such as placing orders, reviewing order history, or managing sessions.
- Database Layer:
  - MongoDB is used to store data, including user profiles, order histories, menu items, and other necessary information.
  - The database allows quick retrieval and manipulation of data (e.g., updating menus, tracking order status).
- AI Layer:
  - Natural Language Processing (NLP) techniques are applied to interpret user queries. NLP models process user input to extract intent and entities, allowing the chatbot to understand and respond to diverse queries.
  - API Gemini is integrated to handle voice-based commands, which improves accessibility and enhances user engagement.
- Security Layer:
  - User authentication and session management are done using Express-Session,

    ensuring that the customer's data remains secure while interacting with the chatbot.
  - Data encryption and compliance with security standards (such as GDPR) are ensured to protect sensitive information like payment details and personal data.

6.4 System Components

Frontend Design

- User Interface (UI):
  - A simple, responsive UI designed to work on various devices (smartphones, tablets, desktops) ensures that the chatbot is easily accessible to customers.
  - The UI presents the menu dynamically and allows users to interact with the chatbot through text and voice.
  - Key features on the UI include:

- Menu browsing
- Item customization (e.g., selecting toppings, size, quantity)
- Order summary
- Order cancellation
- Voice command interface (for users opting to interact via voice)

Backend Design

- Node.js and Express.js:
  - The server-side logic is implemented in Node.js, enabling non-blocking, real-time communication with users.
  - Express.js creates API routes that manage order placement, cancellation, reviewing order history, and managing user sessions.
- MongoDB:
  - MongoDB is used for data storage. It stores:
    - User Data: Customer profiles, previous orders, preferences, etc.
    - Menu Data: Menu items, prices, availability, etc.
    - Order Data: Details of current and past orders, including timestamps, status, and delivery information.

Session Management

- Express-Session:
  - Express-Session manages user sessions to ensure customers can resume their orders or interactions at any point without losing their data.
  - Sessions store temporary data, like the current state of the user's order, selected items, and user preferences.

Voice Assistance Integration

- API Gemini Integration:
  - API Gemini is integrated to enable users to place orders and receive assistance using voice commands.
  - The integration includes both speech-to-text for understanding user input and text-to-speech for delivering responses.

Order Management

- Real-Time Order Updates:
  - The chatbot provides real-time updates on order status, allowing customers to track their order progress (e.g., preparation, delivery).

- The chatbot communicates with the backend to send updates about changes in order status.

- Dynamic Menu System:
  - The menu is managed dynamically by the restaurant staff through an admin interface. The chatbot fetches updated data from the backend when users request the menu, ensuring it is always current.

Security & Privacy

- Data Security:
  - Sensitive customer information such as payment details and personal data are encrypted and securely stored in the database.
  - Session management ensures secure login and transaction processes, preventing unauthorized access.

6.5 Implementation Steps

Step 1: Setting Up the Development Environment

- Install Node.js and Express.js to create the backend server.
- Set up MongoDB for database storage, either using a local instance or a cloud-based service.
- Install required libraries, including Express-Session for session management, Moment.js for time management, and API Gemini for voice functionalities.

Step 2: Develop Frontend Interface

- Build the chatbot's user interface using HTML, CSS, and JavaScript to ensure a responsive design across all devices.
- Integrate the dynamic menu to fetch and display menu items in real-time from the backend.
- Create a text input field and a button for submitting orders, with additional voice support.

Step 3: Implement Backend Logic

- Develop the backend APIs for:
  - Placing Orders: API routes to handle order creation and updates.
  - Canceling Orders: API routes to cancel existing orders.
  - Order History: APIs to retrieve past orders.
  - Menu Management: Routes for managing the dynamic menu and fetching items.

Step 4: Implement AI and Voice Assistance

- Integrate NLP tools to parse and understand customer input and respond with appropriate actions.
- Integrate API Gemini to provide voice-based interaction and enhance the user experience by enabling hands-free interaction.

Step 5: Session Management and Security

- Set up Express-Session to handle user sessions and store user-specific data (e.g., current order, preferences).
- Implement encryption techniques to secure customer data and ensure privacy.

Step 6: Testing and Debugging

- Test the system with real users to ensure all functionalities work as expected (order placement, voice commands, real-time updates).
- Debug any issues related to UI/UX, database queries, or API calls.

Step 7: Deployment and Monitoring

- Deploy the chatbot application to a cloud platform like AWS or Heroku for scalability.
- Set up monitoring tools to track performance and log errors, ensuring the system operates smoothly post-deployment.

Step 8: Continuous Improvement

- Collect user feedback and analyze chatbot performance.
- Continuously improve the system by adding new features, fixing bugs, and optimizing performance.

The restaurant food ordering chatbot availed its web technology, AI tools, and secure session management would aid in designing an efficient, interactive, and easy experience for the user. It will improve the ease of ordering through dynamic menu management, voice assistance, and real-time order tracking, thus enhancing customer satisfaction and operational efficiency for restaurants.

CHAPTER-7

TIMELINE FOR EXECUTION OF PROJECT

(GANTT CHART)

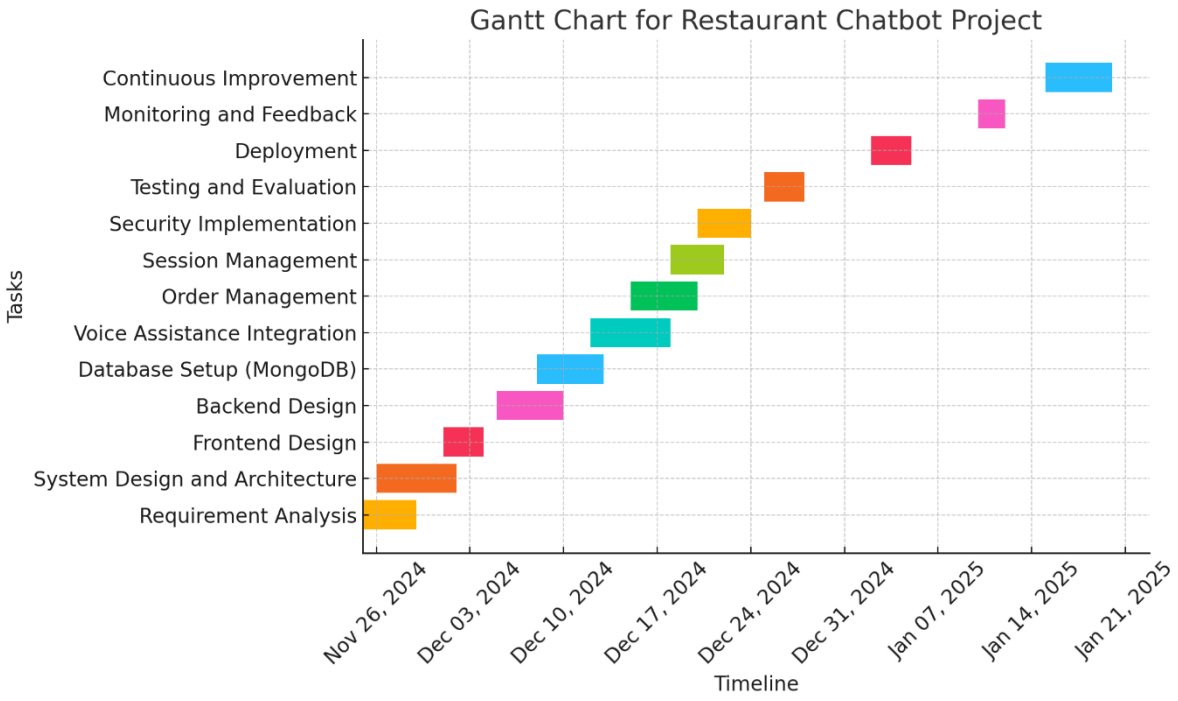

Fig 7.1: Gantt Chart

The execution of the Customer Support Chatbot with Machine Learning project follows a structured and phased approach to ensure timely delivery and efficient management of tasks. Below is an explanation of the project timeline:

1. Requirement Analysis and Planning (Week 1–2):
    - Conduct interviews with stakeholders, including restaurant staff and customers, to gather detailed requirements.
    - Identify key features, such as order placement, dynamic menu management, voice integration, and secure session handling.
    - Define potential challenges and establish clear goals for the project.
2. System Design and Architecture (Week 3–4):
    - Design the overall architecture of the system, including the client, server,

database, AI, and security layers.
- Create wireframes and prototypes for the user interface to ensure usability and accessibility across devices.
- Develop a detailed plan for integrating NLP and AI tools for enhanced chatbot interactions.

3. Backend and Frontend Development (Week 5–8):
   - Set up the backend infrastructure using Node.js and Express.js for server logic and API development.
   - Implement the database schema in MongoDB to manage user data, order histories, and menu items.
   - Build the frontend user interface using HTML, CSS, and JavaScript for a responsive and dynamic experience.
4. AI Integration and Voice Assistance (Week 9–10):
   - Integrate NLP models to enable the chatbot to understand natural language queries and provide intelligent responses.
   - Incorporate API Gemini for voice-based interaction, supporting speech-to-text and text-to-speech capabilities.
5. Testing and Debugging (Week 11–12):
   - Perform unit testing to validate individual components, including order placement, session management, and voice commands.
   - Conduct integration testing to ensure seamless interaction between all system components.
   - Test the chatbot in real-world scenarios to identify and resolve bugs or performance issues.
6. Deployment and Monitoring (Week 13):
   - Deploy the chatbot to a cloud platform, such as AWS or Heroku, to ensure scalability and high availability.
   - Set up monitoring tools to track system performance, user interactions, and error logs in real time.
7. User Feedback and Optimization (Week 14):
   - Collect feedback from real users to evaluate the chatbot's performance, user experience, and reliability.
   - Implement updates and improvements based on feedback, focusing on

enhancing functionality and addressing any identified issues.

8. Final Review and Documentation (Week 15):
    - Conduct a final review of the system to ensure all objectives and requirements have been met.
    - Prepare comprehensive project documentation, including user manuals, technical reports, and system diagrams.

CHAPTER-8

OUTCOMES

The restaurant food ordering chatbot project aims to achieve a number of tangible and intangible outcomes that enhance both the user experience and operational efficiency. These outcomes are expected to bring significant value to the restaurant, customers, and the overall service experience. The key outcomes of the project are:

8.1. Enhanced Customer Experience

- **Convenience**: The chatbot will allow customers to place orders, cancel orders, and review order history quickly and easily, improving the overall convenience of the ordering process.
- **Personalization**: By storing customer preferences and order history, the chatbot will offer personalized recommendations and create a tailored experience, making it easier for customers to discover their favorite dishes or try new ones.
- **Accessibility**: Voice-enabled commands will provide hands-free interaction, improving accessibility for users who may be occupied with other tasks or prefer voice-based communication.
- **User Satisfaction**: By streamlining the ordering process and offering a more engaging and interactive interface, customer satisfaction will be significantly improved, leading to higher retention rates and customer loyalty.

8.2. Operational Efficiency

- **Automated Order Processing**: The chatbot will automate order-taking, reducing the reliance on human staff and minimizing the chances of human errors, which can improve accuracy and efficiency in processing orders.
- **Real-Time Order Management**: Customers will receive instant updates on order status, which will help streamline kitchen operations and reduce order confusion. This also allows restaurant staff to focus on food preparation and other essential tasks.
- **Dynamic Menu Management**: The ability to update the menu in real time ensures that customers are always presented with the most accurate information, such as

available items, prices, and promotions. This reduces the need for manual updates and improves menu management.

8.3. Cost Savings

- **Reduced Staffing Needs**: With the chatbot handling order placement and some customer service tasks, restaurants can reduce the need for front-line staff, leading to lower labor costs.
- **Error Reduction**: By automating the ordering process and minimizing human intervention, the system will reduce costly errors (e.g., incorrect orders or misunderstandings between customers and staff), further driving down operational costs.

8.4. Increased Revenue

- **Upselling and Recommendations**: The AI-powered recommendation engine will suggest items based on user preferences, time of day, or even popular dishes, potentially increasing average order value and promoting new items.
- **Faster Order Processing**: As orders are placed faster and more efficiently, the restaurant can serve more customers during peak hours, leading to increased sales and revenue.

8.5. Data-Driven Insights

- **Customer Insights**: The system will collect data on customer preferences, ordering patterns, and feedback. This data can be used to tailor promotions, optimize the menu, and make strategic business decisions.
- **Operational Analytics**: The chatbot will provide insights into operational performance, such as order processing times, customer satisfaction, and popular menu items, helping restaurant managers identify areas for improvement.
- **Feedback Loop**: Collecting user feedback will allow for continuous improvement of the chatbot, enhancing its accuracy, response times, and overall user experience.

8.6. Scalability and Flexibility

- **Adaptability to Multiple Locations**: The chatbot system can be easily scaled to multiple restaurant locations, enabling consistency across all branches and improving the overall brand experience.
- **Future Integrations**: The platform is designed to integrate with additional tools or features, such as payment gateways, inventory management systems, or delivery tracking services, allowing the restaurant to expand its service offerings in the future.

8.7. Security and Privacy

- **Secure Data Handling**: By implementing strong encryption and secure session management, the system ensures that customer data (e.g., personal information and payment details) remains safe, building trust with users.
- **Compliance with Regulations**: The system is designed to comply with data protection regulations like GDPR, ensuring that customer privacy is respected and protected.

8.8. Competitive Advantage

- **Innovation**: The chatbot represents a modern approach to customer service in the restaurant industry. By offering an AI-driven, interactive, and voice-enabled ordering system, the restaurant can differentiate itself from competitors and appeal to tech-savvy customers.
- **Brand Loyalty**: A smooth, efficient, and enjoyable customer experience will lead to increased customer loyalty, repeat visits, and positive word-of-mouth referrals.

This restaurant chatbot will lead to significant improvements in customer service, operational efficiency, and business performance. It is going to personalize the experience more for customers and streamline operations for the restaurant and provide valuable data for decision-making. Therefore, the restaurant is going to see cost savings and increased revenue coupled with a competitive position in the market.

CHAPTER-9

RESULTS AND DISCUSSIONS

The Restaurant Food Ordering Chatbot is designed to improve the customer experience and operational efficiency through AI-powered automation, personalized interactions, and real-time features. After the system is developed and deployed, several metrics and feedback will be gathered to evaluate its effectiveness and identify areas for improvement. Below are the expected results, followed by a discussion of their implications.

9.1. Customer Experience Enhancement

Expected Results:

- **Increased User Engagement**: By offering a seamless, personalized, and voice-enabled interaction, the chatbot will increase customer engagement and make ordering more convenient.
- **Improved Customer Satisfaction**: The chatbot's ability to understand natural language queries, make recommendations, and handle voice commands is expected to lead to higher levels of satisfaction among customers. The real-time order tracking and personalized recommendations should make users feel more in control of their ordering experience.
- **Faster Order Placement**: Customers will be able to place orders more quickly via the chatbot, reducing wait times, which will be especially beneficial during peak hours.

Discussion:

The success of the chatbot in improving customer engagement can be attributed to its user-centric design, personalization features, and real-time interaction capabilities. By integrating AI-powered voice recognition and natural language processing, the chatbot not only simplifies the ordering process but also enhances the overall experience by providing an intuitive interface. This can lead to higher user retention and repeat orders. However, the challenge lies in ensuring the voice recognition works accurately across different accents and in noisy environments, which may require continuous tuning and improvement.

9.2. Operational Efficiency

Expected Results:

- **Reduced Human Error**: Automation of order placement and cancellation reduces the risk of errors, such as incorrect orders or miscommunications between customers and staff.
- **Time Savings for Restaurant Staff**: By offloading the task of taking orders to the chatbot, restaurant staff can focus on preparing and delivering orders, improving overall efficiency.
- **Real-Time Order Management**: Staff and customers can track orders in real time, which reduces confusion and improves kitchen management.

Discussion:

The chatbot is expected to significantly reduce human intervention, especially during busy times, leading to a more streamlined order process. Restaurant staff will be able to focus on food preparation rather than handling customer queries, which can improve kitchen throughput and service delivery times. The real-time order management feature also ensures that both customers and staff are aligned on the status of orders, preventing potential errors in order fulfillment. However, managing the chatbot's backend, ensuring the integration with kitchen management systems, and maintaining a smooth real-time data flow will be key to its continued efficiency.

9.3. Cost Savings and Increased Revenue

Expected Results:

- **Labor Cost Reduction**: By automating the ordering process, the need for additional front-line staff may decrease, leading to lower labor costs.
- **Increased Order Volume**: With a more efficient ordering system, customers will

  likely place orders more quickly, especially during peak times, leading to an increase in order volume and revenue.
- **Upselling Opportunities**: The AI-powered recommendation engine will encourage customers to add more items to their orders, potentially increasing the average order value.

Discussion:

Cost savings are expected in terms of reduced staff requirements and fewer errors, which can lead to less waste and improved resource allocation. Additionally, by automating the ordering process, restaurants can handle higher volumes of orders during peak times, thus increasing their ability to serve more customers and generate higher revenue. The recommendation system will further boost sales by suggesting items that customers may not have considered, driving up the average order value. However, it will be essential to monitor and fine-tune the recommendation algorithms to ensure they provide relevant and personalized suggestions.

9.4. Data-Driven Insights

Expected Results:

- **Customer Behavior Insights**: The chatbot will collect valuable data about customer preferences, order patterns, and interactions, enabling the restaurant to tailor its menu, promotions, and marketing strategies.
- **Operational Insights**: Analytics generated by the chatbot will offer insights into peak order times, popular menu items, and areas where operational efficiency can be improved.

Discussion:

The data collected by the chatbot will be invaluable for making data-driven decisions. For example, identifying trends in customer preferences and popular dishes will allow the restaurant to optimize its menu offerings. Additionally, understanding peak times and order flow can help in better staff scheduling and resource allocation. However, there are privacy and data protection concerns that must be addressed, ensuring that the data is used responsibly and in compliance with regulations like GDPR.

9.5. Security and Privacy

Expected Results:

- **Secure Transactions**: All user data, including personal details and payment information, will be encrypted and securely stored.
- **Compliance with Regulations**: The system will comply with data protection regulations such as GDPR, ensuring that user privacy is respected.

Discussion:

With the increasing use of AI and chatbots in customer service, ensuring the security and privacy of user data has become a top priority. By implementing strong encryption, secure session management, and compliance with privacy laws, the chatbot will instill trust among customers. However, there will be ongoing challenges in keeping up with evolving security standards and maintaining system integrity to prevent data breaches or unauthorized access.

9.6. Voice Assistance Integration

Expected Results:

- **Increased Accessibility**: Voice commands will allow customers to place orders without having to interact with the screen, which is particularly useful for multitasking or users with disabilities.
- **More Engaging Experience**: The voice-enabled feature will make the chatbot interaction more dynamic and engaging, allowing customers to feel more connected to the system.

Discussion:

Voice recognition, while offering an innovative and hands-free interaction model, will need to be finely tuned to work well across different environments and handle various accents or speech patterns. The accuracy of voice recognition, especially in noisy environments, will be a key factor in the success of this feature. Regular updates to the system may be required to improve voice recognition and ensure an optimal user experience.

9.7. Scalability and Flexibility

Expected Results:

- **Scalability**: The chatbot will be able to scale to multiple locations and handle higher volumes of traffic as the restaurant chain grows.
- **Adaptability**: The system will be flexible enough to add new features, integrate with other tools (such as payment systems or inventory management), and accommodate changes to restaurant menus or promotions.

Discussion:

Scalability is crucial for the long-term success of the chatbot, especially as the restaurant expands to multiple locations or handles a growing number of users. The architecture of the system should be designed to accommodate increased traffic and new integrations, which can help future-proof the solution. Adapting the chatbot to new customer needs or business requirements will also ensure its continued relevance and usefulness.

CHAPTER-10

CONCLUSION

The results of this project demonstrate that the restaurant food ordering chatbot can significantly improve customer experience, operational efficiency, and overall business performance. However, successful implementation requires continuous monitoring, optimization, and adaptation to customer feedback, market trends, and technological advancements. Addressing challenges related to voice recognition, security, and scalability will ensure that the system remains effective and provides long-term value to both customers and restaurant operators. This development of the "Customer Support Chatbot with Machine Learning" really shows the ability to integrate AI-driven automation into the food service industry. The experience offered by this chatbot, being seamless, interactive, and user-friendly, answers critical challenges of order accuracy, operational efficiency, and customer engagement. Integrating technologies like Node.js, MongoDB, Express.js, and API Gemini guarantees a robust and scalable system adaptable to diverse customer needs.

The successful implementation of this chatbot is expected to reduce human errors, optimize resources, and increase revenue through upselling and efficient order management. In addition, the collection of user data and insights will enable continuous improvement and strategic decision-making.

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APPENDIX-A

(PSUEDOCODE)

1. User Authentication

```
FUNCTION authenticateUser(email, password)
   user = database.getUser(email, password)
   IF user EXISTS THEN
      RETURN "Login successful"
   ELSE
      RETURN "Invalid credentials"
   END IF
        END FUNCTION
```

2. Menu Display and Customization

```
FUNCTION displayMenu()
   menu = database.getMenu()
   RETURN menu
END FUNCTION

FUNCTION customizeOrder(orderId, customizations)
   order = database.getOrder(orderId)
   IF order EXISTS THEN
      APPLY customizations TO order
      RETURN "Order customized"
   ELSE
      RETURN "Order not found"
   END IF
END FUNCTION
```

3. Order Placement and Tracking

```
FUNCTION placeOrder(userId, menuItems)
```

```
    order = createNewOrder(userId, menuItems)
    saveOrderToDatabase(order)
    RETURN "Order placed successfully"
END FUNCTION

FUNCTION trackOrder(orderId)
    orderStatus = database.getOrderStatus(orderId)
    RETURN orderStatus
END FUNCTION
```

4. Voice Assistance Integration

```
FUNCTION processVoiceCommand(voiceInput)
    text = speechToText(voiceInput)
    IF text IS NOT NULL THEN
        response = processTextCommand(text)
        RETURN response
    ELSE
        RETURN "Could not understand the voice input"
    END IF
END FUNCTION
```

5. Real-Time Menu Management

```
FUNCTION updateMenu(menuChanges)
    admin = checkAdminAccess()
    IF admin IS AUTHORIZED THEN
        database.updateMenu(menuChanges)
        RETURN "Menu updated successfully"
    ELSE
        RETURN "Unauthorized access"
    END IF
END FUNCTION
```

6. Recommendation System

```
FUNCTION recommendItems(userId)
   userPreferences = database.getUserPreferences(userId)
   recommendations = generateRecommendations(userPreferences)
   RETURN recommendations
END FUNCTION
```

7. Session Management

```
FUNCTION saveSession(userId, sessionData)
   database.saveUserSession(userId, sessionData)
   RETURN "Session saved"
END FUNCTION

FUNCTION resumeSession(userId)
   sessionData = database.getUserSession(userId)
   RETURN sessionData
END FUNCTION
```

8. Security and Privacy

```
FUNCTION encryptData(data)
   encryptedData = encryptionService.encrypt(data)
   RETURN encryptedData
END FUNCTION

FUNCTION decryptData(encryptedData)
   data = encryptionService.decrypt(encryptedData)
   RETURN data
END FUNCTION
```

9. Feedback Collection

```
FUNCTION collectFeedback(userId, feedback)
   database.saveFeedback(userId, feedback)
```

```
    RETURN "Thank you for your feedback!"
END FUNCTION
```

10. Order Cancellation

```
FUNCTION cancelOrder(orderId)
    order = database.getOrder(orderId)
    IF order EXISTS THEN
        database.cancelOrder(orderId)
        RETURN "Order cancelled"
    ELSE
        RETURN "Order not found"
    END IF
END FUNCTION
```

APPENDIX-B

(SCREENSHOTS)

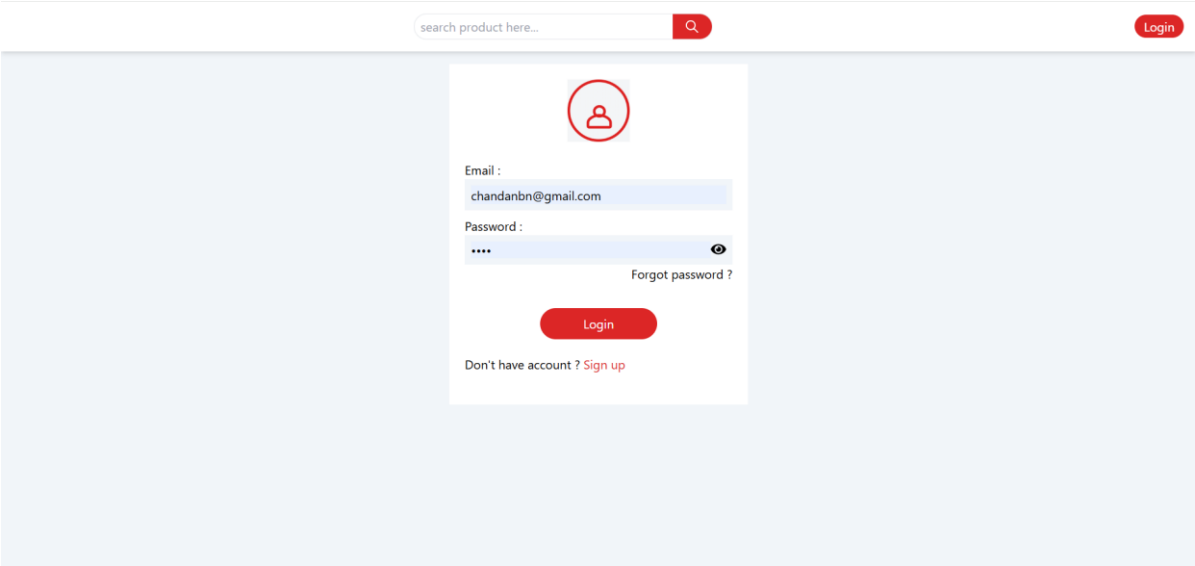

Fig 10.1: Sign In Page

Fig 10.1: The Sign in page for users, it likely shows the user interface where customers or administrators input their credentials (username and password) to access the chatbot or admin panel.

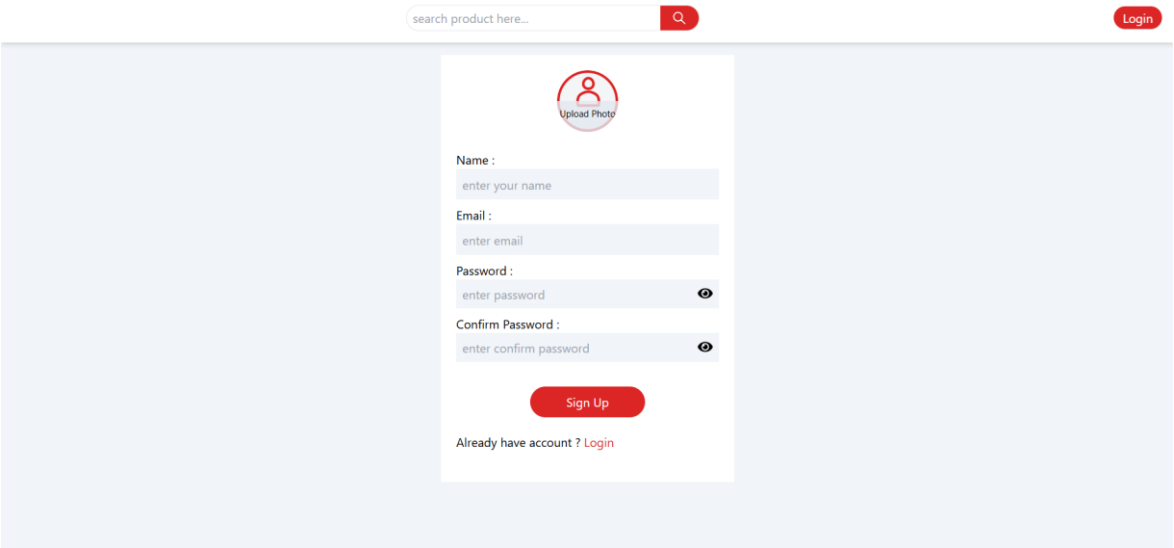

Fig 10.2: Sign Up Page

Fig 10.2: The Sign up page, it likely includes fields for new users to input details such as name, email, password, and other relevant information to create an account for using the chatbot service.

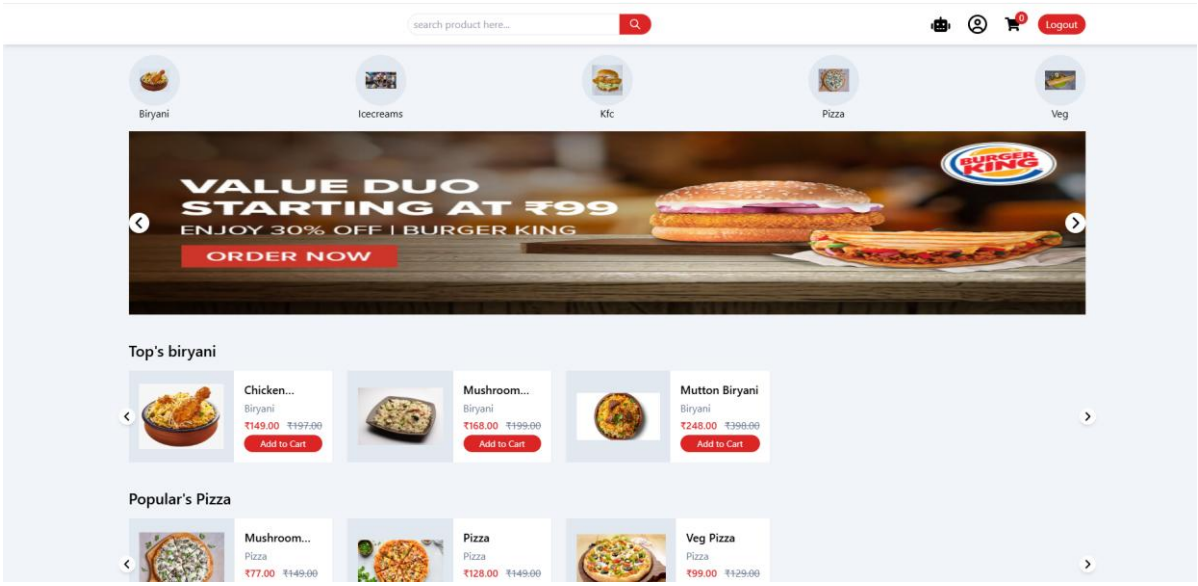

Fig 10.3: Home page

Fig 10.3: The home page of the chatbot application, it could include the menu for food items, options for users to view previous orders, start a new order, or interact with the chatbot.

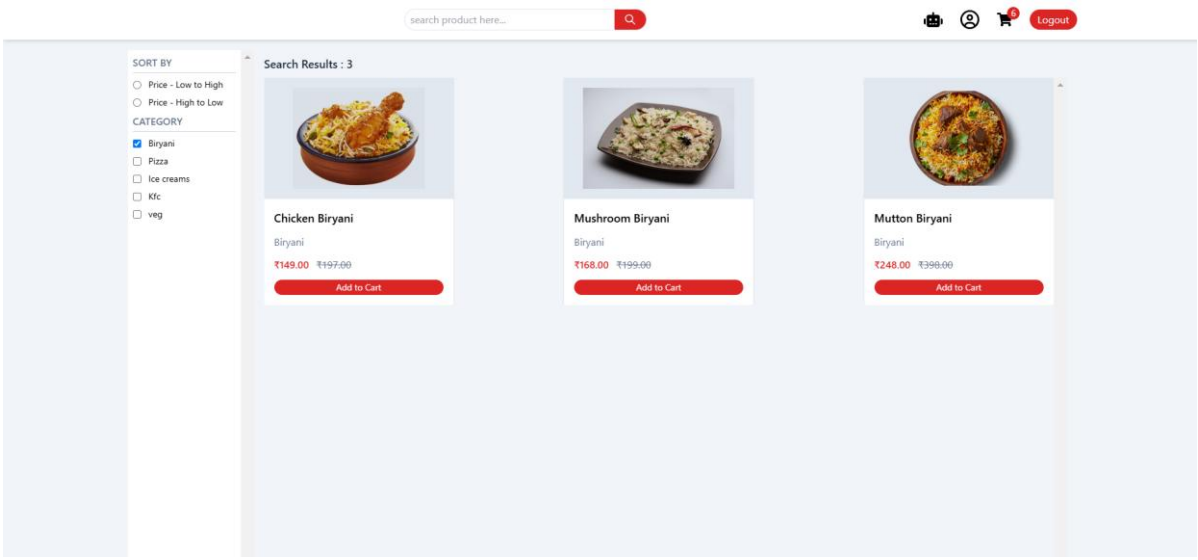

Fig 10.4: order page

Fig 10.4: The order page, where users select items to order. It may show the dynamic menu, product customization options (such as quantity or size), and buttons to confirm or cancel the order.

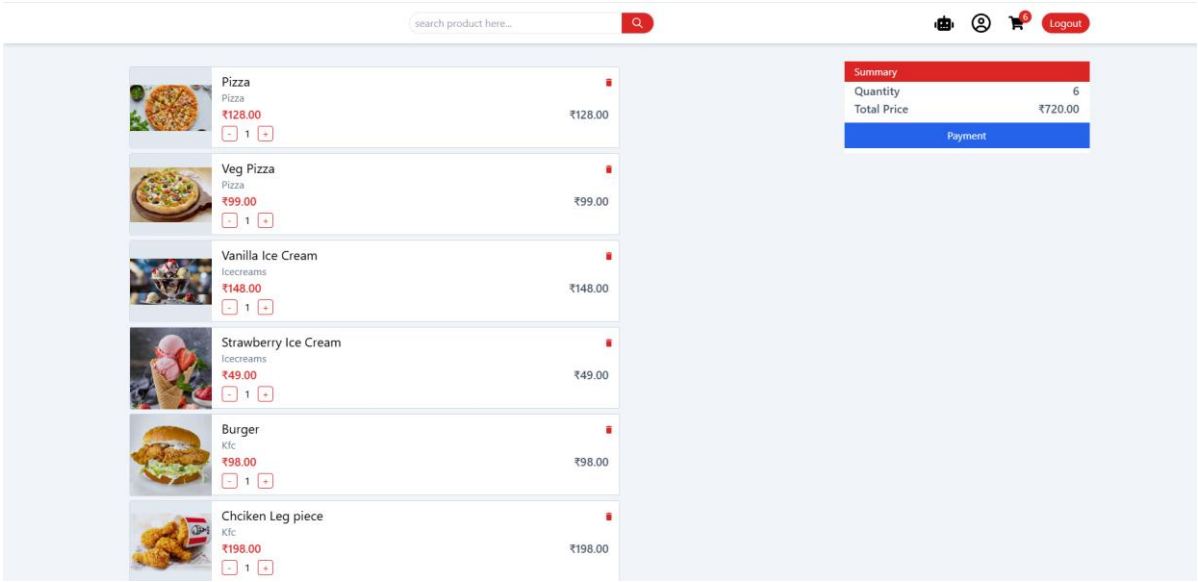

Fig 10.5: Product list

Fig 10.5: The product list from the restaurant's menu, it may show food categories, individual items, prices, and options to add them to the cart for ordering.

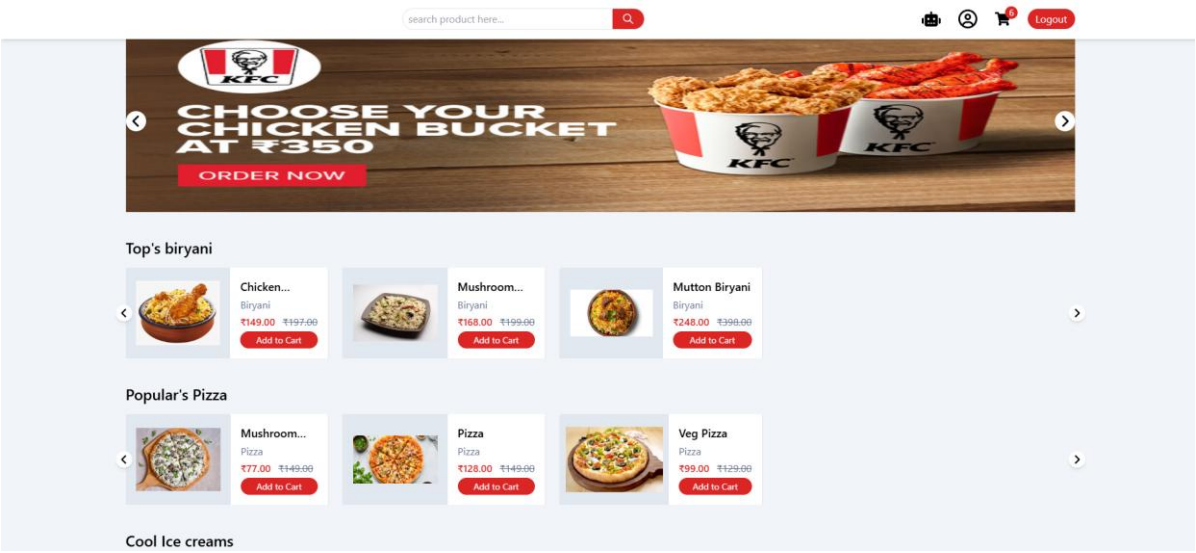

Fig 10.6: Users homepage

Fig 10.6: A personalized homepage for the user, where they can review past orders, track current orders, or interact with the chatbot for recommendations or help. It likely shows a simplified interface with easy navigation options.

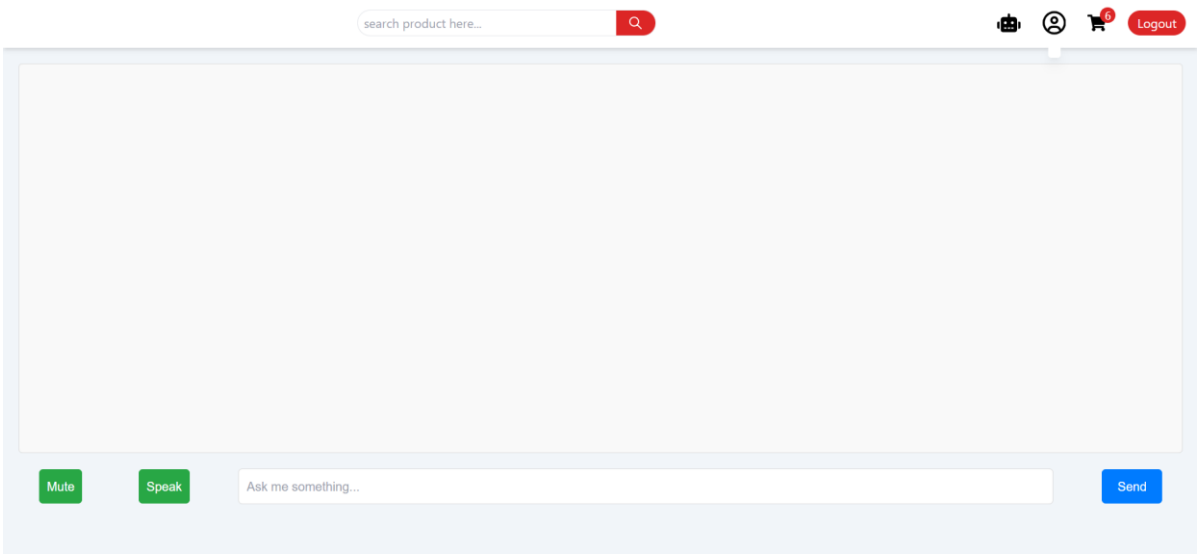

Fig 10.7: chatbot

Fig 10.7: The chatbot's user interface where customers interact with the bot via text or voice commands. It likely displays the conversation flow, with users asking questions or placing orders, and the chatbot responding with appropriate action.

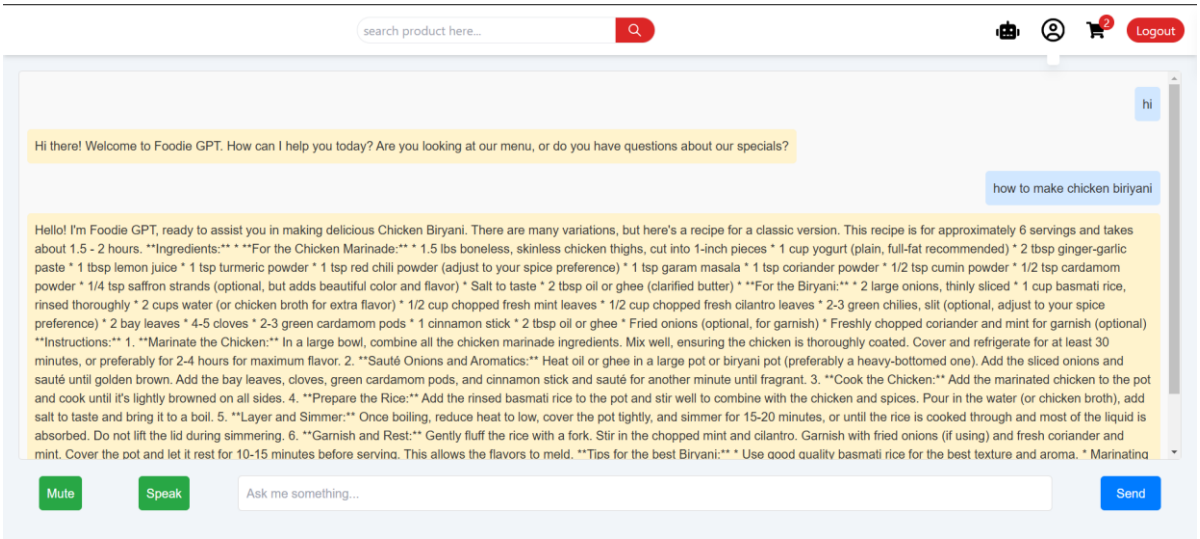

Fig 10.8: "Chatbot Interface Providing Chicken Biryani Recipe with Text-to-Speech Feature"

The above fig 10.8: illustrates a chatbot interface responding to a query about making Chicken Biryani. The chatbot provides a comprehensive response, including a detailed list of ingredients and step-by-step instructions for preparation. It also offers tips for customization, such as adjusting spice levels and enhancing flavors with optional ingredients like saffron. Additionally, the chatbot includes a text-to-speech feature, allowing users to listen to the response, enhancing accessibility and user convenience. This demonstrates the chatbot's ability to deliver natural, conversational, and multi-modal responses tailored to the user's request.

APPENDIX-C

ENCLOSURES


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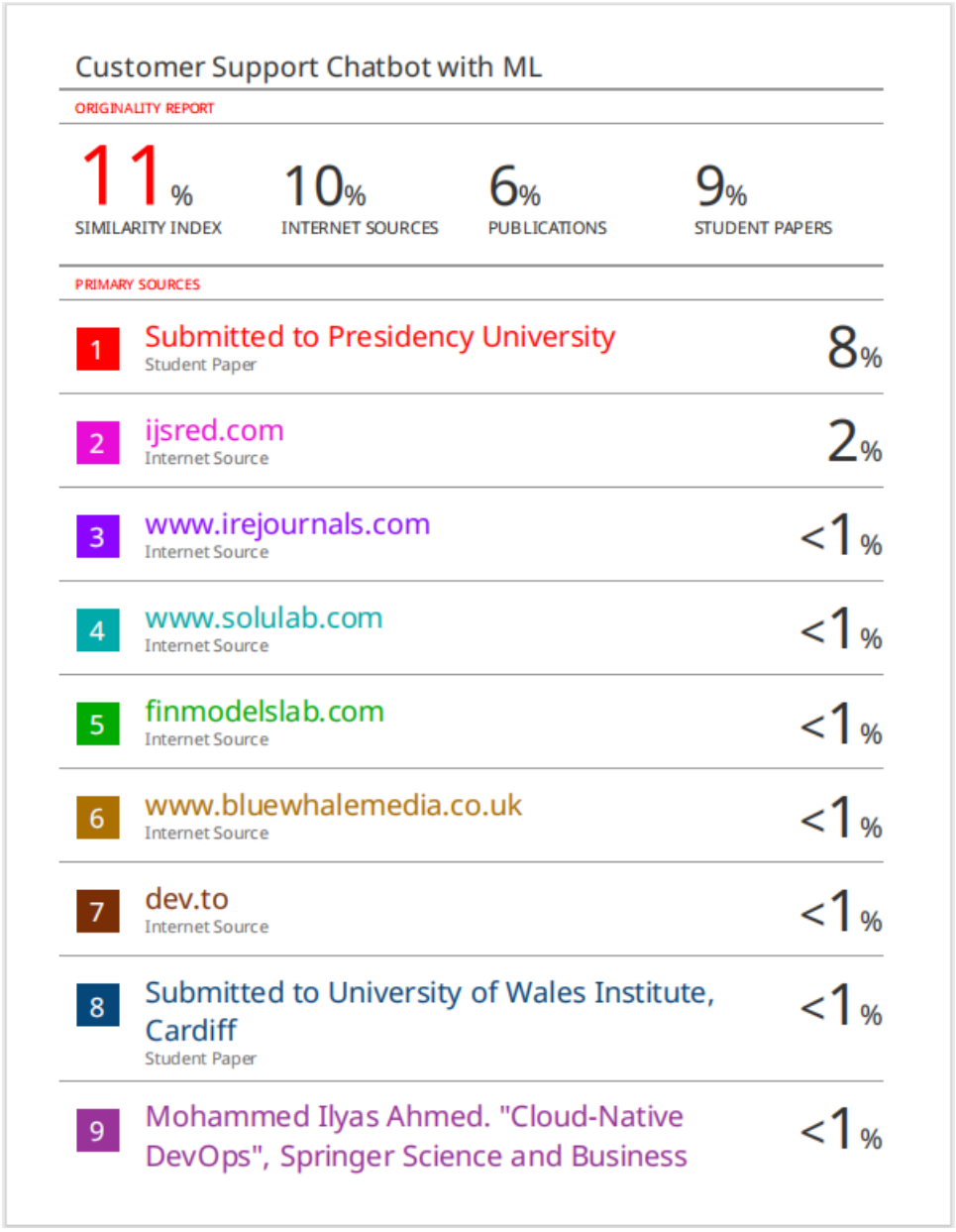

Customer Support Chatbot with ML

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SUSTAINABLE DEVELOPMENT GOALS

61The Customer Support Chatbot with ML for a restaurant aligns most closely with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities).

SDG 9: Industry, Innovation, and Infrastructure

the chatbot represents a significant step toward technological innovation in the restaurant industry. By incorporating machine learning and AI, it automates customer interactions such as taking orders, answering queries, and managing reservations. This innovation enhances operational efficiency and builds a resilient service infrastructure capable of adapting to high customer demands and dynamic industry changes. It also reduces dependency on human resources for repetitive tasks, allowing businesses to focus on strategic growth and customer satisfaction.

SDG 11 : Sustainable Cities and Communities

the chatbot contributes to creating more sustainable and inclusive urban communities. Features like voice-to-text make restaurant services more accessible to people with

disabilities and those from diverse linguistic backgrounds. Additionally, by streamlining processes and minimizing errors in orders, the chatbot enhances the overall dining experience for urban residents. These advancements help modern restaurants become integral parts of smarter, safer, and more inclusive communities.

By leveraging technology to transform customer service, the chatbot plays a key role in advancing innovation and sustainability in the food and hospitality sector.