Mealmate: A Revolutionary Tiffin Service Platform Powered by Machine Learning

Sarthak Boraste[1], Chaitanya Walture[2], Bhargav Sonar[3], Harshad Neve[4],Mrs. Shital Bedse[5]

[1,2,3,4]Department of Computer Engineering, Met Institute of Engineering, SPPU Pune University, India.
[5]Internal Guide Dept. Department of Computer Engineering, Met Institute of Engineering, SPPU Pune University, India.

Abstract: **Mealmate revolutionizes the tiffin service industry by integrating cutting-edge technologies such as Django, Bootstrap, and SQLite. This web application, powered by machine learning and artificial intelligence, offers a seamless and user-friendly experience. Customers can customize their orders, receive intelligent reorder recommendations, and provide feedback through sentiment analysis. The platform caters to those seeking affordable, top-tier, and hygienic meals, particularly beneficial for individuals away from home due to work- related relocations. Mealmate use of technology extends to a centralized hub for tiffin providers, facilitating growth opportunities and efficient event catering. With a comprehensive menu, flexible payment options, and professional chef oversight, Mealmate represents a modernized approach to the tiffin service industry, emphasizing convenience, personalization, and growth through technology.**

Keywords: Bootstrap, Django, Machine learning, Mealmate, SQLite.

I.	INTRODUCTION

In the intricate tapestry of our fast-paced lives, Mealmate emerges as a transformative force, simplifying the art of meal management with an innovative approach. Picture a world where culinary delights are effortlessly woven into your daily routine, and the complexities of meal planning are seamlessly managed by a revolutionary platform.

Mealmate is not just a tiffin service; it's a culinary concierge designed to enhance your lifestyle. Our platform acts as a bridge between you and local mess owners, redefining the way you experience daily meals. Imagine chef-made delicacies arriving at your doorstep, eliminating the need for grocery shopping or spending hours in the kitchen.

Simplicity, efficiency, and security are the cornerstones of Mealmate. Beyond the realm of traditional tiffin services, our project extends its capabilities to cater events and employs sophisticated data analysis to uncover valuable insights. Mealmate is not just a meal provider; it's a comprehensive culinary experience.

Our commitment extends beyond mere satisfaction; we strive to understand your unique food preferences. Mealmate is your culinary companion, dedicated to crafting a world where each meal is an indulgence, each bite a celebration. Welcome to Mealmate – where convenience meets taste, and every meal is a step towards a healthier, more delightful lifestyle.

II.	LITERATURE SURVEY

This chapter undertakes an extensive exploration of studies and research initiatives within the food delivery industry. The objective is to discern prevalent scenarios and emerging trends, especially in the integration of cutting-edge technologies. Additionally, the examination includes endeavors aimed at enhancing user experiences through the introduction of innovative solutions

2.1   Meals on Wheels: A Platform to Connect Tiffin Services to Users

In India, students, working professionals, and bachelors often prefer having lunch at their workplace due to

budget constraints, eliminating the option of dining out. To address this, tiffin vendors, known as dabbawallas, offer budget-friendly and healthy meal options delivered directly to customers' locations [1]. During the COVID-19 pandemic, concerns about ordering from restaurants led to increased demand for tiffin services. However, despite the growing popularity, the industry remains largely unorganized, with around 90 percent of the market lacking structure. This fragmentation highlighted the need for a centralized platform to streamline and organize the multitude of tiffin services available.

2.2 Super Meals: An Online Tiffin Delivery Platform

Supermeals, a revolutionary player in the food and hospitality sector, leverages advanced technology, particularly Machine Learning (ML), to transform the online tiffin service landscape. The platform, exemplified by the order management software Supermeals, employs a robust technology stack comprising PHP, Java/JS, HTML/CSS/SCSS, Bootstrap, Android, and a MySQL Database. This amalgamation facilitates efficient management of user information, meal providers' records, and order data. The core modules of Online Mess Searching, Online Mess Booking, Tiffin Delivery, and Job Opportunity collectively streamline user access to meal services, offer job opportunities, and optimize the ordering process from multiple providers. Supermeals' primary goal is to provide affordable, high-quality meals, particularly catering to newcomers in new cities. The system architecture prioritizes user characteristics, emphasizing individual preferences through user subscriptions. Operating on a central server, Supermeals accommodates both web and mobile applications for users and delivery personnel. However, challenges such as potential data transfer delays, the necessity for a constant internet connection, and dependency on delivery partner availability pose constraints to the seamless operation of the platform [2]. Despite these challenges, Supermeals stands as a technological innovation driving efficiency and convenience in the food delivery industry.

2.3 Recommendation System Based on Deep Sentiment Analysis and Matrix Factorization

This paper introduces a novel recommendation system, Sentiment Analysis and Matrix Factorization (SAMF), to address challenges in traditional recommendation systems. SAMF combines topic modeling (LDA) and deep learning (BERT) for sentiment analysis to enhance the rating matrix [4]. The methodology involves generating topic distributions, integrating feature matrices, and incorporating sentiment analysis to update the user-item rating matrix. SAMF aims to overcome data sparsity and credibility issues in collaborative filtering, offering improved recommendation accuracy. Experimental results on Amazon datasets demonstrate SAMF outperforming classical algorithms in rec- commendation performance.

2.4 Online Tiffin Service

This project presents a web application for Dabba service ordering, catering to the rising demand for homemade food. It addresses the limitations of traditional food delivery services by emphasizing the delivery of fresh, homemade meals before lunchtime. Key components include convenient online ordering, benefits for consumers and homemade food providers, and robust security measures through user authentication [3]. The technological framework employs HTML, CSS, Django, and SQLite for seamless functionality. In response to challenges faced by both customers and providers in conventional tiffin services, the system facilitates efficient communication, order management, and hassle-free service delivery. This initiative responds to the impact of COVID-19, offering a solution for individuals concerned about the health implications of restaurant food. Overall, the web-based platform aims to bridge the gap between consumers seeking homemade meals and local homemade food providers, providing an accessible and secure solution for efficient food search, ordering, and delivery.

III.   **PROPOSED METHOD**

Problem Statement

In the contemporary landscape of fast-paced lifestyles and digital connectivity, the demand for efficient and personalized food services has seen a substantial rise. As individuals increasingly rely on online platforms for their daily needs, the conventional methods of food ordering are being redefined. Recognizing the evolving preferences ofconsumers and the growing significance of technology in the food industry.

Amidst the evolving culinary landscape, existing food ordering systems lack the innovation required tomeet the heightened expectations of users. This project seeks to address these challenges by developing an innovative Tiffin Ordering System that not only simplifies the food ordering process but also elevates user interactions through features like personalized meal suggestions and sentiment analysis. By doing so, it aims to empower food service businesses to foster customer loyalty, enhance service quality, and make informed decisions based on data insights. Furthermore, the system is committed to ensuring robust data security and scalable performance, laying the foundation for a future-proof solution in the dynamic landscape of online food services.

Objectives

• To help students and working professionals who are far from their home to efficiently order homemade andhealthy food.

• To provide users with personalized meal suggestions that align with their preferences and historical orderingpatterns.

• To analyze user feedback to derive service quality metrics and understand customer sentiments.

• To implement a feedback loop for continuous system enhancement.

• To ensure the quality and consistency of meal suggestions and order fulfilment.

• To provide a helping hand to mess operators to grow their business

Advantages

The Mealmate platform, driven by cutting-edge machine learning, offers numerous advantages in transforming the traditional tiffin service industry. The foremost benefit lies in its ability to provide an extensive reach and accessibility for users who have relocated for work or education. By employing advanced technology, Mealmate optimizes the potential of individual preferences and facilitates convenient, high-quality meal options Additional advantages of the Mealmate system include:

Cost-Effective and Hygienic: The platform ensures affordability and hygiene, positioning home-cooked meals as asuperior option.

