

Su Chef - Design Document

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1. Introduction

This document outlines the design and development of Su Chef, an AI-powered cooking assistant. Su Chef leverages AI to personalize recipes, provide interactive step-by-step guidance, and enhance the overall cooking experience.

2. Project Overview

Objective

Su Chef enables users to cook efficiently by offering:

- Personalized recipe recommendations based on user preferences.
- Hands-free, real-time audio guidance during cooking.
- Adaptive learning to refine recommendations based on past interactions.

User Story

As a home cook, I want an intelligent and interactive cooking assistant that helps me find recipes based on my available ingredients, dietary preferences, and time constraints. I want real-time, hands-free guidance to walk me through the cooking process step by step, ensuring that I don't miss any critical steps. Additionally, I want the system to learn my preferences over time, refining recipe recommendations to better

suit my tastes and skill level, making my cooking experience more enjoyable and stress-free.

Use Cases

1. Personalized recipe recommendations based on user input.
2. Hands-free interactive cooking guidance.
3. Real-time adaptive learning to enhance user experience.
4. Inventory-based recipe suggestions.
5. Custom recipe insertion with interactive assistance.

3. Functional Specification

Functional Requirements

- **Personalized Recipe Suggestions:** Generates recipe recommendations based on ingredients, dietary preferences, and available time.
- **Interactive Cooking Mode:** Step-by-step hands-free audio guidance with real-time adjustments.
- **Adaptive Learning:** System refines recommendations based on user feedback and past selections.
- **Inventory Management:** Users log available ingredients, and the system suggests recipes accordingly.
- **Recipe Insertion:** Users add personal recipes and receive interactive guidance.
- **Feedback Mechanism:** Users rate recipes and cooking experience to improve system recommendations.

Ecosystem Scan

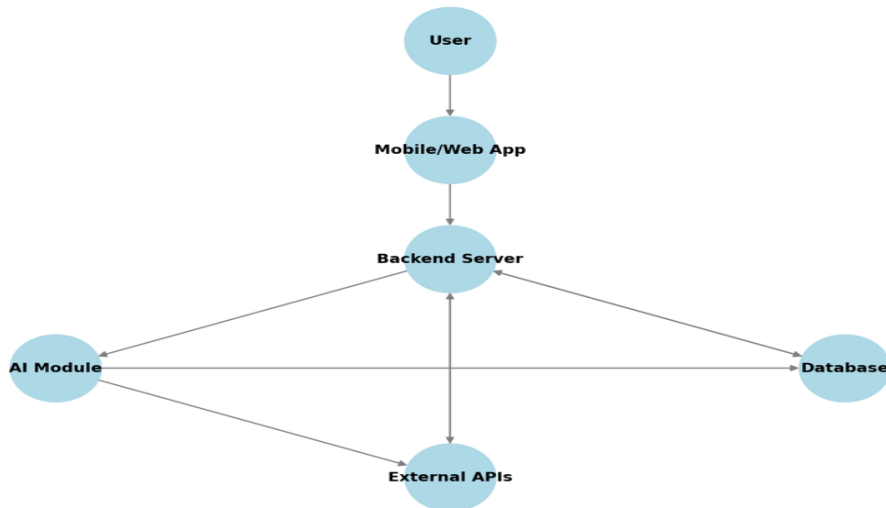
Existing solutions include:

- **Recipe Websites/Apps (e.g., Yummly, AllRecipes):** Provide recipe filtering but lack interactive guidance.
- **Voice Assistants (e.g., Alexa, Google Assistant):** Offer cooking help but do not personalize guidance.

Differentiation

- **AI-Powered Personalization:** Unlike competitors, Su Chef adapts to users' preferences dynamically.
- **Real-Time Interactive Assistance:** Hands-free guidance during cooking enhances usability.
- **Custom Recipe Support:** Users can add their own recipes and receive step-by-step instructions.

High-Level Functional Flow of Su Chef



4. System Architecture

Main Components

- **Frontend:** Mobile/Web app for user interaction.
- **Backend:** Server to handle data processing and API requests.
- **AI Module:** Provides personalized recommendations and NLP-based interactions.
- **Database:** Stores user preferences, recipes, and history.
- **External APIs:** Interfaces with recipe databases, speech recognition, and text-to-speech services.

Technology Stack

- **Frontend:** React.js / Flutter
- **Backend:** Node.js with Express
- **AI & NLP:** Python, TensorFlow, NLP models
- **Database:** MongoDB
- **Cloud Infrastructure:** AWS / Firebase

5. Technical Specification

- **Programming Languages:** JavaScript, Python
- **Frameworks:** React.js, Node.js, TensorFlow
- **APIs:** RESTful APIs for frontend-backend communication
- **Database:** MongoDB for NoSQL data storage
- **Cloud Provider:** AWS for deployment and scalability

6. User Interface Design

Main Screens

1. **Home Screen** – Displays recommended recipes based on user preferences.
2. **Recipe Selection Screen** – Shows recipe details and an option for guided cooking mode.
3. **Interactive Cooking Mode** – Hands-free, real-time cooking assistance.
4. **User Preferences & Inventory** – Allows users to update preferences and ingredient inventory.
5. **Feedback & History** – Displays past cooking sessions and collects user feedback.

7. Data Management

- **User Preferences Storage:** Secure storage of user dietary needs, ingredient availability, and cooking habits.
- **Recipe Data Handling:** AI processes and categorizes recipes for personalized recommendations.
- **Feedback Integration:** Continuous learning based on user input.

8. Security Considerations

- **Authentication:** OAuth 2.0 for secure login.
- **Data Encryption:** Protecting user preferences and interaction history.
- **Privacy Compliance:** GDPR/CCPA adherence for data handling.

9. Testing and Quality Assurance

- **Unit Testing:** Ensures individual modules function correctly.
- **Integration Testing:** Validates seamless communication between components.
- **User Acceptance Testing:** Collects feedback from beta users.
- **Performance Testing:** Measures response time and system load capacity.

10. Deployment Plan

- **Development Environment:** Local setup for feature development.
- **Staging Environment:** Testing new features before production.
- **Production Environment:** Live deployment on AWS with continuous monitoring.

11. Maintenance and Support

- **Regular Updates:** Feature improvements and bug fixes.
- **User Support:** FAQ, chatbots, and helpdesk support.

- **Monitoring & Logging:** Continuous tracking of system performance.

12. Conclusion

Su Chef aims to revolutionize home cooking by making recipes more accessible, cooking more interactive, and overall experience more enjoyable. Through AI-driven personalization and real-time guidance, it enhances the way people cook.

13. Related Work

1. "RecipeRec: A Heterogeneous Graph Learning Model for Recipe Recommendation"

This study introduces RecipeRec, a model that leverages a user-recipe-ingredient graph to enhance recipe recommendations. By capturing both recipe content and collaborative signals through a heterogeneous graph neural network, the system provides personalized suggestions based on user preferences and ingredient relationships.

2. "Personalized Food Recommendation as Constrained Question Answering over a Large-scale Food Knowledge Graph"

In this research, the authors model food recommendation as a question-answering task over a comprehensive food knowledge base. The system considers user queries alongside dietary preferences and health guidelines to provide tailored recipe recommendations, ensuring both relevance and adherence to individual nutritional needs.

3. "Kochen Helfer: An AI-Based Cooking Assistant"

This project presents 'Kochen Helfer,' an AI-driven cooking assistant designed to assist users in achieving desired food quality through image processing, classification, and recommendation techniques. The system aims to guide users, especially novices, in the cooking process by providing real-time assistance and suggestions.

[researchgate.net+1link.springer.com+1](#)

4. "RecipeRadar: An AI-Powered Recipe Recommendation System"

'RecipeRadar' focuses on delivering personalized recipe recommendations by analyzing user preferences, dietary restrictions, and nutritional goals. The system employs advanced algorithms to suggest recipes that align with individual health objectives, such as low-carb or high-protein diets. [researchgate.net](#)