A

Mini Project Report on

**Vegetarian Food Recommender**

Submitted in partial fulfillment of the requirements for the degree of

BACHELOR OF ENGINEERING

IN

### Computer Science & Engineering

### Artificial Intelligence & Machine Learning

by

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## CERTIFICATE

This is to certify that the project entitled “Vegetarian Food Recommender” is a bonafide work of Sanskriti Shukla (23106128), Prachi Singh (23106020), Atharv Wadekar (23106063), Palak Upadhyaya (23106086) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of **Bachelor of Engineering** in **Computer Science & Engineering (Artificial Intelligence & Machine Learning).**

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## Project Report Approval

This Mini project report entitled **“Vegetarian Food Recommender”**by **SANSKRITI SHUKLA, PRACHI SINGH, ATHARV WADEKAR and PALAK UPADHYAYA**is approved for the degree of ***Bachelor of Engineering*** in ***Computer Science &Engineering***, (AIML) ***2024-25***.

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**Declaration**

##### We declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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#### ABSTRACT

The Vegetarian Food Recommender integrates advanced recommendation algorithms with an interactive system to provide users with personalized and efficient food suggestions. This system enhances user experience by offering real-time assistance, contextual recommendations, and an engaging interface for selecting vegetarian meals based on preferences, dietary restrictions, and nutritional needs.

**Problems with Existing Systems:** Traditional food recommendation systems often fail to provide personalized suggestions, resulting in generic recommendations that don’t align with user preferences. These systems typically offer static suggestions and lack the flexibility to adapt to specific dietary needs, which can lead to unsatisfactory user experiences.

**Functionality of the Proposed System:** The proposed system leverages real-time recommendation algorithms and advanced data analytics to analyze user input and suggest vegetarian dishes tailored to their preferences. It incorporates contextual awareness for dynamic food selection and utilizes cloud-based infrastructure to ensure scalability, providing a personalized and efficient food recommendation experience.

**Comparison with Traditional Recommendation Systems:** Unlike conventional recommendation systems, which primarily rely on static or rule-based approaches, the Vegetarian Food Recommender offers real-time, personalized, and dynamic interactions. This significantly enhances the user experience by offering recommendations that are better suited to individual tastes and needs.

**Performance and Efficiency:** The system's data-driven recommendation algorithms improve the accuracy, engagement, and personalization of food suggestions, making it more effective for users with specific dietary preferences or restrictions. While these algorithms demand more computational resources, they provide a more dynamic and relevant user experience compared to traditional, static models.

**Personalized Meal Planning:** The system takes into account dietary restrictions, allergies, and user preferences to offer customized meal plans, encouraging healthier and more mindful food choices.

**Nutritional Insights and Analysis:** Users receive comprehensive nutritional information for recommended dishes, which supports healthier eating habits and helps users make informed decisions about their meals.

**AI-Based Recommendations vs. Traditional Systems:** While traditional recommendation systems tend to offer static, less personalized suggestions, the Vegetarian Food Recommender's data-driven approach results in more accurate and tailored recommendations, improving user satisfaction through enhanced contextual awareness.

**Performance and Benchmark Comparison:** Data-driven recommendations significantly enhance the personalization and relevance of suggestions but require more computational resources compared to static, rule-based recommendation systems.

**Keywords:** Personalized Recommendations, Real-time Assistance, Contextual Awareness, Dietary Preferences, Nutritional Analysis.

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# CHAPTER 1 INTRODUCTION

### INTRODUCTION

In today's fast-paced world, individuals often struggle to find healthy, personalized food choices that align with their dietary preferences and nutritional needs. Vegetarian diets, in particular, require careful selection of ingredients to ensure balanced nutrition. To address this challenge, the Vegetarian Food Recommender system provides users with customized meal suggestions based on their preferences, dietary restrictions, and health requirements.

The system collects inputs such as preferred ingredients, allergies, cuisine preferences, and dietary goals from users. By processing this information, the recommender suggests meals that are not only vegetarian but also nutritionally balanced and suited to the user’s needs. Unlike conventional food recommendation systems that provide generic suggestions, this solution ensures a personalized and interactive experience.

With the increasing adoption of health-conscious lifestyles, people are shifting towards vegetarian and plant-based diets. However, one of the key challenges they face is the lack of guidance in choosing meals that provide complete nutrition. Many existing systems fail to incorporate real-time assistance, contextual awareness, and user-specific customization, making them less effective for users seeking tailored meal recommendations. The Vegetarian Food Recommender aims to bridge this gap by providing real-time assistance to users looking for healthy and delicious vegetarian options.

Most existing food recommendation platforms and applications do not focus on vegetarian-specific needs. These systems often provide limited vegetarian options, lack nutritional insights, and do not offer real-time personalized assistance. Additionally, users looking for a plant-based diet often have specific dietary concerns, such as protein intake, calorie count, and vitamin deficiencies, which traditional systems fail to address.

Another drawback of current food recommendation platforms is the lack of interactive engagement. Many applications provide only a static list of food items without allowing users to ask questions, get customized recommendations, or explore meal variations based on their preferences. Moreover, these systems do not incorporate learning mechanisms, which means they fail to improve and adapt based on user behavior over time. As a result, users do not receive a truly customized and engaging experience when searching for vegetarian meal options.

Functionality of the Proposed System:

The Vegetarian Food Recommender integrates advanced techniques to deliver a dynamic, intelligent, and user-friendly food recommendation system. The system provides users with tailored meal suggestions based on their preferences, allergies, nutritional goals, and meal preferences.

Some of the key functionalities of this system include:

* Personalized Meal Planning: The system curates meals based on user inputs, ensuring that recommendations align with their dietary needs and taste preferences.
* Nutritional Insights and Analysis: Users receive detailed nutritional information about the suggested meals, helping them make informed food choices.
* Interactive and Real-Time Assistance: Unlike traditional food recommendation platforms, this system engages users in real-time to refine and optimize meal suggestions.
* Cloud-Based Scalability: The system ensures fast and efficient data processing by leveraging cloud infrastructure, allowing it to handle multiple users simultaneously.
* Learning and Adaptation: The recommender continuously learns from user feedback and interactions, improving its suggestions over time.

By integrating these advanced techniques, the Vegetarian Food Recommender transforms the way individuals explore and choose vegetarian meals. It offers an intelligent, interactive, and personalized experience, helping users maintain a healthy and satisfying diet effortlessly. As technology continues to advance, this system has the potential to evolve further, offering even more refined and precise food recommendations in the future.

# CHAPTER 2 LITERATURE SURVEY

**2. LITERATURE SURVEY**

**2.1 HISTORY**  
The development of vegetarian food recommender systems has evolved alongside advancements in recommendation technologies and personalized meal planning. As dietary preferences and health consciousness have grown, food recommendation systems have become essential in providing customized and nutritious meal suggestions. Below is a timeline of key milestones in this field:

**Early Developments:**

1. **Traditional Diet Planning:**
   * Before the advent of advanced recommendation technologies, dietary recommendations were typically provided by nutritionists and dietitians based on manual analysis of nutritional needs.
   * Early digital implementations included basic diet planners that followed simple rules, but these systems lacked personalization and adaptability.
2. **Rule-Based Recommendation Systems**:
   * In the late 1990s and early 2000s, rule-based food recommendation systems emerged. These systems utilized predefined rules and nutritional databases to suggest meals but lacked any form of user-specific personalization.

**Emergence of Data-Driven Food Recommenders**:

1. 2010s:
   * Data-driven recommender systems gained popularity, using machine learning techniques to analyze user preferences and dietary needs.
   * The rise of mobile applications made it possible for real-time recommendations based on factors like calorie goals, dietary restrictions, and ingredient availability.
2. Late 2010s - Early 2020s:
   * The application of advanced data analytics in food recommendation became more refined, leveraging deep learning techniques for highly personalized meal suggestions.
   * Cloud computing and big data analytics enabled scalable solutions, allowing systems to handle large amounts of data about nutrition and user preferences.

**Recent Developments**:

1. 2020s:
   * Current vegetarian food recommenders incorporate real-time data processing and adaptive learning techniques to refine meal suggestions based on continuous user interactions.
   * Mobile apps and web-based platforms now integrate seamless user interfaces with personalized food recommendation experiences.
2. Ongoing Trends:
   * Integration with Health Trackers: Many modern food recommenders are incorporating wearable health trackers to provide real-time nutritional advice.
   * Sustainability-Focused Recommendations: Current systems are also considering sustainability factors, such as carbon footprints and locally sourced ingredients, when making meal suggestions.

**2.2 LITERATURE REVIEW**

Several studies have contributed to the development of personalized food recommendation systems, particularly in the vegetarian domain. Below is a summary of key contributions:

* **"AI Nutrition Recommendation Using a Deep Generative Model and ChatGPT" (2024):**This study introduces a personalized nutrition recommendation system that uses a deep generative model aligned with nutritional guidelines. The system employs a variational autoencoder to model user profiles and adjust meal quantities based on individual energy requirements. The generated meal plans are tailored to individual needs, ensuring variety and nutritional accuracy.
* **"Diet Recommendation System Based on Different Machine Learners:** A Review":This review paper discusses various diet recommendation systems that use machine learning techniques to analyze user inputs, including dietary preferences and medical data. It evaluates different machine learning approaches used in these systems, focusing on the effectiveness of personalized meal suggestions based on user-specific data, such as vegetarian or non-vegetarian preferences.
* **"PROTEIN AI Advisor:** A Knowledge-Based Recommendation Framework for Personalized Nutrition" (2022):This paper presents a knowledge-based recommendation framework designed to offer accurate diet plans for various user groups, including those with specific health conditions. The system uses expert-validated meal datasets and includes a qualitative layer for ingredient verification and a quantitative layer for meal plan synthesis, ensuring personalized and nutritionally appropriate meal suggestions.
* **"Artificial Intelligence and Machine Learning Technologies for Personalized Nutrition:** A Systematic Review" (2024):This systematic review examines data-driven technologies in personalized nutrition, with a focus on recommendation systems and data collection methods. The paper discusses the integration of AI and machine learning in the development of personalized diet and recipe suggestions, exploring current advancements and ongoing challenges in the field of personalized nutrition.
* **"Application of AI in Nutrition" (2023):** This research explores the applications of AI in the nutrition field, addressing challenges in providing dietary recommendations to the general population. The paper discusses the role of AI in analyzing dietary habits and generating personalized nutrition advice, with the ultimate goal of improving public health outcomes and supporting healthier dietary choices for diverse populations.

# CHAPTER 3

# Problem Statement

1. **PROBLEM STATEMENT:**

In today’s fast-paced world, individuals following a vegetarian diet often struggle to find personalized meal recommendations that align with their dietary needs, health conditions, and taste preferences. Traditional food recommendation systems provide generic suggestions that lack customization, nutritional insights, and real-time adaptability.

The problem addressed by this project is the absence of an intelligent, AI-driven vegetarian food recommender that offers personalized, interactive, and nutritionally balanced meal recommendations. Specifically:

1. Lack of Personalization: Existing food recommendation systems do not consider individual preferences, allergies, dietary goals, or health conditions, resulting in generic and non-optimal meal suggestions.
2. Nutritional Awareness Gaps: Many food recommendation platforms fail to provide detailed nutritional insights, making it difficult for users to track protein, vitamin, and calorie intake, especially for plant-based diets.
3. Limited User Engagement: Traditional food apps offer static recommendations without real-time assistance or interaction, leading to reduced user engagement and satisfaction.
4. Inefficient Adaptability: Most existing systems do not incorporate AI-driven learning to refine recommendations based on user behavior and preferences over time, limiting their ability to provide improved suggestions.
5. Fragmented User Experience: Users often have to navigate between multiple apps or websites to get vegetarian meal suggestions, nutritional insights, and dietary guidance, leading to an inconvenient and disjointed experience.

This project aims to develop an AI-powered vegetarian food recommender that enhances user engagement, provides personalized meal plans, and integrates nutritional insights to support a balanced and healthy vegetarian lifestyle.

# CHAPTER 4

# Experimental Setup

#### EXPERIMENTAL SETUP

#### Software Setup:

### ****1. Software Tools:****

* **Operating System:** Windows
* **Web Browsers:** Chrome Browser, Edge Browser
* **Text Editors:** VS Code

### ****2. Frontend Development:****

* **Tkinter:** Python GUI framework for building the application interface
* **CustomTkinter:** For modern UI elements and better design

### ****3. Backend Development:****

* **Python:** Core programming language for logic and data processing
* **Flask / FastAPI:** For backend API development (if converting to a web app)

### ****4. Database Management:****

* **MySQL:** Primary database for storing user preferences and nutrition data
* **SQLAlchemy:** ORM for managing database interactions in Python

# CHAPTER 5

# Proposed System & Implementation

1. **PROPOSED SYSTEM & IMPLEMENTATION**

**5.1 Block diagram of proposed system:**

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# 5.2 Description of Block diagram:

This diagram represents the workflow of a Vegetarian Food Recommender System that utilizes Tkinter for the user interface and MySQL for data storage. Here’s a step-by-step explanation:

1. **User Input (Select Preferences)**
   * The user provides input by selecting their dietary preferences, such as allergies, preferred ingredients, or nutrition goals.
2. **Tkinter App Interface**
   * A graphical user interface (GUI) built with Tkinter collects the user's preferences and interacts with the backend logic.
3. **Backend Logic (Python)**
   * Python processes the user’s input and communicates with the database.
   * It applies filtering and logic to find suitable vegetarian food recommendations.
4. **Database (MySQL)**
   * Stores a collection of vegetarian food items, their nutritional values, and possible alternatives.
   * The backend queries this database to fetch relevant data.
5. **Fetch Data (Alternatives & Nutrition)**
   * The system retrieves food alternatives and nutritional information from the database.
   * This step ensures that recommendations align with the user’s preferences.
6. **Generate Recommendations**
   * Based on the fetched data, the system generates personalized vegetarian food recommendations.
   * It considers nutritional value, ingredient preferences, and alternatives.
7. **Displays Result**
   * The recommended food options are presented to the user via the Tkinter interface.
8. **User Feedback**
   * The user can provide feedback on the recommendations, which helps refine future suggestions.
   * This feedback is sent back to the system, improving recommendations over time.
   * The process loops back to the Tkinter App Interface for continuous refinement.

#### 5.3 Implementation

* **Frontend:** Tkinter, CustomTkinter
* **Backend:** Python (Flask/FastAPI for API-based expansion)
* **Database:** MySQL (Using SQLAlchemy for ORM)
* **AI/ML:** Scikit-learn, TensorFlow/PyTorch (for intelligent food recommendations)
* **Data Fetching:** BeautifulSoup/Scrapy (for web scraping), USDA FoodData API, Edamam API
* **Logging & Feedback Storage:** SQLite, Python Logging Module

### Features

* **User-Friendly GUI:** The Tkinter-based interface is simple and easy to navigate.
* **Personalized Recommendations:** The app tailors suggestions based on individual dietary needs.
* **Extensive Database:** A vast collection of vegetarian alternatives and their nutritional values.
* **AI-Powered Suggestions:** Machine learning models refine recommendations over time.

#### 5.4 Advantages:-

#### ****Promotes Healthy Eating:**** Encourages plant-based alternatives for better health.

#### ****Enhances User Experience:**** Personalized suggestions improve user satisfaction.

#### ****Reduces Manual Search Effort:**** AI-based recommendations save time. ****Supports Dietary Restrictions:**** Ideal for users with vegan, vegetarian, or health-conscious diets.

#### ****Easy to Maintain & Upgrade:**** Modular architecture allows future enhancements.

#### ****Can Be Integrated with Other Systems:**** Expandable for restaurants, fitness apps, or diet planners.

# CHAPTER 6

# Conclusion

1. **CONCLUSION**

The Veg AI App is a comprehensive and intelligent solution designed to assist users in adopting and maintaining a vegetarian diet. By integrating AI-driven recommendations, a user-friendly interface, and a robust database system, the application effectively provides personalized food alternatives based on user preferences. The seamless interaction between the Tkinter-based GUI, Python-powered backend logic, and MySQL database ensures a smooth and efficient user experience.

One of the key strengths of this application lies in its ability to fetch real-time nutritional data from external sources, making recommendations both accurate and relevant. The AI-based recommendation engine enhances decision-making by analyzing user inputs and continuously improving through feedback. The modular and scalable architecture allows for future enhancements, such as transitioning to a web or mobile platform using Flask, FastAPI, or React Native.

In addition to its technical strengths, the Veg AI App also serves as a health-conscious guide, helping users discover plant-based food alternatives that align with their dietary goals. The feedback loop ensures that the system evolves over time, learning from user interactions to refine its suggestions. Whether for individuals transitioning to a vegetarian diet or those seeking healthier food alternatives, this app simplifies the process by eliminating guesswork and providing reliable recommendations.

As AI and machine learning continue to evolve, future iterations of the Veg AI App could incorporate more advanced predictive analytics, meal planning, and integration with fitness tracking apps. Additionally, incorporating voice assistants and multilingual support would further enhance accessibility and usability.

Overall, the Veg AI App is not just a food recommendation tool—it is a step towards a smarter and healthier lifestyle. By leveraging AI and database technologies, it provides a practical and sustainable solution for users seeking nutritious vegetarian food options.

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