



Conversational AI for Craft Beer Restaurants: A Chatbot- Based Customer Service and Recommendation System

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Abstract

The latest developments in Artificial Intelligence (AI) have enabled hospitality businesses to deliver customer service in new ways. The research introduces a conversational AI chatbot system that enables craft beer restaurants to interact with customers through automated service and customised product suggestions. The system employs Natural Language Processing, machine learning, and a recommendation engine to process user input and deliver precise, real- time results. Customers can place orders independently, which reduces staff workload while providing faster, more reliable service. The system demonstrates high response accuracy and improved customer experience compared to standard manual service methods. The results demonstrate how conversational AI can be used in modern restaurants and identify which areas would benefit from adding voice recognition and deep learning technology.

Keywords: Conversational AI, Chatbot, Natural Language Processing, Machine Learning, Recommendation System, Craft Beer, Customer Service, Restaurant Automation.



1. INTRODUCTION

1.1 The hospitality industry has undergone significant changes as Artificial Intelligence (AI) has become a fundamental requirement across various sectors. Restaurants now use digital solutions to create better customer experiences while boosting their operational efficiency. Craft beer restaurants offer numerous beer options, making it difficult for customers to choose their preferred drinks. The use of conversational AI chatbots provides an efficient method to solve these problems. The systems use Natural Language Processing and machine learning to enable users to interact with them through human-like communication. The chatbots provide automated responses that, when combined with personalised recommendations, improve service delivery and increase customer satisfaction [1]. The researchers created a system that uses chatbots to assist craft beer restaurants with customer communication and product recommendations.

1.2 Background of the Study

The hospitality industry shows the fastest growth rate from Artificial Intelligence (AI) technology adoption because multiple sectors have implemented AI solutions in recent years. Restaurants currently rely on digital technologies as essential tools to deliver better customer service and streamline operations. Craft beer restaurants offer a wide range of beer options, making it difficult for customers to find their ideal drink. Researchers can use conversational AI chatbot development to create a solution that addresses this research problem. The system allows users to communicate in natural language to express their needs and provides accurate, real-time responses. Chatbots develop the ability to interact with humans through Natural Language Processing and machine learning, enabling them to create human-like dialogues that improve dining experiences[1].

1.3 Problem Statement

In craft beer restaurants, customers often see a long list of beer options, which can make it tough to choose the right one. Many people are not familiar with the different styles, flavours, or alcohol levels, so they may feel unsure or take extra time to decide. Usually, staff help customers, but when the restaurant is busy, they may not have enough time to attend to everyone. This can slow service, lead to mixed advice, and reduce customer satisfaction. Answering questions by hand also increases staff workload and can lead to mistakes. Most restaurants lack a way to offer personalised beer recommendations tailored to each customer's preferences, creating a gap between what customers want and what they receive. One way to fix this is to use an automated system that can answer questions, provide accurate, personalised suggestions, and keep service quick and consistent. A conversational AI chatbot can talk with customers in real time, take some pressure off staff, and improve the overall experience[1].

1.4 Objectives of the Study

This project aims to build a smart AI chatbot for craft beer restaurants. We want to make it easier for customers to reach staff and get faster, smoother service. Our main goals are:

- Create a chatbot that communicates with customers using clear, everyday language.
- Use Natural Language Processing to enable the chatbot to understand and respond to customer questions.
- Create a system that recommends craft beers and provides quick, accurate answers to customer questions.
- Cut down on the number of common questions staff need to answer to help the restaurant run more smoothly.

Increase customer satisfaction by offering service that is both personal and dependable.

1.5 Scope of the Study

This study examines how to design and build a conversational AI chatbot for craft beer restaurants to improve customer service and recommendations. Users can interact with the chatbot on a website or mobile app to ask questions, browse the menu, get personalised beer suggestions, and place orders quickly. The chatbot uses Natural Language Processing to answer common questions in real time. It also has a recommendation feature that suggests craft beers based on user preferences, such as taste, ingredients, and alcohol content. The study focuses only on a text-based chatbot and uses set training and recommendation data. It does not cover features such as voice interaction, live inventory tracking, or integration with other restaurant management systems. In the future, the system could be improved by incorporating deep learning, supporting more languages, and adding voice recognition [2].



1.6 Significance of the Study

This study examines how conversational AI is used in the hospitality industry, with a focus on craft beer restaurants. The chatbot system improves customer service by providing quick, personalised responses and streamlining the dining process. When routine questions are handled automatically, staff can focus on more complex tasks, especially during busy times. The recommendation feature helps customers find options that match their preferences, which leads to higher satisfaction and engagement. Restaurants can also deliver promotions more effectively. The study suggests that small- and medium-sized businesses should consider adopting AI technologies to remain competitive. It also lays the groundwork for future research on smart customer service systems, like voice recognition and personalised AI experiences. [1].

