رواد مصر الرقمية

AI FITNESS TRAINER

Smart nutrition begins with smart data

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AGENDA

- Introduction
- Project Phases (Research, Coding, & UI/UX)
- Advantages
- Marketing Ideas
- Future Improvements

INTRODUCTION

This project focuses on building a **Smart Diet Type Recommendation System** that predicts the ideal diet category **(Balanced, High-Protein, or Low-Carb)** based on an **individual's physical and lifestyle characteristics.** The idea behind the project is to help people **make better nutritional decisions with less need for a personal trainer or nutritionist.**

With **obesity and health awareness rising globally**, people are searching for fast, personalized recommendations. Our system serves as an **AI-based assistant that analyzes user inputs and instantly suggests the most suitable diet plan.**

RESEARCH PHASE

Business Understanding: In today's fitness and wellness industry, personalized diet recommendations are crucial for achieving specific goals like weight loss, muscle gain, or maintenance. Automating diet suggestions using a machine learning model:

- **Reduces** the need for a personal dietitian for basic recommendations.
- Helps users **quickly identify** a suitable diet based on objective data.
- Can be **integrated into fitness apps, gyms, or online wellness platforms.**

Nutrition is a cornerstone of human health and well-being. The food choices we make determine not only our physical energy and growth but also our risk for many chronic diseases. Over the last few decades, global dietary habits have shifted toward processed, calorie-dense, and nutrient poor foods, leading to alarming increases in obesity and nutrition-related health problems

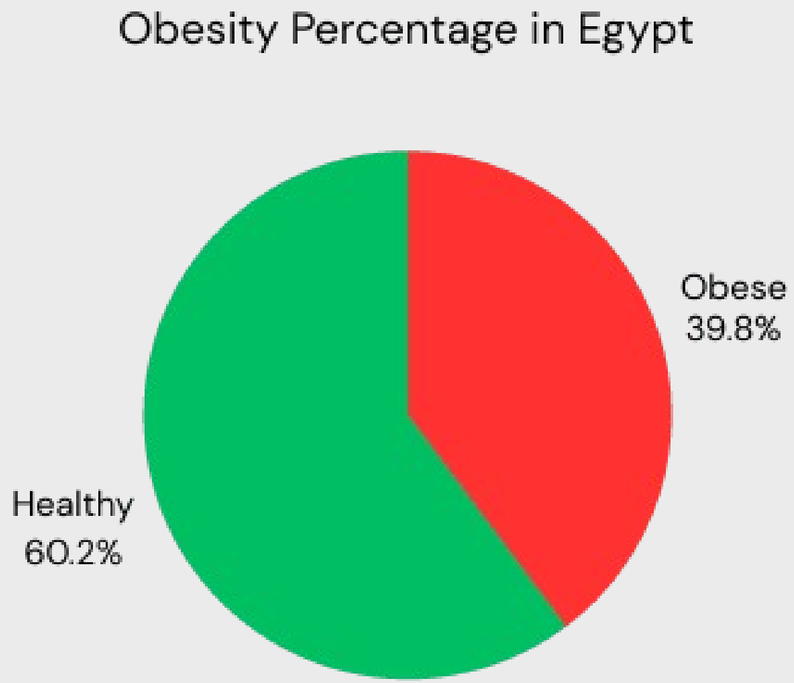
OBESITY RATES

- In 2022, approximately **2.5 billion adults** aged 18 years or older were classified as overweight, and around **890 million were obese.** This means that **43%** of adults worldwide were living with overweight or obesity, and nearly **16%** were obese. Even among children and adolescents aged 5–19, the rates of overweight and obesity rose dramatically — from about **8% in 1990 to 20% in 2022.**

- According to the World Health Organization, **one in every eight people worldwide is now living with obesity**. This growing trend is a major public health concern, as obesity is a leading risk factor for diseases such as type 2 diabetes, cardiovascular disease, and certain cancers. A well-structured and balanced diet plan can help individuals maintain a healthy weight, reduce disease risk, and improve overall quality of life

2030 EGYPT VISION

- In Egypt, the burden of diet-related health problems is particularly acute and warrants focused attention. According to the **“100 Million Health”** survey conducted in 2019 across about 49.7 million Egyptian adults, approximately **39.8%** of adults were classified as **obese (BMI ≥ 30 kg/m²)**, with a marked gender difference: about **49.5% of adult females compared to 29.5% of adult males.**



WHY A DIET?

- A healthy diet helps prevent and manage multiple health conditions. Research shows that most cases of **type 2 diabetes are directly linked to overweight and obesity.** According to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), roughly **9 out of 10** people with **type 2 diabetes** are overweight or obese. Weight reduction of just **5–7%** of total body weight can significantly lower the risk of developing diabetes

- A balanced diet rich in whole grains, fruits, vegetables, lean proteins, and healthy fats supports cardiovascular health, stabilizes blood sugar levels, and strengthens the immune system. Studies also suggest that diets high in fiber and low in added sugars can reduce the risk of heart disease by **up to 30%**, while sufficient consumption of fruits and vegetables **may prevent 2.7 million premature deaths per year worldwide**

DIET TYPES

- A **balanced diet** provides the body with all essential nutrients—carbohydrates, proteins, fats, vitamins, and minerals—in appropriate proportions. It emphasizes variety and moderation while avoiding excess sugar, saturated fats, and processed foods. A balanced diet supports healthy weight maintenance, boosts immunity, and reduces the risk of chronic diseases such as diabetes, hypertension, and cardiovascular disease.
- **Low-carb** diets reduce carbohydrate intake while emphasizing proteins and healthy fats. These diets can improve blood sugar regulation and promote weight loss by stabilizing insulin levels
- A **high-protein** diet is a dietary approach that emphasizes increasing protein intake while reducing carbohydrate and fat consumption. This diet is often used to support weight loss, improve energy levels, and stabilize blood sugar levels.

DATASET OVERVIEW

Feature Overview **(Dataset Link)**

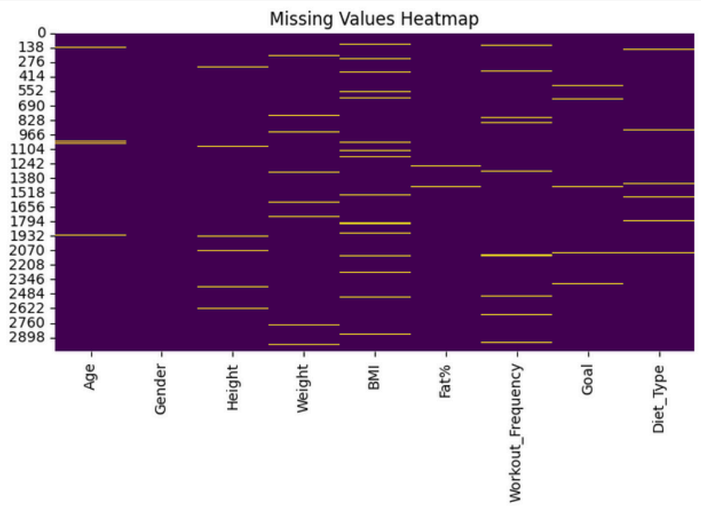
- **Age:** Age of the user in years
- **Gender:** Encoded gender (e.g., 0 = Female, 1 = Male)
- **Weight (kg):** Body weight in kilograms
- **Height (m):** Height in meters
- **BMI:** Body Mass Index calculated as Weight / (Height²)
- **Fat%:** Body fat percentage
- **Workout_Frequency:** Number of workout days per week
- **Goal_Label:** Fitness goal: 0 = Maintain, 1 = Muscle Gain, 2 = Weight Loss
- **Diet_Type:** (**Target variable)** Balanced, High-Protein, Low-Carb

