

NutriSense AI- Nutrition Science through Gemini AI

Team Name:

NutriSenseAI

Team Members:

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- Veekshana Baireddy
- Divya Sree Nagulapalli

Phase-1: Brainstorming & Ideation

Objective:

Many individuals struggle with planning and maintaining a balanced diet due to lack of time, knowledge, or access to personalized nutritional guidance. Existing solutions often require manual tracking, rigid meal plans, or extensive research, making it difficult for users to adopt and sustain healthy eating habits. Additionally, people with dietary restrictions, fitness goals, or medical conditions face challenges in finding meals that align with their specific needs.

NutriSense aims to simplify meal planning by using AI-driven nutrition analysis to provide personalized, data-backed meal recommendations based on user preferences, health goals, and dietary restrictions. By eliminating the need for complex tracking or generic meal plans, NutriSense helps users make informed food choices effortlessly, leading to better health, improved eating habits, and a more convenient way to maintain a balanced diet. The project's impact extends to individuals, families, and even health professionals seeking an intelligent tool for nutrition management and wellness optimization.

1. Problem Statement:

A web-based application designed to provide users with detailed nutritional information about various food items. By leveraging Google Generative AI, the application delivers instant, comprehensive data on macronutrients (protein, fat, carbohydrates), micronutrients (vitamins, minerals), and calorie content. This tool aims to assist individuals in making informed dietary choices and understanding the nutritional value of the foods they consume.

2. Proposed Solution:

- Build a user-friendly, responsive web application where users can input dietary preferences, health conditions, allergies, and fitness levels.
- Implement an intuitive UI/UX design to enhance accessibility and ease of use.
- Use GeminiAI to process user inputs and generate personalized meal plans. Leverage AI to analyze food items and provide real-time nutritional breakdowns, including macronutrients, micronutrients, and calorie content.
- Include detailed recipes and corresponding **grocery lists** for user convenience.
- Ensure variety, balanced nutrition, and alignment with health goals (e.g., weight loss, muscle gain, diabetes-friendly diets)

3. Target Users:

- Health-Conscious Individuals
- People with Dietary Restrictions
- Fitness Enthusiasts & Athletes
- Busy Professionals & Students
- Medical & Wellness Professionals

4. Expected Outcome:

The expected outcome of NutriSense is to provide users with AI-powered, personalized meal recommendations tailored to their dietary preferences, health goals, and restrictions. By leveraging Google Gemini AI, NutriSense will help users save time, improve nutrition awareness, and make informed food choices without the complexity of manual planning. The platform aims to enhance user engagement, support diverse dietary needs, and integrate with fitness and wellness goals, ultimately fostering healthier lifestyles through smart, data-driven meal suggestions. Over time, the AI will continuously improve, ensuring more accurate and effective recommendations.

Phase-2: Requirement Analysis

- **Technical Requirements:**

- **AI Model** for generating personalized meal plans (Google Gemini 1.5 Pro)
- **Cloud Storage** for user preferences and meal plans (Firebase, AWS, or local database) **Web & Mobile-Friendly Interface** using **Streamlit** (Web) and future expansion for mobile compatibility

- **Functional Requirements:**

1. **User Input Handling**

- Users can enter dietary preferences, health goals, allergies, and meal requests.
- Form-based input through Streamlit UI.

2. **Nutritional Insights & Analysis**

- The app provides nutritional breakdown (calories, macros, vitamins, etc.).
- AI ensures recommendations align with health goals and restrictions.

3. **Deployment & Accessibility**

- The app is hosted on a cloud platform (Streamlit Cloud, AWS, or GCP).
- Users access it via a web browser with no installation required.

4. **Real-Time AI Processing**

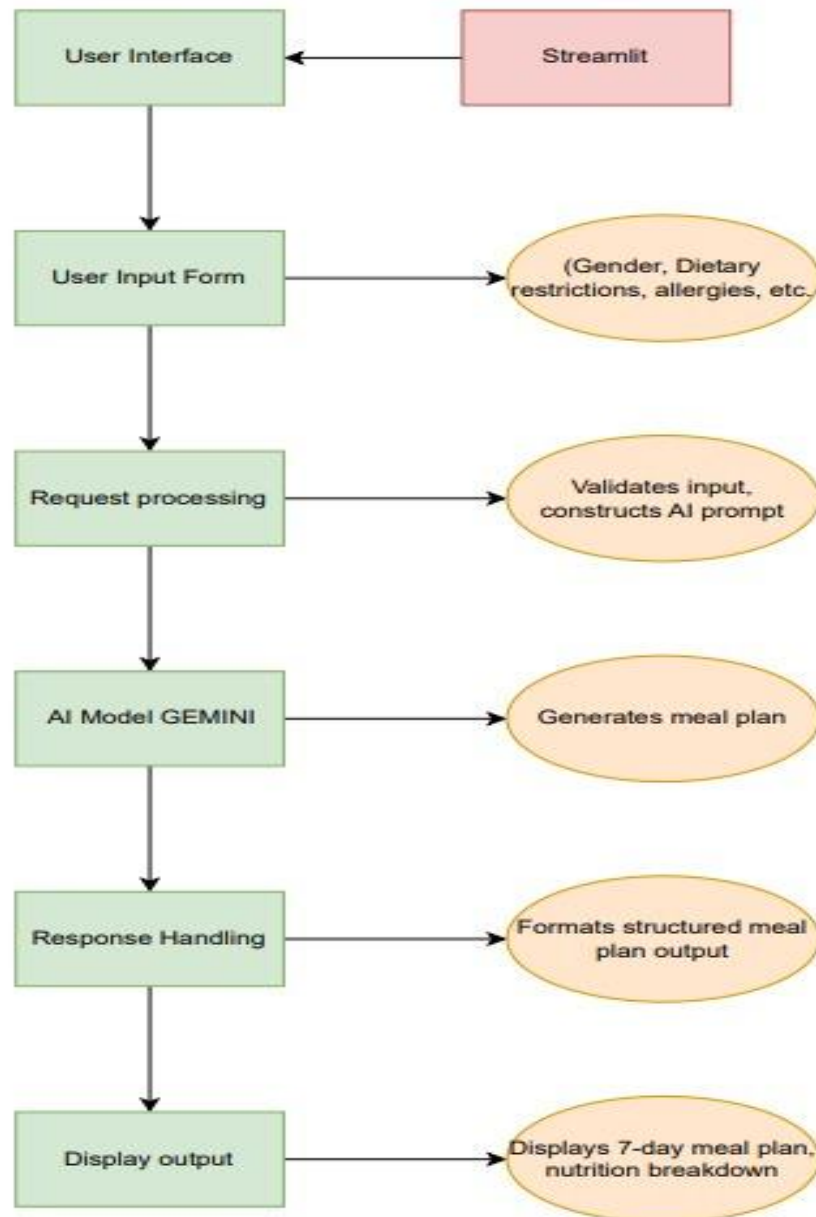
- Responses are generated dynamically without storing large datasets.
- System handles multiple user queries efficiently.

5. **User-Friendly Interface**

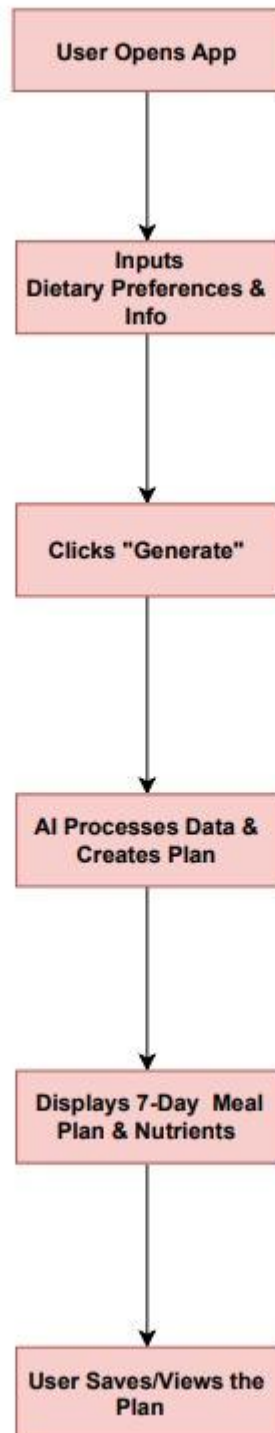
- Streamlit provides an interactive and simple UI.
- Users can view meal plans, make adjustments, and get instant feedback.

Phase-3: Project Design

1. System Architecture Diagram:



2. User Flow:



Phase-4: Project Planning (Agile Methodologies)

Key Points:

1. Sprint Planning:

- Pre-requisite
- Building solution
- Submitting the solution
- Documentation

2. Task Allocation:

- Pre-requisites: Ruthika Kondamadugu
- Building solution: Chaitanya Teretapalli, Goutham Gadepaka
- Submitting the solution: Veekshana Baireddy
- Documentation: Ruthika Kondamadugu, Divya Sree Nagulapalli

3. Timeline & Milestones:

- Architectural diagram, User flow diagram
- Code for app.py
- Debugging and Interpreting
- Deployment
- Submission
- Demo video capturing

Phase-5: Project Development.

1. Technology Stack Used:

- **Frontend:** Streamlit (for UI & interactivity)
- **Backend:** FastAPI (if needed for additional API management)
- **AI Model:** Google Gemini 1.5 Pro (for meal plan generation)
- **Development Tools:** VS Code, Python, streamlit, google-generativeai

2. Development Process:

1. Setting Up the Environment

- Installed required dependencies (streamlit, google-generativeai)
- Created a requirements.txt file for easy setup

2. Frontend Development (Streamlit UI)

- Designed an interactive user input form (dietary preferences, health conditions, etc.)
- Added buttons & spinners for a smooth user experience

3. Backend Integration & AI Model

- Configured Google Generative AI API with the Gemini model
- Developed the AI prompt to ensure structured meal plan generation

4. Meal Plan Processing & Display

- Processed AI-generated response into a clear 7-day structured format
- Displayed meal plans with nutrient breakdown

5. Testing & Debugging

- Verified AI-generated responses for accuracy & relevance
- Ensured dietary restrictions were properly considered

Phase-6: Functional & Performance Testing

Objective:

- To create an AI system that leverages the Stable Diffusion Pipeline to efficiently generate diverse and realistic clothing designs, aiding fashion designers and retailers in their creative processes.

1. Test Cases Executed:

1. User Input Validation

Scenario: Users enter dietary restrictions, allergies, and health conditions.

Expected Outcome: The system correctly captures and processes user inputs.

Result: Passed

2. AI Meal Plan Generation

Scenario: Users submit their details and request a meal plan.

Expected Outcome: The AI returns a structured 7-day meal plan with meals and a detailed nutrient breakdown.

Result: Passed

3. Dietary Restrictions Handling

Scenario: Users input specific dietary restrictions (e.g., vegan, keto, gluten-free).

Expected Outcome: The AI-generated meal plan strictly adheres to the given dietary needs.

Result: Passed

4. Allergy Consideration

Scenario: Users enter allergies such as nuts, dairy, or seafood.

Expected Outcome: The AI ensures allergens are not included in meal suggestions.

Result: Passed

5. Activity Level Impact

Scenario: Users select different activity levels (Sedentary, Lightly active, Moderately active, Very active).

Expected Outcome: The AI adjusts meal portions and macronutrient distribution accordingly.

Result: Passed

6. Performance Testing

Scenario: Multiple users request meal plans at the same time.

Expected Outcome: The system responds within acceptable time limits without crashes or significant delays.

Result: Passed

7. UI & UX Testing

Scenario: Users navigate through the interface, submit forms, and observe loading indicators.

Expected Outcome: A smooth user experience with no crashes, UI glitches, or unresponsive elements.

Result: Passed

2. Bug Fixes & Improvements:

- **Issue:** AI not strictly considering dietary restrictions in meal plans

Fix: Modified prompt to enforce all input constraints (restrictions, allergies, health conditions)

- **Issue:** AI sometimes included non-relevant ingredients

Fix: Refined AI model query to ensure accurate ingredient selection

- **Issue:** Long response time for meal generation

Fix: Optimized prompt to reduce response time without compromising details

- **Issue:** Unstructured output formatting

Fix: Reformatted AI response for better readability

3. **Final Validation:**

- The project meets all initial requirements by successfully generating AI-powered, personalized meal plans that strictly adhere to user preferences, restrictions, and nutritional needs.
- The AI model now properly considers dietary constraints, allergens, and health conditions when generating meal plans.
- The system delivers structured 7-day meal plans with detailed nutritional information in a web-friendly interface using Streamlit.