

**VIVEKANAND EDUCATION SOCIETY'S
INSTITUTE OF TECHNOLOGY**

Department of Computer Engineering



Project Report on

**SmartServe:
AI Solutions for Restaurant Management and
Customer Engagement**

In partial fulfillment of the Fourth Year (Semester-VII), Bachelor of Engineering
(B.E.) Degree in Computer Engineering at the University of Mumbai

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(2024-25)

**VIVEKANAND EDUCATION SOCIETY'S
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CERTIFICATE of Approval

This is to certify that Vishakha Mangtani, Ruchir Jain, Ketan Paryani of Fourth Year Computer Engineering studying under the University of Mumbai has satisfactorily presented the project on "SmartServe: AI Solutions for Restaurant Management and Customer Engagement" as a part of the coursework of PROJECT-I for Semester-VII under the guidance of Mrs. Yugchhaya Galphat, in the year 2024-2025.

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Computer Engineering Department

COURSE OUTCOMES FOR B.E PROJECT

Learners will be to:-

Course Outcome	Description of the Course Outcome
CO 1	Do literature survey/industrial visit and identify the problem of the selected project topic.
CO2	Apply basic engineering fundamental in the domain of practical applications for problem identification, formulation and solution
CO 3	Attempt & Design a problem solution in a right approach to complex problems
CO 4	Cultivate the habit of working in a team
CO 5	Correlate the theoretical and experimental/simulations results and draw the proper inferences
CO 6	Demonstrate the knowledge, skills and attitudes of a professional engineer & Prepare report as per the standard guidelines.

ABSTRACT

SmartServe is an integrated platform designed to revolutionize restaurant management and customer interaction by streamlining bulk ordering, feedback collection, and customer service through AI-powered chatbots. The platform allows users to place large orders across multiple restaurants, receive tailored quotations, and compare options, simplifying the process for events or gatherings. Through the use of unique QR codes, customers can provide real-time feedback, which is analyzed using Natural Language Processing (NLP) techniques to generate actionable insights for restaurants. Additionally, SmartServe includes an intelligent chatbot that automates customer inquiries and provides personalized recommendations, enhancing user experience and operational efficiency.

SmartServe aims to address existing gaps in the food service industry, such as the lack of efficient bulk order management, limited feedback mechanisms, and the absence of AI-powered customer interaction tools. By utilizing modern technologies like React for the frontend, Spring Boot for backend development, and machine learning for recommendation systems, the platform not only improves order management but also fosters stronger relationships between restaurants and customers through timely feedback and personalized interactions. With features like sentiment analysis and data-driven reports, SmartServe empowers restaurants to make data-backed decisions, leading to improved service quality and customer satisfaction.

SmartServe goes beyond traditional food ordering platforms by addressing significant gaps in the current restaurant management systems. Existing platforms often lack bulk order handling capabilities and provide limited customer feedback options, usually restricted to star ratings or basic reviews. SmartServe fills this gap by introducing an intelligent bulk ordering module, where customers can receive multiple quotations from different restaurants and easily compare their options before finalizing their orders. This feature is particularly useful for large events, enabling a seamless experience for users looking to coordinate complex orders across multiple vendors.

Moreover, the platform's use of QR code-based feedback collection allows for real-time customer insights. Once a meal is completed, customers can scan the QR code to submit their feedback, which is processed instantly. SmartServe's backend uses sentiment analysis to categorize feedback as positive or negative, helping restaurant managers address concerns quickly and efficiently. This real-time feedback loop, combined with data-driven reporting, ensures continuous service improvement, while the AI-powered chatbot personalizes customer interactions, offering a highly efficient and user-friendly solution for both restaurants and their patrons.

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1. Introduction

1.1. Introduction

In the rapidly evolving landscape of the food industry, customer expectations have become increasingly demanding. The global food market, which was valued at \$56 billion in 2021, is expected to grow at a compound annual growth rate (CAGR) of 9% until 2025. This projected growth presents both opportunities and challenges for restaurants and food businesses. As customer preferences fluctuate, businesses face fierce competition and must constantly innovate to stay relevant. To succeed, restaurants need to streamline their operations while offering exceptional customer service and engagement.

While platforms like Zomato and Swiggy have revolutionized food delivery services, they often fall short when it comes to efficiently handling large or bulk orders. Customers placing large orders still encounter difficulties, such as managing multiple restaurant communications and selecting the best options. On the other side, restaurants often rely on outdated feedback systems that offer limited insights—traditional methods like paper-based surveys or simple star ratings fail to provide meaningful, actionable feedback to drive business improvements.

Existing platforms catering specifically to bulk orders, such as Caterninja, operate independently from mainstream food delivery apps, which limits customer choice and convenience. This disconnect forces users to rely on multiple platforms, making the entire process more cumbersome.

SmartServe:AI Solutions for Restaurant Management and Customer Engagement aims to bridge these gaps by offering a unified system that streamlines bulk order management, enhances customer engagement, and introduces automated feedback systems. By integrating these functionalities into a single platform, SmartServe not only simplifies restaurant operations but also elevates the overall customer experience. Through automation and seamless interaction, the solution empowers restaurants to efficiently manage bulk orders and provides businesses with deeper insights from customers, ensuring sustained growth and satisfaction.

1.2. Motivation

Restaurants are under pressure to not only provide excellent food but also to enhance customer experience and operational efficiency. Traditional systems are fragmented and outdated, resulting in inefficient management. Here are some key motivations driving this project:

1. **Lack of Bulk Ordering Solutions:** Platforms like Zomato and Swiggy primarily cater to individual orders. Handling bulk orders for events or catering is challenging as customers need to contact multiple restaurants manually.
2. **Inadequate Feedback Systems:** Feedback mechanisms today are limited to star ratings and short reviews. There is little depth in these reviews, making it difficult for restaurants to identify areas for improvement. Paper-based surveys are outdated, leading to low participation rates.
3. **Need for Digital Transformation:** With increasing digitalization, customers expect convenient feedback mechanisms and efficient service. Restaurants need AI-powered solutions to meet these demands and improve customer engagement.
4. **Opportunity for Enhanced Customer Interaction:** Personalized services through AI (e.g., chatbots) can improve customer satisfaction by providing tailored recommendations. This also helps in building long-term loyalty through better engagement.

SmartServe is motivated by the need to address these gaps and create a unified, digital-first solution for both customers and restaurants. It leverages cutting-edge tools such as QR codes, Natural Language Processing (NLP), and AI-based chatbots to streamline operations, enhance customer engagement, and automate feedback collection. QR codes simplify the customer experience by enabling quick access to menus, order tracking, and feedback forms without the need for manual input. NLP-powered chatbots improve communication by offering real-time responses, personalized recommendations, and seamless handling of inquiries, allowing customers to interact naturally with the system. AI-based chatbots also automate repetitive tasks, such as order confirmation and follow-ups, freeing up restaurant staff to focus on core operations.

1.3. Problem Definition

Despite the growth and widespread adoption of food delivery services, several critical gaps remain in how these systems operate, especially for large-scale orders and effective customer engagement. This project identifies the following key challenges:

- 1. Fragmentation of Services:** Existing food ordering platforms such as Zomato and Swiggy are designed for individual orders or small group deliveries, leaving event organizers and customers struggling to place bulk orders efficiently. These systems are not equipped to handle the logistical complexities of large orders for events, corporate meetings, or social gatherings. As a result, customers must manually contact multiple restaurants, compare offers, and coordinate deliveries—making the process time-consuming, complicated, and prone to errors. This fragmentation increases operational challenges for both customers and restaurants.
- 2. Outdated Feedback Mechanisms:** Many restaurants continue to rely on traditional feedback methods, such as paper cards or manual surveys, which often result in low participation rates and delayed responses. Customers are less likely to fill out physical forms, and restaurant owners are unable to collect real-time insights for operational improvements. Furthermore, the limited scope of online feedback systems—such as basic star ratings and text reviews—fails to offer meaningful, data-driven insights. This prevents restaurants from addressing specific customer concerns and improving service quality in a targeted manner.
- 3. Lack of Automated Solutions:** Current food delivery systems often lack AI-powered tools that can streamline operations through automation. Without AI-driven solutions such as chatbots or personalized recommendation engines, restaurants miss opportunities to enhance customer interaction and simplify the order process. In bulk order scenarios, personalized recommendations, automated responses, and intelligent scheduling could significantly reduce the workload for restaurant staff while improving customer satisfaction. However, the absence of such tools limits the efficiency of these platforms.
- 4. Customer Engagement Issues:** Inefficient services lead to reduced customer satisfaction, making it difficult for restaurants to build loyalty and maintain long-term relationships with their customers. Additionally, customers often lack tools to compare restaurant offerings effectively, such as bulk pricing, delivery capabilities, and customer reviews, which further limits their ability to make informed decisions. This poor engagement not only frustrates customers but also

results in lost business opportunities for restaurants that could have stood out through better service or offerings.

SmartServe aims to address these challenges by providing a centralized portal that integrates key functions such as bulk order management, automated customer interactions, and advanced feedback collection. By leveraging AI-powered chatbots, NLP-based communication tools, and real-time feedback mechanisms, SmartServe will offer an all-in-one solution for both restaurants and customers. The goal is to create a seamless and efficient experience that improves operational efficiency, enhances customer engagement, and ensures long-term satisfaction.

1.4. Relevance of the Project

This project aligns with the ongoing digital transformation of the food industry by addressing key gaps in current systems through a platform that streamlines operations and enhances customer engagement. As customer demands grow more complex, restaurants need integrated solutions to remain efficient and competitive. SmartServe offers technology-driven tools that enhance operational performance, improve customer satisfaction, and promote business growth.

1. Operational Efficiency: Managing bulk orders for events and corporate gatherings is often time-consuming and labor-intensive. SmartServe provides a centralized platform that simplifies the ordering process, allowing customers to efficiently place, track, and coordinate large orders. Restaurants also benefit from real-time order management, which ensures timely delivery and minimizes errors. Additionally, SmartServe offers immediate feedback mechanisms, enabling restaurants to make on-the-spot service adjustments and retain customers by addressing issues promptly.

2. Improved Customer Satisfaction: SmartServe's QR code-based feedback system enables quick and hassle-free reviews, ensuring higher participation rates and more actionable insights for restaurants. This allows businesses to respond quickly to customer concerns and continuously improve their service. The platform also incorporates AI-powered chatbots, which engage customers through personalized interactions, providing tailored recommendations and timely updates. This personalized experience fosters loyalty, enhances satisfaction, and encourages repeat business.

3. Competitive Advantage: Restaurants using SmartServe gain a significant edge over competitors by offering seamless bulk order services and building strong customer relationships through loyalty programs, personalized recommendations, and automated engagement tools. The platform's ability to generate real-time insights allows restaurants to remain adaptive to evolving market trends and customer needs. With data-driven decisions, businesses can optimize menus, improve services, and maintain sustainable growth, ensuring they stay relevant and ahead in a highly competitive market.

1.5. Methodology Used

SmartServe employs multiple technological and operational methodologies to effectively address the challenges identified in the food delivery and bulk ordering landscape. Below is a detailed breakdown of the methodologies utilized to ensure a seamless and efficient experience for both customers and restaurants.

1. Customer Feedback System

Objective: The primary goal is to provide a streamlined mechanism for collecting real-time feedback from customers, enabling restaurants to make immediate improvements based on customer experiences.

Methodology:

1. QR Code Integration: Each order generates a unique QR code, which customers can scan to submit feedback instantly. This system not only simplifies the feedback process but also encourages higher participation rates, as customers can easily provide their input without needing to fill out cumbersome forms.

2. NLP-Based Sentiment Analysis: The collected customer feedback is analyzed using Natural Language Processing (NLP) techniques to gauge overall satisfaction levels and identify specific areas for improvement. By categorizing feedback into positive, negative, and neutral sentiments, restaurants can prioritize their response efforts effectively.

Outcome: Restaurants receive actionable insights that allow them to enhance food quality and service in real time, fostering a culture of continuous improvement and responsiveness to customer needs.

2. Bulk Ordering System

Objective: The aim is to streamline event management by efficiently handling large-scale orders, making it easier for customers to place and manage their bulk orders.

Methodology:

1. Order Aggregation: The system aggregates orders based on customer location and restaurant availability. This ensures that customers are presented with options that are both convenient and feasible for the restaurants involved.

2. Quotation and Notification System: Customers receive competitive quotes from multiple restaurants, allowing them to make informed decisions based on price and service quality. Simultaneously, restaurants are promptly notified of new orders and requests for quotes, facilitating quicker responses.

3. Decision Support: The platform provides customers with the ability to compare quotes side-by-side, helping them select the best restaurant based on various criteria such as price, reviews, and delivery time.

Outcome: This streamlined process improves efficiency in managing large orders, resulting in higher customer satisfaction and smoother logistics for restaurants.

3. AI-Powered Chatbot

Objective: The objective here is to automate customer interactions, enhancing the overall experience while providing personalized recommendations tailored to individual customer preferences.

Methodology:

1. Reinforcement Learning and NLP: The chatbot utilizes reinforcement learning algorithms along with NLP to learn from user interactions over time. This allows it to adapt and improve its responses, offering a tailored service based on the customer's past behavior and preferences.

2. Automated Queries: The chatbot efficiently handles inquiries regarding restaurant availability, menu items, bulk order options, and personalized recommendations, thus providing immediate assistance to customers without the need for human intervention.

Outcome: The implementation of the AI-powered chatbot results in an enhanced user experience characterized by personalized interactions, increased engagement, and timely responses to

customer queries. This not only helps in building customer loyalty but also reduces the workload on restaurant staff, allowing them to focus on core operations.

In summary, SmartServe's comprehensive methodologies tackle key challenges encountered by both customers and restaurants in the food delivery industry. For restaurants, these strategies streamline operations by optimizing order management, kitchen workflows, and delivery logistics, reducing errors and ensuring timely service. Advanced data analytics and AI-powered tools allow restaurants to better forecast demand, manage inventory, and personalize customer offerings, leading to improved resource allocation and reduced food waste. For customers, SmartServe enhances the ordering experience by offering a user-friendly interface, real-time updates on order status, and personalized recommendations based on their preferences and past orders. The platform also integrates various payment options, loyalty programs, and customer support, which contribute to higher satisfaction levels.

2. Literature Survey

2.1. Research Papers Referred (Abstracts and Inferences)

Paper 1: Usage of QR Codes in Web-Based System for Electronic Market Research (2021)

Authors: Z. Čović, Ū. Viktor, J. Simon, D. Dobrilović, and Ž. Stojanov

Abstract: This paper explores the growing trend of utilizing QR codes as a substitute for traditional paper surveys in electronic market research. The authors present evidence that QR codes significantly enhance response rates by providing a convenient mechanism for respondents to participate in surveys. By enabling real-time data collection, QR codes not only streamline the feedback process but also enhance the overall quality of market research. The findings suggest that integrating QR codes into research methodologies can lead to more efficient and effective data collection strategies.

Inference: The study validates the effectiveness of QR codes as a tool for gathering feedback, confirming their pivotal role in the feedback collection module of SmartServe. By adopting QR code technology, SmartServe can facilitate easier customer interactions, thereby enhancing engagement and encouraging higher participation rates. The convenience offered by QR codes resonates with contemporary consumer preferences, aligning well with SmartServe's objectives of improving service delivery and customer satisfaction through timely and actionable insights.

Summary: The paper by Čović et al. (2021) underscores the advantages of QR codes in modern market research, particularly in replacing paper surveys. The authors argue that QR codes not only enhance the convenience of participating in surveys but also lead to increased response rates and real-time data collection. This integration of technology into market research methodologies allows for a more efficient and engaging process, providing researchers with immediate insights that are crucial for informed decision-making. The findings from this paper strongly support the implementation of QR codes in SmartServe's feedback collection strategy, emphasizing their potential to transform customer engagement and improve overall service quality in the food industry.

Paper 2: A Cloud-Based Smart Expiry System Using QR Code (2023)

Author: T. Khan

Abstract: This paper presents a novel implementation of QR codes designed for tracking product expiration dates to significantly minimize food wastage. The proposed cloud-based smart expiry system enables businesses to receive timely alerts regarding products nearing expiration, allowing for proactive inventory management. By leveraging QR codes, the system enhances visibility into product lifecycles, ensuring that businesses can take necessary actions to prevent waste and optimize their stock levels. The study emphasizes the potential for QR codes to revolutionize inventory management practices in the food industry.

Inference: The findings of this study highlight the operational advantages of QR codes in enhancing inventory management and reducing food waste. This insight inspires the integration of real-time feedback collection within SmartServe's framework, thereby not only improving service quality but also promoting sustainability by ensuring that products are managed effectively. By utilizing QR codes for feedback and tracking, SmartServe can create a more responsive and efficient service model that aligns with contemporary sustainability goals in the food industry.

Summary: In the paper by T. Khan (2023), the author explores the use of QR codes in a cloud-based smart expiry system aimed at addressing the pressing issue of food wastage. The study demonstrates how QR codes can facilitate accurate tracking of product expiration dates, providing businesses with timely alerts to manage their inventory more effectively. This proactive approach to inventory management not only helps in reducing food waste but also optimizes stock levels, ultimately enhancing operational efficiency. The paper's insights into the effectiveness of QR codes in inventory management inspire the incorporation of similar technology in SmartServe's real-time feedback collection system, aligning with broader goals of improving service quality and sustainability in the food sector.

Paper 3: An Online QR Code Scanner for Real-Time User Feedback and Ratings Collection (2024)

Authors: A. Alkhayyat, R. Kumar, S. Singh, R. Singh, Y. Kumar, and U. Sharma

Abstract: This paper introduces an innovative feedback collection system integrated with a local web server that utilizes QR codes for real-time user feedback and ratings. The system allows customers to submit their feedback easily through QR code scanning, enabling businesses to collect and analyze data immediately. By streamlining the feedback process, the paper emphasizes how businesses can leverage real-time insights to make informed decisions quickly, enhancing customer satisfaction and service quality.

Inference: The findings of this study resonate closely with our objectives to streamline the feedback collection process within SmartServe. By adopting a similar QR code-based feedback system, we can ensure that restaurants receive immediate insights into customer experiences, allowing them to implement continuous improvements effectively. This approach not only enhances operational efficiency but also fosters a culture of responsiveness to customer needs, ultimately leading to higher satisfaction rates and loyalty among diners.

Summary: In the paper by Alkhayyat et al. (2024), the authors explore the development of an online QR code scanner integrated with a local web server aimed at facilitating real-time user feedback and ratings collection. The proposed system allows customers to provide their feedback effortlessly by scanning QR codes, which results in a streamlined and efficient process for both customers and businesses. The immediate analysis of feedback data empowers businesses to make timely decisions based on customer input, thus enhancing service quality and customer satisfaction. The insights from this research align with SmartServe's goals, providing a strong foundation for integrating QR codes in our feedback collection module to drive continuous improvement in restaurant services.

Paper 4: Genie: AI-Powered Chatbot for the Restaurant Industry (2024)

Authors: Megha Gupta, Venkatasai Dheekonda, Mohammad Masum

Abstract: This paper presents "Genie," an AI-powered chatbot system designed specifically for the restaurant industry. The chatbot enhances operational efficiency by automating customer interactions, allowing restaurants to manage inquiries more effectively. By providing personalized recommendations based on user preferences and past behavior, Genie improves user engagement and boosts customer satisfaction. The study highlights the transformative potential of AI in streamlining restaurant operations and fostering meaningful interactions with customers.

Inference: The findings of this study validate our strategy of incorporating an AI-powered chatbot into the SmartServe platform. By automating customer inquiries and offering personalized food recommendations, SmartServe can significantly enhance user engagement and satisfaction. This integration aligns perfectly with our objectives of providing efficient, responsive service to customers, ultimately leading to improved loyalty and retention in the competitive food industry.

Summary: In the paper by Gupta et al. (2024), the authors discuss the development of "Genie," an AI-powered chatbot tailored for the restaurant sector. The chatbot serves as a virtual assistant that automates various customer interactions, allowing restaurants to handle inquiries seamlessly and efficiently. By leveraging AI algorithms, Genie provides personalized food recommendations based on customer preferences, which not only enhances the overall dining experience but also encourages repeat business. The insights gained from this study affirm the importance of implementing an AI chatbot in SmartServe's framework, enabling us to foster deeper customer relationships while improving operational efficiency in the restaurant industry.

2.2. Books, Journals, and Articles Referred

1. Article. 1: Usage of QR Codes in Web-Based System for Electronic Market Research (2021)

Authors: Z. Čović, Ū. Viktor, J. Simon, D. Dobrilović, and Ž. Stojanov

Journal: IEEE 14th International Symposium on Intelligent Systems and Informatics (SISY)

Summary: This study investigates the effectiveness of QR codes in enhancing customer participation in surveys, advocating for their use as a replacement for traditional paper-based feedback methods. By implementing QR codes, the authors found a significant improvement in response rates, as they provide a convenient and user-friendly way for participants to submit their feedback. The ability to collect data in real-time was highlighted as a crucial advantage, allowing researchers to obtain immediate insights that inform operational decisions and improve the quality of market research. The study demonstrates that QR codes not only streamline the feedback process but also foster a more engaging experience for respondents, ultimately leading to better data quality and actionable results.

Inference: The mechanism of utilizing QR codes for feedback collection is instrumental in ensuring higher participation rates and immediate insights. This aligns perfectly with the objectives of SmartServe's customer feedback system, forming a key component that enhances the overall user experience and enables restaurants to respond effectively to customer needs.

2. Article. 2: A Cloud-Based Smart Expiry System Using QR Code (2023)

Author: T. Khan

Journal: IEEE International Conference on Electro/Information Technology

Summary: This study introduces an innovative system that leverages QR codes for tracking product expiration dates, aimed at minimizing food wastage in the food industry. By integrating QR codes into a cloud-based platform, the system enables businesses to receive timely alerts as products approach their expiry, facilitating better inventory management. The research emphasizes the operational efficiency gained through real-time monitoring, allowing businesses to make informed decisions and take proactive measures to reduce waste. The findings highlight the potential of QR codes not only as a tracking mechanism but also as a vital tool for enhancing overall operational effectiveness.

Inference: Inspired by this research, SmartServe aims to utilize QR codes not only for collecting customer feedback but also to ensure that restaurants receive instant insights for continuous service improvement. This dual application of QR code technology will enhance responsiveness to customer needs and optimize inventory management, ultimately leading to improved operational efficiency and customer satisfaction.

3. Article. 3: An Online QR Code Scanner for Real-Time User Feedback and Ratings Collection with Local Web Server (2024)

Authors: A. Alkhayyat, R. Kumar, S. Singh, R. Singh, Y. Kumar, and U. Sharma

Journal: IEEE Conference on Computing for Sustainable Global Development

Summary: This paper explores the integration of local web servers with QR codes to facilitate real-time user feedback and ratings collection. The authors demonstrate that this combination allows businesses to gather immediate feedback from customers, significantly enhancing the quality and speed of data analysis. By streamlining the feedback process, businesses can derive actionable insights quickly, leading to improved customer satisfaction and informed decision-making. The research emphasizes the effectiveness of utilizing QR codes in conjunction with local servers to create a responsive feedback mechanism that supports operational improvements and fosters customer engagement.

Inference: This research supports the real-time feedback component of SmartServe, ensuring that data collection is both efficient and actionable. By implementing a similar QR code-based system, SmartServe can provide restaurants with timely insights into customer preferences and experiences, ultimately enhancing service quality and promoting a customer-centric approach.

4. Article. 4: NLP-Based Chatbot for Multiple Restaurants (2021)

Authors: R. Garg et al.

Journal: International Conference on System Modeling & Advancement in Research Trends (SMART)

Summary: This paper presents the development of an NLP-powered chatbot designed to interact with customers across various restaurant databases. The authors detail how the chatbot leverages Natural Language Processing (NLP) to understand customer inquiries and provide personalized recommendations and services. By integrating with multiple restaurant databases, the chatbot can

offer tailored responses based on user preferences and past interactions. The research highlights the potential of NLP technology to enhance customer engagement and streamline communication between restaurants and patrons, ultimately leading to improved user satisfaction and loyalty.

Inference: The chatbot feature in SmartServe draws heavily from this research, focusing on automating interactions and personalizing customer experiences. By utilizing NLP technology, SmartServe aims to provide efficient, relevant responses to customer inquiries, thereby enhancing user engagement and fostering stronger relationships between restaurants and their customers.

5. Article. 5: AI Food Recommendation Systems (2022)

Authors: S.-H. Wu, J. Hsiao, Y.-S. Wu, and J.-T. Jeng

Journal: IEEE International Conference on Big Data

Summary: This paper examines the development of AI-powered food recommendation systems that utilize deep learning techniques to accurately predict customer preferences. The authors discuss the integration of advanced predictive models and graph autoencoders, which enable the system to analyze complex relationships between various food items and user preferences. By leveraging these technologies, the recommendation system is able to provide highly personalized suggestions that cater to individual tastes and dietary requirements. The research underscores the potential of AI in enhancing user experiences by delivering tailored recommendations that align with customer expectations, thereby promoting customer satisfaction and loyalty.

Inference: This research reinforces the use of AI-powered chatbots in SmartServe to provide personalized food recommendations and enhance decision-making for customers. By integrating advanced AI techniques, SmartServe aims to deliver relevant suggestions that improve the overall dining experience and encourage users to explore menu options based on their preferences.

2.3. Interactions with Domain Experts

Engaging in conversations with Mrs. Yugchaya Galphat, the project mentor, provided valuable insights into the current challenges faced by the restaurant industry. Through these discussions, we were able to identify several critical areas of concern that directly influence operational efficiency and customer satisfaction. Below are the key takeaways from our interactions:

- 1. Operational Bottlenecks:** One of the primary challenges highlighted was the difficulty restaurants encounter in managing bulk orders efficiently. Many establishments lack a streamlined process for handling large-scale requests, leading to delays and miscommunication. This operational inefficiency not only frustrates restaurant staff but also negatively impacts the customer experience. The inability to handle bulk orders seamlessly can deter potential customers from choosing a restaurant for event-based catering, highlighting the need for a robust solution.
- 2. Customer Engagement Gaps:** Another significant issue is the low participation rates in traditional feedback mechanisms. Restaurants often rely on outdated methods, such as paper surveys or basic rating systems, which do not effectively capture customer opinions. The lack of engagement can lead to missed opportunities for improvement, as restaurants are left without actionable insights. This gap emphasizes the need for innovative approaches to feedback collection that can encourage more customers to share their experiences and suggestions.
- 3. Opportunities for AI:** The discussions also revealed promising opportunities for integrating AI technologies within restaurant operations. AI-powered chatbots were identified as a potential solution to automate routine customer inquiries, thus improving response times and enhancing customer engagement. By handling common questions and providing personalized recommendations, chatbots can free up staff to focus on more complex tasks, ultimately improving operational efficiency and customer satisfaction. These interactions with domain experts have significantly shaped our methodologies for developing SmartServe's bulk ordering and feedback systems.

2.4. Patent Search

In our efforts to develop SmartServe, we conducted a comprehensive patent search to identify relevant technologies that align with our project's objectives. Below is a summary of patents associated with the technologies we are utilizing:

1. European Patent – QR Code Feedback System

Abstract: This patent describes a system designed for collecting customer feedback through QR codes. The emphasis is placed on facilitating real-time responses and ensuring ease of use for customers during the feedback process. By scanning a QR code, customers can quickly access feedback forms, which enhances their engagement and increases participation rates.

Relevance: This patent validates the use of QR codes for gathering customer feedback in SmartServe, confirming that our approach is supported by existing technological innovations and providing a foundation for implementing an effective feedback collection mechanism.

2. US Patent – AI-Based Restaurant Recommendation System

Abstract: This patent outlines an advanced AI-based system that delivers personalized restaurant and dish recommendations to users by leveraging machine learning algorithms. The system analyzes user preferences and behavior to suggest tailored dining options that align with individual tastes.

Relevance: This patent supports the chatbot-driven recommendation system in our project. By incorporating similar machine learning techniques, SmartServe aims to provide users with customized dining recommendations that enhance their overall experience.

3. European Patent – Automated Quotation System for Bulk Orders

Abstract: This patent describes a system capable of generating automated quotations for bulk orders, allowing businesses to manage order comparisons effectively. The system streamlines the quotation process by providing users with competitive pricing from multiple suppliers, facilitating informed decision-making.

