AI/ML-Based Personalized Diet Plan Generator from Medical Reports

1 Problem Statement

Medical reports often contain crucial numeric data (blood sugar, cholesterol, BMI) and textual notes (doctor prescriptions and comments). Patients often struggle to interpret these reports or adjust their diet accordingly. Generic diet suggestions do not account for individual medical conditions.

AI-NutriCare aims to **analyze patient medical reports**, extract relevant information using ML and AI/NLP models, and **generate a personalized diet plan** that considers health conditions, allergies, and dietary preferences.

2 Objectives

- Parse medical reports (PDF, text, scanned images) to extract structured data.

- Use ML algorithms to analyze numeric lab results and classify health conditions.

- Use AI/NLP models to interpret textual notes and prescriptions.

- Generate daily diet plans tailored to the patient's health profile.

- Provide output in PDF/HTML/JSON for easy consumption.

3 Expected Outcome

- Automatic detection of critical health metrics from medical reports.

- Generation of personalized diet plans considering medical conditions, preferences, and allergies.

- Exportable diet plan in PDF or JSON format.

- User-friendly visualization of diet recommendations.

4 Technology Stack

- **Programming Language:** Python 3

- **ML Libraries:** scikit-learn, XGBoost, LightGBM

- **AI/NLP Models:** GPT-4/5, BERT

- **OCR:** Tesseract / EasyOCR

- **Frontend:** Streamlit / React

- **Database:** PostgreSQL / SQLite

- **Export:** PDF (ReportLab), JSON

5 System Architecture
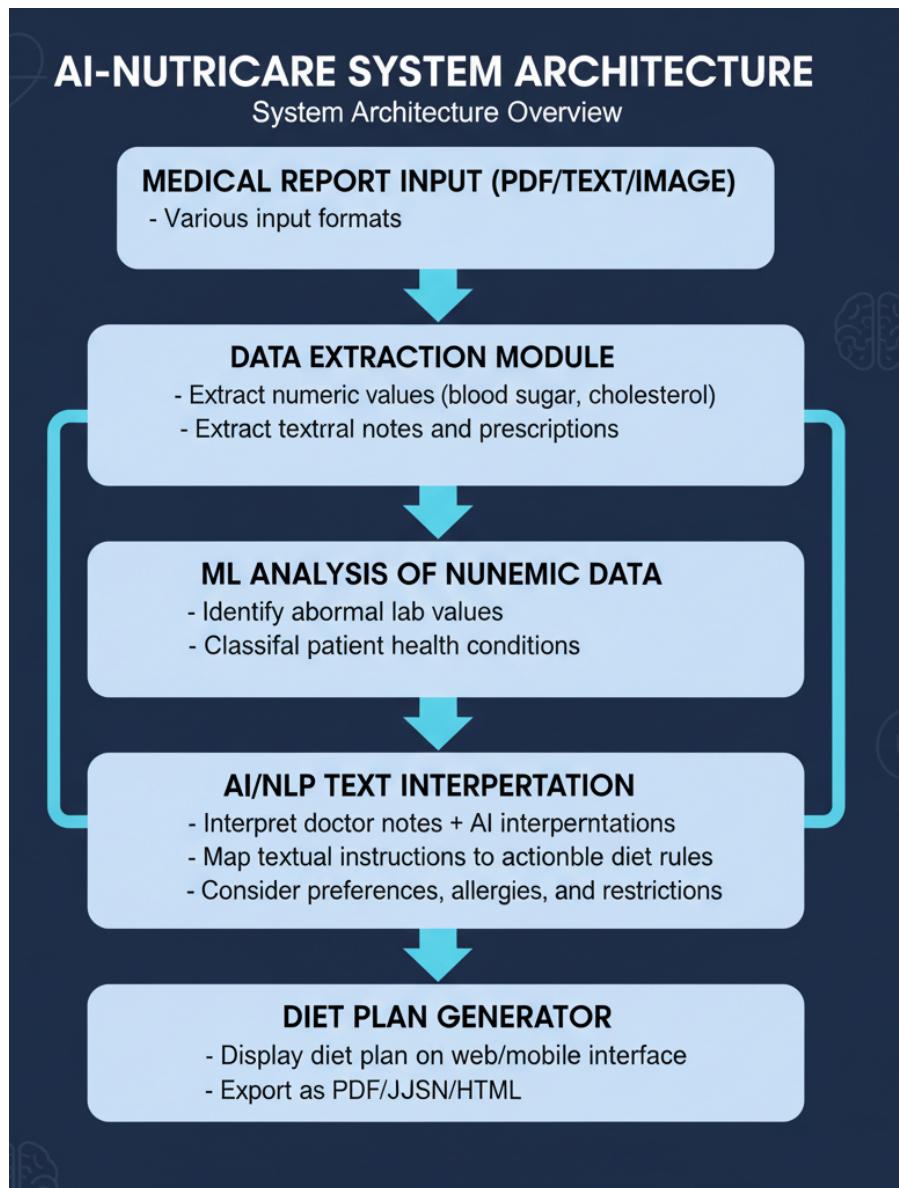
Figure 1: System Architecture Diagram for AI-NutriCare

The system architecture of AI-NutriCare consists of several interconnected modules:

- **Medical Report Input:** Accepts PDF, image, or text-based reports uploaded by the user.

- **Data Extraction Module:** Uses OCR and parsing techniques to extract structured numerical and textual data.

- **ML Analysis of Numeric Data:** Evaluates blood test and health metrics to identify potential risks.

- **AI/NLP Text Interpretation:** Uses transformer-based models to understand doctor notes and map them to health insights.

- **Diet Plan Generator:** Combines ML and NLP outputs to create a balanced diet plan tailored to the user's needs.

- **Output Module:** Exports results in PDF or JSON and displays them in a user-friendly interface.

6 Example User Interface
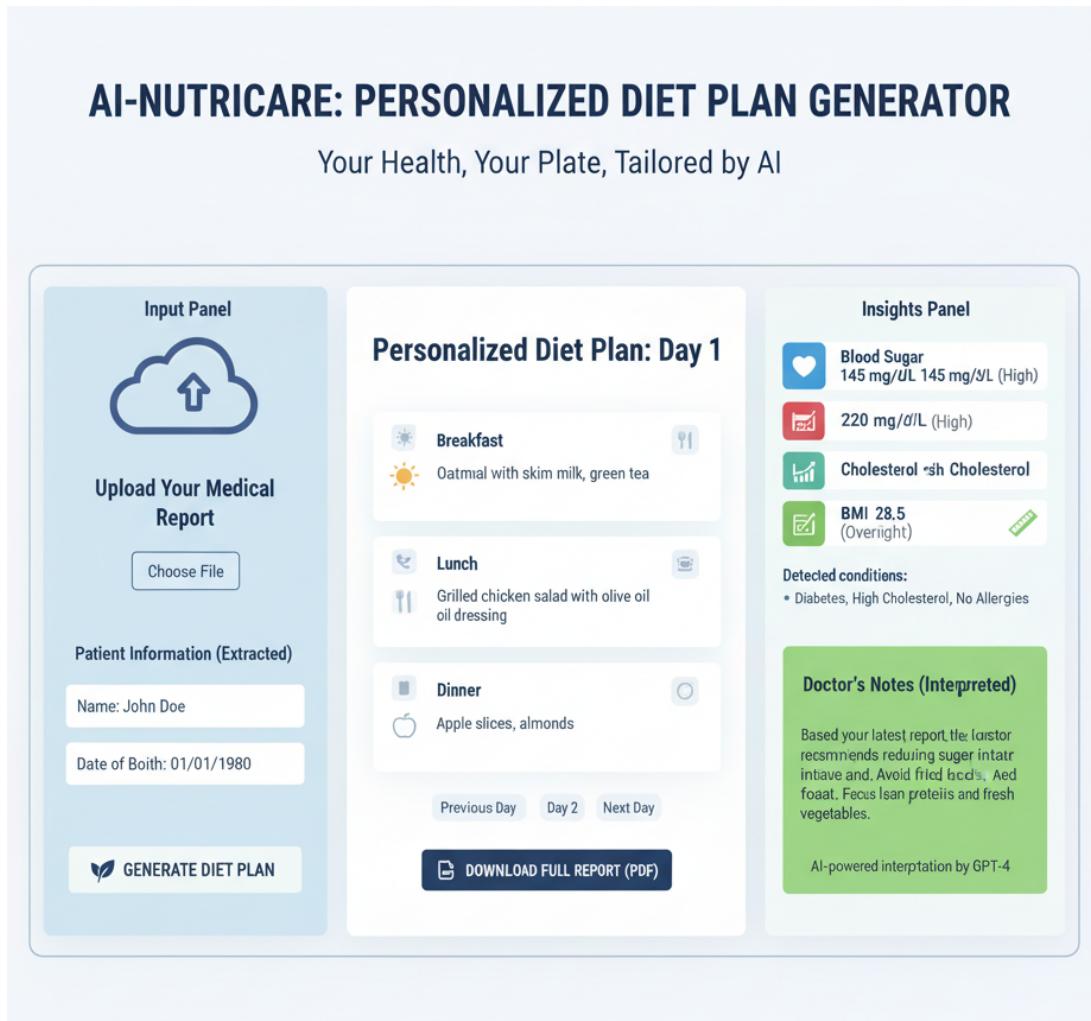
Figure 2: User Interface Mockup for AI-NutriCare Dashboard

Figure presents a mockup of the AI-NutriCare dashboard. The interface allows users to upload medical reports, view extracted data summaries, and visualize the generated personalized diet plan.

7 Example Output

Listing 1: Sample Diet Plan from AI-NutriCare

```
Patient: John Doe
Medical Condition: Diabetes, High Cholesterol
Day 1:
Breakfast: Oatmeal with skim milk, green tea
Lunch: Grilled chicken salad with olive oil dressing
Snack: Apple slices, almonds
Dinner: Steamed fish, steamed vegetables
Day 2:
Breakfast: Vegetable smoothie, whole grain toast
Lunch: Quinoa salad with legumes
Snack: Low-fat yogurt, berries
Dinner: Grilled tofu with spinach
Exported Diet Plan: JohnDoe_DietPlan.pdf
```

8   Two-Month Project Timeline

Week 1–2: Data Collection and Preprocessing

- Collect sample medical reports (PDF, text, scanned images).

- Implement OCR for scanned reports and text extraction.

- Milestone: Successfully extract structured numeric and textual data from sample reports.

Week 3–4: ML-Based Health Analysis

- Train ML models to classify health conditions from numeric lab results.

- Implement thresholds and alerts for abnormal values.

- Milestone: ML model achieves ¿85% accuracy in detecting critical conditions.

Week 5–6: NLP/AI Text Interpretation

- Integrate GPT/BERT for interpreting doctor notes and prescriptions.

- Map textual instructions to actionable diet guidelines.

- Milestone: Convert at least 80% of textual notes into actionable diet rules.

Week 7–8: Diet Plan Generation and UI Integration

- Combine ML and AI insights to generate personalized diet plans.

- Implement frontend with Streamlit or React for visualization.

- Export diet plans in PDF and JSON formats.

- Milestone: Fully functional end-to-end prototype tested with sample reports.

9   Learning Outcomes

Working on AI-NutriCare will help achieve the following learning objectives:

- Gain practical experience in extracting structured and unstructured data from medical reports using OCR and NLP.

- Understand and implement ML algorithms for health condition classification based on lab results.

- Learn to fine-tune or utilize AI language models (GPT/BERT) for text interpretation in the healthcare domain.

- Develop skills in generating actionable insights from combined numeric and textual medical data.

- Design and implement a full-stack application integrating backend ML/AI modules with a frontend interface.

- Understand ethical considerations and data privacy for handling sensitive health data.