HEART DISEASES

Data analytics project

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The Heart Disease Project detects whether or not that person has heart disease , based on some attributes.

we have the dataset contains 1009 rows and 12 Column.

The dataset contains information about individuals and their heart health, with

the following attributes:

Age: Age of the individual in years (numerical).

Sex: Gender of the individual (categorical: 'M' for male, 'F' for female).

ChestPainType: The type of chest pain the individual is experiencing (categorical: '**ATA**' for atypical angina, '**NAP**' for non-anginal pain, '**ASY**' for asymptomatic, '**TA**' for typical angina).

RestingBP: Resting blood pressure of the individual (numerical).

Cholesterol: Serum cholesterol level of the individual in mg/dl (numerical).

FastingBS: Fasting blood sugar of the individual, where 1 means fasting blood sugar > 120 mg/dl and 0 otherwise (binary).

RestingECG: Resting electrocardiographic results of the individual (categorical: 'Normal', 'ST', 'T').

MaxHR: Maximum heart rate achieved by the individual (numerical).

ExerciseAngina: Whether the individual has angina induced by exercise, where 'Y' means yes and 'N' means no (binary).

Oldpeak: ST depression induced by exercise relative to rest (numerical).

ST_Slope: The slope of the peak exercise ST segment, where 'Up' is upsloping, 'Flat' is flat, and 'Down' is downsloping (categorical).

HeartDisease: The presence of heart disease, where 1 has heart disease and 0 not have heart disease (binary).

Steps:

- Preprocessing

-we read dataset from csv file and display info of this dataset:

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1008 entries, 0 to 1007
Data columns (total 12 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Age             1008 non-null   int64
 1   Sex             1007 non-null   object
 2   ChestPainType   1007 non-null   object
 3   RestingBP       1000 non-null   float64
 4   Cholesterol     1002 non-null   float64
 5   FastingBS       1007 non-null   float64
 6   RestingECG      1002 non-null   object
 7   MaxHR           1003 non-null   float64
 8   ExerciseAngina  1001 non-null   object
 9   Oldpeak         1008 non-null   float64
 10  ST_Slope        1008 non-null   object
 11  HeartDisease    1008 non-null   int64
dtypes: float64(5), int64(2), object(5)
```

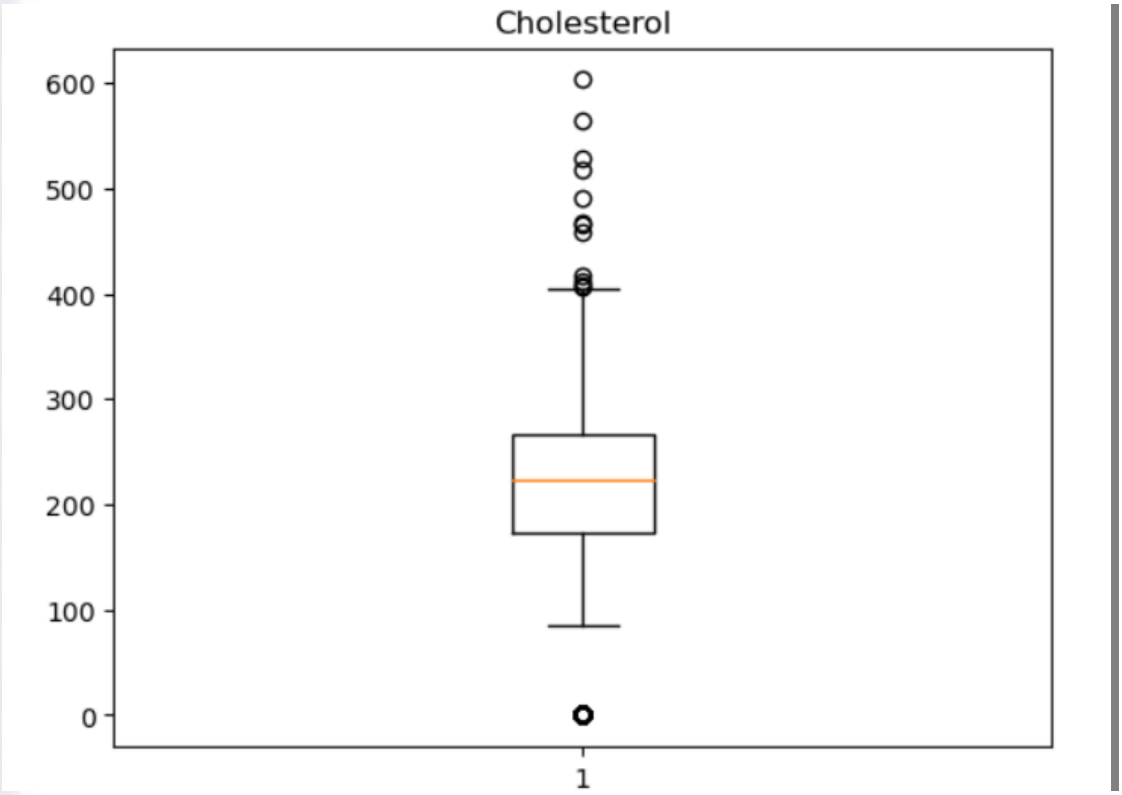
- Found 8 rows with null values and They were dropped.

--checked about duplicate rows and find 81 duplicated and They were dropped.

- detect outliers in some attributes:

(Cholesterol , RestingBP, MaxHR)

Detect outliers in ‘cholesterol’ attribute by Boxplot:



Q1 (25%) = 174.0 Q3 (75%) = 267.0 IQR = 93.0

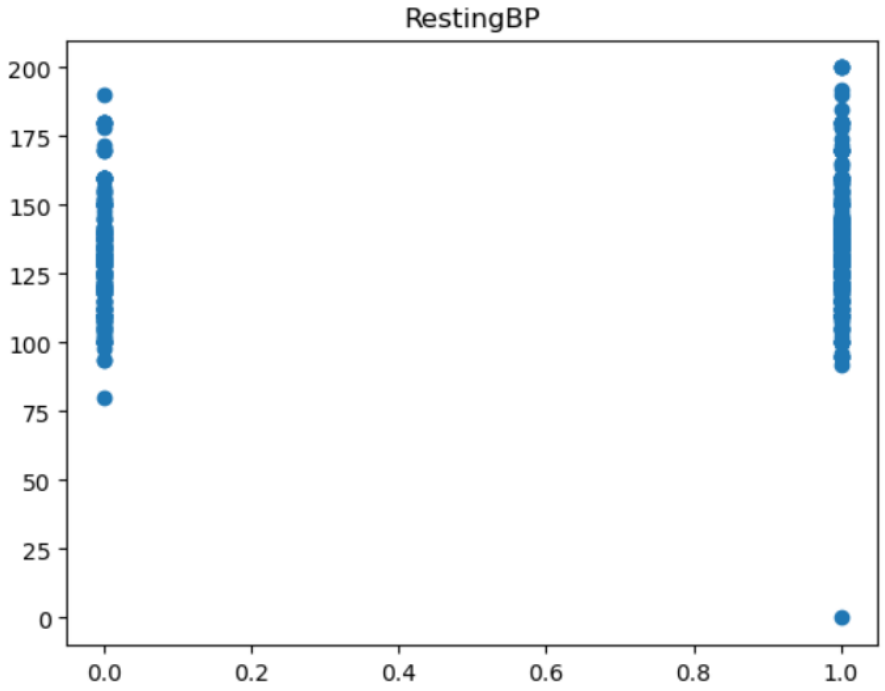
lower = 34.5 upper = 406.5

Number Of Outlier Element : 183 elements.

Number Of Non Outlier Element : 734 elements.

Detect outliers in ‘RestingBP’ attribute by

Scatter plot:



Q1 (25%) = 120.0 Q3 (75%) = 140.0 IQR = 20.0

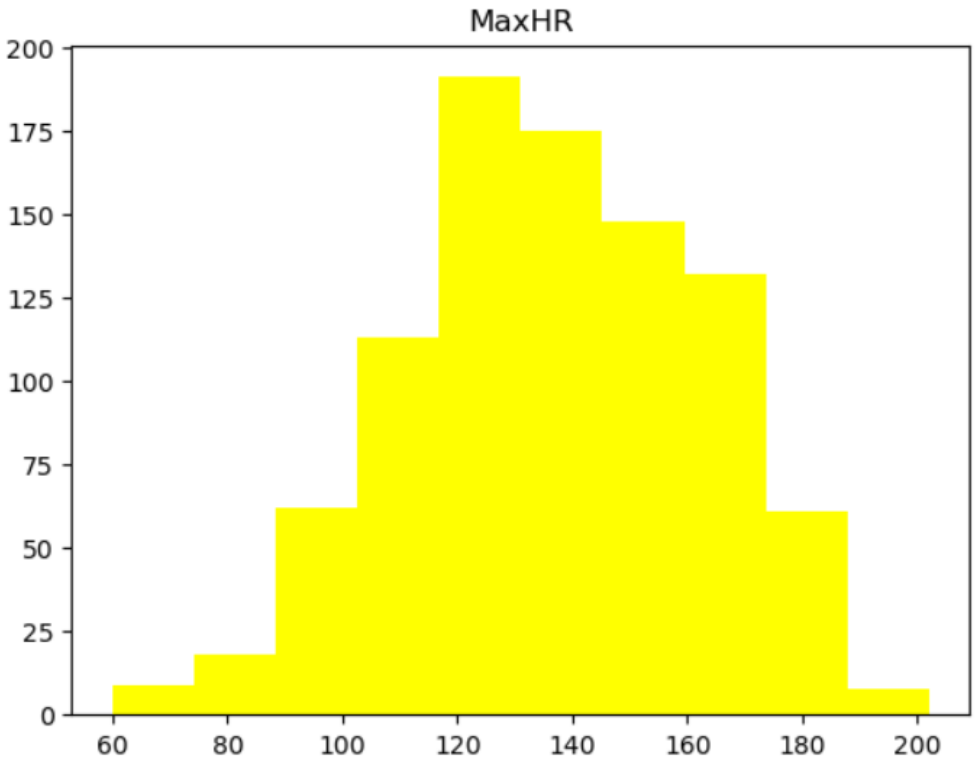
lower = 90.0 upper = 170.0

Number Of Outlier Element : 28 elements

Number Of Non Outlier Element : 889 elements

The range of outliers is [80:200] and it is acceptable in Resting BP so we didn't removed.

Detect outliers in ‘MaxHR’ attribute by Histogram: (not outliers in MaxHR)



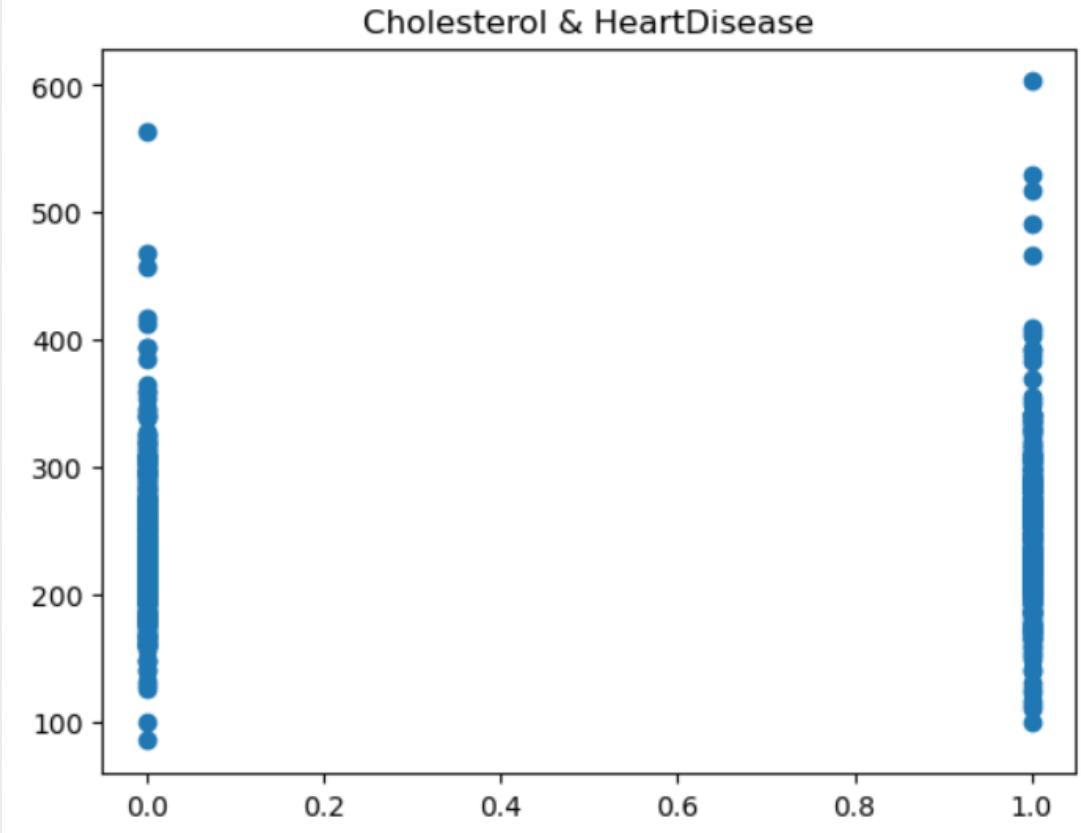
- Convert categorical data to numeric:

```
data["ST_Slope"]=data["ST_Slope"].replace({"Flat":1, "Up":2,"Down":0}, inplace=False)
data["ExerciseAngina"]=data["ExerciseAngina"].replace({"N": 0, "Y":1}, inplace=False)
data["RestingECG"]=data["RestingECG"].replace({"Normal":0, "ST":1,"LVH":2}, inplace=False)
data["Sex"]=data["Sex"].replace({"M": 1, "F":0}, inplace=False)
data["ChestPainType"]=data["ChestPainType"].replace({"ATA": 0, "TA":1,"NAP": 2, "ASY":3}, inplace=False)
```

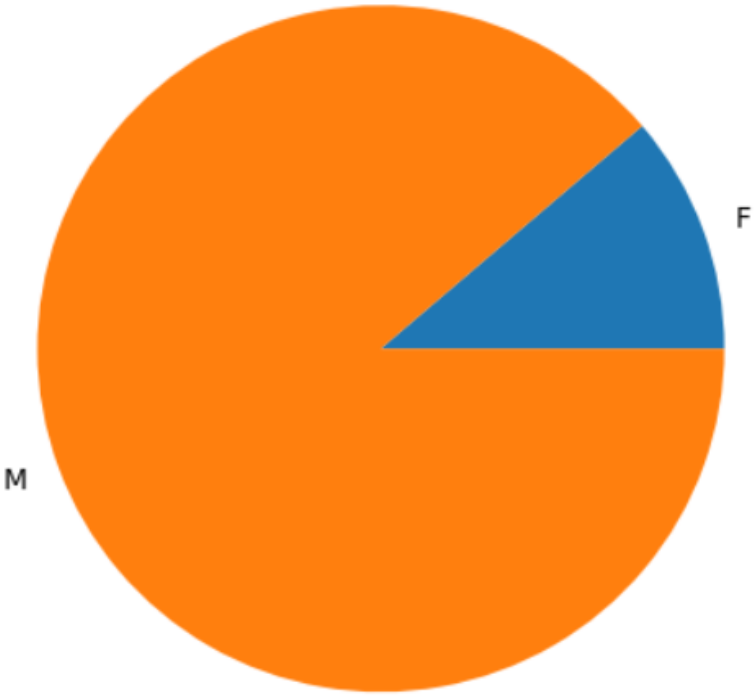
- data visualization charts:

  - scatter plot chart :

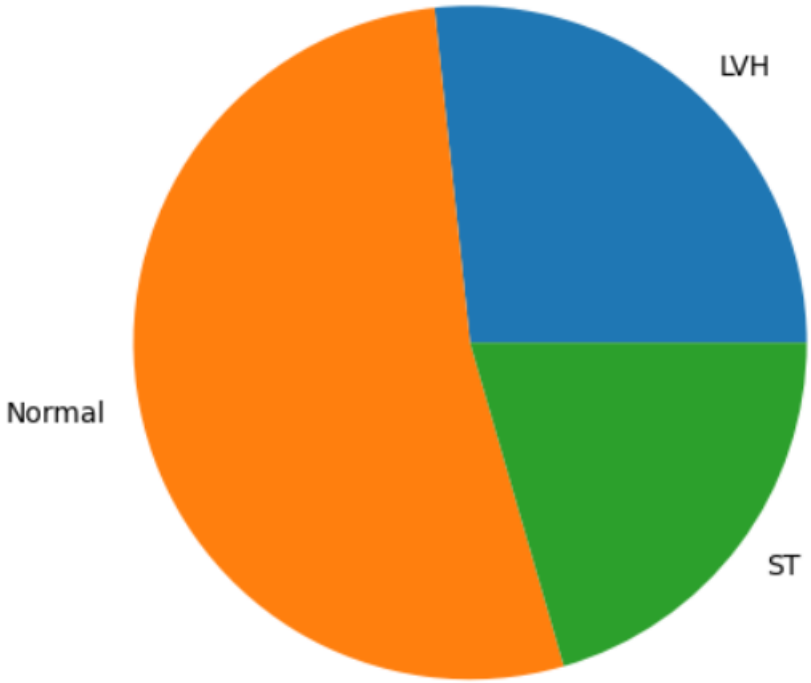
  Cholesterol above 400 indicates heart disease.



-pie chart: The percentage of men with heart disease is more than that of women.

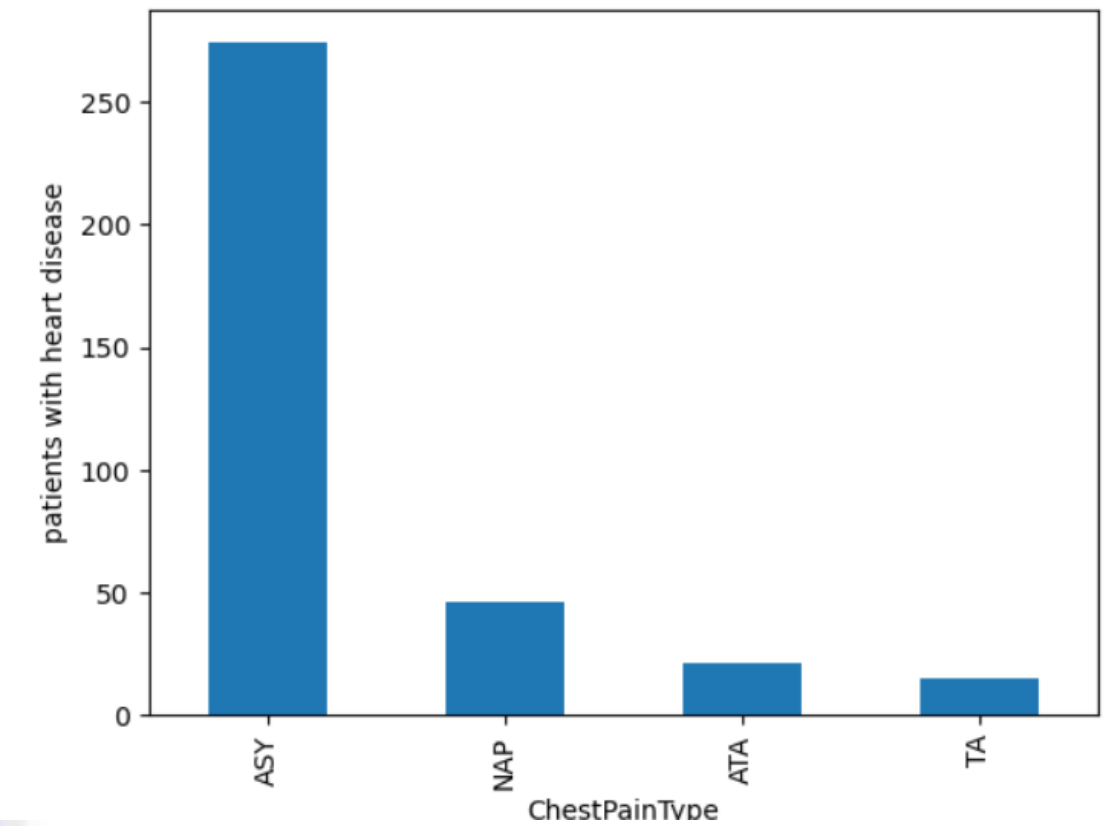


-More than half of people with heart disease have an regular heartbeat



- Most of those who feel TA or ATA (typical angina) do not have heart disease.

-Most people who feel the pain of angina asymptomatic (ASY), has a heart disease

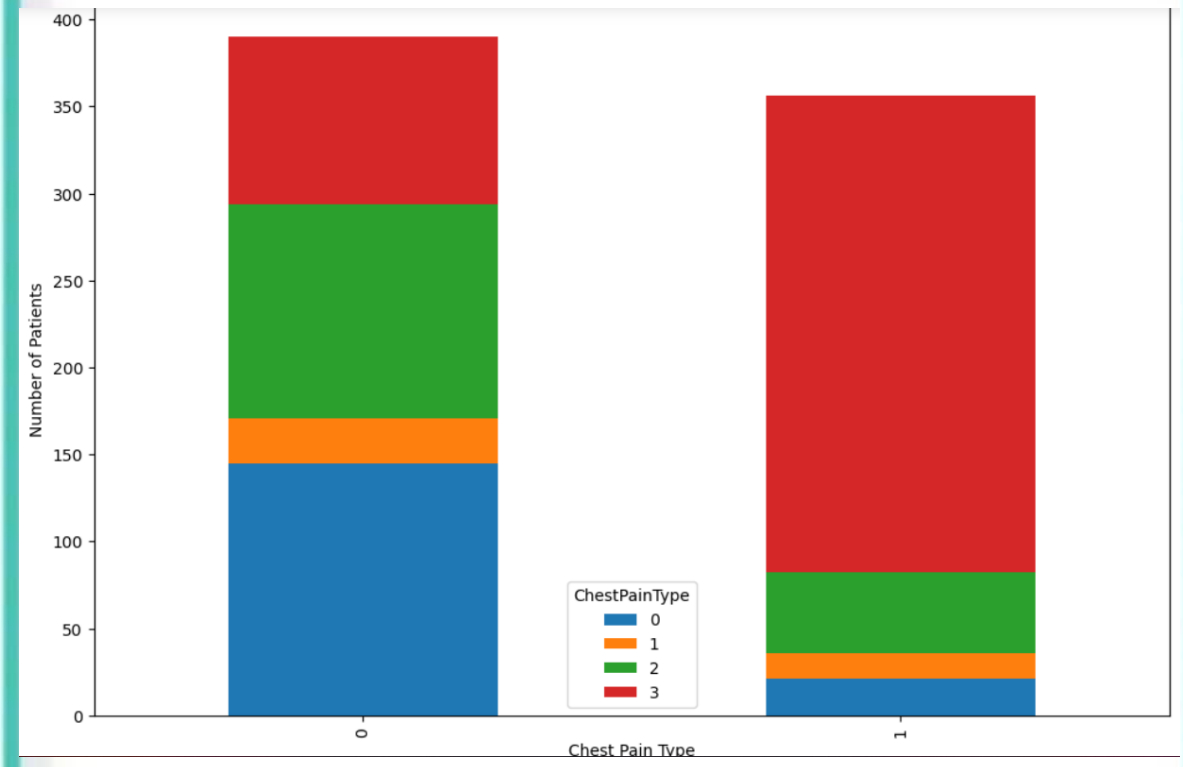


- Stacked Column Chart of Chest Pain Type and Heart Disease:

Blue: ATA ,Orande: TA ,Green: NAP , Red: ASY

Most of those who feel ATA (typical angina) do not have heart disease .

Most of those who feel ASY(Angina pain is not accompanied by symptoms) have heart disease .



- classification models:

implement GNB Classifier

```
from sklearn.metrics import accuracy_score
predict=nv.predict(x_test)
accuracy_score(y_test,predict)
```

```
0.84
```

```
from sklearn.metrics import confusion_matrix
confusion_matrix(y_test,predict)
```

```
array([[48, 29],
       [27, 46]], dtype=int64)
```

implement knn Classifier

```
accuracy_score(y_test,predict)
```

```
0.6266666666666667
```

```
confusion_matrix(y_test,predict)
```

```
array([[45, 31],
       [25, 49]], dtype=int64)
```

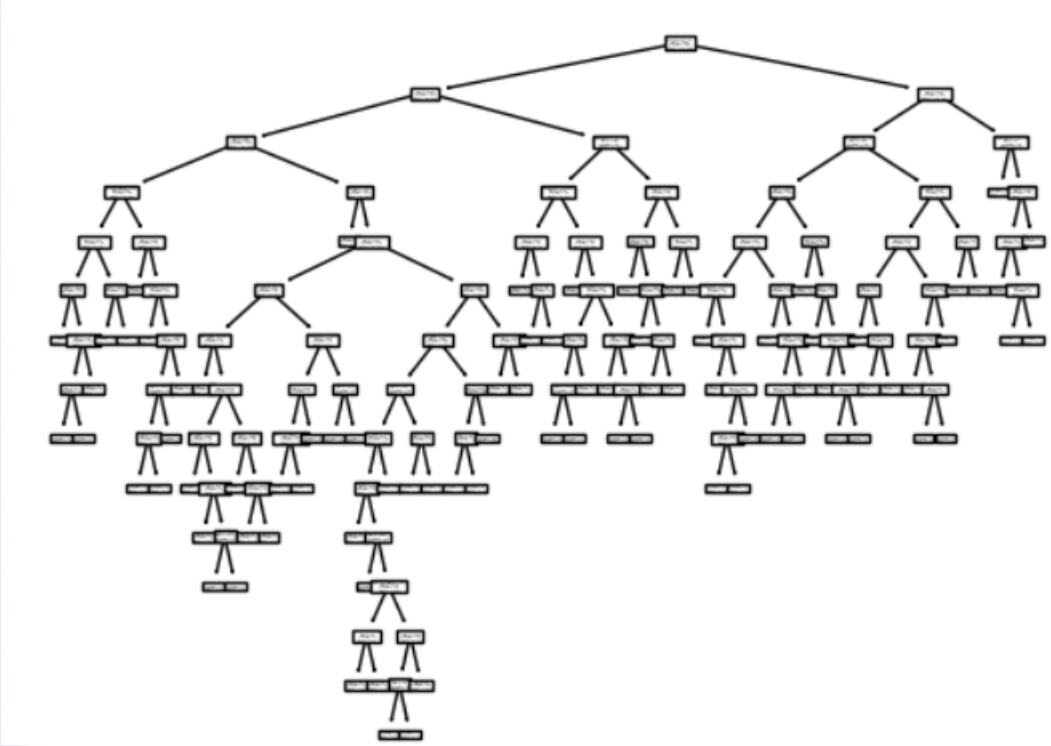
implement Decision Tree Classifier Classifier

```
predict=dtree.predict(x_test)
accuracy_score(y_test,predict)
```

```
0.8
```

```
confusion_matrix(y_test,predict)
```

```
array([[64, 12],
       [18, 56]], dtype=int64)
```



Concolusion:

Best classifier to predict the new person has heart disease or not based on some attributes is GNB Classifier with accuracy 0.84