Relevance: This patent aligns closely with our bulk order management feature, which offers customers the ability to receive multiple restaurant quotations. By leveraging automated quotations, SmartServe will enhance efficiency and customer satisfaction in managing large-scale orders.

4. US Patent – NLP-Based Virtual Assistant for the Food Industry

Abstract: This patent details an NLP-powered virtual assistant specifically designed for automating customer interactions within the food industry. The virtual assistant utilizes natural language processing to understand and respond to customer inquiries, thereby enhancing the overall service experience.

Relevance: This patent confirms the feasibility of implementing our AI-powered chatbot in SmartServe. By utilizing NLP technology, we aim to automate routine customer inquiries and provide personalized recommendations, ultimately improving customer engagement and operational efficiency.

2.5. Existing Systems

In developing SmartServe, we have analyzed several existing systems in the food delivery and catering industry. This analysis helped identify gaps and opportunities for improvement, ultimately shaping our platform's unique features and functionalities. Below are two notable systems that have influenced our design and development process:

1. Zomato/Swiggy

Zomato and Swiggy are two of the leading food delivery platforms, widely recognized for their user-friendly interfaces and extensive restaurant networks. These platforms primarily focus on individual order placements, catering primarily to everyday consumers looking for convenience in meal delivery. However, while they excel in this area, they present several limitations, particularly concerning bulk orders.

1. Lack of Bulk Order Support: Neither Zomato nor Swiggy effectively accommodates large-scale orders, which are often necessary for events or gatherings. This gap poses challenges for customers such as event organizers who require efficient coordination and management of multiple meal options from various restaurants.

2. Feedback Mechanisms: The feedback systems implemented by these platforms are largely limited to star ratings and short text reviews. This simplistic approach does not provide restaurants with actionable insights or comprehensive understanding of customer preferences. The reliance on basic feedback methods inhibits the potential for deeper engagement with customers and fails to foster continuous improvement in service quality.

By understanding these limitations, SmartServe aims to offer a more comprehensive solution for bulk orders while enhancing the feedback collection process to drive actionable insights.

2. Caterninja

Caterninja is a platform that specializes in catering services, catering specifically to customers looking for larger meal orders for events and functions. While it provides a service tailored to bulk ordering, it also has significant drawbacks that limit its effectiveness and appeal.

1. Standalone Platform:

Caterninja operates independently and does not connect with other restaurants in the broader food delivery ecosystem. This lack of integration means that customers are restricted to a limited selection of catering options, which can hinder their ability to find the best fit for their needs. Unlike platforms that aggregate offerings from multiple restaurants, Caterninja fails to leverage a diverse network to enhance customer choice.

2. Absence of Integrated Feedback System:

Caterninja lacks a robust feedback system that would allow customers to provide insights about their experiences. Without effective feedback mechanisms, restaurants miss out on valuable information that could help improve their offerings and overall service quality. Moreover, the absence of a comparison feature prevents customers from easily evaluating different catering options, which can lead to suboptimal decision-making.

In contrast to these existing systems, SmartServe is designed to bridge the gaps identified in Zomato, Swiggy, and Caterninja. By integrating bulk order management with an advanced feedback collection system, SmartServe aims to deliver a seamless and user-friendly experience that caters to both individual and large-scale orders. Our platform will enable customers to receive multiple quotes from various restaurants, fostering informed decision-making while enhancing operational efficiency.

2.6. Lacuna in Existing Systems

Despite the advancements made by various food ordering and management platforms, significant gaps persist that hinder their effectiveness and user satisfaction. These limitations highlight the necessity for an integrated solution like SmartServe. Below are the major lacunae identified in current systems:

- 1. Limited Bulk Order Management:** Many existing platforms primarily focus on individual orders, leaving a critical gap in their ability to handle event-based bulk ordering. This lack of functionality is particularly problematic for customers planning gatherings, corporate events, or large parties who require coordinated meal options from multiple restaurants. Without an effective bulk order management system, customers face challenges in efficiently managing their requests, leading to potential delays and confusion.
- 2. Basic Feedback Mechanisms:** The feedback systems utilized by many platforms often rely on simplistic star ratings and short reviews. While these methods provide a quick overview of customer satisfaction, they lack the depth needed for actionable insights. Restaurants miss out on critical feedback that could inform their decision-making and enhance their service quality. Comprehensive feedback collection methods, such as open-ended questions or sentiment analysis, are necessary to capture a full spectrum of customer experiences.
- 3. Fragmented Operations:** In the absence of an integrated platform, customers must manually contact multiple restaurants to arrange bulk orders. This fragmented approach not only complicates the ordering process but also increases the likelihood of errors and miscommunications. Customers are left to juggle various menus, pricing, and timelines without a centralized system to streamline their interactions, leading to inefficiencies and potential dissatisfaction.
- 4. No Automated Interactions:** The lack of AI-powered chatbots in existing systems results in slower customer service and limits the ability to provide personalized interactions. Without automated assistance, customers may experience longer response times when seeking information about menu items, order status, or special requests. AI chatbots can enhance user experience by providing instant responses, personalized recommendations, and efficient handling of common inquiries, thereby improving overall customer engagement.

2.7. Comparison of Existing Systems and Proposed Work

Feature	Zomato/Swiggy	Caterninja	SmartServe (Proposed)
Bulk Ordering	Not supported	Supported	Enhanced with quotation system
Feedback Mechanism	Basic reviews	None	QR code-based, real-time feedback
Integration with Chatbot	No	No	Yes, AI-powered chatbot
Customer Decision Support	Limited	Limited	Comprehensive quote comparison
Personalization	No	No	AI-powered recommendations
Loyalty Programs	Yes	No	Yes
Customer Engagement	Promotions and offers	Limited to service availability	Continuous engagement via feedback

Table No. 1 :Comparison of Existing Systems and Proposed Work

2.8. Focus Area

The primary focus areas of the SmartServe project are essential for enhancing the user experience for both customers and restaurants:

- 1. Bulk Order Management System:** SmartServe will streamline event-based ordering, enabling customers to efficiently manage large-scale orders. This system will provide real-time quotations from multiple restaurants, allowing for easy comparison of prices, menu options, and service quality. By simplifying the bulk ordering process, we aim to enhance customer satisfaction and reduce operational complexities for restaurants.
- 2. Customer Feedback System:** The project will implement a QR code-based feedback mechanism to collect real-time insights from customers. This allows for quick and convenient feedback submission, which restaurants can analyze to improve service and offerings. By fostering continuous feedback, we aim to enhance food quality and customer engagement.
- 3. AI-Powered Chatbot:** An AI-powered chatbot will automate customer interactions using Natural Language Processing (NLP). This will streamline inquiries, assist with order placements, and provide personalized recommendations based on customer preferences. This focus area aims to improve response times and overall user experience, making interactions more efficient.
- 4. Customer Loyalty Program:** To encourage repeat business, SmartServe will introduce a loyalty program that rewards customers with points for their engagement, such as placing orders and providing feedback. These points can be redeemed for discounts or special offers, fostering customer loyalty and building long-term relationships with users.

3. Requirement

3.1. Proposed Model

The proposed model for SmartServe is designed to create an integrated platform that enhances the overall ordering experience by facilitating bulk orders, collecting real-time customer feedback, and automating interactions through AI-powered chatbots. This model emphasizes user engagement, operational efficiency, and continuous improvement based on customer insights.

The User Interface (UI) is designed to be intuitive and user-friendly, ensuring that customers can easily navigate the platform to place orders and submit feedback. The interface will be responsive, accessible on various devices, including desktops, tablets, and smartphones, and visually appealing to enhance user experience. It will allow for easy order placement for both individual and bulk orders, provide clear navigation menus for accessing different functionalities, and include user-friendly feedback submission forms integrated with QR codes.

In terms of the Feedback System, SmartServe leverages QR code technology to facilitate real-time feedback collection from customers. After placing an order, customers will receive a unique QR code that links to a feedback form. This component ensures instant access to feedback forms via QR codes, enhancing participation rates, and employs Natural Language Processing (NLP) techniques to analyze feedback sentiments and extract actionable insights. Additionally, dashboards will be provided for restaurants to visualize feedback trends and identify areas for improvement.

The Bulk Ordering Module is specifically designed to manage large orders efficiently, catering to event organizers and group orders. It automates the quotation process and streamlines communication between customers and restaurants. This module aggregates orders based on location and restaurant availability, features an automated quotation system that allows customers to receive and compare quotes from multiple restaurants, and includes a decision support system that enables customers to make informed choices based on real-time data.

An AI-powered chatbot serves as an intelligent assistant that automates customer interactions, providing instant responses to inquiries and personalized recommendations based on user preferences. With its Natural Language Processing capabilities, the chatbot can effectively understand and respond to customer queries, offer personalized menu recommendations based on

past orders and preferences, and ensure 24/7 availability to handle inquiries, enhancing service efficiency.

Finally, the backend analytics engine processes the collected feedback and user interactions to provide insights that drive continuous improvement in services and customer satisfaction. This analytics component enables real-time data processing to monitor trends and identify potential issues promptly, offers reporting tools for restaurant owners to assess performance and customer satisfaction metrics, and utilizes predictive analytics to forecast customer preferences and optimize menu offerings.

In conclusion, the integration of these key components in the proposed model for SmartServe will create a cohesive platform that not only enhances the efficiency of food ordering but also fosters stronger relationships between restaurants and customers. By focusing on user experience, real-time feedback, and automation, SmartServe aims to revolutionize the bulk ordering process and set a new standard in the food service industry.

3.2. Functional Requirements

Functional requirements detail the specific behaviors and capabilities that the SmartServe system must exhibit to meet user needs and provide a seamless experience. For the SmartServe platform, the functional requirements are outlined as follows:

- 1. User Registration/Login:** Users must be able to create personal accounts and log in securely to the SmartServe platform. The registration process should include verifying the user's email address and ensuring that sensitive information, such as passwords, is encrypted and securely stored. Users should also have the option to recover their passwords if they forget them.
- 2. Bulk Ordering:** The platform must enable users to place bulk orders by allowing them to select multiple items from various restaurants seamlessly. Users should be able to specify quantities for each item and view an aggregated order summary. The system must automatically generate and send personalized quotes to users based on their selected items, taking into account factors such as restaurant pricing, delivery fees, and any applicable discounts. Additionally, users should be able to modify their orders before finalizing the purchase.
- 3. Feedback Collection:** Each order processed through SmartServe must generate a unique QR code linked to a feedback submission form. This QR code should be included in order confirmation notifications sent to users. Users should be able to scan the QR code or click the

link to easily access the feedback form, enabling them to provide feedback on their dining experience, the quality of the food, and the service received. The system should also allow users to leave suggestions for improvements.

4. AI Chatbot Integration: The SmartServe platform must feature an AI-powered chatbot capable of responding to a wide range of customer queries regarding menu items, order statuses, and available restaurant options. The chatbot should utilize Natural Language Processing (NLP) to understand and interpret user inquiries accurately. Furthermore, it must provide personalized recommendations based on users' past orders and preferences, enhancing the customer experience by suggesting relevant menu items that align with their tastes.

5. Reporting and Analytics: The system should include a robust reporting and analytics module that generates insightful reports on customer feedback, ordering trends, and other key performance indicators. Restaurant owners should have access to dashboards displaying metrics related to customer satisfaction, popular menu items, and overall performance. This analytics feature will empower restaurant owners to make data-driven decisions, allowing them to adapt their offerings and improve service quality based on real-time feedback.

3.3. Non-Functional Requirements

Non-functional requirements define the quality attributes and constraints of the SmartServe system, ensuring it operates effectively and meets user expectations. These requirements cover various aspects such as performance, usability, reliability, and security, which are crucial for delivering a positive user experience and maintaining trust. For SmartServe, the non-functional requirements are as follows:

1. Performance: The SmartServe system must be capable of handling up to 1,000 simultaneous users without any noticeable performance degradation. This requirement is essential to ensure that the platform remains responsive, particularly during peak usage times, such as lunch and dinner hours. Additionally, the feedback processing system should operate in real-time, allowing users to see their feedback reflected immediately and enabling restaurant owners to access insights as they are collected.

2. Usability: The user interface (UI) of SmartServe must be designed with usability in mind, ensuring that it is intuitive and easy to navigate for users of all age groups and technical backgrounds. This includes providing clear instructions, accessible menus, and responsive design

elements that work seamlessly on various devices, including smartphones, tablets, and desktops. Feedback forms should be straightforward and quick to complete, with minimal required fields to encourage user participation and reduce the time needed for submission.

3. Reliability: SmartServe must maintain an uptime of 99.9% to ensure continuous availability, particularly during peak ordering times. This high level of reliability is crucial for maintaining user trust and ensuring that customers can place orders without interruptions. To enhance reliability, the system should have backup mechanisms in place, including regular data backups and failover strategies, to ensure data recovery in case of unexpected failures or outages.

4. Security: Security is a paramount concern for SmartServe, especially regarding the protection of user data. All sensitive user information, such as login credentials and personal details, must be encrypted and securely stored to prevent unauthorized access and data breaches. The system should also comply with relevant data protection regulations, such as the General Data Protection Regulation (GDPR), ensuring that user data is handled responsibly and transparently. Additionally, the platform should implement robust authentication measures, including multi-factor authentication (MFA), to further safeguard user accounts.

3.4. Hardware & Software Requirements

Hardware Requirements:

1. Server:

- The server must be equipped with a minimum of 16GB RAM to ensure smooth operation and efficient data processing.
- An 8-core CPU is essential for handling multiple requests and managing concurrent user sessions effectively.
- A minimum of 512GB SSD is required for hosting the backend, allowing for rapid data retrieval and storage capabilities.

2. Client Devices:

- The system should be accessible on standard user devices, including smartphones, tablets, and laptops.
- All devices must have reliable internet access to facilitate seamless communication between clients and the server.

Software Requirements:

1. Operating System:

The server environment can run on various operating systems, including Windows, macOS, or Linux, depending on the specific requirements of the deployment.

2. Frontend Technologies:

- The user interface will be developed using HTML, CSS, and JavaScript to ensure compatibility and responsiveness across different devices.
- React will be utilized for building dynamic and interactive components, enhancing the overall user experience.

3. Backend Technologies:

- The server-side development will be conducted using Spring Boot, which offers a robust framework for creating RESTful APIs and handling business logic.
- The database management will utilize Microsoft SQL Server (MSSQL) for data storage, providing reliable and efficient data handling capabilities.

