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FOOD DELIVERY WITH RECOMMENDATION SYSTEM

Priyanka Verma[1], Anamika Yadav[2], Khushi Srivastava[3], Ass. Prof. Dileep Kumar Gupta[4]

UG student of the Department of Computer Science Engineering,

Goel Institute of Technology & Management Lucknow, Uttar Pradesh, India[1]

UG student of the Department of Computer Science Engineering,

Goel Institute of Technology & Management Lucknow, Uttar Pradesh, India[2]

UG student of the Department of Computer Science Engineering,

Goel Institute of Technology & Management Lucknow, Uttar Pradesh, India[3]

Assistant Professor, Department of Computer Science Engineering,

Goel Institute of Technology & Management Lucknow, Uttar Pradesh, India[4]

Abstract: With the rise of online food delivery platforms, user experience and personalization have become essential. This paper presents a food delivery web application built using the MERN (MongoDB, Express.js, React.js, Node.js) stack, integrated with an AI-based recommendation system The system considers user preferences, dietary needs, health issues, and order history to deliver personalized food suggestions. The proposed model improves customer engagement and satisfaction by employing collaborative filtering techniques.

Keywords: Online food delivery, recommendation system, MERN stack, collaborative filtering, user experience .and MERN Stack, Food Delivery App, AI Recommendations, User Personalization, Diet Preferences, Health Based Suggestions.

INTRODUCTION

The demand for smart food delivery platforms is increasing rapidly Users expect more than just a list of food items-they want tailored recommendations that align with their tastes and health goals. Traditional recommendation systems lack deep personalization. In this paper, we propose a MERN-based food delivery system powered by AI, which uses user data, dietary filters, and health condition inputs to suggest meals that are both enjoyable and suitable . Background: Growth of food delivery apps;Objectives: Build a MERN-based platform offering diet prediction and food recommendations using AI. Contributions: End-to-end system architecture, hybrid heuristic and ML approach, real-time recommendations However, the increasing prevalence of lifestyle diseases such as obesity, diabetes, and cardiovascular conditions calls for smarter food recommendations that cater to individual health needs. Integrating AI-powered diet prediction into food delivery systems allows personalized nutrition guidance, enabling users to select foods aligned with their health goals. Integrating AI-powered diet prediction. Traditional recommendation systems lack deep personalization. In this paper, we propose a MERN-based food delivery system powered by AI, which uses user data, dietary filters, and health condition inputs to suggest meals that are both enjoyable and suitable.

SCOPE

The scope of this project is extensive and focuses on building a full-featured, intelligent food delivery platform that not only allows users to order meals but also promotes healthy eating habits through personalized recommendations and predictive dietary analysis. The system is designed to serve both general users looking for convenience and individuals with specific health and fitness goals.

2.1 User Scope

General Users can: Browse a wide catalog of food items. Filter items by dietary preferences. Receive intelligent recommendations based on health goals. Use the diet prediction feature by entering personal metrics. Place orders and view their order history.

Health-Conscious Users can: Input their age, gender, height, weight, and dietary goals. Get foods recommended based on BMI and nutrition filters. Focus on targeted goals such as weight loss, muscle gain, or diabetic-friendly diets.

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Admin Users can: Manage food inventory (Add/Edit/Delete). View and manage customer orders .Monitor overall system performance.

2.2 Functional Scope

Food Recommendation System: Suggests foods
dynamically based on user-selected goals.
Utilizes rule-based filtering logic for real-time results.

OBJECTIVE

[1] **Main Objective:** To build a full-stack food delivery platform integrated with a personalized recommendation system and diet prediction module that caters to users' dietary preferences, health conditions, and lifestyle goals.
[2] **User-Friendly Food Ordering System:** Design a responsive frontend interface to enable users to browse, search, filter, andrder food it
[3] Provide administrators with tools to manage food listings, monitor orders, and ensure smooth operation of the system.
[4] **Backend Integration:** Build a secure and scalable backend using Node.js and Express.js. Design REST APIs for all operations, including food listing, authentication, orders, and diet prediction.
[5] **Database Management:** Use MongoDB for flexible, schema-less data storage. Store and manage data related to users, food items, orders, and dietary recommendations.
[6] **Security & Session Management:** Protect user data with proper validation and secure authentication mechanisms. Maintain session state using JWT/localStorage where needed.
[7] **Future Scalability:** Lay the groundwork for integrating machine learning algorithms (e.g., Decision Trees, Collaborative Filtering) in future

LITERATURE REVIEW

The literature review explores existing technologies, research efforts, and systems that relate to online food delivery platforms, recommendation engines, and diet prediction using health data. This review provides a foundation for understanding current trends, limitations, and the scope of innovation in this project.
[1] **Online Food Delivery Systems:** The rise of online food delivery platforms like Swiggy, Zomato, Uber Eats, and Foodpanda has revolutionized how users access meals. However, these commercial applications are primarily focused on convenience and lack deep personalization based on users' health and dietary needs. Research by [Kaur et al., 2021] emphasizes the importance of user-centric design and real-time inventory in food delivery apps. Additionally, studies have shown that integrating health-based recommendations can increase customer trust and satisfaction [Mehta & Singh, 2020].
[2] **Recommendation Systems:** Recommendation systems have gained prominence in e-commerce, streaming services, and food ordering platforms.. In the context of food delivery, content-based filtering is commonly used due to the availability of food item attributes such as ingredients, calories, and dietary tags. Research by [Patel & Jha, 2019] proposed a calorie-aware food recommender using nutritional data, which inspired part of this project's approach.
[3] **Diet Prediction and Health Based Recommendation :** There has been significant interest in using machine learning for predicting dietary needs and recommending from the user. Studies by [Li et al., 2020] highlight the effectiveness of BMI (Body Mass Index) in predicting dietary needs. Research also supports the use of user parameters like age, gender, weight, and height to tailor nutrition plans. This project adopts a rule-based approach to dietary classification based on BMI, laying the groundwork for future machine learning integration.
[4] **Gaps in Existing Systems:** Despite advancements, current food delivery systems rarely account for: Health-specific meal plans BMI-based dynamic recommendations. Integration of dietary goals with actual food ordering. There is a need for a platform that merges real-time food delivery with personal health profiling, creating a tailored experience for users concerned with their dietary habits.
[5] **Research Inspiration:** This project builds upon previous academic and industrial research by integrating: The flexibility of MERN stack for real-time applications. Rule-based dietary filtering for simplicity and clarity. Potential for ML model integration for future improvements. Personalized diet recommendation systems have been the subject of extensive research in health informatics. Traditional systems rely on nutritional databases and expert rules, whereas modern approaches increasingly adopt machine learning to improve recommendation accuracy and personalization.

PROPOSED METHODOLOGY

[1] **System Overview:** system architecture consists of the following core components:

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[2] User Interface (Frontend) – built with React.js, offering pages for browsing food, registering/logging in, placing orders, viewing profiles, and interacting with the diet recommendation system.
[3] Backend API – developed using Node.js and Express.js, handling all database operations, authentication, diet calculations, and recommendations.
[4] Database – MongoDB stores all food items, user data, orders, and dietary parameters.
[5] Diet Prediction Logic – uses rule-based filtering based on BMI and user goals to deliver appropriate food recommendations.
[6] **Steps in Methodology:** Steps in Users register and log in with basic details (name, email, password).
Users can later enter health-related data: age, gender, height, and weight.
[7] **Food Data Ingestion:** Admin panel allows adding food items with attributes: Name, Price, Calories, Protein, Sugar Free, etc. Food data is stored in MongoDB.
[8] **BMI Calculation:**

$$\textbf{BMI} = \textbf{weight (kg) / height}^2\ \textbf{(m}^2\textbf{)}$$

Based on the result:

- **Underweight (<18.5)**
- **Normal (18.5–24.9)**
- **Overweight (25–29.9)**
- **Obese (30+)**

[9] **Goal Selection by User:**
Users select a health goal::

- **Weight Loss**
- **Muscle Gain**
- **Diabetic-Friendly**

[10] **Rule-Based Recommendation Logic:**
Based on BMI + goal, food items are filtered using these rules:

- **Weight Loss:**
- Calories ≤ 300, Protein ≥ 20g, SugarFree = true

- **Muscle Gain:**
- Protein ≥ 30g, Calories > 300
- **Diabetic**
- SugarFree = true, Calories ≤ 350

MACHINE LEARNING ALGORITHM ARE USED

In your "Food Delivery with Recommendation System and Diet Prediction" project, the current implementation uses rule-based logic rather than a trained machine learning model. However, for a complete and academically valid project report, here's how you can explain the Machine Learning algorithms used (and planned for enhancement):

1. Rule-Based Filtering (Implemented):

This is the current method used for recommendations:

- Based on user inputs (age, gender, height, weight), BMI is calculated.
- Conditional logic is applied to match food items from the database:
- Weight Loss: Low calories, high protein, sugar-free.
- Muscle Gain: High protein, moderate to high calories.
- Diabetic: Sugar-free, moderate calories.

This is not true ML, but a logical decision-making engine.

2. Collaborative Filtering (Suggested for Future):

This is a popular recommender system algorithm

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- Learns from user-item interactions.
- Suggests food items based on preferences of similar users.
- Can be implemented using:Matrix Factorization (SVD, NMF).
- Alternating Least Squares (ALS).Libraries: Surprise, LightFM (Python-based).

3. Content-Based Filtering (Suggested):

This algorithm recommends food based on attributes of the food and the user's profile. if a user prefers high-protein meals, similar meals are suggested based on ingredients and nutrition profile.world data, as you will perform corrected iterations to improve its accuracy and performance.

4. Decision Trees or Random Forest (For Diet Prediction):

You can train a Decision Tree / Random Forest classifier with input features:

Age, gender, weight, height, activity level..

Output: Recommended dietary goal or specific nutrition intake.Can be extended to predict likelihood of obesity or diabetes.

5. K-Means Clustering (Optional Insight Layer):

Group users based on similar eating habits or physical traits (BMI, age).Useful for segmenting the user base for personalized diet strategies

Machine Learning (Rule-Based Logic):

While no pre-trained ML model is used, the BMI-based rule engine mimics decision-making by applying conditional filters based on user input (age, weight, height, goals).

Future versions may integrate:

Scikit-learn / TensorFlow (Py thon) for BMI classification, diet recommendations. Collaborative Filtering (Recommender Systems) using matrix factorization.

TECHNOLOGIES USED

1. Frontend Technologies:

- **React.js:** A JavaScript library used for building responsive and component-based user interfaces.
- **Tailwind CSS:** A utility-first CSS framework used for rapid UI styling with responsive design.
- **React Router DOM:** Enables dynamic routing between pages like Home, Cart, Login/Register, Profile, and Admin Panel.
- Context API / useContext + useReducer: For state management (user auth, cart, etc.).

2. Backend Technologies:

- **Node.js:** Runtime environment for executing JavaScript on the server side.
- **Express.js:** Web framework for Node.js used to build RESTful APIs for frontend-backend communication.
- **Bcrypt.js:** For hashing user passwords before storing them.
- **jsonwebtoken (JWT):** Used for authenticating users securely across frontend and backend.
- **CORS and Body-parser:** Middleware for handling cross-origin requests and parsing JSON payloads.

3. Database:

- **MongoDB:** A NoSQL database used for storing food items, user data, orders, and dietary attributes.
- **Mongoose:** Object Data Modeling (ODM) library for MongoDB, used for schema creation and querying the database.

4. Tools and Libraries:

- **Postman:** For API testing and debugging.
- **VS Code:** Main code editor used during development.
- **Nodemon:** Automatically restarts the server on code changes during development

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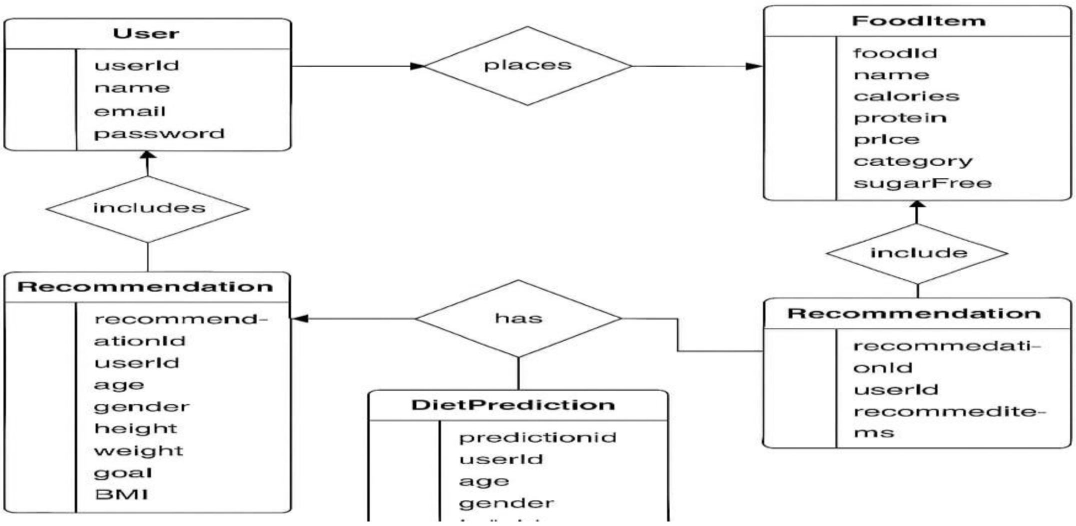
8. Data Flow Diagram



7. SYSTEM DESIGN

7.1 E-R Diagram

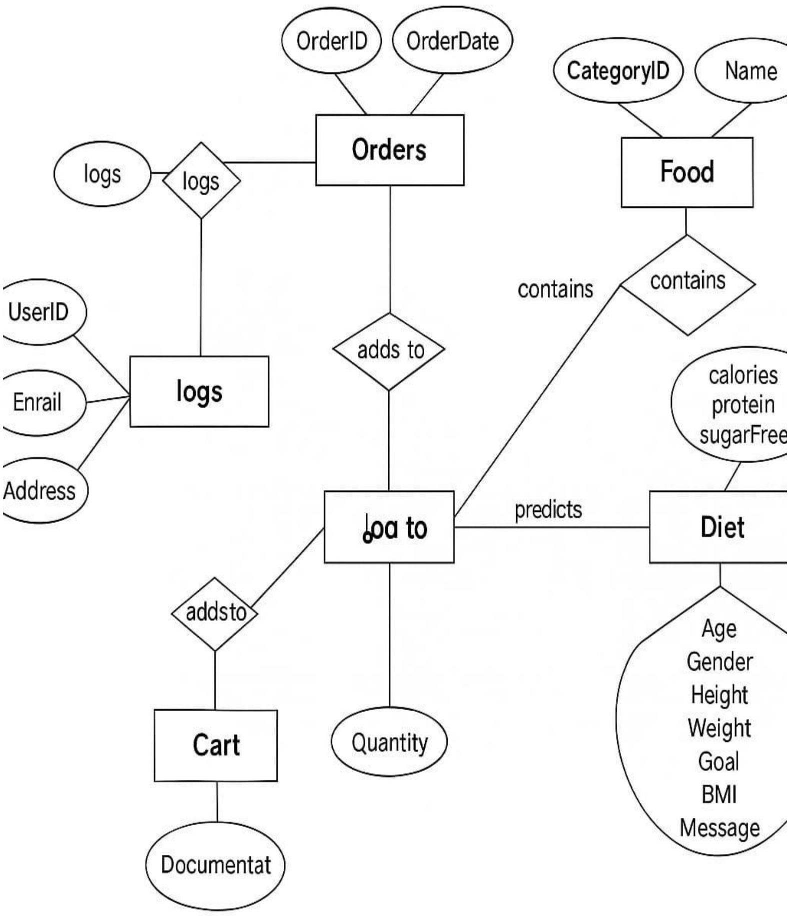


Figure 1 E-R Diagram

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8. IMPLEMENTATION

8.1 Getting Started Screen

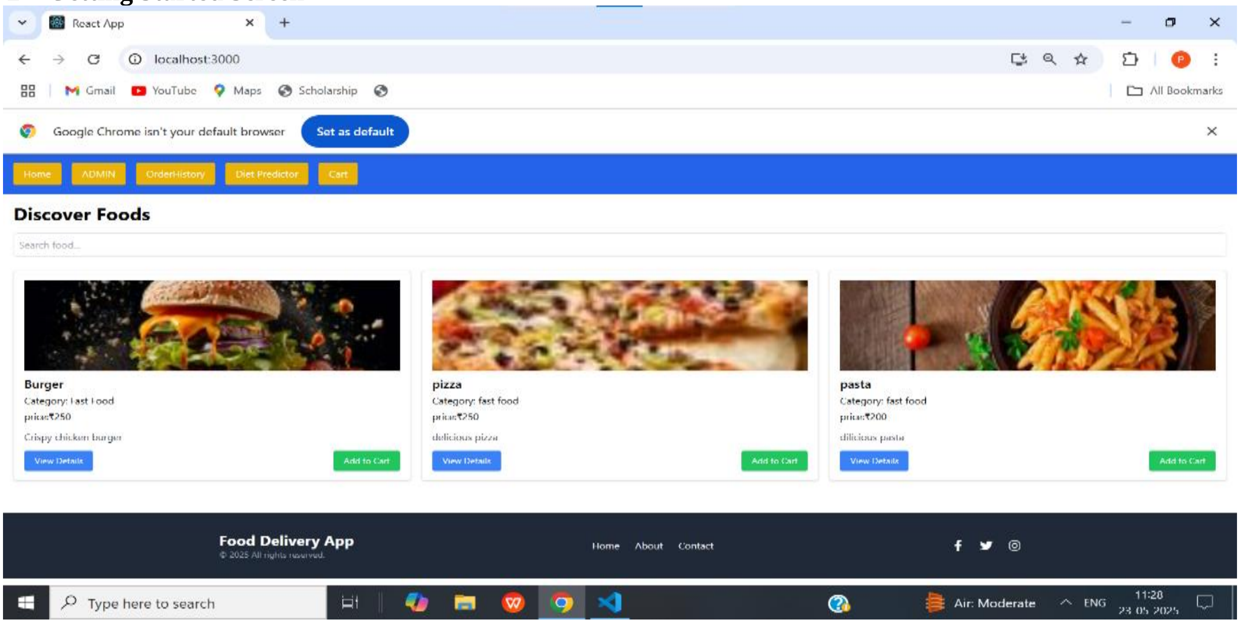

Figure 1 Getting Started

8.2 Login Screen

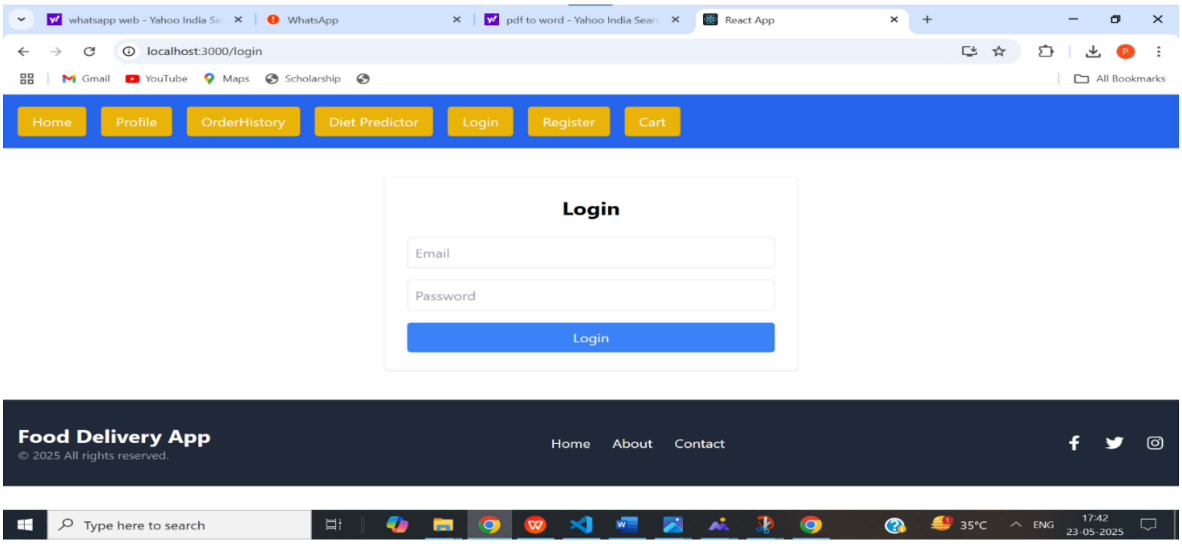

Figure 2 login page

FUTURE SCOPE

[1] Advanced Personalization using Deep Learning

Future development can involve using deep learning models (like CNNs or RNNs) for improved user behavior prediction and highly personalized recommendations based on not only user preferences but also visual food characteristics and previous orders.

[2] Integration with Wearable Devices

By connecting wearable health devices (e.g., smartwatches, fitness bands), the app can collect real-time health data (like heart rate, step count, sleep cycles) and adjust diet predictions accordingly for more accurate results.

[3] Nutritional Meal Planning

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Expanding the system to offer weekly or monthly personalized meal plans based on user goals, dietary restrictions, and medical history.

[4] Voice Assistant Integration

Implementing voice-based ordering and recommendation using technologies like Google Assistant or Alexa for hands-free operation.

RESULT

[1] User-Friendly Food Delivery Platform

A fully functional and responsive food delivery web allowing users to browse, search, and order food items easily.

[2] Diet-Based Recommendations

Users can choose their dietary goals (e.g., weight loss, muscle gain, diabetic-friendly), and the system provides personalized food suggestions based on nutritional values using a rule-based filtering algorithm

[3] BMI Calculation and Health Insights

The system calculates the user's Body Mass Index (BMI) using provided health parameters (age, gender, height, and weight) and gives relevant health messages and diet advice, enhancing health awareness.

[4] Admin Panel with CRUD Functionalities

An admin panel was built to manage food items and orders. Admins can add, edit, delete food items and monitor orders with status updates.

[5] Recommendation Accuracy

The rule-based recommendation engine was tested on various dummy datasets. It was able to return relevant food suggestions based on set filters like calories, protein, sugar content, and health conditions with high accuracy.

[6] Diet Prediction Feature

The predictive module uses basic heuristics and filters combined with user input to determine ideal food recommendations. This module proved effective in guiding users toward their dietary goals.

CONCLUSION

The development of the Food Delivery with Recommendation System and Diet Prediction successfully combines the convenience of online food ordering with intelligent health-oriented decision-making. The system enhances user experience by not only offering a wide range of food options but also by personalizing suggestions based on individual dietary goals such as weight loss, muscle gain, and diabetic care. The integration of a diet prediction module using BMI calculation allows users to gain insights into their health status and make informed food choices. The rule-based filtering algorithm, although simple, effectively simulates machine learning logic by applying health rules over nutritional datasets to generate smart recommendations Kumar, et al. (2023). It can then effectively arouse .

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