Program Functionlity and Design:

1. FoodComponent:

- calculate_weekly_serves(daily_intake: float): Abstract method to be implemented by subclasses for calculating weekly serves based on daily intake.

- __str__(): Abstract method to be implemented by subclasses for providing a string representation.

2. FoodItem:

- __init__(name: str, recommended_daily_serves: float, single_serve_size: float): Constructor to initialize a FoodItem object with name, recommended daily serves, and single serve size.

- calculate_weekly_serves(daily_intake: float): Calculates weekly serves based on daily intake and single serve size.

- __str__(): Returns a string representation of the FoodItem.

3. FoodCategory:

- Inherits from FoodItem.

- __init__(name: str, recommended_daily_serves: float, single_serve_size: float): Constructor to initialize a FoodCategory object.

- Adds an attribute category to represent the category name.

4. FoodDecorator:

- __init__(decorated_food: FoodComponent): Constructor to initialize a FoodDecorator object with a decorated food component.

- calculate_weekly_serves(daily_intake: float): Delegates calculation of weekly serves to the decorated food component.

- __str__(): Returns a string representation of the decorated food component.

5. NutritionalInfoDecorator:

- Inherits from FoodDecorator.

- __init__(decorated_food: FoodComponent): Constructor to initialize a NutritionalInfoDecorator object.

- Extends the functionality of FoodDecorator by adding nutritional information.

6. UserData:

- __init__(age: int, gender: str, weight: float, height: float, daily_intake: dict): Constructor to initialize a UserData object with age, gender, weight, height, and daily intake data.

- calculate_bmi(): Calculates the BMI based on user's weight and height.

7. Visualization Functions:

- visualize_bar_chart(user_data, food_categories): Generates a bar chart to visualize user's daily serving intake compared to recommended values across different food categories.

- visualize_pie_charts(user_data, food_categories): Generates pie charts to visualize user's daily serving intake compared to recommended values across different food categories.

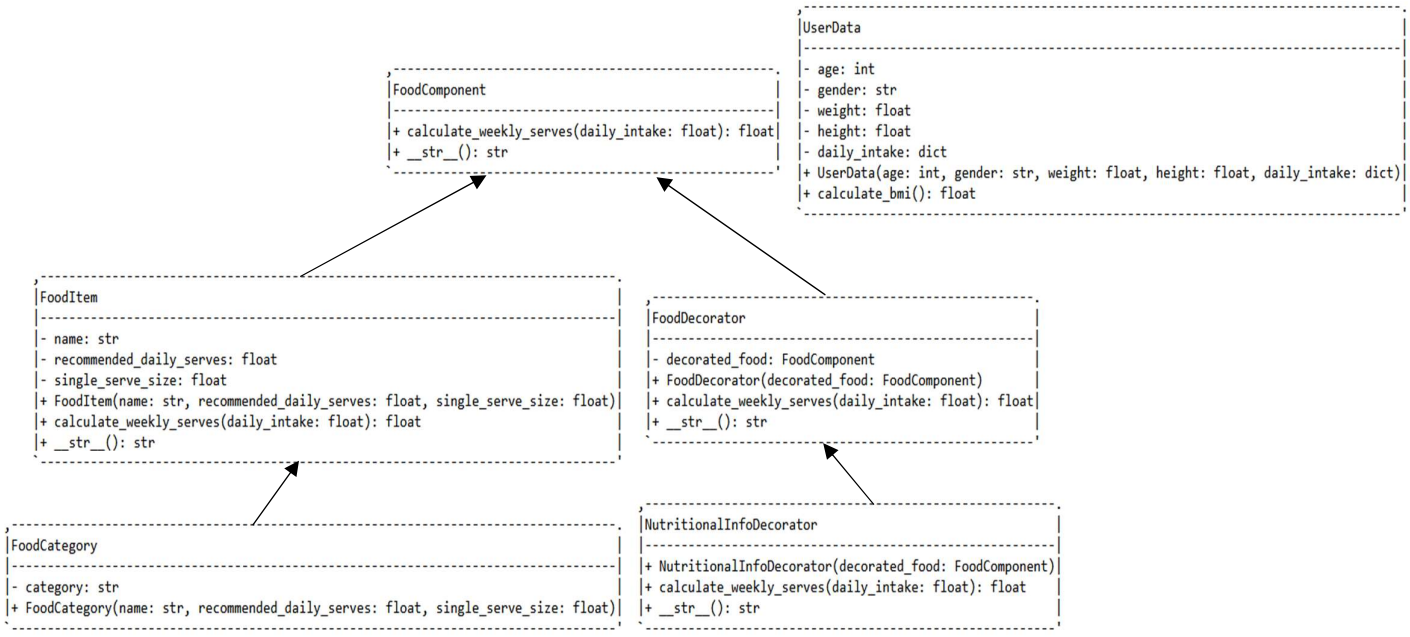
- visualize_line_chart(user_data, food_categories): Generates a line chart to visualize user's daily serving intake compared to recommended values across different food categories.

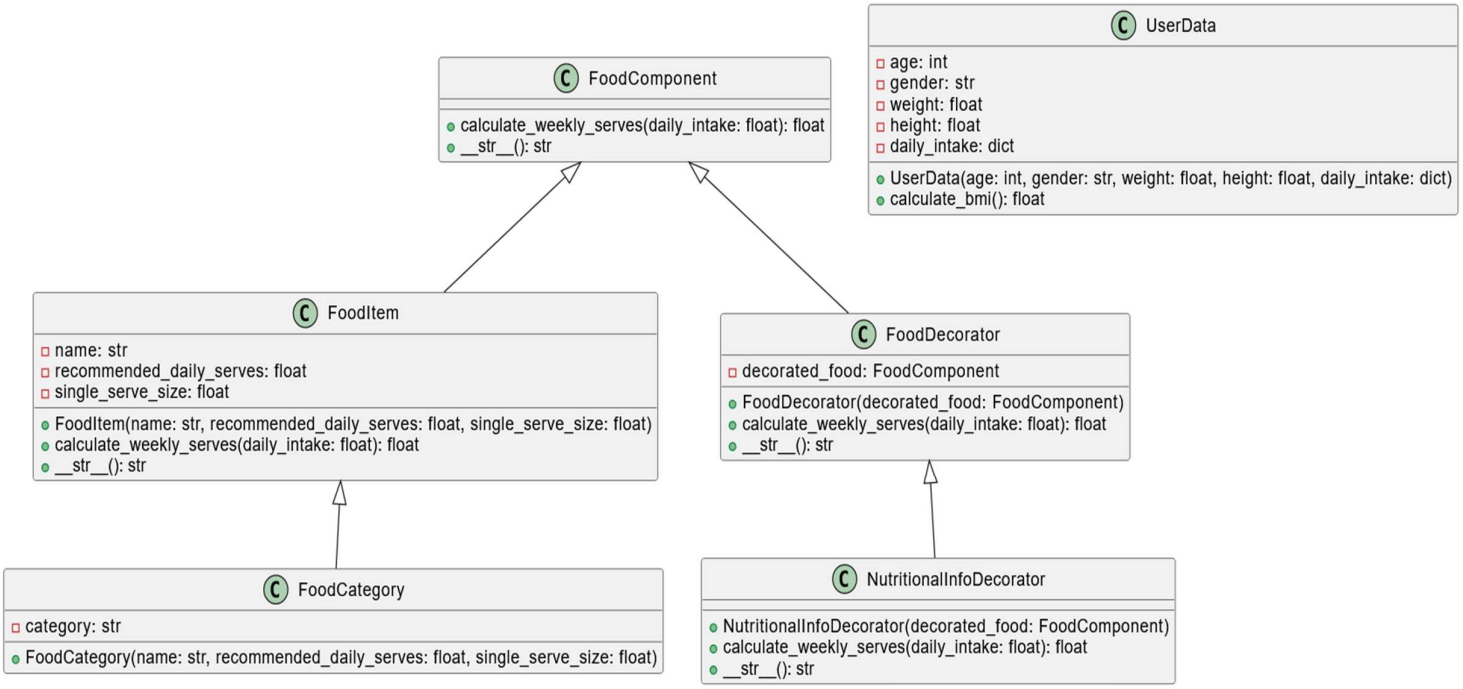
- visualize_bubble_chart(user_data, food_categories): Generates a bubble chart to visualize user's daily serving intake compared to recommended values across different food categories.

- visualize_bmi_chart(bmi): Generates a BMI chart to visualize the user's BMI category based on calculated BMI value.

Design Pattern:

Decorator Pattern: Utilized in FoodDecorator and NutritionalInfoDecorator classes to add functionality dynamically to food components without modifying their structure.





Screenshots of Test Results: