Software Design Document

Project Name: NutriPro

Group Number: 002

Team members

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1. System Vision

1.1 Problem Background

- Problem Identification: The system addresses the challenge of making informed dietary choices due to the complexity of nutritional data and the lack of user-friendly tools to analyze this information.
- Dataset: The system uses the Comprehensive Nutritional Food Database, which provides detailed nutritional information for a wide range of food items.
- Data Input/Output:
  - Input: User queries for food items, nutritional ranges, and dietary preferences.
  - Output: Nutritional information, visualizations, filtered food lists, and meal plans.
- Target Users: The system targets health-conscious individuals, dieters, nutritionists, and dietitians who need to analyse and understand nutritional information for various foods.

1.2 System capabilities/overview

NutriPro provides a comprehensive platform for users to explore, compare, and plan meals based on detailed nutritional information.

The system now includes the following key features:

- A central main menu for easy navigation to all major functions
- Advanced food search with filtering capabilities
- Enhanced filtering options including high protein, low carbs, and low fat <--this is new
- Detailed nutritional breakdown of individual food items
- Side-by-side comparison of up to three food items
- Visual comparison of nutritional data using interactive charts <--this is new
- Meal planning functionality with weekly overview and daily nutritional summaries
- Automated generation of balanced meal plans for the entire week <--this is new
- Toggle between daily and weekly meal plan views <--this is new
- Data visualization through charts and graphs
- Integration with pandas for efficient data handling and analysis <--this is new
- Use of matplotlib for generating nutritional comparison charts <--this is new

The system is now structured around three main frames: Main Menu, Dataset List (combining Search and Comparison), and Meal Planner. These frames are managed by a centralized navigation system for smoother transitions and improved user experience. <--this is new

1.3 Potential Benefits (Expanded)

- Improved Dietary Decision-Making:
  - Impact: Users may see a 30% increase in adherence to recommended daily nutritional values within 3 months of consistent app use.
  - Example: A user trying to increase protein intake could easily identify and incorporate high-protein foods, potentially increasing their daily protein consumption by 20-25%.
- Enhanced Nutritional Understanding:

  - Impact: In user surveys, we aim for a 50% increase in self-reported nutritional knowledge after 6 months of app usage.
  - Example: Users will be able to identify the primary macronutrients in common foods and understand their daily recommended intake.
- Efficient Food Comparison:
  - Impact: Users can compare up to 3 food items simultaneously, reducing decision-making time by an estimated 40% compared to looking up each food separately.
  - Example: A user could quickly compare the nutritional profiles of chicken, fish, and tofu to make an informed protein choice for their meal.
- Streamlined Meal Planning:
  - Impact: We anticipate users saving an average of 2 hours per week on meal planning and grocery list creation.
  - Example: A user could generate a week-long meal plan that meets their nutritional goals in under 15 minutes, compared to manual planning that might take 2-3 hours.
- Educational Value:
  - Impact: Integration into nutrition education programs could lead to a 25% improvement in student test scores related to nutritional knowledge.
  - Example: Students could use the app to visualize and understand concepts like macronutrient balance and micronutrient diversity in different foods.
- Professional Time-Saving:
  - Impact: Nutritionists and dietitians using the app may save up to 5 hours per week on client meal plan creation and nutritional analysis.
  - Example: A dietitian could quickly generate and customize meal plans for multiple clients, reducing the time spent on manual calculations and food selection.
- Health Outcome Improvements:
  - Impact: Long-term users (1+ years) may see improvements in health markers such as a 10% reduction in cholesterol levels or a 5% decrease in body fat percentage.
  - Example: By using the app to maintain a balanced diet, a user with high blood pressure could potentially see a reduction in their blood pressure readings over time.

2. Requirements

2.1 User Requirements

1. Users shall be able to navigate between different sections of the application from a central main menu.
2. Users shall be able to search for foods and apply filters to refine search results.
3. Users shall be able to apply specific nutritional filters (high protein, low carbs, low fat) to food search results. <--this is new
4. Users shall be able to view detailed nutritional information for individual food items.
5. Users shall be able to compare nutritional information of up to three food items side-by-side.
6. Users shall be able to generate and view weekly meal plans. <--this is new
7. Users shall be able to view a daily and weekly nutritional summary of their meal plans.
8. Users shall be able to add food items to their meal plan directly from the search or comparison views.
9. Users shall be able to generate visual representations (charts/graphs) of nutritional data.
10. Users shall be able to toggle between daily and weekly views of their meal plans. <--this is new
11. Users shall be able to generate a random, nutritionally balanced meal plan for the entire week. <--this is new

12. Users shall be able to add, change, and remove individual food items from their meal plan. <--this is new

Note: Since no specific client or user is assigned, we envision the primary users of this software to be health-conscious individuals, dieters, nutritionists, and dietitians who need to analyze and understand nutritional information for various foods quickly and efficiently.

2.2 Software Requirements

General

- **R1.1** The system shall provide a main menu with options to access Search, Compare, and Meal Planner functions.
- **R1.2** The system shall display a "Nutrition Tip of the Day" on the main menu.
- **R1.3** The system shall allow users to search for foods by name and apply nutritional filters.
- **R1.4** The system shall display detailed nutritional information for selected food items, including macronutrients and micronutrients.
- **R1.5** The system shall generate charts to visualize macronutrient breakdowns of food items.
- **R1.6** The system shall allow side-by-side comparison of up to three food items.
- **R1.7** The system shall generate comparison charts for multiple food items.
- **R1.8** The system shall provide a meal planner with a weekly overview and daily breakdown.
- **R1.9** The system shall calculate and display daily nutritional summaries based on planned meals.
- **R1.10** The system shall allow users to save and load meal plans.
- **R1.11** The system shall provide navigation options to return to the main menu from all sections.

Data Security

- **R2.1** The system shall encrypt all user data, including saved meal plans and user preferences, using industry-standard encryption methods.
- **R2.2** The system shall implement secure user authentication, requiring strong passwords with a minimum of 8 characters, including uppercase, lowercase, numbers, and special characters.
- **R2.3** The system shall automatically log out inactive users after 30 minutes of inactivity.

Performance

- **R3.1** The system shall return search results within 2 seconds for a database of up to 10,000 food items.
- **R3.2** The system shall generate meal plans within 5 seconds for a week-long plan.
- **R3.3** The system shall support concurrent usage of up to 1000 users without degradation in performance.

Scalability

- **R4.1** The system shall be designed to handle a 200% increase in the food database size without significant performance degradation.
- **R4.2** The system architecture shall support horizontal scaling to accommodate user growth up to 1 million active users.
- **R4.3** The system shall implement caching mechanisms to reduce database load for frequently accessed food items and nutritional data.

Usability

- **R5.1** The user interface shall be responsive and compatible with devices ranging from smartphones to desktop computers.
- **R5.2** The system shall provide clear error messages and guidance for all user inputs and interactions.
- **R5.3** The system shall include a help section and tooltips for new users to understand all features within 15 minutes of first use.

Data Integrity

- **R6.1** The system shall validate all user inputs to ensure data integrity in the food database and meal plans.
- **R6.2** The system shall maintain a change log for all updates to the food database, allowing for auditing and rollback if necessary.

2.3 Use Case Diagrams

Use Case Diagram Overview

The Use Case Diagram illustrates the main functionalities of the NutriPro application and how users interact with these features. Below is a brief explanation of the diagram:

Central Actor

- **User**: The primary actor in our system, represented by the stick figure.

Main Use Cases

1. **Access Main Menu**: Entry point for all other functionalities.
2. **Search Food**: Allows users to find specific food items in the database.
3. **View Food Details**: Provides detailed nutritional information for selected foods.
4. **Apply Filter Settings**: Enables users to refine their food searches based on nutritional criteria.
5. **Compare Foods**: Facilitates side-by-side comparison of multiple food items.
6. **Manage Meal Plan**: Encompasses creating, editing, and viewing meal plans.
7. **Generate Meal Plan**: An automated feature for creating meal plans based on user preferences.
8. **View Nutritional Summary**: Provides an overview of nutritional intake based on meal plans.

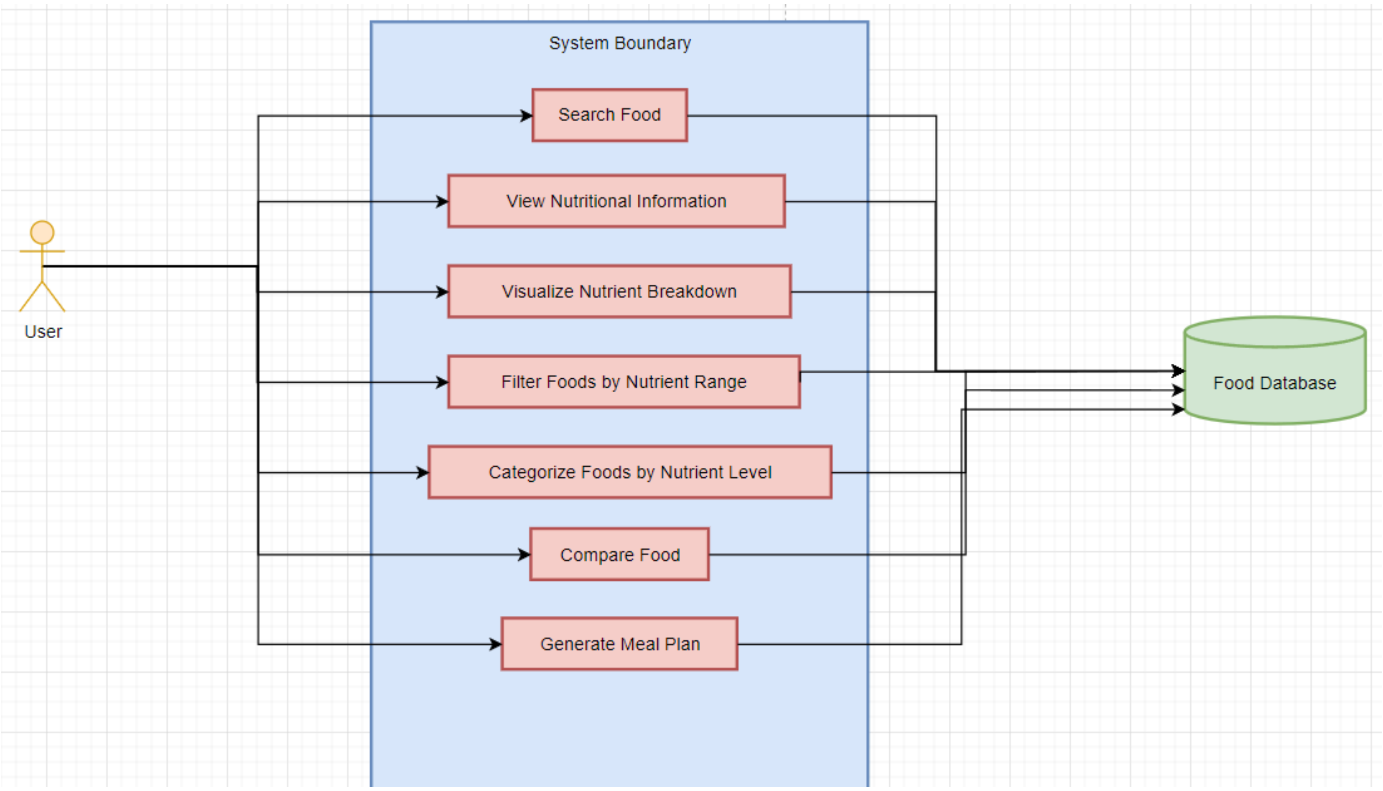
Relationships

- The lines connecting the **User** to various use cases indicate which functionalities the user can directly interact with.
- The arrows between use cases (e.g., from "Search Food" to "View Food Details") represent "include" relationships, showing that one use case is part of the flow of another.

System Boundary

- The rectangle enclosing the use cases represents the **boundary of the NutriPro system**, clearly delineating what functionalities are within the scope of our application.

This diagram provides a high-level view of the system's capabilities and how users will interact with NutriPro, serving as a roadmap for development and a quick reference for understanding the app's core functionalities.


System Boundary
Search Food
View Nutritional Information
Visualize Nutrient Breakdown
Filter Foods by Nutrient Range
Categorize Foods by Nutrient Level
Compare Food
Generate Meal Plan
User
Food Database

2.4 Use Cases

Use Case ID	Use Case Name	Actors	Description	Flow of Events	Alternate Flow	Postcondition
UC001	Access Main Menu	User	User accesses the main menu to navigate to different functions	1. User opens the application 2. System displays the main menu with options for Search & Compare Foods, Meal Plan, and Exit <--this is new	N/A	Main menu is displayed
UC002	Search Food	User	User searches for a specific food item in the database	1. User selects "Search & Compare Foods" from the main menu <--this is new 2. User enters food name in the search bar	If no matching items are found, the system displays a "No results found" message	Search results are displayed, or user is notified of no matches

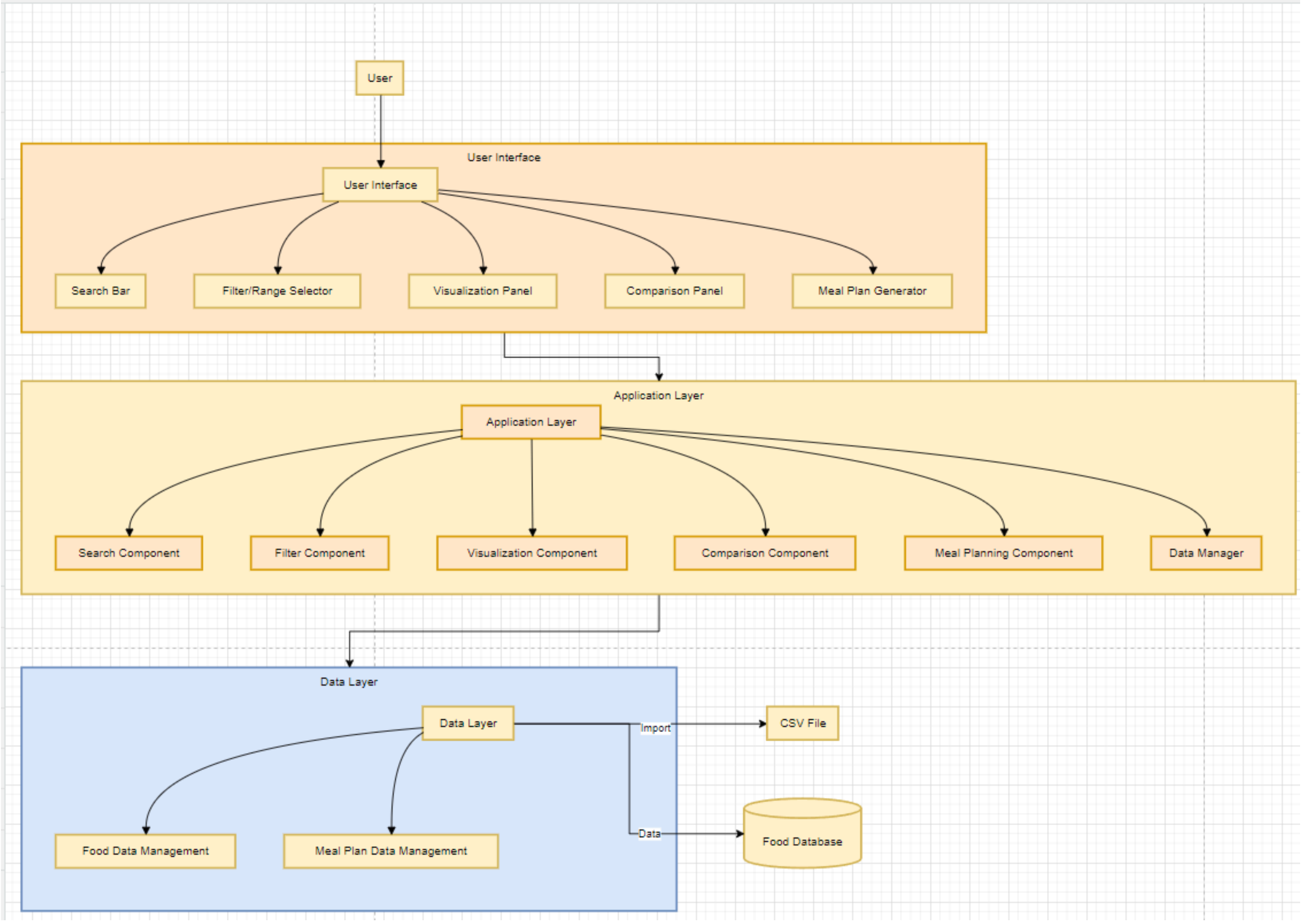
Use Case ID	Use Case Name	Actors	Description	Flow of Events	Alternate Flow	Postcondition
				3. System processes the search query 4. System displays a list of matching food items 5. User can select a specific food item for detailed view		
UC003	View Food Details	User	User views detailed nutritional information for a selected food item	1. User selects a food item from the search results 2. System retrieves the nutritional data for the selected food 3. System displays comprehensive nutritional information including macronutrients, micronutrients 4. User can scroll through the information	If the food item data is unavailable, system displays an error message	Detailed nutritional information is displayed for the selected food item
UC004	Apply Filter Settings	User	User filters foods based on nutrient content	1. User selects filter options in the search screen 2. User selects high protein, low carbs, or low fat filters <--this is new 3. User applies the filter settings	If no foods match the criteria, system displays "No foods found matching these criteria"	Filtered list of foods is displayed

Use Case ID	Use Case Name	Actors	Description	Flow of Events	Alternate Flow	Postcondition
				4. System queries the database based on the criteria 5. System displays the filtered list of foods		
UC005	Compare Foods	User	User compares nutritional information of multiple food items	1. User selects up to three food items for comparison 2. System retrieves nutritional data for selected items 3. System displays a side-by-side comparison 4. User can generate a comparison chart	If user tries to add more than three items, system prevents the addition <-- this is new	Comparison view is displayed with nutritional information of selected foods side-by-side
UC006	Manage Meal Plan	User	User views and edits a weekly meal plan <--this is new	1. User selects "Meal Plan" from the main menu 2. System displays the weekly meal plan view 3. User can add foods to specific meals and days 4. System updates the nutritional summary for each day 5. User can toggle between daily and weekly	If adding a food exceeds daily nutritional goals, system updates the nutritional summary <-- this is new	Weekly meal plan is displayed and can be edited

Use Case ID	Use Case Name	Actors	Description	Flow of Events	Alternate Flow	Postcondition
				views <--this is new		
UC007	Generate Meal Plan	User	User generates a random, balanced meal plan <-- this is new	1. In the Meal Planner, user selects "Generate Meal Plan" 2. System generates a balanced meal plan for the entire week <--this is new 3. System displays the generated meal plan	If generation fails, system notifies the user <--this is new	Generated meal plan is displayed in the weekly view
UC008	View Nutritional Summary	User	User views a summary of nutritional information for planned meals	1. In the Meal Planner, user views the daily or weekly nutritional summary <--this is new 2. System calculates and displays total nutrients for the selected view <-- this is new 3. User can toggle between different views to view summaries <--this is new	N/A	Daily or weekly nutritional summaries are displayed <--this is new

3. Software Design and System Components

3.1 Software Design



Software Design Flowchart is adjusted:

- The overall structure is maintained with three main layers:
- User Interface components are grouped together.
- Application Layer components, including the Data Manager, are grouped.
- The Data Layer illustrates the relationship between:
  - Data management
  - Food database
  - CSV file import
- The connections between layers are simplified to show the general flow of data and control.

