

# Project Report

## Mobile App Development

### 1. Project Title

App Name: Meal Muse

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Course: Mobile App Development | Instructor: Umber Nisar

Date: 01/12/2025

### 2. Overview

#### Objective:

To develop a full-featured recipe discovery application that transforms household ingredients into personalized meal solutions. MealMuse enables users to intelligently manage their food inventory, receive expiry alerts, and find recipes tailored to their available ingredients and dietary restrictions. The application incorporates an AI-powered chatbot for culinary assistance and includes a complete shopping list system with seamless inventory integration. Built with robust user authentication and administrative controls, this cross-platform solution delivers an intuitive, theme-aware experience designed to reduce food waste and simplify meal planning through comprehensive digital kitchen management.

**Platform(s):** Cross-Platform (Flutter for Android)

**Tools:** Android Studio, Firebase (Auth, Firestore/Realtime DB, Storage), Spoonacular API, and Grok API

### 3. Features

Feature	Description	Status
Add inventory item	Add item with units, category, purchase date, expiry date, notes	Complete
Edit inventory item	Edit any field of an existing item	Complete
Remove inventory item	Delete item from inventory	Complete
Recipe finder	Find recipes using inventory items	Complete
Recipe filtering	Filter recipes based on intolerances or restrictions	Complete
Save recipe	Save recipe for later	Complete
Add missing recipe items to shopping list	Move missing ingredients to shopping list	Complete
Manually add to shopping list	Add custom items to shopping list	Complete
Remove from shopping list	Delete items from shopping list	Complete
Move shopping list items to inventory	Convert purchased items into inventory items	Complete
AI chatbot	Ask AI for help inside the app	Complete
Dark/Light mode	Switch between themes	Complete
Expiry notifications	Notify user when items are expiring soon	Complete
Expiring soon screen	Show items nearing expiry	Complete
Language change	Switch app language	Incomplete
User registration	Create new account	Complete
User login	Login with credentials	Complete
Admin login	Login with admin privileges	Complete
Admin delete users	Admin can remove users	Complete
Admin delete user data	Admin can delete anything from user database	Complete
Change username	Update username	Complete
Change password	Update password	Complete
Logout	Sign out of user account	Complete
Reset/Forgot password	Reset password via email	Complete
Scan Receipt	Scan receipt and extract items list to add to inventory directly	Complete

### 4. Screenshots/UI

[HomeScreen](#), [RecipesList](#), [SavedRecipes](#), [AddItem](#), [Inventory](#), [Recipe](#), [Settings](#)

Material Design principles with custom color schemes

Color-coded expiration system

Responsive layouts for various screen sizes

RTL support for Urdu language

## 5. Tech Stack

Frontend: Flutter

Backend: Firebase (Auth, Firestore).

API:

- **Spoonacular** (<https://spoonacular.com/food-api>),
- **Grok** (<https://grok-api.apidog.io/>),
- **Veryfi** (<https://www.veryfi.com/veryfi-lens/>)

## 6. Challenges & Solutions

### 1. Data Type Standardisation Issue

**Issue:**

Inconsistent data types when displaying items due to different input sources saving values differently.

**Solution:**

Implemented conversion logic to standardise all data types before displaying on screen.

### 2. App Scalability & Database Structure

**Issue:** Maintaining scalability without breaking existing features as more functionality was added.

**Solution:** Standardised data types and enforced a consistent Firestore database structure to keep future additions stable.

### 3. Recipe Filtering API Constraint Issue

**Issue:** Recipe filtering API failed due to overly strict request constraints.

**Solution:** Removed unnecessary constraints to ensure proper API responses.

### 4. Inventory Unit Conversion Logic

**Issue:** Incorrect unit conversion and quantity merging when adding items into inventory.

**Solution:** Implemented a conversion and addition system to correctly combine units before saving.

### 5. UI Responsiveness Across Screen Sizes

**Issue:** UI elements did not scale properly on devices with different screen sizes.

**Solution:** Implemented responsive layouts that automatically adjust based on screen dimensions.

### 6. Duplicate Recipe Saves

**Issue:** Users could save the same recipe multiple times, cluttering saved recipes.

**Solution:** Added a Firestore query check for existing recipeId and disabled the Save button with a “Saved” state.

## 7. Theme Preference Not Persisting

**Issue:** Theme (dark/light) reset to default after app restart.

**Solution:** Integrated shared\_preferences with ThemeProvider to save theme locally and load it on app startup.

## 8. Language Switching Without Restart

**Issue:** Language change required app restart for changes to apply.

**Solution:** Implemented a LocaleProvider using ChangeNotifier so setLocale() rebuilds the UI instantly with updated translations.

## 7. Learning Outcomes

- Gained hands-on experience with Flutter, Firebase integration, state management, and handling real-time data.
- Improved skills in API integration, debugging, and solving data consistency issues across multiple features.
- Applied clean architecture principles to ensure scalability and maintainability as the app grew.
- Strengthened understanding of UI/UX considerations, theme management, and multi-language support.
- Practiced version control using Git, maintaining organised commits and structured project workflow.

## 8. Future Work

- Complete and polish multi-language translation across all screens
- Add collaboration and shared inventory features for households or groups
- Improve offline mode with full local caching and seamless sync
- Enhance recipe recommendations with smarter filtering and personalised suggestions
- Add analytics to track usage patterns and optimise user experience

## 9. Links

GitHub Repo: <https://github.com/keijaz/MealMuseApp>

## 10. Conclusion

**Summary:** MealMuse is an intelligent kitchen assistant that changes how users interact with their food inventory. By seamlessly connecting ingredient tracking, expiry management, and personalized recipe discovery, the app helps reduce food waste while simplifying meal planning. With features like dietary filtering, AI-powered culinary guidance, and integrated shopping lists, MealMuse provides a comprehensive solution for modern kitchen management. The clean, scalable architecture ensures an intuitive user experience while supporting future enhancements and expansion.

Team Contribution:

### **Komal Eijaz:**

- Database Integration
- Authorization and Authentication
- Login, Register, and Forgot Password
- Add Users to database
- Add/Remove/Edit Items in Inventory
- Add inventory Items to database
- Spoonacular API integration to Find Recipes
- Recipe Filtering for dietary restrictions and preferences
- Grok AI API implementation and integration for Chatbot
- Save Recipes implementation and integration with Firebase
- Shopping List implementation and integration
- Move items from shopping list to inventory
- Search functionality for recipes and inventory items
- All Admin functionalities, UI, and logic
- App UI
- Scan Receipt implementation and integration

### **Soha Khan:**

- UI
- Firebase
- CRUD
- Notifications
- Scheduling and Logic

- Theme System
- Language Localization
- State Management
- Preference Retention
- Navigation
- Integration

## **11. Declaration**

We confirm this is our original work.

Signatures: KomalEijaz, SohaKhan

Date: 01/12/2025

## **Attachments**

GitHub Repo: <https://github.com/keijaz/MealMuseApp>

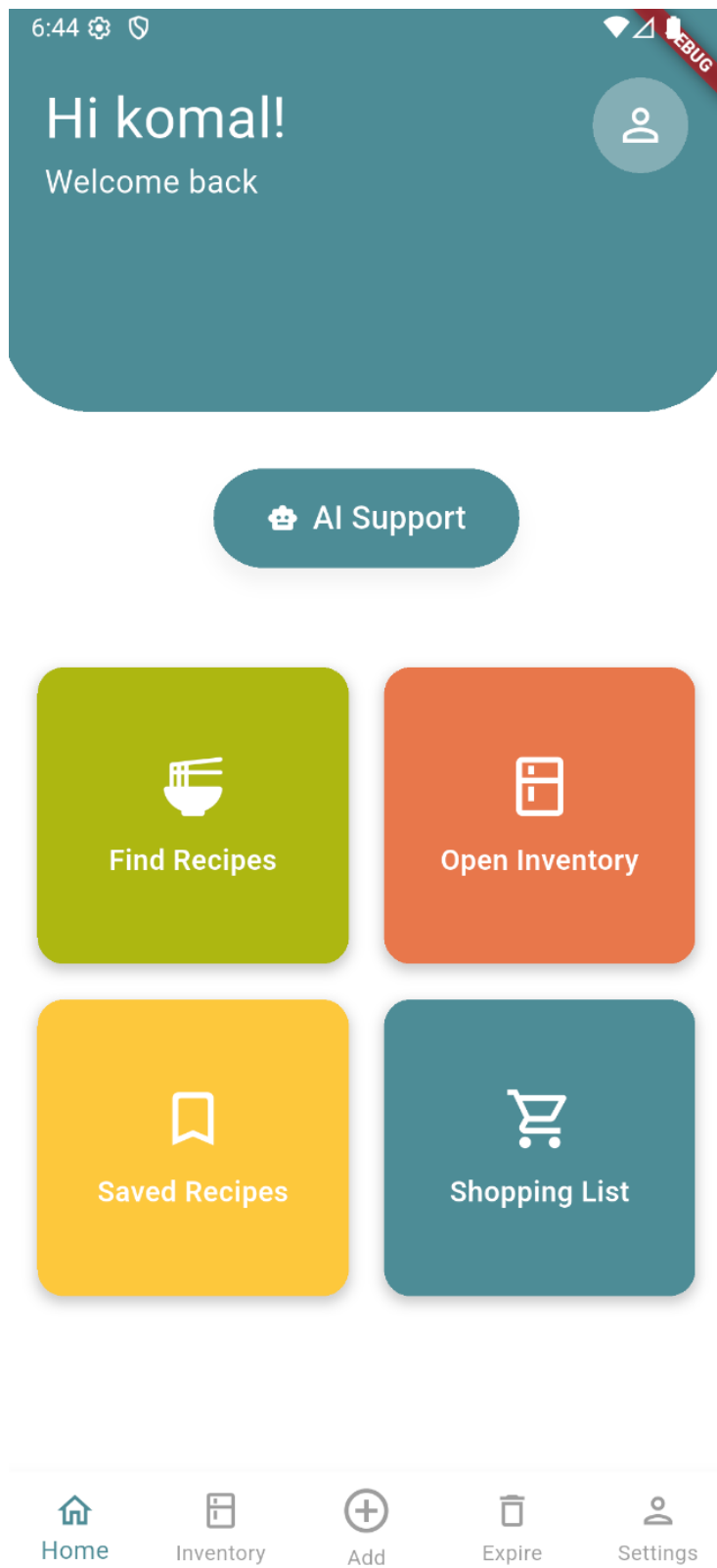


Fig 1.0: HomeScreen

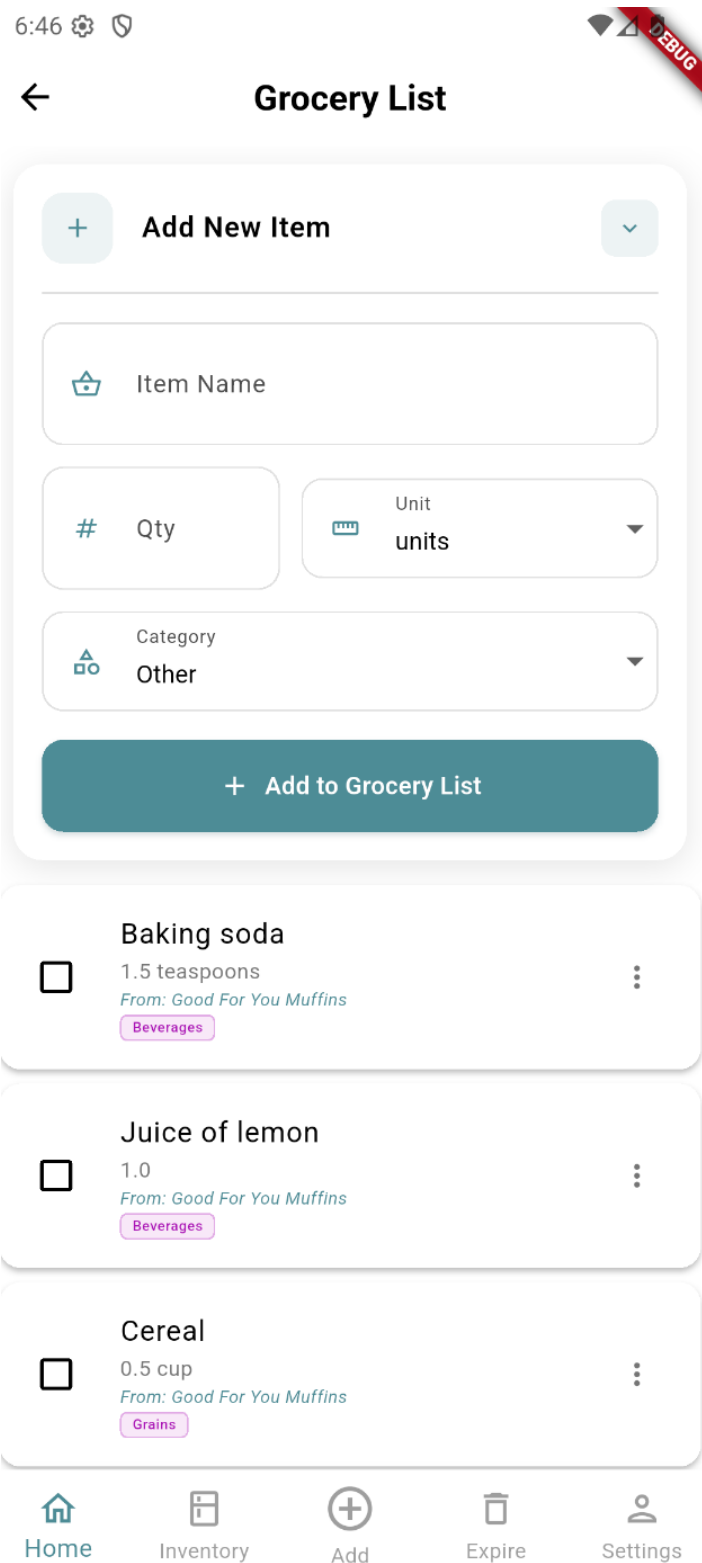


fig 1.1: Grocery List Screen



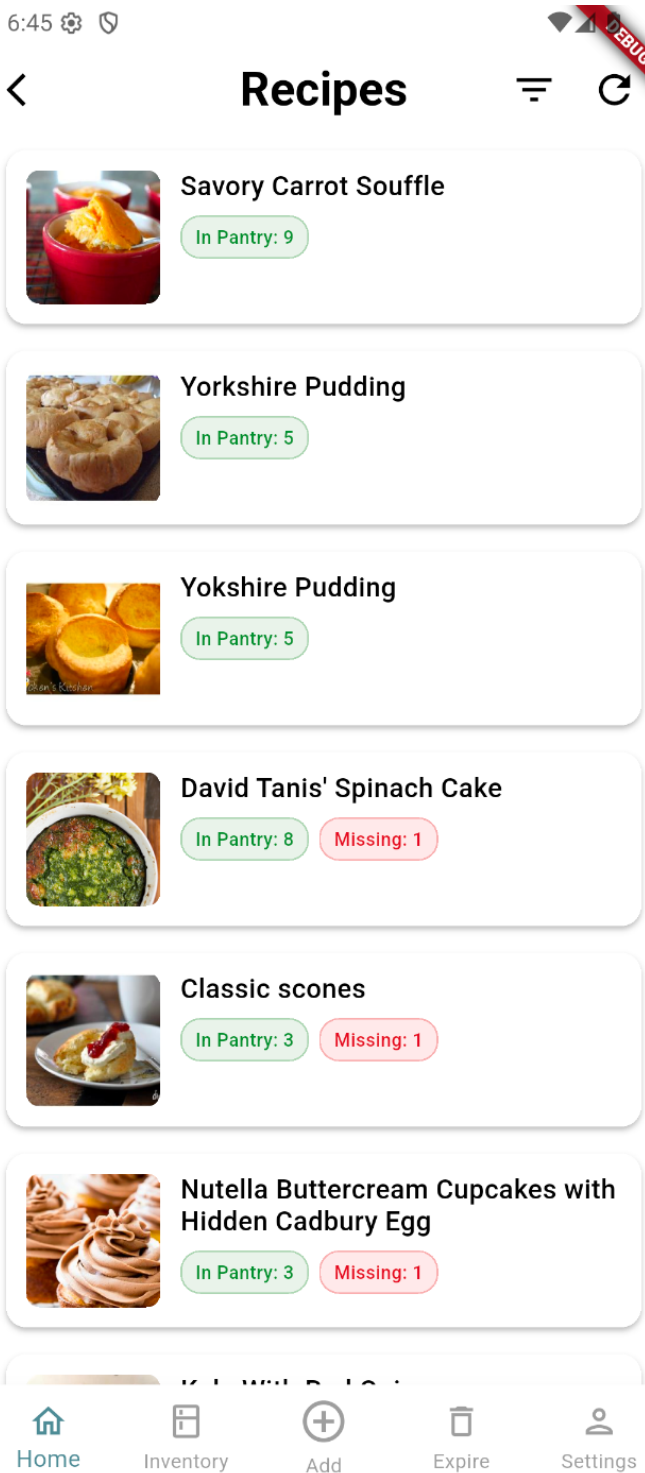


fig 1.2: Recipe Screen

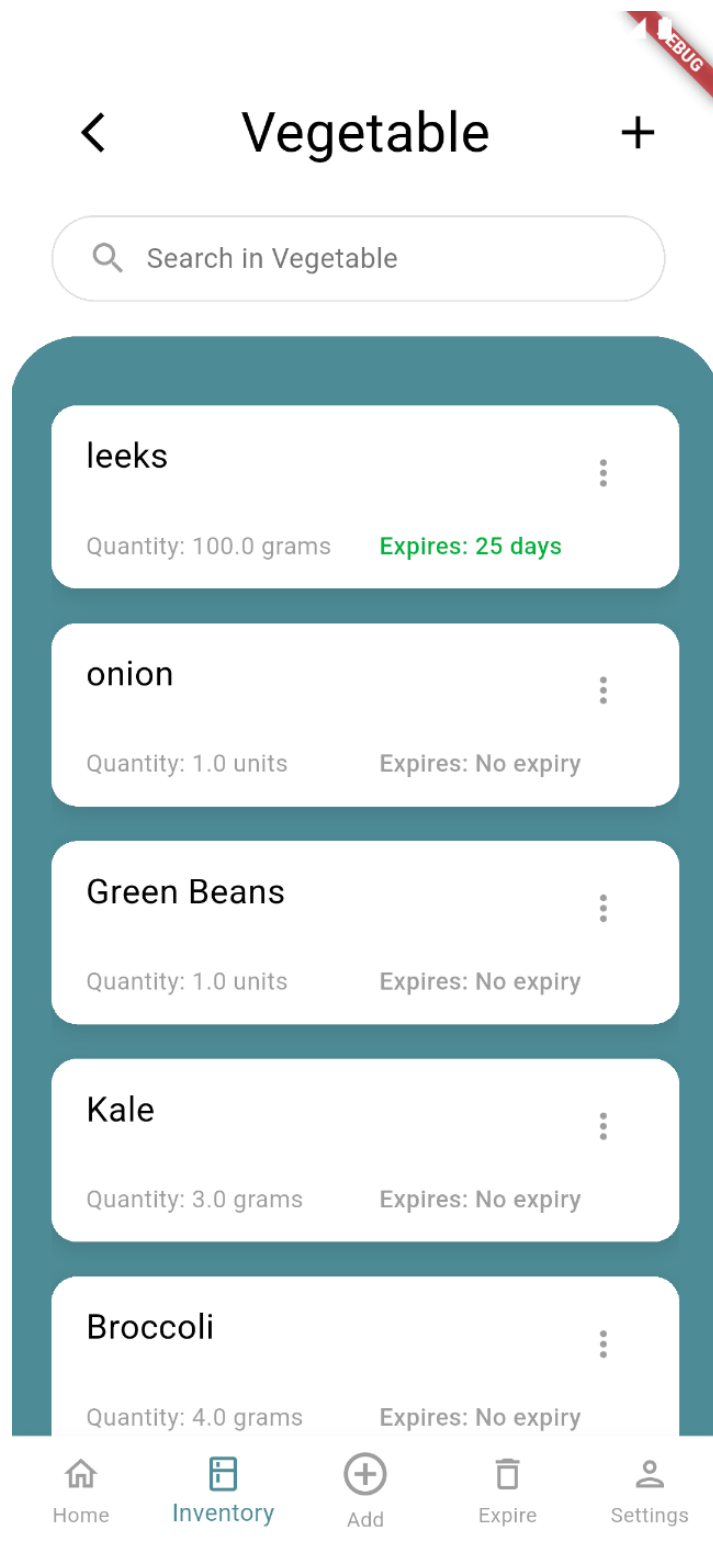


fig 1.3: Inventory -> Vegetable Screen

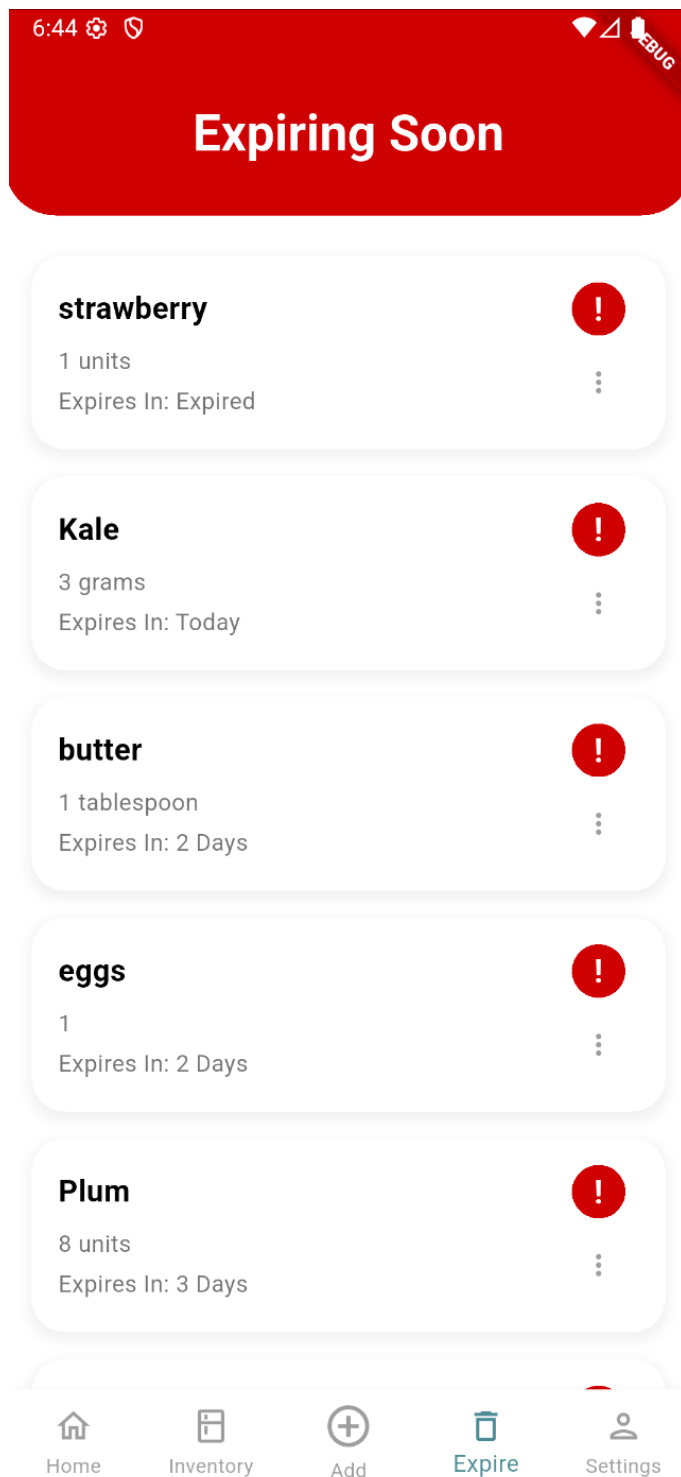


fig 1.4: Expiring Soon Screen

```

void _sendMessage() {
    final text = _textController.text.trim();
    if (text.isEmpty) return;

    // Add user message
    final userMessage = ChatMessage(
        text: text,
        isUser: true,
        timestamp: DateTime.now(),
    ); // ChatMessage
    setState(() {
        _messages.add(userMessage);
    });

    _textController.clear();
    _scrollToBottom();

    // Set loading state
    setState(() {
        _isLoading = true;
    });

    // Get AI response from Groq
    _groqService.generateResponse(text).then((response) {
        final aiMessage = ChatMessage(
            text: response,
            isUser: false,
            timestamp: DateTime.now(),
        ); // ChatMessage
        setState(() {
            _messages.add(aiMessage);
            _isLoading = false;
        });
        _scrollToBottom();
    }).catchError((e) {
        final errorMessage = ChatMessage(
            text: 'Error: $e',
            isUser: false,
            timestamp: DateTime.now(),
        ); // ChatMessage
        setState(() {
            _messages.add(errorMessage);
            _isLoading = false;
        });
        _scrollToBottom();
    });
}

```

fig 2.0: AI chatbot API integration code snippet

```

Future<void> _checkIfRecipeSaved() async {
  try {
    final user = FirebaseAuth.instance.currentUser;
    if (user == null) return;

    // Check both 'id' (from API) and 'recipeId' (from saved recipes)
    final recipeId = widget.recipe['id'] ?? widget.recipe['recipeId'];
    if (recipeId == null) return;

    final existingRecipeQuery = await FirebaseFirestore.instance
      .collection('users')
      .doc(user.uid)
      .collection('saved_recipes')
      .where('recipeId', isEqualTo: recipeId)
      .get();

    setState(() {
      _isSaved = existingRecipeQuery.docs.isNotEmpty;
    });
  } catch (e) {
    print('Error checking if recipe is saved: $e');
  }
}

Future<void> _fetchRecipeDetails() async {
  try {
    // Use the recipeId from the constructor
    final recipeId = widget.recipeId;
    if (recipeId.isEmpty) {
      throw Exception('Recipe ID not found');
    }

    // Convert String to int for the API calls
    final int recipeIdInt = int.tryParse(recipeId) ?? 0;
    if (recipeIdInt == 0) {
      throw Exception('Invalid Recipe ID: $recipeId');
    }

    // Fetch recipe details and instructions
    final details = await ApiService.fetchRecipeDetails(recipeIdInt);
    final instructions = await ApiService.fetchRecipeInstructions(recipeIdInt);

    // Calculate ingredient status
    _calculateIngredientStatus(details['extendedIngredients'] ?? []);

    setState(() {
      _recipeDetails = details;
      _recipeInstructions = instructions;
      _isLoading = false;
    });
  } catch (e) {

```

fig 2.1: Saved Recipes Screen code snippet

```

// Fetch recipes using complexSearch with filters
static Future<List<dynamic>> fetchRecipesWithComplexSearch({
  required String sort,
  List<String> diets = const [],
  List<String> intolerances = const [],
  int number = 10,
}) async {
  try {
    // Check internet connection first
    final hasConnection = await hasInternetConnection();
    if (!hasConnection) {
      throw Exception('No internet connection. Please check your network settings.');
```

fig 3.2: Spoonacular API integration code snippet