heart-disease-predictions

April 28, 2024

1 Heart Disease Prediction

In this machine learning project, I have collected the dataset from Kaggle (https://www.kaggle.com/ronitf/heart-disease-uci) and I will be using Machine Learning to predict whether any person is suffering from heart disease

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from matplotlib import rcParams
from matplotlib.cm import rainbow
%matplotlib inline
import warnings
warnings.filterwarnings('ignore')
```

Here we will be experimenting with 3 algorithms 1. KNeighborsClassifier 2. DecisionTreeClassifier 3. RandomForestClassifier

[2]:
```
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
```

[3]:
```
df = pd.read_csv('dataset.csv')
```

[4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 303 entries, 0 to 302
Data columns (total 14 columns):
age         303 non-null int64
sex         303 non-null int64
cp          303 non-null int64
trestbps    303 non-null int64
chol        303 non-null int64
fbs         303 non-null int64
restecg     303 non-null int64
thalach     303 non-null int64
exang       303 non-null int64
oldpeak     303 non-null float64
```

```
slope       303 non-null int64
ca          303 non-null int64
thal        303 non-null int64
target      303 non-null int64
dtypes: float64(1), int64(13)
memory usage: 33.2 KB
```

[6]:
```
df.describe()
```

[6]:

	age	sex	cp	trestbps	chol	fbs	\
count	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	
mean	54.366337	0.683168	0.966997	131.623762	246.264026	0.148515	
std	9.082101	0.466011	1.032052	17.538143	51.830751	0.356198	
min	29.000000	0.000000	0.000000	94.000000	126.000000	0.000000	
25%	47.500000	0.000000	0.000000	120.000000	211.000000	0.000000	
50%	55.000000	1.000000	1.000000	130.000000	240.000000	0.000000	
75%	61.000000	1.000000	2.000000	140.000000	274.500000	0.000000	
max	77.000000	1.000000	3.000000	200.000000	564.000000	1.000000	

