TASK-8: HEART ATTACK PREDICTION

In [1]:
```
#inpoting the libraries
import numpy as np # linear algebra
import pandas as pd # data processing, CSV file I/O (e.g. pd.read_csv)
from sklearn.metrics import confusion_matrix,accuracy_score
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.metrics import classification_report
```

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

In [3]:
```
data.shape
```

Out[3]:
```
(294, 14)
```

In [29]:
```
data.describe
```

Out[29]:
```
<bound method NDFrame.describe of           age  trestbps      chol   thalach   oldp
eak  target  sex_0  sex_1  \
0   -2.524482 -0.150386 -1.794987  1.933389 -0.652282       0      0      1
1   -2.396889 -0.715960 -0.096999  0.878681 -0.652282       0      0      1
3   -2.269296  2.111910 -0.188782  1.300564 -0.652282       0      1      0
4   -2.141704 -1.847108 -0.464132  0.456798 -0.652282       0      1      0
5   -2.014111 -1.564321 -0.785373  1.089622 -0.652282       0      1      0
..        ...       ...       ...       ...       ...     ...    ...    ...
289  0.537748  1.546336  1.249153 -1.905748  2.044892       1      0      1
290  0.792934 -0.150386  0.683157 -1.652618 -0.652282       1      1      0
291  1.048120  1.263549  1.417422  0.456798  2.584327       1      0      1
292  1.303306  2.677483  2.197578 -1.230735  0.426588       1      1      0
293  2.196456 -0.150386  0.392510 -1.019793  0.426588       1      0      1

     cp_1  cp_2  cp_3  cp_4  fbs_0  fbs_1  restecg_0  restecg_1  restecg_2  \
0       0     1     0     0      1      0          0          0          1
1       0     1     0     0      1      0          1          0          0
3       1     0     0     0      1      0          0          1          0
4       0     1     0     0      1      0          0          1          0
5       0     1     0     0      1      0          1          0          0
..    ...   ...   ...   ...    ...    ...        ...        ...        ...
289     0     0     0     1      1      0          1          0          0
290     0     0     1     0      1      0          0          1          0
291     0     0     0     1      0      1          1          0          0
292     0     1     0     0      1      0          1          0          0
293     0     0     0     1      1      0          0          1          0

     restecg_?  exang_0  exang_1
0            0        1        0
1            0        1        0
3            0        1        0
4            0        1        0
5            0        1        0
..         ...      ...      ...
289          0        0        1
290          0        0        1
291          0        0        1
292          0        0        1
293          0        0        1

[261 rows x 20 columns]>
```

In [30]:
```
data.tail()
```

Out[30]:

	age	trestbps	chol	thalach	oldpeak	target	sex_0	sex_1	cp_1	cp_2	cp_3	cp
289	0.537748	1.546336	1.249153	-1.905748	2.044892	1	0	1	0	0	0	
290	0.792934	-0.150386	0.683157	-1.652618	-0.652282	1	1	0	0	0	1	
291	1.048120	1.263549	1.417422	0.456798	2.584327	1	0	1	0	0	0	
292	1.303306	2.677483	2.197578	-1.230735	0.426588	1	1	0	0	1	0	
293	2.196456	-0.150386	0.392510	-1.019793	0.426588	1	0	1	0	0	0	

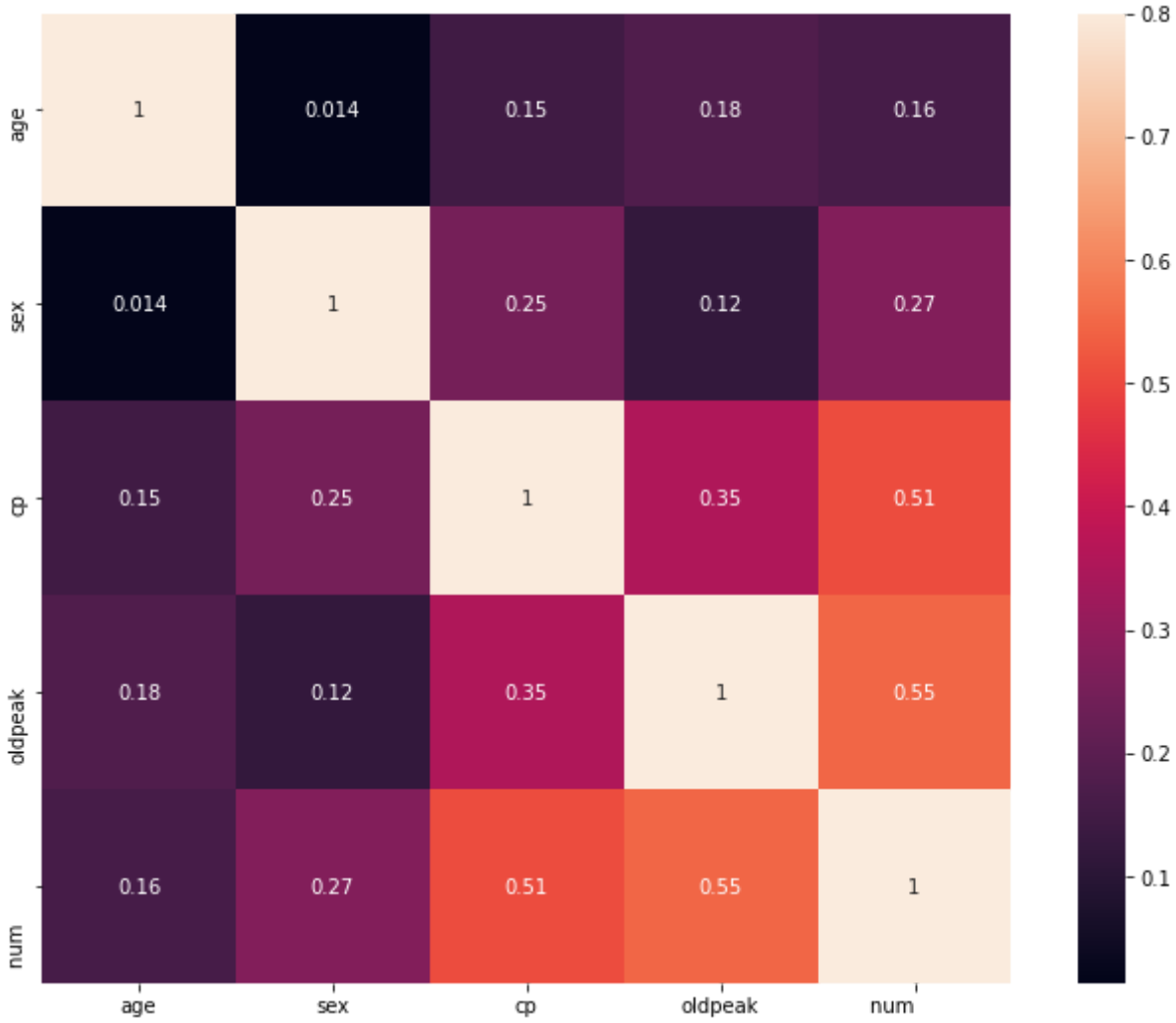
In [31]:
```
data.info
```

Out[31]:
```
<bound method DataFrame.info of           age  trestbps      chol   thalach   oldpea
k  target  sex_0  sex_1  \
0   -2.524482 -0.150386 -1.794987  1.933389 -0.652282       0      0      1
1   -2.396889 -0.715960 -0.096999  0.878681 -0.652282       0      0      1
3   -2.269296  2.111910 -0.188782  1.300564 -0.652282       0      1      0
4   -2.141704 -1.847108 -0.464132  0.456798 -0.652282       0      1      0
5   -2.014111 -1.564321 -0.785373  1.089622 -0.652282       0      1      0
..        ...       ...       ...       ...       ...     ...    ...    ...
289  0.537748  1.546336  1.249153 -1.905748  2.044892       1      0      1
290  0.792934 -0.150386  0.683157 -1.652618 -0.652282       1      1      0
291  1.048120  1.263549  1.417422  0.456798  2.584327       1      0      1
292  1.303306  2.677483  2.197578 -1.230735  0.426588       1      1      0
293  2.196456 -0.150386  0.392510 -1.019793  0.426588       1      0      1

     cp_1  cp_2  cp_3  cp_4  fbs_0  fbs_1  restecg_0  restecg_1  restecg_2  \
0       0     1     0     0      1      0          0          0          1
1       0     1     0     0      1      0          1          0          0
3       1     0     0     0      1      0          0          1          0
4       0     1     0     0      1      0          0          1          0
5       0     1     0     0      1      0          1          0          0
..    ...   ...   ...   ...    ...    ...        ...        ...        ...
289     0     0     0     1      1      0          1          0          0
290     0     0     1     0      1      0          0          1          0
291     0     0     0     1      0      1          1          0          0
292     0     1     0     0      1      0          1          0          0
293     0     0     0     1      1      0          0          1          0

     restecg_?  exang_0  exang_1
0            0        1        0
1            0        1        0
3            0        1        0
4            0        1        0
5            0        1        0
..         ...      ...      ...
289          0        0        1
290          0        0        1
291          0        0        1
292          0        0        1
293          0        0        1

[261 rows x 20 columns]>
```

Visualization Of Data

In [4]:
```
import matplotlib.pyplot as plt
import seaborn as sns
```

```
corrmat = data.corr()
f, ax = plt.subplots(figsize=(12, 9))
sns.heatmap(corrmat, vmax=.8, square=True, annot=True);
```



In [5]:

```
for col in data.columns:
    if 'num' in col:
        continue
    print(col, '\n------------\n')
    print("Unknown % = {}".format(len(data[data[col] == '?'])/ len(data)))
    print("Median: {}".format(data[data[col] != '?'][col].median()))
    print("Mean: {}".format(data[data[col] != '?'][col].mean()))
temp = data.drop(['ca', 'thal', 'slope'], axis=1)
temp.head()
```

```
age
------------

Unknown % = 0.0
Median: 49.0
Mean: 47.826530612244895
sex
------------

Unknown % = 0.0
Median: 1.0
Mean: 0.7244897959183674
cp
------------

Unknown % = 0.0
```

```
Median: 3.0
Mean: 2.9829931972789114
trestbps
------------

Unknown % = 0.003401360544217687
Median: 130.0
Mean: inf
chol
------------

Unknown % = 0.0782312925170068
Median: 243.0
Mean: inf
fbs
------------

Unknown % = 0.027210884353741496
Median: 0.0
Mean: 3.496503496503496e+246
restecg
------------

Unknown % = 0.003401360544217687
Median: 0.0
Mean: 6.829692833109283e+289
thalach
------------

Unknown % = 0.003401360544217687
Median: 140.0
Mean: inf
exang
------------

Unknown % = 0.003401360544217687
Median: 0.0
Mean: 3.4129692832764505e+257
oldpeak
------------

Unknown % = 0.0
Median: 0.0
Mean: 0.5860544217687075
slope
------------

Unknown % = 0.6462585034013606
Median: 2.0
Mean: 2.0405973184828e+101
ca
------------

Unknown % = 0.9897959183673469
Median: 0.0
Mean: 0.0
thal
------------

Unknown % = 0.9047619047619048
Median: 6.0
Mean: 2.2619058492059418e+26
```

Out[5]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	num
0	28	1	2	130	132	0	2	185	0	0.0	0
1	29	1	2	120	243	0	0	160	0	0.0	0
2	29	1	2	140	?	0	0	170	0	0.0	0

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	num
3	30	0	1	170	237	0	1	170	0	0.0	0
4	31	0	2	100	219	0	1	150	0	0.0	0

In [6]:

```
for col in temp.columns:
    print(col, '\n----------------\n',temp[temp[col] == '?'], '\n----------------------
# print(temp[temp != '?'])
```

```
age
----------------
 Empty DataFrame
Columns: [age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, num
]
Index: []
-----------------------

sex
----------------
 Empty DataFrame
Columns: [age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, num
]
Index: []
-----------------------

cp
----------------
 Empty DataFrame
Columns: [age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, num
]
Index: []
-----------------------

trestbps
----------------
     age  sex  cp trestbps chol fbs restecg thalach exang  oldpeak  num
90   48    0   2        ?  308   0       1       ?     ?      2.0           0
-----------------------

chol
----------------
      age  sex  cp trestbps chol fbs restecg thalach exang  oldpeak  num
2     29    1   2      140    ?   0       0     170     0      0.0           0
31    39    1   2      120    ?   0       1     146     0      2.0           0
34    39    1   2      130    ?   0       0     120     0      0.0           0
44    40    1   3      140    ?   0       0     188     0      0.0           0
65    43    0   3      150    ?   0       0     175     0      0.0           0
72    45    0   2      180    ?   0       0     180     0      0.0           0
75    45    1   3      135    ?   0       0     110     0      0.0           0
86    47    0   3      130    ?   0       0     145     0      2.0           0
91    48    0   2      120    ?   1       1     148     0      0.0           0
97    48    1   2      100    ?   0       0     100     0      0.0           0
101   49    0   2      110    ?   0       0     160     0      0.0           0
102   49    0   2      110    ?   0       0     160     0      0.0           0
108   49    1   4      140    ?   0       0     130     0      0.0           0
124   52    0   2      140    ?   0       0     140     0      0.0           0
134   53    1   2      120    ?   0       0     132     0      0.0           0
154   54    1   3      150    ?   0       0     122     0      0.0           0
168   56    1   3      130    ?   0       0     114     0      0.0           0
182   59    1   4      140    ?   0       0     140     0      0.0           0
226   38    1   4      110    ?   0       0     150     1      1.0           1
239   52    1   4      170    ?   0       0     126     1      1.5           1
244   54    1   4      140    ?   0       0     118     1      0.0           1
275   59    1   4      130    ?   0       0     125     0      0.0           1
278   66    1   4      140    ?   0       0      94     1      1.0           1
-----------------------
```

```
fbs
----------------
      age  sex  cp trestbps chol fbs restecg thalach exang  oldpeak  num
27    38    0   2      120  275   ?       0     129     0      0.0          0
81    46    1   3      150  163   ?       0     116     0      0.0          0
107   49    1   4      120  297   ?       0     132     0      1.0          0
131   53    0   2      113  468   ?       0     127     0      0.0          0
144   54    0   2      140  309   ?       1     140     0      0.0          0
166   56    0   3      130  219   ?       1     164     0      0.0          0
197   40    1   4      120  466   ?       0     152     1      1.0          1
199   41    1   4      120  237   ?       0     138     1      1.0          1
-----------------------

restecg
----------------
      age  sex  cp trestbps chol fbs restecg thalach exang  oldpeak  num
268   55    1   1      140  295   0       ?     136     0      0.0          1
-----------------------

thalach
----------------
     age  sex  cp trestbps chol fbs restecg thalach exang  oldpeak  num
90   48    0   2        ?  308   0       1       ?     ?      2.0          0
-----------------------

exang
----------------
     age  sex  cp trestbps chol fbs restecg thalach exang  oldpeak  num
90   48    0   2        ?  308   0       1       ?     ?      2.0          0
-----------------------

oldpeak
----------------
 Empty DataFrame
Columns: [age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, num
]
Index: []
-----------------------

num
----------------
 Empty DataFrame
Columns: [age, sex, cp, trestbps, chol, fbs, restecg, thalach, exang, oldpeak, num
]
Index: []
-----------------------
```

In [7]:

```
data.rename(columns={'num       ': 'target'}, inplace=True)
data.drop(['ca', 'thal', 'slope'], axis=1, inplace=True)
#Deleting outliers for now
data.drop(index=[2, 31, 34, 44, 65, 72, 75, 86, 91, 97, 101, 102, 108, 124, 134, 154

# for col in data.columns:
#     data.drop(index=data[data[col] == '?'], inplace=True)
# data['chol']=data['chol'].replace('?', data[data['chol'] != '?']['chol'].median())
# data=data.replace('?',None)
# data=data.replace('?',0)

data.head()
```

Out[7]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	target
0	28	1	2	130	132	0	2	185	0	0.0	0
1	29	1	2	120	243	0	0	160	0	0.0	0

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	target
3	30	0	1	170	237	0	1	170	0	0.0	0
4	31	0	2	100	219	0	1	150	0	0.0	0
5	32	0	2	105	198	0	0	165	0	0.0	0

In [8]:
```
#Getting Pandas Dummies for ['sex', 'cp', 'fbs', 'restecg', 'exang', 'slope', 'ca',

#data = pd.get_dummies(data, columns = ['sex', 'cp', 'fbs', 'restecg', 'exang', 'slo
data = pd.get_dummies(data, columns = ['sex', 'cp', 'fbs', 'restecg', 'exang'])
```

In [9]:
```
#Scaling the other attributes using normal scaler

standardScaler = StandardScaler()
columns_to_scale = ['age', 'trestbps', 'chol', 'thalach', 'oldpeak']

data[columns_to_scale] = standardScaler.fit_transform(data[columns_to_scale])
scaling_values = {}
computed_scaling_values = [standardScaler.mean_, np.sqrt(standardScaler.var_)]
for idx, col in enumerate(columns_to_scale):
    scaling_values[col] = {'mean': computed_scaling_values[0][idx], 'std': computed_
scaling_values
```

Out[9]:
```
{'age': {'mean': 47.78544061302682, 'std': 7.837424872831495},
 'trestbps': {'mean': 132.65900383141764, 'std': 17.68115339039127},
 'chol': {'mean': 249.34099616858236, 'std': 65.37151861285574},
 'thalach': {'mean': 139.17241379310346, 'std': 23.703245277858866},
 'oldpeak': {'mean': 0.6045977011494253, 'std': 0.9268958675421668}}
```

In [10]:
```
data.head()
```

Out[10]:

	age	trestbps	chol	thalach	oldpeak	target	sex_0	sex_1	cp_1	cp_2	cp_3	cp_
0	-2.524482	-0.150386	-1.794987	1.933389	-0.652282	0	0	1	0	1	0	
1	-2.396889	-0.715960	-0.096999	0.878681	-0.652282	0	0	1	0	1	0	
3	-2.269296	2.111910	-0.188782	1.300564	-0.652282	0	1	0	1	0	0	
4	-2.141704	-1.847108	-0.464132	0.456798	-0.652282	0	1	0	0	1	0	
5	-2.014111	-1.564321	-0.785373	1.089622	-0.652282	0	1	0	0	1	0	

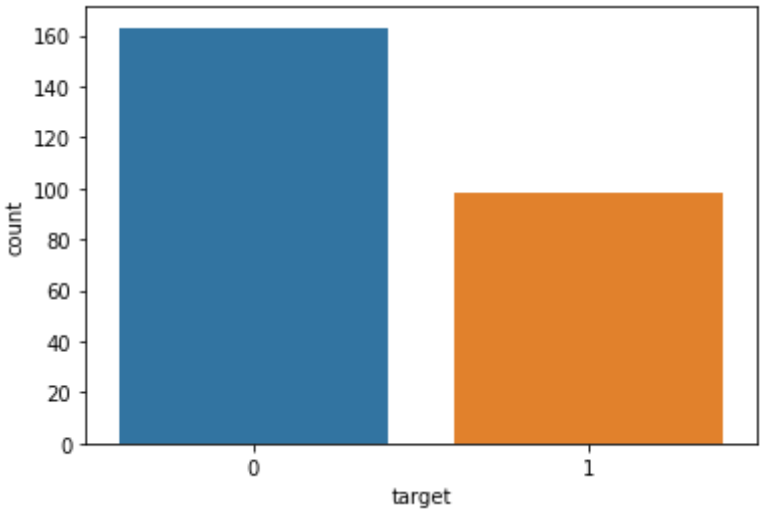
Splitting Data As Train and Test

In [11]:
```
y = data['target']
X = data.drop('target',axis=1)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.20, random_sta

#80% Train and 20% Test Data
```

In [12]:
```
#Plotting the Target (Heart Disease)
plt.figure(figsize=(6,4))
```

```
sns.countplot(y)
plt.show()
```

```
c:\users\vrinda bajaj\python 3.7.2\lib\site-packages\seaborn\_decorators.py:43: Futu
reWarning: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



In [13]:
```
#Analysing the shape of X_train and X_test Data

print(X_train.shape)
print(X_test.shape)
```

```
(208, 19)
(53, 19)
```

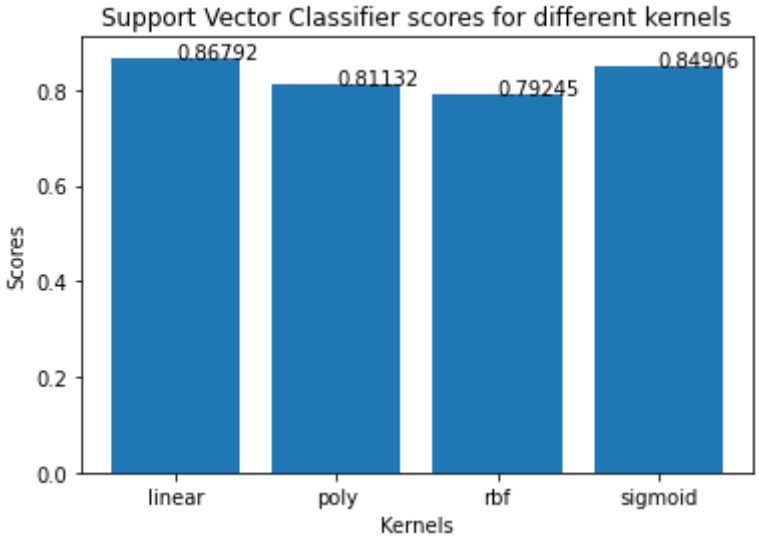
MACHINE LEARNING MODELS

1. SVM

In [14]:
```
from sklearn.svm import SVC

#Function for storing model scores using various kernals
svc_scores = []
kernel_type = ['linear', 'poly', 'rbf', 'sigmoid']
for type in kernel_type:
    svc_classifier = SVC(kernel = type)
    svc_classifier.fit(X_train, y_train)
    svc_scores.append(svc_classifier.score(X_test, y_test))
```

In [15]:
```
#Plotting the accuracy

for i in range(len(kernel_type)):
    label = round(svc_scores[i], 5)
    plt.text(i, svc_scores[i], label)
plt.xlabel('Kernels')
plt.ylabel('Scores')
plt.title('Support Vector Classifier scores for different kernels')
plt.bar(kernel_type, svc_scores)
```

Out[15]:
```
<BarContainer object of 4 artists>
```



In [16]:
```
#Training the model on 'rbf' Kernal

svc =  SVC(kernel='linear')
svc.fit(X_train, y_train)
svc_predicted = svc.predict(X_test)
svc_conf_matrix = confusion_matrix(y_test, svc_predicted)
svc_acc_score = accuracy_score(y_test, svc_predicted)

#Printing the confussion matrix and accuracy scores
print("confussion matrix")
print(svc_conf_matrix)
print(classification_report(y_test, svc_predicted))
print("\n")
print("Accuracy of Support Vector Classifier: {:.3f}".format(svc_acc_score*100),'%\n
```

```
confussion matrix
[[31  2]
 [ 5 15]]
              precision    recall  f1-score   support

           0       0.86      0.94      0.90        33
           1       0.88      0.75      0.81        20

    accuracy                           0.87        53
   macro avg       0.87      0.84      0.85        53
weighted avg       0.87      0.87      0.87        53


Accuracy of Support Vector Classifier: 86.792 %
```

2. RANDOM FOREST

In [20]:
```
from sklearn.ensemble import RandomForestClassifier

model=RandomForestClassifier(n_estimators=500)
model.fit(X_train,y_train)
rfpred=model.predict(X_test)
RF_conf_matrix = confusion_matrix(y_test, rfpred)
rf_acc_score = accuracy_score(y_test, rfpred)

#Printing the confussion matrix and accuracy scores
print("\t Confussion Matrix")
print(RF_conf_matrix)
```

```
print(classification_report(y_test, rfpred))
print("\n")
print("Accuracy of Random Forest Classifier: {:.3f}".format(rf_acc_score*100),'%\n')
```

```
        Confussion Matrix
[[29  4]
 [ 7 13]]
              precision    recall  f1-score   support

           0       0.81      0.88      0.84        33
           1       0.76      0.65      0.70        20

    accuracy                           0.79        53
   macro avg       0.79      0.76      0.77        53
weighted avg       0.79      0.79      0.79        53


Accuracy of Random Forest Classifier: 79.245 %
```

3. LOGISTIC REGRESSION

In [21]:

```
from sklearn.linear_model import LogisticRegression

lr = LogisticRegression()
model = lr.fit(X_train, y_train)
lr_predict = lr.predict(X_test)
lr_conf_matrix = confusion_matrix(y_test, lr_predict)
lr_acc_score = accuracy_score(y_test, lr_predict)

#Printing the confussion matrix and accuracy scores
print("\t Confussion Matrix")
print(lr_conf_matrix)
print("\n")
print(classification_report(y_test,lr_predict))
print("Accuracy of Logistic Regression: {:.3f}".format(lr_acc_score*100),'%\n')
```

```
        Confussion Matrix
[[30  3]
 [ 5 15]]


              precision    recall  f1-score   support

           0       0.86      0.91      0.88        33
           1       0.83      0.75      0.79        20

    accuracy                           0.85        53
   macro avg       0.85      0.83      0.84        53
weighted avg       0.85      0.85      0.85        53

Accuracy of Logistic Regression: 84.906 %
```

In [19]:

```
from sklearn.model_selection import StratifiedKFold
def cv_model(classifier, splits=10):
    accuracy = []
    skf = StratifiedKFold(n_splits=splits)
    for train_idx, test_idx in skf.split(X, y):
        X_train, X_test, y_train, y_test = X.iloc[train_idx], X.iloc[test_idx], y.il
        classifier.fit(X_train, y_train)
        model_prediction = classifier.predict(X_test)
        conf_matrix = confusion_matrix(y_test, model_prediction)
```

```
        acc_score = accuracy_score(y_test, model_prediction)
        accuracy.append(acc_score)
    print('Accuracy:\n', accuracy)
    print('Average Accuracy:', np.mean(accuracy))
```

In [23]:

```
kernel_type = ['linear', 'poly', 'rbf', 'sigmoid']
for t in kernel_type:
    print("\tKernel: ", t)
    cv_model(SVC(kernel=t), 10)
    print('\n-----------------\n')
```

```
        Kernel:  linear
Accuracy:
 [0.7777777777777778, 0.9230769230769231, 0.6923076923076923, 0.7692307692307693, 0.
8076923076923077, 0.8461538461538461, 0.8461538461538461, 0.8076923076923077, 0.8846
153846153846, 0.7692307692307693]
Average Accuracy: 0.8123931623931625

------------------

        Kernel:  poly
Accuracy:
 [0.7037037037037037, 0.8846153846153846, 0.6538461538461539, 0.7692307692307693, 0.
8076923076923077, 0.8076923076923077, 0.8846153846153846, 0.8846153846153846, 0.9230
769230769231, 0.7307692307692307]
Average Accuracy: 0.8049857549857549

------------------

        Kernel:  rbf
Accuracy:
 [0.7407407407407407, 0.8846153846153846, 0.6923076923076923, 0.7692307692307693, 0.
7692307692307693, 0.8076923076923077, 0.8461538461538461, 0.8461538461538461, 0.8846
153846153846, 0.7692307692307693]
Average Accuracy: 0.8009971509971511

------------------

        Kernel:  sigmoid
Accuracy:
 [0.7777777777777778, 0.8846153846153846, 0.7692307692307693, 0.8076923076923077, 0.
8076923076923077, 0.8461538461538461, 0.8461538461538461, 0.7307692307692307, 0.8461
538461538461, 0.7692307692307693]
Average Accuracy: 0.8085470085470086

------------------
```

In [24]:

```
cv_model(LogisticRegression(), 10)
```

```
Accuracy:
 [0.7407407407407407, 0.9230769230769231, 0.6923076923076923, 0.7692307692307693, 0.
8076923076923077, 0.8461538461538461, 0.8846153846153846, 0.8076923076923077, 0.8461
538461538461, 0.7307692307692307]
Average Accuracy: 0.8048433048433047
```

In [25]:

```
cv_model(RandomForestClassifier(n_estimators=800), 10)
```

```
Accuracy:
 [0.7407407407407407, 0.8461538461538461, 0.6538461538461539, 0.6923076923076923, 0.
7692307692307693, 0.8076923076923077, 0.7692307692307693, 0.7307692307692307, 0.7692
307692307693, 0.6923076923076923]
Average Accuracy: 0.7471509971509972
```

In [26]:

```
def cv_model_get_best_fit(classifier, splits=10):
    accuracy = []
    batch = []
    skf = StratifiedKFold(n_splits=splits)
    for train_idx, test_idx in skf.split(X, y):
        X_train, X_test, y_train, y_test = X.iloc[train_idx], X.iloc[test_idx], y.il
        batch.append([X_train, X_test, y_train, y_test])
        classifier.fit(X_train, y_train)
        model_prediction = classifier.predict(X_test)
        conf_matrix = confusion_matrix(y_test, model_prediction)
        acc_score = accuracy_score(y_test, model_prediction)
        accuracy.append(acc_score)
    print('Accuracy:\n', accuracy)
    print('Average Accuracy:', np.mean(accuracy))
    print('Max Accuracy:{} at {} '.format(np.max(accuracy), np.argmax(accuracy)))
    return batch[np.argmax(accuracy)]
```

In [27]:

```
final_model = SVC(kernel='linear')
X_train, X_test, y_train, y_test = cv_model_get_best_fit(final_model)

final_model.fit(X_train, y_train)
```

```
Accuracy:
 [0.7777777777777778, 0.9230769230769231, 0.6923076923076923, 0.7692307692307693, 0.
8076923076923077, 0.8461538461538461, 0.8461538461538461, 0.8076923076923077, 0.8846
153846153846, 0.7692307692307693]
Average Accuracy: 0.8123931623931625
Max Accuracy:0.9230769230769231 at 1
```

Out[27]:

```
SVC(kernel='linear')
```

In [28]:

```
[X_test.iloc[20], '==================',y_test.iloc[20]]
```

Out[28]:

```
[age         -0.227810
 trestbps    -0.715960
 chol         0.423105
 thalach     -0.597910
 oldpeak      0.426588
 sex_0        0.000000
 sex_1        1.000000
 cp_1         0.000000
 cp_2         0.000000
 cp_3         0.000000
 cp_4         1.000000
 fbs_0        1.000000
 fbs_1        0.000000
 restecg_0    1.000000
 restecg_1    0.000000
 restecg_2    0.000000
 restecg_?    0.000000
 exang_0      0.000000
 exang_1      1.000000
 Name: 203, dtype: float64,
 '==================',
 1]
```

In [ ]: