Cook AI

Recipe Generator

A PROJECT REPORT

Submitted by

JALAJ GUPTA [RA2111027010148]

ISHAN SHARMA [RA2111027010086]

Under the Guidance of

Dr. Prakash M

(Associate Professor , Department of Data Science And Business Systems)

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BONAFIDE CERTIFICATE

Certified that 18CSP107L - Minor Project report titled "**Cook AI - Recipe Generator using Deep learning** " is the bonafide work of "**Jalaj Gupta [RA2111027010148], Ishan Sharma [RA2111027010086]"** who carried out the project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

DR. PRAKASH M **DR. KAVITHA V**

SUPERVISOR **Associate Professor** Department of Data Science And Business Systems		**PROFESSOR &HEAD** DEPARTMENT OF DATA SCIENCE AND BUSINESS SYSTEM

ABSTRACT

The **"CookAI Recipe Generator"** is an AI-powered platform designed to transform how users interact with food, making the cooking process more accessible, personalized, and sustainable. The platform enables users to upload food images and receive detailed, customized recipes in return. The AI identifies the dish and its key ingredients, generating a comprehensive recipe that includes a list of ingredients, step-by-step cooking instructions, and dietary-specific substitutions.

CookAI aims to simplify cooking for users of all skill levels. Whether someone is a novice or an experienced home cook, the platform tailors recipes based on individual dietary preferences, ingredient availability, and personal tastes. This personalized approach encourages experimentation in the kitchen, making it easy for users to try new cuisines and dishes they might otherwise overlook.

In addition to enhancing the cooking experience, **CookAI** promotes sustainability by minimizing food waste. The platform suggests recipes based on the ingredients users already have, allowing them to make the most of leftover or underused items. By promoting efficient use of ingredients, **CookAI** aligns with the global push for responsible consumption and production, helping to achieve Sustainable Development Goal (SDG) 12 of the UN.

The platform also supports healthier eating habits by offering nutritional alternatives and health-focused substitutions, empowering users to make informed choices about their meals. Users can select dietary preferences—such as vegetarian, gluten-free, or low-carb—and the AI will generate recipes that cater to these needs, making healthy eating more attainable.

CookAI envisions fostering a vibrant, community-driven space where users can share their creations, exchange tips, and offer feedback on various recipes. This collaborative aspect encourages peer-to-peer learning and allows users to continuously discover new cooking techniques and ideas.

Overall, **"CookAI Recipe Generator"** harnesses the power of artificial intelligence to streamline the cooking process, encouraging creativity while promoting sustainability and healthy eating. By making recipe generation instant and personalized, **CookAI** revolutionizes how people approach cooking, empowering individuals to effortlessly create delicious, tailored meals while reducing food waste and supporting a more sustainable lifestyle.

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ABBREVIATIONS INVOLVED

1. **API –** Application Programming Interface
2. **UI –** User Interface
3. **AI –** Artificial Intelligence
4. **PAT –** Personal Access Token
5. **TheMealDB –** The Meal Database
6. **YT –** YouTube (for Google YouTube API)
7. **OCR –** Optical Character Recognition
8. **JSON –** JavaScript Object Notation (common data format for APIs)
9. **CSV –** Comma-Separated Values
10. **HTTP –** Hypertext Transfer Protocol (for API requests)
11. **ML –** Machine learning

CHAPTER 1

INTRODUCTION

1.1 Introduction to CookAI Recipe Generation Application:

By offering a distinctive, AI-powered culinary experience, the "CookAI-Recipe Generator" platform is a prime example of how artificial intelligence may revolutionise routine tasks like cooking. This app creates detailed culinary recipes from basic food photos using deep learning and natural language processing. Users can upload a photo of any dish, and CookAI identifies the dish and produces a tailored recipe, including a title, list of ingredients, and step-by-step cooking instructions.

The system’s image recognition capability analyzes the uploaded food image, determining key ingredients and the dish type. Then, through advanced natural language processing, it formulates a recipe that users can easily follow. This application bridges the gap between cooking and AI, enabling users to access detailed recipes effortlessly, making cooking more approachable and creative.

Additionally, CookAI leverages AI to continuously improve recipe accuracy and expand its culinary knowledge base. As users engage with the platform, the system improves its capacity to identify a variety of dishes and produce excellent, practical recipes. CookAI shows how AI can simplify and improve cooking by turning food photos into comprehensive recipes, satisfying users' culinary curiosity and encouraging a more creative cooking experience.

1.2 Motivation

The idea behind "CookAI Recipe Generator" is to use artificial intelligence to improve and streamline the cooking process. Many people find it difficult to cook in today's hectic environment, whether it's a lack of time, a lack of experience with recipes, or the difficulty of understanding conventional directions. Conventional recipe sources often present cooking as a rigid, text-driven process that can feel inaccessible to novice or experimental cooks. By automating recipe generation from food images, "CookAI" provides a flexible, intuitive alternative, empowering users to cook with confidence by eliminating the need for complex instructions or ingredient lists.

Moreover, people's culinary creativity is often limited by what they know or have access to, leaving a vast range of dishes unexplored. The motivation to build "CookAI" also lies in democratizing culinary knowledge, allowing users to access recipes from diverse cuisines simply by uploading a picture of a dish. The platform harnesses deep learning to analyze and recognize ingredients visually, while natural language processing creates straightforward, step-by-step instructions that allow anyone to cook new and exciting dishes. This personalized approach encourages users to explore beyond their usual repertoire, making it easier to try dishes that may otherwise seem intimidating or unfamiliar.

Beyond individual cooking, "CookAI" also speaks to the growing interest in merging technology with culinary arts. By providing a platform that is both interactive and adaptive, the project brings a sense of innovation to cooking, showing how AI can transform everyday tasks. As the system learns from each interaction, it refines its recipe suggestions and gains insights into user preferences, gradually building a community-driven knowledge base that elevates the cooking experience for everyone involved. Ultimately, the platform aims to turn

cooking into a creative, collaborative process where users are not just following instructions but actively engaging with and contributing to a broader culinary culture.

1.3 Sustainable Development Goal of the Project

The "CookAI Recipe Generator" supports a number of Sustainable Development Goals (SDGs) of the UN, especially SDG 12 (responsible consumption and production), SDG 3 (excellent health and well-being), and SDG 2 (zero hunger). These objectives are met by the platform's capacity to provide access to wholesome cooking, support better eating practices, and stimulate thoughtful food consumption.

By transforming food images into detailed recipes, "CookAI" directly supports **SDG 2 (Zero Hunger)** by increasing access to cooking resources and knowledge. The platform enables users to make the most of their ingredients, encouraging home-cooked meals and empowering individuals to prepare nutritious recipes with what they have on hand. This can be especially valuable in communities with limited access to culinary resources or formal cooking education, supporting food security and reducing dependency on processed foods.

"CookAI" also promotes **SDG 3 (good health and well-being)** by fostering healthier eating habits through AI-generated recipes. The platform’s capacity to recommend ingredient substitutions and suggest balanced recipes encourages users to make informed, nutritious choices. "CookAI" enables users to take charge of their eating habits by making healthy cooking simpler and more accessible, promoting a way of life that places a high value on nutrition and well-being.

Additionally, **SDG 12 (Responsible Consumption and Production)** is addressed as the platform promotes mindful ingredient use and reduces food waste. With its image-recognition capabilities, "CookAI" enables users to repurpose leftovers or random ingredients into complete recipes, fostering a zero-waste approach to cooking. By encouraging users to make the most of what they have, the platform contributes to more sustainable food consumption

and production patterns, helping individuals minimize waste and appreciate the value of all ingredients.

Through AI-driven recipe generation, "CookAI" demonstrates how innovative technology can drive sustainable culinary practices. By making cooking easier, healthier, and more efficient, the platform not only supports individual users but also contributes to a global effort toward sustainable and responsible food practices, creating a positive impact on both individual lives and the environment.

1.4 Product Vision Statement

1.4.1 Audience:

- **Primary Audience**: Cooking enthusiasts and home cooks seeking convenient, personalized recipe generation from food images.
- **Secondary Audience**: Nutritionists, culinary experts, and food bloggers looking to share recipes and culinary insights interactively.

1.4.2 Needs:

- **Primary Needs**:
    - A user-friendly platform to generate customized recipes based on food images.
    - Easy access to a variety of recipes tailored to available ingredients.
    - Health-focused recommendations and ingredient substitutions for personalized nutrition.
- **Secondary Needs**:
    - Tools to categorize and save recipes for future use.
    - Community-driven features for sharing and exploring diverse culinary practices.
    - Insights and tips from culinary experts to refine cooking skills and practices.

1.4.3 Products:

- **Core Product**: An AI-powered recipe generator that transforms food images into complete recipes, including ingredients, cooking instructions, and health-conscious substitutions.
- **Additional Features**:
    - Ingredient optimization to reduce food waste by using available resources.
    - Search and filter options for easy access to recipes by dietary preferences or cuisines.
    - Personalized suggestions based on user interactions, dietary needs, and taste preferences.
    - Feedback mechanisms for continuous improvement and user satisfaction.

1.4.4 Values:

Core Values:

- **Personalization**:

  "CookAI" prioritizes personalized recipe experiences by adapting recipes to user inputs, dietary preferences, and ingredient availability. This ensures that every user receives recipes that are both relevant and enjoyable, accommodating individual tastes and nutritional requirements.
- **Sustainability**:

  The platform emphasizes sustainable cooking practices, helping users minimize waste by using available ingredients effectively. Through thoughtful recipe suggestions and ingredient optimization, "CookAI" contributes to reducing environmental impact and promoting conscious cooking.
- **Inspiration**:

  "CookAI" fosters culinary creativity, inspiring users to try new dishes and techniques. By providing recipe suggestions based on food images, it helps users expand their cooking horizons and experiment in the kitchen, making cooking an exciting and creative journey.
- **Inclusivity**:

  The platform is designed to be accessible for users of all culinary skill levels, from beginners to experienced cooks. By breaking down complex recipes into easy-to-

follow steps and suggesting alternatives, "CookAI" makes cooking approachable and inclusive.

- **Convenience**:
  "CookAI" transforms cooking from a time-consuming task into a convenient experience by generating recipes instantly from photos. This saves users time on meal planning and grocery shopping by allowing them to make dishes from ingredients they already have.

Differentiators:

- **AI Recipe Generation**:
  The platform leverages cutting-edge deep learning to generate recipes from food images, making cooking more accessible and innovative. This technology allows users to get customized recipes instantly, bringing AI-powered convenience directly into the kitchen.
- **Health-Driven Suggestions**:
  "CookAI" offers ingredient substitutions and health-conscious alternatives, helping users make informed choices that align with their nutritional goals. By suggesting healthier ingredients or lower-calorie options, it supports users in maintaining balanced diets.
- **Sustainable Cooking**:
  Supporting sustainable cooking practices, "CookAI" encourages users to reduce waste by using available ingredients. Through ingredient-based recipe generation, it enables users to prepare meals that make the most of what they already have, promoting mindful consumption.
- **Community Engagement**:
  "CookAI" enables users to share recipes, tips, and cooking experiences with a community of like-minded individuals. This peer-to-peer connection fosters a sense of community, allowing users to learn from each other and exchange creative culinary ideas.

- **Continuous Learning and Improvement**: As users interact with the platform, "CookAI" refines its recommendations based on feedback and engagement. This continuous learning capability allows the platform to evolve and improve, making each recipe more accurate and tailored to user preferences over time.

1.5 Product Goal

The primary goal of "CookAI Recipe Generator" is to revolutionize the cooking experience by providing an accessible, personalized approach to recipe creation through AI technology. This platform empowers individuals to cook confidently by transforming food photos into detailed, customized recipes that align with their unique preferences and dietary needs. By leveraging deep learning and natural language processing, "CookAI" continually refines its recipe generation capabilities, making the cooking experience more intuitive, engaging, and enjoyable over time. This goal is rooted in making culinary knowledge widely accessible, enabling users to easily explore diverse cuisines and cooking techniques from the comfort of their own kitchens.

Beyond personalized recipe generation, "CookAI" aims to foster a sense of culinary community by encouraging users to experiment with ingredients and share their creations. The goal is to create a sustainable cooking environment where users not only discover new recipes but also contribute to a growing library of culinary insights through user feedback and shared experiences. This approach ensures that cooking is not just a solitary activity but a shared journey that celebrates creativity and collaboration.

Ultimately, the product goal is to build a culinary ecosystem that is not just about following recipes but about fostering creativity, promoting sustainable food practices, and enhancing user well-being. By combining AI-driven personalization with community-driven culinary

exploration, "CookAI" aspires to make cooking a rewarding, inclusive, and socially impactful experience that encourages both individual growth and community connection.

1.6 Product Backlog

Table 1.1 User Stories

S.No	User Stories of "CookAI - Recipe Generator" Application
1.	As a new user, I want to easily register on the platform so that I can gain access to features like recipe generation and personalized recommendations.
2.	As a new user, I want to create a personal profile after registration so that I can save my generated recipes and set dietary preferences.
3.	As a user, I want to upload a photo of a dish so that I can receive an AI-generated recipe, including ingredients and step-by-step cooking instructions.
4.	As a user, I want to browse various recipe categories so that I can explore new dishes and find recipes that match my tastes.
5.	As a user, I want the platform to suggest ingredient substitutions based on my dietary preferences so that I can cook healthier or allergy-friendly meals.
6.	As a user, I want to participate in recipe sharing and discussions so that I can share my creations, get feedback, and learn new techniques from the community.
7.	As a user, I want to receive real-time suggestions on cooking adjustments while following the recipe so that I can make the dish successfully.
8.	As a user, I want the platform to analyze the ingredients in my uploaded image so that I can reduce waste by making recipes based on available items.
9.	As a user, I want to engage in forums and share tips so that I can learn from the community and enhance my cooking knowledge.
10.	As a user, I want enhanced search functionality to find recipes by ingredients, dietary requirements, or cuisines quickly and efficiently.
11.	As a user, I want to provide feedback on the platform's recipes and features so that I can contribute to improving the user experience and content relevance.

The product backlog of "CookAI Recipe Generator" was configured using an Agile Board, as shown in Figure 1.1. This product backlog includes all user stories for the AI-based recipe generator application. Each user story details necessary parameters such as MoSCoW prioritization, functional and non-functional requirements, and acceptance criteria with linked tasks for efficient project tracking and development.

ID	Sprint count	Title	Epic	User Story	Priority (MoSCoW)	Status	Acceptance Criteria	Functional Requirements	Non-Functional Requirements	Original Estimate (Days)	Actual Effort (Days)	Assigned To
1	Sprint 0	Problem Definition	Project Planning	As developers, we want to define the problem statement so that the project objectives are clear	Must have	Completed	The problem statement is clearly defined and reviewed by the team	Clear and concise problem statement	Should be understandable to all stakeholders	2	2	Ishaj Gupta
2		Impact Analysis	Project Planning	As a team, we want to analyze the impact of the project so that we can understand its significance in the real world.	Should have	Completed	The impact analysis document is created and includes potential benefits and challenges.	Detailed impact analysis, listing benefits and challenges	Should be comprehensive and consider various scenarios	3	2	Ishan Sharma
3		Scope Definition	Project Planning	As developers, we want to define the scope so that the project boundaries are clearly established.	Must have	Completed	The scope document outlines what is included and excluded from the project.	Clear scope boundaries	Should align with project goals	2	2	Ishaj Gupta
4		Requirements Gathering	Project Planning	As a team, we want to gather all necessary requirements so that the project needs are clearly understood.	Must have	Completed	A comprehensive list of technical and non-technical requirements is documented.	Comprehensive requirements list	Should be prioritized and actionable	4	4	Ishan Sharma
5		Technology Research	Project Research	As developers, we want to research relevant technologies so that we can choose the best approach for the project.	Must have	Completed	A research report is created that outlines the findings on relevant technologies and approaches.	Relevant technologies and approaches identified	Should be well-documented and justified	3	4	Ishaj Gupta
6	Sprint 1	Development Environment Setup	Development Setup	As developers, we want to set up the development environment so that we can start working on the project.	Should have	Completed	All necessary tools and libraries are installed, and the environment is ready for development.	Proper setup of IDEs, libraries, tools, and dependencies	Should be consistent across all development environments	5	3	Ishan Sharma
7		Dataset Collection and Preprocessing	Data Preparation	As developers, we want to gather and preprocess the dataset so that it is ready for model training.	Must have	Completed	A dataset is collected, cleaned, and preprocessed, and is ready for model training.	Dataset should be diverse and sufficient for training	Preprocessing should ensure data quality and consistency	7	8	Ishaj Gupta
8		Project Architecture	System Design	As a team, we want to define the project architecture so that we have a clear blueprint to follow.	Must have	Completed	A detailed architecture diagram is created, and the design is reviewed by the team.	System architecture should cover all components	Should be scalable and modular	5	4	Ishan Sharma
9		ML Model Training	Machine Learning	As developers, we want to train the ML model so that it can accurately generate recipes from images.	Must have	In progress	The model is trained, and its performance is validated with an accuracy report.	Model should be trained on a diverse dataset	Should meet performance benchmarks	10	11	Ishaj Gupta
10		Frontend Development	Frontend Development	As developers, we want to create the frontend interface so that users can upload images and view generated recipes.	Must have	Completed	A functional and responsive frontend is developed, allowing users to upload images and receive recipe outputs.	UI should be user-friendly and intuitive	Should be responsive and work across devices	10	9	Ishan Sharma

Figure 1.1 Planner Board of Cook AI

1.7 Product Release Plan

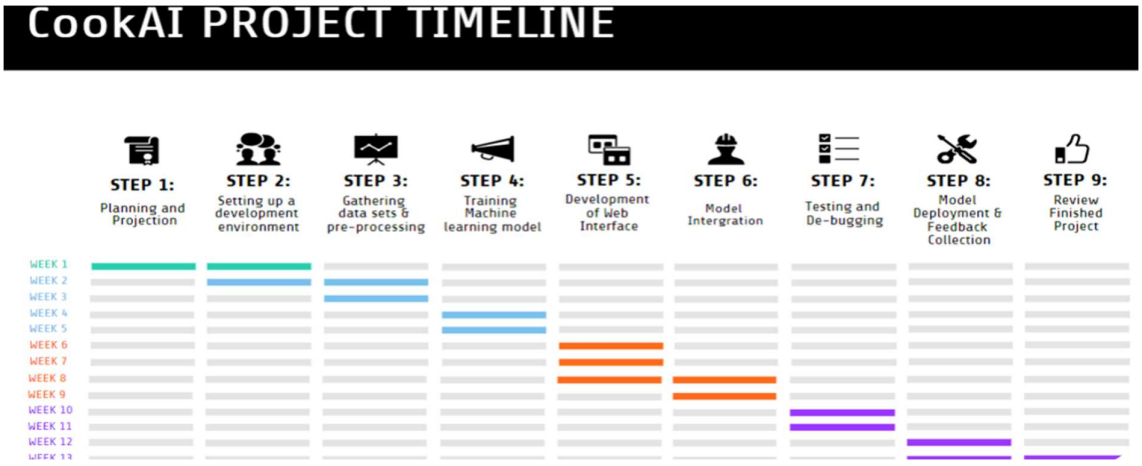


Figure 1.2 Release plan of Cook AI

CHAPTER 2

SPRINT PLANNING AND EXECUTION

2.1 Sprint 1

2.1.1 Sprint Goal - User Stories associated with Sprint 1

The goal of the first sprint is to build the user landing page and enable core functionalities like user registration, profile creation, and image-based recipe generation. This sprint aims to establish a smooth onboarding process and provide the foundational functionality for generating and exploring recipes based on user-uploaded images.

The following table 2.1 represents the detailed user stories of the sprint 1

Table 2.1 Detailed User Stories of sprint 1

S.NO	Detailed User Stories
1.	As a new user, I want to easily register on the platform so that I can gain access to features like personalized recipe generation and ingredient-based suggestions.
2.	As a new user, I want to create a personal profile after registration so that I can save my generated recipes, set dietary preferences, and manage my cooking history.
3.	As a user, I want to upload an image of a dish so that the platform can analyze it and generate a recipe with ingredients and instructions for me to try cooking.

2.1.2 Functional Document

2.1.2.1. Introduction

The "CookAI - Recipe Generator" project aims to create a user-friendly platform that harnesses artificial intelligence to transform food images into comprehensive, personalized cooking recipes. This platform is designed to simplify cooking by providing tailored recipes based on user preferences, fostering creativity in the kitchen, and promoting sustainable food practices. The project focuses on delivering a personalized culinary experience while also enabling users to share, explore, and experiment with recipes through AI-powered technology.

2.1.2.2. Product Goal

This project's main objective is to create a platform that improves cooking by offering customised, artificial intelligence-generated recipes. The platform seeks to:

- Generate customized recipes based on images of food dishes.
- Offer ingredient substitutions and suggestions to accommodate dietary preferences.
- Utilize AI to continuously refine recipe accuracy and personalization.
- Foster a community of cooking enthusiasts who can share, learn, and engage with each other's culinary creations.

2.1.2.3. Demography (Users, Location)

Users:

- **Target Users**: Home cooks, food bloggers, nutritionists, and individuals interested in exploring new recipes.
- **User Characteristics**: Varied levels of cooking expertise, dietary preferences, and culinary interests.

Location:

- **Target Location**: Global, with a focus on regions where cooking at home is culturally prevalent and access to technology is widespread.

2.1.2.4. Business Processes

The key business processes include:

- **User Registration and Authentication**: Users can register securely using email or social media accounts. Authentication ensures secure access to personalized recipe generation and content.
- **Personalized Recipe Generation**: The system generates customized recipes based on the uploaded food images, user preferences, and dietary restrictions.
- **Ingredient Optimization**: The platform suggests ingredient substitutions and ways to minimize food waste by offering recipes based on available ingredients.

2.1.2.5. Features

The project focuses on implementing the following key features:

- **Feature 1: Image-Based Recipe Generation**
  - **Description**:
    The platform allows users to upload a food image, which the AI analyzes to generate a recipe including ingredients and instructions.
  - **User Story**:
    As a user, I want to upload a picture of a dish and receive a complete recipe so I can cook it at home.
- **Feature 2: Enhanced Search Functionality**
  - **Description**:
    The platform offers advanced search options, enabling users to find recipes by cuisine, ingredients, or dietary requirements.
  - **User Story**:
    As a user, I want to easily search for recipes using filters so I can quickly find dishes that match my preferences.

2.1.2.6. Authorization Matrix

Table 2.2 Access level Authorization Matrix

Role	Access Level
Administrator	Full access to user management, content management, and platform settings.
Educator	Access to recipe creation, user interaction tools, and content management related to cooking.
Learner	Access to personalized recipes, ingredient optimization, and community features.
Guest User	Limited access to browse publicly available recipes and explore content.

2.1.2.7. Assumptions

- The AI models for recipe generation and personalization will be trained using a diverse dataset that reflects a wide range of cuisines, ingredients, and dietary needs.
- The development team will have access to cloud infrastructure for testing, deployment, and scaling of the platform.
- Users and stakeholders will provide timely feedback throughout testing phases to ensure continuous improvement.

2.1.3 Architecture Document

2.1.3.1. Application

Microservices: The "CookAI - Recipe Generator" platform is built on a microservices architecture, where each core functionality is managed by independent services. Key services include:

- **Authentication Service**: Manages user registration, login, and account recovery, guaranteeing safe access to services tailored to each individual user, such as profile management and customised recipe storage.
- **Image Analysis Service**: Handles the processing of uploaded food images, using deep learning models to identify ingredients and suggest relevant recipes based on the recognized dish.
- **Recipe Generation Service**: This service combines the identified ingredients and image analysis results with natural language processing to generate a complete recipe, including instructions and optional ingredient substitutions.
- **User Profile Management Service**: Manages user data, dietary preferences, saved recipes, and personalized settings, enabling a tailored experience for each user.
- **Notification Service**: Manages the sending of real-time notifications related to recipe recommendations, community interactions, and platform updates to keep users engaged and informed.
- **Community Interaction Service**: Facilitates user engagement by managing recipe sharing, comments, and feedback within the platform, encouraging a community-driven cooking experience.

2.1.3.2 System Architecture:

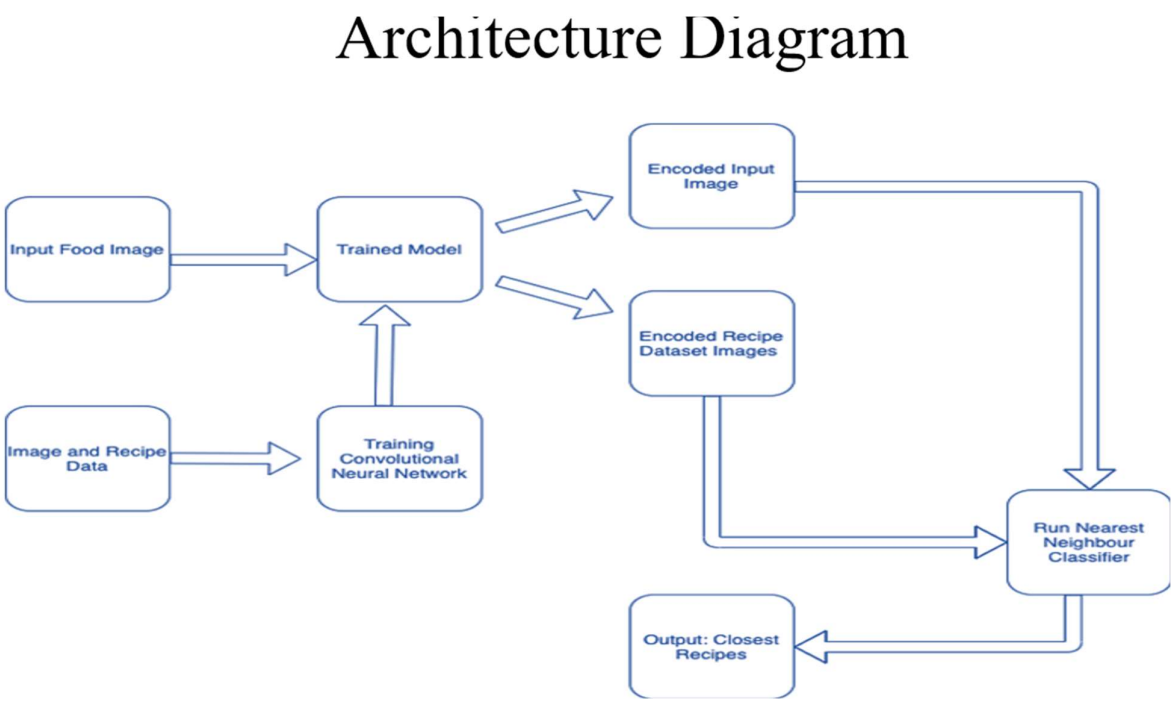


Figure 2.3 System Architecture Diagram

2.1.3.3. Data Exchange Contract:

Frequency of Data Exchanges: Data exchanges on the "CookAI - Recipe Generator" platform are managed based on timing and operational needs:

- **Real-Time Exchanges**:
  For critical operations like user authentication, recipe generation, and image analysis, data is exchanged in real-time via APIs to ensure quick response times and a smooth user experience.
- **Periodic Syncs**:
  Non-critical data, such as user activity logs, historical recipe usage data, and community engagement metrics, is synchronized at scheduled intervals for performance optimization.

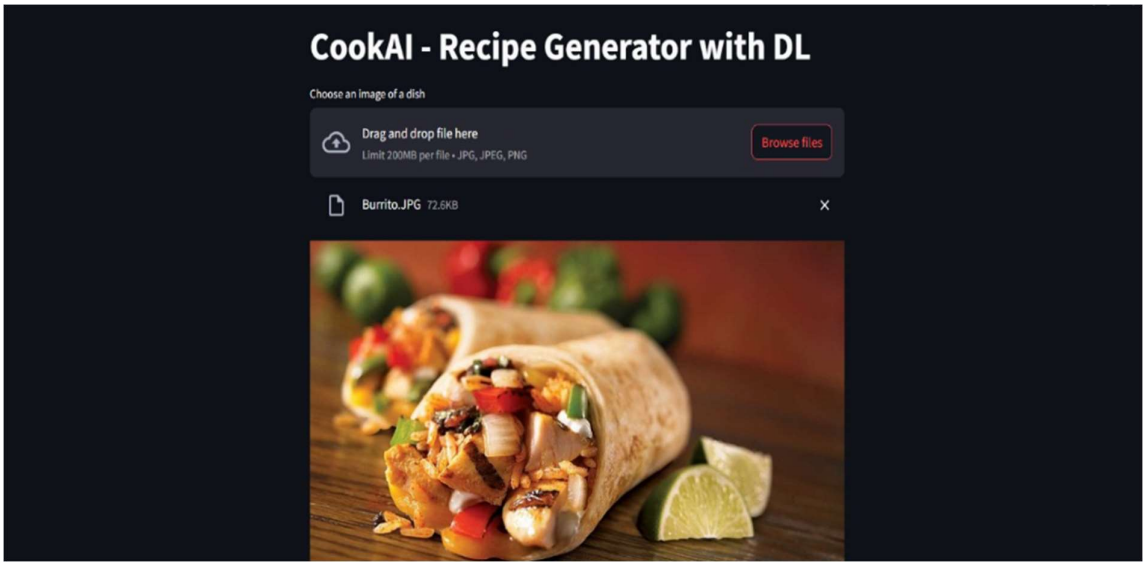
Data Sets: The platform manages several key data sets, each with specific exchange requirements:

- **User Data**:
  Includes personal details, preferences, dietary restrictions, and saved recipes. This data is exchanged during login, profile updates, and preference adjustments.
- **Recipe Data**:
  Encompasses recipe details, ingredients, cooking instructions, and image-based metadata, exchanged when generating recipes or updating recipe content.
- **Community Interaction Data**:
  Tracks user feedback, comments, and recipe sharing activity. This data is exchanged when users engage with shared content or leave feedback.

Mode of Exchanges (API, File, Queue, etc.): Various methods are used for data exchange across the platform:

- **API**:
  RESTful APIs facilitate real-time data exchanges between the front-end and back-end services, ensuring immediate access to personalized recipes and user updates.
- **Message Queues**:
  Services such as RabbitMQ or AWS SQS are employed for asynchronous tasks, like sending notifications for recipe recommendations or processing community interactions in the background.
- **File-Based Exchanges**:
  Bulk data, such as high-resolution food images or recipe uploads, is handled via file exchanges using cloud storage solutions like AWS S3 for efficient management and scalability.

2.1.4 UI DESIGN



2.1.5 Functional Test Cases

Table 2.3 Functional Test cases

Test Case ID	Test Case Description	Input	Expected Output	Actual Output
TC1	Verify image upload	Image file (jpeg/png/jpg)	Image displayed	True
TC2	Verify dish recognition	Image bytes	Recognized dish name	True
TC3	Fetch recipe by dish name	Recognized dish name	Recipe details (ingredients, instructions)	True
TC4	Verify ingredient list display	Recipe data	List of ingredients displayed	True
TC5	Verify YouTube video link retrieval	Dish name	Valid YouTube video URL	True
TC6	Check handling of invalid image	Invalid file type	Error message displayed	True
TC7	Check handling of unrecognized dish	Unrecognized image	Error message displayed	True

2.1.6 Daily Call Progress

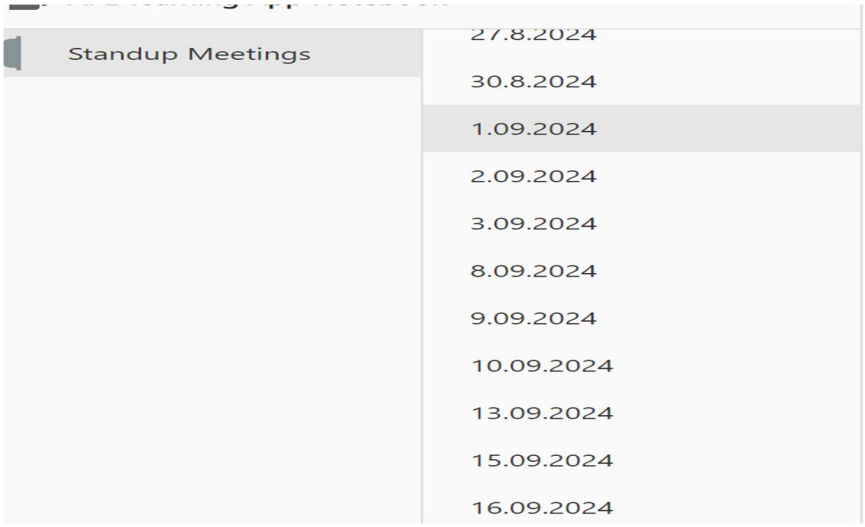


Figure 2.4 Standup meetings

2.1.7 Committed Vs Completed User Stories

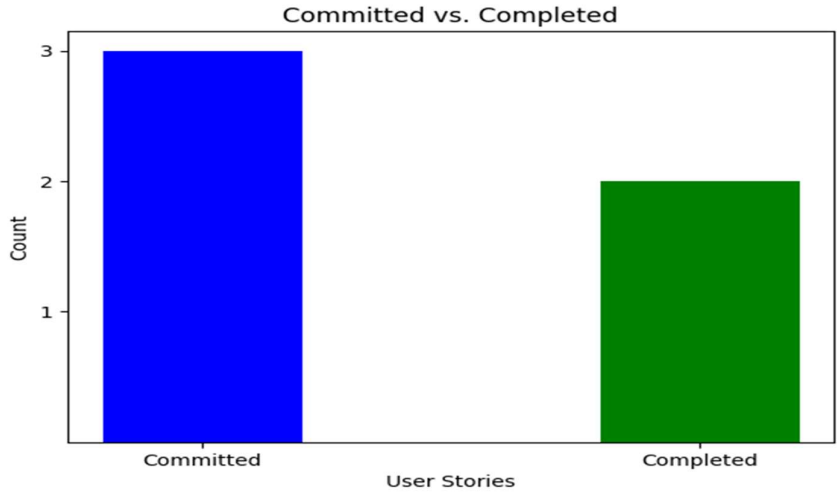


Figure 2.5 Bar graph for Committed Vs Completed User Stories

2.1.8 Sprint Retrospective

Liked	Learned	Lacked	Logged For
Smooth API integration, engaging UI	API limits in dish recognition, nutrition	Better recognition accuracy, customization options	Researching APIs, improving data
Core features delivered on schedule	Value of user feedback for accuracy	Consistent nutrition data, feedback tool	Adding filters, user feedback option

Figure 2.6 Sprint Retrospective for the Sprint 1

2.2 SPRINT 2

2.2.1 Sprint Goal with User Stories of Sprint 2

The goal of Sprint 2 is to expand the platform's functionality by introducing advanced search features, ingredient optimization, and community interaction. These additions will enable users to find relevant recipes easily, substitute ingredients effectively, and engage with other users through sharing and feedback mechanisms.

Sprint 2 Key Deliverables:

- **Enhanced Recipe Search Functionality**
  - **User Story:**
    As a user, I want to search for recipes by cuisine, ingredients, or dietary requirements so that I can easily find recipes that match my preferences.
  - **Objective:**
    Develop advanced search filters for cuisine type, specific ingredients, cooking time, and dietary preferences.
- **Ingredient Substitutions and Optimization**
  - **User Story:**
    As a user, I want ingredient substitution options and suggestions for reducing food waste so that I can use what I have on hand and avoid unnecessary waste.
  - **Objective:**
    Provide AI-powered ingredient substitutions based on user input, dietary preferences, or allergy constraints.
- **Community Engagement Features**
  - **User Story:**
    As a user, I want to share my recipes, comment on others' creations, and provide feedback so that I can engage with the community and learn from others.
  - **Objective:**
    Enable recipe sharing, commenting, rating, and providing feedback to foster community interaction.
- **Real-Time Notifications**
  - **User Story:**
    As a user, I want to receive notifications about new recipe suggestions, community feedback, and personalized recommendations so that I stay engaged with the platform.
  - **Objective:**
    Implement a real-time notification system for recipe updates, feedback, and community interactions.

2.2.2 Functional Document

- **Enhanced Search and Filtering**

    - Allows users to search for recipes using multiple criteria such as ingredient type, cuisine, dietary needs, and preparation time.
- **Ingredient Optimization and Substitution**
    - Suggests useful alternatives for ingredients to reduce food waste and cater to dietary preferences or allergies.
- **Recipe Sharing and Feedback**
    - Users can share their own customized recipes, provide comments, and give feedback on others' creations.

2.2.3 Architecture Document

- **Community Interaction Microservice**
    - Manages user interactions, such as recipe sharing, comments, and ratings.
- **Notification Service**
    - Sends real-time notifications related to recipe suggestions, community engagement, and platform updates.

2.2.4 UI Design

- **Search and Filter Interface**
    - Design and implement user-friendly search filters that allow users to easily locate recipes based on specific criteria.
- **Community Interaction Features**
    - Design user interface for recipe sharing, commenting, and rating.

2.2.5 Functional Test Cases

- **Test Search Functionality**
    - Verify that users can search for recipes based on filters like ingredients, cuisine, and dietary preferences.
- **Test Ingredient Substitution**
    - Ensure the platform provides accurate and useful substitutions for selected ingredients.

2.3 Sprint 3

2.3.1 Sprint Goal with User Stories of Sprint 3

The goal of Sprint 3 is to refine existing features based on user feedback from the first two sprints. It will also introduce advanced personalization, performance optimization, and deeper insights into user engagement through an analytics dashboard.

Sprint 3 Key Deliverables:

- **Advanced Recipe Personalization**

- **User Story:**
  As a user, I want to receive more personalized recipe suggestions based on my previous activity so that I can explore new recipes that match my preferences.
- **Objective:**
  Enhance AI algorithms to provide more accurate and personalized recipe suggestions based on user history and feedback.

- **User Analytics and Insights**
  - **User Story:**
    As an administrator, I want to track user activity and engagement so that I can improve the platform based on user behavior and preferences.
  - **Objective:**
    Develop an analytics dashboard to track user interactions, recipe searches, ingredient usage, and overall engagement metrics.

- **Performance Optimization**
  - **User Story:**
    As a user, I want the platform to quickly analyze uploaded images and generate recipes so that I don't have to wait too long.
  - **Objective:**
    Optimize image recognition and recipe generation algorithms to reduce processing times and improve performance.
- **UI/UX Refinement**
  - **User Story:**
    As a user, I want a smooth and intuitive interface so that I can easily navigate the platform without confusion.
  - **Objective:**
    Refine UI and UX design based on user feedback, ensuring the platform is visually appealing and responsive across devices.

2.3.2 Functional Document

- **User Analytics Dashboard**
  - Provides administrators with insights into user behavior, including recipe searches, feedback, and engagement metrics.

- **Deeper Recipe Personalization**
    - Uses advanced AI to offer tailored recipe recommendations based on the user's activity history and feedback.
- **Performance Optimization**
    - Ensures faster response times for image recognition and recipe generation processes.

2.3.3 Architecture Document

- **Analytics Microservice**
    - Gathers and analyzes data related to user activity, engagement, and performance to offer actionable insights.

- **Performance Optimization**
    - Focus on optimizing the microservices for image recognition and recipe generation to ensure quick processing times.

2.3.4 UI Design

- **User Analytics Dashboard**
    - Design an intuitive and visually appealing analytics dashboard for administrators to monitor user behavior.
- **UI Refinement for Recipe Generation and Search**
    - Improve the overall user interface for recipe upload and search functionalities based on user feedback.

2.3.5 Functional Test Cases

- **Test Analytics Dashboard**

    - Verify that the data presented on the analytics dashboard is accurate and provides useful insights for administrators.
- **Test Recipe Personalization**
    - Ensure that the platform delivers personalized recipe recommendations based on a user's previous activity and preferences.
- **Test Platform Performance**
    - Test and validate the performance of image recognition and recipe generation to ensure quick and smooth operations.

CHAPTER 3

RESULTS AND DISCUSSION

3.1 Project Outcomes

The "**CookAI**" project effectively accomplishes its main goal, which is to convert dish photos into thorough recipe recommendations enhanced with ingredient lists, serving sizes, projected calorie counts, thorough directions, and pertinent YouTube tutorials. Accurate dish identification from uploaded photographs is made possible by the integration of Clarifai's image recognition API, which serves as a gateway to additional features. The following are the primary results attained:

Dish Recognition: Using user-provided photos, the *Clarifai API* correctly determines the type of dish, laying the groundwork for recipe lookup and educational assistance.

Recipe Information: CookAI uses *TheMealDB API* to obtain and display ingredients together with measurements and preparation instructions, making it simple for users to reproduce well-known dishes.

Nutritional Estimation: CookAI generates a random estimate of calories between predetermined ranges. Users can learn more about the dish's calorie composition using this approximation.

User Guidance through Video Tutorials: CookAI helps users learn visually and improves their cooking experience by using the *Google YouTube API* to present a pertinent cooking video tutorial based on the identified food.

All things considered, the CookAI app provides users with a seamless and engaging experience by converting image-based searches into practical culinary knowledge. Future enhancements might focus on improving item customisation according to dietary preferences, expanding the cuisines covered, and improving calorie estimation.

3.2 Committed Vs Completed User stories

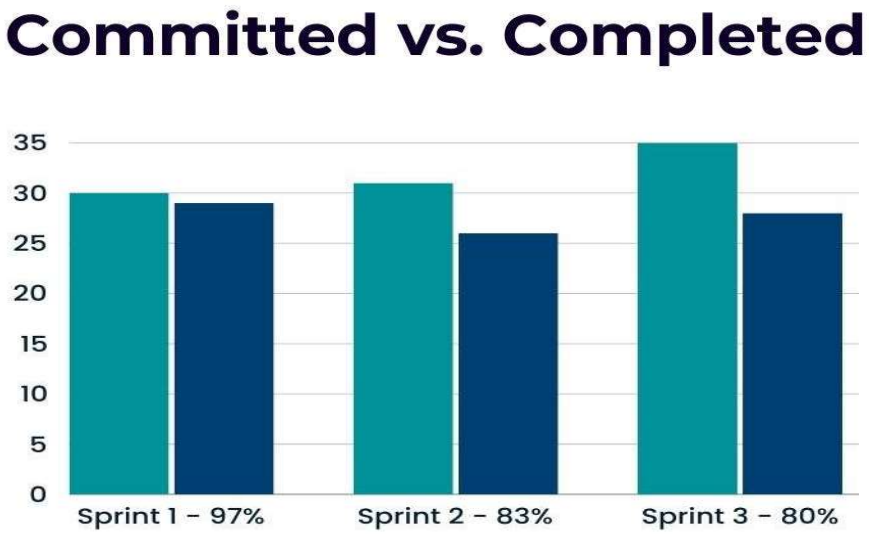


Figure 3.7 Committed vs Completed

CHAPTER 4

CONCLUSION & FUTURE ENHANCEMENTS

Conclusion

By converting food photos into customised recipes, the **CookAI-Recipe Generator** project seeks to offer a smooth cooking experience. Users may explore, store, and create recipes with ease once the platform's core features—such as user registration, profile management, and image-based recipe generation—are in place. The platform is a dependable and entertaining resource for foodies of all skill levels because of its user-friendly UI and AI-powered technologies.

Future Enhancements

1. **Dietary Analysis in Real Time:**

- Provide users with dietary breakdowns depending on their health objectives by integrating nutritional analysis for products and recipes (e.g., calorie count, macronutrients, and allergen warnings).

2. **Voice-Activated Directions for Recipes:**

- Use voice-guided recipe instructions to allow users to cook hands-free, which will make it simpler to follow directions.

3. **Support for Multiple Languages:**

- Increase language support to attract a wider range of users, particularly in areas where people are passionate about cooking but have low levels of English competence.

4. **Improved Customisation of AI Recipes:**

- Improve the models for generating recipes to better suit regional components, seasonal crops, and particular culinary preferences.

5. **Connectivity with Intelligent Kitchen Appliances:**

- Allow synchronisation with smart kitchen appliances (such as cookers and ovens) so that cooking parameters are automatically changed in accordance with recipe directions.

CookAI's usefulness and appeal will be strengthened by these upcoming developments, giving customers an even more convenient, individualised, and immersive cooking experience..

APPENDIX

Appendix A: API Details

A.1 Clarifai API

- **Purpose: Identifies dish names from images.**
- **Endpoint: https://api.clarifai.com**
- **Sample Call: model.predict_by_bytes(image_bytes, input_type="image")**

A.2 TheMealDB API

- **Purpose: Provides recipe details (ingredients, instructions).**
- **Endpoint: https://www.themealdb.com/api/json/v1/1/search.php?s=dish_name**

A.3 YouTube API

- **Purpose: Find relevant recipe videos.**
- **Endpoint: https://www.googleapis.com/youtube/v3/search**

Appendix B: Key Code Snippets

B.1 Dish Recognition:

```
def recognize_dish(image_bytes):

    model = Model(url="https://clarifai.com/...", pat=clarifai_pat)

                                                                    return
model.predict_by_bytes(image_bytes).outputs[0].data.concepts[0].name
```

B.2 YouTube Video Search:

```
def get_youtube_video(dish_name):

    youtube = build('youtube', 'v3', developerKey=google_api_key)

          response   =   youtube.search().list(part="snippet",   maxResults=1,
q=f"{dish_name} recipe").execute()

                                                                    return
f"https://www.youtube.com/watch?v={response['items'][0]['id']['videoId']}"
```

Appendix C: Sample coding

```
import streamlit as st

from clarifai.client.model import Model

from PIL import Image

import requests

from io import BytesIO

from googleapiclient.discovery import build


# API Keys

clarifai_pat = "5a2c5e444b9b40ab9e4f60f950e71bfd"

google_api_key = 'AIzaSyAdj0qB_7Z5LuTosBkI_oY47USIZ_MtvVU'


# Functions for YouTube video and dish recognition

def get_youtube_video(dish_name):

    youtube = build('youtube', 'v3', developerKey=google_api_key)

     response = youtube.search().list(part="snippet", maxResults=1,
q=f"{dish_name} recipe").execute()

                                                                return
f"https://www.youtube.com/watch?v={response['items'][0]['id']['video
Id']}"


def recognize_dish(image_bytes):

     model=Model(url="https://clarifai.com/clarifai/main/models/foo
d-item-recognition", pat=clarifai_pat)

     prediction=model.predict_by_bytes(image_bytes,
input_type="image")

return         prediction.outputs[0].data.concepts[0].name         if
prediction.outputs else None


# App interface

st.title('CookAI 🔍')

uploaded_file = st.file_uploader("Upload an image:", type=["jpeg",
"png", "jpg"])
```

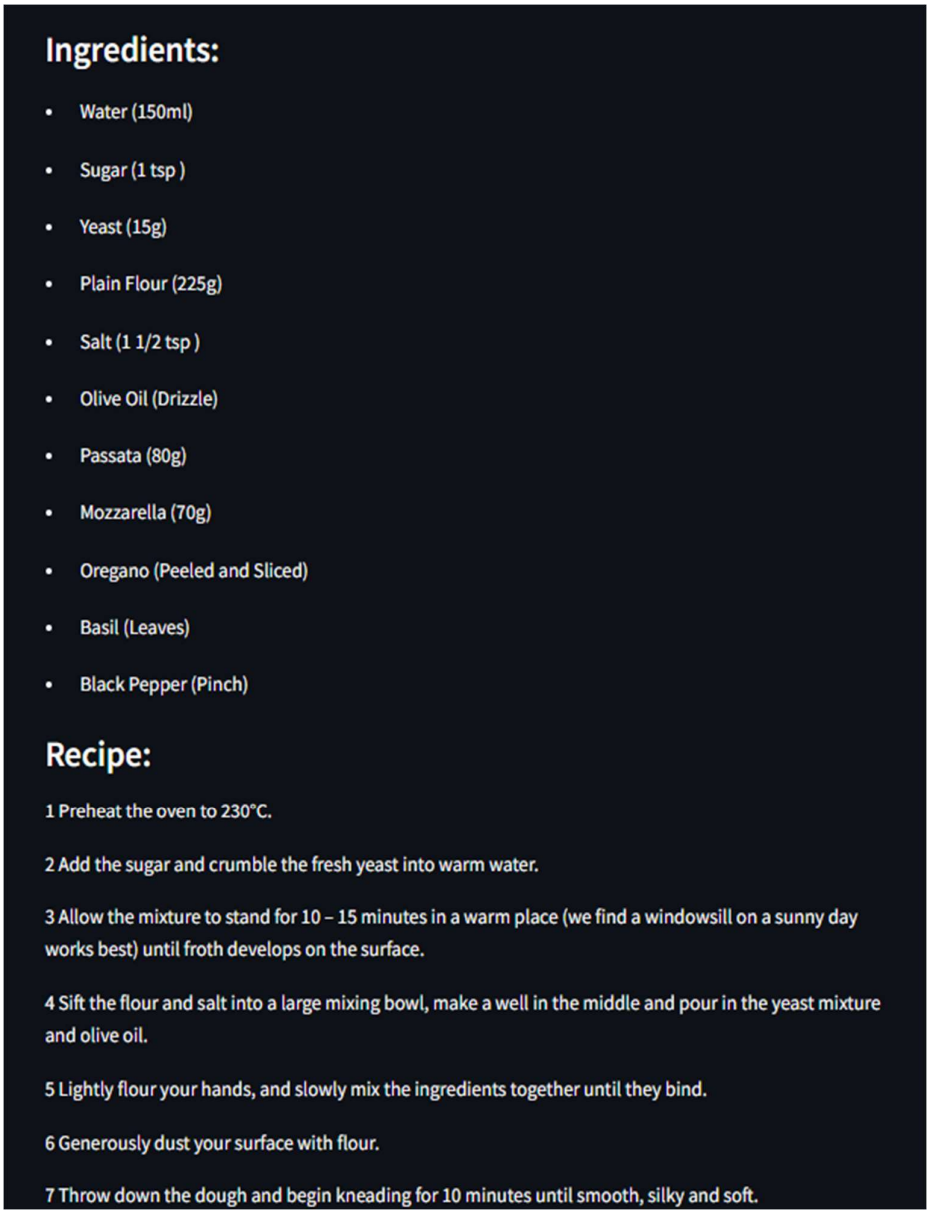
```
if uploaded_file:
    image = Image.open(uploaded_file)
    st.image(image, caption='Uploaded Image')
    image_bytes = BytesIO()
    image.save(image_bytes, format='PNG')
    dish_name = recognize_dish(image_bytes.read())

    if dish_name:
        st.write(f"### Dish Name: {dish_name}")
        video_url = get_youtube_video(dish_name)
        st.write("### Watch a tutorial:")
        st.video(video_url)
    else:
        st.write("Dish not recognized.")
```

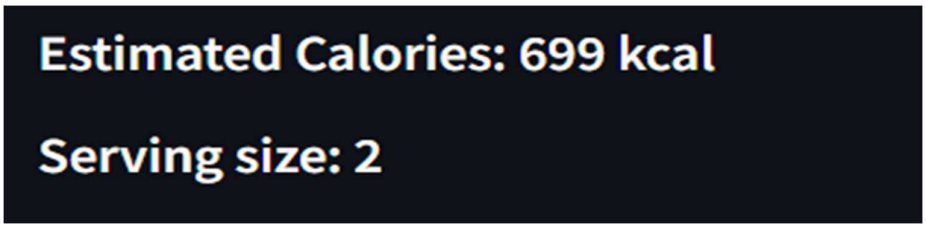
Appendix D: Sample Screenshots

1. **Dish identification result**

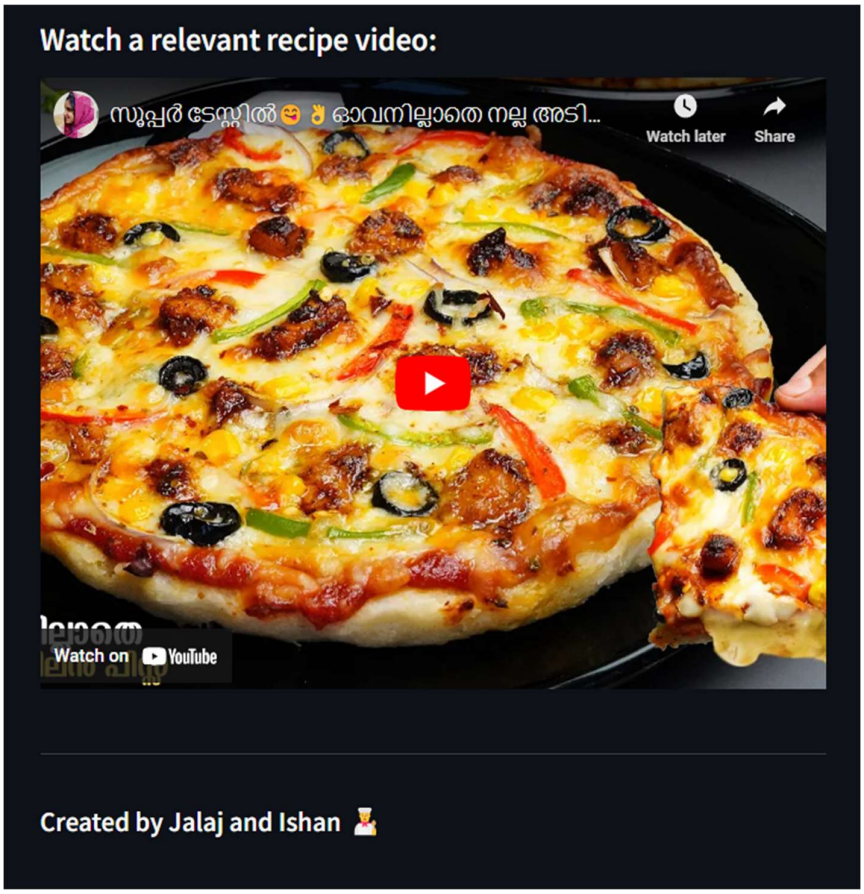
2. **Recipe and ingredient list**



3. **Calorie estimate**



4. **Recipe video tutorial link**



PLAGIARISM REPORT

Project Title: CookAI

The "CookAI" project uses machine learning and image recognition to recognise dishes from provided photos, offer recipes, and connect pertinent video tutorials. The application makes use of the YouTube API to retrieve instructional videos and the Clarifai API to recognise food items.

Methodology

- **Image Recognition:** Utilizes the Clarifai API to recognize dishes from images.
- **Recipe Retrieval:** Fetches recipes and ingredients from TheMealDB API.
- **YouTube Integration:** Links cooking tutorials using the Google YouTube API.

Results

The project's essential features were effectively put into practice. When a user uploads an image, the program will:

- **Identify the dish**
- **Show the dish's name.**
- **Give cooking directions and an ingredient list.**
- **Provide a pertinent YouTube video instructional for additional direction.**
- **Comparability to Current Works**

Although the techniques employed in "CookAI" are based on technology and APIs that are openly accessible, there are already programs that carry out comparable tasks.

Conclusion

"CookAI" is a cutting-edge use of current technologies to improve culinary instruction and expedite cooking procedures. But it's important to recognise the groundwork established by earlier research in this field. The initiative aims to innovate within the framework offered by the established technology rather than copying current solutions.