Group No -- 16

PROJECT REPORT: PYTHON HEALTH TRACKER

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1. Problem Statement

The objective of this project is to develop a Python-based application that helps users monitor their physical health metrics. While standard calculators exist, they often lack data persistence or advanced metrics. Our solution calculates Body Mass Index (BMI) and estimates Body Fat Percentage (BFP) using the specific U.S. Navy Method (which requires waist, neck, and height measurements). Furthermore, the system addresses the need for long-term tracking by saving all user data to a persistent CSV file.

2. Approach & Methodology

We implemented the solution using a modular approach in Python.

- **Mathematical Models:**

    - **BMI:** Calculated as `Weight(kg) / Height(m)²`.
    - **Body Fat % (U.S. Navy Method):** We imported the `math` library to implement the logarithmic formulas required for the Navy method, which differs for men and women.
- **File Handling:** We used the `csv` and `os` modules to check if a database file exists. If not, the code creates one with headers; if it does, it appends new records.
- **Error Handling:** We utilized `try-except` blocks to handle invalid inputs (non-numeric data) and mathematical errors (ZeroDivisionError), ensuring the program does not crash.
- **Validation:** Input loops ensure users cannot enter negative numbers for physical attributes or invalid characters for gender selection.

3. Sample Input/Output

(Note: Below is a text representation. Please attach the actual screenshots from your code execution here as required by the rubric).

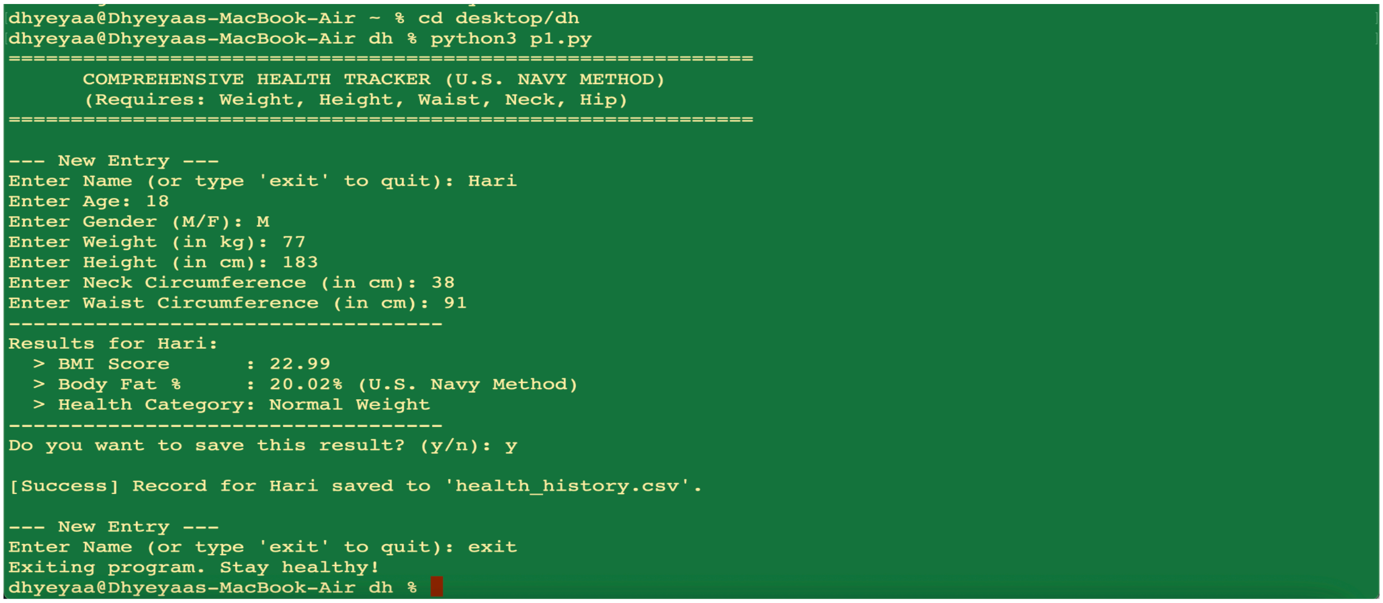
Input:

