

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

```
df = pd.read_csv('heart.csv')
```

```
df.head()
```

| | age | sex | cp | trestbps | chol | fbs | restecg | thalach | exang | oldpeak | slope | ca |
|---|-----|-----|----|----------|------|-----|---------|---------|-------|---------|-------|----|
| 0 | 63 | 1 | 3 | 145 | 233 | 1 | 0 | 150 | 0 | 2.3 | 0 | 0 |
| 1 | 37 | 1 | 2 | 130 | 250 | 0 | 1 | 187 | 0 | 3.5 | 0 | 0 |
| 2 | 41 | 0 | 1 | 130 | 204 | 0 | 0 | 172 | 0 | 1.4 | 2 | 0 |
| 3 | 56 | 1 | 1 | 120 | 236 | 0 | 1 | 178 | 0 | 0.8 | 2 | 0 |
| 4 | 57 | 0 | 0 | 120 | 254 | 0 | 1 | 163 | 1 | 0.6 | 2 | 0 |

```
X = df.drop(columns=['target'])
y = df['target']
```

```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.2,random_state=8)
```

```
from sklearn.preprocessing import StandardScaler
```

```
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

```
from sklearn.ensemble import RandomForestClassifier
rf = RandomForestClassifier()
```

```
model = rf.fit(X_train,y_train)
```

```
y_pred = model.predict(X_test)
```

```
from sklearn.metrics import accuracy_score
print("Accuracy: ", accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.819672131147541
```

```
from sklearn.metrics import confusion_matrix
```

```
conmat = confusion_matrix(y_test, y_pred)
```

```
val = np.mat(conmat)
```

```
classnames = list(set(y_train))
```

```
df_cm = pd.DataFrame(val, index=classnames, columns=classnames,)
print(df_cm)
```

```

      0    1
0  19    3
1   8   31
```

▼ Boosting

```
from sklearn.ensemble import AdaBoostClassifier
```

```
ada = AdaBoostClassifier(estimator=rf, n_estimators=50, learning_rate=1, random_state=0)
```

```
model1 = ada.fit(X_train, y_train)
y_pred = model1.predict(X_test)
```

```
from sklearn.metrics import accuracy_score
```

```
print("Accuracy: ", accuracy_score(y_test, y_pred))
```

```
Accuracy: 0.8524590163934426
```

```
accuracy: 0.9924999199999728
```

```
from sklearn.metrics import confusion_matrix

conmat = confusion_matrix(y_test, y_pred)

val = np.mat(conmat)

classnames = list(set(y_train))

df_cm = pd.DataFrame(val, index=classnames, columns=classnames,)
print(df_cm)
```

```

  0  1
0 20  2
1  7 32
```

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