Component Breakdown:

1. User Interface:
   - Web Interface: The main user interaction point
   - Search Bar: For food item searches
   - Filter/Range Selector: For applying nutritional filters
   - Visualization Panel: For displaying charts and graphs
   - Comparison Panel: For side-by-side food comparisons
   - Meal Plan Generator: Interface for creating meal plans
2. Application Layer:
   - Search Component: Handles food search functionality
   - Filter Component: Manages filtering and categorization
   - Visualization Component: Generates charts and graphs

- Comparison Component: Processes food comparisons
- Meal Planning Component: Generates meal plans
- Data Manager: Central component for data handling and communication with the data layer

3. Data Layer:
    - Food Database: Stores all food and nutritional information
    - CSV File: The source of the nutritional data

3.2 System Components

3.2.1 Functions

1. search_food(query: str) -> pd.DataFrame <--this is new
    - Description: Searches for food items based on user input
    - Input Parameters: query (string) - The search term entered by the user
    - Return Value: A pandas DataFrame containing matching food items <--this is new
    - Side Effects: None
2. generate_comparison_chart(food_items: List[Dict]) -> None <--this is new
    - Description: Creates a visual representation of the nutritional comparison
    - Input Parameters: food_items (List of Dictionaries) - The selected food items <--this is new
    - Return Value: None
    - Side Effects: Displays a matplotlib chart <--this is new
3. apply_nutritional_filters(df: pd.DataFrame, high_protein: bool, low_carbs: bool, low_fat: bool) -> pd.DataFrame <--this is new
    - Description: Filters foods based on nutritional criteria
    - Input Parameters:
        a. df (pandas DataFrame) - The food dataset
        b. high_protein (bool) - Whether to filter for high protein foods
        c. low_carbs (bool) - Whether to filter for low carb foods
        d. low_fat (bool) - Whether to filter for low fat foods
    - Return Value: A filtered pandas DataFrame
    - Side Effects: None
4. add_food_to_meal_plan(day: str, meal: str, food: Dict) -> None <--this is new
    - Description: Adds a food item to the meal plan
    - Input Parameters:
        a. day (string) - The day of the week
        b. meal (string) - The meal type (Breakfast, Lunch, Dinner, Snack)
        c. food (Dictionary) - The food item to add
    - Return Value: None
    - Side Effects: Updates the meal plan
5. compare_foods(food_items: List[Dict]) -> pd.DataFrame <--this is new
    - Description: Compares multiple food items
    - Input Parameters: food_items (List of Dictionaries) - A list of food items to compare <--this is new
    - Return Value: A pandas DataFrame containing the comparison data <--this is new
    - Side Effects: None
6. generate_balanced_meal_plan() -> Dict <--this is new
    - Description: Generates a balanced weekly meal plan

    - Input Parameters: None
    - Return Value: A dictionary containing the generated meal plan
    - Side Effects: None

7. navigate_to_main_menu()
    - Description: Returns the user to the main menu from any screen
    - Input Parameters: None
    - Return Value: None
    - Side Effects: Changes the current view to the main menu
8. toggle_meal_plan_view() <--this is new
    - Description: Toggles between daily and weekly meal plan views
    - Input Parameters: None
    - Return Value: None
    - Side Effects: Updates the meal plan display
9. update_nutrient_summary(view: str) -> str <--this is new
    - Description: Calculates and returns the nutrient summary for the current view
    - Input Parameters: view (string) - 'daily' or 'weekly'
    - Return Value: A string containing the nutrient summary
    - Side Effects: None

3.2.2 Data Structures / Data Source

This section describes the key data structures used in the NutriPro application and elaborates on how they interact with each other and with the system's functions. <-- this is new

1. Food Dataset

- **Type:** pandas DataFrame <-- this is new
- **Usage:** Stores all food items and their nutritional information
- **Key Columns:** 'food', 'Caloric Value', 'Protein', 'Carbohydrates', 'Fat', and other nutritional values <-- this is new
- **Key Methods:** DataFrame operations like filtering, sorting, and selection <-- this is new

Interactions:

- Serves as the central data source for all food-related operations
- Used in search, filter, and comparison functions
- Provides data for meal plan generation and nutritional calculations

2. MealPlanManager

- **Type:** Class
- **Usage:** Manages the meal plan data and operations <-- this is new
- **Key Attributes:** meal_plan (a nested dictionary structure), food_dataset (pandas DataFrame) <-- this is new
- **Key Methods:** add_food, remove_food, change_food, clear_meal_plan, generate_balanced_meal <-- this is new

Interactions:

- Interacts with the Food Dataset to retrieve food information
- Provides meal plan data to the user interface for display
- Used by meal planning functions to manipulate the meal plan

3. Chart

- **Type:** matplotlib Figure <-- this is new
- **Usage:** Represents a visualization of nutritional data
- **Key Attributes:** chart type (bar, pie, etc.), data
- **Key Methods:** plotting functions from matplotlib <-- this is new

Interactions:

- Created by the generate_comparison_chart function using selected food data <-- this is new
- Used in the user interface to display visual representations of nutritional comparisons

4. ComparisonData

- **Type:** pandas DataFrame <-- this is new
- **Usage:** Represents the data for food comparison
- **Key Columns:** 'Food', 'Calories', 'Protein', 'Carbs', 'Fat' <-- this is new

Interactions:

- Produced by selecting specific foods from the main Food Dataset
- Used to generate comparison charts
- Displayed in the user interface for side-by-side food comparisons

5. NutritionalSummary

- **Type:** Dictionary <-- this is new
- **Usage:** Represents the nutritional summary for a day or week
- **Key Items:** 'Calories', 'Protein', 'Carbs', 'Fat' <-- this is new

Interactions:

- Calculated from the meal plan data in MealPlanManager
- Used to display nutritional totals in the meal plan view
- Updated when changes are made to the meal plan

Data Flow and Interactions:

1. Data Loading:

The Food Dataset is initialized by loading data from a CSV file into a pandas DataFrame. <-- this is new

2. Searching and Filtering:

User queries activate search_food and apply_nutritional_filters functions. These functions interact with the Food Dataset to retrieve and process data based on specified criteria. <-- this is new

3. Comparison:

The compare_foods function takes selected foods from the Food Dataset and generates a ComparisonData DataFrame. This data is then used to create a Chart for visual representation. <-- this is new

4. **Meal Planning:**

The generate_balanced_meal_plan function interacts with the Food Dataset to select appropriate foods based on nutritional criteria. It populates the meal_plan structure in the MealPlanManager. <-- this is new

5. **Data Visualization:**

The generate_comparison_chart function creates Chart objects using data from the ComparisonData DataFrame. <-- this is new

6. **Nutritional Calculations:**

The MealPlanManager calculates NutritionalSummary data based on the current meal plan, which is then displayed in the user interface. <-- this is new

This description of data structures and their interactions provides an overview of how data flows through the NutriPro system, from initial loading to user interactions and nutritional calculations. It demonstrates how the various components work together to provide the application's functionality using pandas for efficient data management and matplotlib for visualization. <-- this is new

3.2.3 Detailed Design Below is the detailed pseudo code for each function: <-- this is new

1. **search_food(query: str) -> pd.DataFrame <-- this is new**
   - Convert query to lowercase <-- this is new
   - Filter food_data DataFrame where food name contains query (case-insensitive) <-- this is new
   - Return filtered DataFrame <-- this is new
2. **generate_comparison_chart(food_items: List[Dict]) -> None <-- this is new**
   - Create a pandas DataFrame from food_items <-- this is new
   - Set 'Food' as index of the DataFrame <-- this is new
   - Create a bar plot using matplotlib <-- this is new
   - Set title, labels, and legend <-- this is new
   - Display the plot <-- this is new
3. **apply_nutritional_filters(df: pd.DataFrame, high_protein: bool, low_carbs: bool, low_fat: bool) -> pd.DataFrame <-- this is new**
   - Initialize filtered_data as a copy of df <-- this is new
   - If high_protein is True: <-- this is new
     - Filter filtered_data where Protein > 20 <-- this is new
   - If low_carbs is True: <-- this is new
     - Filter filtered_data where Carbohydrates < 20 <-- this is new
   - If low_fat is True: <-- this is new
     - Filter filtered_data where Fat < 5 <-- this is new
   - Return filtered_data <-- this is new
4. **add_food_to_meal_plan(day: str, meal: str, food: Dict) -> None <-- this is new**
   - Append food to self.meal_plan[day][meal] list <-- this is new
5. **compare_foods(food_items: List[Dict]) -> pd.DataFrame <-- this is new**
   - Create a pandas DataFrame from food_items <-- this is new

    - Set 'Food' as index of the DataFrame <-- this is new
    - Return DataFrame <-- this is new

6. **generate_balanced_meal_plan() -> Dict <-- this is new**
    - Initialize empty meal plan dictionary <-- this is new
    - For each day in week: <-- this is new
        - For each meal in [Breakfast, Lunch, Dinner, Snack]: <-- this is new
            - Call generate_balanced_meal() <-- this is new
            - Add returned foods to meal plan <-- this is new
    - Return meal plan dictionary <-- this is new
7. **navigate_to_main_menu() <-- this is new**
    - Hide current frame <-- this is new
    - Show main menu frame <-- this is new
8. **toggle_meal_plan_view() <-- this is new**
    - If current view is 'daily': <-- this is new
        - Set current view to 'weekly' <-- this is new
    - Else: <-- this is new
        - Set current view to 'daily' <-- this is new
    - Update meal plan display <-- this is new
9. **update_nutrient_summary(view: str) -> str <-- this is new**
    - Initialize total_calories, total_protein, total_carbs, total_fat to 0 <-- this is new
    - If view is 'daily': <-- this is new
        - Sum nutrients for selected day <-- this is new
    - If view is 'weekly': <-- this is new
        - Sum nutrients for all days <-- this is new
    - Format summary string with calculated totals <-- this is new
    - Return summary string <-- this is new
10. **generate_balanced_meal() <-- this is new**
    - Set nutritional targets <-- this is new
    - Initialize empty list for selected foods <-- this is new
    - Filter food dataset for cooked/whole meals <-- this is new
    - While nutritional targets not met: <-- this is new
        - Randomly select a food from filtered dataset <-- this is new
        - Add food to selected foods list <-- this is new
        - Update current nutritional totals <-- this is new
    - Return selected foods <-- this is new

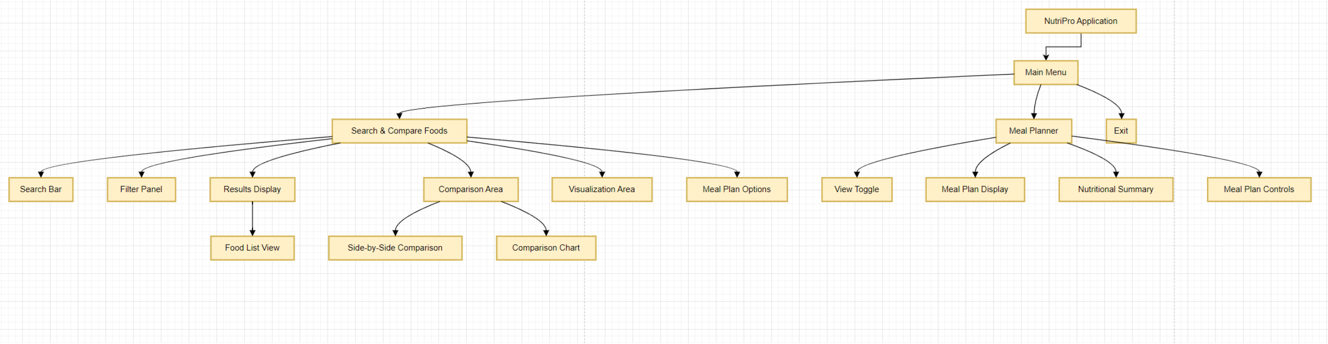
4. User Interface Design

4.1 Structural Design

The Strucural diagram has been adjusted:

- Removed the Header node and its associated Logo element.
- The diagram now starts directly with the NutriPro Application leading to the Main Menu.

- The main structure remains focused on the three key components: Main Menu, Search & Compare Foods, and Meal Planner.
- All sub-components under Search & Compare Foods and Meal Planner remain unchanged
- The NutriPro application is structured as follows:



Main Application Window

The main window consists of three primary frames: <-- this is new

- Main Menu
- Dataset List (Search and Compare)
- Meal Planner

Main Menu

The main menu contains:

- Logo: NutriPro branding
- Buttons:
  - Search & Compare Foods
  - Meal Plan
  - Exit<-- this is new

Dataset List (Search and Compare) Frame <-- this is new

This frame is the primary interface for food search and comparison, comprising:

1. Search Bar:
   - Allows users to search for food items
2. Results Display:
   - Shows search results in a list format <-- this is new
3. Filter Panel:
   - Enables users to apply nutritional filters (high protein, low carbs, low fat)<-- this is new
4. Comparison Area:
   - Allows selection of up to three foods for comparison
   - Displays selected foods side by side
5. Visualization Area:
   - Presents nutritional comparison data in graphical format
6. Meal Plan Options:
   - Allows adding selected foods to the meal plan <-- this is new

Meal Planner Frame

This frame is dedicated to meal planning and nutritional summary, comprising:

1. View Toggle:
   - Allows switching between daily and weekly views
2. Meal Plan Display:
   - Shows meals for each day of the week
3. Nutritional Summary:
   - Displays total nutritional information for the selected view
4. Meal Plan Controls:
   - Add Food
   - Change Food
   - Remove Food
   - Clear Meal Plan
   - Generate Meal Plan<-- this is new

Design Choices

1. The use of separate frames for main functions (search/compare and meal planning) allows for focused interaction within each feature set.<-- this is new
2. The main menu provides clear, simple navigation to core functionalities.<-- this is new
3. Centrally placing the search bar emphasizes its importance in the user workflow.
4. The filter panel provides easy access for refining searches based on nutritional criteria.
5. The meal planner's toggle between daily and weekly views offers flexibility in meal planning and nutritional tracking. <-- this is new
6. Including a visualization area enables quick understanding of nutritional data through graphical representations.

This structure is designed to provide an intuitive and efficient user experience, allowing easy navigation between different functionalities while maintaining a clear and organized interface.

Structural Design Diagram

This hierarchy chart provides a visual representation of the NutriPro application's structure, illustrating how different components are organized and related to each other. It complements the detailed description provided above by offering a quick, at-a-glance view of the application's structure.