Customization and Flexibility: Customers enjoy the liberty to customize their orders, fostering a personalizedculinary experience.

Limitations

• **Technology Adoption:** Some users may take time to adapt to the integration of machine learning in their mealselection processes.

• **Geographical Constraints:** The platform's reach may be limited in certain geographical areas initially.

Applications

• **Individual Consumers:** Providing a modernized approach to convenient, personalized, and cost-effectivemeal solutions.

• **Students:** Transforming the conventional mess system, offering reliable local tiffin services for students

- **Event Catering:** Centralizing catering services for events, creating growth opportunities for culinaryentrepreneurs

IV.   MATHEMATICAL MODELLING

Main Mathematical Model:
In this representation, the main mathematical model incorporates three sub models, each addressing a specific aspect of the overall system. The sub models are encapsulated within the main model, and their respective inputs, outputs, and mathematical formulations are defined. This structure helps illustrate how the main model integrates and coordinates the functionalities of the individual sub models.

Overall System:
Input: User preferences (U), historical data (H), user order details (D), real-time conditions (R), user feedback (F).
Output: The overall system (P), Set of personalized meal suggestions (S), order confirmation (O), deliveryschedule, service quality metrics (M).

Mathematical Formulation:
$P[S, O, M]$

$[S = f(U, H)]$

$[O = g(D, R)]$

$[M = h(F)]$

In this model, (P) represents the coordinated results of the three sub models, illustrating how the personalized meal suggestions, order processing, and sentiment analysis work together within the overall system. Each sub model contributes to the comprehensive functioning of the system, ensuring a tailored and high-quality user experience.

Sub models:

1.   Personalized Meal Suggestions Algorithm:

Input: User preferences (U): User preferences, indicating preferred cuisine Dietaryrestrictions, etc.
Historical data (H): Historical data, providing insights into past meal preferences and choices.
Output: Set of personalized meal suggestions (S) tailored to the user's preferences.
Mathematical Formulation: $(S = f(U, H))$

The algorithm (f) processes user preferences (U) and historical data (H) to generate personalized meal suggestions (S). The specifics of the algorithm would involve techniques like collaborative filtering, content-based filtering, or machine learning models trained on historical data.

2.   Order Processing:

Input: User order details (D): User order details, specifying the type and quantity of food requested.

Real-time conditions (R):
Real-time conditions, considering factors like order demand.
Output: Order confirmation (O), delivery schedule.
Mathematical Formulation: $(O = g(D, R))$

The order processing function (g) considers user order details (D) and real-time conditions (R) to confirm orders (O) and schedule deliveries. This could involve algorithms to optimize delivery routes and estimate delivery times.

3.   Sentiment Analysis:

Input: User feedback (F) - User feedback, including comments, ratings and sentiments related to the delivered meals.

Output: Service quality metrics (M) derived from sentiment analysis.

Mathematical Formulation: $(M = h(F))$

The sentiment analysis function (h) processes user feedback (F) to generate service quality metrics (M). This may involve natural language processing (NLP) techniques, machine learning models, or pre-trained sentiment analysis tools to determine the sentiment and satisfaction level expressed in user comments.

V.   MODELING

A. *Use Case Diagram*

A use case diagram is a type of behavioral diagram defined by the UML created from a use case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals represented as use case and any dependencies between those use cases.

Four modeling elements make up the use case diagram; these are:

* **Actors:** Actors refer to a type of users, users are people who use the system. In this case common public (intended user), mess owner and admin are the users of the application.

* **Use cases:** A use case defines behavioral features of a system. Each use case is named using a verb phrase that express a goal of the system. The name may appear inside or outside the ellipse.

* **Associations:** An association is a relationship between an actor and a use case. The relationship is represented by a line between an actor and a use case.

