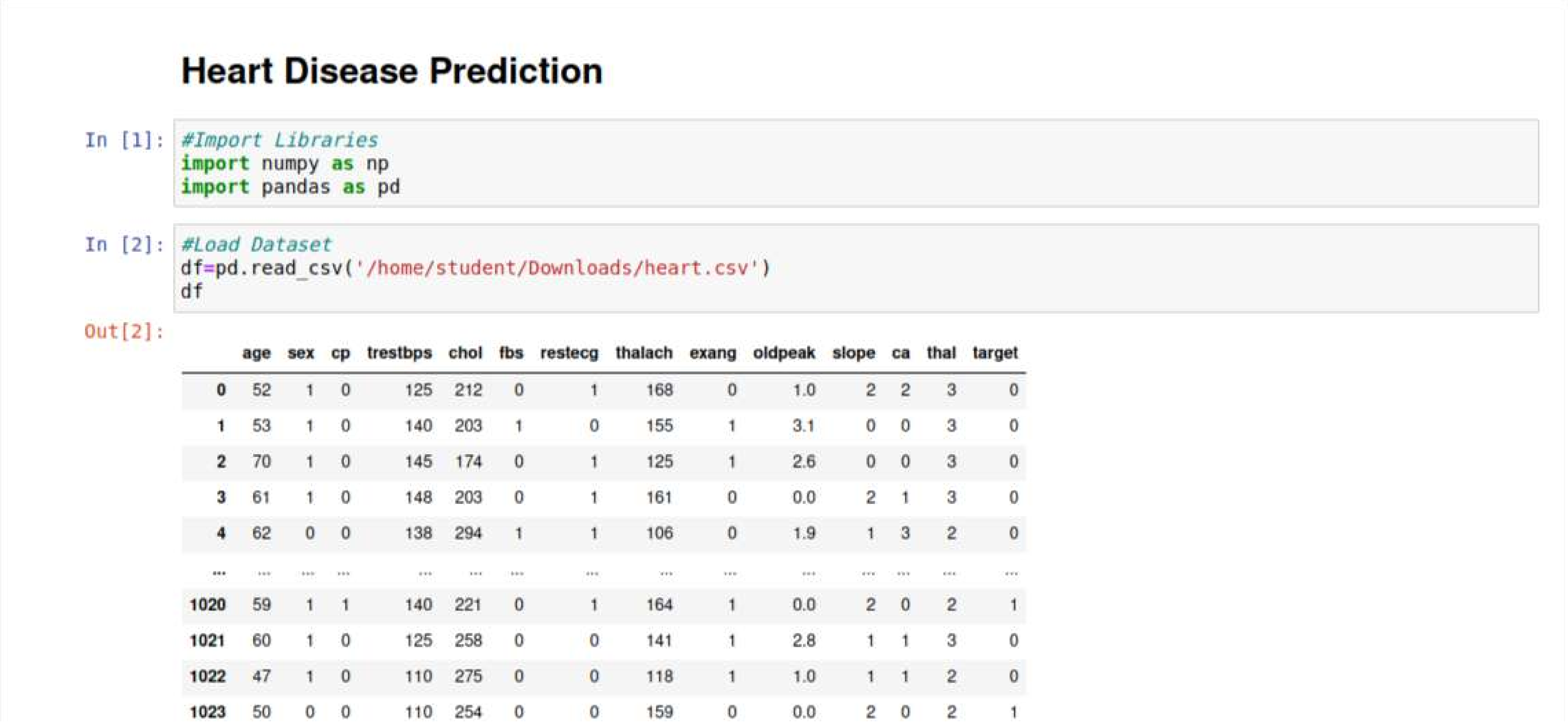


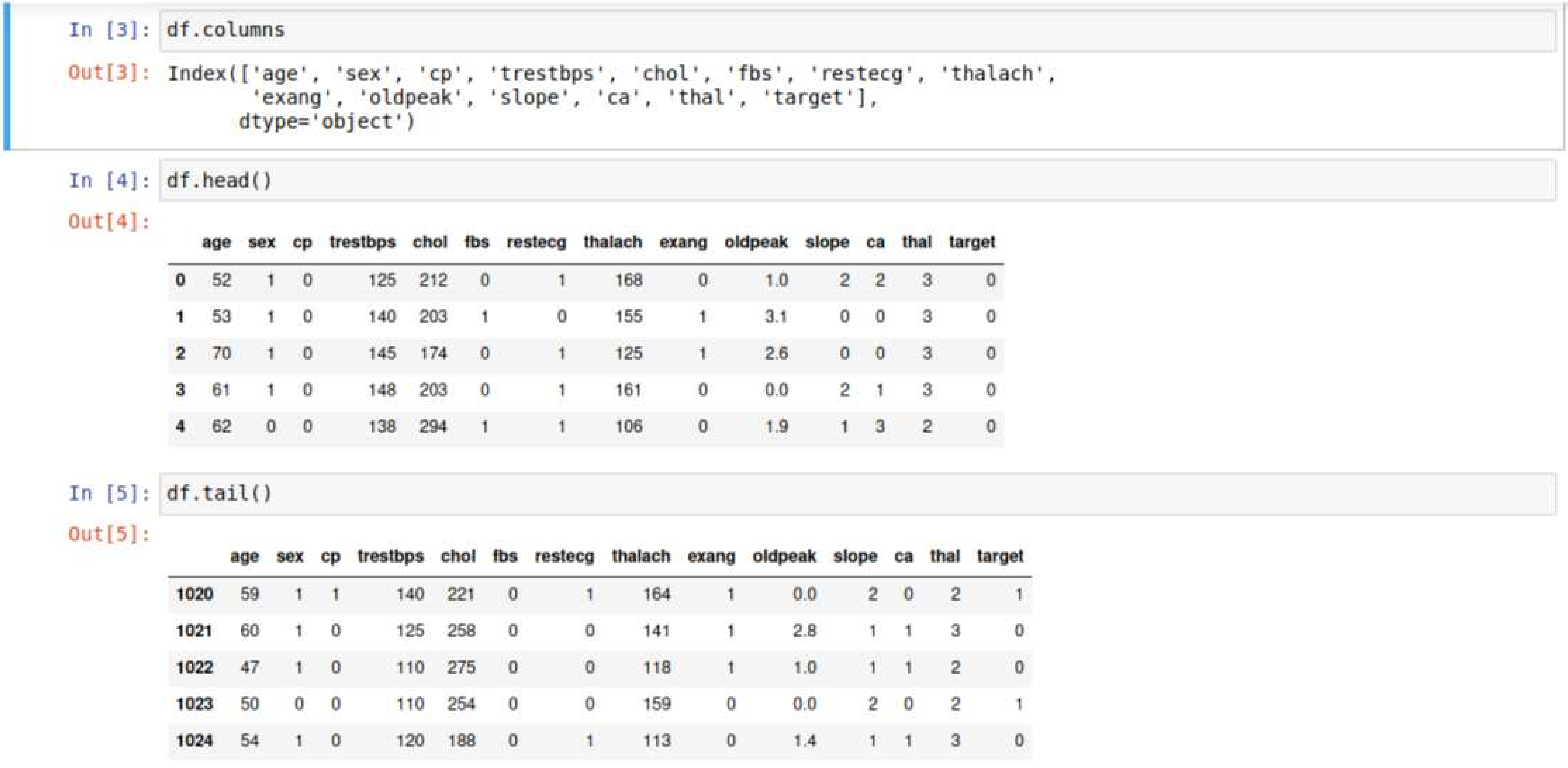
Heart Disease Prediction

In [1]:
```
#Import Libraries
import numpy as np
import pandas as pd
```

In [2]:
```
#Load Dataset
df=pd.read_csv('/home/student/Downloads/heart.csv')
df
```