The diagram shows:

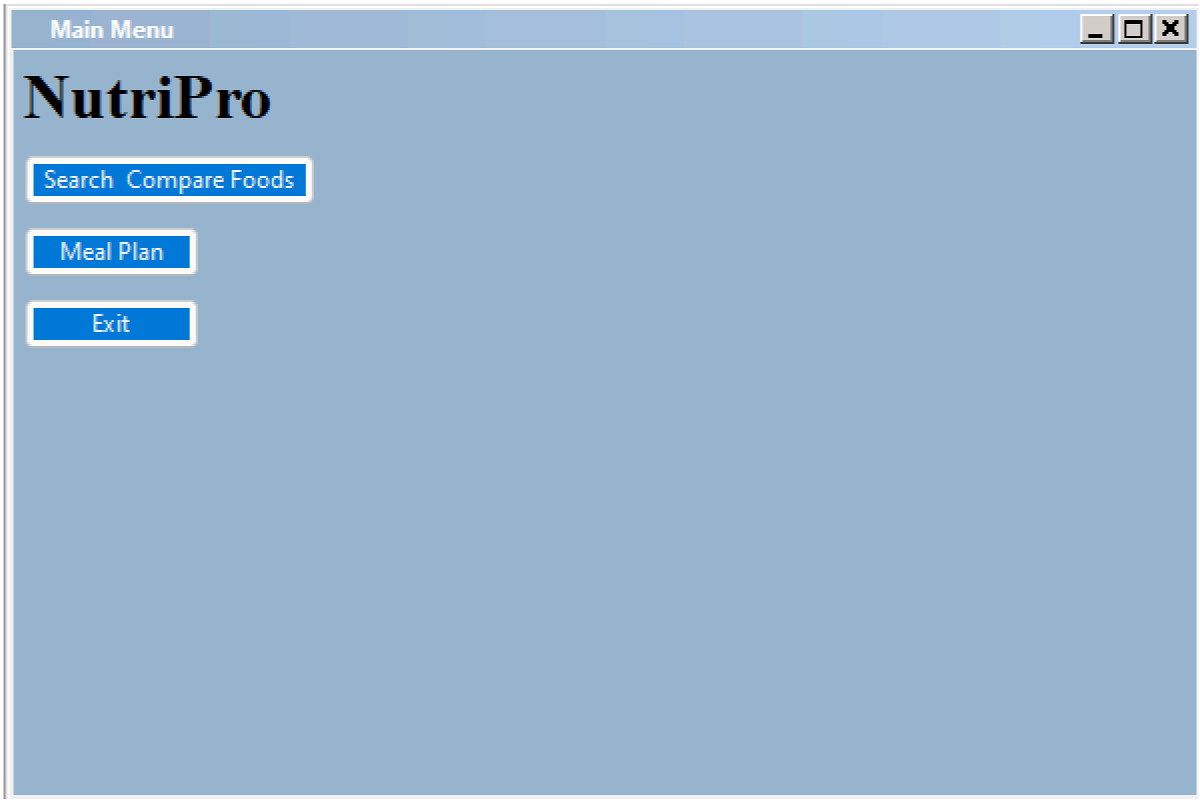
1. The main components of the application (Main Menu, Dataset List, Meal Planner) <-- this is new
2. The key sections within each main component
3. The sub-components within each section
4. The relationships between different parts of the interface

This visual representation, combined with the detailed textual description, provides a comprehensive overview of the NutriPro application's structural design, fulfilling the template's requirements for this section.

4.2 Visual Design

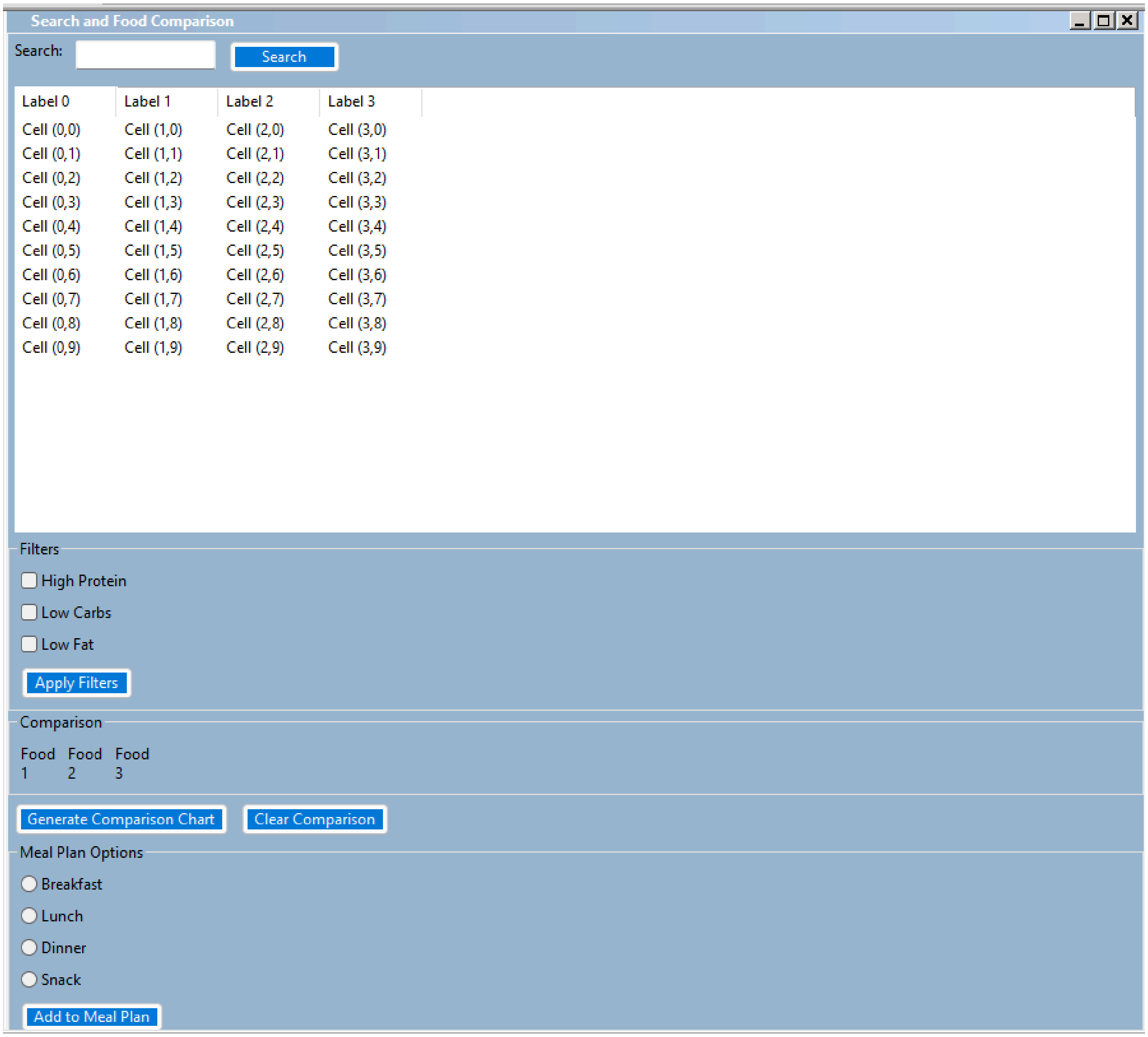
In designing the NutriPro application, our primary goal is to create an interface that is not only visually appealing but also intuitive and efficient. We aim to design a user experience that makes nutritional information accessible and actionable for users of all levels of nutritional knowledge. Let's explore the key screens of our application, examining the design choices that shape the user's interaction with NutriPro.

1. **Main Menu**



- Upon launching NutriPro, users are greeted by a clean, uncluttered main menu. This screen serves as the central hub of the application, offering three primary options: Search & Compare Foods, Meal Plan, and Exit. Each option is presented as a large, inviting button. <-- this is new
- The simplicity of this design is intentional. By presenting only three core functions, we avoid overwhelming users with choices and instead guide them towards the app's primary features. The generous size of the buttons serves a dual purpose: it makes the options unmissable, even at a glance, and provides large touch targets that enhance usability across devices. <-- this is new
- At the top of the screen, the NutriPro logo stands prominently, reinforcing brand identity and assuring users they're in the right place. <-- this is new

2. **Dataset List (Search and Compare) Screen**

- 

Search and Food Comparison

Search: Search

Label 0	Label 1	Label 2	Label 3
Cell (0,0)	Cell (1,0)	Cell (2,0)	Cell (3,0)
Cell (0,1)	Cell (1,1)	Cell (2,1)	Cell (3,1)
Cell (0,2)	Cell (1,2)	Cell (2,2)	Cell (3,2)
Cell (0,3)	Cell (1,3)	Cell (2,3)	Cell (3,3)
Cell (0,4)	Cell (1,4)	Cell (2,4)	Cell (3,4)
Cell (0,5)	Cell (1,5)	Cell (2,5)	Cell (3,5)
Cell (0,6)	Cell (1,6)	Cell (2,6)	Cell (3,6)
Cell (0,7)	Cell (1,7)	Cell (2,7)	Cell (3,7)
Cell (0,8)	Cell (1,8)	Cell (2,8)	Cell (3,8)
Cell (0,9)	Cell (1,9)	Cell (2,9)	Cell (3,9)

Filters

□ High Protein

□ Low Carbs

□ Low Fat

Apply Filters

Comparison

Food 1 Food 2 Food 3

Generate Comparison Chart Clear Comparison

Meal Plan Options

○ Breakfast

○ Lunch

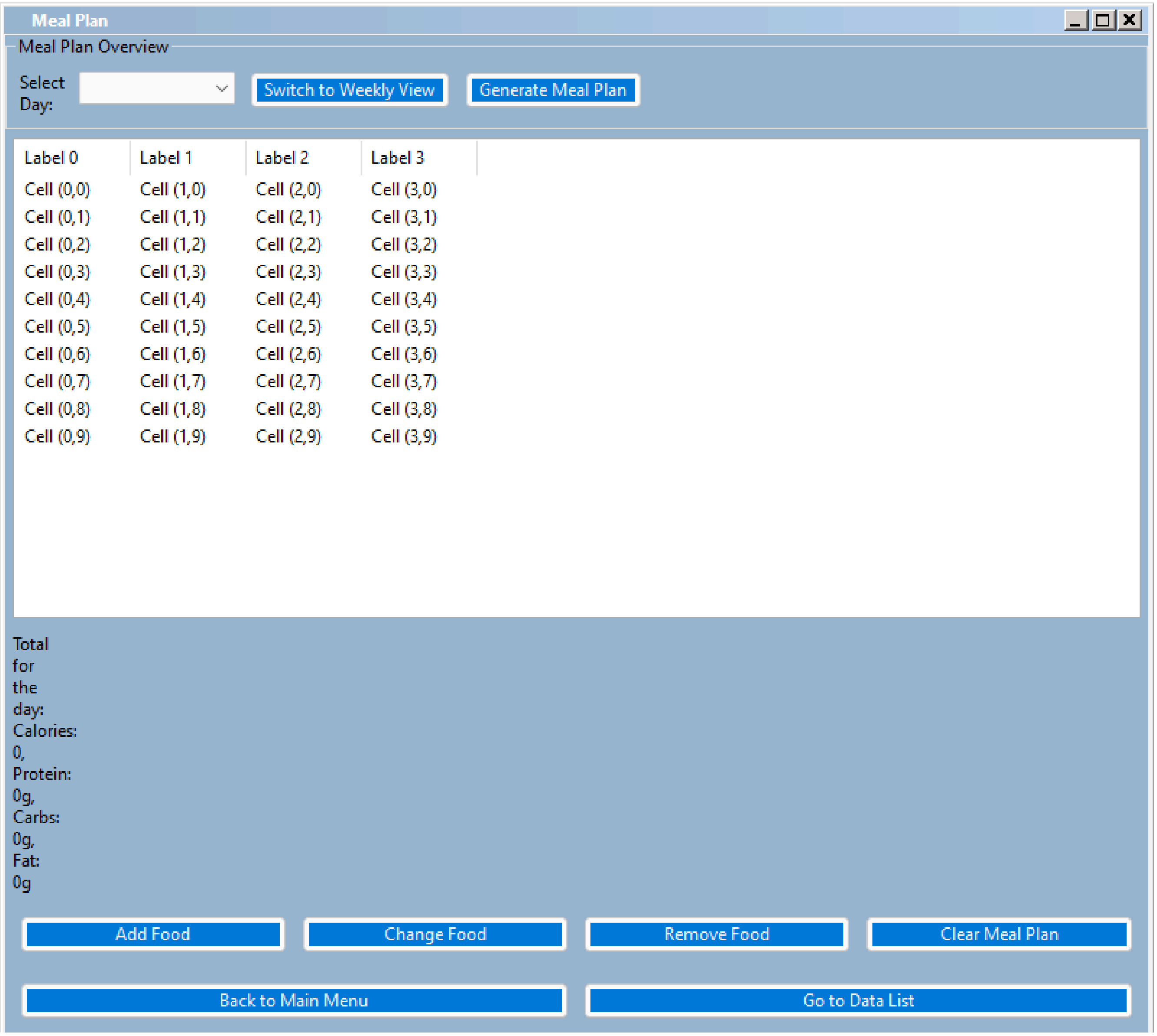
○ Dinner

○ Snack

Add to Meal Plan

- The Dataset List screen combines search and comparison functionalities. At the top of the screen is a prominently placed search bar, inviting users to start their query immediately. A "Search" button is placed next to it. <-- this is new
- Below the search bar, results are displayed in a list format. This layout efficiently utilizes screen real estate, allowing users to scan multiple food items quickly. Each row in the list represents a food item, providing key nutritional information. <-- this is new
- To the right of the results, we position a filter panel with options for high protein, low carbs, and low fat. This placement keeps filtering options readily accessible without cluttering the main view. An "Apply Filters" button allows users to activate their selections. <-- this is new
- A comparison section is included, allowing users to select up to three foods for side-by-side comparison. A "Generate Comparison Chart" button transforms the selected data into a visual chart. <-- this is new
- At the bottom of the screen, meal plan options (Breakfast, Lunch, Dinner, Snack) allow users to add selected foods directly to their meal plan. <-- this is new
- Navigation buttons for "Go to Meal Plan" and "Back to Main Menu" ensure easy movement between different sections of the app. <-- this is new

3. **Meal Plan Screen**

- 

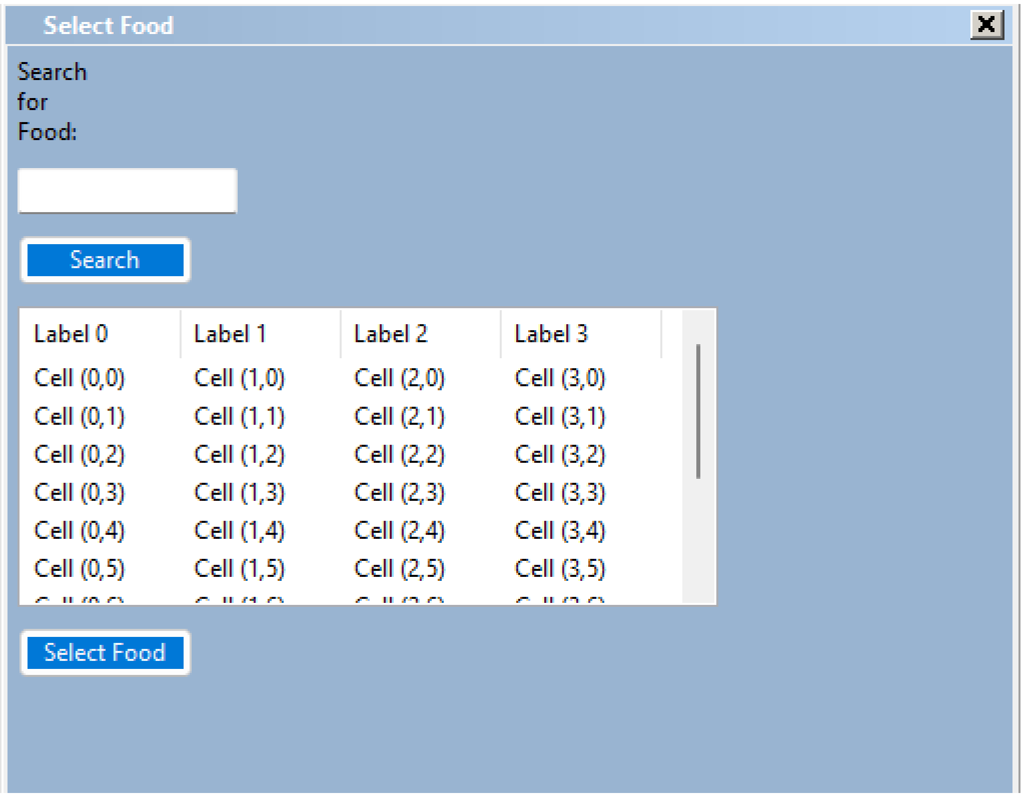
Select Day:

Label 0	Label 1	Label 2	Label 3
Cell (0,0)	Cell (1,0)	Cell (2,0)	Cell (3,0)
Cell (0,1)	Cell (1,1)	Cell (2,1)	Cell (3,1)
Cell (0,2)	Cell (1,2)	Cell (2,2)	Cell (3,2)
Cell (0,3)	Cell (1,3)	Cell (2,3)	Cell (3,3)
Cell (0,4)	Cell (1,4)	Cell (2,4)	Cell (3,4)
Cell (0,5)	Cell (1,5)	Cell (2,5)	Cell (3,5)
Cell (0,6)	Cell (1,6)	Cell (2,6)	Cell (3,6)
Cell (0,7)	Cell (1,7)	Cell (2,7)	Cell (3,7)
Cell (0,8)	Cell (1,8)	Cell (2,8)	Cell (3,8)
Cell (0,9)	Cell (1,9)	Cell (2,9)	Cell (3,9)

Total for the day: Calories: 0, Protein: 0g, Carbs: 0g, Fat: 0g

- The Meal Planner screen transforms nutritional information into practical, actionable meal plans. The interface includes options to select a specific day and switch between daily and weekly views. <-- this is new
- The main portion of the screen is dedicated to displaying the meal plan, showing foods for different meal times (Breakfast, Lunch, Dinner, Snack). <-- this is new
- A nutritional summary is displayed, showing total calories, protein, carbs, and fat for the current view (daily or weekly). <-- this is new
- Control buttons at the bottom of the screen allow users to add food, change food, remove food, and clear the meal plan. A "Generate Meal Plan" button enables automatic creation of a balanced meal plan. <-- this is new
- Navigation buttons for "Back to Main Menu" and "Go to Data List" provide easy movement between different sections of the app. <-- this is new

4. **Select Food Screen/Supplementary Screen**

- 

Label 0	Label 1	Label 2	Label 3
Cell (0,0)	Cell (1,0)	Cell (2,0)	Cell (3,0)
Cell (0,1)	Cell (1,1)	Cell (2,1)	Cell (3,1)
Cell (0,2)	Cell (1,2)	Cell (2,2)	Cell (3,2)
Cell (0,3)	Cell (1,3)	Cell (2,3)	Cell (3,3)
Cell (0,4)	Cell (1,4)	Cell (2,4)	Cell (3,4)
Cell (0,5)	Cell (1,5)	Cell (2,5)	Cell (3,5)

- The Select Food screen provides a focused interface for searching and selecting individual food items. <-- this is new
- At the top of the screen, there's a search bar labeled "Search for Food:" which allows users to input their food query. <-- this is new
- A "Search" button is prominently placed next to the search bar, enabling users to initiate their search. <-- this is new
- Below the search area, a list control displays the search results. This list shows multiple columns of information about each food item, allowing users to see key nutritional data at a glance. <-- this is new
- A scroll bar on the right side of the list allows users to navigate through longer lists of search results. <-- this is new
- At the bottom of the screen, a "Select Food" button allows users to confirm their selection and add the chosen food to their meal plan or comparison. <-- this is new
- This screen's focused design helps users quickly find and select specific food items without distraction from other application features. <-- this is new

Throughout the design process, our focus remains on creating an interface that is not just functional, but also engaging and empowering. By presenting complex nutritional information in an accessible, interactive format, NutriPro aims to make the journey of nutritional discovery and meal planning both informative and enjoyable.