- **Name:** Hari
- **Gender:** M
- **Weight:** 77 kg
- **Height:** 183 cm
- **Waist:** 91 cm

- **Neck:** 38 cm

Output:

- **BMI Score:** 22.99
- **Body Fat %:** 20.02% (U.S. Navy Method)
- **Category:** Normal Weight
- **System Message:** [Success] Record for Hari saved to 'health_history.csv'.



```
dhyeyaa@Dhyeyaas-MacBook-Air ~ % cd desktop/dh
dhyeyaa@Dhyeyaas-MacBook-Air dh % python3 p1.py
============================================================
      COMPREHENSIVE HEALTH TRACKER (U.S. NAVY METHOD)
      (Requires: Weight, Height, Waist, Neck, Hip)
============================================================

--- New Entry ---
Enter Name (or type 'exit' to quit): Hari
Enter Age: 18
Enter Gender (M/F): M
Enter Weight (in kg): 77
Enter Height (in cm): 183
Enter Neck Circumference (in cm): 38
Enter Waist Circumference (in cm): 91
-----------------------------------
Results for Hari:
  > BMI Score      : 22.99
  > Body Fat %     : 20.02% (U.S. Navy Method)
  > Health Category: Normal Weight
-----------------------------------
Do you want to save this result? (y/n): y

[Success] Record for Hari saved to 'health_history.csv'.

--- New Entry ---
Enter Name (or type 'exit' to quit): exit
Exiting program. Stay healthy!
dhyeyaa@Dhyeyaas-MacBook-Air dh %
```

4. Challenges Faced

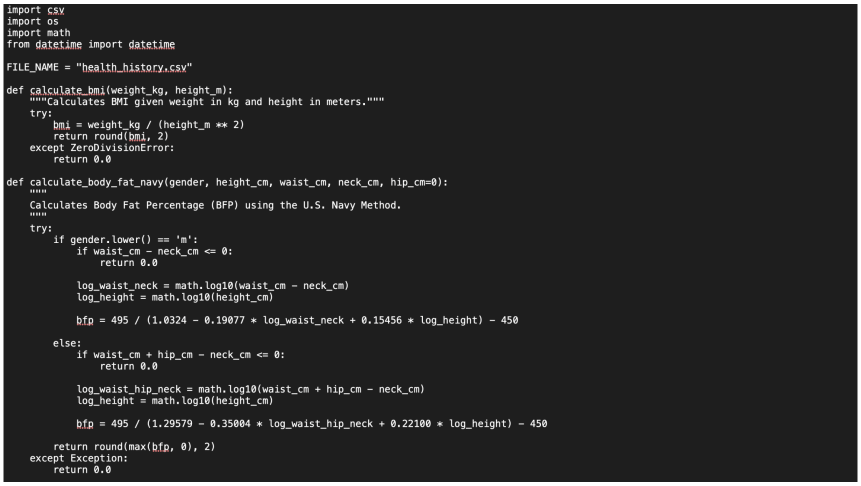
- **Formula Complexity:** Implementing the U.S. Navy Body Fat formula was challenging due to the specific logarithmic calculations (`math.log10`) and ensuring the subtraction of measurements (e.g., Waist - Neck) did not result in negative numbers passed to the log function.

- **File Management:** Handling the logic to create a new CSV file with headers for the *first* user, but only appending data for subsequent users without rewriting headers.
- **Input Validation:** Ensuring the program didn't crash if a user accidentally typed a string instead of a number for weight or height.

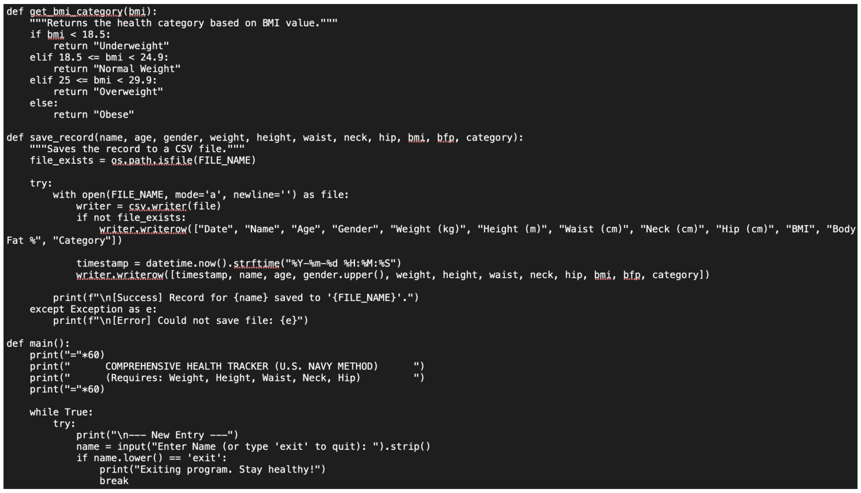
5. Scope for Improvement

- **Visualizations:** We could integrate `matplotlib` to generate a line graph showing how a user's BMI has changed over time based on the CSV history.
- **GUI:** The current command-line interface could be upgraded to a Graphical User Interface using `Tkinter` for better user experience.
- **Dietary Recommendations:** Based on the calculated BMI category, the program could suggest a basic calorie intake limit (BMR calculation).

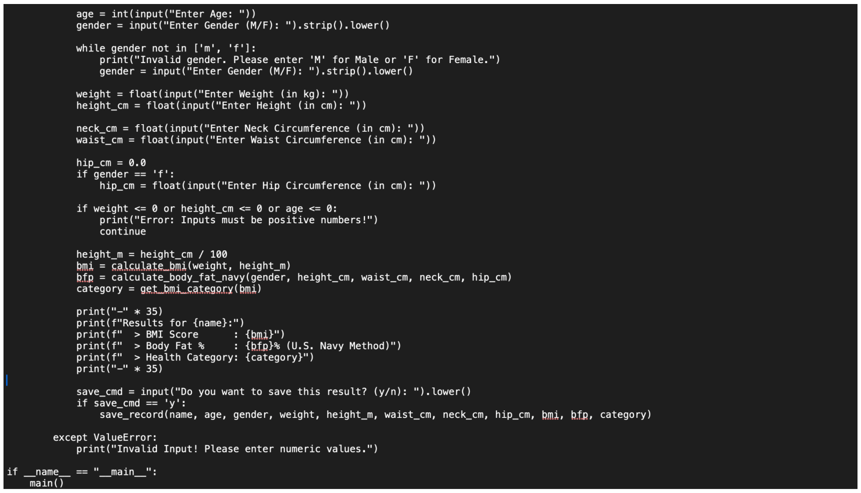
6.Code



```python
import csv
import os
import math
from datetime import datetime

FILE_NAME = "health_history.csv"

def calculate_bmi(weight_kg, height_m):
    """Calculates BMI given weight in kg and height in meters."""
    try:
        bmi = weight_kg / (height_m ** 2)
        return round(bmi, 2)
    except ZeroDivisionError:
        return 0.0

def calculate_body_fat_navy(gender, height_cm, waist_cm, neck_cm, hip_cm=0):
    """
    Calculates Body Fat Percentage (BFP) using the U.S. Navy Method.
    """
    try:
        if gender.lower() == 'm':
            if waist_cm - neck_cm <= 0:
                return 0.0

            log_waist_neck = math.log10(waist_cm - neck_cm)
            log_height = math.log10(height_cm)

            bfp = 495 / (1.0324 - 0.19077 * log_waist_neck + 0.15456 * log_height) - 450

        else:
            if waist_cm + hip_cm - neck_cm <= 0:
                return 0.0

            log_waist_hip_neck = math.log10(waist_cm + hip_cm - neck_cm)
            log_height = math.log10(height_cm)

            bfp = 495 / (1.29579 - 0.35004 * log_waist_hip_neck + 0.22100 * log_height) - 450

        return round(max(bfp, 0), 2)
    except Exception:
        return 0.0
```

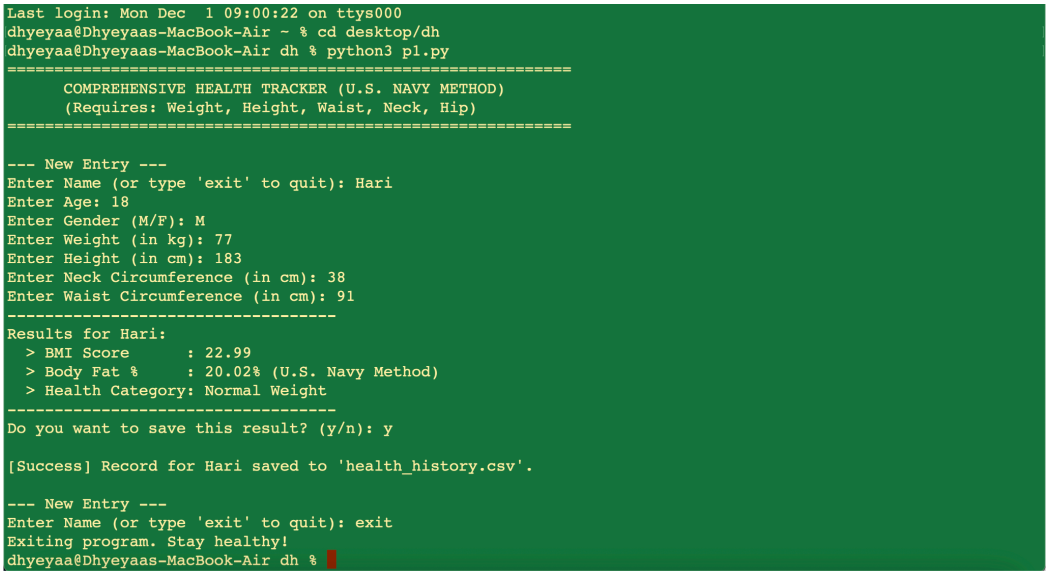


```python
def get_bmi_category(bmi):
    """Returns the health category based on BMI value."""
    if bmi < 18.5:
        return "Underweight"
    elif 18.5 <= bmi < 24.9:
        return "Normal Weight"
    elif 25 <= bmi < 29.9:
        return "Overweight"
    else:
        return "Obese"

def save_record(name, age, gender, weight, height, waist, neck, hip, bmi, bfp, category):
    """Saves the record to a CSV file."""
    file_exists = os.path.isfile(FILE_NAME)

    try:
        with open(FILE_NAME, mode='a', newline='') as file:
            writer = csv.writer(file)
            if not file_exists:
                writer.writerow(["Date", "Name", "Age", "Gender", "Weight (kg)", "Height (m)", "Waist (cm)", "Neck (cm)", "Hip (cm)", "BMI", "Body
Fat %", "Category"])

            timestamp = datetime.now().strftime("%Y-%m-%d %H:%M:%S")
            writer.writerow([timestamp, name, age, gender.upper(), weight, height, waist, neck, hip, bmi, bfp, category])

        print(f"\n[Success] Record for {name} saved to '{FILE_NAME}'.")
    except Exception as e:
        print(f"\n[Error] Could not save file: {e}")

def main():
    print("="*60)
    print("      COMPREHENSIVE HEALTH TRACKER (U.S. NAVY METHOD)      ")
    print("      (Requires: Weight, Height, Waist, Neck, Hip)         ")
    print("="*60)

    while True:
        try:
            print("\n--- New Entry ---")
            name = input("Enter Name (or type 'exit' to quit): ").strip()
            if name.lower() == 'exit':
                print("Exiting program. Stay healthy!")
                break
```



```python
            age = int(input("Enter Age: "))
            gender = input("Enter Gender (M/F): ").strip().lower()

            while gender not in ['m', 'f']:
                print("Invalid gender. Please enter 'M' for Male or 'F' for Female.")
                gender = input("Enter Gender (M/F): ").strip().lower()

            weight = float(input("Enter Weight (in kg): "))
            height_cm = float(input("Enter Height (in cm): "))

            neck_cm = float(input("Enter Neck Circumference (in cm): "))
            waist_cm = float(input("Enter Waist Circumference (in cm): "))

            hip_cm = 0.0
            if gender == 'f':
                hip_cm = float(input("Enter Hip Circumference (in cm): "))

            if weight <= 0 or height_cm <= 0 or age <= 0:
                print("Error: Inputs must be positive numbers!")
                continue

            height_m = height_cm / 100
            bmi = calculate_bmi(weight, height_m)
            bfp = calculate_body_fat_navy(gender, height_cm, waist_cm, neck_cm, hip_cm)
            category = get_bmi_category(bmi)

            print("-" * 35)
            print(f"Results for {name}:")
            print(f"  > BMI Score      : {bmi}")
            print(f"  > Body Fat %     : {bfp}% (U.S. Navy Method)")
            print(f"  > Health Category: {category}")
            print("-" * 35)

            save_cmd = input("Do you want to save this result? (y/n): ").lower()
            if save_cmd == 'y':
                save_record(name, age, gender, weight, height_m, waist_cm, neck_cm, hip_cm, bmi, bfp, category)

        except ValueError:
            print("Invalid Input! Please enter numeric values.")

if __name__ == "__main__":
    main()
```

7)Input and Output



```
Last login: Mon Dec  1 09:00:22 on ttys000
dhyeyaa@Dhyeyaas-MacBook-Air ~ % cd desktop/dh
dhyeyaa@Dhyeyaas-MacBook-Air dh % python3 p1.py
============================================================
      COMPREHENSIVE HEALTH TRACKER (U.S. NAVY METHOD)
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--- New Entry ---
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Results for Hari:
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  > Health Category: Normal Weight
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Do you want to save this result? (y/n): y

[Success] Record for Hari saved to 'health_history.csv'.

--- New Entry ---
Enter Name (or type 'exit' to quit): exit
Exiting program. Stay healthy!
dhyeyaa@Dhyeyaas-MacBook-Air dh % 
```

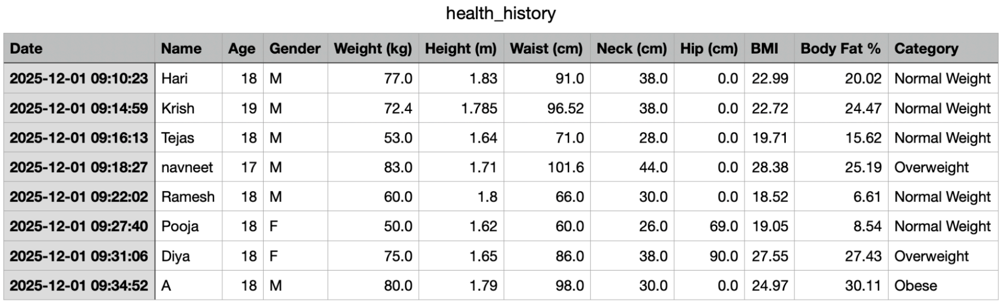

health_history

Date	Name	Age	Gender	Weight (kg)	Height (m)	Waist (cm)	Neck (cm)	Hip (cm)	BMI	Body Fat %	Category
2025-12-01 09:10:23	Hari	18	M	77.0	1.83	91.0	38.0	0.0	22.99	20.02	Normal Weight
2025-12-01 09:14:59	Krish	19	M	72.4	1.785	96.52	38.0	0.0	22.72	24.47	Normal Weight
2025-12-01 09:16:13	Tejas	18	M	53.0	1.64	71.0	28.0	0.0	19.71	15.62	Normal Weight
2025-12-01 09:18:27	navneet	17	M	83.0	1.71	101.6	44.0	0.0	28.38	25.19	Overweight
2025-12-01 09:22:02	Ramesh	18	M	60.0	1.8	66.0	30.0	0.0	18.52	6.61	Normal Weight
2025-12-01 09:27:40	Pooja	18	F	50.0	1.62	60.0	26.0	69.0	19.05	8.54	Normal Weight
2025-12-01 09:31:06	Diya	18	F	75.0	1.65	86.0	38.0	90.0	27.55	27.43	Overweight
2025-12-01 09:34:52	A	18	M	80.0	1.79	98.0	30.0	0.0	24.97	30.11	Obese

THANK YOU!!!