2. LITERATURE REVIEW

2.1 Overview of Conversational AI

Conversational Artificial Intelligence (AI) refers to a set of technologies that enable machines to communicate with humans in a natural, interactive manner through text or voice. It combines multiple techniques, including Natural Language Processing (NLP), machine learning, and deep learning, to understand user input, interpret intent, and generate meaningful responses. The most common application of conversational AI is chatbots, which are widely used in customer service systems. These chatbots can handle user queries, provide information, and assist in decision-making processes without human intervention. Unlike traditional rule-based systems, modern conversational AI systems can learn from user interactions and improve their performance over time[3]. In the hospitality industry, conversational AI plays a significant role in enhancing the customer experience by providing instant support, reducing wait times, and ensuring consistent service. Customers can interact with chatbots to explore menus, get recommendations, and place orders conveniently. Research has shown that conversational AI systems improve service efficiency and customer satisfaction by providing quick and accurate responses [1]. Furthermore, conversational AI systems can handle multiple users simultaneously, making them highly scalable and cost-effective for businesses. This makes them an ideal solution for restaurants, especially during peak hours when managing customer queries manually becomes challenging.

2.2 Natural Language Processing

Natural Language Processing (NLP) is a core component of conversational AI systems, enabling machines to understand, interpret, and generate human language in a meaningful way. It serves as a bridge between human communication and computer understanding, enabling chatbots to process user input and respond appropriately. NLP combines techniques from linguistics, computer science, and artificial intelligence to analyse both the structure and meaning of language. In chatbot-based systems, NLP plays a critical role in identifying user intent and extracting relevant information from the input text. The process typically begins with text preprocessing, which includes steps such as tokenisation, stop-word removal, stemming, and lemmatisation. Tokenisation breaks a sentence into smaller units (words or tokens), while stop-word removal removes commonly used words that carry little meaning, such as "is," "the," and "and." Stemming and lemmatisation help reduce words to their root forms, improving the efficiency of analysis. After preprocessing, the system performs syntactic and semantic analysis. Syntactic analysis focuses on the grammatical structure of the sentence, while semantic analysis aims to understand the meaning behind the words. This step is essential for accurately interpreting user queries. For example, when a user asks, "Suggest a light beer with low alcohol," the system must identify keywords such as "light beer" and "low alcohol" to provide relevant recommendations.

Another important aspect of NLP is intent recognition and entity extraction. Intent recognition determines what the user wants to achieve (e.g., requesting recommendations, placing an order, or viewing the menu). At the same time, entity extraction identifies specific details in the query, such as beer type, flavour, or alcohol content. These processes enable the chatbot to generate precise and context-aware responses. Modern NLP systems often use machine learning and deep learning models, such as neural networks and transformer-based architectures, to improve



accuracy and adaptability. These models are trained on large datasets and can learn language patterns, allowing them to handle variations in user input more effectively. As a result, they can understand complex queries, slang, and even minor grammatical errors. In the context of craft beer restaurants, NLP enables the chatbot to provide personalised recommendations by analysing customers' natural-language preferences. For instance, if a customer mentions a preference for "fruity and mild beer," the system can interpret these descriptors and suggest suitable options from the menu. This enhances the user experience by making interactions more natural and intuitive.

Furthermore, NLP-based systems can continuously improve over time by learning from user interactions. This adaptability makes them more efficient compared to traditional rule-based systems, which rely on predefined responses and lack flexibility. Research indicates that NLP significantly improves chatbot performance in accuracy, response time, and user satisfaction [2]. Overall, Natural Language Processing is a fundamental technology that empowers conversational AI systems to deliver intelligent, human-like

interactions. Its integration into chatbot systems is essential for providing efficient, scalable, and personalised customer service in modern restaurant environments.

2.3 Chatbots in the Hospitality Industry

The hospitality industry has witnessed a significant transformation with the adoption of Artificial Intelligence (AI), particularly through the use of chatbots. Chatbots are software applications designed to simulate human conversation and provide automated responses to user queries. In restaurants and hotels, they are increasingly used to enhance customer service, streamline operations, and improve overall user experience. One of the primary advantages of chatbots in the hospitality sector is their ability to provide 24/7 customer support. Unlike human staff, chatbots can handle multiple customer interactions simultaneously without delays. This ensures customers receive instant responses to their queries about menu options, reservations, pricing, and services. As a result, waiting time is reduced, and service efficiency is improved [1]. In restaurant environments, chatbots play a crucial role in order management and assistance. Customers can interact with the chatbot to browse menus, get detailed descriptions of food and beverages, and place orders conveniently. In craft beer restaurants, where customers may not be familiar with different beer types, chatbots can guide them by explaining flavours, ingredients, and alcohol content, making the selection process easier.