4. Development Tools:

- Integrated Development Environments (IDEs) like IntelliJ IDEA will be used for backend development, offering powerful features for code management and debugging.
- Visual Studio Code will serve as the primary tool for frontend development, providing a lightweight and versatile environment for building user interfaces.

3.5. Technology and Tools Utilized

The development of SmartServe will leverage a range of modern technologies and tools to create a robust, user-friendly platform. The following components will be integrated into the project:

1. Frontend Development:

- **React:** This JavaScript library will be utilized to build dynamic and interactive user interfaces, allowing for a seamless user experience across various devices. React's component-based architecture enables efficient rendering and easy maintenance of UI components.
- **AgCharts:** To enhance data visualization, AgCharts will be implemented for displaying analytics and reports. This tool provides rich charting capabilities, making it easier for restaurant owners to interpret feedback and order trends effectively.

2. Backend Development:

- **Spring Boot:** This framework will be employed to develop RESTful APIs that facilitate smooth communication between the client and server. Spring Boot's ability to simplify the configuration and deployment of applications will accelerate the backend development process.
- **MSSQL Database:** Microsoft SQL Server will serve as the database management system for storing critical information, including user data, order details, and feedback. Its reliability and scalability make it an ideal choice for managing large datasets efficiently.

3. Artificial Intelligence:

- **Natural Language Processing (NLP):** NLP technologies will be integrated into the AI chatbot, enabling it to comprehend and respond accurately to customer queries. This capability enhances user engagement by providing instant support and information.
- **Machine Learning:** Machine learning algorithms will be utilized to analyze user data and generate personalized recommendations. By understanding customer preferences and behaviors, the system can offer tailored dining suggestions that improve the overall user experience.

4. QR Code Generation:

- **QR Code Libraries:** Various libraries will be incorporated for generating QR codes that link feedback forms to individual orders. This feature streamlines the feedback collection process, encouraging customers to provide insights effortlessly while enhancing the overall efficiency of the system.

Through the strategic use of these technologies and tools, SmartServe aims to create an innovative platform that addresses existing challenges in the food ordering industry while providing enhanced customer experiences and operational efficiency.

3.6. Constraints of Working

During the development of SmartServe, several constraints may impact the project's execution and overall success. These constraints include:

- 1. Time Constraints:** Limited timeframes for project completion can significantly influence the scope of features implemented within SmartServe. Tight deadlines may necessitate prioritizing certain functionalities over others, potentially leading to a less comprehensive solution at launch.
- 2. Budget Limitations:** Financial constraints can restrict the resources available for both hardware and software purchases. This limitation might affect the quality of infrastructure and tools used in development, which could impact performance, scalability, and overall user experience.
- 3. Technological Limitations:** The dependence on third-party libraries or APIs may introduce challenges related to integration and compatibility. Issues such as outdated documentation, lack of support, or changes in third-party services can hinder development efforts and require additional time for troubleshooting.
- 4. User Adoption:** There may be potential resistance from users, including both restaurants and customers, to adopting a new platform like SmartServe. This reluctance could impact initial usage rates and the effectiveness of feedback collection, ultimately influencing the platform's success and long-term viability.

By identifying and understanding these constraints early in the development process, the SmartServe team can strategize effectively to mitigate their impact and enhance the project's overall success.

4. Proposed Design

4.1. Block Diagram of the proposed system

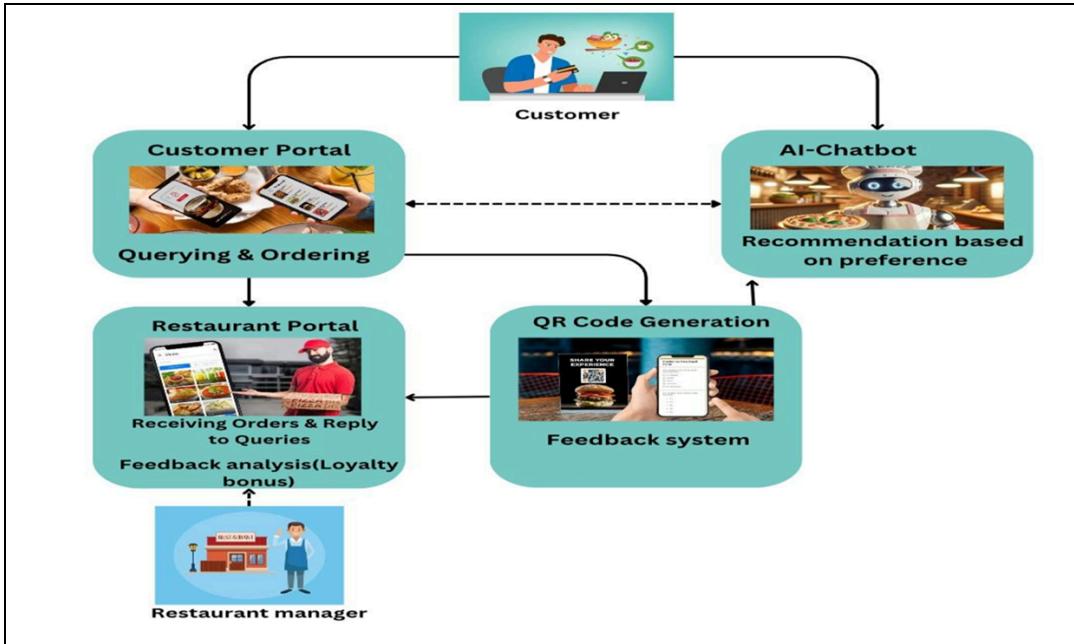


fig.1: block diagram

This modular diagram illustrates the architecture of your project, which focuses on streamlining food ordering and feedback collection in the restaurant industry. Here's a breakdown of each component:

1. Customer Portal (Querying & Ordering):

The customer portal serves as the primary interface for users to engage with the system, enabling them to browse various restaurants, view detailed menus, and make informed choices. It supports the seamless placement of both regular and bulk orders, making it particularly useful for large-scale events or corporate functions. The portal also allows customers to track their order status in real-time, enhancing transparency and keeping users informed throughout the process, thus boosting overall user satisfaction.

2. AI-Chatbot (Recommendation Based on Preference):

The AI-powered chatbot leverages machine learning and natural language processing to provide personalized recommendations based on customer preferences, past orders, and browsing history. It can engage with customers in conversational language, instantly addressing queries or

suggesting dishes tailored to individual tastes. Over time, the chatbot learns from interactions, continually refining its recommendations to better match customer expectations, which not only improves the user experience but also drives higher order conversion rates.

3. Restaurant Portal (Receiving Orders & Reply to Queries):

The restaurant portal is designed for restaurant staff to manage incoming orders and respond to customer queries efficiently. It provides a centralized dashboard where restaurant managers can oversee order details, including special instructions, bulk requests, and real-time updates. Additionally, the portal facilitates direct communication with customers, enabling staff to address specific inquiries or order changes promptly. The portal also offers valuable insights and analytics, allowing restaurant managers to track performance, analyze customer feedback, and implement improvements.

4. QR Code Generation & Feedback System:

The QR code-based feedback system simplifies the process of collecting customer reviews by generating scannable codes for each order or dining experience. This system allows customers to quickly provide feedback on their experience, making it more likely for them to participate. The collected feedback is analyzed to identify trends and areas for improvement, and the system can reward customers with loyalty bonuses or incentives based on their feedback, promoting a culture of continuous improvement and customer loyalty.

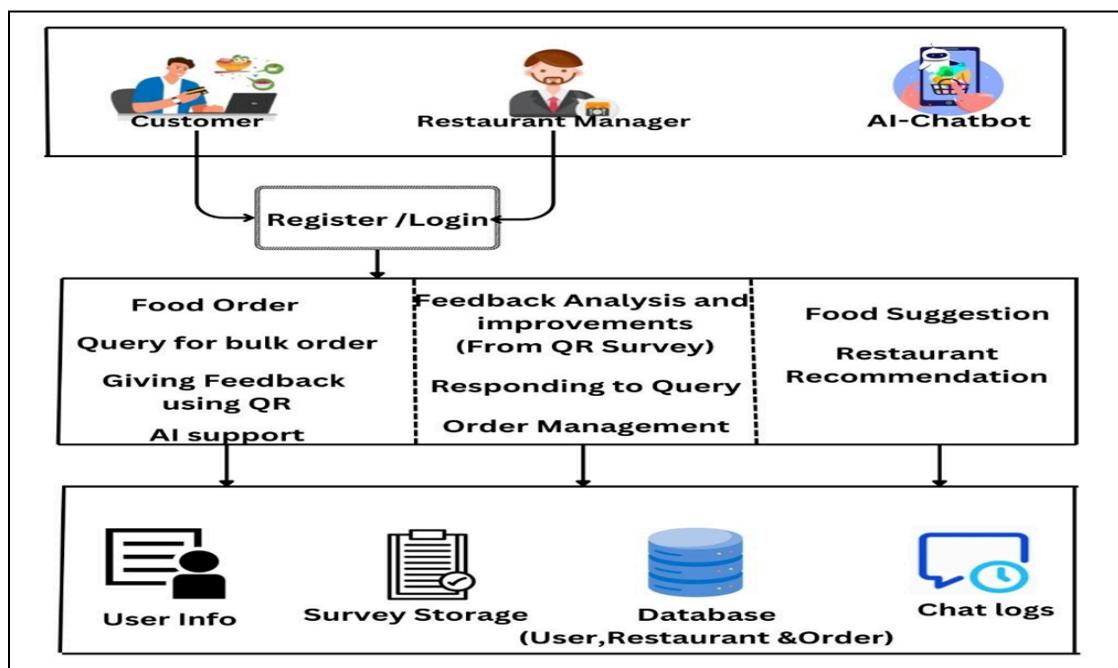


fig.2: block diagram

This diagram outlines the functional flow and data management architecture of your system, illustrating how different components interact with each other to support food ordering, feedback analysis, and AI recommendations. Here's a detailed explanation of each section:

1. Top-Level Users:

- **Customer:** Represents the end-users who place orders, provide feedback, or inquire about bulk orders. They interact directly with the system through a register/login process.
- **Restaurant Manager:** Handles order management, customer queries, and analyzes feedback for service improvements. The manager uses the system to oversee restaurant operations and respond to customer needs.
- **AI-Chatbot:** Provides AI-based food suggestions and restaurant recommendations, enhancing the user experience by offering personalized assistance and automated support.

2. Core Functional Modules:

The system's main functionalities are divided into three sections:

- **Customer-Related Tasks:** Includes ordering food, submitting bulk order queries, providing feedback via QR codes, and accessing AI support for recommendations. This section addresses customer needs and facilitates a smooth ordering experience.
- **Restaurant Manager-Related Tasks:** Focuses on feedback analysis and implementing improvements based on survey data collected through the QR system. It also covers responding to customer queries and managing orders efficiently.
- **AI-Based Recommendations:** Uses customer data to generate food suggestions and restaurant recommendations tailored to individual preferences, improving engagement and user satisfaction.

3. Data Management Layer:

- **User Info:** Stores essential customer information, which helps personalize interactions and recommendations.
- **Survey Storage:** Collects feedback from QR code surveys, which is then used for analysis to identify areas of improvement and enhance service quality.
- **Database (User, Restaurant & Order):** Centralizes data management, maintaining records related to users, restaurants, and order histories to support system functionality and analytics.

- **Chat Logs:** Keeps a log of customer interactions with the AI-chatbot, providing valuable data for improving chatbot responses and understanding customer behavior patterns.

Overall, this diagram illustrates how the system integrates customer interactions, AI-driven support, and restaurant management tasks, supported by a robust data infrastructure to ensure a seamless experience.

4.2. Modular diagram

1. Bulk Ordering Module:

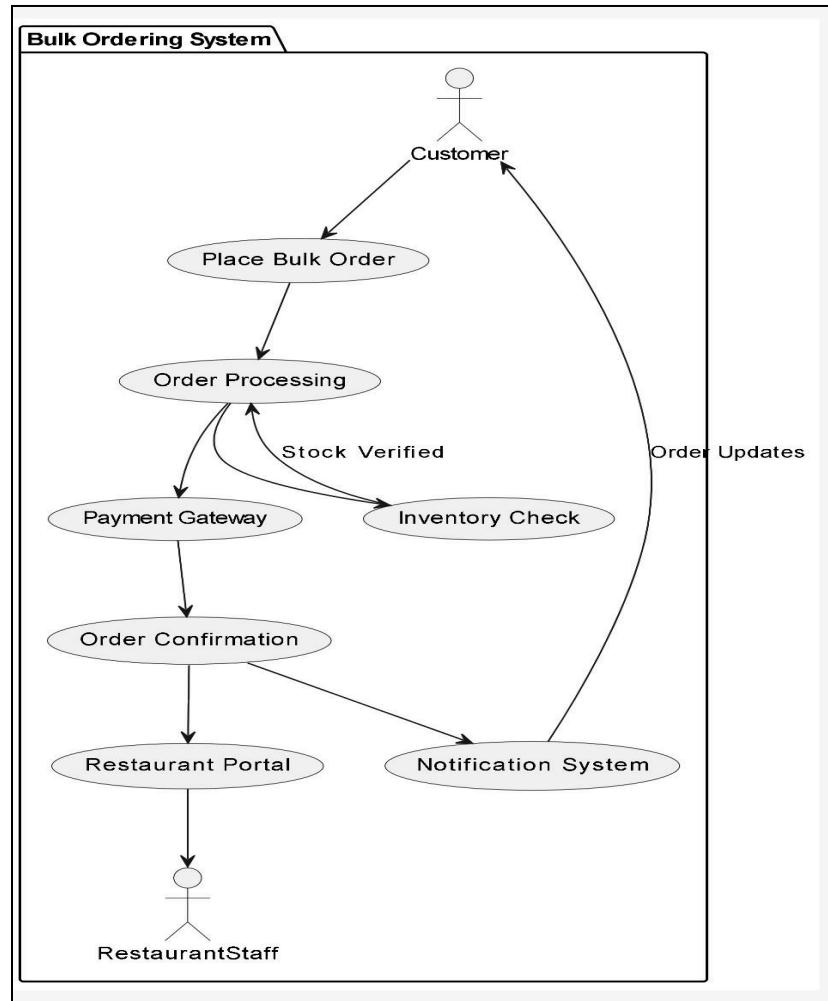


Fig 3: Bulk Ordering Module

On the restaurant management side, this module facilitates efficient handling of large orders by breaking down the process into manageable tasks. It notifies the restaurant staff about bulk order requirements in advance, allowing for better resource allocation, such as staff management and ingredient procurement. Additionally, it supports real-time updates on order status, giving customers visibility over their order's progress and expected delivery time. This module is crucial for addressing the limitations of traditional food ordering systems, which are not optimized for handling large-scale orders.

The Bulk Ordering Module is designed to cater to large-scale food order requirements, commonly needed for events, corporate gatherings, and parties. It provides a dedicated interface for customers to place bulk orders with ease, ensuring that the process is streamlined and efficient. The module allows users to select items in larger quantities, add special requirements (e.g., dietary preferences, catering instructions), and schedule the delivery according to their event timing.

2. AI Chatbot System

The AI Chatbot Module plays a central role in enhancing user experience by providing personalized support and recommendations. It uses artificial intelligence to understand user preferences, based on historical order data, browsing behavior, and explicit user inputs. The chatbot is equipped with natural language processing capabilities, allowing it to converse with customers in a friendly and intuitive manner. It can assist customers in finding suitable dishes, answering common queries related to menu options or restaurant policies, and even guiding them through the ordering process.

The recommendation engine within the AI Chatbot utilizes algorithms that analyze customer preferences to suggest menu items that are likely to match their tastes. Over time, the chatbot learns from customer interactions, becoming more adept at understanding individual preferences and improving the quality of recommendations.

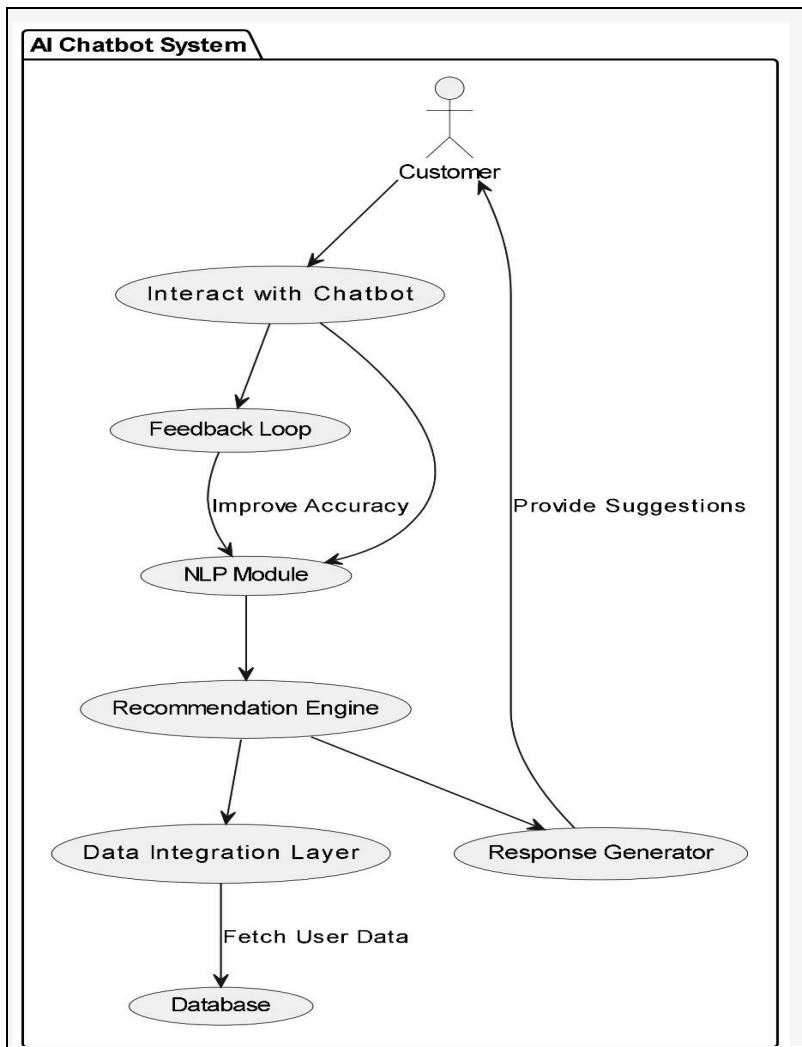


Fig 4.: AI Chatbot Module

3. QR Based Feedback System

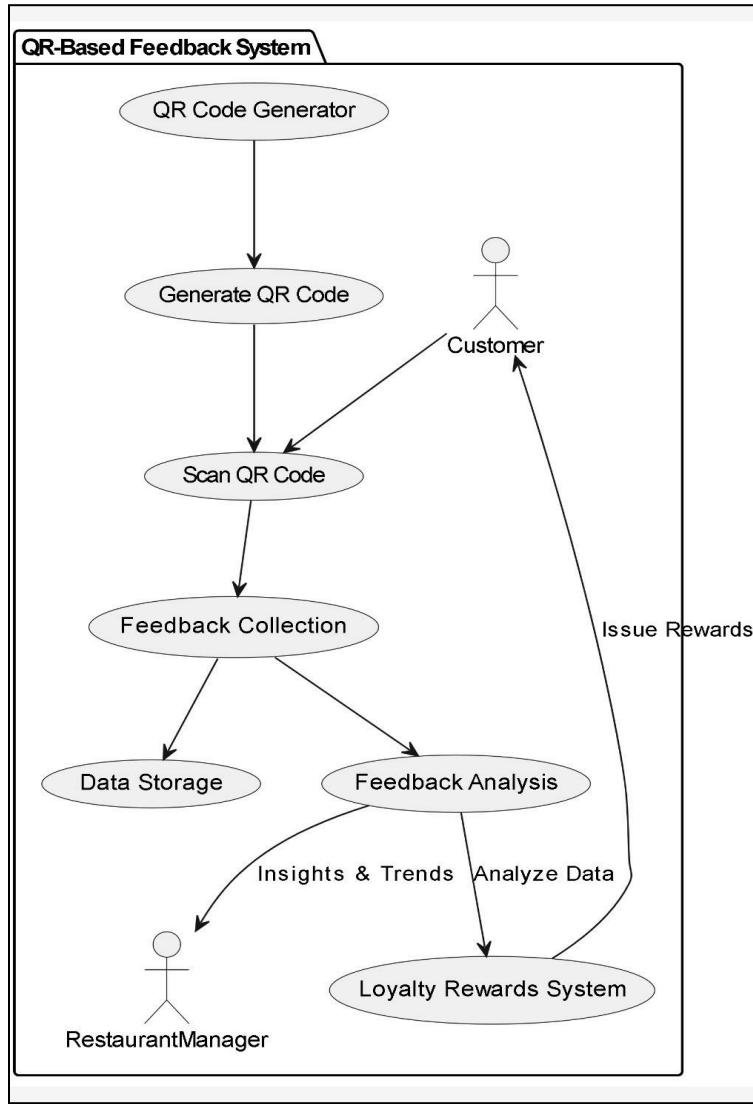


Fig 5: QR Based Feedback Module

The QR Feedback Module is designed to streamline the process of collecting customer feedback, making it quick and accessible. After a customer completes an order, they receive a QR code linked to the order or dining experience. Scanning the QR code directs the customer to a feedback form where they can rate their experience and provide comments. This method simplifies the feedback process, leading to higher participation rates compared to traditional methods, such as printed surveys or email requests.

The module not only gathers feedback but also stores and analyzes it to identify key trends, customer satisfaction levels, and areas that need improvement. This analysis is valuable for the restaurant management to make informed decisions about service enhancements. Additionally,

the module can be integrated with a loyalty program, where customers receive rewards or points based on their feedback, incentivizing them to share their experiences regularly. The insights obtained from this module help close the loop between customer experience and service improvements, ultimately leading to higher customer retention and satisfaction.

4.3. Detailed Design

1. DFD 0

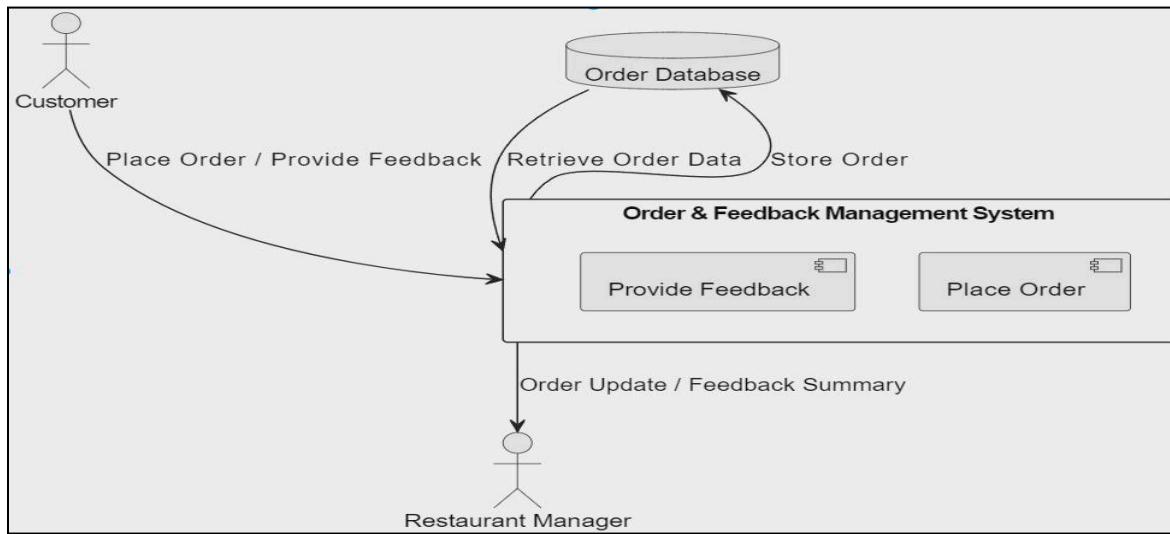


Fig. 6: DFD 0

A DFD Level 0 (Context Diagram) provides a high-level overview of the entire system, showing how external entities interact with it and how data flows in and out. In the case of the Order and Feedback Management System, the key external entities are the Customer and the Manager. Customers interact with the system by placing orders and submitting feedback. These interactions result in order information being stored in the Order Database and feedback being saved in the Feedback Database. The system serves as a bridge, ensuring smooth data exchange between users and internal processes without exposing its detailed inner workings.

On the other side, Managers interact with the system by receiving order status updates and feedback summaries, helping them track operations and improve service quality. The system processes the incoming data and sends it to the relevant databases for storage and retrieval. This context-level diagram simplifies the system into one main process, focusing only on how external entities communicate with the system, rather than providing intricate process-level

details. It acts as a foundation for understanding the overall workflow before diving deeper into specific components in lower-level DFDs.

2. DFD 1

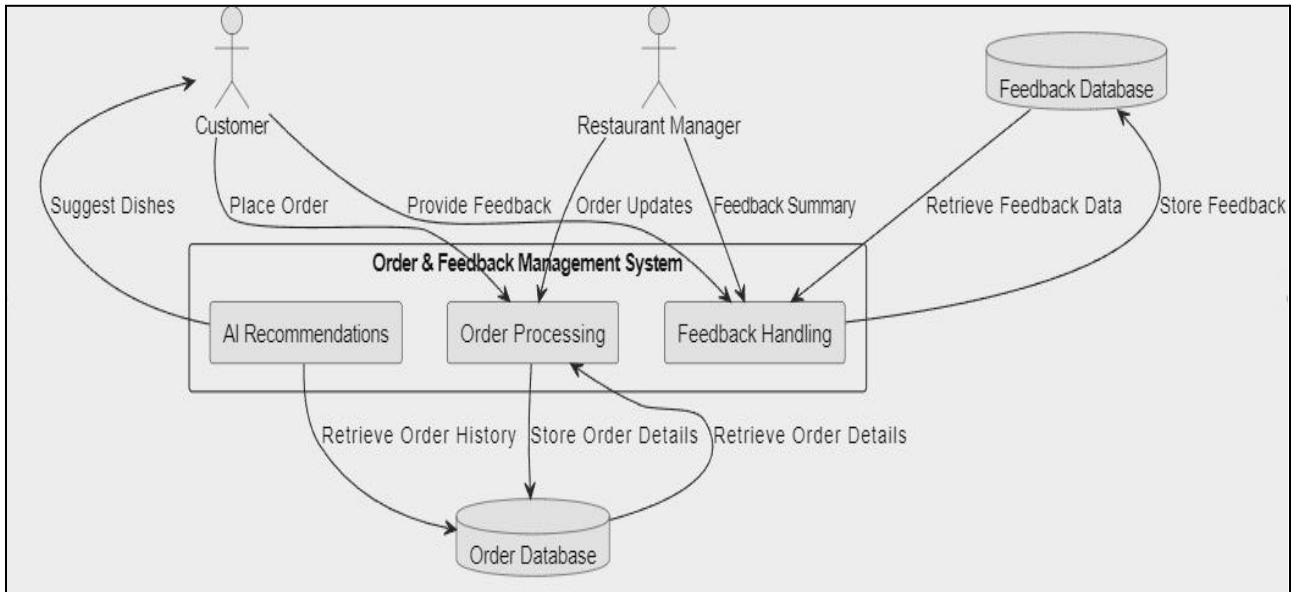


Fig 7: DFD 1

The DFD Level 1 diagram offers a deeper breakdown of the Order and Feedback Management System, showcasing the interaction between its key modules: AI Recommendations, Order Processing, and Feedback Handling. This level provides a clearer picture of how each module contributes to the smooth operation of the system. The AI Recommendations module helps customers by suggesting dishes based on preferences or order history, enhancing the user experience.

Meanwhile, the Feedback Handling module ensures that customer feedback is collected and processed efficiently, with all feedback data being stored in the Feedback Database for further analysis. Both customers and managers actively interact with the system—the Customer places orders, provides feedback, and receives recommendations, while the Manager monitors order updates and reviews feedback summaries to maintain service quality. The seamless data flow between the system's components and databases ensures that every action, from order placement to feedback collection, is managed effectively and reflected in real-time.

3. State Transition Diagram

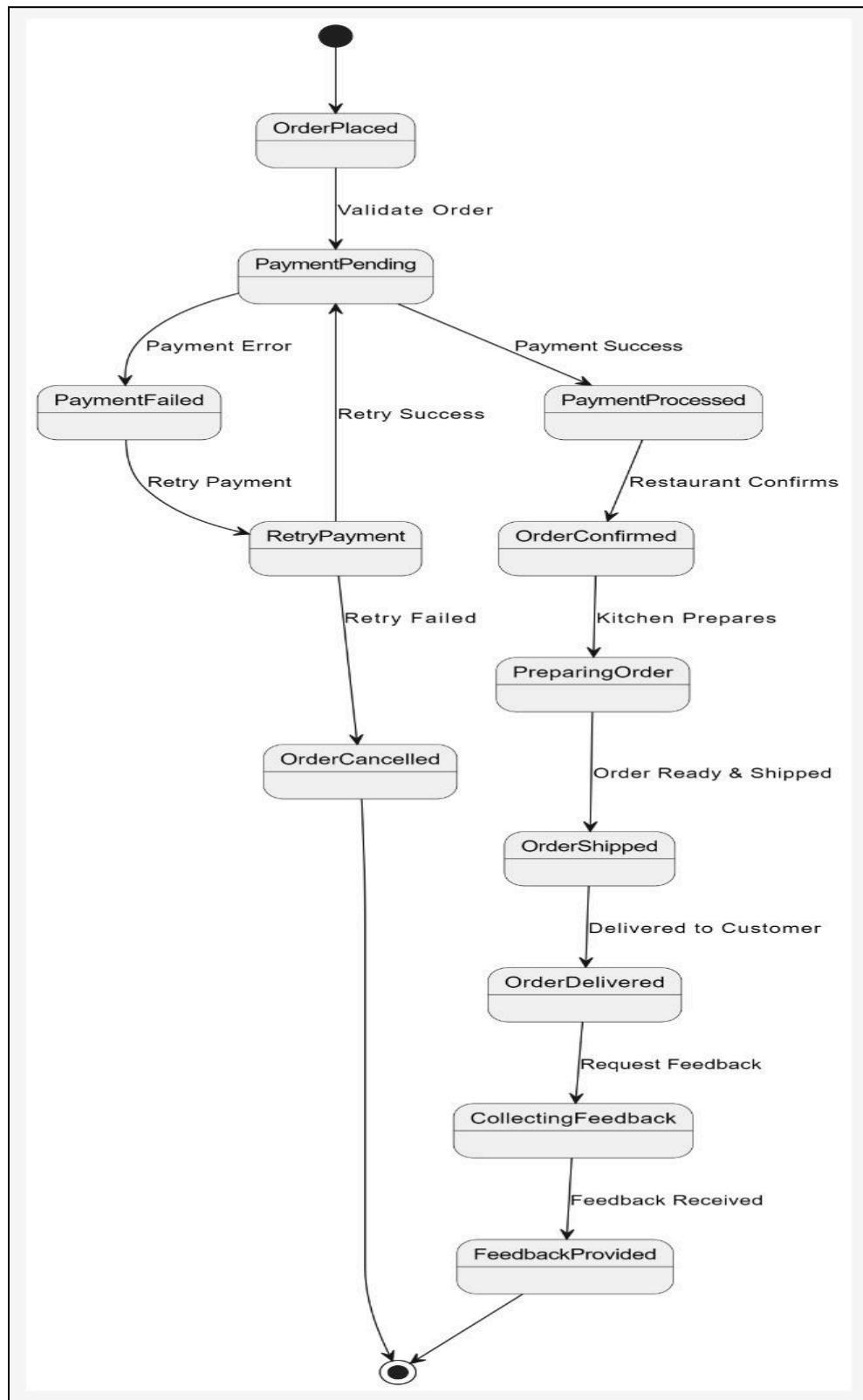


Fig. 8: State Transition Diagram

The State Transition Diagram outlines the entire lifecycle of an order in the Order and Feedback Management System, from the moment it is placed until the feedback is collected. It shows how the order progresses through different states based on specific events and actions, highlighting both successful and failed outcomes.

Initially, an OrderPlaced state is reached, where the system validates the order and transitions to PaymentPending. If the payment is successful, the state shifts to PaymentProcessed, and the restaurant confirms the order, moving it to OrderConfirmed. The kitchen then begins preparation, transitioning the order to PreparingOrder, and once ready, it is shipped to the customer (OrderShipped). After delivery (OrderDelivered), the system requests feedback, eventually entering the CollectingFeedback and FeedbackProvided states.

However, if the payment fails, the system moves to the PaymentFailed state, allowing the customer to RetryPayment. If the retry succeeds, the flow continues, but if it fails again, the order is OrderCancelled. This diagram clearly maps each potential state of the order, ensuring that all scenarios—from successful delivery to order cancellation—are accounted for, providing a comprehensive view of the order processing journey.

4. Relational Schema Diagram

The Bulk Ordering Module is designed to cater to large-scale food order requirements, commonly needed for events, corporate gatherings, and parties. It provides a dedicated interface for customers to place bulk orders with ease, ensuring that the process is streamlined and efficient. The module allows users to select items in larger quantities, add special requirements (e.g., dietary preferences, catering instructions), and schedule the delivery according to their event timing.

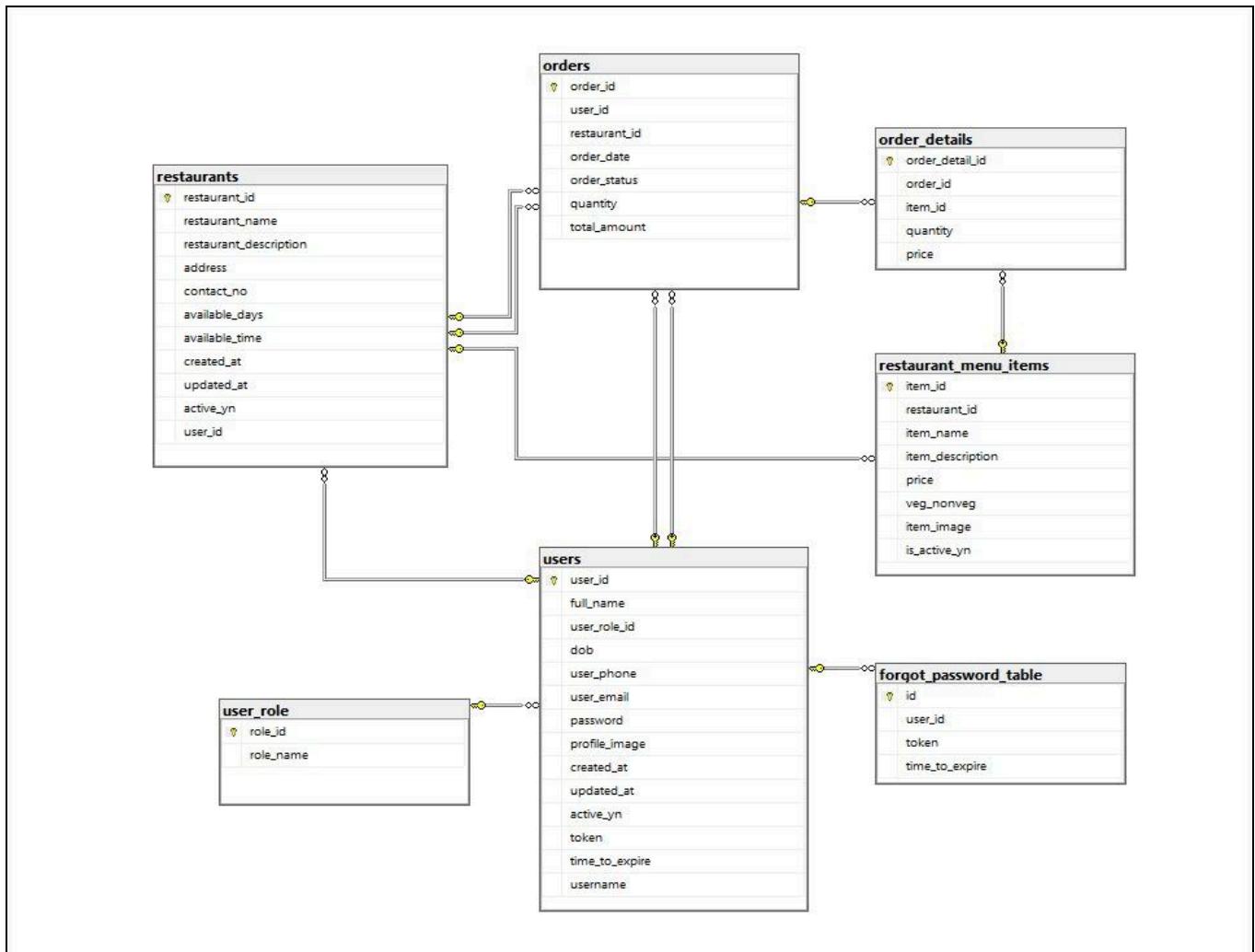


Fig. 9.: Relational Schema

The Relational Schema Diagram for the restaurant management system outlines the relationships between key entities like User, Restaurant, MenuItem, Order, OrderDetail, and UserDetail. The User entity stores information such as user_id, username, password, email, and user_type (e.g., customer or restaurant manager), ensuring secure authentication and role-based access. The UserDetail entity further captures personal information like name, phone_number, and address for enhanced profile management. The Restaurant entity includes attributes such as restaurant_id, name, location, and ensures each restaurant's unique identity in the system.

The relationships among these entities allow for effective data management. A User can place multiple Orders, creating a One-to-Many relationship, while each Order may include multiple MenuItems stored via the OrderDetail entity, forming a Many-to-One link between orders and

menu items. Additionally, each Restaurant offers multiple MenuItems, reinforcing a One-to-Many relationship. The OrderDetail entity records the quantity and specifics of menu items ordered within an order. This well-structured diagram ensures data consistency, minimizes redundancy, and enables efficient system functionalities like order placement, menu updates, and user management. The design supports seamless order tracking, personalized customer interactions, and secure access control, crucial for smooth restaurant operations.

4.4. Proposed algorithms

The proposed algorithms for SmartServe are designed to enhance the platform's functionality, ensuring a seamless experience for both customers and restaurant operators. Below are detailed descriptions of the algorithms for the Customer Feedback System, Bulk Ordering System, and AI-Powered Chatbot.

1. Customer Feedback System Algorithm

Objective: To efficiently collect and analyze customer feedback through the use of QR codes and advanced sentiment analysis techniques.

Algorithm Steps:

- 1. Generate QR Code:** Each time a customer places an order, the system generates a unique QR code that is directly linked to a feedback form. This QR code is included on the customer's receipt or sent via a digital order confirmation.
- 2. Feedback Submission:** After their dining experience, customers scan the QR code using their smartphones, which redirects them to the feedback form. The interface is designed to be user-friendly, ensuring that the form is easy to navigate, encouraging customers to share their thoughts quickly.
- 3. Data Collection:** Feedback responses submitted via the form are captured in a secure database. This database is structured to allow easy access and retrieval of data for analysis. Each entry is timestamped to track when feedback was provided, helping identify trends over time.
- 4. Sentiment Analysis:** The collected feedback undergoes sentiment analysis utilizing Natural Language Processing (NLP) techniques. This involves:
 1. Tokenization: Breaking down the feedback text into individual words or phrases to facilitate analysis.

2. **Sentiment Scoring:** Assigning sentiment scores to each piece of feedback, categorizing it as positive, negative, or neutral. This scoring helps in quantifying customer sentiment toward the restaurant and its offerings.

5. Data Processing: The feedback is then aggregated based on sentiment scores and categorized into key themes such as service quality, food taste, and ambiance. This aggregation provides restaurant managers with a clear understanding of areas that require improvement.

6. Generate Reports: Actionable insights and comprehensive reports are generated from the processed data, enabling restaurant management to make informed decisions. These reports include visual representations of customer sentiment trends and highlight recurring issues or praises.

7. Feedback Loop: The analyzed data is shared with restaurants, allowing them to implement changes based on customer feedback. This continuous feedback loop fosters an environment of improvement and responsiveness to customer needs.

2. Bulk Ordering System Algorithm

Objective: To effectively manage large-scale order processing, providing customers with a smooth and transparent ordering experience.

Algorithm Steps:

1. Receive Bulk Order: Customers can place bulk orders through an online portal specifically designed for this purpose. The portal allows users to select multiple items from different restaurants simultaneously, catering to events or large gatherings.

2. Order Aggregation: Once orders are received, the system aggregates them based on factors such as the customer's geographical location and the availability of items at various restaurants. This grouping helps streamline the quoting process.

3. Quote Generation: The system calculates tailored quotes for each grouped order, taking into account factors like distance from the restaurant, item availability, and current market pricing. This ensures that customers receive competitive pricing for their orders.

4. Notification System: After generating quotes, the system sends notifications to customers via email or SMS, informing them of the quotes and providing an overview of the selected items. Additionally, relevant restaurants are notified about incoming bulk orders for their acknowledgment.

- 5. Customer Comparison:** Customers are given the option to compare the received quotes, facilitating informed decision-making. This comparison feature highlights differences in pricing, delivery times, and available services, empowering customers to choose the best option.
- 6. Order Confirmation:** Once customers select their preferred restaurant, they confirm the order through the portal. This step solidifies their choice and initiates the processing phase.
- 7. Process Order:** The system sends the confirmed orders to the respective restaurants for fulfillment. This process includes all necessary details such as delivery address, contact information, and itemized lists, ensuring smooth execution of the order.

3. AI-Powered Chatbot Algorithm

Objective: To automate customer interactions and provide a personalized service experience through an intelligent chatbot.

Algorithm Steps:

- 1. User Interaction:** The chatbot is designed to initiate interaction whenever a customer sends a message or query. This can happen through various channels, such as the website, mobile app, or social media platforms.
- 2. Intent Recognition:** The chatbot employs NLP techniques to analyze the user's query, identifying the underlying intent. This could range from inquiries about menu items and order status to requests for feedback submission.
- 3. Response Generation:** Based on the recognized intent, the chatbot retrieves relevant information from a database or knowledge base. It uses reinforcement learning to tailor responses based on past interactions with the user, thereby enhancing personalization.
- 4. Feedback Loop:** Customers are encouraged to provide feedback on the chatbot's responses, which allows for continuous improvement. This feedback mechanism helps refine the chatbot's performance over time.
- 5. Continuous Learning:** The chatbot's knowledge base is regularly updated to incorporate new information and adapt to changing customer preferences. As it interacts with more users, it learns to better understand context and nuances in language, improving its overall effectiveness.

4.5. Project Scheduling

1. Planning Phase (Week 1 - Week 4)

Task 1.1: Define Project Scope and Objectives (Week 1)-Establish project goals, including functionalities like bulk ordering, AI chatbot, and QR feedback to enhance customer and restaurant management experiences.

Task 1.2: Requirement Gathering and Analysis (Week 1 - Week 3)-Collect functional and non-functional requirements from stakeholders to clarify expectations and system performance needs.

2. Design Phase (Week 5 - Week 8)

Task 2.1: System Architecture Design (Week 5)-Develop a modular architecture featuring bulk ordering, AI chatbot, and QR feedback modules, ensuring smooth data integration.

Task 2.2: Database Design (Week 6)-Create a database schema for storing user, order, feedback, and chat data, focusing on data consistency and system performance.

Task 2.3: User Interface (UI) Design (Week 4)-Design intuitive interfaces for the customer and restaurant portals, emphasizing ease of navigation.

3. Development Phase (Week 8 - Week 12)

Task 3.1: Development of Bulk Ordering Module (Week 8 - Week 12)-Implement features for managing large orders and facilitating restaurant responses.

Task 3.2: Integration and Testing of Modules (Week 12)-Combine modules and test to ensure seamless communication and data accuracy.

4. Testing Phase (Week 12-14)

Task 4.1: Unit Testing (Week 13)-Test individual components for functional correctness.

Task 4.2: System Testing (Week 11 - Week 12)-Perform end-to-end testing to ensure system-wide functionality.

5. Deployment & Maintenance Phase (Week 15)

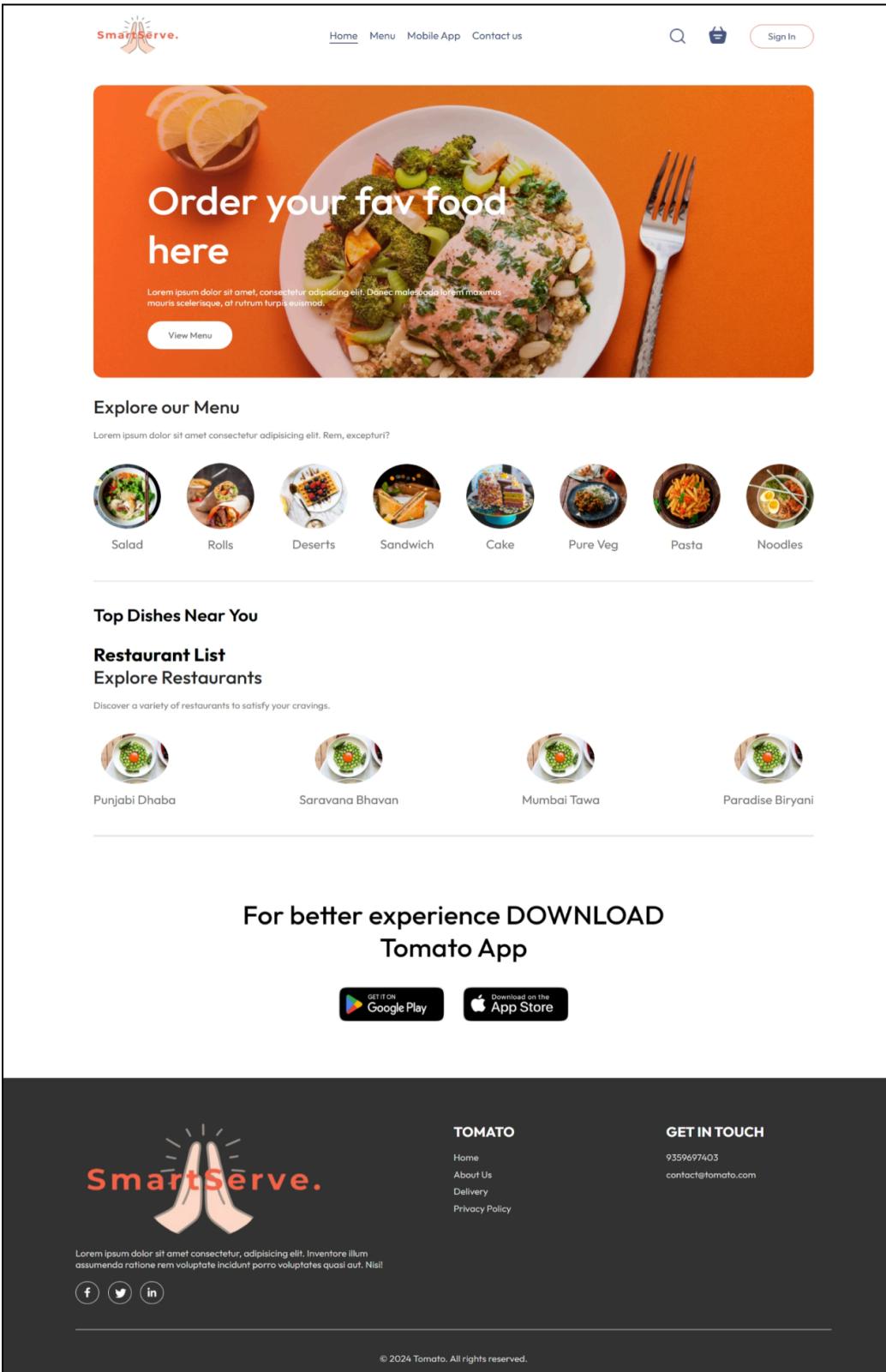
Task 5.1: Deployment to Live Environment (Week 13)-Launch the system for real-world use, configuring the production environment.

5. Results and Discussions

5.1. Results and Discussion

- 1. Customer Feedback System:** implementation of the customer feedback system through QR code integration has proven to be an effective method for gathering instant feedback. By enabling customers to scan QR codes and provide their input, we observed a significant increase in feedback submissions compared to traditional methods. The use of Natural Language Processing (NLP) for sentiment analysis has allowed us to process this feedback efficiently, extracting key insights related to food taste and quality. As a result, restaurants received immediate, actionable insights that directly contributed to service quality enhancements. This system has not only fostered a culture of continuous improvement but has also made customers feel valued, as their opinions directly impact the dining experience.
- 2. Bulk Ordering System:** The bulk ordering system has successfully streamlined the management of large-scale events and bulk order processing. By aggregating orders based on customer location and restaurant availability, we significantly reduced the complexity and time required to fulfill large orders. The quote generation process enabled customers to receive timely and tailored responses, allowing them to compare quotes and make informed decisions about their orders. Feedback from customers indicated a marked improvement in satisfaction levels due to the efficiency of the ordering process and the prompt notifications received from restaurants. This system has not only improved operational efficiency but has also enhanced the overall customer experience, leading to higher retention rates for bulk orders.
- 3. AI-Powered Chatbot:** The introduction of the AI-powered chatbot has revolutionized customer interactions by automating responses and providing personalized service. Utilizing reinforcement learning and NLP techniques, the chatbot effectively understands and addresses customer queries, delivering tailored recommendations based on user history. User feedback highlights that customers appreciate the instant assistance and the ability to resolve their inquiries without waiting for human intervention. The chatbot's efficiency in managing customer interactions has resulted in improved response times and increased customer engagement. Overall, the automation of interactions has enhanced the user experience, providing a more seamless and satisfying journey for our customers.

5.2. Implementation



The screenshot displays the homepage of the SmartServe food delivery platform. At the top, there is a navigation bar with links for Home, Menu, Mobile App, and Contact us, along with a search icon, a shopping cart icon, and a Sign In button. The main header features a large orange background with a white plate of salmon and vegetables, a lemon wedge, and a fork. The text "Order your fav food here" is prominently displayed in white. Below the main image, there is a placeholder text: "Lorem ipsum dolor sit amet, consectetur adipiscing elit. Donec malesuada lorem maximus mauris scelerisque, at rutrum purus euismod." A "View Menu" button is located below this text. The next section, titled "Explore our Menu", shows eight categories with corresponding icons: Salad, Rolls, Deserts, Sandwich, Cake, Pure Veg, Pasta, and Noodles. Below this is a section titled "Top Dishes Near You". Underneath it, there is a "Restaurant List" section with a heading "Explore Restaurants" and a subtext "Discover a variety of restaurants to satisfy your cravings." It lists four restaurants with their names and small images: Punjabi Dhaba, Saravana Bhavan, Mumbai Tawa, and Paradise Biryani. At the bottom of the page, there is a call to action: "For better experience DOWNLOAD Tomato App" with download links for Google Play and the App Store. The footer is dark with the SmartServe logo featuring two hands holding a flame. It includes links for TOMATO (Home, About Us, Delivery, Privacy Policy) and a "GET IN TOUCH" section with contact information: 9359697403 and contact@tomato.com. Social media links for Facebook, Twitter, and LinkedIn are also present. The footer also contains a copyright notice: "© 2024 Tomato. All rights reserved."

Fig. 10: Home Page

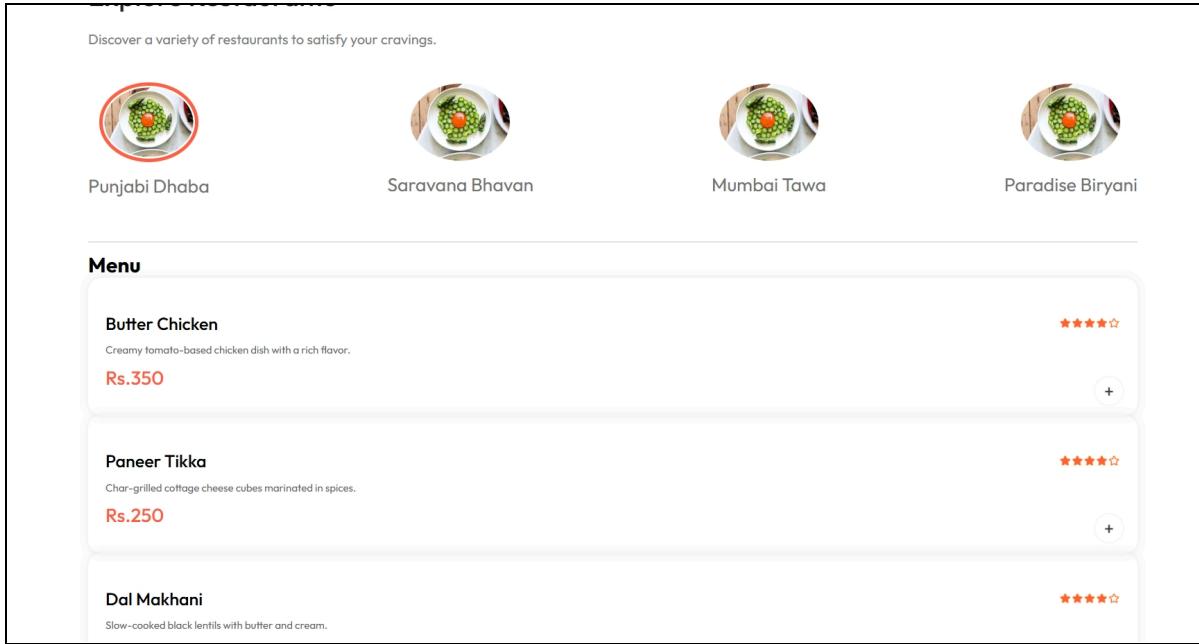


Fig. 11: Place Order Section

The "Place Order" section of the SmartServe platform is designed to offer a seamless and intuitive experience for users. This section features a clean, user-friendly interface where customers can browse through various restaurants, select multiple items from the menu, and easily add them to their bulk orders. Users can view real-time order summaries and receive quotes from different restaurants, simplifying the process of choosing the best options for their needs. Additionally, this section integrates advanced filtering options to help users navigate through the menu based on cuisine, restaurant location, or pricing.

The home page serves as the central hub for all user activities. It offers quick access to key features such as bulk order placement, viewing past orders, and scanning QR codes for feedback submission. The interface is designed with simplicity in mind, providing users with easy navigation through the platform's core functionalities. Bold visuals and clear call-to-action buttons ensure that customers can quickly access the "Place Order" feature, explore restaurant options, and manage their interactions smoothly.

The screenshot shows the SmartServe cart page. At the top, there's a navigation bar with the SmartServe logo, a search icon, a shopping cart icon with a red notification dot, and a user profile icon. Below the navigation is a table showing the user's current order items:

Items	Title	Price	Remove
Butter Chicken	Butter Chicken	Rs.350	
Paneer Tikka	Paneer Tikka	Rs.250	

Below the table, there are input fields for 'Number of People' (1), 'Date' (06-11-2024), and 'Time' (00:24). To the right, under 'Restaurant Details', is information for 'Punjabi Dhaba' (Authentic North Indian cuisine with tandoori specialties) located at Plot No. 45, Sector 18, Chandigarh. It includes a phone number (9876543210) and available days (Monday-Sunday). A 'Send Query' button is also present.

The footer features the SmartServe logo, a social media links section with icons for Facebook, Twitter, and LinkedIn, and a copyright notice: © 2024 Tomato. All rights reserved.

Fig. 12: Cart

The cart section of SmartServe provides a concise and organized summary of the user's selected items. It displays the total number of items, price breakdowns, and an option to modify the order before finalizing it. Users can review their choices, remove or adjust quantities, and proceed to request quotations from multiple restaurants, ensuring a smooth checkout experience. The cart is designed to offer clarity and convenience, helping users make informed decisions with ease.

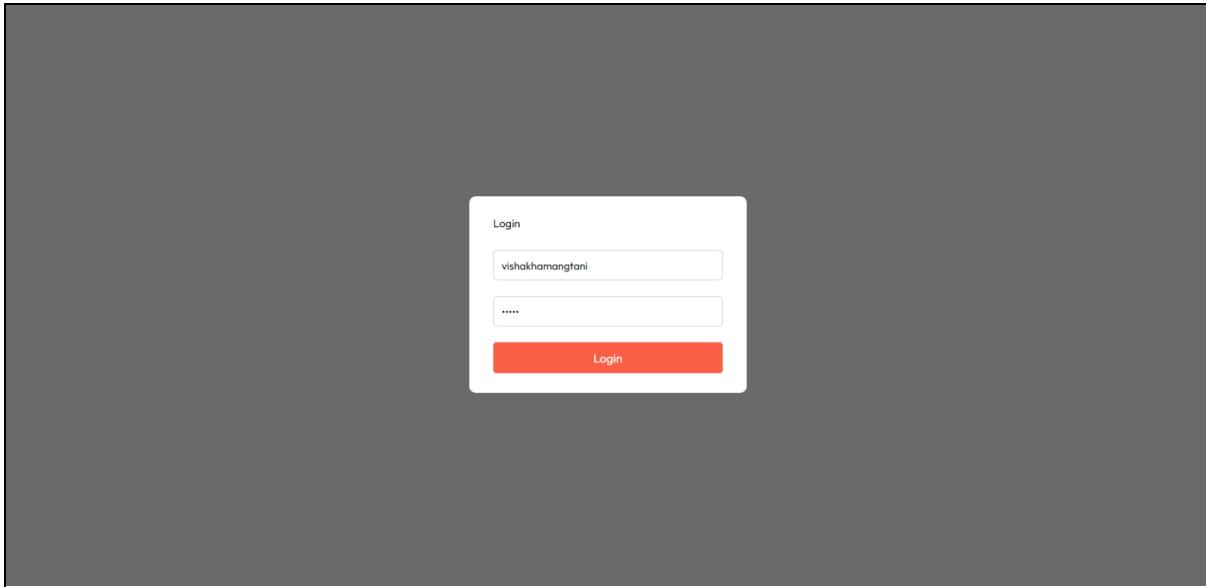


Fig. 13: Login UI

A screenshot of the "Tomato. Admin Panel". The top left shows the "Tomato." logo and "Admin Panel" text. The top right has a user profile icon. On the left, there's a sidebar with three items: "Add Items" (with a plus icon), "list Items" (with a checkmark icon), and "orders" (with a checkmark icon). The main area is currently empty.

Fig. 14: Admin Panel UI

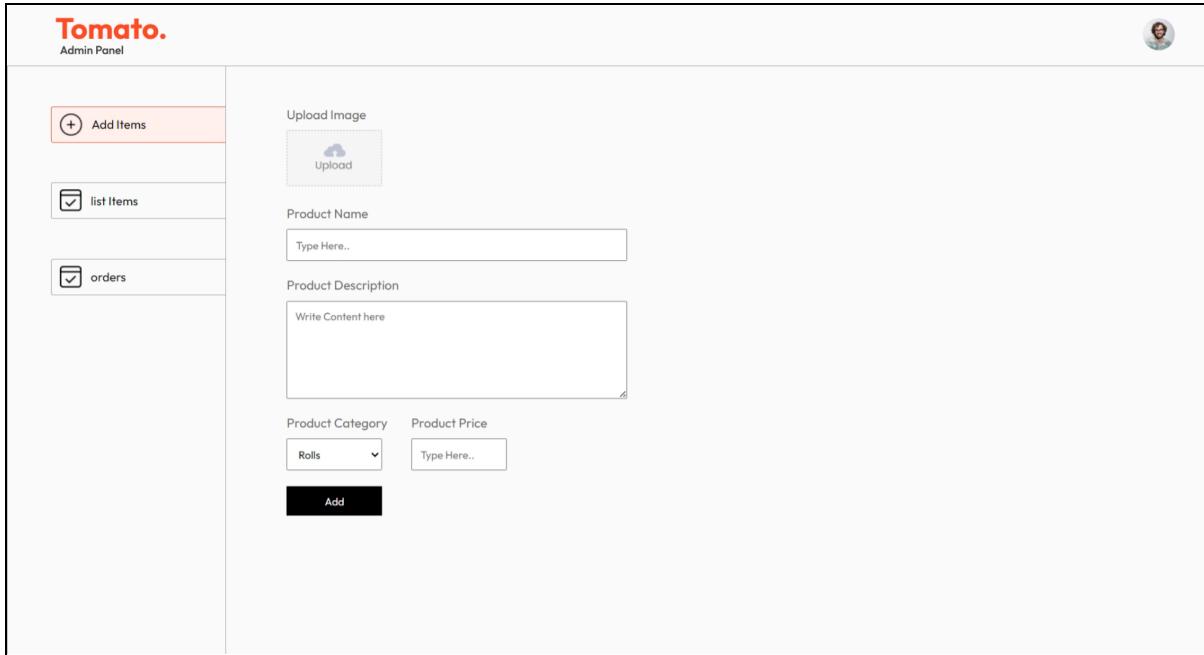


Fig. 15: Admin Features

The admin panel UI of SmartServe is designed for ease of use and efficient management of restaurant operations. Upon logging in, administrators are greeted with a clean, intuitive dashboard that provides an overview of key metrics, such as total orders, customer feedback, and active promotions. The panel features navigation tabs for managing bulk orders, monitoring customer interactions, and analyzing feedback data. Administrators can easily access tools for generating reports, managing restaurant listings, and responding to customer inquiries through the AI chatbot. The streamlined interface ensures that admins can perform their tasks quickly and effectively, enhancing operational efficiency and supporting data-driven decision-making..

Dataset Link: [LINK](#)

Colab: [LINK](#)

1 to 10 of 10000 entries Filter							
Restaurant	Reviewer	Review	Rating	Metadata	Time	Pictures	7514
Beyond Flavours	Rusha Chakraborty	The ambience was good, food was quite good . had Saturday lunch , which was cost effective . Good place for a sate brunch. One can also chill with friends and or parents. Waiter Soumen Das was really courteous and helpful.	5	1 Review , 2 Followers	5/25/2019 15:54	0	2447
Beyond Flavours	Anusha Tirumalaneedi	Ambience is too good for a pleasant evening. Service is very prompt. Food is good. Over all a good experience. Soumen Das - kudos to the service	5	3 Reviews , 2 Followers	5/25/2019 14:20	0	
Beyond Flavours	Ashok Shekhwat	A must try.. great food great ambience. Thnx for the service by Pradeep and Subroto. My personal recommendation is Penne Alfredo (Pasta) Also the music in the background is amazing.	5	2 Reviews , 3 Followers	5/24/2019 22:54	0	
Beyond Flavours	Swapnil Sarkar	Soumen das and Arun was a great guy. Only because of their behavior and sincerely, And good food off course, I would like to visit this place again.	5	1 Review , 1 Follower	5/24/2019 22:11	0	
Beyond Flavours	Dileep	Food is good.we ordered Kodi drumsticks and basket mutton biryani. All are good. Thanks to Pradeep. He served well. We enjoyed here. Ambience is also very good.	5	3 Reviews , 2 Followers	5/24/2019 21:37	0	
Beyond Flavours	Nagabhavani K	Ambiance is good, service is good, food is aPradeep and subro best service Food is good. Papiya good hostess and ur caption very good. This is 4star restaurant.	5	1 Review	5/24/2019 15:22	0	
Beyond Flavours	Jamuna Bhawalka	Its a very nice place, ambience is different, all the food we ordered was very tasty, service is also gud, worth visit. Its reasonable as well. Really a must visit place.	5	1 Review	5/24/2019 1:02	0	
Beyond Flavours	Sandhya S	Well after reading so many reviews finally visited this place...ambience was so good and coming to food crispy corn is nice. Tawa fish was ok.. Basket Biryani disappointed us.. biryani was ok but not flattering as they claimed.. Staff was polite and prompt especially pradeep and Suman.	4	1 Review	5/23/2019 15:01	0	
Beyond Flavours	Akash Thorat	Excellent food , specially if you like spicy food . Courteous staff . Shubro and pradeep and papiya gave excellent service to our corporate team dinner . Overall great for team dinners and party	5	1 Review , 1 Follower	5/22/2019 23:12	0	
Beyond Flavours	Smarak Patnaik	Came for the birthday treat of a close friend. Perfect place for a treat like this. Very hospitable and cooperative staff. Food was delicious, ambience was really good with the music and the lighting. Chili honey lotus stem is a must try here. Special mention to Papiya who took good care of us.	5	1 Review , 1 Follower	5/22/2019 22:37	0	

Show 10 per page

1 2 10 100 900 990 1000

Fig. 16: Preview of dataset

The dataset consists of 10,000 rows and 8 columns, each capturing essential information related to restaurant reviews. Among these columns, the most critical for our sentiment analysis are "Review" and "Rating." The "Review" column contains customer feedback in textual form, while the "Rating" column holds numerical ratings that range from 1 to 5. To perform sentiment analysis, we will employ Natural Language Processing (NLP) techniques specifically on the "Review" column, enabling us to extract meaningful insights from the textual data.

Our categorization strategy will utilize the ratings to determine sentiment polarity. Reviews assigned a rating above 3 will be classified as "Positive," indicating a satisfactory or favorable experience, while those with a rating below 3 will be categorized as "Negative," reflecting dissatisfaction or issues encountered by customers. This systematic approach not only provides a clear view of overall customer sentiment but also highlights key areas where restaurants can enhance their services, thereby driving improvements and elevating customer satisfaction levels. The insights gained from this analysis will be invaluable for restaurant management in making data-driven decisions to optimize their operations and better meet customer expectations.

```
Welcome to the Restaurant Recommendation Chatbot!
Ask for a restaurant recommendation (type 'exit' to quit): recommend pizza places
Here are some restaurants you might like:
- Flechazo: This place has received great reviews!

Ask for a restaurant recommendation (type 'exit' to quit): i wish to have vegetable biryani
Here are some restaurants you might like:
- Beyond Flavours: This place has received great reviews!

Ask for a restaurant recommendation (type 'exit' to quit): recommend places for chicken and meat
Here are some restaurants you might like:
- Beyond Flavours: This place has received great reviews!

Ask for a restaurant recommendation (type 'exit' to quit): places for mutton biryani
Here are some restaurants you might like:
- Beyond Flavours: This place has received great reviews!

Ask for a restaurant recommendation (type 'exit' to quit): 
```

Fig. 17: Chatbot Implementation

The implementation of the AI-powered chatbot in SmartServe is a pivotal feature that leverages Natural Language Processing (NLP) to automate customer interactions and deliver personalized recommendations effectively. Integrated seamlessly within the user interface, the chatbot acts as a virtual assistant, adeptly handling a wide range of common queries, including menu inquiries, order status updates, and restaurant suggestions. By employing advanced machine learning algorithms, the chatbot continuously learns from user interactions, allowing it to refine its responses and enhance its accuracy over time.

One of the key aspects of the chatbot's functionality is its use of reinforcement learning, which enables it to tailor its recommendations based on individual user behavior and preferences. As customers engage with the chatbot, it analyzes their past interactions to understand their likes and dislikes, ensuring that the suggestions it provides are relevant and personalized. This personalized approach not only enhances customer engagement by making users feel understood and valued but also streamlines the support process. As a result, the chatbot significantly reduces the need for human intervention in routine tasks, allowing restaurant staff to focus on more complex customer needs and improve overall service efficiency. The AI chatbot ultimately plays a crucial role in creating a more responsive and user-friendly experience within SmartServe, driving higher customer satisfaction and loyalty.

6. Plan of action for the next semester

In our future project plans, we are dedicated to enhancing customer interaction and operational efficiency through the implementation of a system that generates unique QR codes for each order. This innovative feature is designed to simplify the order tracking process for customers, ensuring a seamless experience when accessing feedback forms. By utilizing unique QR codes, we aim to facilitate quick and convenient communication, which will encourage customers to share their thoughts and experiences. This open line of communication will ultimately lead to valuable insights that can drive continuous improvements in our services, enhancing overall customer satisfaction.

In addition to the QR code system, we are committed to developing a comprehensive user interface that caters to both customers and administrators. The customer user panel will be intuitively designed to provide an effortless experience, allowing users to easily navigate their orders, access feedback forms, and view relevant updates in real time.

Simultaneously, the admin panel will equip our team with the necessary tools to manage orders effectively and analyze customer feedback efficiently. This backend interface will provide robust functionalities for tracking order status, assessing customer sentiments, and implementing necessary changes based on data-driven insights. By empowering our team with these capabilities, we can respond quickly to customer needs and preferences, creating a more agile and adaptable operational environment.

Together, these enhancements will not only streamline operations but also foster a more engaging and responsive relationship with our customers. By prioritizing user experience and leveraging technology to facilitate communication, we are positioning SmartServe to become a leader in the food ordering industry. Our focus on continuous improvement and responsiveness to customer feedback will ensure that we meet the evolving needs of our users while driving long-term success for our platform and restaurant partners.

7. Conclusion

In conclusion, the proposed enhancements for SmartServe aim to revolutionize the food ordering experience, creating a more efficient and customer-centric system. By establishing a streamlined order management system, we are setting up a centralized portal that allows customers to easily place both individual and group orders. This innovation significantly enhances convenience and accessibility, making it simpler for customers to manage their dining needs, whether for casual meals or large-scale events.

The introduction of a flexible quotation system is another critical improvement that empowers customers to inquire about and receive tailored quotes from multiple restaurants. This feature promotes greater flexibility in purchasing decisions, enabling customers to compare options and choose the one that best fits their preferences and budget. By facilitating a transparent quoting process, we aim to eliminate the uncertainty often associated with bulk ordering.

Moreover, integrating QR codes for real-time feedback collection is essential for maintaining a responsive and customer-focused approach. This mechanism enables us to promptly gather customer concerns and suggestions, allowing for continuous improvements to our offerings. By actively listening to our customers, we can adapt our services to better meet their needs, enhancing overall satisfaction and loyalty.

Additionally, our loyalty points program is strategically designed to boost customer retention by rewarding repeat business. This program will not only encourage customers to return but also foster a strong sense of community and loyalty among our clientele. By recognizing and valuing their engagement, we aim to build lasting relationships that contribute to the long-term success of our platform.

Finally, the implementation of a sophisticated recommendation engine will further personalize the dining experience. By analyzing previous orders and customer preferences, this feature will suggest menu items tailored to individual tastes, making it easier for customers to discover new favorites and enhancing their overall experience.

Collectively, these enhancements will not only elevate customer satisfaction but also drive long-term business success for both SmartServe and our restaurant partners. By embracing innovation and prioritizing customer needs, SmartServe is poised to set a new standard in the food ordering industry, fostering a dynamic and engaging environment for all users.

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9. Appendix

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