



FitFeast: Personalized Nutrition & Meal Planning System

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Submitted By

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1- Introduction

FitFeast is an innovative food planning application meticulously crafted to address the growing need for personalized nutrition and precise dietary management. Unlike conventional food delivery services that offer a one-size-fits-all approach, FitFeast empowers users to make informed dietary choices by providing customized meal kits that cater to individual dietary preferences and nutritional requirements. The application uses advanced algorithms to analyze user profiles, including dietary restrictions, health goals, and taste preferences, to generate meal plans that are both nutritionally balanced and tailored to each user's unique needs. In addition to personalized meal kits, FitFeast integrates an accurate calorie counting feature, allowing users to track their caloric intake effortlessly. By leveraging comprehensive nutritional databases and real-time data, the app ensures that users receive precise calorie information, helping them manage their diet effectively and make healthier choices. The combination of these features supports users in achieving their health and wellness goals. With FitFeast, users can enjoy a more engaging and tailored dining experience, making healthy eating both accessible and enjoyable.

1.1- Problem Statement

In the current food delivery market, users often struggle to find meal options that meet their dietary preferences and nutritional needs. Existing services provide generic meal plans and calorie tracking that may not address individual dietary restrictions or preferences effectively.

1.2 Motivation

The motivation behind FitFeast stems from the increasing demand for personalized nutrition and convenience in meal planning. Observing the limitations of current food delivery and calorie tracking apps, FitFeast aims to provide a more tailored solution that combines personalized meal kits with accurate calorie counting. This approach aligns with the growing trend towards health-conscious eating and personalized diet management. Applications like **MyFitnessPal** for its effective calorie tracking, **Blue Apron** for its personalized meal kits, and **Eat This Much** for automated meal planning. These platforms highlight the demand for tailored diet solutions, which **FitFeast** aims to enhance by integrating personalized meal kits with precise calorie counting in one innovative application.

1.3 FYP Objectives

- Develop a food delivery application with features for personalized meal kit recommendations and calorie counting.
- Implement a system that integrates user dietary preferences and restrictions into meal planning.
- Utilize machine learning algorithms to suggest compatible food combinations and track nutritional intake accurately.

1.4 Literature Review

Research Papers:

1. **"Personalized Nutrition: Principles and Applications" (2020)** - A comprehensive review of personalized nutrition concepts and techniques. Published on **January 2007**.

Authors: José M. Ordovás, Dolores Corella, Katherine L. Tucker, and José M. Martínez-González

https://www.researchgate.net/publication/237845209_Personalized_nutrition_Principles_and_applications

This review paper discusses the latest advancements in personalized nutrition, including the use of genetic information, gut microbiome analysis, and machine learning algorithms to tailor dietary recommendations to individual needs. The authors highlight the potential benefits of personalized nutrition for chronic disease prevention and treatment.

2. **"Food recommendation system based on nutritional needs of human beings and user preferences"**

Authors: Mahdi Nsaif Jasim & Ahmed Bahaddin Hamid. Published on 15-06-2022 <https://sciencescholar.us/journal/index.php/ijhs/article/view/9031>

This paper presents a food recommendation system that considers both user preferences (e.g., taste, texture) and nutritional information (e.g., calorie, macronutrient content). The authors propose a hybrid approach combining content-based filtering and collaborative filtering to suggest personalized food recommendations.

3. **"Machine Learning in Nutrition Research"** - Advances in Nutrition, Volume 14, Issued on 3-May-2023.

<https://www.sciencedirect.com/science/article/pii/S2161831323000923>

Authors: Daniel Kirk, Esther Kok, Michele Tufano, Bedir Tekinerdogan, Edith J M Feskens, Guido Camps

The current article aims to bridge this knowledge gap by supplying nutrition researchers with a resource to facilitate the use of ML in their research. ML is first explained and distinguished from existing solutions, with key examples of applications in the nutrition literature provided. Two case studies of domains in which ML is particularly applicable, precision nutrition and metabolomics, are then presented. Finally, a framework is outlined to guide interested researchers in integrating ML into their work. By acting as a resource to which researchers can refer, we hope to support the integration of ML in the field of nutrition to facilitate modern research.



