

```
In [1]: import pandas as pd
```

```
In [2]: data = pd.read_csv('heart.csv')
```

```
In [3]: data
```

Out[3]:

| | Unnamed: 0 | Age | Sex | ChestPain | RestBP | Chol | Fbs | RestECG | MaxHR | ExAng | Oldpeak |
|-----|------------|-----|-----|--------------|--------|------|-----|---------|-------|-------|---------|
| 0 | 1 | 63 | 1 | typical | 145 | 233 | 1 | 2 | 150 | 0 | 2.0 |
| 1 | 2 | 67 | 1 | asymptomatic | 160 | 286 | 0 | 2 | 108 | 1 | 1.0 |
| 2 | 3 | 67 | 1 | asymptomatic | 120 | 229 | 0 | 2 | 129 | 1 | 2.0 |
| 3 | 4 | 37 | 1 | nonanginal | 130 | 250 | 0 | 0 | 187 | 0 | 3.0 |
| 4 | 5 | 41 | 0 | nontypical | 130 | 204 | 0 | 2 | 172 | 0 | 1.0 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 298 | 299 | 45 | 1 | typical | 110 | 264 | 0 | 0 | 132 | 0 | 1.0 |
| 299 | 300 | 68 | 1 | asymptomatic | 144 | 193 | 1 | 0 | 141 | 0 | 3.0 |
| 300 | 301 | 57 | 1 | asymptomatic | 130 | 131 | 0 | 0 | 115 | 1 | 1.0 |
| 301 | 302 | 57 | 0 | nontypical | 130 | 236 | 0 | 2 | 174 | 0 | 0.0 |
| 302 | 303 | 38 | 1 | nonanginal | 138 | 175 | 0 | 0 | 173 | 0 | 0.0 |

303 rows × 15 columns

```
In [4]: data.shape
```


Out[4]: (303, 15)

```
In [5]: data.isnull()
```

Out[5]:

| | Unnamed: 0 | Age | Sex | ChestPain | RestBP | Chol | Fbs | RestECG | MaxHR | ExAng | Oldpe |
|-----|------------|-------|-------|-----------|--------|-------|-------|---------|-------|-------|-------|
| 0 | False | False | False | False | False | False | False | False | False | False | Fa |
| 1 | False | False | False | False | False | False | False | False | False | False | Fa |
| 2 | False | False | False | False | False | False | False | False | False | False | Fa |
| 3 | False | False | False | False | False | False | False | False | False | False | Fa |
| 4 | False | False | False | False | False | False | False | False | False | False | Fa |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| 298 | False | False | False | False | False | False | False | False | False | False | Fa |
| 299 | False | False | False | False | False | False | False | False | False | False | Fa |
| 300 | False | False | False | False | False | False | False | False | False | False | Fa |
| 301 | False | False | False | False | False | False | False | False | False | False | Fa |
| 302 | False | False | False | False | False | False | False | False | False | False | Fa |

303 rows × 15 columns



```
In [6]: data.isnull().sum()
```

Out[6]:

| | |
|------------|---|
| Unnamed: 0 | 0 |
| Age | 0 |
| Sex | 0 |
| ChestPain | 0 |
| RestBP | 0 |
| Chol | 0 |
| Fbs | 0 |
| RestECG | 0 |
| MaxHR | 0 |
| ExAng | 0 |
| Oldpeak | 0 |
| Slope | 0 |
| Ca | 4 |
| Thal | 2 |
| AHD | 0 |

dtype: int64

```
In [7]: data.dtypes
```

```
Out[7]: Unnamed: 0      int64  
Age      int64  
Sex      int64  
ChestPain object  
RestBP   int64  
Chol     int64  
Fbs      int64  
RestECG  int64  
MaxHR    int64  
ExAng    int64  
Oldpeak  float64  
Slope    int64  
Ca       float64  
Thal     object  
AHD      object  
dtype: object
```

```
In [8]: data[data==0].count()
```

```
Out[8]: Unnamed: 0      0  
Age      0  
Sex      97  
ChestPain 0  
RestBP   0  
Chol     0  
Fbs      258  
RestECG  151  
MaxHR    0  
ExAng    204  
Oldpeak  99  
Slope    0  
Ca       176  
Thal     0  
AHD      0  
dtype: int64
```

```
In [9]: data["Age"].mean()
```

```
Out[9]: 54.43894389438944
```

```
In [11]: ndata=data[["Age", "Sex", "ChestPain", "RestBP", "Chol"]]
```

In [12]: `ndata`

Out[12]:

| | Age | Sex | ChestPain | RestBP | Chol |
|-----|-----|-----|--------------|--------|------|
| 0 | 63 | 1 | typical | 145 | 233 |
| 1 | 67 | 1 | asymptomatic | 160 | 286 |
| 2 | 67 | 1 | asymptomatic | 120 | 229 |
| 3 | 37 | 1 | nonanginal | 130 | 250 |
| 4 | 41 | 0 | nontypical | 130 | 204 |
| ... | ... | ... | ... | ... | ... |
| 298 | 45 | 1 | typical | 110 | 264 |
| 299 | 68 | 1 | asymptomatic | 144 | 193 |
| 300 | 57 | 1 | asymptomatic | 130 | 131 |
| 301 | 57 | 0 | nontypical | 130 | 236 |
| 302 | 38 | 1 | nonanginal | 138 | 175 |

303 rows × 5 columns

In [13]: `from sklearn.model_selection import train_test_split`

```
-----
ImportError                                Traceback (most recent call last)
~\AppData\Local\Temp\ipykernel_14180\1366848395.py in <module>
----> 1 from sklearn.model_selection import train_test_split

ImportError: cannot import name 'train_test_split' from 'sklearn.model_selection' (C:\Users\admin\anaconda3\lib\site-packages\sklearn\model_selection\__init__.py)
```

In [14]: `from sklearn.model_selection import train_test_split`

In [15]: `train , test = train_test_split(ndata, random_state=0, test_size=0.25)`

```
In [16]: train
```

```
Out[16]:
```

| | Age | Sex | ChestPain | RestBP | Chol |
|-----|-----|-----|--------------|--------|------|
| 173 | 62 | 0 | asymptomatic | 140 | 394 |
| 261 | 58 | 0 | nontypical | 136 | 319 |
| 37 | 57 | 1 | asymptomatic | 150 | 276 |
| 101 | 34 | 1 | typical | 118 | 182 |
| 166 | 52 | 1 | nonanginal | 138 | 223 |
| ... | ... | ... | ... | ... | ... |
| 251 | 58 | 1 | asymptomatic | 146 | 218 |
| 192 | 43 | 1 | asymptomatic | 132 | 247 |
| 117 | 35 | 0 | asymptomatic | 138 | 183 |
| 47 | 50 | 1 | asymptomatic | 150 | 243 |
| 172 | 59 | 0 | asymptomatic | 174 | 249 |

227 rows × 5 columns

```
In [17]: import numpy as np
```

```
In [18]: actual = list (np.ones(45)) + list(np.zeros(55))
```

```
In [20]: predicted = list (np.ones(40)) + list(np.zeros(52)) + list(np.ones(8))
```

```
In [51]: from sklearn.metrics import confusion_matrix, ConfusionMatrixDisplay  
import matplotlib.pyplot as plt
```

```
In [52]: cm = confusion_matrix(actual, predicted)

disp = ConfusionMatrixDisplay(confusion_matrix=cm, display_labels=['Class 0',
disp.plot(cmap=plt.cm.Blues, values_format='d')
plt.title("Confusion Matrix")
plt.show()
```



```
In [31]: from sklearn.metrics import classification_report
```

```
In [33]: print(classification_report(actual, predicted))
```

| | precision | recall | f1-score | support |
|--------------|-----------|--------|----------|---------|
| 0.0 | 0.90 | 0.85 | 0.88 | 55 |
| 1.0 | 0.83 | 0.89 | 0.86 | 45 |
| accuracy | | | 0.87 | 100 |
| macro avg | 0.87 | 0.87 | 0.87 | 100 |
| weighted avg | 0.87 | 0.87 | 0.87 | 100 |

```
In [ ]:
```