Interactive Adult BMI Calculator

Report: Adult BMI Calculator Code Explanation

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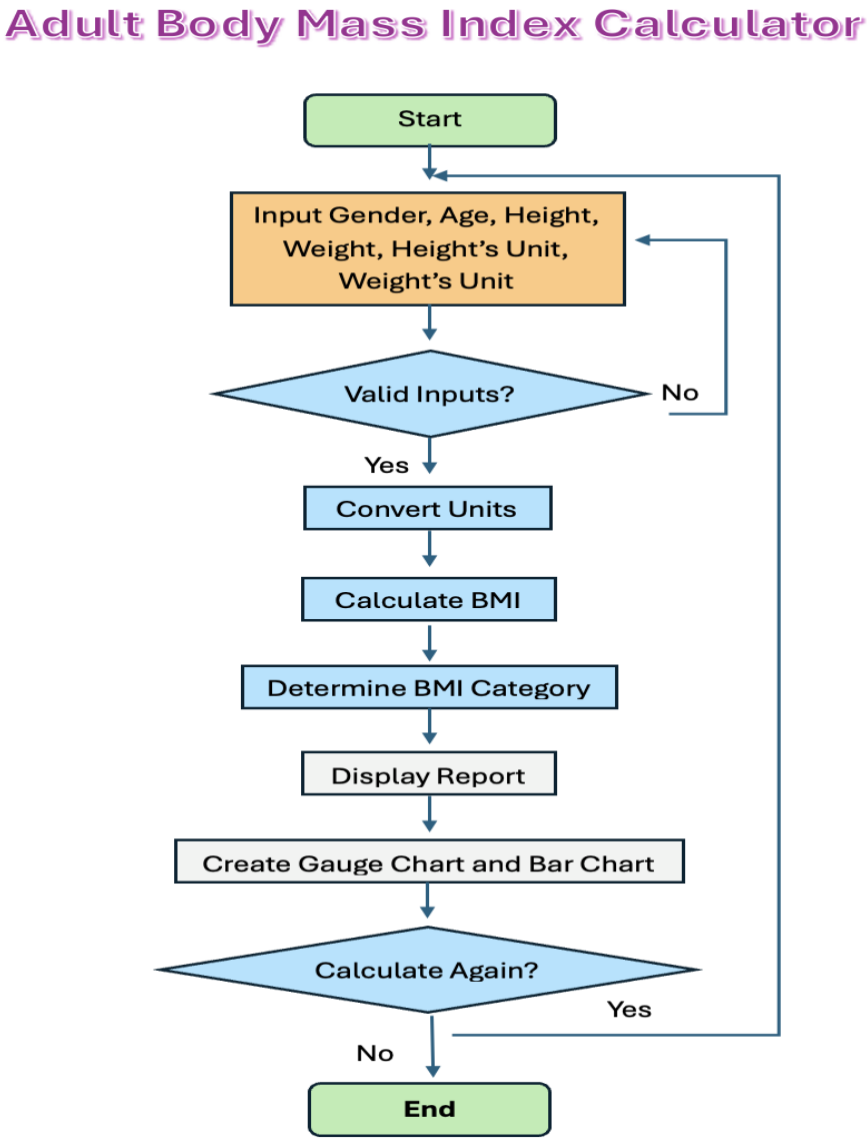
Objective

This interactive script collects user inputs such as gender, age, height, and weight (with units), calculates Body Mass Index (BMI) with appropriate unit conversions, classifies BMI into standardized health categories, and displays personalized results with dynamic visualizations. It uses:

- **IPython HTML display** for styled feedback,
- **Plotly** for an interactive gauge chart,
- **Matplotlib** for comparative bar charts.

Additionally, the tool provides **gender- and age-specific health advice** based on BMI results.

High-Level Workflow



Step-by-Step Analysis

1. Imports

- "from IPython.display import display, HTML"
  ➔ Used to present colorful, styled messages in HTML.
- "import matplotlib.pyplot as plt"
  ➔ Used for generating a bar chart to visualize BMI categories.
- "import plotly.graph_objects as go"
  ➔ Used to create an interactive gauge chart for BMI.

2. Main Program Loop

The script runs within a `while True:` loop to continuously accept new inputs until the user decides to exit.

3. User Inputs & Validation

All inputs are validated carefully:

- **Gender:**
  ➔ Accepts only 'male' or 'female'.
- **Age:**
  ➔ Must be between **18** and **110** years.
- **Height:**
  ➔ Numeric value between **20** and **280** (units: cm or inches).
- **Weight:**
  ➔ Numeric value between **2** and **1500** (units: kg or pounds).

Invalid inputs trigger styled error messages and re-prompting.

4. Unit Conversion

To standardize units before BMI calculation:

- **Height:**
  ➔ If entered in inches, convert to centimeters (inches × 2.54).
- **Weight:**
  ➔ If entered in pounds, convert to kilograms (pounds ÷ 2.205).

5. BMI Calculation

BMI is computed using the formula: **BMI = Weight / ((Height/100) **2)**

- Result rounded to **two decimal places** for clarity.

6. BMI Categorization (CDC Standards)

The calculated BMI is categorized according to CDC guidelines:

BMI Range	Category
< 18.5	Underweight
18.5 – 24.9	Normal weight
25 – 29.9	Overweight
30 – 34.9	Obesity (Class 1)
35 – 39.9	Obesity (Class 2)
≥ 40	Extreme Obesity

7. Displaying Personalized Report

A detailed, stylized HTML report includes:

- User's **Gender**, **Height**, **Weight**
- **Calculated BMI** value
- **Health Category**
- **Contextual Health Notes**:
  - Metabolism changes
  - Muscle mass vs. fat distribution (gender-specific)
  - Age-related physiological effects

8. Visualization

A. Plotly Gauge Chart

- A colorful gauge displaying BMI within a **0–50** range.
- **Color-coded segments:**
  - Sky Blue → Underweight
  - Lime Green → Normal
  - Gold → Overweight
  - Orange → Obesity Class 1
  - Orangered → Obesity Class 2
  - Crimson → Extreme Obesity
- A **threshold line** highlights the user's BMI.

B. Matplotlib Bar Chart

- Bar chart of BMI categories.
- User's BMI shown with a **dashed blue line**.
- Correct BMI category highlighted with a **bold black border**.

9. Re-run Option

At the end of each session:

- Prompt:
  "Do you want to calculate BMI again? (yes / no)"
- If **yes** ➔ Program restarts.
- If **no** ➔ Displays a "Thank You" message and exits.

Reference

- CDC BMI Categories