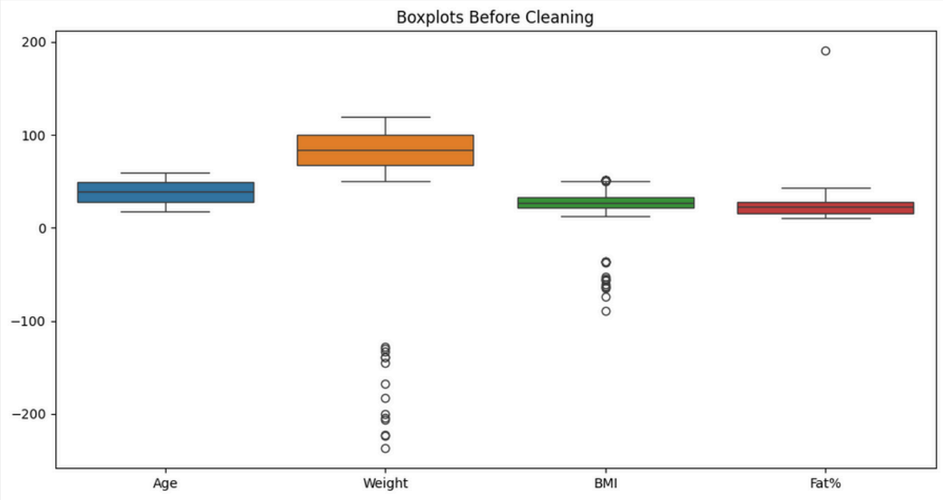
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3030 entries, 0 to 3029
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Age                3000 non-null   float64
 1   Gender             3030 non-null   int64
 2   Height             2940 non-null   object
 3   Weight             2940 non-null   object
 4   BMI                2880 non-null   float64
 5   Fat%               2966 non-null   float64
 6   Workout_Frequency  2908 non-null   float64
 7   Goal               2973 non-null   object
 8   Diet_Type          2969 non-null   object
dtypes: float64(4), int64(1), object(4)
memory usage: 213.2+ KB
```

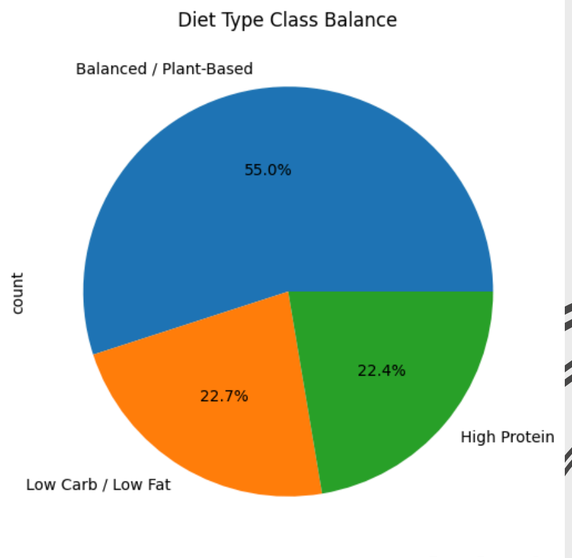
	Age	Gender	BMI	Fat%	Workout_Frequency
count	3000.000000	3030.000000	2880.000000	2966.000000	2908.000000
mean	38.654333	0.490099	29.157847	22.326703	3.505502
std	12.040231	0.499984	14.183081	7.782347	1.720284
min	18.000000	0.000000	12.000000	10.000000	1.000000
25%	28.000000	0.000000	21.900000	16.000000	2.000000
50%	39.000000	0.000000	27.400000	23.000000	4.000000
75%	49.000000	1.000000	33.600000	28.000000	5.000000
max	59.000000	1.000000	200.300000	190.400000	6.000000

PREPROCESSING

- The **preprocessing stage** was essential to raise the quality of our dataset. We handled **missing values, fixed incorrect labels, normalized skewed features, encoded categorical values, and removed duplicates.** Applying methods like **LabelEncoder, StandardScaler, and SMOTE** showed our understanding of transforming raw data into structured and meaningful information. This step directly improved model accuracy and stability.



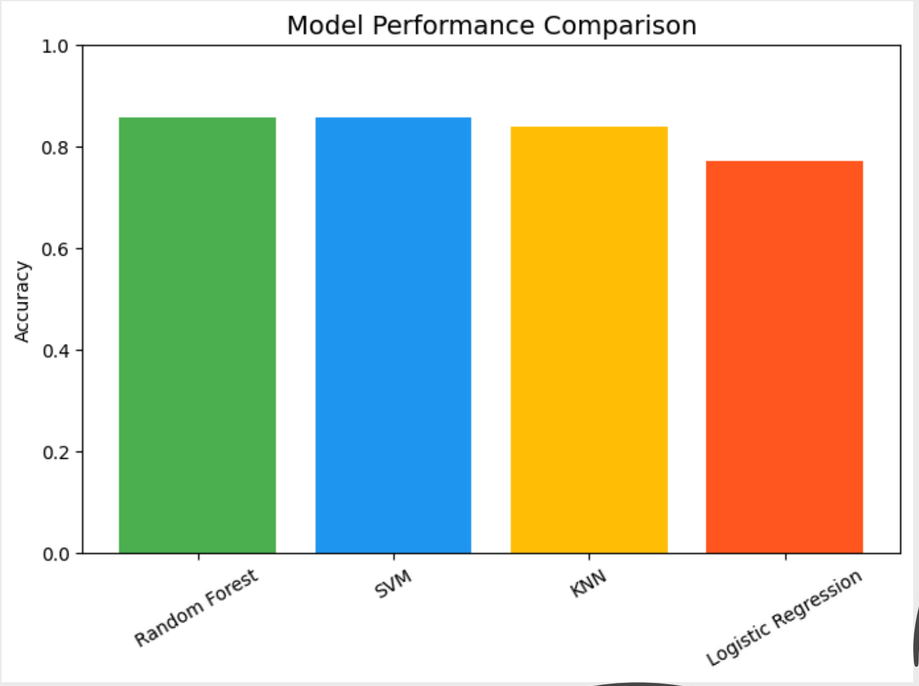




MODEL BUILDING

- In **model-building stage**, specific features were selected that have a strong influence on dietary needs: **Age, Gender, Height, Weight, BMI, Fat%, Workout Frequency, and Goal.** This ensured the model bases its prediction on realistic and science-backed attributes.

- Multiple models were trained, and the **best-performing** one was selected using cross-validation. **Random Forest and SVM models** produced strong accuracy and consistent predictions. Also, it was evaluated by using **confusion matrices, classification reports, and accuracy** scoring, making sure the model generalizes well to unseen real data.



FINAL RESULTS

- After evaluating multiple machine learning algorithms, the top-performing models (Random Forest and SVM) were selected for **fine-tuning to maximize their performance.**

- **SVM** won the contest with a total accuracy of **85.7%**

NOTEBOOK LINK

