In [46]:
```
# Importing Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import os
from matplotlib import rcParams
from matplotlib.cm import rainbow

import warnings
warnings.filterwarnings('ignore')
```

In [47]:
```
# Loading dataset
df=pd.read_csv('D:/MS DS/TT for DS Theory/data set of cardio disease/heart_statlog_cleveland_hungary_final.csv',index_col=0)
#df=data.copy()
df.head(20)
```

Out[47]:

age	sex	chest pain type	resting bps	cholesterol	fasting blood sugar	resting ecg	max heart rate	exercise angina	oldpeak	ST slope	target
40	1	2	140	289	0	0	172	0	0.0	1	0
49	0	3	160	180	0	0	156	0	1.0	2	1
37	1	2	130	283	0	1	98	0	0.0	1	0
48	0	4	138	214	0	0	108	1	1.5	2	1
54	1	3	150	195	0	0	122	0	0.0	1	0
39	1	3	120	339	0	0	170	0	0.0	1	0
45	0	2	130	237	0	0	170	0	0.0	1	0
54	1	2	110	208	0	0	142	0	0.0	1	0
37	1	4	140	207	0	0	130	1	1.5	2	1
48	0	2	120	284	0	0	120	0	0.0	1	0
37	0	3	130	211	0	0	142	0	0.0	1	0
58	1	2	136	164	0	1	99	1	2.0	2	1
39	1	2	120	204	0	0	145	0	0.0	1	0
49	1	4	140	234	0	0	140	1	1.0	2	1
42	0	3	115	211	0	1	137	0	0.0	1	0
54	0	2	120	273	0	0	150	0	1.5	2	0
38	1	4	110	196	0	0	166	0	0.0	2	1
43	0	2	120	201	0	0	165	0	0.0	1	0
60	1	4	100	248	0	0	125	0	1.0	2	1
36	1	2	120	267	0	0	160	0	3.0	2	1

In [48]:
```
df.target
```

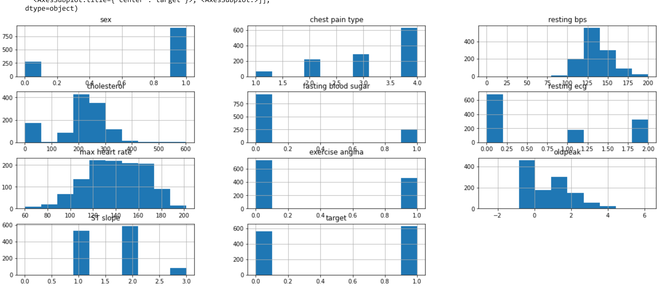
Out[48]:
```
age
40    0
49    1
37    0
48    1
54    0
     ..
45    1
68    1
57    1
57    1
38    0
Name: target, Length: 1190, dtype: int64
```

In [49]:
```
df.shape
```

Out[49]:
```
(1190, 11)
```

In [71]:
```
plt.rcParams['figure.figsize'] = (20,8)
df.hist()
```

Out[71]:
```
array([[<AxesSubplot:title={'center':'sex'}>,
        <AxesSubplot:title={'center':'chest pain type'}>,
        <AxesSubplot:title={'center':'resting bps'}>],
       [<AxesSubplot:title={'center':'cholesterol'}>,
        <AxesSubplot:title={'center':'fasting blood sugar'}>,
        <AxesSubplot:title={'center':'resting ecg'}>],
       [<AxesSubplot:title={'center':'max heart rate'}>,
        <AxesSubplot:title={'center':'exercise angina'}>,
        <AxesSubplot:title={'center':'oldpeak'}>],
       [<AxesSubplot:title={'center':'ST slope'}>,
        <AxesSubplot:title={'center':'target'}>, <AxesSubplot:>]],
      dtype=object)
```



In [50]:
```
X = df.iloc[:, 0:-1]
y = df.iloc[:, -1]
```

In [51]:
```
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=2020)

print('Shape of X_train = ', X_train.shape)
print('Shape of y_train = ', y_train.shape)
print('Shape of X_test = ', X_test.shape)
print('Shape of y_test = ', y_test.shape)
```

```
Shape of X_train =  (952, 10)
Shape of y_train =  (952,)
Shape of X_test =  (238, 10)
Shape of y_test =  (238,)
```

In [52]:
```
from sklearn.tree import DecisionTreeClassifier
```

In [53]:
```
classifier = DecisionTreeClassifier(criterion='gini')
classifier.fit(X_train, y_train)
```

Out[53]:
```
DecisionTreeClassifier()
```

In [54]:
```
classifier.score(X_test, y_test)
```

Out[54]:
```
0.8319327731092437
```

In [55]:
```
classifier_entropy = DecisionTreeClassifier(criterion='entropy')
classifier_entropy.fit(X_train, y_train)
```

Out[55]:
```
DecisionTreeClassifier(criterion='entropy')
```

In [56]:
```
classifier_entropy.score(X_test, y_test)
```

Out[56]:
```
0.8445378151260504
```

In [57]:
```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
```

In [58]:
```
sc.fit(X_train)
```

Out[58]:
```
StandardScaler()
```

In [59]:
```
X_train_sc = sc.transform(X_train)
X_test_sc = sc.transform(X_test)
```

In [60]:
```
classifier_sc = DecisionTreeClassifier(criterion='gini')
classifier_sc.fit(X_train_sc, y_train)

classifier_sc.score(X_test_sc, y_test)
```

Out[60]:
```
0.8403361344537815
```

In [61]:
```
pred = classifier.predict(X_test)
```

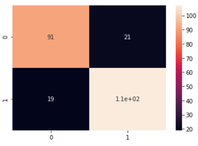
In [62]:
```
# importing Confusion Matrix and Classification Report
from sklearn.metrics import confusion_matrix,classification_report
```

In [63]:
```
cm=confusion_matrix(y_test,pred)
cm
```

Out[63]:
```
array([[ 91,  21],
       [ 19, 107]], dtype=int64)
```

In [64]:
```
# Heatmap of Confusion matrix
sns.heatmap(pd.DataFrame(cm), annot=True)
```

Out[64]:
```
<AxesSubplot:>
```



In [65]:
```
print(classification_report(y_test,pred))
```

```
              precision    recall  f1-score   support

           0       0.83      0.81      0.82       112
           1       0.84      0.85      0.84       126

    accuracy                           0.83       238
   macro avg       0.83      0.83      0.83       238
weighted avg       0.83      0.83      0.83       238
```

In [66]:
```
patient1 = [40,1,2,140,289,0,0,172,0,1]
```

In [67]:
```
patient1 = np.array([patient1])
patient1
```

Out[67]:
```
array([[ 40,   1,   2, 140, 289,   0,   0, 172,   0,   1]])
```

In [68]:
```
classifier.predict(patient1)
```

Out[68]:
```
array([0], dtype=int64)
```

In [69]:
```
pred = classifier.predict(patient1)
```

In [72]:
```
if pred[0] == 0:
  print('Patient has no Heart Heart Attack in Future')
else:
  print('Patient has Heart Heart Attack in Future')
```

```
Patient has no Heart Heart Attack in Future
```

In [ ]:
```

```

In [ ]:
```

```