Online Resources:

1. **Academy of Nutrition and Dietetics (AND)** - A professional organization providing evidence-based nutrition information. https://en.wikipedia.org/wiki/Academy_of_Nutrition_and_Dietetics
2. **National Institutes of Health (NIH)** - A trusted source for health and nutrition research. <https://www.nih.gov/>
3. **American Council on Exercise (ACE)** - A fitness organization offering nutrition and meal planning resources. <https://www.acefitness.org/>

Books:

1. **"Personalized Nutrition: Translating Genomic Information into Therapeutic Action"** (2019) - A book exploring the intersection of genomics and personalized nutrition. <https://doi.org/10.3390/nu12103118>

By Veronica A. Mullins, William Bresette, Laurel Johnstone, Brian Hallmark and Floyd H. Chilton
Floyd H. Chilton

2. **"Personalized Flexible Meal Planning for Individuals with Diet-Related Health Concerns: System Design and Feasibility Validation Study"**.

Reviewed by Liz Quintana, Anne-Sophie Brazeau, and Yuen Ling Leung **Authors:**
Maryam Amiri, Juan Li & Wordh Hasan.

3. **"Nutrition and Machine Learning"** (2020) - A book discussing machine learning applications in nutrition. <https://www.sciencedirect.com/science/article/abs/pii/S1746809423012429> **Authors:** Andrea Zignoli, Kristina Skroce, David J. Lipman, Howard C. Zisser .

Websites:

1. **MyPlate (USDA)** - A government website providing personalized nutrition recommendations. <https://www.myplate.gov/>
2. **Nutritionix** - A database of nutrition information and APIs for developers. <https://www.nutritionix.com/>
3. **Edamam** - A platform offering nutrition data and meal planning tools. <https://www.edamam.com/>

2. Project Scope

The FitFeast application aims to deliver a comprehensive solution for personalized nutrition and meal planning. Core features include user management, personalized meal kit recommendations based on dietary preferences and nutritional needs, and automated calorie tracking. FitFeast uses a machine learning model to prevent incompatible food combinations. The system analyzes ingredient compatibility based on culinary standards and user preferences. For instance, if a user attempts to add an unconventional item like chocolate to a dish such as biryani, the application will flag it as incompatible and suggest alternatives. This is achieved by training the model on a dataset of traditional recipes and user feedback, ensuring that recommended meals are both nutritionally balanced and palatable.

CONTEXT DIAGRAM

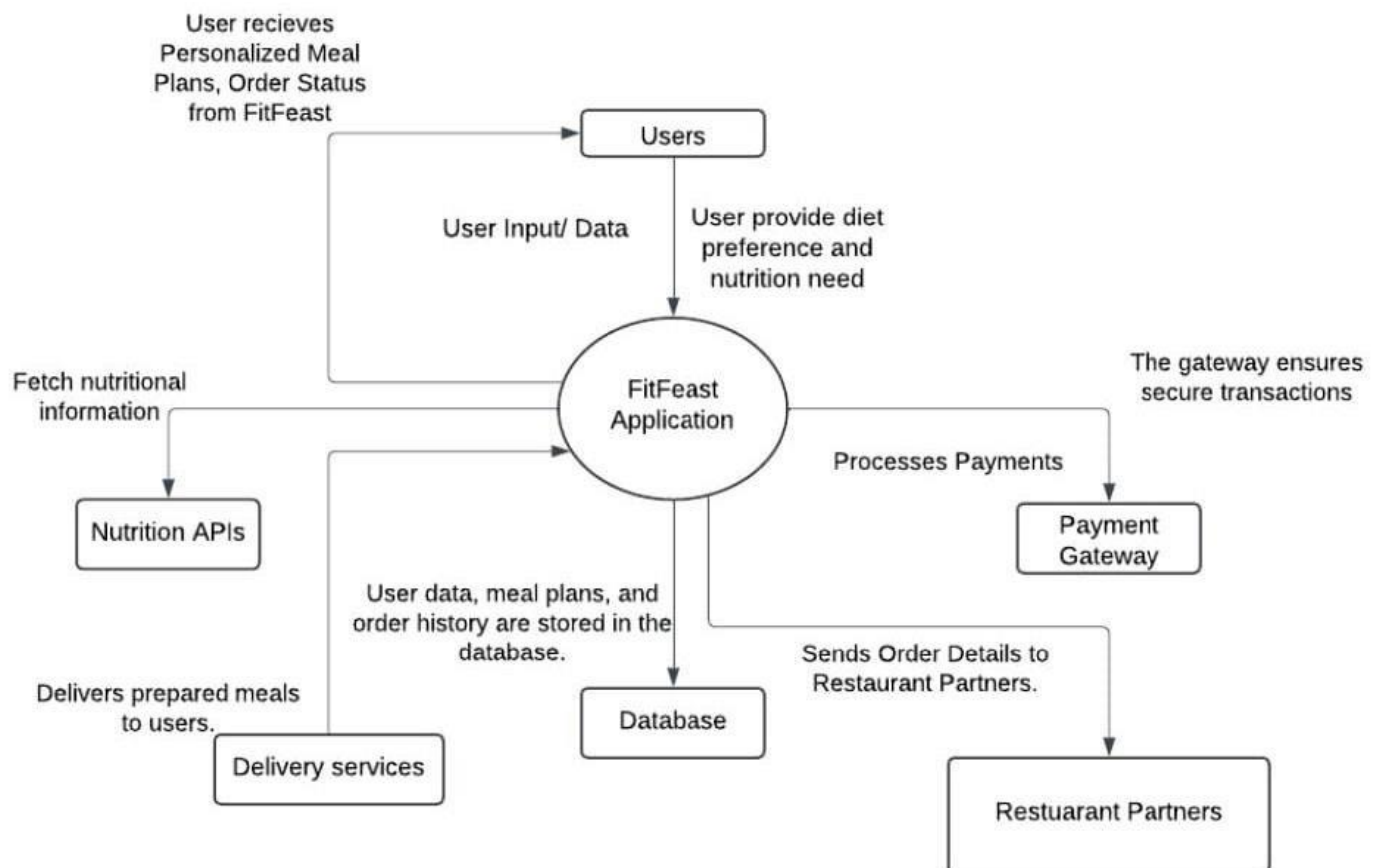


Fig.2.1 Context Diagram for FitFeast App

3. Methodology

This project will employ the Agile methodology, utilizing iterative development and continuous improvement to deliver a flexible and adaptable solution. By using Agile, we will be able to respond quickly to changing requirements and customer feedback, ensuring a solution that meets the evolving needs of the business and its users. We will follow the Scrum framework, with the following practices:

- Bi-weekly sprints to deliver incremental functionality
- Daily stand-up meetings for team alignment and progress tracking
- Prioritized product backlog to ensure focus on high-value features
- Continuous integration and testing to ensure quality and stability
- Regular retrospectives to identify areas for improvement and implement changes
- Collaborative approach to requirements gathering and prioritization with stakeholders

3.1 Project Approach

For our FitFeast application, we have chosen to adopt the Agile methodology. Agile is a flexible and iterative approach to software development that emphasizes collaboration, customer feedback, and incremental delivery. This methodology is well-suited for our project because it allows us to respond quickly to changes in requirements and incorporate feedback from stakeholders throughout the development process.

3.2 Team Role & responsibilities (RACI matrix)

| TASK | Rabail | Sara | Maryam | Supervisor |
|-------------------------|--------|------|--------|------------|
| Project Planning | A | I, C | R, C | C, I |
| Project Analysis | R | C | I | C, I |
| Project Design | A | R | I, C | C, I |
| Project Implementation | C, I | A | R | C, I |
| Project Documentation | R | I | A | C, I |
| Finalize and Deployment | R | C | I | C, I |



3.3 Requirement Development

3.3.1 Elicitation of Requirements

For FitFeast, we will gather requirements from potential users, including customers, nutritionists, and meal kit suppliers through surveys and interviews. This will help us understand user needs, dietary preferences, and expectations for personalized meal kits and calorie counting.

3.3.2 Analysis of Requirements

We will analyze the collected data to identify common themes, prioritize features, and define clear objectives. This will help us ensure that the FitFeast application addresses the most critical needs identified during the elicitation phase.

3.3.3 Software Requirements Specification (SRS)

We will document detailed software requirements in the SRS, including descriptions of system features such as personalized meal plan creation, automatic calorie calculation, user interfaces, data management, security requirements, and performance expectations.

3.3.4 Requirement Validation

We will engage stakeholders in review sessions to validate the requirements. This iterative process allows stakeholders to provide input, clarify ambiguities, and confirm that the documented requirements meet their nutritional needs, dietary preferences, and operational requirements.

3.4 Use Case Architecture:

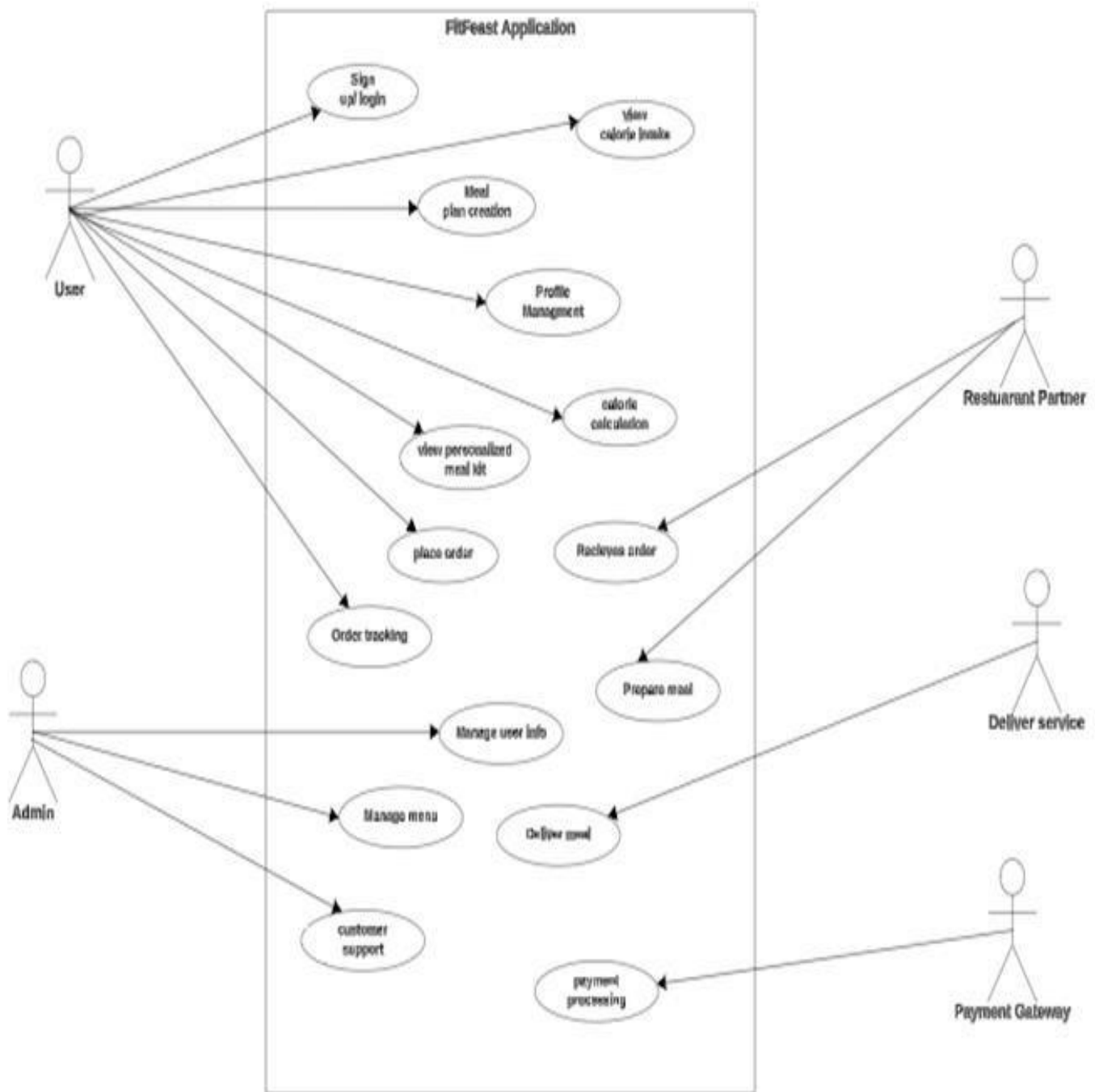


Fig 3.1 Use Case Diagram for FitFeast

3.5 Application (or Project) Testing

Testing Phases and Approaches

1. Unit Testing:

- **Purpose:** Verify the functionality of individual components like meal kit personalization and calorie counting.
- **Responsibility:** Developers.
- **Tools:** flutter_test for Flutter, pytest for Python.
- **Activities:** Developers write and execute test cases to validate the behavior of their code modules.

2. Integration Testing:

- **Purpose:** Verify interactions between integrated components to ensure they work together as expected.
- **Responsibility:** Testing team.
- **Tools:** flutter_test for Flutter, pytest for Python, mock services or APIs.
- **Activities:** Test interactions between modules, data flow between components, and overall system integration.

3. User Acceptance Testing (UAT):

- **Purpose:** Validate the system from the user's perspective to ensure it meets business requirements.
- **Responsibility:** End users or designated stakeholders.
- **Tools:** Test scenarios, scripts, and possibly automation tools like Selenium.
- **Activities:** Users perform real-world scenarios to ensure usability, functionality, and performance meet expectations.

Testing Process

- **Test Planning:** Define test objectives, scope, and strategies for unit, integration, and UAT phases.
- **Test Case Development:** Create detailed test cases based on the functional and non-functional requirements.
- **Test Execution:** Execute test cases systematically, record results, and report any issues.
- **Defect Management:** Track and manage defects using a defect tracking system like Jira or GitHub Issues.
- **Test Reporting:** Generate test reports summarizing test coverage, results, and overall system readiness.

Continuous Testing and Feedback

- **Iterative Approach:** Conduct testing iteratively throughout the development process.
- **Feedback Loop:** Incorporate feedback from testing phases into subsequent development sprints to address issues and improve the system.

By following this structured testing approach, FitFeast will deliver a robust and reliable application that meets user expectations, functions correctly, and provides a seamless experience for all stakeholders involved.

4. Project Planning

4.1 Gantt Chart

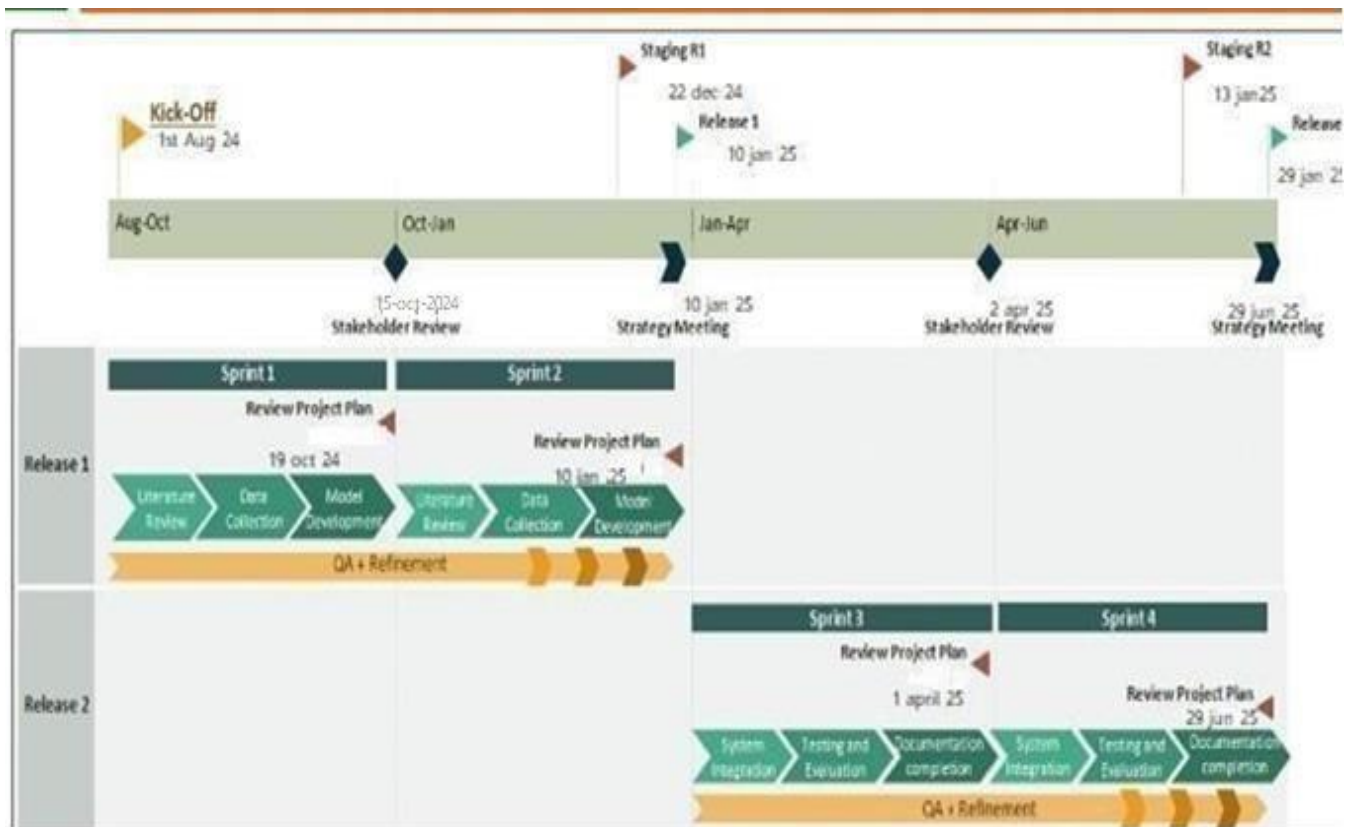


Fig 4.1 Gantt Chart



WORK BREAKDOWN WBS

| Task | Start Date | End Date | Resource Allocation |
|--------------------------------------|-------------|------------|---------------------|
| Requirement Gathering | 25-Aug-2024 | 15-09-2024 | Member 1 & 2 |
| System Design | 16-09-2024 | 30-09-2024 | All Members |
| Database Setup | 01-09-2024 | 15-10-2024 | Member 3 |
| Development of Personalized Meal Kit | 16-10-2024 | 15-11-2024 | Member 1 |
| Calorie Calculation Implementation | 16-11-2024 | 15-12-2024 | Member 2 |
| API Integration (Food Data) | 16-12-2024 | 15-01-2025 | Member 3 |
| Frontend Development | 16-01-2025 | 15-02-2025 | Member 1 & 2 |
| Testing and Validation | 16-02-2025 | 31-03-2025 | All Members |
| Final Report Compilation | 01-03-2025 | 25-06-2025 | All Members |



Milestones & Timeline

1. Project Planning

- **Task:** Define project objectives, scope, timeline, and resources