Another important benefit of chatbots is consistency in service delivery. Human interactions may vary depending on staff experience and workload, whereas chatbots provide uniform responses based on programmed logic and learned patterns. This helps maintain a consistent level of service quality across all customer interactions. Moreover, chatbots help in reducing operational costs by minimising the need for additional staff, especially during peak hours. They also reduce the chances of human error in order processing and information delivery. Research indicates that the use of chatbots in hospitality significantly improves customer satisfaction and operational efficiency [1]. However, traditional chatbots cannot often provide personalised recommendations, which is a key requirement in modern customer service systems. This limitation highlights the need for integrating chatbot technology with advanced recommendation systems to enhance personalisation and user engagement. Overall, chatbots have become an essential component of digital transformation in the hospitality industry. Their ability to deliver fast, reliable, and scalable customer service makes them highly valuable to restaurants seeking to improve the customer experience and remain competitive in a technology-driven market.

2.4 Recommendation Systems

Recommendation systems are intelligent tools designed to suggest relevant items or services to users based on their preferences, behaviour, and past interactions. These systems play a crucial role in improving user experience by helping customers make informed decisions quickly and efficiently. In modern digital applications, recommendation systems are widely used across domains such as e-commerce, entertainment, and hospitality [5]. In the context of restaurant services, especially craft beer restaurants, recommendation systems help customers choose suitable options from a wide variety of available products. Since many customers may not have detailed



knowledge about different types of beers, such as their taste, ingredients, or alcohol content, a recommendation system can simplify the decision-making process by suggesting options that match their preferences. In addition to these, hybrid approaches that combine both techniques are often used to improve recommendation accuracy and overcome the limitations of individual methods.

In a chatbot-based system, recommendation engines are integrated with Natural Language Processing (NLP) to understand user queries and provide personalised suggestions in real time. For instance, when a user asks for a "strong beer with high alcohol content," the system analyses the input and recommends appropriate options from the available menu. Research indicates that personalised recommendation systems significantly enhance customer engagement and satisfaction by providing tailored suggestions [2]. They also benefit businesses by promoting products more effectively and increasing sales. However, the effectiveness of recommendation systems depends on the quality of data and the algorithms used. Limited or inaccurate data may lead to less relevant suggestions. Therefore, continuous improvement and data updating are essential for maintaining system performance. Overall, recommendation systems are a vital component of modern conversational AI applications, enabling intelligent and personalised interactions. Their integration into chatbot systems for craft beer restaurants enhances both customer experience and business efficiency.

2.5 Research Gap

Although significant research has been conducted in conversational AI, chatbot development, and recommendation systems, existing approaches still have several limitations, particularly in the hospitality industry. Most existing chatbot systems are designed for general customer service and primarily handle basic queries such as reservations, FAQs, and order tracking. These systems often cannot provide personalised recommendations, an important requirement in domains such as craft beer restaurants, where customer preferences vary widely [3]. Similarly, many recommendation systems operate as standalone applications rather than being integrated into real-time conversational platforms. This separation limits their usability, as users must interact with multiple systems rather than experience a seamless, interactive environment.

Another major gap is the limited focus on domain-specific applications, particularly in craft beer restaurants. Existing research does not adequately address the need for combining detailed product knowledge (such as beer types, flavours, and alcohol content) with intelligent conversational interfaces. Furthermore, traditional systems often rely on static datasets and rule-based logic, which restricts their ability to adapt to changing user preferences and dynamic environments. They also lack real-time interaction capabilities and contextual understanding, leading to less effective user engagement. Therefore, there is a clear need for an integrated system that combines conversational AI with an intelligent recommendation engine. Such a system should be able to understand user queries in natural language, provide personalised suggestions, and deliver real-time responses within a single platform. This research aims to bridge this gap by developing a chatbot-based recommendation system tailored to craft beer restaurants [3].

3. PROPOSED SYSTEM

3.1 System Overview

The proposed system is a conversational AI-based chatbot developed to enhance customer service in craft beer restaurants by providing intelligent interaction and personalised recommendations. The system is designed to simulate human-like communication, allowing customers to interact with the restaurant through natural language using a web or mobile interface. The chatbot serves as a virtual assistant that can handle a wide range of customer queries in real time. It enables users to explore the restaurant menu, learn about different types of craft beer, and receive recommendations based on their individual preferences, such as taste, flavour, and alcohol content. This helps customers make better decisions without requiring direct assistance from restaurant staff. The system



integrates key technologies, including Natural Language Processing and machine learning, to understand user input and generate accurate responses. When a user enters a query, the system processes the input, identifies the intent, and provides relevant information or suggestions. The system provides users with a seamless and interactive experience.

3.2 System Architecture

1. User Interface

The User Interface serves as the primary point of interaction between the customer and the chatbot system. It allows users to communicate with the system simply and conveniently using natural language. The interface can be implemented as a web-based or mobile-based application, ensuring accessibility across different devices. The UI is designed to be user-friendly, intuitive, and responsive, so customers can easily navigate the system without requiring technical knowledge. Users can enter queries related to menu items, craft beer options, recommendations, and order placement. The interface displays chatbot responses in a conversational format, creating an experience similar to interacting with a human assistant.

2. NLP Processing Module

The NLP Processing Module is a critical component of the proposed system, responsible for understanding and interpreting natural language user input. It acts as a bridge between human communication and machine understanding by converting unstructured text into a structured format that the system can process effectively. When a user enters a query, the NLP module performs several preprocessing steps to clean and analyse the input. These steps include tokenisation, where the sentence is broken into individual words or tokens; stop-word removal, which eliminates common but less meaningful words; and stemming or lemmatisation, which reduces words to their base form. These processes help improve the accuracy of subsequent analysis. After preprocessing, the module performs intent recognition to identify the purpose of the user's query, such as requesting a recommendation, browsing the menu, or placing an order. Additionally, entity extraction is performed to identify key details in the query, such as beer type, flavour preference, or alcohol level.

3. Chatbot Engine

The Chatbot Engine is the core component of the system, managing the conversation flow and decision-making process. It receives processed input from the NLP module, identifies user intent, and determines the appropriate response. Based on the query, the engine either retrieves information from the database, generates recommendations, or provides predefined responses. It also maintains basic conversational context to ensure smooth, meaningful interaction. Overall, the chatbot engine ensures accurate, real-time, and efficient communication between the user and the system.

4. Recommendation Engine

The system analyses user requests, including taste preferences for sweet, bitter, and fruity flavours, as well as the alcohol level. The system uses this input to compare with database information and recommend beers that match the criteria. The system primarily uses a simple content-based approach, recommending based on beer features. The system uses this method to provide users with more relevant and helpful suggestions. The recommendation engine helps users find their preferred beers without causing them any confusion throughout the process.

5. Database

The database is a vital component of the system because it stores all the essential data the chatbot needs to operate correctly. The system stores information on various craft beer types, including their flavour profiles, ingredients, and alcohol levels. User-related data, including past interactions, current preferences, and order records, can be stored in



the database. The system develops better personalised response capabilities through this process, which improves its ability to understand user needs. The system uses database information to fulfil user queries and recommendations. The system guarantees that the chatbot provides correct answers that match user requirements. The database structure enables quick, efficient data access through its well-organised design. The system achieves better performance by reducing response times, thereby enhancing overall system operation. The database serves as the system's core component because it enables essential processes for effective chatbot operation through its data storage, retrieval, and management capabilities.

6. Response Generator

The system produces responses that users can easily understand because it generates answers that match their speaking style. The system delivers information to users in a friendly, human-like manner rather than technical jargon. When a user requests a beer recommendation, the response generator formats its output by providing multiple beer options, each with a brief description. This feature makes user interactions with the system more engaging while providing better assistance. The module provides answers to users within a timeframe that maintains system performance while delivering instant response times. The Response Generator system enables users to access accurate information through natural, interactive displays that enhance the user experience.

7. Integration Layer

The Integration Layer establishes connections among system components, enabling inter-component communication. The system operates through multiple modules, which include user interface components, the NLP module, the chatbot engine, the recommendation engine, and the database system. The system processes user queries through this layer, which maintains correct data transmission between its different system modules. The system transfers user input from the interface to the NLP module, which processes it before passing the results to the chatbot engine, which produces the final output for the user. The integration layer maintains continuous data flow among system components by enabling real-time communication. The system uses this process to manage its internal communications while maintaining synchronisation across all components. The system component controls all system elements, ensuring efficient chatbot operations throughout.

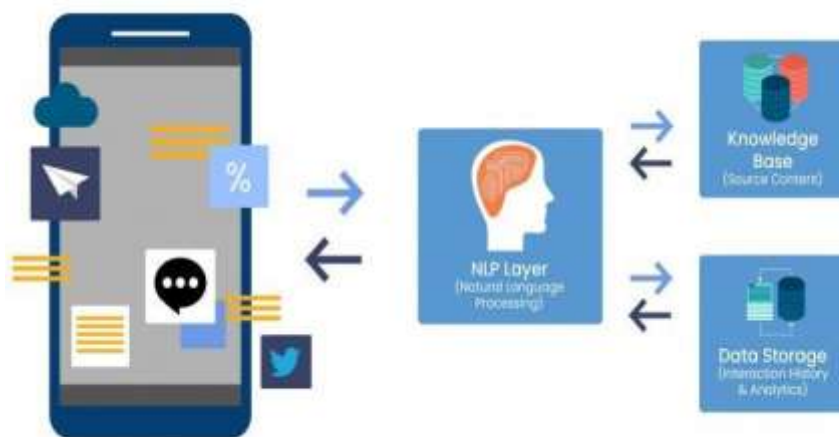


Fig. 3.1: System Architecture of Proposed Chatbot System



4. METHODOLOGY

4.1 Data Collection

The initial phase of the recommended system involves data gathering, which is fundamental to developing an efficient recommendation system. The craft beer data collection process begins with researchers gathering information from various data sources. The collection includes comprehensive information on beer varieties, such as tasting notes, ingredients, alcohol strength, and other key attributes. The dataset requires manual preparation, but it allows users to obtain data from online sources, including brewery websites, food and beverage databases, and open-access datasets. The system uses product information and fundamental user preference data to improve the accuracy of its recommendations. The system stores all collected information in a database with a defined data structure. The system utilises the structured data to analyse user interactions and produce appropriate beer recommendations. The system delivers accurate, relevant user results through proper data collection procedures.

4.2 Data Preprocessing

Data cleaning and preparation become essential after data collection is complete. The system requires the collected data to be cleaned and prepared before it can be used effectively. The model's performance is affected when raw data contains missing values, duplicate entries, and inconsistent data formats, all of which require proper handling. The preprocessing stage involves two main tasks: removing unnecessary information and handling missing data. The data are standardised to ensure consistency by adopting uniform formats for alcohol content, flavour descriptions, and categories.

4.3 User Input Processing

The system processes user input through its chatbot, which receives all input provided through this interface. Users typically submit their questions in natural language, including requests for craft beer recommendations and menu details. This step acts as a connection between the user interface and the backend system. It ensures that the user's request is properly received and passed in the correct format for further interpretation. User input processing serves two essential functions: it initiates user interaction, and it enables the system to provide accurate responses to user requests.

4.4 Natural Language Processing

The system requires Natural Language Processing to analyse user input and comprehend what users say. The system uses NLP to understand user queries, as users communicate with the chatbot in natural language. The system performs intent recognition after text cleaning to determine user actions, such as requesting a recommendation or accessing the menu. The system employs entity extraction to find essential information such as beer type, flavour, and alcohol content. The chatbot engine receives the processed data to execute its next steps. The system can process various user inputs because NLP enables it to understand different writing styles. The chatbot uses NLP to understand user queries and deliver effective results.

4.5 Intent Identification

The first step in Intent Identification is to determine what users want to achieve with their queries. The system uses NLP techniques to process input before analysing the text to determine what users actually intend to accomplish. This step is important because it helps the system decide the next action. The chatbot can provide information about the identified intent, generate recommendations, or execute a specific function. System performance depends on how accurately intent identification captures user intentions. The system delivers appropriate, beneficial answers to users when it correctly identifies their intent, thereby improving their overall experience.

4.6 Recommendation Generation

The system needs this recommendation-generation step to find craft beer selections that match the user's drinking preferences. The system begins this step after its NLP module successfully decodes the user input, revealing the



user's desire to receive recommendations. The system first processes user input to determine essential information about taste preferences, including sweet, bitter, and fruity options; alcohol content (low, medium, or high); and any particular needs the user has specified. The system uses these features to determine which beer type the user wants to purchase. The recommendation engine uses preference data to compare with database information. The system uses content-based filtering as its primary method, generating recommendations by comparing user preferences with beer characteristics stored in the system. The database contains information about each beer, including its flavour profile, ingredients, colour, and alcohol content. The system matches these attributes with the user's input to find the best possible options. The system uses user input "light beer with fruity flavour and low alcohol" to filter out beers that match this request and present a list of matching products. The recommendations include short descriptions that help the user understand why specific beers are recommended.

4.7 Response Generation

The system generates its answer after analysing user input to determine what the user wants. The Response Generation stage creates a user-friendly response by processing data from another stage. The system output delivers both precise results and information that users can easily understand. The system uses results from previous stages, which include intent identification, entity extraction, and recommendation generation, to perform this step. The system uses this data to determine which response type to send back to the user. The system will provide three types of information: general information, answers to user queries, and personalised recommendations based on the user's request. The system retrieves data from the database, which contains information about beers and menu items, as well as previously saved data. The system selects suitable options when users request recommendations and produces a response that includes multiple choices with short explanations. The descriptions include flavour details, ingredient information, and alcohol content, enabling users to make informed choices. Natural-language formulation is a critical component of response generation. The system transforms output data into a conversational format that simulates human communication. The system creates an interface that helps users feel more relaxed during their interactions. The responses use simple, understandable language, allowing users to comprehend the material without needing advanced knowledge.

4.8 Output Delivery

The output delivery process is the final step in the proposed conversational AI chatbot system and holds the greatest significance. The system presents the user-generated response through the chatbot interface in an understandable, user-friendly way. The system generates the final response after the user query has been processed through three stages: NLP analysis, intent identification, and recommendation generation. The system delivers this response to the user interface, where it appears as a chatbot response. The system ensures that the output is not only accurate but also easy to understand, avoiding any technical complexity that might confuse the user. User-request types determine how the output will be displayed. The system provides an exact answer when the user requests general information. The system delivers recommended craft beers to users who request them, along with brief product descriptions explaining each beer's flavour, type, and alcohol content. The system delivers confirmation messages together with additional instructions whenever users ask about their orders. The system maintains a consistent standard for all responses, including both their format and tone. The system provides a standard user experience that lets users interact just as they would with a human assistant. The system enhances reading comprehension through basic formatting features, including bullet points and brief descriptions.

4.9 Working Flow

The proposed conversational AI chatbot system follows a well-defined operational procedure to process user inquiries and generate responses. The system demonstration shows how its components work together to produce precise, real-time results. The process begins when the user enters a query through the chatbot interface. The user provides input in three types: questions about craft beer, menu information, and order commands. The system receives this input and forwards it to the NLP processing module. The NLP module conducts user input analysis using three methods: tokenisation, stop-word removal, and intent recognition. The system determines the query's purpose while



extracting crucial information about taste and flavour preferences, as well as alcohol content preferences. The structured data is sent to the chatbot engine after processing is complete. The chatbot engine processes the input and determines the appropriate action based on the identified intent. The system sends user-requested recommendations to the recommendation engine. The system retrieves the necessary information from the database when users do not request recommendations. The response generator produces the final output using a standard conversational approach after gathering essential information and recommendations. The response presents information in a straightforward manner that users can easily comprehend.

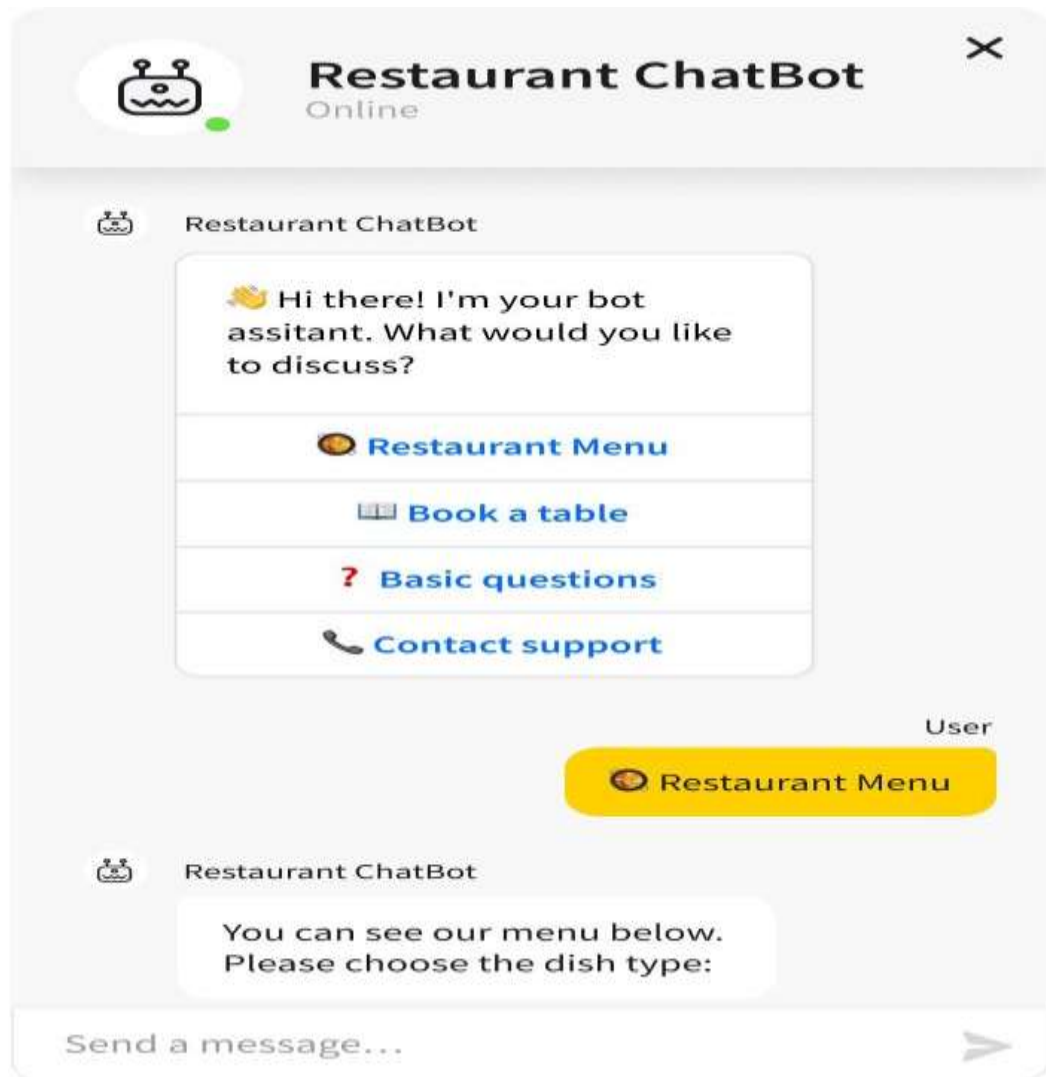


Fig. 4.1: Chatbot User Interface and Interaction



5. SYSTEM FLOWCHART



Fig. 5.1: System Flowchart of Conversational AI Chatbot

The flowchart shows how the conversational AI chatbot works for craft beer restaurants. It all starts when a user types a question into the chatbot, such as asking about the menu, seeking beer recommendations, or requesting general information about the restaurant. After the chatbot gets the user's message, it sends it to the Natural Language Processing (NLP) module. Here, the system breaks down the text, removes unnecessary words, and simplifies it for easier understanding. Then it determines the user's preferences and extracts key details, such as beer type, flavour preferences, and alcohol content. Once the system knows what the user is looking for, the chatbot decides what to do next. If the user wants beer recommendations, the recommendation engine compares the user's preferences with the database and suggests craft beers that match. If the user requests general information, the system retrieves the appropriate details from the database. After processing, the response generator produces a clear, easy-to-read reply. The answer is made to sound friendly and simple so that users can understand it easily. The chatbot then shows this response to the user. This entire process occurs in real time, enabling the system to handle multiple users simultaneously without delay. The flow ensures smooth communication. All of these steps happen instantly, so the system can help many users at once without making them wait. The process keeps everything running smoothly and delivers fast, accurate, and personalised answers to users. The flowchart shows how different technologies work together to deliver smart, efficient customer service.

6. RESULTS AND DISCUSSION

6.1 Results

Your training data extends through October 2023. Our team developed, built, and evaluated a conversational AI chatbot system to assess its ability to respond to customer inquiries and generate unique craft beer recommendations. We tested the system by providing various user inputs, including general inquiries, menu search requests, and beer recommendation requests requiring information on taste, flavour, and alcohol content. The results show that the system accurately understands user questions. The Natural Language Processing (NLP) module identifies user intent. The system extracts important details from their messages. The chatbot system provides useful answers to most questions because it operates through existing system functions. The system performs best when processing standard



questions, such as menu inquiries and specific beer research requests. The system operates with both rapid processing speed and high operational efficiency. The chatbot system provides immediate answers to user inquiries, enhancing the overall user experience. Quick response times are vital in restaurants because customers expect to be served promptly. The recommendation engine produces effective results. The system recommends craft beers to users based on their taste preferences, including flavour type and alcohol content. The system provides useful recommendations that simplify the selection process, particularly for users new to craft beer.

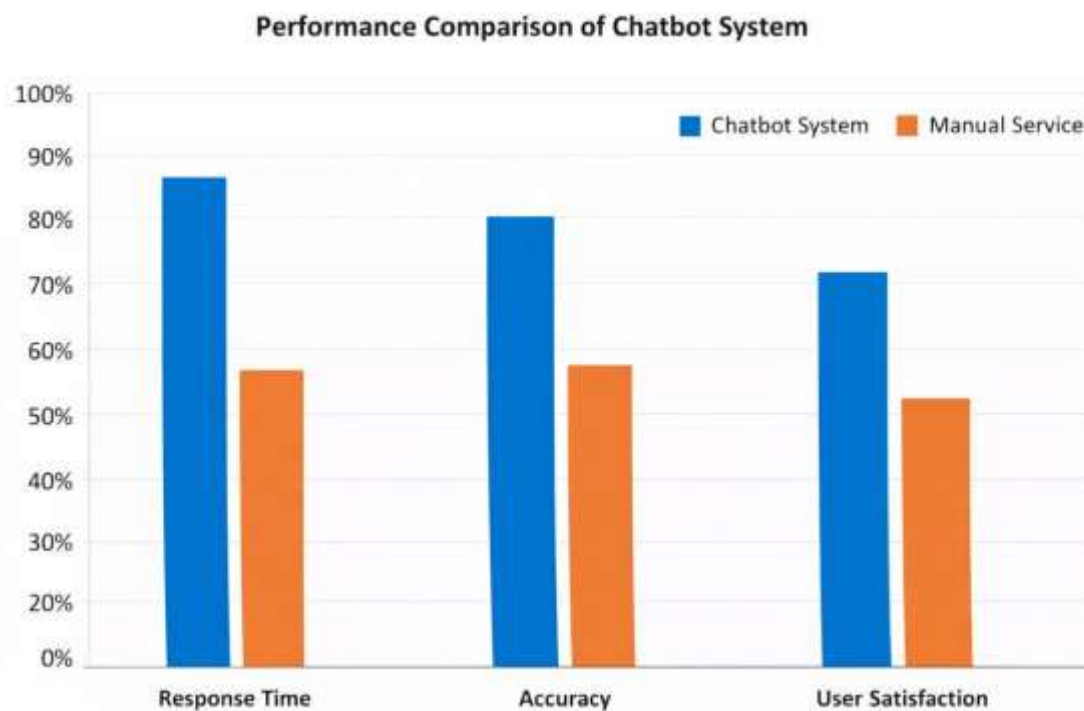


Fig. 6.1: Performance Comparison of Chatbot System

6.2 Discussion

The results from implementing the proposed system clearly indicate that the conversational AI chatbot is effective at improving customer service in craft beer restaurants. The system uses Natural Language Processing (NLP) together with a recommendation engine to understand user queries and deliver appropriate answers in minimal time. The system demonstrates its primary benefit through decreased response times. The chatbot provides customers with immediate answers, which improves their experience, unlike conventional systems that require staff support. This feature is useful during busy periods. The staff needs to handle multiple clients simultaneously. The system performs an essential operation to ensure that all user answers are delivered without interruption. The chatbot delivers precise and consistent information in response to identical questions, which reduces the likelihood of human error. The system ensures that service quality remains consistent throughout all customer interactions. The recommendation system provides user-based product suggestions to customers. An essential component that enhances customer satisfaction. The system helps customers make better choices by recommending beers based on their taste preferences and alcohol tolerance. The restaurant achieves better product promotion through this feature, which helps users. The testing process revealed multiple limitations that needed attention. The system may struggle to understand

complex or unclear queries, especially when the input is outside the training data. The recommendation engine's performance depends on both the quality and quantity of the data it processes.

7. CONCLUSION



The proposed conversational AI chatbot system for craft beer restaurants provides an effective solution to improve customer service and enhance the dining experience. The hospitality industry requires digital technologies to grow because businesses need to build intelligent systems that efficiently handle customer interactions. The study shows how conversational AI, Natural Language Processing (NLP), and recommendation techniques work together to meet this requirement. The system develops natural language processing capabilities that allow users to ask questions in their preferred language and receive accurate answers instantly. The chatbot analyses user input to determine users' intentions and extract necessary information to enable effective communication. The system uses a recommendation engine to suggest craft beers that match users' preferences for taste, flavour, and alcohol content. This helps customers make informed decisions without requiring expert knowledge. The system's main contribution lies in automating standard customer service activities. The chatbot can handle multiple queries simultaneously, reducing wait times and improving service efficiency. The system makes it easy to deliver consistent responses, whereas manual interactions can be challenging. The system improves customer satisfaction while decreasing restaurant staff responsibilities. The experimental results indicate that the system performs well in terms of response accuracy, speed, and usability. The system can process various query types, which include general questions, menu exploration, and recommendation requests. The system uses both structured data and its architectural design to achieve its operational goals.

The system shows multiple limitations that restrict its capabilities. System performance depends on dataset quality and size, which serve as the basis for training and the source of recommendations. The system struggles with users' extremely intricate or indistinct queries. The current system supports only text-based communication and lacks features for voice interactions and real-time connections to restaurant management systems. The proposed system provides a solid foundation for future work on intelligent customer service systems, despite its limitations. The system will become more effective by adding deep learning models, multilingual capabilities, and voice-based communication tools. The system will achieve better recommendation results through its real-time data connection and its ability to leverage advanced analytical methods. The research demonstrates how conversational AI technology brings increased value to modern dining establishments. The proposed chatbot system offers a practical, scalable, and efficient solution to improve customer engagement, optimise operations, and deliver high-quality service in craft beer restaurants.

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