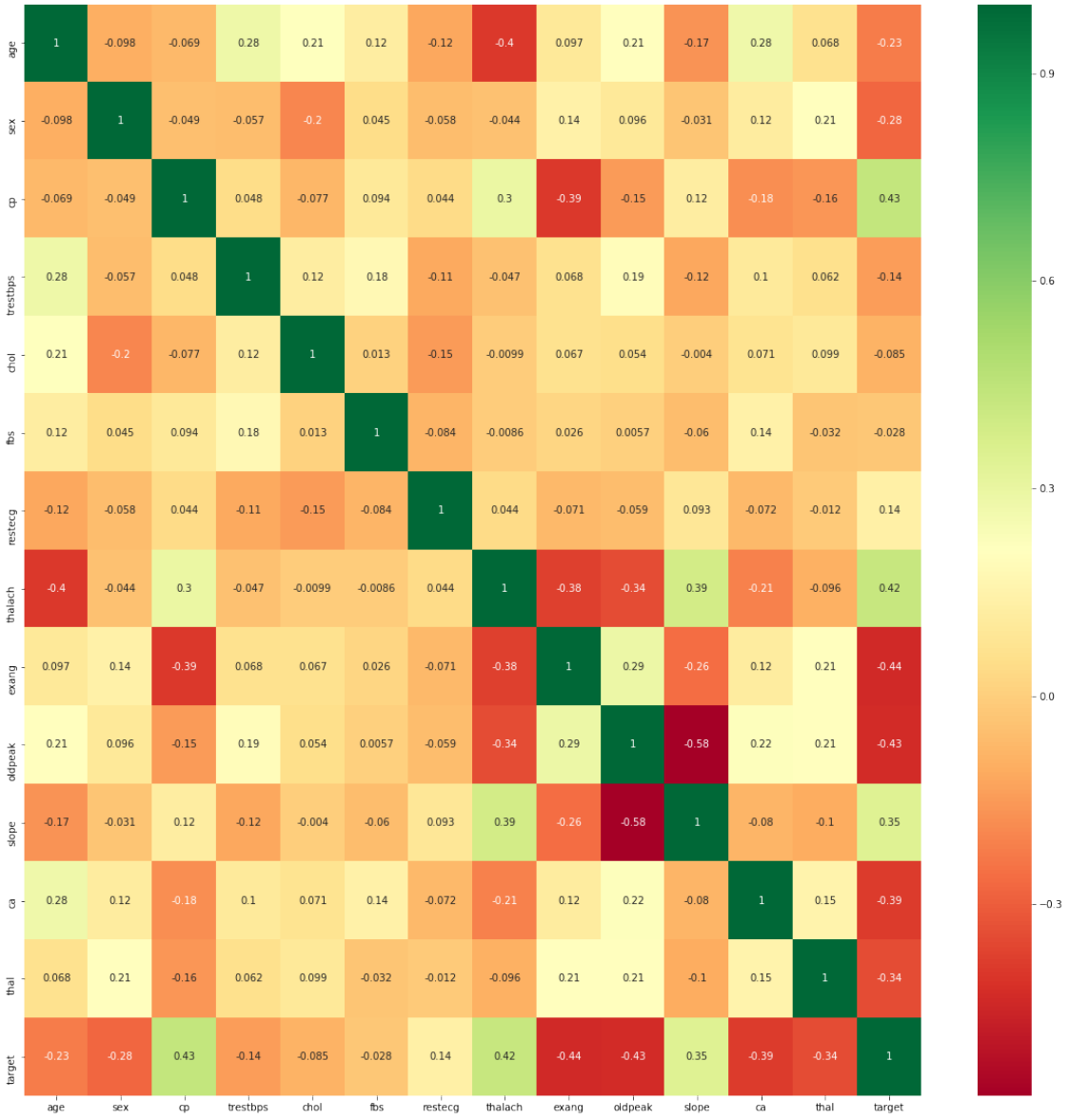
	restecg	thalach	exang	oldpeak	slope	ca	\
count	303.000000	303.000000	303.000000	303.000000	303.000000	303.000000	
mean	0.528053	149.646865	0.326733	1.039604	1.399340	0.729373	
std	0.525860	22.905161	0.469794	1.161075	0.616226	1.022606	
min	0.000000	71.000000	0.000000	0.000000	0.000000	0.000000	
25%	0.000000	133.500000	0.000000	0.000000	1.000000	0.000000	
50%	1.000000	153.000000	0.000000	0.800000	1.000000	0.000000	
75%	1.000000	166.000000	1.000000	1.600000	2.000000	1.000000	
max	2.000000	202.000000	1.000000	6.200000	2.000000	4.000000	

	thal	target
count	303.000000	303.000000
mean	2.313531	0.544554
std	0.612277	0.498835
min	0.000000	0.000000
25%	2.000000	0.000000
50%	2.000000	1.000000
75%	3.000000	1.000000
max	3.000000	1.000000

1.1 Feature Selection

[11]:
```
import seaborn as sns
#get correlations of each features in dataset
corrmat = df.corr()
top_corr_features = corrmat.index
plt.figure(figsize=(20,20))
#plot heat map
```