* **The include relationship:** It is analogous to a call between objects. One use case requires some type of behavior which is fully defined in another use case.
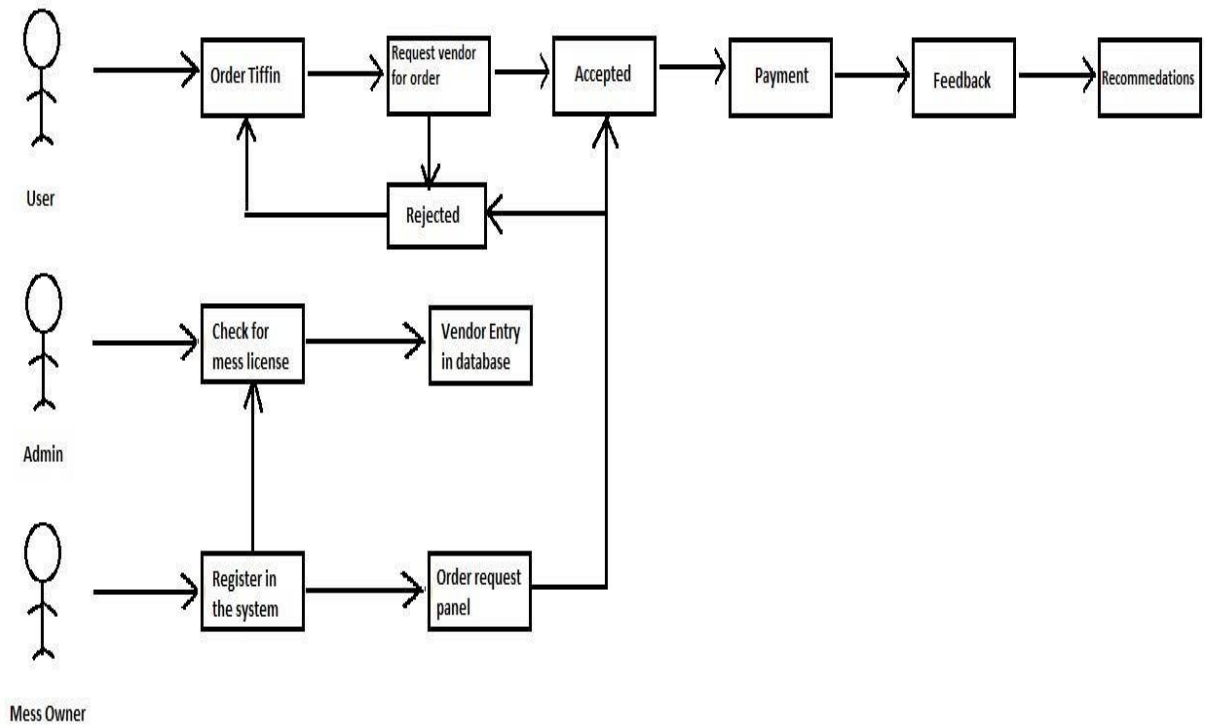
Figure 1: Use Case Diagram

B. Class Diagram

The class diagram shows the building blocks of any object-oriented system. Class diagram depicts a static view of the model or part of the model, describing what attributes and behavior it has rather that the detailing the methods of achieving operations. Class diagrams are most useful in illustrating relationships between classes and interfaces. Generalizations, aggregations, and associations are all valuable in reflecting interface, composition or usage and connections receptively.