Out[2]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	52	1	0	125	212	0	1	168	0	1.0	2	2	3	0
1	53	1	0	140	203	1	0	155	1	3.1	0	0	3	0
2	70	1	0	145	174	0	1	125	1	2.6	0	0	3	0
3	61	1	0	148	203	0	1	161	0	0.0	2	1	3	0
4	62	0	0	138	294	1	1	106	0	1.9	1	3	2	0
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1020	59	1	1	140	221	0	1	164	1	0.0	2	0	2	1
1021	60	1	0	125	258	0	0	141	1	2.8	1	1	3	0
1022	47	1	0	110	275	0	0	118	1	1.0	1	1	2	0
1023	50	0	0	110	254	0	0	159	0	0.0	2	0	2	1



```
In [3]: df.columns
```

```
Out[3]: Index(['age', 'sex', 'cp', 'trestbps', 'chol', 'fbs', 'restecg', 'thalach',
               'exang', 'oldpeak', 'slope', 'ca', 'thal', 'target'],
              dtype='object')
```

```
In [4]: df.head()
```

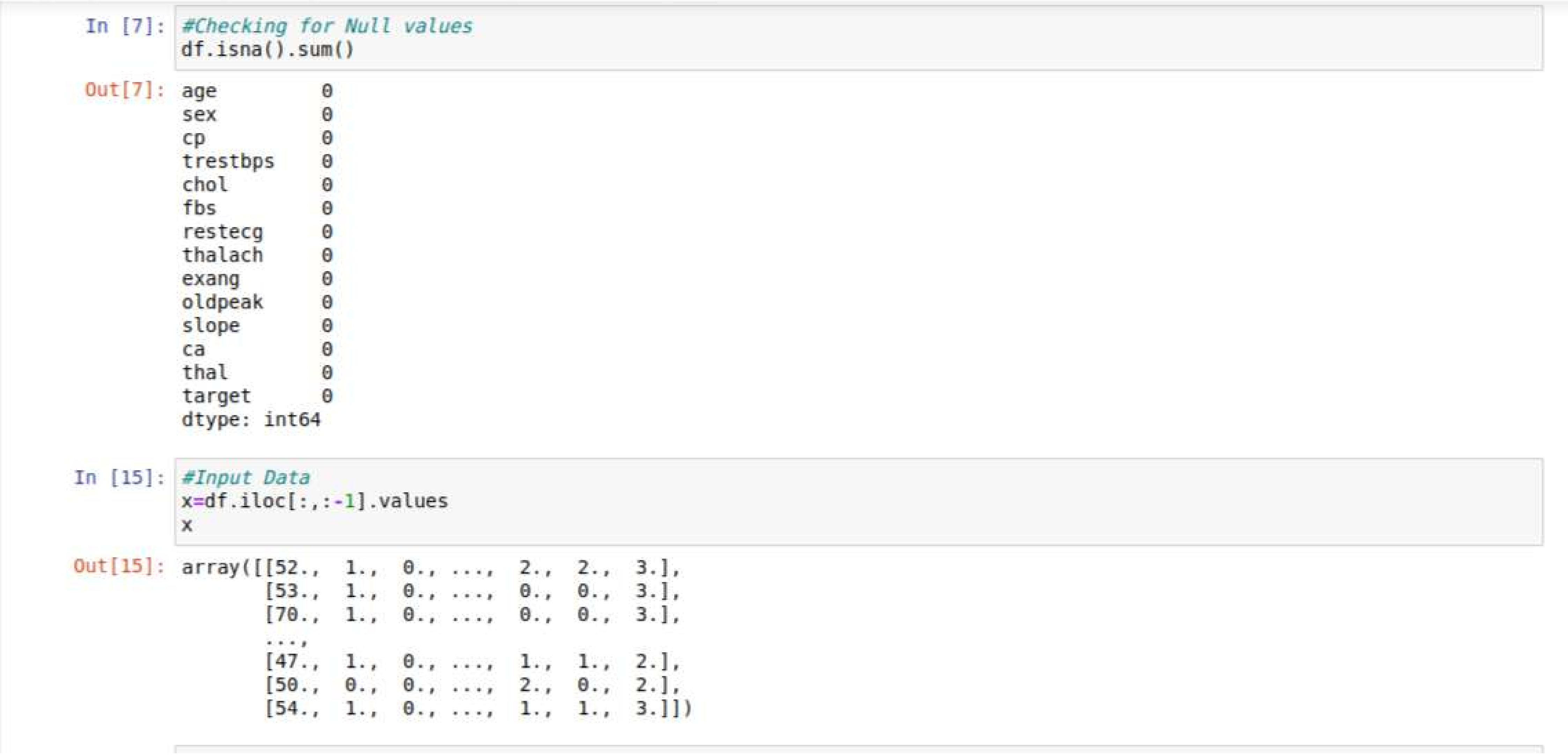
Out[4]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	52	1	0	125	212	0	1	168	0	1.0	2	2	3	0
1	53	1	0	140	203	1	0	155	1	3.1	0	0	3	0
2	70	1	0	145	174	0	1	125	1	2.6	0	0	3	0
3	61	1	0	148	203	0	1	161	0	0.0	2	1	3	0
4	62	0	0	138	294	1	1	106	0	1.9	1	3	2	0

```
In [5]: df.tail()
```

Out[5]:

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
1020	59	1	1	140	221	0	1	164	1	0.0	2	0	2	1
1021	60	1	0	125	258	0	0	141	1	2.8	1	1	3	0
1022	47	1	0	110	275	0	0	118	1	1.0	1	1	2	0
1023	50	0	0	110	254	0	0	159	0	0.0	2	0	2	1
1024	54	1	0	120	188	0	1	113	0	1.4	1	1	3	0

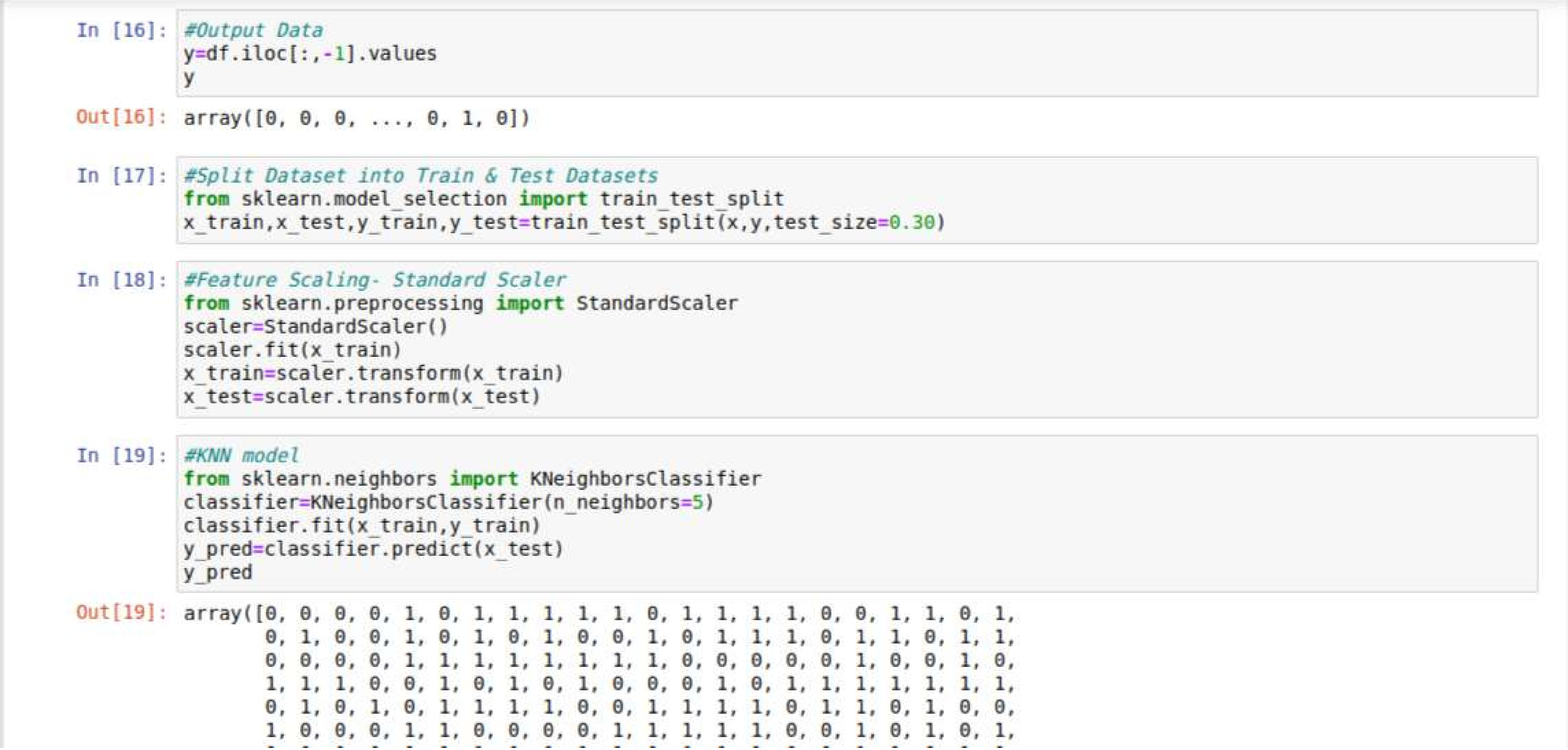


In [7]:
```
#Checking for Null values
df.isna().sum()
```

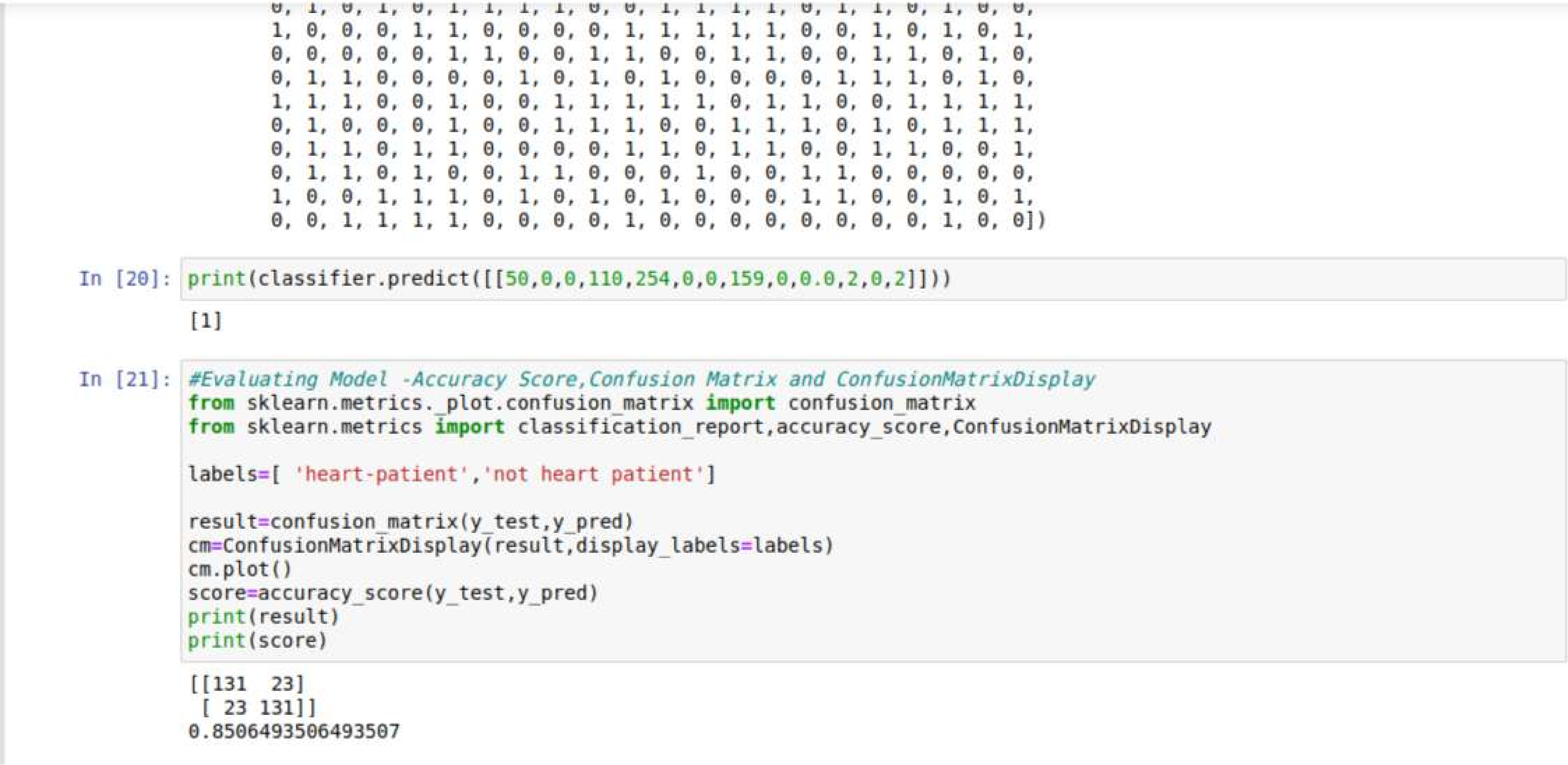
Out[7]:
```
age         0
sex         0
cp          0
trestbps    0
chol        0
fbs         0
restecg     0
thalach     0
exang       0
oldpeak     0
slope       0
ca          0
thal        0
target      0
dtype: int64
```

In [15]:
```
#Input Data
x=df.iloc[:,:-1].values
x
```

Out[15]:
```
array([[52.,  1.,  0., ...,  2.,  2.,  3.],
       [53.,  1.,  0., ...,  0.,  0.,  3.],
       [70.,  1.,  0., ...,  0.,  0.,  3.],
       ...,
       [47.,  1.,  0., ...,  1.,  1.,  2.],
       [50.,  0.,  0., ...,  2.,  0.,  2.],
       [54.,  1.,  0., ...,  1.,  1.,  3.]])
```



```
In [16]: #Output Data
         y=df.iloc[:,-1].values
         y

Out[16]: array([0, 0, 0, ..., 0, 1, 0])

In [17]: #Split Dataset into Train & Test Datasets
         from sklearn.model_selection import train_test_split
         x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.30)

In [18]: #Feature Scaling- Standard Scaler
         from sklearn.preprocessing import StandardScaler
         scaler=StandardScaler()
         scaler.fit(x_train)
         x_train=scaler.transform(x_train)
         x_test=scaler.transform(x_test)

In [19]: #KNN model
         from sklearn.neighbors import KNeighborsClassifier
         classifier=KNeighborsClassifier(n_neighbors=5)
         classifier.fit(x_train,y_train)
         y_pred=classifier.predict(x_test)
         y_pred

Out[19]: array([0, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1,
                0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1,
                0, 0, 0, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0,
                1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1,
                0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 0,
                1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1,
```



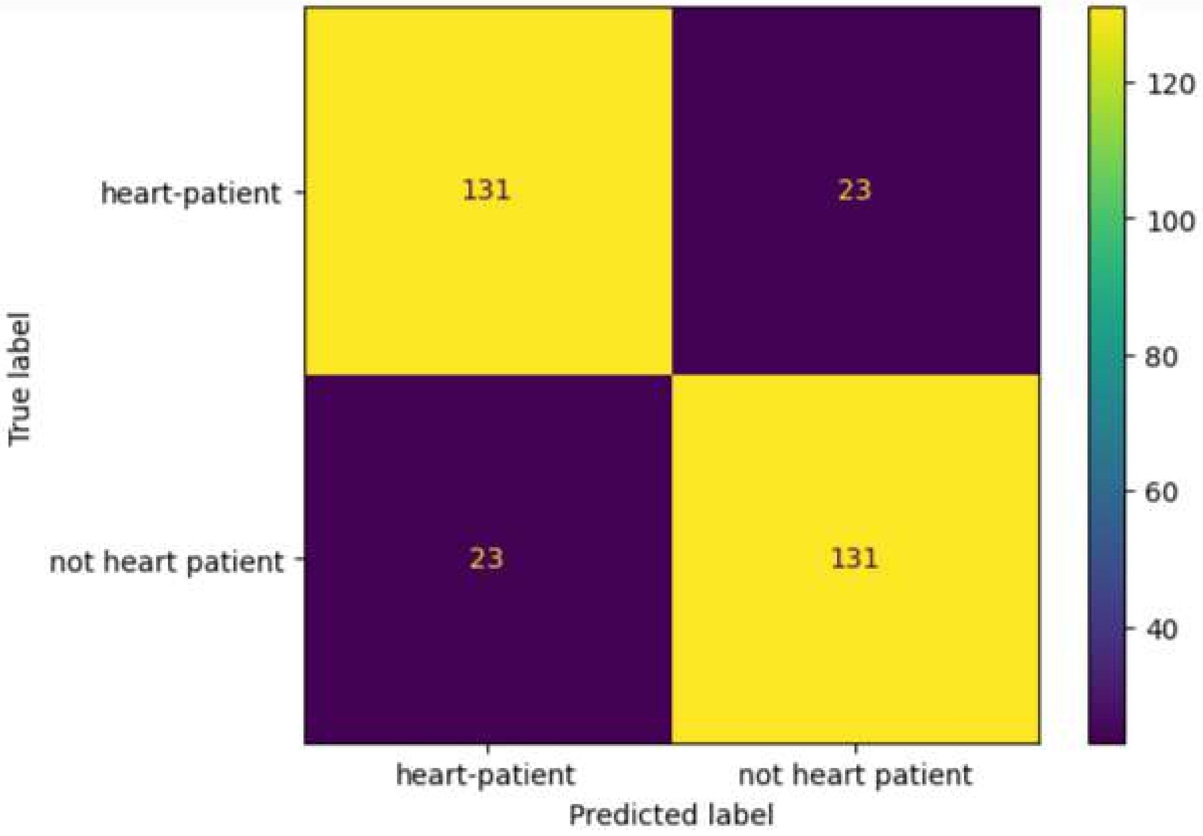
```
        0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 0,
        1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1,
        0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1, 1, 0, 1, 0,
        0, 1, 1, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0,
        1, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1, 0, 0, 1, 1, 1, 1,
        0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1,
        0, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1,
        0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 0,
        1, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 1,
        0, 0, 1, 1, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0])
```

```
In [20]: print(classifier.predict([[50,0,0,110,254,0,0,159,0,0.0,2,0,2]]))
```

```
[1]
```

```
In [21]: #Evaluating Model -Accuracy Score,Confusion Matrix and ConfusionMatrixDisplay
         from sklearn.metrics._plot.confusion_matrix import confusion_matrix
         from sklearn.metrics import classification_report,accuracy_score,ConfusionMatrixDisplay

         labels=[ 'heart-patient','not heart patient']

         result=confusion_matrix(y_test,y_pred)
         cm=ConfusionMatrixDisplay(result,display_labels=labels)
         cm.plot()
         score=accuracy_score(y_test,y_pred)
         print(result)
         print(score)
```

```
[[131  23]
 [ 23 131]]
0.8506493506493507
```


131
23
23
131
heart-patient
not heart patient
True label
heart-patient
not heart patient
Predicted label
120
100
80
60
40