Heart Disease Data Analysis with NumPy, Pandas, and Matplotlib

Objective:

Analyze a heart disease dataset using NumPy, Pandas, and Matplotlib to gain insights into how different factors contribute to heart disease.

Task Requirements

1. Data Loading & Preprocessing (Pandas)

- **Load the dataset.**
- **Display all of its columns.**
- **Display the first few and last rows of the dataset.**
- **Display the descriptive statistics for the whole data.**
- **Check for missing values and handle them appropriately with mean imputation**
- **Display the data null values and their count before and after imputations.**
- **Check and remove outliers of at least one column.**
- **Check for the data shape before and after imputation.**

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2. Numerical Analysis (NumPy & Pandas)

- **Compute statistics for key medical indicators:**
  - **Mean, Median, and Standard Deviation of Cholesterol (`chol`)**
  - **Mean Blood Pressure (`trestbps`) for patients with and without heart disease**
  - **Max and Min values for Maximum Heart Rate (`thalach`)**
- **Sorting & Searching (NumPy):**
  - **Sort patients by cholesterol levels.**
  - **Identify patients with cholesterol above 300 mg/dL.**

    - Find patients older than 60 with abnormal ECG (`restecg` > 0).
- Reshape & Split the whole Data using `numpy.reshape()` and `numpy.split()`

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3. Data Visualization (Matplotlib & Seaborn)

Objective: Identify trends and correlations in heart disease factors.

✅ Histogram:

- Distribution of cholesterol (`chol`) across all patients.
- Helps identify common cholesterol levels and potential outliers.

✅ Scatter Plot:

- Age (`age`) vs. Maximum Heart Rate (`thalach`)
- Shows how age affects heart rate and potential risk zones.

✅ Bar Chart:

- Comparison of patients with and without heart disease (`target`)
- Helps visualize how many patients have heart disease.

✅ 3D Plot:

- Cholesterol (`chol`), Age (`age`), and Heart Disease (`target`)
- Shows how cholesterol and age interact in heart disease diagnosis.

✅ Pie Chart:

- Proportion of different Chest Pain Types (`cp`) among patients.
- Highlights which pain types are most common in heart disease cases.

File Structure

```
heart_disease_analysis/
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├── heart_disease_analysis.ipynb   # Jupyter Notebook with analysis
├── heart_data.csv                 # Heart disease dataset
└── README.md                       # Instructions on running the notebook
```
