

NutriSage: Smart Nutrition Assistant for Food Analysis and Personalized Meal Guidance

BY

Aaditya Kumar Dhaka (2448001)

Neelanjan Dutta (2448040)

Aim -

To develop **NutriSage**, an AI-powered nutrition assistant that makes food data more interpretable and actionable. The system will leverage **structured Indian and global food datasets** (IFCT 2017, INDB, MM-Food-100K) to analyze meals, track daily intake, and deliver **personalized dietary recommendations**. By combining **nutrition science with AI-driven interpretation**, NutriSage aims to help users make healthier, data-backed food choices.

Objectives -

1. **Design an interpretability layer** that presents nutrient values with clear, health-related explanations (e.g., “high sodium → blood pressure risk”).
2. **Implement multi-modal input** by supporting natural language meal descriptions and food image recognition.
3. **Develop a knowledge-driven chatbot** for nutrition Q&A, personalized suggestions, and healthier alternatives using retrieval-augmented generation (RAG).
4. **Build supporting tools** for daily nutrition tracking, meal planning, and food comparison to promote balanced dietary intake.
5. **Ensure usability and scalability** by keeping the interface intuitive, modular, and adaptable for Indian and global food datasets.

Abstract -

Nutritional data often exists as raw numbers (calories, proteins, fats, etc.), but most people struggle to interpret what those values mean for their health. This project aims to develop a **NutriSage: Smart Nutrition Assistant** that makes nutrition data understandable, personalized, and actionable.

We will use **multiple curated datasets**:

- **IFCT 2017 (Indian Food Composition Tables)** for staple Indian foods (with micronutrients).
- **INDB (Indian Nutrition Database)** for cooked dishes (macros + micros).
- **MM-Food-100K** for global + branded foods (macros, images, portion sizes).

The system will:

- Explain food nutrients in plain language (e.g., “This apple provides 5% of daily energy needs and is rich in potassium, good for heart health”).
- Accept flexible input: **text meals** (“2 chapatis + dal”) or **food images** (future extension).
- Offer a **chatbot** for Q&A, health tips, and alternative suggestions.
- Provide **tools for planning and tracking**, with smart recommendations to balance intake.

By combining **structured food data** with **AI interpretability and retrieval-augmented generation (RAG)**, this project will make nutrition advice more accessible and meaningful for Indian users while being extensible globally.

Key Features -

▪ **Core Novel Features :**

1. Interpretability Layer

- Nutrient breakdown with simple explanations.
- Highlights health risks (*“High sodium → may increase blood pressure risk”*).
- Provides a “nutrient diversity score” for overall balance.

2. Multi-Modal Input

- **Text input:** Parse meals in natural language → convert to nutrition facts.
- **Image input:** Upload a food photo → classify → fetch nutrients.

3. Chatbot with RAG

- Answers nutrition questions.
- Explains interpretability outputs.
- Suggests healthy alternatives (*“Instead of fries → try roasted sweet potatoes”*).

▪ **Supporting Features :**

4. Daily Nutrition Tracker

- Logs meals.
- Dashboard: calories, macros, % RDA coverage.
- Smart recommendations for balancing nutrients.

5. Meal/Diet Planner (Phase 2)

- Generates personalized daily/weekly meal plans.
- Uses nutrient diversity score.

6. Food Comparison Tool (Phase 2)

- Side-by-side comparison of foods.
- Highlights nutrient differences and health context.

Project Timeline and Gantt Chart -

Phase	Duration	Dates	Key Tasks
1. Dataset Collection & Integration	1 week	Sep 21 – Sep 27	Collect IFCT, INDB, MM-Food-100K; clean schema; remove duplicates
2. Exploratory Data Analysis (EDA)	2 weeks	Sep 28 – Oct 11	Analyze macros & micros, identify missing data, check Indian/global coverage, generate insights
3. Model Development (Text-based)	2 weeks	Oct 12 – Oct 25	NLP-based meal parsing, macro/micro prediction models, validation
4. Image-based Food Recognition	1.5 weeks	Oct 26 – Nov 5	Train CNN (transfer learning), link with nutrition dataset
5. Integration: Multi-Modal + Interpretability	1.5 weeks	Nov 6 – Nov 16	Merge text + image models, implement interpretability layer, nutrient diversity score
6. Chatbot & Recommendation System	1 week	Nov 17 – Nov 23	Build RAG chatbot, Q&A system, healthy alternatives
7. Testing, Validation & Documentation	1 week	Nov 24 – Nov 30	End-to-end testing, performance evaluation, final documentation & submission