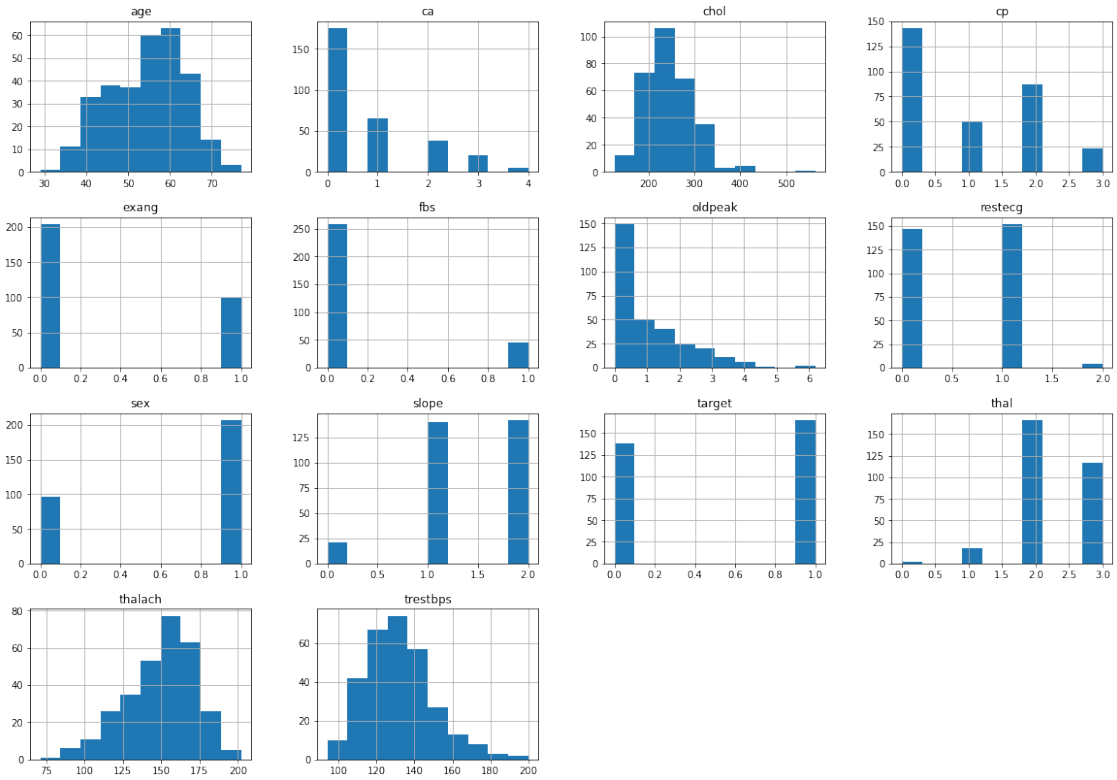
```
g=sns.heatmap(df[top_corr_features].corr(),annot=True,cmap="RdYlGn")
```



[14]:
```
df.hist()
```

[14]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x0000017C18BE4FD0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C18C12EF0>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C18BDB2E8>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C19D50550>],
       [<matplotlib.axes._subplots.AxesSubplot object at 0x0000017C1959F7B8>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C190A4A20>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C19427C88>,
```

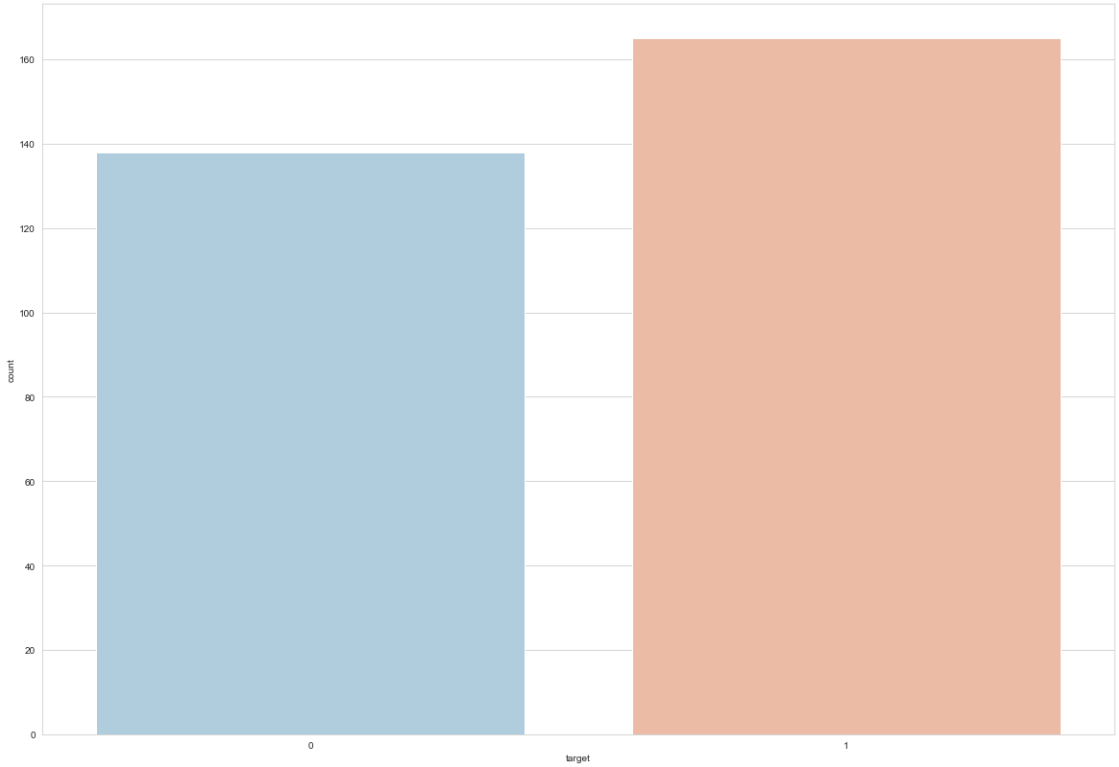
```
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C1949BF28>],
[<matplotlib.axes._subplots.AxesSubplot object at 0x0000017C1949BF60>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C19224400>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C1A03F668>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C18F138D0>],
[<matplotlib.axes._subplots.AxesSubplot object at 0x0000017C19505B38>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C19577DA0>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C1A28A048>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x0000017C1A3B72B0>]],
dtype=object)
```



It's always a good practice to work with a dataset where the target classes are of approximately equal size. Thus, let's check for the same.

[16]:
```
sns.set_style('whitegrid')
sns.countplot(x='target',data=df,palette='RdBu_r')
```

[16]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x17c19761208>
```



1.1.1 Data Processing

After exploring the dataset, I observed that I need to convert some categorical variables into dummy variables and scale all the values before training the Machine Learning models. First, I'll use the `get_dummies` method to create dummy columns for categorical variables.

[17]:
```
dataset = pd.get_dummies(df, columns = ['sex', 'cp', 'fbs', 'restecg', 'exang',␣
 ↪'slope', 'ca', 'thal'])
```

[18]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
standardScaler = StandardScaler()
columns_to_scale = ['age', 'trestbps', 'chol', 'thalach', 'oldpeak']
dataset[columns_to_scale] = standardScaler.
 ↪fit_transform(dataset[columns_to_scale])
```

```
C:\Users\krish.naik\AppData\Local\Continuum\anaconda3\envs\myenv\lib\site-
packages\sklearn\preprocessing\data.py:625: DataConversionWarning: Data with
input dtype int64, float64 were all converted to float64 by StandardScaler.
  return self.partial_fit(X, y)
C:\Users\krish.naik\AppData\Local\Continuum\anaconda3\envs\myenv\lib\site-
packages\sklearn\base.py:462: DataConversionWarning: Data with input dtype
int64, float64 were all converted to float64 by StandardScaler.
```

```
    return self.fit(X, **fit_params).transform(X)
```

[19]:
```
dataset.head()
```

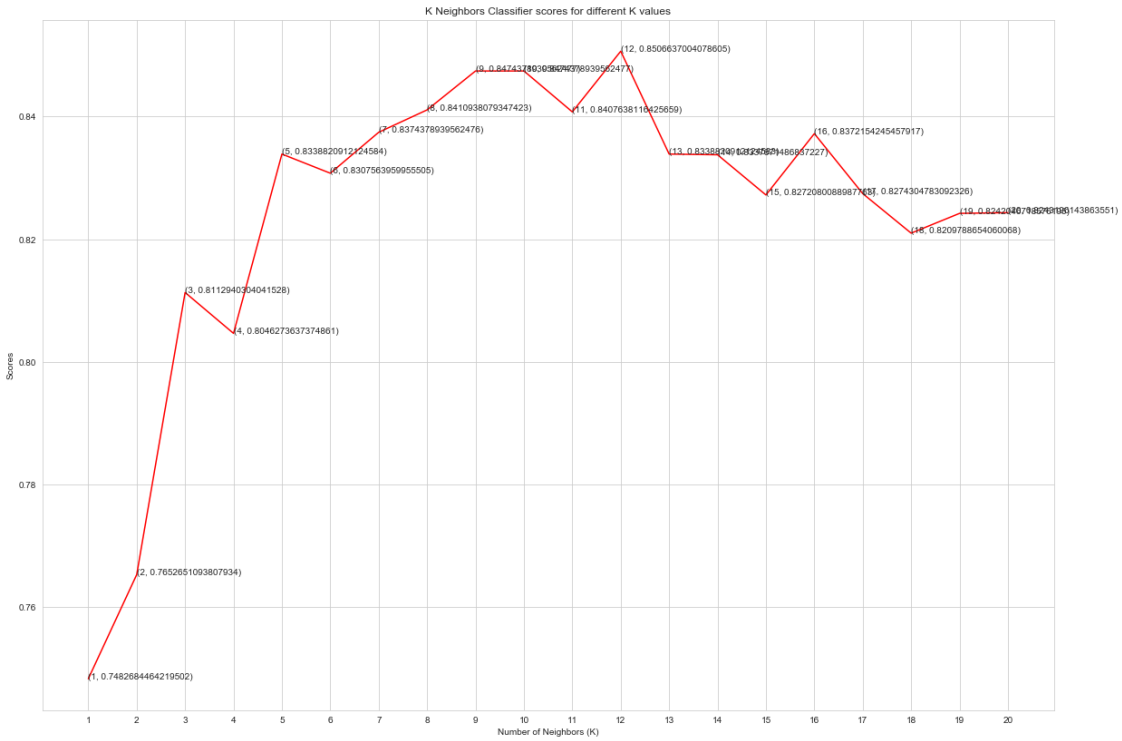
[19]:
```
        age  trestbps      chol   thalach   oldpeak  target  sex_0  sex_1  \
0  0.952197  0.763956 -0.256334  0.015443  1.087338       1      0      1
1 -1.915313 -0.092738  0.072199  1.633471  2.122573       1      0      1
2 -1.474158 -0.092738 -0.816773  0.977514  0.310912       1      1      0
3  0.180175 -0.663867 -0.198357  1.239897 -0.206705       1      0      1
4  0.290464 -0.663867  2.082050  0.583939 -0.379244       1      1      0

   cp_0  cp_1   …    slope_2  ca_0  ca_1  ca_2  ca_3  ca_4  thal_0  thal_1  \
0     0     0   …          0     1     0     0     0     0       0       1
1     0     0   …          0     1     0     0     0     0       0       0
2     0     1   …          1     1     0     0     0     0       0       0
3     0     1   …          1     1     0     0     0     0       0       0
4     1     0   …          1     1     0     0     0     0       0       0

   thal_2  thal_3
0       0       0
1       1       0
2       1       0
3       1       0
4       1       0

[5 rows x 31 columns]
```

[24]:
```
y = dataset['target']
X = dataset.drop(['target'], axis = 1)
```

[25]:
```
from sklearn.model_selection import cross_val_score
knn_scores = []
for k in range(1,21):
    knn_classifier = KNeighborsClassifier(n_neighbors = k)
    score=cross_val_score(knn_classifier,X,y,cv=10)
    knn_scores.append(score.mean())
```

[26]:
```
plt.plot([k for k in range(1, 21)], knn_scores, color = 'red')
for i in range(1,21):
    plt.text(i, knn_scores[i-1], (i, knn_scores[i-1]))
plt.xticks([i for i in range(1, 21)])
plt.xlabel('Number of Neighbors (K)')
plt.ylabel('Scores')
plt.title('K Neighbors Classifier scores for different K values')
```

[26]:
```
Text(0.5, 1.0, 'K Neighbors Classifier scores for different K values')
```



[36]:
```
knn_classifier = KNeighborsClassifier(n_neighbors = 12)
score=cross_val_score(knn_classifier,X,y,cv=10)
```

[38]:
```
score.mean()
```

[38]: 0.8506637004078605

1.2 Random Forest Classifier

[27]:
```
from sklearn.ensemble import RandomForestClassifier
```

[30]:
```
randomforest_classifier= RandomForestClassifier(n_estimators=10)

score=cross_val_score(randomforest_classifier,X,y,cv=10)
```

[31]:
```
score.mean()
```

[31]: 0.8199888765294772

[ ]:

[ ]: