**Diet Health Scoring Bot - Problem Definition and Project Goals**

The Diet Health Scoring Bot addresses the problem that many people lack easy feedback on how healthy a particular meal is. Users input natural language descriptions of foods consumed, and the bot parses the input, computes nutrient breakdown, and provides a "health score" for that meal. This system applies USDA nutritional data to everyday meals through AI analysis. By translating complex nutrition rules into simple scores and suggestions, the bot makes dietary guidance more accessible. For example, USDA principles like balanced macronutrients and adequate fiber intake are incorporated into the meal evaluation.

This solution is valuable because it provides immediate nutritional awareness. Users see calories, protein, fat, carbs, and fiber for their meal, plus a 0-10 health score with actionable feedback. The expected outcome is a demonstration system showing how generative AI can promote healthy eating habits. We provide clear feedback (e.g., "This meal is low on fiber; consider adding vegetables") using a 0-10 scale. The final implementation illustrates how AI can translate nutritional science into practical advice.

**Design and Implementation Plan**

- **AI Architecture:** The system uses a dual-stage DeepSeek-R1 model approach:

1. **Parsing Stage:** Extracts food items and estimates quantities from natural language input

2. **Analysis Stage:** Generates nutritional score (0-10) and explanations

- Model: DeepSeek-R1 (deepseek-chat)

- Temperature: 0.2 for consistent outputs

- Max Tokens: 512 for concise responses

- **Input Processing Workflow:**

1. User inputs meal description (e.g., "2 eggs and 1 cup broccoli")

2. DeepSeek parser extracts food items and standardizes to USDA names

3. System queries USDA FoodData Central API for nutritional data

4. Nutrient totals are calculated per meal component

5. DeepSeek analysis model generates health score and feedback

- **Nutritional Data Handling:**

- Core nutrients: Calories, Protein, Fat, Carbohydrates, Fiber

- API: USDA FoodData Central (https://api.nal.usda.gov/fdc/v1)

- Standardization: Converts food names to USDA equivalents (e.g., "egg" → "egg, whole, cooked, hard-boiled")

- Quantity estimation: Handles vague descriptions (e.g., "a bowl" → "250g")

- **Scoring System:**

- Scale: 0-10 (whole numbers only)

- Scoring criteria:

- Macronutrient balance (protein/fat/carb ratios)

- Fiber adequacy

- Nutrient density

- Presence of processed ingredients

- Calorie appropriateness

- Output structure:

- Score: X/10

- Pros/cons breakdown

- Specific improvement suggestions

- **Implementation Details:**

```python

# Core functions from implementation:

def parse\_food\_amount(user\_input):

"""Uses DeepSeek to extract foods and estimate quantities"""

# Returns JSON array: [{"food": "...", "amount": "..."}]

def query\_usda(food\_name):

"""Queries USDA API for nutritional data"""

# Returns standardized nutrient values

def analyze\_nutrition(meal\_info):

"""Uses DeepSeek to generate score and analysis"""

# Returns formatted text explanation

* **Strengths Validated by Testing:**
  1. **Robust Parsing:** Accurately handles diverse inputs including:
     + Single items ("1 boiled egg")
     + Multi-food meals ("2 eggs, 150g chicken, 1 cup broccoli")
     + Vague quantities ("a few slices of cucumber" → "3 slices (30g)")
     + Branded items ("McDonald's Big Mac")
  2. **Comprehensive Analysis:**
     + Provides pros/cons breakdown
     + Highlights nutritional strengths (e.g., "High-quality protein")
     + Identifies deficiencies (e.g., "No fiber")
     + Offers actionable suggestions
  3. **User-Friendly Output:**
     + Clear 0-10 scoring
     + Structured Markdown formatting
     + Non-technical language
* **Limitations and Improvements:**
  1. **Data Accuracy:**
     + Issue: USDA matches occasionally incorrect (e.g., egg carbs in Example 2)
     + Solution: Add data validation checks
  2. **Combo Meal Handling:**
     + Issue: Incomplete totals for branded items (Example 4 Big Mac calories)
     + Solution: Implement custom food databases
  3. **Transparency:**
     + Issue: No indication of estimation confidence
     + Solution: Add data source indicators (e.g., "Estimated from similar foods")
  4. **Scoring Methodology:**
     + Issue: Weighting logic not explicit
     + Solution: Document scoring criteria in output
  5. **Error Handling:**
     + Issue: JSON parsing failures not gracefully handled
     + Solution: Add fallback parsing mechanisms
* **Tools and APIs:**
  1. **AI Service:** DeepSeek API (<https://api.deepseek.com/v1>)
  2. **Nutrition Database:** USDA FoodData Central API
  3. **Tech Stack:**
     + Python 3.x
     + LangChain (llm integration)
     + Requests (API calls)
     + dotenv (secret management)
* **Testing Methodology:**
  1. **Test Cases:**
     + Basic foods (eggs, vegetables)
     + Combination meals
     + Vague quantities ("a bowl of...")
     + Fast food combos
     + Desserts and drinks
  2. **Validation Approach:**
     + Compare against USDA reference values
     + Expert review of analysis quality
     + Iterative prompt refinement
  3. **Output Requirements:**
     + Consistent JSON parsing
     + Nutritionally accurate explanations
     + Actionable improvement suggestions

**Conclusion**  
The implemented system demonstrates how generative AI can provide actionable nutritional feedback. By combining DeepSeek's language understanding with USDA nutritional data, we've created a practical tool for dietary awareness. Future improvements will focus on data accuracy and explanatory transparency while maintaining the user-friendly approach. This implementation serves as an effective demonstration of how AI can bridge nutritional science and everyday eating habits.