

# **EASY COOK-RECIPE FINDER APPLICATION**

## **A PROJECT REPORT**

*Submitted by*

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**to**

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*In partial fulfilment of the requirements for the award of  
the degree of*

**MASTER OF COMPUTER APPLICATION**



**Thangal Kunju Musaliar College of Engineering  
Kerala**

**DEPARTMENT OF COMPUTER APPLICATIONS**

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## DECLARATION

I undersigned hereby to declare that the project report on **EASY COOK-RECIPE FINDER APPLICATION**, submitted for partial fulfilment of the requirements for the award of degree of Master of Computer Application of the APJ Abdul Kalam Technological University, Kerala is a Bonafide work done by me under supervision of **Prof. Sheera Shamsu**. This submission represents my ideas in my own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources. I also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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**CERTIFICATE**

This is to certify that, the report entitled **Easy Cook-Recipe Finder Application** submitted by **Rinsha T (TKM23MCA-2050)** to the **APJ Abdul Kalam Technological University** in partial fulfillment of the requirements for the award of the Degree of **Master of Computer Application** is a Bonafide record of the project work carried out by him/her under my/our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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# ABSTRACT

The **Recipe Finder App** is a comprehensive, user-centric mobile application designed to assist individuals in overcoming the common challenge of meal planning and preparation, particularly for those with limited cooking skills or those struggling to decide what to cook with the ingredients they currently have. By utilizing an intuitive interface, the app allows users to quickly and easily input their available ingredients using a simple checkbox system, ensuring a hassle-free and efficient user experience. Once the ingredients are selected, the app leverages advanced filtering mechanisms to offer personalized recipe suggestions that align with users' dietary preferences (e.g., vegetarian, gluten-free), preferred cuisines (e.g., Italian, Asian), desired cooking times, and varying levels of cooking expertise. This allows users to discover meals that are not only feasible but also tailored to their individual needs, preferences, and constraints.

Built with **Flutter** for cross-platform mobile development, the Recipe Finder App ensures a smooth and responsive experience on Android devices. The app's backend infrastructure is powered by **Firebase**, providing reliable authentication, real-time database management, and seamless synchronization across devices. Additionally, **Firestore** is employed for scalable and flexible data storage, supporting the app's ability to store user-generated data. One of the app's standout features is its integration with the **Spoonacular API**, which provides access to an expansive database of recipes and nutritional information. This integration allows the app to pull thousands of recipe suggestions, ensuring users are provided with a broad range of meal options that align with their available ingredients and dietary needs.

The Recipe Finder App not only aims to make cooking more accessible and enjoyable but also has a broader social impact. By promoting the use of available ingredients, the app helps users minimize food waste, contribute to a more sustainable food system, and encourages healthier eating habits. Whether for novice home cooks or experienced chefs, the app is a tool designed to inspire culinary creativity and ease the stress of daily meal preparation.

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# Chapter 1

## Introduction

In today's fast-paced world, where time and convenience are essential, many people struggle with the challenge of meal planning and cooking. While cooking at home can be healthier and more economical, it often becomes overwhelming, especially for individuals with limited cooking skills, busy schedules, or a lack of inspiration. Additionally, food waste remains a significant global issue, with millions of tons of edible food being discarded every year simply because it is not used in time or because people do not know how to utilize available ingredients effectively.

The **Recipe Finder App** was created to address these challenges by providing an intuitive solution for meal planning, recipe discovery, and cooking inspiration. This app is designed to assist users in making the most of the ingredients they already have in their kitchen, minimizing food waste, and promoting healthier eating habits. By offering personalized recipe recommendations based on the ingredients the user has on hand, as well as their dietary preferences, cuisine preferences, cooking time, and skill level, the app aims to make cooking accessible, efficient, and enjoyable.

The app integrates with the **Spoonacular API**, which gives users access to a vast and diverse recipe database, ranging from quick meals to complex dishes. This partnership allows the app to provide a wide array of options, from globally inspired cuisines to familiar comfort foods, ensuring there is something for every user.

Technologically, the Recipe Finder App combines modern tools and platforms to create a seamless experience. Developed using **Flutter**, a popular framework for cross-platform mobile development, the app ensures that users enjoy consistent performance and design on Android devices. The backend is powered by **Firebase** and **Firestore**, which provide scalable, real-time data synchronization and secure storage for user preferences and recipe information.

By integrating these advanced technologies, the Recipe Finder App not only enhances the cooking experience but also contributes to a larger goal: reducing food waste. With access to personalized recipes, users are encouraged to use up what they have before it expires, ultimately leading to less food being thrown away. The app also inspires healthier eating choices by suggesting nutritious recipes based on dietary goals, allowing users to take control of their food choices without the stress of meal planning.

In this context, the Recipe Finder App is more than just a tool—it is a comprehensive platform that empowers users to explore the joy of cooking, experiment with new ingredients, and enjoy nutritious, delicious meals every day.

## 1.1 Existing System

The concept of recipe discovery and meal planning has been addressed by various apps and platforms over the years, but many existing solutions still face challenges in providing a truly personalized, efficient, and user-friendly experience for individuals seeking to optimize their cooking and meal preparation. Existing systems typically fall into one or more of the following categories:

### 1. Recipe Aggregator Apps:

Popular apps like AllRecipes, Epicurious, and Yummly aggregate a vast collection of recipes. While these apps provide users with access to thousands of recipes, they typically focus on broad categories and search functionalities, which means users need to manually filter through many options to find recipes suited to their specific available ingredients, dietary restrictions, or time constraints. These apps usually have the following limitations:

- **Ingredient-based Filtering:** While some apps allow users to input ingredients, the filtering options may not be as advanced or flexible as users require. Users may need to manually select recipes or go through multiple rounds of filtering to find the right match for their available ingredients.
- **Personalization:** Many recipe aggregators offer limited personalization based on dietary preferences, skill level, or available cooking time. The user experience is often not as tailored, leaving users to manually adjust settings or choose from generalized recipe categories.
- **Food Waste Prevention:** Although some apps allow ingredient searches, they do not actively promote reducing food waste by recommending recipes based on what is already in a user's pantry, leading to missed opportunities for minimizing waste.

### 2. Diet and Nutrition Apps:

Apps like MyFitnessPal, Lose It!, and Cronometer focus on helping users track their diet and manage nutrition. While these apps excel at providing nutritional information, they are often not designed to assist with meal planning based on available ingredients. Users are required to input ingredients manually, and the app typically suggests meals without taking into account the ingredients already present in the user's kitchen. These apps may also:

- Lack **recipe variety** and might only suggest meals focused on calorie count or

specific health goals, rather than considering ease of preparation, available time, or personal taste.

- Have limited integration with grocery shopping and ingredient availability, which leads to users needing to search externally for recipes that match their dietary requirements or available ingredients.

### **3. Smart Kitchen Assistant Apps:**

Apps like Google Home or Amazon Alexa's cooking skills offer integration with voice-activated assistants and can help users find recipes or give cooking instructions. However, these apps are still in their infancy when it comes to delivering personalized recipe suggestions based on available ingredients in the kitchen. Their limitations include:

- Lack of advanced ingredient filtering: Many apps that rely on voice assistants don't allow users to input multiple ingredients or have intuitive systems for managing ingredient availability.
- Limited recipe customization: These systems may not allow the user to specify constraints such as dietary preferences, cooking time, or desired skill level, leading to less relevance in recipe suggestions.

### **4. Traditional Recipe Books/Websites:**

Physical cookbooks and websites with recipe databases (like BBC Good Food, Food Network, and others) are still widely used. These sources often offer a wealth of recipes but lack interactivity. Users cannot easily find recipes based on their current inventory or access personalized suggestions. Key challenges with these traditional systems include:

- Manual searching: Users often have to type in specific keywords and browse through large lists of recipes without a way to filter based on ingredients they already have.
- No integration with real-time databases: These systems do not integrate with APIs or real-time ingredient-based suggestions, making it difficult for users to adapt their recipe search dynamically as they check their pantry or fridge.

## **5. Recipe Sharing Platforms:**

Platforms like Pinterest and Instagram offer recipes shared by users and influencers. While these apps are great for finding inspiration and visual appeal, they don't provide robust ingredient-based filtering or the ability to personalize recommendations based on what users already have. These platforms focus on discovery, but they don't help users with practical decision-making when it comes to meal planning.

## **1.2 Problem Statement**

In today's fast-paced world, many individuals struggle with meal planning, cooking, and utilizing the ingredients they already have in their kitchens. While cooking at home offers numerous benefits, including healthier eating and cost savings, deciding what to cook and managing limited ingredients can be overwhelming, especially for those with limited cooking skills or busy lifestyles. This challenge is compounded by the rising issue of food waste, as many people end up discarding ingredients that go unused or purchase unnecessary items due to uncertainty about what to cook.

Many existing recipe apps fail to provide an efficient and personalized experience for users. One major limitation is the lack of advanced ingredient-based search functionality, which forces users to sift through a large number of irrelevant recipes that don't align with the ingredients they have, their dietary preferences, or the time they can dedicate to cooking. Additionally, many systems fail to offer the level of personalization needed to cater to specific dietary requirements such as gluten-free, vegan, or low-carb diets, as well as users' preferred cuisines or cooking skill levels. This results in overwhelming and irrelevant recipe suggestions. Furthermore, food waste remains a significant issue, as most apps don't actively encourage users to minimize waste by recommending recipes based on the ingredients they already have. This often leads to unnecessary grocery shopping and unused ingredients that end up being discarded. Lastly, the user experience in many apps is subpar, as they often require users to manually input ingredients and preferences for every search, with interfaces that are not intuitive or streamlined, leaving users frustrated and making the meal planning process more time-consuming than it should be.

## **1.3 Proposed System**

The Recipe Finder App aims to simplify meal planning, reduce food waste, and promote

healthier eating by leveraging modern technology to create a personalized, efficient, and user-friendly platform for discovering recipes based on the ingredients users have on hand. By transitioning from traditional methods of recipe searching to a digital, ingredient-based approach, this application addresses the challenges faced by current systems and provides an improved experience for users of all cooking skill levels.

The core feature of the application is its intuitive user interface that allows users to input the ingredients they currently have in their kitchen, making it easier to find recipes that match their available items. With a simple checkbox or search-based system, users can quickly select their ingredients, and the app will present personalized recipe suggestions based on these inputs. This eliminates the need for users to browse through irrelevant recipes and ensures that meal planning is both efficient and convenient.

For users with specific dietary needs or preferences, the app offers advanced filtering options. Users can filter recipes based on factors like dietary restrictions (e.g., vegan, gluten-free, keto), cuisine types (e.g., Italian, Mexican, Indian), cooking time, and skill level. This ensures that recipe recommendations are tailored to individual tastes and requirements, empowering users to make informed meal choices while accommodating dietary goals.

The food waste reduction feature is a key focus of the app. By suggesting recipes based on the ingredients users already have, the app encourages users to utilize what they already own, helping to minimize unnecessary grocery shopping and reduce food waste. Additionally, the app integrates with real-time data management tools to keep track of users' ingredient inventory, allowing for smarter shopping and more sustainable cooking habits.

To ensure seamless performance and security, the app employs Firebase for secure user authentication, real-time data synchronization, and scalable data storage. Firebase ensures that each user's preferences are securely stored and synchronized across devices, providing a personalized experience. Firestore is used to manage the user-generated content, allowing for fast and efficient access to recipes and ingredients.

The app ensures that users receive consistent, accurate recipe suggestions based on their previously saved preferences, contributing to a smoother, more personalized cooking experience. The Recipe Finder App is built using Flutter, enabling it to work seamlessly across both Android platforms. This ensures that users can access the app from a wide range of devices, providing a consistent and reliable experience regardless of platform.

## **1.4 Objectives**

### **1 Provide Personalized Recipe Suggestions**

To offer personalized recipe recommendations based on users' available ingredients, dietary preferences, skill levels, and cooking time, ensuring that the app caters to the unique needs of each individual.

### **2 Reduce Food Waste**

To minimize food waste by suggesting recipes that make use of ingredients users already have in their kitchen. This encourages users to utilize existing pantry items, reducing unnecessary grocery shopping and helping to prevent food spoilage.

### **3 Enhance User Experience**

To create a user-friendly and intuitive interface that simplifies the process of meal planning and recipe discovery. The app should be easy to navigate, with minimal manual input required, ensuring a smooth experience for users of all cooking skill levels.

### **4 Support Diverse Dietary Preferences**

To accommodate a wide range of dietary preferences and restrictions (e.g., vegan, gluten-free, keto, low-carb) by offering tailored recipe recommendations that align with users' specific nutritional needs and goals.

### **5 Offer Advanced Ingredient-Based Search**

To enable users to quickly and easily search for recipes based on the ingredients they already have, reducing the need to browse through irrelevant recipes and helping users discover meals that match their available resources.

### **6 Promote Healthier Eating Habits**

To encourage users to make healthier meal choices by suggesting recipes that are balanced, nutritious, and aligned with users' dietary preferences and health goals.

### **7 Improve Cooking Efficiency and Time Management**

To allow users to filter recipes based on cooking time, making it easy to find quick meals for busy days or more elaborate dishes for weekends or special occasions, thereby improving time management in the kitchen.

## **8 Provide Access to a Wide Variety of Recipes**

To offer a diverse collection of recipes from multiple cuisines, allowing users to explore new types of food and broaden their culinary horizons. The app will integrate with external recipe databases (e.g., Spoonacular API) to provide users with a large selection of recipes.



# Chapter 2

## Literature Survey

A literature survey, also known as a literature review, involves analyzing scholarly sources related to a particular subject. Examining the available literature, provides a comprehensive overview of the state of the field, allowing you to identify relevant theories, approaches, and gaps in the existing body of knowledge. When conducting a literature review from an audit perspective, the main focus is on evaluating the relevant literature. This process covers information that has been published in a specific field of study and sometimes includes information published within a specific time frame.

### 2.1 Purpose of Literature Survey

1. It gives readers easy access to research on a particular topic by selecting high-quality articles or studies that are relevant, meaningful, important and valid, and summarising them into one complete report.
2. It provides an excellent starting point for researchers beginning to do research in a new area by forcing them to summarise, evaluate, and compare original research in that specific area.
3. It ensures that researchers do not duplicate work that has already been done.
4. It can provide clues as to where future research is heading or recommend areas on which to focus.
5. It highlights the key findings.

### 2.2 Related Works

The study of prior research related to this project involves five critical aspects:

1. Recipe Recommendation Systems
2. Food Waste Reduction
3. Personalized Meal Planning

#### 4. Mobile App Development for Recipe Apps

#### 5. Technologies for Recipe Apps

### **2.2.1 Recipe Recommendation Systems**

#### **Personalized Recipe Recommendation System Based on User Preferences**

The study conducted by Hao Liu, Changqing Li, and Jun Li explores personalized recipe recommendation systems. The paper discusses how recipe suggestion systems can be tailored based on user preferences, including taste, dietary restrictions, and available ingredients. It highlights the use of collaborative filtering and content-based methods to provide more relevant recommendations, improving the overall user experience and promoting healthier eating habits. The study emphasizes the importance of personalization in meal planning to meet diverse dietary needs, such as vegan, gluten-free, and low-carb diets.

### **2.2.2 Food Waste Reduction**

#### **Reducing Food Waste with Recipe-Based Systems**

The paper by D. L. Jones and N. N. Tran investigates the potential of recipe-based systems in reducing food waste. It discusses how digital platforms, including mobile apps, can help users make use of ingredients they already have, minimizing unnecessary grocery shopping and reducing food waste. The study emphasizes the role of technology in encouraging sustainable cooking practices, focusing on the benefits of recommending recipes based on available ingredients and the importance of real-time inventory tracking. It highlights the growing trend of integrating food waste reduction strategies into mobile recipe apps.

### **2.2.3 Personalized Meal Planning**

#### **Personalized Diet Plans and Recipes with Artificial Intelligence**

M. P. Robinson and J. K. Lee's paper discusses the application of artificial intelligence (AI) in creating personalized diet plans and recipes. The study explores how AI algorithms can analyze user data, including health goals, dietary preferences, and ingredient availability, to generate meal recommendations that are both nutritious and tailored to individual needs. It highlights the importance of integrating AI to enhance personalization, making it easier for

users to follow specific diets (e.g., keto, vegan, weight loss) while promoting healthy eating habits.

#### **2.2.4 Mobile App Development for Recipe Apps**

##### **Mobile Application for Recipe Discovery and Cooking Assistance**

A. W. Collins and B. L. Duffy discuss the development of a mobile app designed for recipe discovery and cooking assistance. The paper highlights key features such as ingredient-based search, real-time cooking guidance, and personalized recommendations, which align with the needs of modern home cooks. The app aims to streamline the process of finding recipes, reducing meal planning time, and enhancing the cooking experience. The study stresses the importance of designing intuitive, easy-to-use interfaces to improve user engagement and support novice to experienced cooks alike.

#### **2.2.5 Technologies for Recipe Apps**

##### **A Comparative Study of Backend Technologies for Recipe Apps**

J. T. Snyder and C. A. Watson present a comparative study of backend technologies used in recipe apps, with a focus on Firebase, AWS, and Node.js. The paper compares these technologies based on factors like scalability, real-time data management, and ease of integration with third-party services (e.g., Spoonacular API). It concludes that Firebase is a strong choice for mobile recipe apps due to its support for real-time synchronization, user authentication, and seamless integration with other services, making it an ideal backend solution for the Recipe Finder App.

# Chapter 3

## Methodology

The Recipe Finder App is designed to provide a personalized cooking experience by offering recipe suggestions based on the ingredients users have available. The development methodology follows a User-Centered Design (UCD) approach, emphasizing ease of use, personalization, and accessibility. The app's primary goal is to help users find recipes that match their dietary preferences, cooking time, and ingredient inventory, promoting healthier eating and reducing food waste. The development process began with gathering user requirements, identifying common pain points such as excessive food waste and difficulty in meal planning. Based on these insights, the app was designed to allow users to input available ingredients using a simple checklist system. This input is then used to filter recipes from a vast database, which includes options for different cuisines, dietary needs, and preparation times.

The technical architecture of the app is based on Flutter for front-end development, providing a smooth experience on Android devices. The backend uses Firebase for real-time data management, including user authentication, data storage, and synchronization of user preferences and recipes. The app integrates with the Spoonacular API to retrieve a large dataset of recipes and nutritional information. The app also includes advanced filtering options that allow users to narrow down their recipe searches based on dietary preferences (e.g., vegan, gluten-free), cooking times, and difficulty levels. The methodology includes a continuous feedback loop, where user interactions with the app are analyzed to refine and personalize future recipe suggestions. The app was tested for usability, performance, and security, ensuring a seamless and reliable user experience.

### 3.1 Architecture

The architecture of the Recipe Finder App is designed to provide a scalable, secure, and efficient user experience. The system follows a Client-Server Architecture, where the mobile client (built with Flutter) communicates with the server-side backend, which handles data processing, storage, and third-party API integrations.

The app's user interface is structured with a tab-based navigation system to separate the different sections: Ingredients, Recipes, Profile, and Settings. The main screen allows users to input their available ingredients, with an intuitive checkbox system for easy selection. Once the ingredients are selected, users can choose additional filters such as cooking time,

difficulty, or dietary preferences to narrow down their recipe options.

The Firebase Firestore database stores user preferences, ingredients, dietary restrictions, and saved recipes. This database allows for quick and secure retrieval of user data. Firebase Functions are used to perform real-time filtering of recipes based on the user's selections and preferences. The Spoonacular API serves as the primary data source for recipes, providing a wide range of options with nutritional data.

### 3.1.1 System Design

The Recipe Finder App is designed with a focus on simplicity and usability. It utilizes an intuitive design that allows users to easily search for recipes based on the ingredients they have on hand, their dietary restrictions, and their cooking preferences. The design ensures that all core features, such as ingredient input, personalized recipe suggestions, and filtering options, are easily accessible.

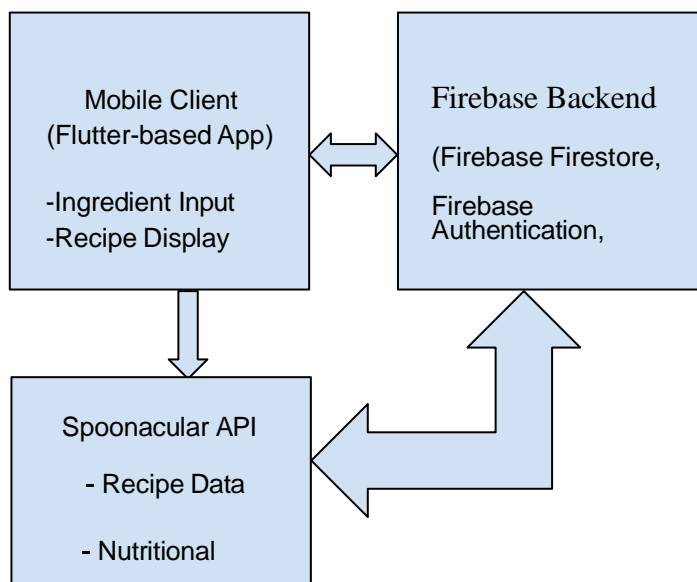


Figure 3.1.1 System overview

## 3.2 Software Requirements and Specifications

The software requirements for this project includes:

1. Flutter
2. Firebase
3. Google Chrome
4. VS Code

5. Android Studio
6. Spoonacular API
7. Dart

### **3.2.1 Flutter**

Flutter is a versatile framework created by Google for building cross-platform applications from a single codebase, covering mobile (Android and iOS), web, and desktop. Written in the Dart programming language, Flutter offers native-like performance by compiling directly to

machine code. Its “hot reload” feature stands out, allowing developers to instantly view changes in the app without restarting it, thus enhancing productivity. Flutter's rich library of customizable widgets simplifies the development of aesthetically consistent UIs across platforms, with dedicated widgets for both Android (Material Design) and iOS (Cupertino).

Another key feature is Flutter's layered architecture, which offers full control over UI rendering and customization. This flexibility makes it easy to create complex animations and tailor visual elements precisely. Moreover, Flutter supports plugins and integrations with services like Firebase, Google Maps, and device APIs, making it suitable for feature-rich applications. The framework is supported by a large community, extensive documentation, and continuous updates from Google, helping developers stay up-to-date and troubleshoot effectively. With its balance of performance, flexibility, and ease of use, Flutter is an increasingly popular choice for businesses and developers aiming for consistency and efficiency in cross-platform app development.

### **3.2.2 Firebase**

Firebase is a robust backend-as-a-service platform provided by Google that supports the development of web and mobile applications. It offers a suite of tools and services that streamline backend functionality, allowing developers to focus more on building engaging user experiences. A key feature of Firebase is its Authentication service, which simplifies user login with support for email and social logins like Google and Facebook. Firebase also provides powerful, cloud-hosted databases: Firestore for structured data and Realtime Database for applications that need data updates in real-time across multiple users.

Beyond data storage, Firebase includes Cloud Functions, which enable server-side code execution in response to app events, reducing the need for traditional backend infrastructure. Cloud Storage in Firebase is ideal for handling and serving large files such as images or videos, and Firebase Hosting offers fast, secure deployment for web applications and static content. Additionally, Firebase Analytics allows developers to monitor app performance, user engagement, and events, while Crashlytics offers detailed reports to address app crashes and improve stability. Finally, Firebase's Machine Learning Kit makes it easy to incorporate AI features like image recognition or text analysis with minimal setup.

Together, these features make Firebase highly scalable and flexible, catering to both small projects and large-scale enterprise applications. Its seamless integration with Google's ecosystem also allows developers to leverage other services like Google Cloud, making Firebase an all-in-one platform that is well-suited to modern app development needs.

### **3.2.3 Google Chrome**

Google Chrome is a fast, secure, and widely-used web browser developed by Google, designed to provide an efficient and smooth browsing experience. Known for its speed and minimalist design, Chrome was built with the WebKit rendering engine and later switched to Google's Blink engine, which enhanced its performance and loading speeds. Chrome supports cross-platform compatibility, available on Windows, macOS, Linux, Android, and iOS.

Its core features include automatic updates, incognito mode for private browsing, tabbed browsing with individual process isolation for each tab, and a robust security system that includes phishing and malware protection. Chrome also seamlessly integrates with Google services, such as Google Drive, Gmail, and Google Docs, offering a unified experience for users in the Google ecosystem.

The browser supports a wide range of extensions and add-ons through the Chrome Web Store, allowing users to customize functionality, from productivity tools to ad blockers. Chrome's sync feature enables users to save bookmarks, passwords, and history across multiple devices when logged into their Google account.

### **3.2.4 VS Code**

Visual Studio Code (VS Code) is a lightweight, open-source code editor developed by Microsoft that offers a range of features for developers. Known for its speed and versatility, VS Code supports a wide variety of programming languages through built-in features and an extensive marketplace of extensions. The editor includes essential tools like syntax highlighting, code navigation, intelligent code completion, and error detection, making it ideal for beginners and advanced developers alike.

One of VS Code's standout features is IntelliSense, an advanced code completion tool that provides context-aware suggestions, enhancing productivity and reducing errors. Additionally, the integrated terminal allows developers to run scripts and commands directly within the editor, streamlining workflows. VS Code also supports version control with Git integration, letting users manage repositories, track changes, and commit code without leaving the editor.

Its extension ecosystem is another major advantage, with plugins for everything from language support (e.g., Python, Java, Go) to frameworks (e.g., React, Angular) and tools (e.g., Docker, Kubernetes). Extensions also enable custom themes, keybindings, and language-specific linting, allowing developers to tailor VS Code to their specific needs. This flexibility, along with its cross-platform compatibility (available on Windows, macOS, and Linux), has made VS Code one of the most popular code editors in the developer community.

### **3.2.5 Android Studio**

Android Studio is an integrated development environment (IDE) developed by Google for building Android applications. Based on IntelliJ IDEA, it provides a suite of tools tailored for Android development, including a powerful code editor, a real-time preview of user interface changes, and extensive debugging options. Android Studio supports features like Gradle-based build system for managing dependencies, emulators for testing on various devices, and code templates for quick setup of standard Android components.

One of its standout features is Android Jetpack integration, which includes libraries, tools, and guidance to help developers reduce boilerplate code and focus on creating robust applications.



Android Studio also provides profiling tools for performance optimization, allowing developers to monitor CPU usage, memory, and network activity. Furthermore, it supports Kotlin and Java for Android app development and integrates seamlessly with Firebase for backend services like authentication and real-time database.

With continuous updates from Google, Android Studio remains the official and most comprehensive IDE for Android development, providing the resources to build, test, and optimize applications on a variety of Android devices.

### **3.2.6 Spoonacular API**

To integrate the Spoonacular API into the Recipe Finder App, certain software requirements need to be met to ensure smooth functionality and optimal performance. First, the app must be developed using a framework that supports HTTP requests, such as Flutter, which is capable of making API calls to retrieve recipe data from Spoonacular's vast database. The Spoonacular API offers endpoints for searching recipes, filtering based on ingredients, dietary preferences, and cuisine, which requires an internet connection and the handling of JSON responses. Therefore, a robust network connectivity feature within the app is essential to facilitate real-time data fetching. Additionally, the app should be able to process and display the JSON data, including parsing and mapping it into the app's user interface, which requires appropriate libraries for data handling. A key requirement is the integration of proper API authentication mechanisms, as Spoonacular provides an API key that needs to be securely stored and used for each request. For efficient data management, the app's backend (powered by Firebase) should be capable of storing user preferences, saved recipes, and custom recommendations, while the API serves dynamic content based on these inputs. Lastly, adequate error handling should be implemented to manage potential issues like API limits or failed requests, ensuring a smooth user experience even when data retrieval faces interruptions.

### **3.2.7 Dart**

Dart is an open-source, general-purpose programming language developed by Google. It's designed to be optimized for building fast, scalable, and high-performance applications, particularly for front-end development on both web and mobile platforms. Dart powers Flutter,

Google's popular UI toolkit, making it especially favoured for cross-platform app development. With a syntax similar to languages like JavaScript and Java, Dart is easy for developers to learn and adopt.

Key features include AOT (Ahead-of-Time) and JIT (Just-in-Time) compilation, which boosts application startup speed and enables hot-reloading, allowing developers to see code changes in real-time during development. Additionally, Dart's asynchronous programming support simplifies handling of operations such as network requests and file I/O, which are common in mobile and web applications.

Dart has a rich standard library that supports tasks like data manipulation, networking, and file handling, and the language emphasizes strong typing and sound null safety to reduce runtime errors. Its combination of ease of use, efficient performance, and cross-platform capabilities makes Dart a powerful choice for modern app development.

### **3.3 Dependencies**

The Dependencies for this project includes:

1. Firebase Core
2. Firebase Auth
3. Firebase Storage
4. Cloud Firestore
5. Spoonacular API Key
6. Intl

#### **3.3.1 Firebase Core**

Firebase Core is a foundational module within Firebase that connects your application to Firebase's backend services. It provides essential functions like app initialization, configuration, and connection to Firebase services. By integrating Firebase Core, developers gain access to tools like analytics, cloud messaging, authentication, and storage, enabling them to build feature-rich, scalable applications quickly. Firebase Core is compatible with various platforms, including Android, iOS, and web applications, and is a critical entry point for leveraging the robust ecosystem of Firebase services.

#### **3.3.2 Firebase Auth**

Firebase Auth is a powerful authentication tool within Firebase that simplifies user sign-in and

authentication processes in mobile and web applications. It supports various authentication methods, including email and password, phone numbers, and third-party providers like Google, Facebook, and Apple. Firebase Auth handles complex backend processes, such as token management and user session persistence, making it easier for developers to secure user data while providing a seamless login experience. Additionally, Firebase Auth integrates with Firebase's other services, allowing for a cohesive development experience with robust security and usability.

### **3.3.3 Firebase Storage**

Firebase Storage is a cloud storage solution that allows developers to store and serve user-generated content such as images, videos, and other files. It offers robust, secure, and scalable storage backed by Google Cloud Storage. With Firebase Storage, developers can upload and download files directly from their apps, using a simple API that integrates seamlessly with Firebase Authentication for secure access control. It also supports features like resumable uploads, metadata management, and access rules to ensure files are stored and shared according to the app's requirements.

### **3.3.4 Cloud Firestore**

Cloud Firestore is a flexible, scalable NoSQL cloud database designed for mobile, web, and server development. It allows developers to store, sync, and query data for their applications in real time. With features like automatic scaling, offline support, and real-time updates, Cloud Firestore simplifies data management for apps. Its powerful querying capabilities and structured data organization help developers create responsive user experiences while ensuring data consistency across different platforms. Integration with other Firebase services further enhances its functionality, making it a robust choice for modern applications.

### **3.3.5 Spoonacular API Key**

The Spoonacular API key is a critical dependency for integrating the Spoonacular API into the Recipe Finder App. The API key serves as a unique identifier that allows the app to authenticate with the Spoonacular API, enabling it to access various endpoints for recipe data, ingredient searches, meal plans, and nutrition information. The key must be securely stored within the app, typically in an environment file or encrypted storage, to prevent unauthorized access and ensure user data privacy. Each API request made by the app includes this key as a part of the HTTP headers or query parameters, allowing the app to interact with Spoonacular's servers and retrieve the necessary data for personalized recipe recommendations and other features.

The API key is also tied to usage limits, meaning the app must handle rate limiting and ensure that the number of requests made does not exceed the allocated quota to avoid service disruptions. Proper management of the API key is essential to ensure smooth and continuous interaction with Spoonacular's services, as well as to protect the app from security risks related to key exposure or misuse. Additionally, depending on the scale of the project, you may need to monitor usage and consider upgrading the API key plan if higher limits or additional features are required.

### **3.3.6 Intl**

Intl is a package in Dart that provides internationalization and localization support for Flutter applications. It allows developers to format dates, numbers, and currencies based on the user's locale. By using the Intl library, developers can easily create applications that cater to diverse language and regional preferences, making it easier to reach a global audience. The package supports pluralization, gender-based translations, and message formatting, enabling a more tailored user experience. Integrating Intl into a Flutter app enhances its accessibility and usability for users worldwide.

## **3.4 Hardware and experimental environment**

This project was built and tested on a consumer laptop with an Amd Ryzen 5 3500H processor with 4 cores and 8 threads, and 16 GB RAM, running on Windows 11 64-bit operating system. The laptop also acted as the web server for serving the project files and the platform for executing the application.

The experimental environment was prepared using Flutter and Firebase on Visual Studio Code. The application was tested on multiple web browsers, namely Google Chrome, Brave Browser, and Mozilla Firefox.

# Chapter 4

## Result and Discussions

The Recipe Finder App has successfully met its design objectives, delivering a functional, user-friendly solution for individuals looking to create meals based on the ingredients they have available at home. Extensive testing has demonstrated that the app performs as expected, providing personalized recipe suggestions based on user inputs. It effectively integrates Firebase for backend services, including user authentication and data storage, while leveraging the Spoonacular API to pull recipe data based on ingredient selection. Additionally, the app successfully handles ingredient-based searches, dietary preferences, and recipe recommendations tailored to the user's needs.

### 4.1 Home Page

Figure 4.1.1 illustrates the homepage of the "Easy Cook" application, showcasing its main search and navigation features. At the top, a search bar allows users to enter recipe names to find relevant recipes. In this example, the user has entered "chicken," triggering a dropdown with recipe suggestions like "chicken 65," "chicken suya," "chicken satay," and "chicken wings," each accompanied by a small thumbnail image for visual reference.

The header area includes icons for accessing the menu, user profile, and logout options, indicating that the user is logged in. Logged-in users have full access to app features, unregistered users can only access the random recipe search, "About" section, and "Sign Up" button. When users tap on the menu icon, they can access features like "Search by Ingredients" and "Advanced Search."

#### 4.1.1 Home Page



Figure 4.1.1 Home Page(Recipe suggestion)

### 4.1.2 Home Page

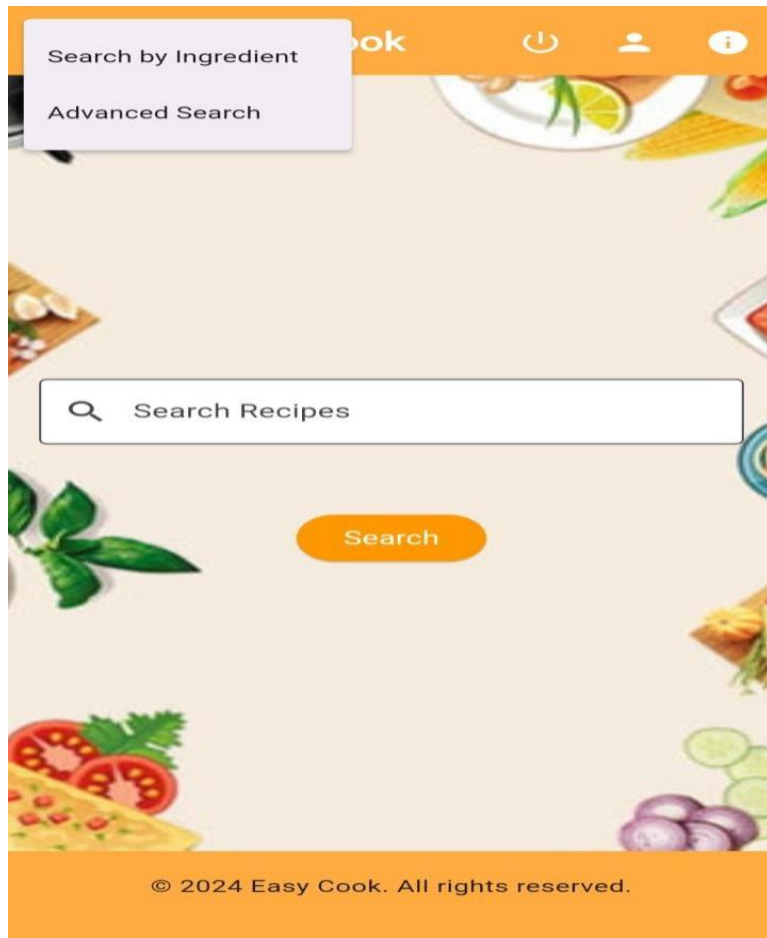


Figure 4.1.2 Home Page(Menu icon)

## 4.2 Sign-up and Login

Figure 4.2.1 represents the Login Page of the Recipe Finder App, where users can log in to their accounts to access the app's features. The page consists of several key elements designed for ease of use and quick access. For users who may have forgotten their password, there is a Forgot Password link below the login button. This link directs users to a page where they can reset their password by entering their email address, allowing them to recover access to their account. Additionally, the page includes a Sign Up navigation link, located at the bottom, for new users who have not yet created an account. Clicking this link takes users to the Sign-Up Page (Figure 4.2.2), where they can register and begin using the app.

The Login Page is designed with a straightforward and user-friendly layout, ensuring that users can easily access their accounts or recover their credentials if needed. It is optimized for both usability and security, ensuring a seamless and safe login experience for all users.

### 4.2.1 Login Page

The image shows a mobile application interface for a sign-up page. At the top, there is an orange header bar with a back arrow on the left and the text 'Sign Up' in the center. Below the header, the form is set against a light pink background. It consists of several input fields, each with a label above it: 'Name' (with placeholder text 'Enter your name'), 'Preferred Cuisine' (a dropdown menu currently showing 'Italian'), 'Dietary Restriction' (a dropdown menu currently showing 'None'), 'Email' (with placeholder text 'Enter your email'), 'Password' (with placeholder text 'Enter your password'), and 'Confirm Password' (with placeholder text 'Confirm your password'). At the bottom of the form is a large, rounded orange button with the text 'Sign Up' in white.

Figure 4.2.1 Login Page

Figure 4.2.2 represents the Sign-Up Page of the Recipe Finder App, designed to gather essential user information for account creation. The page consists of several key input fields that users must complete to register and gain access to the app's personalized features.

This page is designed to be simple and user-friendly, with clear labels and input fields, making it easy for users to register quickly. The form also includes basic validation, ensuring that all required information is provided before proceeding, and error messages are displayed if any field is filled out incorrectly. The Sign-Up Page plays a crucial role in onboarding new users, enabling them to personalize their experience from the start by tailoring recipe suggestions based on their preferences and dietary needs.



### 4.2.2 Sign-up Page

The image shows a login/sign-up interface with a light purple background. At the top, it says "Welcome Back!" in orange. Below this are two input fields: "Email" with an envelope icon and "Password" with a lock icon. Under the password field is a link "Forgot password?". At the bottom, there is an orange "Login" button and a "Sign Up" link in orange text.

Figure 4.2.2 SignUp Page

## 4.3 User Profile

Figure 4.3.1 shows the user profile page in the "Easy Cook" application. This page allows users to manage their personal information and preferences. The page includes fields for the user's name and email address, which are pre-filled based on the information provided during registration.

Additionally, users can select their preferred cuisine and dietary restrictions from dropdown menus. Allowing the app to customize recipe recommendations based on these preferences. At the bottom, an "Update" button enables users to save any changes made to their profile settings.

### 4.3.1 Profile Page

The image shows a user profile page with a black header bar containing a back arrow and the title "Profile". Below the header, there are four input fields: "Name" with the value "John.S", "Email" with the value "john123@gmail.com", "Preferred Cuisine" with a dropdown menu showing "Chinese", and "Dietary Restriction" with a dropdown menu showing "Vegan". At the bottom, there is an orange "Update" button.

Figure 4.3.1 Profile Page

## 4.4 About

A short description of the application. Figure 4.4.1 shows the "About Recipe Finder" page of the Recipe Finder App. This page introduces the app, which allows users to discover recipes based on the ingredients they have available. Key features include searching for recipes by ingredients, saving favorite recipes, a user-friendly interface, and exploring new cooking ideas.

### 4.4.1 About Page



Figure 4.4.1 About Page

## 4.5 Search by ingredient

The "Search by Ingredient" screen allows users to filter recipes based on selected ingredients, making it easier to find recipes that match what they have available. The ingredients are organized into categories, such as "Meats," "Vegetables," and "Spices," with specific items listed under each.

Each ingredient has a checkbox beside it, allowing users to select multiple items across categories. After making their selections, users can tap the "Search Recipes" button at the bottom to view recipes that use their chosen ingredients. This feature provides a convenient way for users to make the best use of available ingredients, reducing food waste and simplifying meal planning. The clean design and organized layout make it easy to navigate and select items.

### 4.5.1 Search by Ingredient Page

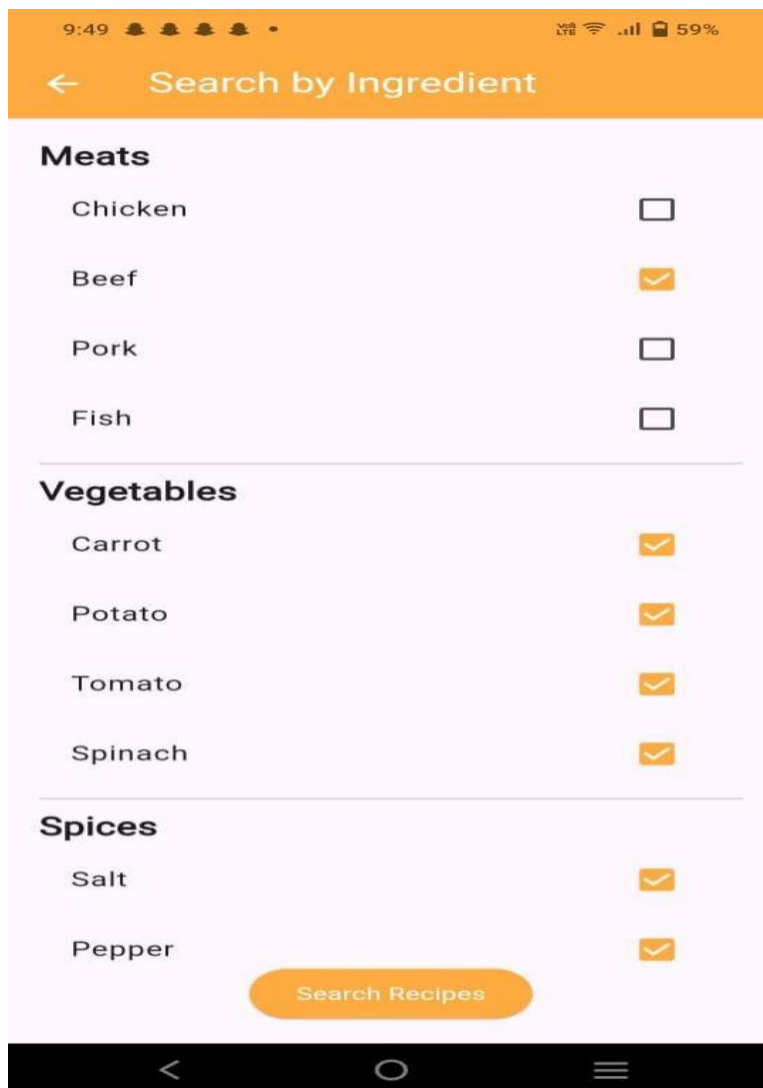


Figure 4.5.1 Search by Ingredient Page

## 4.6 Advanced Search

Figure 4.6.1 shows the "Advanced Search" screen of the Recipe Finder App, where users can filter recipe results based on specific criteria. At the top, a back arrow allows users to return to the previous page. Below the "Advanced Search" title, users can select options for "Preferred Cuisine," "Dietary Restriction," and "Difficulty Level," each with drop-down menus. In this figure, the preferred cuisine is set to "Indian," dietary restriction is set to "None," and difficulty level is set to "Medium." Additionally, a drop-down list is expanded for the "Time" filter, showing options to select recipes based on cooking time, including "Under 30 minutes," "30-60 minutes," and "Over 60 minutes." This layout allows users to customize search results to fit their dietary preferences, skill level, and available time, making it easier to find suitable recipes.

### 4.6.1 Advanced Search Page

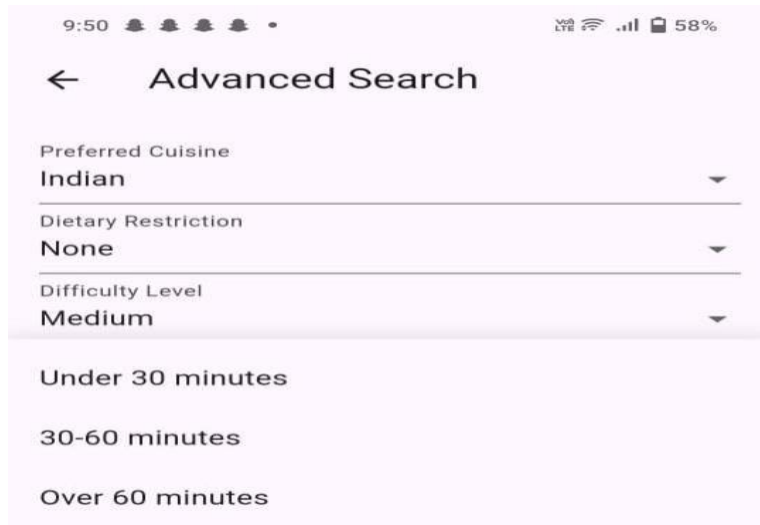


Figure 4.6.1 Advanced Search Page

#### 4.6.2 Search Result



Figure 4.6.2 Search Result

#### 4.6.3 Recipe Detail



**Ingredients:**

- grapeseed oil
- coconut oil
- scallions
- garlic
- cauliflower
- brown rice
- broccoli
- peas
- soy sauce
- sesame oil
- sesame seeds
- additional scallion tops
- salt

**Instructions:**

Remove the cauliflower's tough stem and reserve for another use. Using a food processor, pulse cauliflower florets until they resemble rice or couscous. You should end up with around four cups of "cauliflower rice." Heat 1T butter and 1T oil in a large skillet over medium heat. Add garlic and the white and light green pieces of scallion. SautÃ© about a minute. Add the cauliflower to

Figure 4.6.3 Recipe Detail

# Chapter 5

## Conclusion

In conclusion, the Recipe Finder App is an innovative and practical solution to the everyday challenges of meal planning, food waste, and cooking efficiency. By offering personalized recipe recommendations based on the ingredients users already have, as well as their dietary preferences, skill levels, and available cooking time, the app provides a highly tailored experience that makes cooking more accessible and enjoyable. This functionality not only simplifies the cooking process but also helps users minimize food waste by encouraging them to use up what's already in their kitchen, ultimately reducing the need for unnecessary grocery shopping and preventing food spoilage.

The app also plays a crucial role in promoting healthier eating habits. By accommodating a wide range of dietary restrictions, such as vegan, gluten-free, keto, and low-carb diets, it ensures that users can find meal options that align with their nutritional goals. The inclusion of features like advanced ingredient-based search, cooking time filters, and skill-level adjustments further enhances the user experience, allowing individuals to find recipes that match their schedules and culinary capabilities. Whether users are looking for quick meals during a busy week or more complex dishes for special occasions, the Recipe Finder App offers a versatile selection of recipes to meet diverse needs.

The features not only ensure that users have access to a broad selection of recipes but also help them explore new cuisines and expand their culinary horizons. Additionally, by using Flutter for cross-platform development and Firebase for secure backend support, the Recipe Finder App delivers a seamless, real-time experience that ensures consistent performance across Android devices, further enhancing user satisfaction.

Lastly, by integrating modern technologies like Flutter for cross-platform development and Firebase for secure data storage, the Recipe Finder App delivers a seamless and efficient experience across devices. Its partnership with the Spoonacular API ensures access to a vast and diverse recipe database, giving users the opportunity to explore new cuisines and cooking techniques. In essence, the Recipe Finder App is more than just a tool for meal planning—it's a comprehensive platform that empowers users to cook smarter, waste less, and eat healthier, all while making cooking a fun, creative, and stress-free experience.

## 5.1 Future Enhancements

### 1. Enhanced Recommendation System:

One of the key areas for future enhancement is the implementation of a more intelligent recommendation system powered by machine learning. By analyzing user behavior, such as frequently chosen cuisines, dietary preferences, and cooking habits, the app can provide even more personalized recipe suggestions. Over time, the system could learn from a user's interactions, preferences, and cooking history to suggest recipes that are not only relevant but also tailored to their evolving tastes and goals. This would enhance the user experience by offering a more intuitive and responsive app that adapts to individual needs, making meal planning and cooking even more convenient.

### 2. Nutritional Information Analysis:

As health-conscious eating continues to gain importance, adding a feature to provide detailed nutritional breakdowns for each recipe would be a valuable enhancement. Users could view information on calories, macronutrients (proteins, fats, carbohydrates), micronutrients (vitamins and minerals), and other important dietary elements. This feature would appeal particularly to those with specific dietary goals, such as weight management, muscle building, or managing medical conditions like diabetes. By incorporating this functionality, the app would not only help users find recipes that fit their preferences but also empower them to make more informed decisions about their food choices.

### 3. User-Generated Recipes:

Another exciting future enhancement is the addition of a user-generated recipe feature. Allowing users to submit their own recipes would significantly expand the app's database, enriching the variety of meals and encouraging a sense of community within the platform. This feature could include the ability to upload photos, share personal cooking tips, and rate recipes. By fostering user participation and interaction, the app could become a hub of culinary creativity, where users can not only discover new meals but also contribute to the app's growth and diversity. This would also provide an opportunity for users to engage with others, share their cooking experiences, and find inspiration from a broader pool of ideas.

### 4. Meal Planning and Shopping List Generation:

A major enhancement to further streamline the cooking process would be the introduction of a weekly meal planner feature. This would allow users to plan their meals for the week ahead, select recipes based on their schedule and dietary goals,

and generate an automatic shopping list. By consolidating all the necessary ingredients from the selected recipes, the app would reduce the time spent on meal planning and grocery shopping, making the entire process more efficient. Users could also have the option to adjust the servings or ingredient quantities based on the number of people they're cooking for, ensuring that the shopping list is accurate. This feature would make the app an even more comprehensive solution, helping users save time, reduce food waste, and stick to their meal planning goals more easily.

#### **5. Offline Mode:**

A highly requested feature for future development is the ability to access saved recipes offline. Enabling offline mode would allow users to view their favorite recipes, meal plans, and shopping lists even when they don't have an active internet connection, such as when they're in areas with poor network coverage or while cooking in the kitchen away from their device's data connection. This feature would improve the app's usability, ensuring that users can still access their content at all times, whether they are traveling, cooking on the go, or simply prefer not to use mobile data. By allowing offline access, the app would become even more reliable and convenient, providing uninterrupted support for meal planning and cooking.

#### **6. Voice-Assisted Navigation:**

To further enhance user experience and accessibility, integrating voice-assisted navigation would allow users to interact with the app hands-free while cooking. This feature would enable users to use simple voice commands to search for recipes, navigate between different sections of the app, or adjust settings without needing to touch their devices. For example, users could ask the app to "show the next step," "repeat the ingredients," or "search for a recipe using chicken," making it easier to follow recipes while their hands are busy with cooking tasks. Voice assistance would significantly improve accessibility, especially for users with disabilities or those who simply want a more seamless, hands-free cooking experience. By integrating this feature, the app would cater to a broader audience, ensuring that it remains a versatile tool for users of all needs and skill levels.



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