- **Timeline:** Month 1 – Aug 25, 2024 – Sep 24, 2024

2. Requirement Elicitation and Analysis

- **Task:** Conduct surveys, interviews, analyze data
- **Timeline:** Month 2 – Sep 25, 2024 – Oct 24, 2024

3. Software Requirements Specification (SRS)

- **Task:** Document detailed functional and non-functional requirements
- **Timeline:** Month 3 – Oct 25, 2024 – Nov 24, 2024

4. System Design

- **Task:** Architecture design, database schema, and design documentation
- **Timeline:** Month 4 – Nov 25, 2024 – Dec 24, 2024

5. Feature Development – Meal Kit Personalization & Calorie Calculation

- **Task:** Implement core personalization and calorie tracking features
- **Timeline:** Month 5 – Dec 25, 2024 – Jan 24, 2025

6. API Integration (Food Data)

- **Task:** Integrate external APIs (e.g., Edamam, Nutritionix)
- **Timeline:** Month 6 – Jan 25, 2025 – Feb 24, 2025

7. Frontend Development

- **Task:** Develop user interface (React Native / Flutter)
- **Timeline:** Month 7 – Feb 25, 2025 – Mar 24, 2025

8. Integration of Features

- **Task:** Combine developed modules into a functional app
- **Timeline:** Month 8 – Mar 25, 2025 – Apr 24, 2025

9. Testing Phase

- **Unit Testing & Integration Testing:** Apr 25 – May 24, 2025
- **User Acceptance Testing (UAT):** May 25 – Jun 24, 2025



10. Final Testing & Debugging

- **Task:** Final round of bug fixes and performance checks
- **Timeline:** Month 11 – Jun 25 – Jul 24, 2025

11. Deployment

- **Task:** Make the system ready for end-user deployment
- **Timeline:** Month 12 – Jul 25 – Aug 24, 2025

12. Maintenance

- **Task:** Post-deployment support and updates
- **Timeline:** Ongoing

Key Evaluation Points

Midpoint Evaluation – End of 7th Semester

- Requirement gathering completed
- SRS documentation
- System design finalized
- Core features implemented (Meal Kit + Calorie Calculation)
- Initial testing started

Final Evaluation – End of 8th Semester

- Full integration and functionality
- Completed testing (Unit, Integration, UAT)
- Final project report and deployment



5. Project Requirements

5.1 Software Tools Requirements

For the development, testing, and deployment of the **FitFeast** application, the following software tools are used:

1. Python

- **Framework:** Django or Flask
- **Purpose:** Backend and API development
- **Justification:** Robust and scalable frameworks for complex backend logic and integrations

2. Visual Studio Code

- **Purpose:** Integrated Development Environment (IDE)
- **Justification:** Lightweight, versatile, and widely supported by extensions

3. SQL Server Management Studio (SSMS) or MySQL Workbench

- **Purpose:** Database management and query execution
- **Justification:** Tools necessary for database schema, performance tuning, and data handling

4. Microsoft 365

- **Purpose:** Documentation and collaboration
- **Justification:** Shared cloud-based access for team productivity

5. MS Project

- **Purpose:** Project scheduling and tracking
- **Justification:** Essential for managing Gantt charts, timelines, and workload

6. Postman

- **Purpose:** API testing and validation
- **Justification:** Widely used tool to test HTTP requests and backend endpoints

7. Figma

- **Purpose:** UI/UX design
- **Justification:** Enables collaborative and real-time mockup creation

8. Flutter

- **Purpose:** Frontend mobile development
- **Justification:** Cross-platform support with a single codebase for Android and iOS

9. React Native

- **Purpose:** Alternate frontend development option
- **Justification:** Another flexible tool for mobile app development with native performance



5.2 Hardware Requirements

1. Development Workstations

- **Processor:** Intel Core i7
- **RAM:** 16 GB
- **Storage:** 512 GB SSD

2. Testing Devices

- **Desktops:** With same specs as development machines
- **Mobiles:** Multiple Android and iOS devices for testing compatibility

3. Minimum System Requirements

- **Processor:** Core i5 5th Gen or higher
- **RAM:** 8 GB or more
- **Internet:** Minimum 12 MB connection or fiber optics
- **Backup Storage:** External HDD or cloud storage for backups



6.2 Total Budgeted Cost - of the Project

| Item | Cost (PKR) |
|--|------------|
| Visual Studio Code | Free |
| Python | Free |
| MySQL Community Edition | Free |
| Microsoft 365 Subscription (educational license) | Free |
| MS-Project (educational license) | Free |
| Postman | Free |
| Figma | Free |
| Flutter | Free |
| React Native | Free |
| Development Machines (3 members) | 150,000 |
| Internet Connectivity (10 months) | 20,000 |
| Domain Registration and Hosting | 5,000 |
| Third-Party API Integrations (Edamam, Nutritionix) | 10,000 |
| Miscellaneous | 2,000 |
| Total | 187,000 |

Design and UI/UX Tools

- All done using free/open-source tools (Figma)

Hardware Requirements

| Item | Cost (PKR) |
|--------------------------------|------------|
| Development Machines (3) | 150,000 |
| Internet (10 months @ 2000/mo) | 20,000 |
| Domain & Hosting (1 year) | 5,000 |
| API Integration (Edamam etc.) | 10,000 |
| Miscellaneous (Printing etc.) | 2,000 |

Total Estimated Cost: PKR 187,000

7. Project Deliverables

1. Requirements Documentation

- SRS Document with functional and non-functional specs
- Derived from interviews, feedback, and competitor analysis

2. Design Documents

- ERD: Database structure
- Architecture Diagram: Layered architecture
- Use Case Diagrams
- Process Flow Diagrams (BPMN)

3. Running Application

- Working mobile application with features:
 - Calorie calculation
 - Personalized meal kit customization
 - Meal kit recommendations
 - User profile management

4. Source Code

- Documented and organized in a GitHub repository or provided via CD.

8.0 Reference

- **"Food Recommendation System Using Clustering Analysis for Diabetic Patients, Advanced Virtual and Intelligent Computing (AVIC)"** Research Center Department of Mathematics, Faculty of Science, Chulalongkorn University Pathumwan, Bangkok, Thailand, Proc. 6th Int'l Conf Machine Learning and Cybernetics, August 2007
- **"Healthy Personalized Recipe Recommendations for Weekly Meal Planning"** By Konstantinos Zioutos, Haridimos Kondylakis, and Kostas Stefanidis https://www.researchgate.net/publication/376697965_Healthy_Personalized_Recipe_Recommendations_for_Weekly_Meal_Planning Published on December 2023
- **"Personalized Nutrition: Principles and Applications" (2020)** Authors: Elissa Epel, Ph.D., et al. https://www.researchgate.net/publication/345679123_Belluschi_Pietro
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- **"Interaction design in a mobile food recommender system."** By Elahi, Mehdi, CEUR Workshop Proceedings. CEUR-WS, 2015.