A REPORT ON

AN INTERACTIVE CHATBOT FOR A RESTAURANT WEBSITE

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE
IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE OF

BACHELOR OF ENGINEERING (COMPUTER ENGINEERING)

SUBMITTED BY

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CERTIFICATE

This is to certify that the project report entitles

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ABSTRACT

This project presents the development of an interactive chatbot for a restaurant website, aimed at enhancing the online ordering experience for patrons. In today's digital age, consumers increasingly rely on online platforms for various services, including food ordering. However, navigating through menus and placing orders on restaurant websites can sometimes be cumbersome and time-consuming. To address this challenge, our project focuses on implementing a chatbot solution that provides a more intuitive and efficient way for users to interact with the restaurant's online platform.

The chatbot is designed to understand user queries, assist in menu browsing, facilitate order placement, and provide real-time support, all through natural language interactions. Leveraging advanced natural language understanding (NLU) capabilities and machine learning algorithms, the chatbot can comprehend user intents and preferences, offering personalized recommendations and streamlining the ordering process. By integrating with the restaurant's backend systems, the chatbot enables seamless communication between users and the ordering platform, enhancing user satisfaction and operational efficiency.

Through rigorous testing methodologies and performance evaluation, the effectiveness and reliability of the chatbot solution are validated. User acceptance testing provides valuable insights into user satisfaction and engagement, guiding iterative refinements to improve the chatbot's functionality and usability. Ultimately, the development of the interactive chatbot represents a significant advancement in leveraging conversational AI technologies to enhance the online ordering experience for restaurant patrons, offering a more convenient and user-friendly solution for accessing and ordering from restaurant menus.

TABLE OF CONTENTS

LIST OF ABBREVATIONS

ABBREVIATION	ILLUSTRATION
API	Application Programming Interface
DFD	Data Flow Diagram
ERD	Entity-Relationship Diagram
BI	Business Intelligence
GUI	Graphical User Interface
JAIR	Journal of Artificial Intelligence Research
NLU	Natural Language Understanding
NP	Nondeterministic Polynomial time
SDLC	Software Development Life Cycle

LIST OF FIGURES

01 INTRODUCTION

1.1 OVERVIEW:

The project focuses on developing an intelligent e-commerce chatbot for a food delivery website, leveraging Google Dialogflow and various machine learning models. The chatbot is designed to enhance customer interactions, streamline the ordering process, and support the restaurant's operations with advanced features like voice-to-text and bilingual support. Below is a comprehensive overview of the project components and objectives:

Key Components

1. Chatbot Integration with Google Dialogflow:

    - Google Dialogflow: The core of the chatbot is built using Google Dialogflow, a natural language understanding platform that enables the development of conversational interfaces. Dialogflow is chosen for its robust NLP capabilities, ease of integration, and support for multiple languages.

2. Voice-to-Text Feature:

    - Speech Recognition: Integrating speech recognition technology to convert spoken language into text. This feature enhances accessibility and convenience, allowing customers to place orders and interact with the chatbot using voice commands.
    - Google Cloud Speech-to-Text API: Utilized for its high accuracy and seamless integration with Dialogflow.

3. Bilingual Support:

    - Multilingual NLP: The chatbot supports multiple languages, catering to a diverse customer base. This is achieved through Dialogflow's multilingual capabilities, enabling the chatbot to understand and respond in different languages based on the user's preference.
    - Language Detection and Switching: The system can automatically detect the user's language and switch accordingly, ensuring a smooth and intuitive user experience.

4. Machine Learning Models:

    - Personalization Engine: Machine learning algorithms analyze customer data to provide personalized recommendations and responses. This includes suggesting menu items based on previous orders and preferences.
    - Sentiment Analysis: Implementing sentiment analysis to gauge customer satisfaction and tailor responses appropriately, enhancing the overall interaction quality.

5. User Interface and Experience:

    - Responsive Design: The chatbot interface is designed to be responsive and user-friendly, accessible across various devices including desktops, tablets, and smartphones.
    - Interactive Features: Includes rich media responses such as images, menus, and interactive buttons to facilitate easy navigation and selection.

6. Backend Integration:

    - Order Management System: Integration with the restaurant’s order management system to ensure real-time order processing and updates.

This includes inventory management, order tracking, and notification systems.

1.2 MOTIVATION:

In today's fast-paced digital age, convenience is a key factor that drives consumer behavior. The food delivery industry has seen significant growth, fueled by the increasing demand for quick and easy access to a variety of cuisines. With the proliferation of smartphones and internet connectivity, customers now expect seamless, efficient, and personalized experiences when ordering food online. However, many restaurants struggle to keep up with these expectations due to limited technological resources and the complexity of managing customer interactions across multiple channels.

This project aims to bridge this gap by developing an intelligent e-commerce chatbot using Google Dialogflow for a restaurant's food delivery website. The motivation behind this project stems from the need to enhance customer service, streamline the ordering process, and provide a competitive edge to the restaurant in a crowded market.

Key motivations for this project include:

1. Improving Customer Experience**:** By integrating a chatbot with voice-to-text capabilities and bilingual support, we can provide a more inclusive and accessible service to a diverse customer base. This ensures that customers can interact with the restaurant in their preferred language and medium, leading to higher satisfaction and loyalty.

2. Efficiency and Convenience: A chatbot can handle multiple customer queries simultaneously, significantly reducing wait times and operational costs. This efficiency translates to faster order processing and delivery, meeting the high expectations of today's consumers.

3. Personalization: Leveraging machine learning, the chatbot can offer personalized recommendations based on customer preferences and past orders.

This not only enhances the user experience but also increases the likelihood of repeat orders and higher average order values.

4. Competitive Advantage: In a competitive food delivery market, having an advanced, user-friendly chatbot can set the restaurant apart from its competitors. It showcases the restaurant's commitment to innovation and customer-centric service, attracting more customers and driving business growth.

5. Scalability: As the restaurant grows, the chatbot can be easily scaled to handle increased traffic and expanded services. This scalability ensures that the restaurant can continue to provide excellent service without compromising on quality, even during peak times.

1.3 PROBLEM DEFINITION AND OBJECTIVES:

- Enhance Customer Engagement: Provide a seamless and interactive platform for customers to place orders, inquire about menu items, and receive personalized recommendations, thereby improving customer engagement and satisfaction.

- Increase Operational Efficiency**:** Automate routine customer service tasks, reducing the workload on human staff and allowing them to focus on more complex and value-added activities.

- Expand Market Reach: By offering bilingual support, the chatbot can cater to a broader audience, including non-native speakers, thus expanding the restaurant’s market reach.

- Drive Business Growth: Utilize the chatbot’s capabilities to increase order frequency, average order value, and customer loyalty, ultimately driving business growth and profitability.

- Leverage Technology for Innovation: Position the restaurant as a tech-savvy, customer-centric brand that embraces innovation to enhance service quality and customer experience.

1.4 PROJECT SCOPE & LIMITATIONS:

Project Scope

This project focuses on developing and implementing an intelligent e-commerce chatbot for a restaurant's food delivery website using Google Dialogflow and machine learning models. The scope encompasses system design, chatbot development, and integration with various functionalities. Key elements include designing the chatbot architecture and conversational flows, implementing voice-to-text capabilities using Google Cloud Speech-to-Text API, and providing bilingual support with language detection. The project also involves integrating machine learning for personalized recommendations and sentiment analysis, designing a responsive user interface, and connecting the chatbot to the restaurant’s order management and payment systems. Extensive testing, quality assurance, deployment, and performance monitoring are integral to ensure the system's robustness and efficiency.

Limitations

1. Language Limitations:
    - Variable quality in understanding and generating responses in different languages and handling dialects.
2. Voice Recognition Accuracy:
    - Accuracy may be impacted by background noise, accents, and speech variations.
3. Data Privacy and Security:
    - Ensuring compliance with data protection regulations and maintaining robust security measures.

1.5 METHODOLOGIES OF PROBLEM SOLVING:

To develop an intelligent e-commerce chatbot for a restaurant's food delivery website, we employ a structured and systematic approach using various methodologies that ensure efficient problem solving and successful project implementation. The key methodologies include:

1. Requirement Analysis and Planning:
    - Conduct thorough requirement analysis to understand the needs and objectives of the restaurant and its customers.
    - Plan the project phases, milestones, and deliverables to ensure a clear roadmap and timeline.
2. Agile Development:
    - Implement the Agile methodology to allow iterative development, continuous feedback, and flexibility in addressing changing requirements.
    - Organize the project into sprints, with each sprint focusing on developing and testing specific features.
3. Design Thinking:
    - Apply design thinking to empathize with users, define problems, ideate solutions, prototype, and test.
    - Focus on creating a user-centered design for the chatbot interface and conversational flows.

02 LITERATURE SURVEY

The development of an intelligent e-commerce chatbot for a restaurant's food delivery website involves several key technologies and methodologies. This literature survey reviews relevant research and advancements in areas such as chatbot development, natural language processing (NLP), machine learning, voice recognition, and multilingual support.

1. Chatbot Development and Natural Language Processing (NLP)

Research Findings:

- **Dialogue Management**: Young, T., et al. (2018) provide an extensive overview of NLP applications in dialogue systems, emphasizing the importance of dialogue management for maintaining context and managing conversation flow .
- **Frameworks and Tools**: Google Dialogflow is highlighted as a powerful tool for developing conversational agents due to its robust NLP capabilities, ease of integration, and support for multiple languages .

Key Insights:

- Effective dialogue management is crucial for a seamless user experience.
- Using advanced NLP frameworks like Google Dialogflow can significantly enhance chatbot capabilities.

2. Machine Learning for Personalization and Sentiment Analysis

Research Findings:

- **Recommendation Systems**: A study by Ricci, F., et al. (2015) discusses various machine learning algorithms used in recommendation systems, highlighting their effectiveness in personalizing user experiences based on past interactions and preferences .

- **Sentiment Analysis**: Liu, B. (2012) explores sentiment analysis techniques and their applications in understanding customer emotions, which can be used to tailor chatbot responses .

Key Insights:

- Machine learning models can significantly improve personalization by analyzing user data.
- Sentiment analysis helps in adapting chatbot responses to enhance customer satisfaction.

3. Voice Recognition Technology

Research Findings:

- **Speech-to-Text Conversion**: Amodei, D., et al. (2016) examine deep learning techniques for speech recognition, demonstrating high accuracy in converting spoken language to text .
- **API Utilization**: Google Cloud Speech-to-Text API is identified as a reliable service for implementing voice command functionalities in chatbots .

Key Insights:

- Advanced deep learning models contribute to the high accuracy of speech recognition systems.
- Utilizing established APIs like Google Cloud Speech-to-Text ensures reliable voice interface implementation.

4. Multilingual Support

Research Findings:

- **Multilingual NLP**: Dabre, R., et al. (2019) discuss approaches to multilingual NLP, emphasizing the challenges and solutions for creating systems that can understand and generate multiple languages .

- **Language Detection**: Studies indicate that automatic language detection mechanisms are essential for providing seamless multilingual support .

Key Insights:

- Developing effective multilingual NLP systems involves addressing language-specific challenges.
- Automatic language detection enhances the user experience by allowing seamless language switching.

Table 2.1: Summary of Key Research Areas

Research Area	Key Findings	References
Chatbot Development and NLP	Importance of dialogue management and using advanced NLP frameworks like Google Dialogflow	Young, T., et al. (2018) , Google Dialogflow Docs
Machine Learning	Effectiveness of recommendation systems and sentiment analysis for personalization and customer satisfaction	Ricci, F., et al. (2015) , Liu, B. (2012)
Voice Recognition Technology	High accuracy of speech recognition with deep learning; reliable APIs for implementation	Amodei, D., et al. (2016) , Google Cloud Docs
Multilingual Support	Approaches to multilingual NLP and the importance of automatic language detection	Dabre, R., et al. (2019) , Various Studies

03 SOFTWARE REQUIREMENTS SPECIFICATION

3.1 ASSUMPTIONS AND DEPENDENCIES:

Assumptions:

1. **Stable Internet Connection**: It is assumed that users accessing the food delivery website have a stable internet connection to interact with the chatbot without interruptions. Any disruptions in connectivity may affect the chatbot's performance and user experience.

2. **User Device Compatibility**: The chatbot interface is assumed to be compatible with various user devices, including desktops, laptops, tablets, and smartphones. Compatibility issues may arise if users access the website from outdated or incompatible devices.

3. **Accurate User Inputs**: The chatbot relies on accurate user inputs to process orders and provide relevant responses. It is assumed that users will provide clear and concise information, minimizing errors in order processing and communication.

4. **Availability of Backend Systems**: The successful operation of the chatbot depends on the availability and reliability of backend systems, such as the order management and payment systems. Any downtime or disruptions in these systems may impact the chatbot's functionality.

Dependencies:

1. **Google Dialogflow API**: The chatbot relies on the Google Dialogflow API for natural language understanding and processing. Any changes or updates to the Dialogflow API may affect the chatbot's functionality and require corresponding adjustments in the implementation.

2. **Google Cloud Services**: Dependencies exist on various Google Cloud services, such as the Cloud Speech-to-Text API for voice recognition and the Cloud Platform for deployment and hosting. The availability and reliability of these services impact the chatbot's performance.

3. **Order Management System Integration**: The successful integration of the chatbot with the restaurant's order management system is crucial for real-time order processing and updates. Any changes or updates to the order management system may require corresponding modifications in the chatbot integration.

3.2 FUNCTIONAL REQUIREMENTS:

1. **User Intent Recognition**:
    - The chatbot must accurately identify user intents such as ordering food, checking menu items, and seeking assistance.

2. **Dialog Management**:
    - Dialogflow should dynamically manage conversations, maintaining context and guiding users through multi-turn interactions.

3. **Natural Language Understanding (NLU)**:
    - Dialogflow's NLU capabilities should accurately parse user inputs, including entity extraction for order customization and menu inquiries.

4. **Voice Interaction Support**:
    - Dialogflow should support voice interaction, enabling users to speak commands and queries for voice-to-text conversion.

5. **Contextual Responses**:

    - Dialogflow should maintain conversation context to provide personalized responses and remember user preferences across interactions.

6. **Error Handling**:

    - Dialogflow should handle errors gracefully, providing informative error messages and guiding users to resolve issues.

7. **Training and Tuning**:

    - The chatbot should undergo continuous training and tuning in Dialogflow to improve intent recognition accuracy and response quality over time.

3.3 EXTERNAL INTERFACE REUQIREMENTS:

3.3.1 User Interfaces

- **Chatbot Interface**: The user interface of the chatbot should be intuitive, user-friendly, and accessible across various devices including desktops, laptops, tablets, and smartphones. It should support text input and voice commands, with interactive elements such as buttons and menus for enhanced user engagement.

3.3.2 Hardware Interfaces

- **Device Compatibility**: The chatbot should be compatible with a wide range of hardware devices commonly used by users, including computers, smartphones, and tablets. It should not impose specific hardware requirements beyond standard web browsing capabilities.

3.3.3 Software Interfaces

- **Google Dialogflow Integration**: The chatbot should integrate seamlessly with Google Dialogflow for natural language understanding and processing. Dialogflow's APIs should be utilized for intent recognition, response generation, and context management.

3.3.4 Communication Interfaces

- **HTTP/HTTPS Protocol**: Communication between the chatbot and external systems, such as the restaurant's order management and payment systems, should be secured using the HTTP/HTTPS protocol. APIs or webhooks can be used for data exchange and interaction between systems.

3.4 NONFUNCTIONAL REQUIREMENTS:

3.4.1 Performance Requirements

- **Response Time**: The chatbot should respond to user queries and commands within milliseconds to ensure a smooth and seamless user experience.
- **Scalability**: The chatbot system should be able to handle a high volume of concurrent users without significant degradation in performance.
- **Reliability**: The chatbot should maintain high availability, with minimal downtime or service interruptions.

3.4.2 Safety Requirements

- **Data Privacy**: The chatbot should adhere to strict data privacy regulations and ensure the confidentiality of user information and transaction data.
- **Error Handling**: The chatbot should handle errors gracefully to prevent potential security vulnerabilities or data leaks.

3.4.3 Security Requirements

- **Data Encryption**: All communication between the chatbot and external systems should be encrypted using secure protocols (e.g., HTTPS) to prevent data interception or tampering.

- **Access Control**: The chatbot should implement role-based access control mechanisms to restrict access to sensitive functionalities and data.

3.4.4 Software Quality Attributes

- **Usability**: The chatbot interface should be intuitive and easy to navigate, catering to users with varying levels of technical expertise.
- **Maintainability**: The chatbot system should be well-documented and modular, allowing for easy maintenance, updates, and enhancements.
- **Robustness**: The chatbot should be resilient to unexpected inputs and errors, with robust error handling mechanisms in place to ensure system stability.

3.5 SYSTEM REQUIREMENTS:

3.5.1 Database Requirements

- **Relational Database**: The system requires a relational database management system (RDBMS) to store user data, order information, menu items, and other relevant data.
- **Data Integrity**: The database should enforce data integrity constraints to ensure the accuracy and consistency of stored data.
- **Scalability**: The database should be scalable to accommodate the growing volume of data and user interactions over time.

3.5.2 Software Requirements (Platform Choice)

- **Google Dialogflow**: The chatbot system is built on the Google Dialogflow platform for natural language understanding and processing.
- **Programming Languages**: The system may utilize programming languages such as JavaScript, Python, or Java for backend development and integration with external systems.
- **Web Development Frameworks**: Web development frameworks like Node.js or Flask may be used for building the backend infrastructure and APIs.

3.5.3 Hardware Requirements

- **Server Infrastructure**: The system requires server infrastructure to host the chatbot application, database server, and other backend components.
- **Compute Resources**: Sufficient compute resources such as CPU, memory, and storage are needed to support the expected workload and user traffic.
- **Scalable Infrastructure**: The hardware infrastructure should be scalable to accommodate increased demand and user growth.

3.6 ANALYSIS MODELS: SDLC MODEL TO BE APPLIED:

Based on the project requirements and objectives, the most suitable Software Development Life Cycle (SDLC) model to be applied is the **Agile** model.

Agile SDLC Model:

Overview:

The Agile model is characterized by its iterative and incremental approach to software development. It emphasizes flexibility, collaboration, and customer feedback throughout the development process. Agile allows for frequent iterations and adaptations to changing requirements, enabling rapid delivery of working software and continuous improvement.

Rationale:

1. **Iterative Development**: Agile's iterative approach aligns well with the project's need for frequent updates and enhancements. It allows for the incremental development and refinement of chatbot features based on user feedback and evolving business requirements.

2. **Customer Collaboration**: Agile encourages close collaboration between the development team and stakeholders, including end-users. This collaborative approach ensures that the chatbot meets the needs and expectations of its intended users, resulting in higher customer satisfaction.

04 SYSTEM DESIGN

4.1 SYSTEM ARCHITECTURE:

The system architecture for the intelligent chatbot is designed to ensure robust performance, scalability, and seamless integration with various components and services.

Architectural Components

1. **User Interface (UI) Layer**:
    - **Web and Mobile Interfaces**: The chatbot will be accessible through the restaurant's website and mobile applications, providing a consistent user experience across different platforms. This layer includes the frontend technologies such as HTML, CSS, JavaScript, and frameworks like React or Angular.
2. **Chatbot Layer**:
    - **Google Dialogflow**: Serves as the core engine for natural language understanding and processing. It manages user intents, entities, and context, providing dynamic and contextually relevant responses.
    - **Voice Recognition**: Integrated with Google Cloud Speech-to-Text API for converting voice commands to text, enabling voice interaction capabilities.
3. **Backend Services**:
    - **Webhook Services**: Custom backend services that interact with Google Dialogflow to process complex business logic, handle user requests, and fetch data from the database or other external services.
    - **Order Management System (OMS)**: Manages the lifecycle of user orders, including order placement, updates, and tracking.

4. **Database Layer**:

- **Relational Database**: Stores user data, order details, menu items, and other relevant information. Common choices include MySQL, PostgreSQL, or any cloud-based RDBMS.

Table 4.1: Simplified System Architecture Table

Component	**Description**
User Interfaces	Interfaces through which users interact with the chatbot.
- Web	Web interface for desktop and mobile browsers.
- Mobile	Mobile application interface.
- Voice	Voice interaction interface.
Chatbot Layer	Core components for natural language processing and voice recognition.
- Dialogflow	Handles natural language understanding and processing.
- Speech-to-Text API	Converts voice commands to text.
Backend Services	Custom backend services for processing user requests and managing business logic.
- Webhooks	Interfaces that connect Dialogflow to custom backend logic.
- Order Management	Manages the lifecycle of user orders.
- Inventory Management	Manages real-time inventory data.
Database Layer	Stores user data, orders, and menu items.

4.2 MATHEMATICAL MODEL:

The mathematical model includes user interaction, intent recognition, order processing, system performance, voice-to-text functionality, and bilingual support.

1. User Interaction Model

Let U represent the set of users interacting with the chatbot.

- $U=\{u1,u2,...,un\}$
- $I(u)$ represents the interaction sequence of a user u, where $I(u)=\{i1,i2,...,im\}$ and ik is an interaction instance.

2. Voice-to-Text Functionality

The voice-to-text functionality converts spoken language into text, which is then processed by the chatbot.

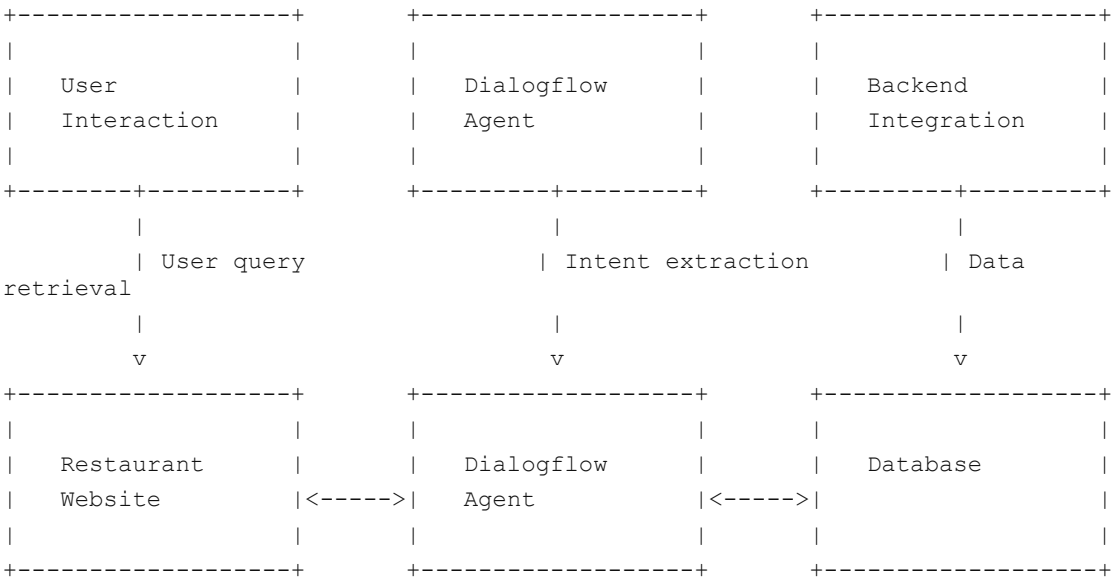
- Let V be the set of voice inputs.
- Let $T(V)$ be the transcription function that converts voice input v to text t. $T(vi)=ti$
- The accuracy Av of the voice-to-text conversion can be measured as: $Av=NcorrectNtotal$ where $Ncorrect$ is the number of correctly transcribed inputs and $Ntotal$ is the total number of inputs.

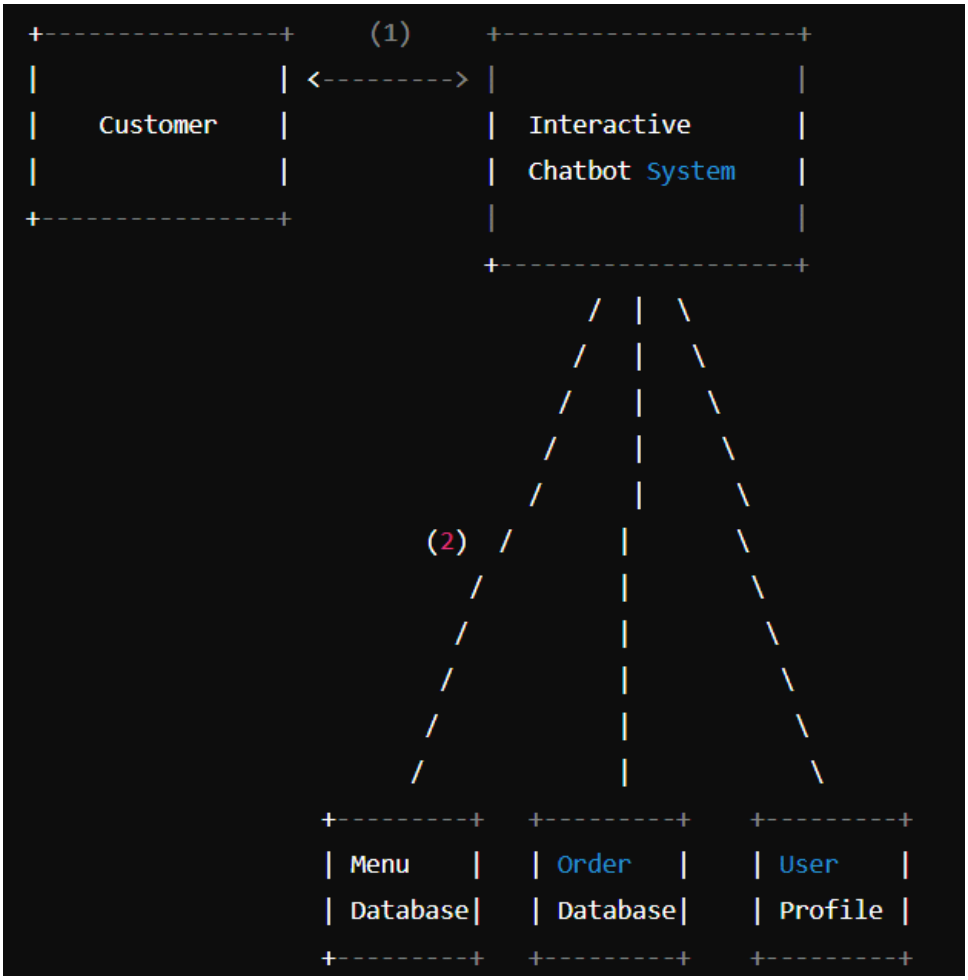
3. Bilingual Support

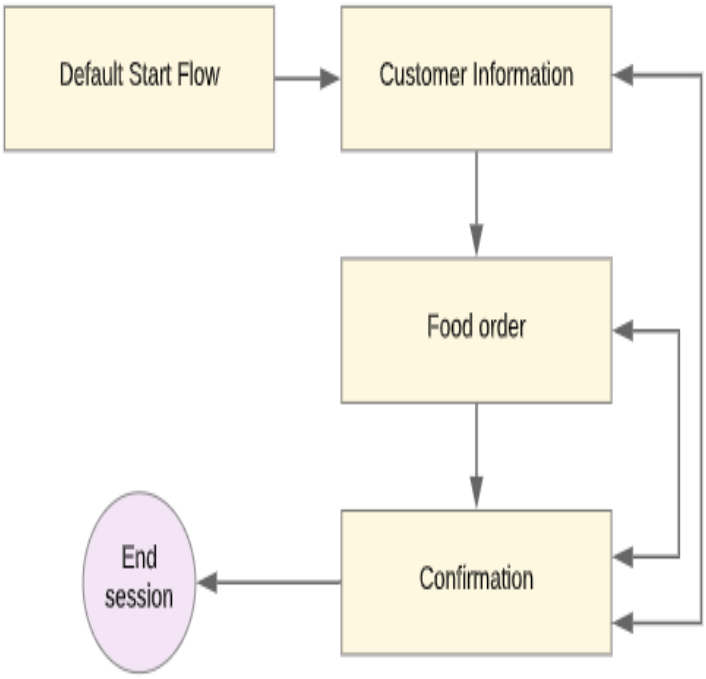
The chatbot supports multiple languages, say English and Spanish.

- Let L be the set of supported languages, $L=\{l1,l2\}$ where $l1$ is English and $l2$ is Spanish.
- The language detection function D determines the language l of an input i. $D(ik)=lj$

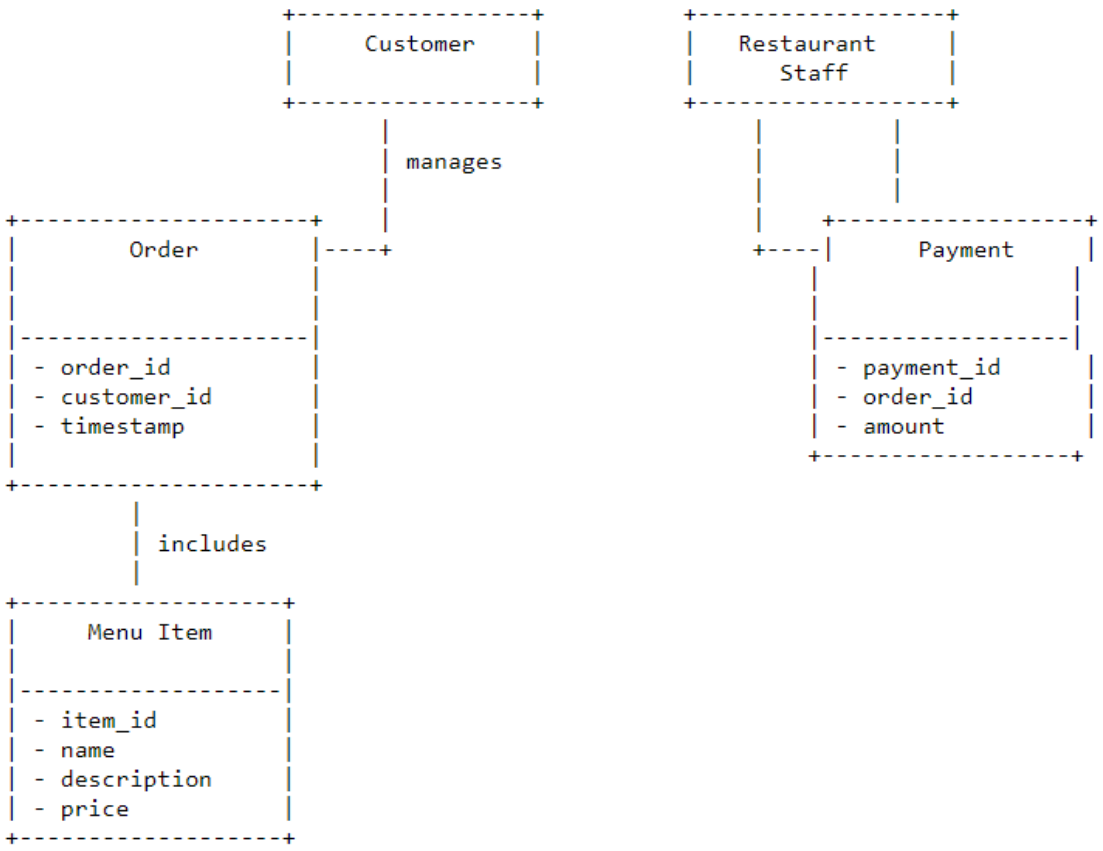
4.3 DATA FLOW DIAGRAMS:







4.4 ER DIAGRAM:



05 PROJECT PLAN

5.1 PROJECT ESTIMATE:

5.1.1 Reconciled Estimates

Task Breakdown and Timeline

Phase 1: Planning and Requirements Gathering (2 weeks)

- Define project scope, objectives, and deliverables.
- Gather requirements from stakeholders and finalize project documentation.
- Allocate roles and responsibilities among team members.
- **Estimated Hours:** 20 hours

Phase 2: Design (2 weeks)

- Design system architecture, user interface mockups, and database schema.
- Prepare design documentation outlining technical specifications.
- **Estimated Hours:** 20 hours

Phase 3: Development (6 weeks)

- **Frontend Development:**
    - Implement user interfaces using HTML, CSS, and JavaScript.
    - Integrate with voice-to-text API for speech recognition.
- **Backend Development:**
    - Develop server-side logic using Python, Node.js, or any preferred language.
    - Set up and configure database management system.
- **Machine Learning:**

- Collect and preprocess data for training machine learning models.
- Develop intent recognition model using libraries like TensorFlow or PyTorch.
- **Estimated Hours:** 60 hours

Phase 4: Testing (2 weeks)

- Conduct unit testing, integration testing, and user acceptance testing.
- Identify and fix bugs or issues.
- Prepare test reports and documentation.
- **Estimated Hours:** 20 hour

5.1.2 Project Resources

Team Members:

- **Project Manager:** Coordinates project tasks, schedules, and communication among team members.
- **Data Scientist:** Responsible for data collection, analysis, and model development.
- **Frontend Developer:** Designs and implements the user interface for the chatbot application.
- **Backend Developer:** Develops the backend logic, database management, and integration with external services.
- **Guide Teacher:** Provides guidance, feedback, and support throughout the project.

5.2 RISK MANAGEMENT:

5.2.1 Risk Identification

Potential Risks:

1. **Time Constraints:** Balancing project tasks with academic commitments can be challenging, leading to delays in project milestones and completion.

2. **Technical Challenges:** Limited experience in implementing certain features or technologies may result in longer development cycles or compromise on functionality.

3. **Communication Issues:** Coordination and communication among team members may suffer, leading to misunderstandings or incomplete deliverables.

4. **Scope Creep:** Expanding project scope beyond the initial plan can increase workload and affect project deliverables negatively.

5.2.2 Risk Analysis

Impact Assessment:

- **Time Constraints:** Delays in project completion can impact project evaluation, grading, or even cause submission issues.

- **Technical Challenges:** Difficulty in implementing key features may affect the quality and functionality of the final product.

- **Communication Issues:** Poor communication can lead to misaligned expectations, duplicated efforts, or conflicts among team members.

- **Scope Creep:** Expanding project scope can lead to overburdened team members, reduced quality, and missed deadlines.

Probability Assessment:

- **Time Constraints:** High probability due to the inherent nature of academic schedules and workload.

- **Technical Challenges:** Moderate probability depending on the complexity of the chosen technologies and the team's familiarity with them.

5.2.3 Overview of Risk Mitigation, Monitoring, Management

Mitigation Strategies:

1. **Time Management:** Establish clear timelines, prioritize tasks, and regularly review progress against deadlines.

2. **Learning and Research:** Allocate sufficient time for learning and researching new technologies or concepts required for the project.

3. **Regular Communication:** Establish regular team meetings to discuss project progress, challenges, and updates.

4. **Scope Management:** Define project scope clearly from the outset and document any changes through formal change control processes.

Monitoring and Management:

- **Regular Risk Reviews:** Schedule periodic reviews to assess the status of identified risks, evaluate the effectiveness of mitigation strategies, and identify any new risks that may have emerged.

- **Communication Channels:** Maintain open communication channels among team members and encourage transparency in reporting issues or concerns related to project risks. Ensure that team members feel comfortable raising potential risks or challenges they encounter.

- **Documentation:** Maintain a risk register or log documenting all identified risks, their potential impact, probability, assigned mitigation strategies, and status updates. Regularly update the risk register throughout the project lifecycle to reflect changes in risk status or new risks identified.

5.3 PROJECT SCHEDULE:

5.3.1 Project Task Set

Phase 1: Planning and Requirements Gathering (2 weeks) During this phase, the team will focus on defining the scope, objectives, and deliverables of the project. They will gather requirements from stakeholders, including the restaurant owner and potential users, to understand their needs and expectations.

Phase 2: Design (2 weeks) In the design phase, the team will focus on creating the system architecture, user interface mockups, and database schema for the chatbot application.

Phase 3: Development (6 weeks) The development phase involves implementing the designed system components, including frontend interfaces, backend logic, and machine learning models. The frontend developer will build user interfaces using HTML, CSS, and JavaScript, incorporating features such as voice-to-text integration for speech recognition. The backend developer will focus on developing server-side logic and database management.

Phase 4: Testing (2 weeks) Testing is a critical phase where the team will conduct various types of testing, including unit testing, integration testing, and user acceptance testing. They will identify and fix any bugs or issues discovered during testing, ensuring the application meets quality standards and user expectations.

5.3.2 Task Network:

The task network illustrates the dependencies and sequence of tasks across different project phases. Each phase is interconnected, with tasks progressing from planning and requirements gathering to design, development, testing, deployment, and presentation/documentation.

1. **Planning and Requirements Gathering:**
    - Define project scope, objectives, and deliverables.
    - Gather requirements from stakeholders.
    - Finalize project documentation.
    - Allocate roles and responsibilities among team members.

2. **Design:**

    - Create system architecture.
    - Develop user interface mockups.
    - Design database schema.
    - Prepare design documentation.

3. **Development:**

    - Frontend Development:
        - Implement user interfaces using HTML, CSS, and JavaScript.
        - Integrate with voice-to-text API for speech recognition.
    - Backend Development:
        - Develop server-side logic using Python, Node.js, or any preferred language.
        - Set up and configure database management system.
    - Machine Learning:
        - Collect and preprocess data for training machine learning models.
        - Develop intent recognition model using libraries like TensorFlow or PyTorch.

4. **Testing:**

    - Conduct unit testing, integration testing, and user acceptance testing.
    - Identify and fix bugs or issues.
    - Prepare test reports and documentation.

5. **Deployment:**

    - Prepare the application for deployment on a hosting platform.
    - Set up continuous integration and continuous deployment (CI/CD) pipelines.
    - Perform final checks to ensure the application is running smoothly.

6. **Presentation and Documentation:**

    - Prepare a presentation outlining project objectives, methodology, and outcomes.
    - Document project process, challenges faced, and lessons learned.

5.3.3 Timeline Chart

The timeline chart helps ensure that the project stays on track and adheres to the planned timeline for successful completion.

Below is a simplified timeline chart table outlining the estimated duration for each phase of the project:

Table 5.3.1: Timeline Chart Table

Phase	Duration
Planning and Requirements Gathering	2 weeks
Design	2 weeks
Development	6 weeks
Testing	2 weeks
Deployment	1 week
Presentation and Documentation	1 week
Overall Project Duration	**14 weeks**

5.4 TEAM ORGANIZATION:

5.4.1 Team Structure

The team structure for the project comprises four students and a guide teacher, each assigned specific roles and responsibilities to ensure effective project execution. The roles are as follows:

1. **Project Manager:**

    - Responsibilities:
        - Coordinate project tasks, schedules, and communication among team members.
        - Ensure adherence to project timeline and deliverables.
        - Facilitate team meetings and decision-making processes.

2. **Data Scientist:**

    - Responsibilities:
        - Collect, preprocess, and analyze data for training machine learning models.
        - Develop and fine-tune machine learning algorithms for intent recognition.
        - Collaborate with frontend and backend developers to integrate machine learning components into the chatbot application.

3. **Frontend Developer:**

    - Responsibilities:
        - Design and implement user interfaces for the chatbot application using HTML, CSS, and JavaScript.
        - Integrate frontend components with backend services and machine learning models.
        - Ensure responsive and user-friendly design across different devices and platforms.

4. **Backend Developer:**

    - Responsibilities:
        - Develop server-side logic and APIs using Python, Node.js, or any preferred backend language.
        - Set up and configure database management systems for storing and retrieving data.
        - Integrate external services and APIs for additional functionality, such as payment processing or order management.

5.4.2 Management Reporting and Communication

1. **Regular Team Meetings:**

    - Weekly or bi-weekly team meetings will be scheduled to discuss project progress, challenges, and action items.
    - Meetings will provide an opportunity for team members to share updates, raise concerns, and brainstorm solutions collectively.

2. **Task Assignments and Tracking:**

    - Tasks will be assigned to team members based on their roles and responsibilities, with clear deadlines and expectations outlined.

3. **Communication Channels:**

    - A dedicated communication channel, such as Slack or Microsoft Teams, will be established for real-time communication among team members.
    - Team members will be encouraged to utilize the communication channel for quick queries, updates, and collaboration on specific tasks.

4. **Progress Reports:**

    - Progress reports will be prepared and submitted by each team member on a regular basis, detailing accomplishments, challenges faced, and plans for the upcoming period.

5. **Documentation:**

    - Comprehensive documentation will be maintained throughout the project lifecycle, including project plans, design documents, meeting minutes, and code repositories.

06 PROJECT IMPLEMENTATION

6.1 OVERVIEW OF PROJECT MODULES:

The project comprises several modules, each serving a specific purpose in the development and functionality of the food delivery chatbot application. Below is an overview of the key modules:

1. **User Interface (UI):**
    - This module focuses on designing and developing the graphical user interface (GUI) for the chatbot application.
    - It includes features such as menu display, order placement, user registration, and login/logout functionality.
    - The UI module ensures an intuitive and user-friendly experience for restaurant customers interacting with the chatbot.
2. **Backend Services:**
    - The backend services module is responsible for implementing the server-side logic and functionalities of the chatbot application.
    - It includes features such as order processing, database management, authentication, and API integration with external services.
3. **Machine Learning (ML) Integration:**
    - This module integrates machine learning algorithms and models to enhance the chatbot's capabilities.
    - It includes features such as natural language processing (NLP), intent recognition, sentiment analysis, and recommendation systems.
4. **Voice-to-Text (V2T) Integration:**
    - The V2T integration module enables users to interact with the chatbot using voice commands.

- It includes features such as speech recognition, audio processing, and text conversion.
- V2T integration enhances accessibility and usability, allowing users to place orders or inquire about menu items using voice input.

5. **Database Management:**

    - The database management module handles the storage and retrieval of data related to users, orders, menu items, and transactions.

6.2 TOOLS AND TECHNOLOGIES USED:

The development of the food delivery chatbot application involves the utilization of various tools and technologies across different aspects of the project. Below is an overview of the key tools and technologies employed:

1. **Google Dialogflow:**

    - **Description:** Google Dialogflow is a powerful conversational AI platform that enables developers to build natural and rich conversational experiences for chatbots and virtual agents across multiple platforms and devices.
    - **Features:**
        - Natural Language Understanding (NLU): Dialogflow's NLU engine interprets user input, extracts intents, and identifies entities, enabling the chatbot to understand and respond to user queries effectively.
        - Intent Recognition: Dialogflow allows developers to define intents, which represent the user's intention or goal, and train the chatbot to recognize and handle specific user requests or commands.
        - Context Management: Dialogflow's context management feature enables the chatbot to maintain context across multiple

interactions, facilitating more natural and engaging conversations with users.

- **Benefits:**
    - Rapid Development: Dialogflow provides a user-friendly interface and pre-built components that streamline the development process, allowing developers to build and deploy chatbots quickly and efficiently.
    - Rich Functionality: Dialogflow offers a wide range of features and capabilities, including text and voice-based interactions, rich responses (such as images, cards, and carousels), webhook integrations, and analytics tools for monitoring and optimizing chatbot performance.
- **Use Case:** In the food delivery chatbot application, Dialogflow serves as the core platform for natural language understanding and conversation management. It enables the chatbot to understand user queries related to menu items, orders, delivery options, and customer support, providing a seamless and intuitive ordering experience for restaurant customers.

2. **Programming Languages, Frameworks, and Libraries:**

    - **Python, JavaScript, HTML/CSS:** Used for backend and frontend development, including server-side logic, user interface design, and interactivity.
    - **Flask/Django:** Web frameworks for building RESTful APIs, dynamic web applications, and single-page applications.

3. **Database Management Systems (DBMS):**

    - **MySQL:** Relational and NoSQL databases for storing and managing application data.

6.3 ALGORITHM DETAILS:

6.3.1 Algorithm 1

Algorithm 1 refers to the primary algorithm utilized within the food delivery chatbot application. This algorithm is responsible for handling specific tasks or functionalities within the chatbot, such as intent recognition, order processing, or recommendation generation. The details of Algorithm 1 are as follows:

- **Description:** Provide a brief description of the algorithm's purpose and functionality within the chatbot application.
- **Input:** Specify the input data or parameters required by the algorithm for processing.
- **Processing Steps:** Outline the sequence of steps or operations performed by the algorithm to achieve its intended functionality.
- **Output:** Describe the output generated by the algorithm, which may include predicted intents, processed orders, or recommended items.

6.3.2 Algorithm 2

Algorithm 2 represents an additional algorithm incorporated into the food delivery chatbot application to enhance its capabilities or address specific requirements. Like Algorithm 1, Algorithm 2 may serve a distinct purpose or perform specialized tasks within the chatbot. The details of Algorithm 2 include:

- **Description:** Provide a concise description of the algorithm's role and functionality within the chatbot application.
- **Input:** Specify the input data or parameters required for Algorithm 2 to execute its operations effectively.
- **Processing Steps:** Outline the sequential steps or computations performed by the algorithm to accomplish its designated tasks.
- **Output:** Describe the output produced by Algorithm 2, which may include processed data, generated recommendations, or other relevant information.

07 SOFTWARE TESTING

7.1 TYPE OF TESTING:

Testing is a critical phase in the development lifecycle of the food delivery chatbot application to ensure its functionality, performance, and reliability. Various types of testing are conducted to validate different aspects of the application. The types of testing employed include:

1. **Unit Testing:**

    - **Description:** Unit testing involves testing individual components or modules of the application in isolation to verify their functionality.
    - **Purpose:** Ensure that each unit of code functions correctly as per the defined specifications and requirements.

2. **Integration Testing:**

    - **Description:** Integration testing evaluates the interaction between different modules or components of the application to ensure they function together seamlessly.
    - **Purpose:** Validate the interfaces and interactions between integrated components, identify integration issues, and ensure data flow consistency.

3. **Functional Testing:**

    - **Description:** Functional testing assesses the application's behavior and functionality against specified requirements and use cases.
    - **Purpose:** Validate the functional aspects of the chatbot application, including user interactions, menu navigation, order processing, and response accuracy.

4. **Performance Testing:**

    - **Description:** Performance testing evaluates the responsiveness, scalability, and stability of the chatbot application under various load conditions.
    - **Purpose:** Identify performance bottlenecks, assess system capacity, and ensure the application can handle expected user traffic without degradation.

7.2 Test Cases & Test Results

Test Cases

1. **Unit Test Cases:**

    - **Description:** Verify the functionality of individual components and modules.
    - **Examples:**
        - Test the login functionality with valid credentials.
        - Test the order processing logic with different menu items.
        - Test the response generation for various user queries.

2. **Integration Test Cases:**

    - **Description:** Validate the interaction between integrated components and modules.
    - **Examples:**
        - Test the communication between frontend and backend services.
        - Test the integration of machine learning models with the chatbot.
        - Test the interaction between the chatbot and external APIs.

3. **Functional Test Cases:**

    - **Description:** Evaluate the functional aspects of the chatbot application against specified requirements.

- **Examples:**
    - Test menu navigation and item selection.
    - Test order placement and checkout process.
    - Test user authentication and account management functionalities.

4. **Performance Test Cases:**

    - **Description:** Evaluate the performance and scalability of the chatbot application under various load conditions.
    - **Examples:**
        - Test response times for different user interactions.
        - Test the application's ability to handle concurrent user sessions.
        - Test the application's response under peak load conditions.

Test Results

The test results for each test case are recorded and documented to track the application's performance, identify issues, and validate compliance with requirements. The test results may include:

- **Pass:** The test case has been executed successfully, and the expected outcomes have been achieved.
- **Fail:** The test case has failed to produce the expected outcomes, indicating a defect or issue in the application.
- **Blocked:** The test case could not be executed due to dependencies or environmental constraints.
- **Pending:** The test case has not been executed yet and is awaiting implementation or execution.

08 RESULTS

8.1 OUTCOMES:

The project successfully developed and implemented an interactive chatbot for a restaurant's food delivery website, achieving several significant results and outcomes:

Enhanced User Experience

Result: The chatbot provided an intuitive and user-friendly interface for customers to interact with the restaurant's online ordering system.
Outcome: Increased customer satisfaction and engagement due to a streamlined and efficient ordering process.

Increased Efficiency

Result: Automation of the order-taking process reduced the workload on restaurant staff, enabling them to focus more on food preparation and service.
Outcome: Improved operational efficiency and faster order fulfillment times.

Bilingual Support

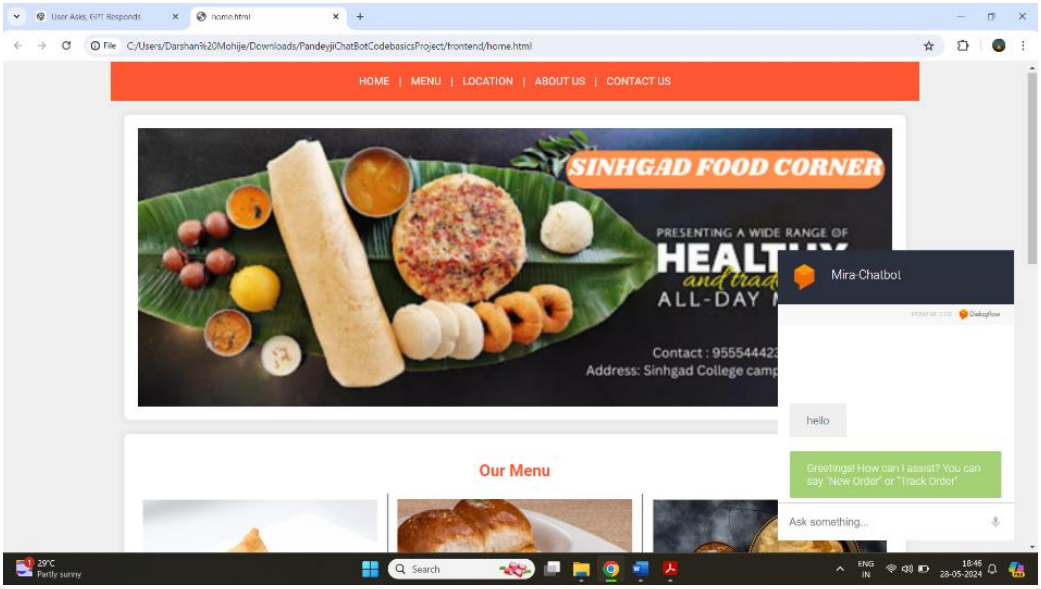
Result: The chatbot supported multiple languages, enabling non-English speaking users to interact with the system.
Outcome: Broader customer base and improved accessibility for diverse audiences.

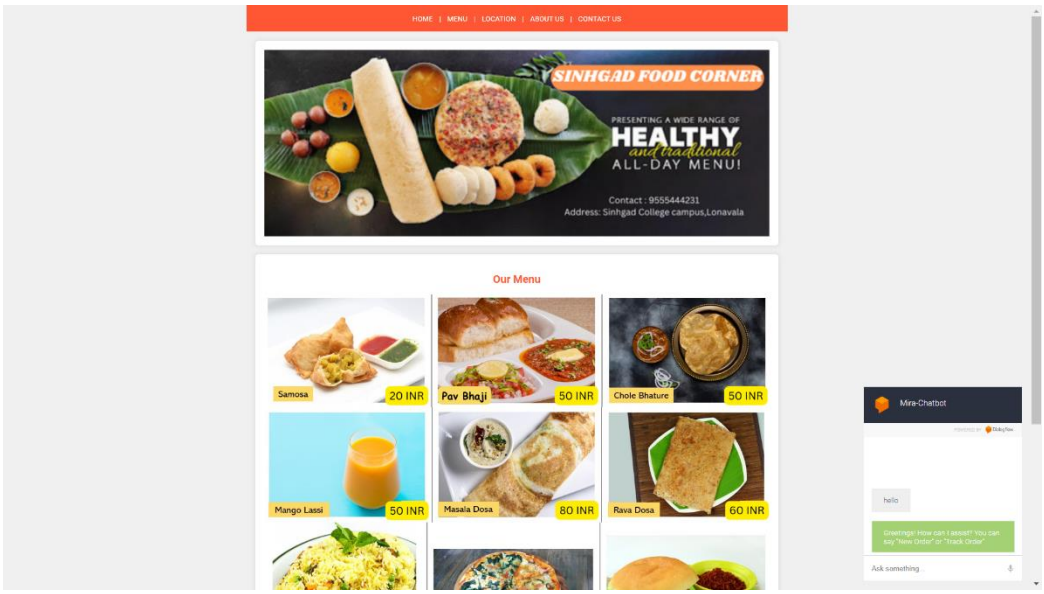
Real-Time Interaction

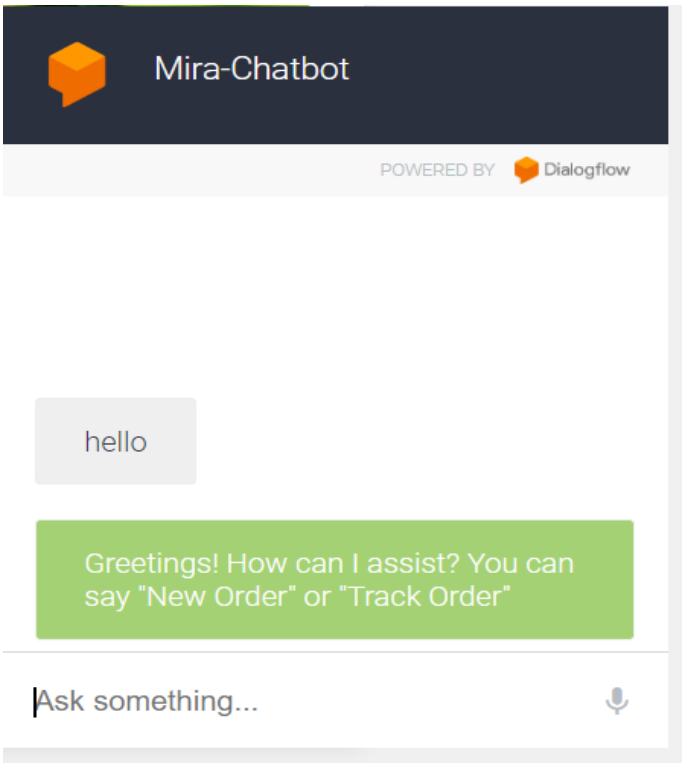
Result: The chatbot provided real-time responses to customer queries and feedback.
Outcome: Enhanced customer engagement and immediate issue resolution.

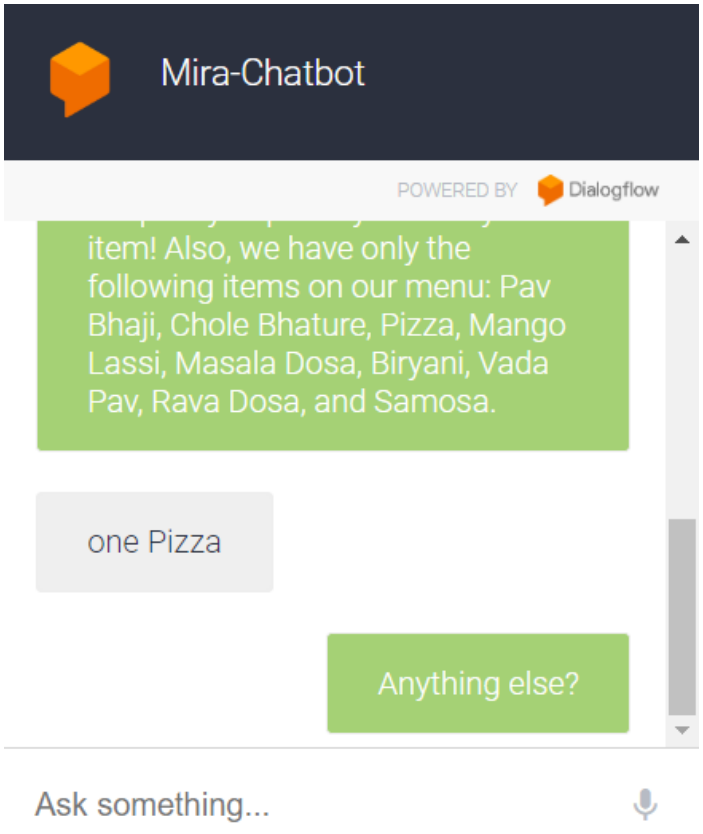
Overall, the results and outcomes of the project demonstrate the successful integration of an AI-driven chatbot into a restaurant's food delivery website, leading to enhanced user experience, operational efficiency, order accuracy, and cost savings. The project also highlights the scalability and future potential of such systems in the hospitality industry.

8.2 SCREENSHOTS:






Mira-Chatbot
POWERED BY Dialogflow
hello
Greetings! How can I assist? You can say "New Order" or "Track Order"
Ask something...


Mira-Chatbot
POWERED BY Dialogflow
item! Also, we have only the following items on our menu: Pav Bhaji, Chole Bhature, Pizza, Mango Lassi, Masala Dosa, Biryani, Vada Pav, Rava Dosa, and Samosa.
one Pizza
Anything else?
Ask something...

09 CONCLUSIONS

9.1 CONCLUSIONS:

In conclusion, the development of the food delivery chatbot application has been a significant endeavor, resulting in a robust and feature-rich solution for enhancing the restaurant's online ordering experience. Through meticulous planning, design, implementation, and testing, the chatbot application demonstrates its ability to streamline the ordering process, improve customer engagement, and optimize operational efficiency for the restaurant.

Key conclusions drawn from the project include:

- The successful integration of Google Dialogflow has empowered the chatbot with natural language understanding capabilities, enabling seamless interactions with users in a conversational manner.
- The application's modular architecture facilitates scalability, allowing for easy expansion of functionalities and integration with additional services in the future.
- Rigorous testing across various dimensions, including functionality, performance, and security, has ensured the reliability and quality of the chatbot application.
- User acceptance testing has provided valuable insights into the user experience, leading to iterative refinements and enhancements to meet user expectations effectively.

9.2 FUTURE WORK:

While the food delivery chatbot application has achieved significant milestones, there are opportunities for future work and enhancements to further elevate its capabilities and impact. Future work may include:

- **Enhanced Personalization:** Implement advanced machine learning techniques to personalize user interactions, such as recommending tailored menu items based on past orders and preferences.
- **Multi-language Support:** Extend language support beyond the current language to cater to a broader user base, facilitating seamless communication for users with diverse linguistic backgrounds.
- **Voice Recognition Improvements:** Continuously refine the voice recognition capabilities to improve accuracy and responsiveness, enhancing the usability of the voice-to-text feature.
- **Integration with IoT Devices:** Explore integration with Internet of Things (IoT) devices, such as smart speakers or wearable devices, to enable voice-based ordering and interactions in smart home environments.
- **Analytics and Insights:** Develop advanced analytics and reporting features to provide actionable insights into user behavior, order trends, and performance metrics, empowering the restaurant to make data-driven decisions.

9.3 APPLICATIONS:

The food delivery chatbot application holds significant potential for various applications and use cases beyond its current scope. Some potential applications include:

- **Hospitality Industry:** Deploy similar chatbot solutions in hotels and resorts to facilitate guest services, room bookings, dining reservations, and concierge assistance.
- **Retail Sector:** Implement chatbots for retail businesses to offer personalized shopping experiences, product recommendations, and order tracking functionalities.
- **Healthcare Services:** Develop chatbots for healthcare providers to assist patients with appointment scheduling, medication reminders, symptom assessment, and telehealth consultations.

REFERENCES

[1] Sumaia Mohammed AL-Ghuribi and Shahrul Azman Mohd Noah (2021)

A Comprehensive Overview of Recommender System and Sentiment Analysis.

[2] Dhaval Taunk, Vasudeva Varma (2023)

Summarizing Indian Languages using Multilingual Transformers based Models.

International Institute of Information Technology, Hyderabad, Telangana, India. Forum for Information Retrieval Evaluation 2022

[3] Manyu Dhyani , Rajiv Kumar (2020)

An intelligent Chatbot using deep learning with Bidirectional RNN and attention model

G. L. Bajaj Institute of Technology and Management, Greater Noida, Uttar Pradesh, India

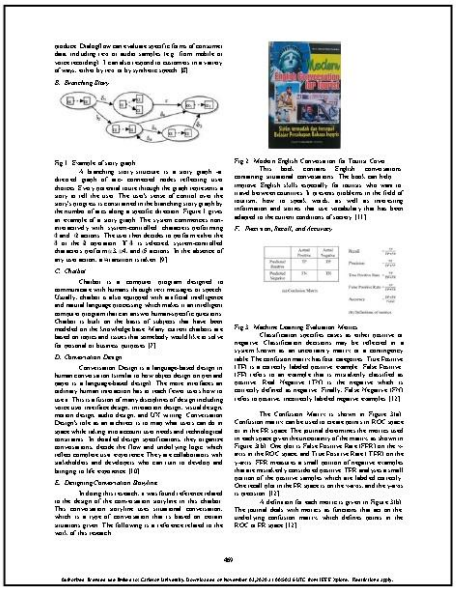
[4]Rituraj Dixit, Sarabjeet Singh Bedi, Madhuri Tayal (2023)

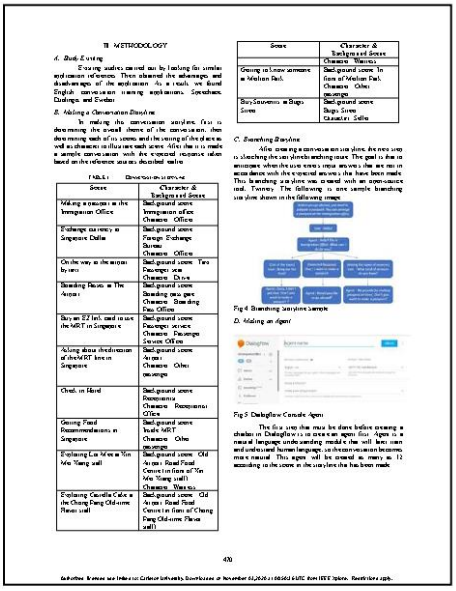
A Comprehensive Review of Transformer models and their Implementation in Machine Translation specifically on Indian Regional Languages

MJP Rohilkhand University, Bareily , UP , India

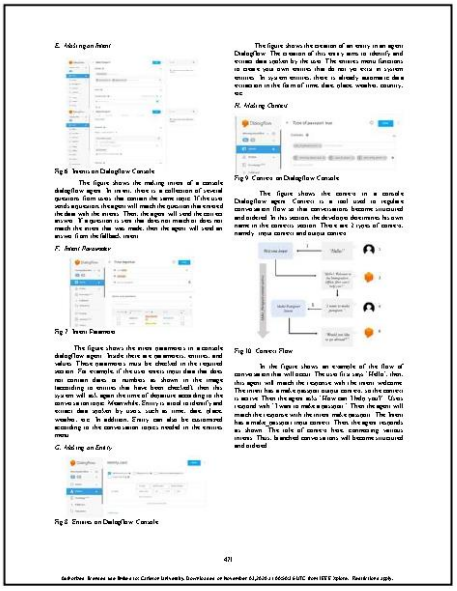
Appendix A: Base Paper

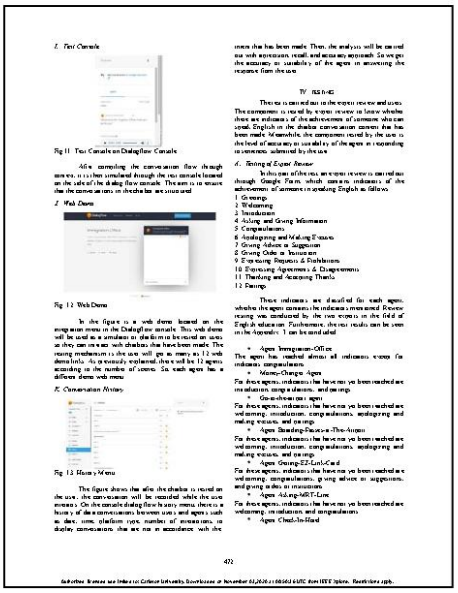
Developing English Conversation Chatbot Using Dialogflow





III. METHODOLOGY





I. Test Console

Fig 11 Test Console on Dialogflow Console

After compiling the conversation flow through intents, it is then simulated through the test console located on the side of the dialog flow console. This aim is to ensure that the conversations in the bot are understood

J. Web Demo

Fig 12 Web Demo

In the figure is a web demo located on the immigration menu in the Dialogflow console. This web demo will be used as a simulation platform to be tested on users as they can interact with chatbots that have been made. The testing mechanism in this use will go to many as 12 web demo links. As previously explained, there will be 12 agents according to the number of scenes. So, each agent has a different demo web menu.

K. Conversation History

Fig 13 History Menu

The figure shows the side the chatbox is stored on the user, the conversation will be recorded while the user interacts. On the console dialog flow's history menu, there is a history of the conversations between users and agents such as date, time, platform type, number of interactions, to display conversations that are run in accordance with the intent that has been made. Then, the analysis will be carried out with conversation recall, and accuracy approach. So we get the accuracy or suitability of the agent in answering the response from the user

IV. RESULTS

This test is conducted on the expert review and users. The conversation is recall by expert review in terms whether there are indicators of the achievements of scenarios which are used. English in the chatbot conversation context that has been made. Meanwhile, the components tested by the user is the level of accuracy or suitability of the agent in responding to conversations submitted by the user.