```
Tuning Random Forest using GridSearchCV...
Fitting 5 folds for each of 108 candidates, totalling 540 fits

Best RF Params: {'bootstrap': True, 'max_depth': None, 'min_samples_leaf': 4, 'min_samples_split': 2, 'n_estimators': 200}
Best RF CV Accuracy: 0.8565

Tuning SVM using GridSearchCV...
Fitting 5 folds for each of 16 candidates, totalling 80 fits

Best SVM Params: {'C': 0.1, 'gamma': 'scale', 'kernel': 'linear'}
Best SVM CV Accuracy: 0.8575

🎯 Final Best Model: SVM

Classification Report:
              precision    recall  f1-score   support

           0       0.98      0.60      0.74       312
           1       0.82      0.99      0.90       313
           2       0.83      0.98      0.90       313

    accuracy                           0.86       938
   macro avg       0.88      0.86      0.85       938
weighted avg       0.88      0.86      0.85       938

Final Test Accuracy: 0.8561
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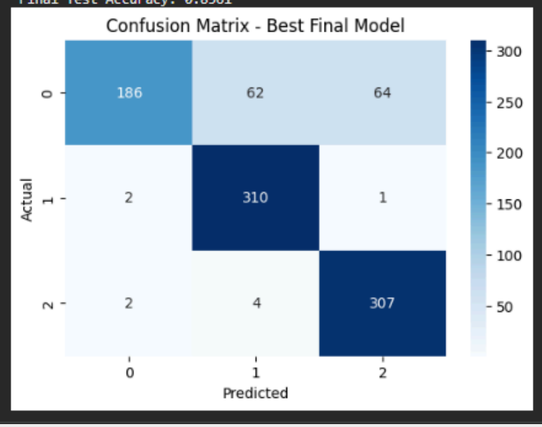
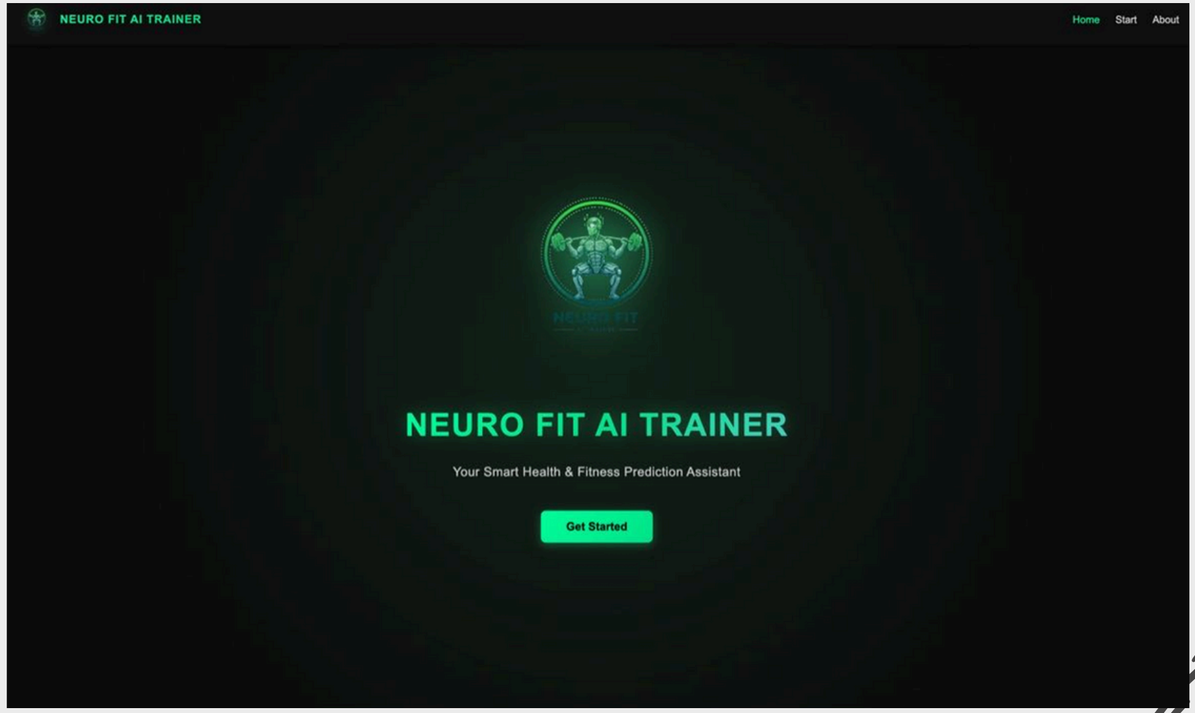


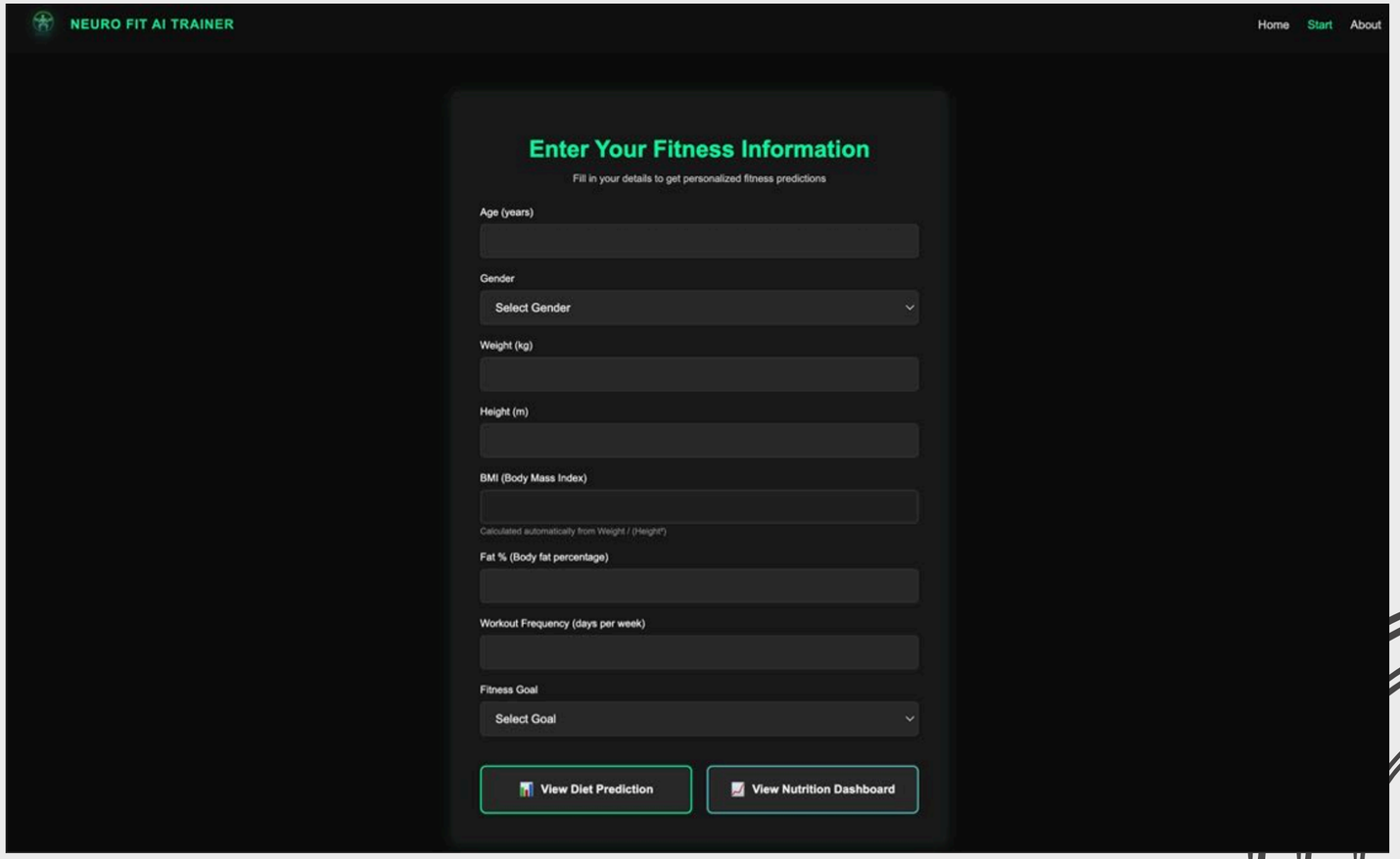
UI/UX PHASE

- Our UI/UX phase focused on making the system accessible to everyday users. Instead of interacting with Python code, the user can easily input their values into a clean and interactive interface. The interface was designed to be simple, fast, and intuitive for people **with no technical background.**



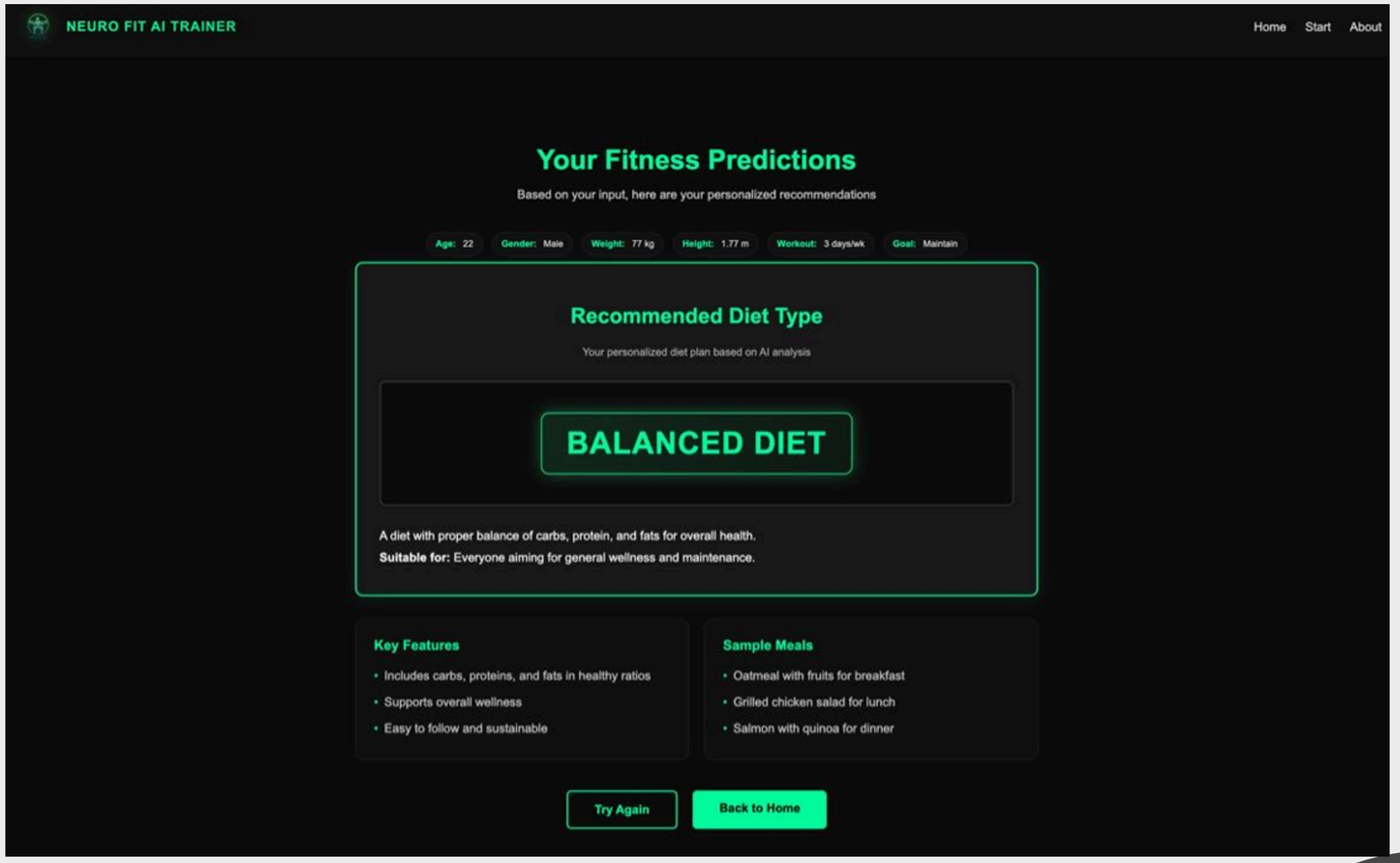
UI/UX PHASE

- The user simply enters basic details—age, gender, weight, goals, etc.—and receives an **instant personalized diet recommendation.** This seamless, guided user flow enhances usability and encourages adoption.



UI/UX PHASE

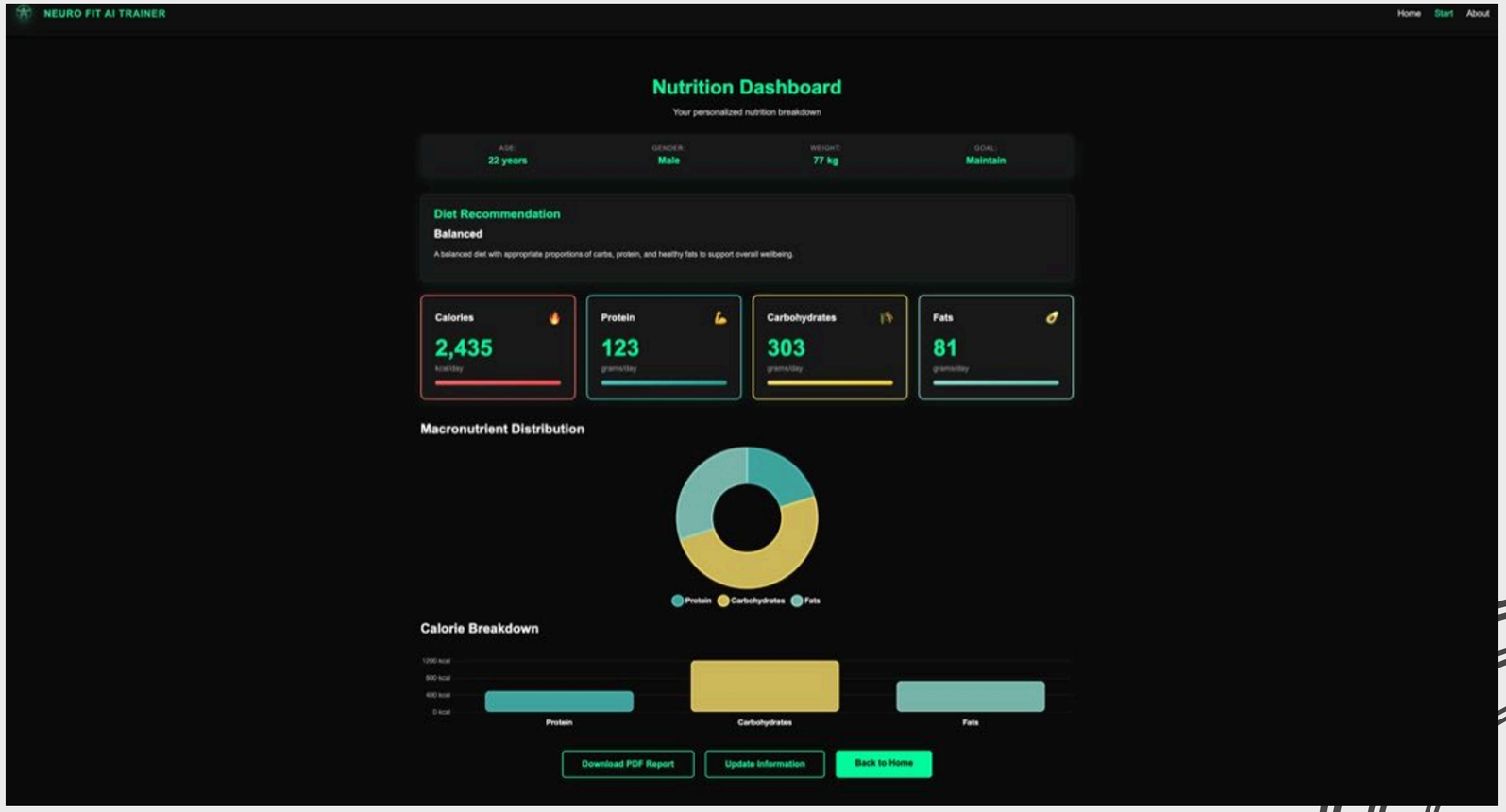
Test Example:



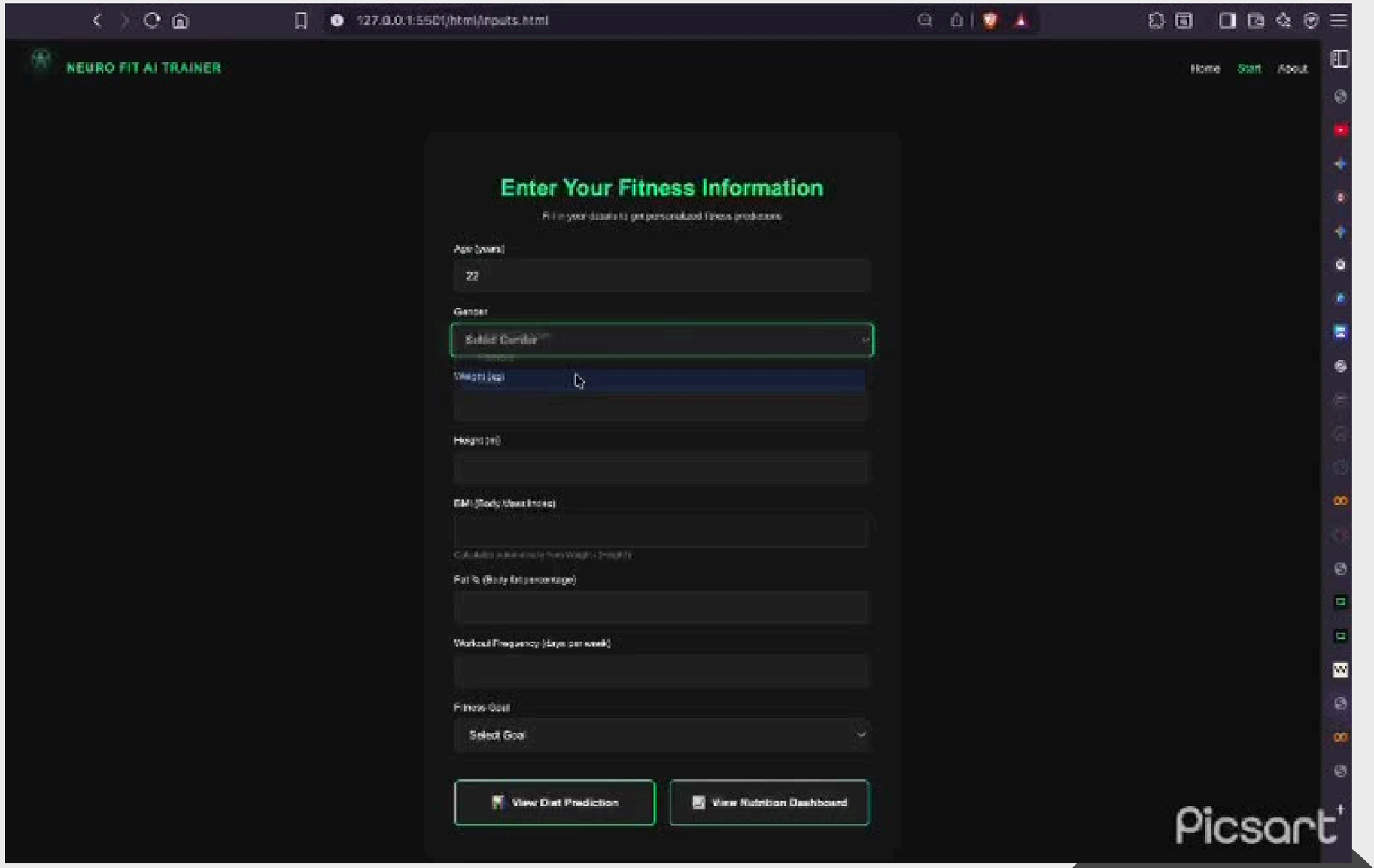
UI/UX PHASE

- We added a nutrition dashboard that shows the **macronutrients** needed for the specific diet type recommended along with the approximate **calories** needed

- Also, we added a button to download **a PDF report** that includes all the information



Live Test:


127.0.0.1:5501/html/inputs.html
NEURO FIT AI TRAINER
Home
Start
About
Enter Your Fitness Information
Age (years)
22
Gender
Height (cm)
Fat % (Body Fat percentage)
Workout Frequency (days per week)
Fitness Goal
Select Goal
View Diet Prediction
View Nutrition Dashboard
Picsart

ADVANTAGES

- The system is **fast, accurate, scalable, and affordable** compared to human nutritionists. It provides personalized diet recommendations, eliminates biases, and handles large amounts of data efficiently.

- The **integration of machine learning** ensures that the system **improves over time and adapts to new users' needs.** Its main advantage is bridging the gap between nutrition science and everyday users.

MARKETING IDEAS

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FUTURE WORK & IMPROVEMENTS

Evolving Nutrition Recommendation System

Basic Nutrition System

Limited diet categories

Feature Expansion

Add meal plans, recipes, tracking

Data Integration

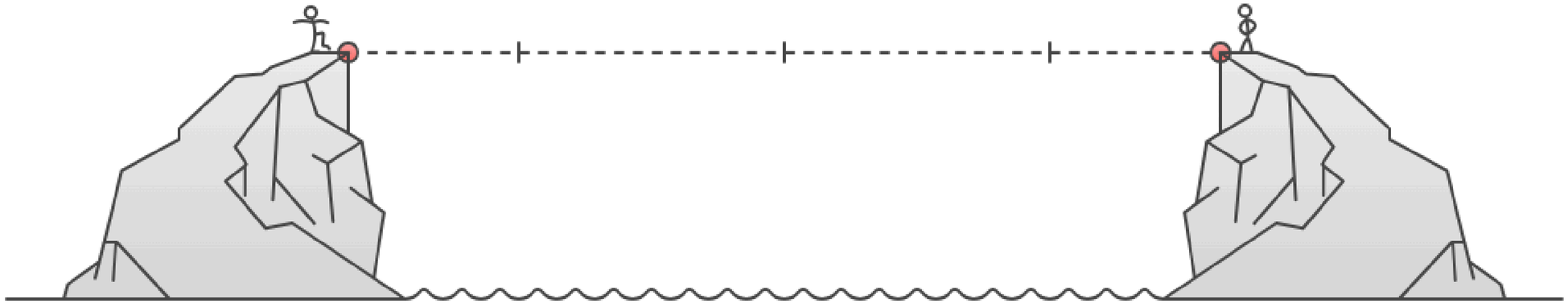
Connect wearable device data

AI Personalization

Apply deep learning models

Personal Nutrition Coach

Complete, personalized nutrition guidance



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THANK YOU