The Figure 6.2 illustrates aggregation relationships between classes. This UML class diagram indicates how different classes are interrelated and the relation by which they are related. It also defines the attributes of the different classes and processes in that respective class.
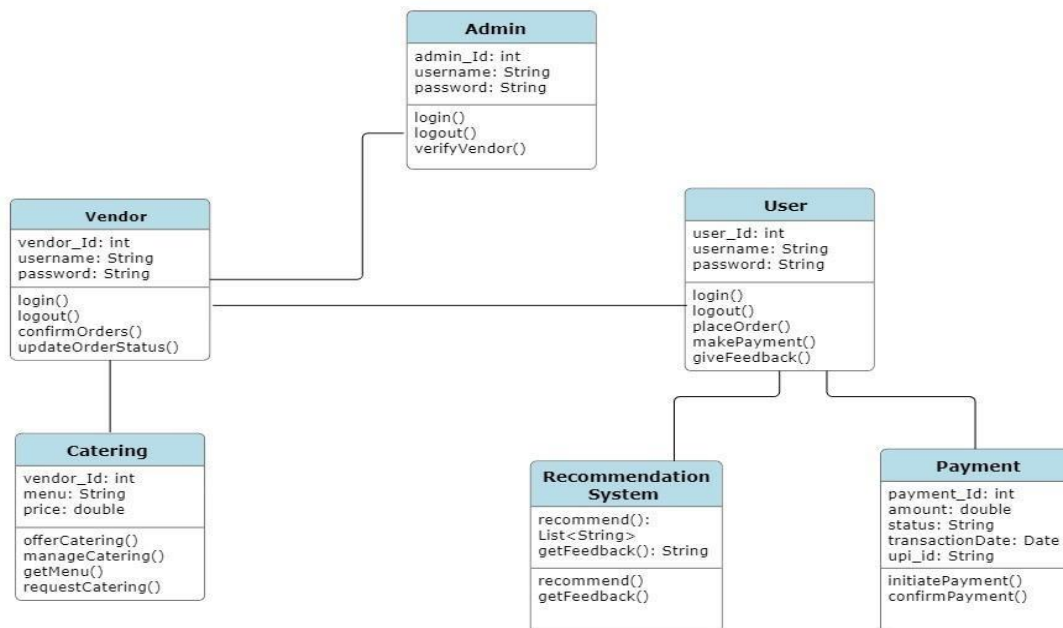

Figure 2: Class Diagram

VI.   CONCLUSION

In summary, our tiffin ordering system revolutionizes the meal-ordering experience through its advanced features such as sentiment-based recommendations, driven by machine learning, data analytics, and user profiling. The platform, accessible on both desktop and mobile devices, not only streamlines the ordering process but also categorizes valuable feedback, providing unparalleled insights. Our ongoing commitment to innovation ensures adaptability to changing trends, all while upholding the highest standards of data privacy and regulatory compliance. As a result, our user-friendly interface and cutting-edge technologies empower both consumers and businesses, making us a trusted leader in the online tiffin ordering space.

In essence, our tiffin ordering system is more than just a convenience; it's a dynamic ecosystem dedicated to enhancing the dining journey. By prioritizing user satisfaction, continuous innovation, and ethical practices, we stand as a beacon of reliability. As we navigate the future, our platform remains at the forefront of the industry, offering a seamless and secure solution that not only meets but anticipates the evolving needs of our users in the ever-changing landscape of online food services.

REFERENCES

[1]   Meals on Wheels: A Platform to Connect Tiffin Services to Users; Jayant Patil, Somesh Kumar, MinakshiPaonia, Pinku Ranjan, IEEE Conference, DOI: 10.1109/IATMSI56455.2022.10119379, December 2022.

[2]   *Digital Tiffin Services Using Responsive Web Application*; Akash Shinde, Premchand Kumar, Minal Lonkar,Abdul Sheikh, Rohan Bhandopia, International
Journal for Research in Applied Science and Engineering Technology (IJRASET), Volume 11, May 2023.

[3]   *Online Tiffin Service;* Gurucharan Kapale, Rushikesh Naikwadi, Rushikesh Devkar, Om Pardeshi, Snehal Gorde, International Research Journal of Modernization in Engineering Technology and Science (IRJMETS), Volume:04, Issue:05, May-2022.

[4]   *Recommendation System Based on Deep Sentiment Analysis and Matrix factorization*; Ning Liu and JianhuaZhao, IEEE Journal, Volume 11-2023, February 2023.

[5]   *A study on tam: analysis of customer attitudes in online food ordering system*; Serhat Murat Alagoza, HalukHekimoglub,Elsevier Ltd. 2012.

[6]   *Digital Ordering System for Restaurant Using Android*; Ashutosh Bhargave, Niranjan Jadhav, Apurva Joshi, Prachi Oke, S. R Lahane, International Journal of Scientific and Research Publications 2013.