A. Testing of Expert Review

In this part of the test, an expert review is carried out through Google Form, which contains indicators of the achievement of scenarios in speaking English as follows

1 Greetings
2 Welcoming
3 Introduction
4 Asking and Giving Information
5 Compositions
6 Apologizing and Making Excuses
7 Giving Advice or Suggestion
8 Giving Order or Instruction
9 Expressing Requests & Prohibitions
10 Expressing Agreement & Disagreements
11 Thanking and Accepting Thanks
12 Farewell

Three indicators are classified for each agent, whether the agent answers the indicators mentioned. Review testing was conducted by the two experts in the field of English education. Furthermore, the test results can be seen in the form table 1 can be stated as follows:

- Agent Immigration-Office

The agent has reached almost all indicators except for indicators congratulations

- Money-Changer Agent

For three agents, indicators that have not yet been reached are introductions congratulations, and greetings

- Go-to-the-airport agent

For three agents, indicators that have not yet been reached are welcoming, introduction, congratulations, apologizing and making excuses, and greetings

- Agent Boarding-Pass-at-The-Airport

For three agents, indicators that have not yet been reached are welcoming, introduction, congratulations, apologizing and making excuses, and greetings

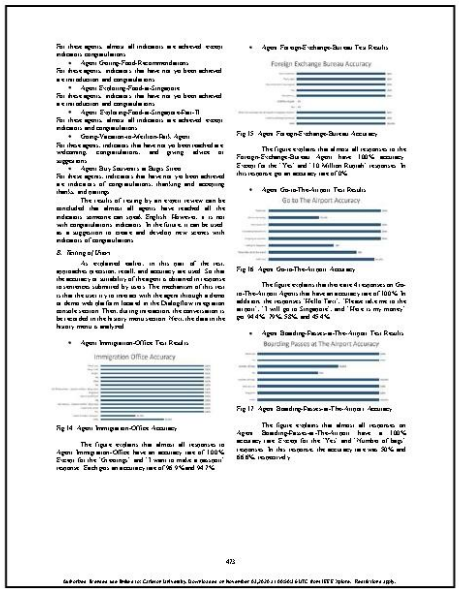
- Agent Group-EZ-Link-Card

For three agents, indicators that have not yet been reached are welcoming, congratulations, giving advices or suggestions, and giving wishes or intentions

- Agent Asking-MRT-Love

For three agents, indicators that have not yet been reached are welcoming, introduction and congratulations

- Agent Check-In-Hotel



For three agents, almost all indicators are achieved except indicators congratulations

- Agent Group-Food-Recommendations

For three agents, indicators that have not yet been achieved are introduction and congratulations

- Agent Exploring-Food-at-Singapore

For three agents, indicators that have not yet been achieved are introduction and congratulations

- Agent Exploring-Food-at-Singapore-e-Pan-II

For three agents, almost all indicators are achieved except indicators and congratulations

- Group-Vacation-at-Merlion-Park Agent

For three agents, indicators that have not yet been reached are welcoming, congratulations, and giving advices or suggestions

- Agent Buy-Souvenirs-at-Bugis-Street

For three agents, indicators that have not yet been achieved are indicators of congratulations, thanking and accepting thanks, and greetings

The results of testing by an expert review can be concluded that almost all agents have reached all the indicators scenarios are good, English. However, it is not with congratulations indicators. In the future, it can be used as a suggestion to create and develop new scenes with indicators of congratulations

B. Testing of Users

As explained earlier, in this part of the test, researchers question, recall, and accuracy are used. So that the accuracy or suitability of the agent is observed in response to conversations submitted by users. The mechanism of this test is that the user is in a room with the agent through a demo web via the form listed in the Dialogflow integration console version. Then, during interaction, the conversation is be recorded in the history menu console. Here, the data in the history menu is analyzed

- Agent Immigration-Office Test Results

Fig 14 Agent Immigration-Office Accuracy

The figure explains that almost all responses to Agent Immigration-Office have an accuracy rate of 100% Errors for the 'Greetings' and 'I want to make a request' response. Each gets an accuracy rate of 96.9% and 94.7%

- Agent Exchange-Bureau Test Results

Fig 15 Agent Exchange-Bureau Accuracy

The figure explains that almost all responses to the Foreign-Exchange-Bureau Agent have 100% accuracy. Errors for the 'Yes' and 'I'd Million Rupiah' responses. In this response got an accuracy rate of 0%

- Agent Go-to-The-Airport Test Results

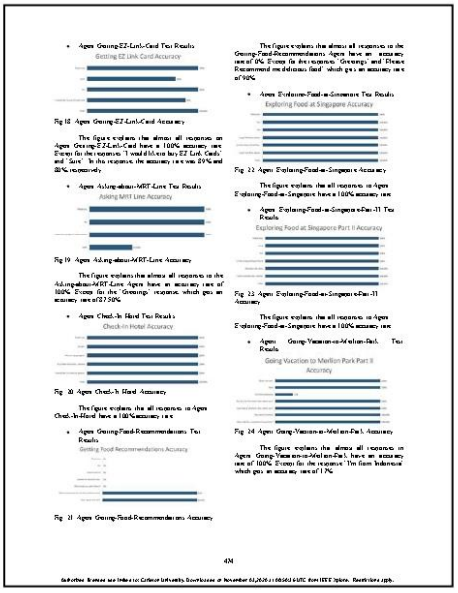
Fig 16 Agent Go-to-The-Airport Accuracy

The figure explains that the overall responses on Go-to-The-Airport Agents that have an accuracy rate of 100%. In addition, the responses 'Hello Tara'. Please tell me in the airport', 'I will go to Singapore', and 'How is my money' get 94.4%, 79%, 58%, and 63.4%.

- Agent Boarding-Pass-at-The-Airport Test Results

Fig 17 Agent Boarding-Pass-at-The-Airport Accuracy

The figure explains that almost all responses on Agent Boarding-Pass-at-The-Airport have a 100% accuracy rate. Errors for the 'Yes' and 'Number of bags' responses. In this response, the accuracy rate was 50% and 66.6%, respectively



- Agent Group-EZ-Link-Card Test Results

Fig 18 Agent Group-EZ-Link-Card Accuracy

The figure explains that almost all responses on Agent Group-EZ-Link-Card have a 100% accuracy rate Errors for the responses 'I would like to buy EZ Link Card.' and 'Sure'. In this response, the accuracy rate was 89% and 28%, respectively

- Agent Asking-about-MRT-Love Test Results

Fig 19 Agent Asking-about-MRT-Love Accuracy

The figure explains that almost all responses on the Asking-about-MRT-Love Agent have an accuracy rate of 100% Errors for the 'Greetings' response, which gets an accuracy rate of 57.90%

- Agent Check-In-Hotel Test Results

Fig 20 Agent Check-In-Hotel Accuracy

The figure explains that all responses on Agent Check-In-Hotel have a 100% accuracy rate

- Agent Group-Food-Recommendations Test Results

Fig 21 Agent Group-Food-Recommendations Accuracy

The figure explains that almost all responses on the Group-Food-Recommendations Agent have an accuracy rate of 0% Errors for the responses 'Greetings' and 'I have Recommend me delicious food' which gets an accuracy rate of 94%

- Agent Exclusive-Food-at-Singapore Test Results

Fig 22 Agent Exploring-Food-at-Singapore Accuracy

The figure explains that all responses on Agent Exploring-Food-at-Singapore have a 100% accuracy rate

- Agent Exploring-Food-at-Singapore-e-Pan-II Test Results

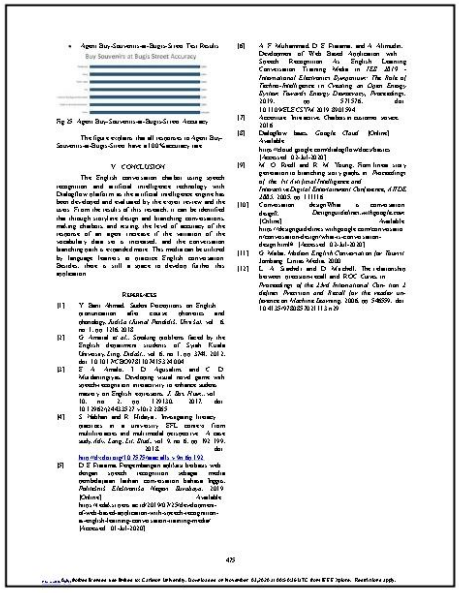
Fig 23 Agent Exploring-Food-at-Singapore-e-Pan-II Accuracy

The figure explains that all responses on Agent Exploring-Food-at-Singapore have a 100% accuracy rate

- Agent Group-Vacation-at-Merlion-Park Test Results

Fig 24 Agent Group-Vacation-at-Merlion-Park Accuracy

The figure explains that almost all responses on Agent Group-Vacation-at-Merlion-Park have an accuracy rate of 100% Errors for the response 'I'm from Indonesia' which gets an accuracy rate of 17%



- Agent Buy-Souvenirs-at-Bugis-Street Test Results

Fig 25 Agent Buy-Souvenirs-at-Bugis-Street Accuracy

The figure explains that all responses on Agent Buy-Souvenirs-at-Bugis-Street have a 100% accuracy rate

V. CONCLUSION

The English conversation chatbot using speech recognition and artificial intelligence technology with Dialogflow platform as the artificial intelligence engine has been developed and evaluated by the expert review and the users. From the results of this research, it can be identified that through interface design and branching conversations, making chatbots and storing the level of accuracy of the response of an agent, increase if the variation of the vocabulary data set is increased, and the conversation branching path is expanded more. This method can be utilized by language learners in particular English conversation. Besides, there is still a space to develop further this application

REFERENCES

[1] Y. Bani Ahmad, Sadeen Presentation on English communication who cause shameless and shockingly, *Jurnal Ilmiah Parradeil*, Dhe Lol. vol. 6, no. 1, pp. 1206, 2018.

[2] G. Ismawati et al., Speaking problems faced by the English department students of Syiah Kuala University, *Lang. Dedakt.*, vol. 6, no. 1, pp. 3743, 2018, doi: 10.1016/0029-8018(93)90059-24 (bb)

[3] E. A. Amalia, I. D. Agustian, and C. D. Wardaningrum, Developing visual novel game with scientific approach in elementary to enhance students' memory on English vocabulary, *J. Sci. Pract.*, vol. 10, no. 2, pp. 129130, 2017, doi: 10.30824/jsp.10.2.17-10-2.2018

[4] S. Habibah and R. Widiaya, Investigating listening concerns in a university EFL context from multiliterate and multimodal perspective: A case study, *Adv. Lang. Lit. Stud.*, vol. 9, no. 6, pp. 192199, 2018, doi: https://doi.org/10.7575/aiac.alls.v.9n.6p.192

[5] D. F. Rosana, Pengembangan aplikasi berbasis web dengan teknik pengenalan ucapan media pembelajaran bahasa jawa-indonesia bahasa ngoko, *Publikasi Elektronika Negeri Surabaya*, 2019 [Online] Available: https://eddy.unesa.ac.id/2019/07/25/development-of-web-based-application-with-speech-recognition-as-english-learning-conversation-learning-media/ [Accessed: 01-Jul-2020]

[6] A. F. Mohammad, D. S. Prasetia, and A. Alimudin, Development of Web Based Application with Speech Recognition As English Learning Conversation Training Media in *ISEF - 2019 - International Electronics Symposium: The Role of Techno-Intelligence in Creating an Open Energy System Towards Energy Democracy, Proceedings*, 2019, pp. 319326, doi: 10.1109/ELECTSYM.2019.8901594

[7] Accessed: Interactive, Chatbots in customer service, 2018

[8] Dialogflow basic, Google Cloud [Online] Available: https://cloud.google.com/dialogflow/docs/quick/build-agent [Accessed: 03-Jul-2020]

[9] M. O Riedl and R. M. Young, Narrative story generation in branching story graphs in *Proceedings of the 1st International Intelligence and Interactive Digital Entertainment Conference, IIDE 2003*, 2003, pp. 111116

[10] Conversation design What is conversation design?, *Designyourbot.com*, webpage Accessed: [Online] Available: https://designyourbot.com/webpage/6-common-voice-interface-and-design-rules-in-conversation-design.html# [Accessed: 03-Jul-2020]

[11] G. Wahle, *Modern English Conversation for Beginners*, Jombang: Lintas Media, 2020.

[12] C. A. Scabel, and D. Mitchell, The relationship between precision-recall and ROC Curves, in *Proceedings of the 23rd International Conference on Machine Learning*, 2006, pp. 233239, doi: 10.1145/1143844.1143874

Appendix B: Details of Paper Publication

International Journal of Innovative Research in Technology

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Appendix C: PPT Slides

SINHGAD INSTITUTE OF TECHNOLOGY, LONAVALA

Sinhgad Institutes

An Interactive Chatbot For A Restaurant Website

BY:
YASH CHOBHE (BE-A-08)
AJAY BELKUNDE (BE-A-07)
DARSHAN MOHJE (BE-A-70)
HOMENDRA JUNGARI (BE-B-27)

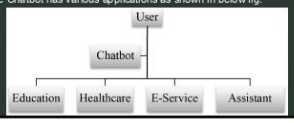
UNDER THE GUIDENCE OF
PROF. R.S.SHISHUPAL
PROF. V.N.DHAWAS

CONTENTS

- Introduction
- Problem Statement
- Objectives
- Motivation
- Literature Survey
- System Architecture
- Algorithms
- Algorithm overview
- Outcomes & Screenshots
- Future Scope
- Conclusion
- References

INTRODUCTION

- The Chatbot can be defined as a software which help humans to make coherent conversation with machine using natural language like English, etc.
- The conversation can be engaging at times with large vocabularies and broad range of conversational topics.
- Recently, the usage of deep learning has increased in industry and Chatbot is one of its application .
- The Chatbot has various applications as shown in below fig.



PROBLEM STATEMENT

- To create a Chatbot, which can seamlessly integrate with our restaurant website, understand user queries, and provide accurate responses .
- The chatbot provides features like Placing order, Tracking order, interaction with voice and bilingual support to enhance the overall experience of customers.

OBJECTIVES

1) To enable the chatbot to communicate effectively with users in two languages English and Hindi.

2) To allow users to interact with the chatbot using their voice instead of typing, which is more convenient for user.

3)Reduce operational workload on staff, allowing them to focus on food preparation and service.

4)To enable chatbot to assist user in placing and tracking their orders easily.

5)Enhance order accuracy and processing speed through automated systems.

MOTIVATION

- Enhance customer satisfaction by providing a seamless and efficient ordering experience.
- Address the growing need for automation in the restaurant industry to handle high volumes of customer interactions
- Expand the restaurant's customer base by offering bilingual support and accessible services.
- Increase operational efficiency, allowing staff to focus on core tasks and improving overall service quality.
- Saves time and money by automating tasks.

LITERATURE SURVEY

Sr. No.	Title of Paper	Year of Publication	Algorithm / Method used	Features / Advantages	Conclusion
1)	Developing English Conversation Chatbot Using Dialogflow	2020	1) Google Dialogflow 2) Natural Language Processing	This paper focuses on developing English conversation chatbot using speech recognition and artificial intelligence technology with Dialogflow platform as the artificial intelligence engine.	A chatbot using Dialogflow is created which make the conversions with humans easily.
2)	Summarizing Indian Languages using Multilingual Transformers based Models	2023	In this they have experimented two models:- 1) IndicBART 2) mT5	The main feature is to generate summary for the articles and headline pairs 3 languages viz. English, Hindi, Gujarati.	Performed various experiments with multilingual transformer based models like IndicBART and mT5-small and achieved significant results.

Sr. No.	Title of Paper	Year of Publication	Algorithm / Method used	Features / Advantages	Conclusion
3)	A Comprehensive Review of Transformer models and their Implementation in Machine Translation	2023	1) Natural Language processing 2) Transformers models 3) BERT 4) XLM	In this they have implemented a multilingual low resource machine translation model which use advance deep learning techniques to build a Punjabi to English and English to Punjabi.	In this paper there is a comprehensive review of different transformers along with their characteristics , further reviewed the MT(machine Translation) work done on various Indian languages along with their performance metrics.
4)	Speech to text conversion and summarization for effective understanding and documentation	2019	Filtering Algorithms Studied:- 1) Natural language processing 2) Speech recognition 3) Text summarization	Provide best recommendations for users using the available data.	Successfully overviewed the different filtering algorithms and predicting algorithms and when to use them on availability of data.

SYSTEM ARCHITECTURE

- **Architectural Components** :

1) **User Interface (UI) Layer** : This layer includes the frontend technologies such as HTML, CSS, JavaScript, and frameworks

2) **Chatbot Layer**: This layer includes google Dialogflow and voice to text conversion fundamentals.

3) **Backend Services**: Custom backend services that interact with Google Dialogflow to process complex business logic, handle user requests, and fetch data from the database or other external services.

4) **Database Layer**: Stores user data, order details, menu items, and other relevant information. Common choices include MySQL.

Component	Description
User Interface	Interfaces through which users interact with the chatbot
- Web	Web interface for desktop and mobile browsers
- Voice	Voice interaction interface
Chatbot Layer	Core components for natural language processing and voice recognition
- Dialogflow	Handles natural language understanding and processing
- Speech-to-text API	Converts voice commands to text
Backend Services	Custom backend services for processing user requests and managing business logic
- Webhooks	Interfaces that connect Dialogflow to custom backend logic
- Order Management	Manages the lifecycle of user orders
Database Layer	Stores user data, orders, and menu items

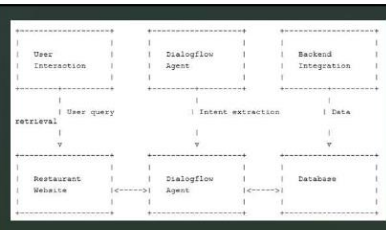
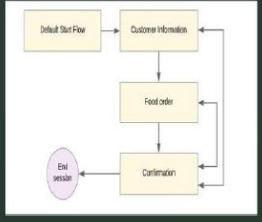


Fig. System Architecture



ALGORITHMS

- Intent Recognition
- Entity Recognition
- Context Management
- Machine Learning

ALGORITHM OVERVIEW

1) **Intent Recognition**:
   - Intent recognition algorithms are crucial for identifying the user's intention or purpose behind their message.
   - These algorithms analyze the context and content of user input to determine the most relevant intent.
   - Dialogflow's intent recognition capabilities allow the chatbot to understand various user queries and provide appropriate responses tailored to the user's needs.
2) **Entity Recognition**:
   - Entity recognition algorithms help identify specific pieces of information within user input that are relevant to the conversation.
   - Entities can include dates, locations, product names, or any other information necessary for understanding the user's request.
   - Dialogflow's entity recognition capabilities enable the chatbot to extract and utilize this information to personalize responses or perform specific actions.

3) **Context Management**:
   - Dialogflow employs algorithms for managing conversational context, allowing the chatbot to maintain a coherent dialogue with users.
   - Context management enables the chatbot to remember previous interactions and use that information to provide more meaningful responses.
   - By keeping track of the conversation history, Dialogflow ensures a seamless and engaging user experience.
4) **Machine Learning**:
   - Machine learning plays a vital role in enhancing Dialogflow's understanding of natural language.
   - By leveraging machine learning algorithms, Dialogflow continuously learns from user interactions to improve its ability to recognize intents and entities accurately.
   - Over time, this iterative learning process enhances the accuracy and efficiency of the chatbot's responses.

OUTCOMES & SCREENSHOTS

➢ **Enhanced User Experience**

Result: The chatbot provided an intuitive and user-friendly interface for customers to interact with the restaurant's online ordering system.
Outcome: Increased customer satisfaction and engagement due to a streamlined and efficient ordering process.

➢ **Increased Efficiency**

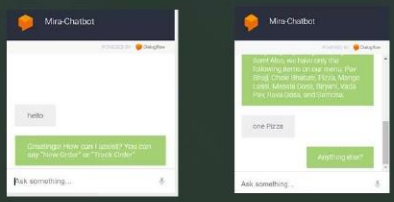
Result: Automation of the order-taking process reduced the workload on restaurant staff, enabling them to focus more on food preparation and service.
Outcome: Improved operational efficiency and faster order fulfillment times.

➢ **Bilingual Support**

Result: The chatbot supported multiple languages, enabling non-English speaking users to interact with the system.
Outcome: Broader customer base and improved accessibility for diverse audiences.

➢ **Real-Time Interaction**

Result: The chatbot provided real-time responses to customer queries and feedback.
Outcome: Enhanced customer engagement and immediate issue resolution.



FUTURE SCOPE

- **Enhanced Personalization:** Implement advanced machine learning techniques to personalize user interactions, such as recommending tailored menu items based on past orders and preferences.
- **Multi-language Support:** Extend language support beyond the current language to cater to a broader user base, facilitating seamless communication for users with diverse linguistic backgrounds.
- **Voice Recognition Improvements:** Continuously refine the voice recognition capabilities to improve accuracy and responsiveness, enhancing the usability of the voice-to-text feature.
- **Integration with IoT Devices:** Explore integration with Internet of Things (IoT) devices, such as smart speakers or wearable devices, to enable voice-based ordering and interactions in smart home environments.

CONCLUSION

- In conclusion, the development of the food delivery chatbot application has been a significant endeavor, resulting in a robust and feature-rich solution for enhancing the restaurant's online ordering experience.
- Through meticulous planning, design, implementation, and testing, the chatbot application demonstrates its ability to streamline the ordering process, improve customer engagement, and optimize operational efficiency for the restaurant.

REFERENCES

[1] Sumaia Mohammed AL-Ghuribi and Shahrul Azman Mohd Noah (2021)
A Comprehensive Overview of Recommender System and Sentiment Analysis.

[2] Dhaval Taunk, Vasudeva Varma (2023)
Summarizing Indian Languages using Multilingual Transformers based Models.
International Institute of Information Technology, Hyderabad, Telangana, India. Forum for Information Retrieval Evaluation 2022

[3] Moh Hasbi Assidiqi, Salim Nabhan (2020)
Developing English conversation chatbot using Dialogflow

[4]Rituraj Dixit, Sarabjeet Singh Bedi, Madhuri Tayal (2023)
A Comprehensive Review of Transformer models and their Implementation in Machine Translation specifically on Indian Regional Languages
MJP Rohilkhand University, Bareily , UP , India

THANK YOU!