decision-tree-algorithm

December 4, 2023

[1]:
```
import pandas as pd
import numpy as np

import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px

from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split, cross_val_score
from sklearn.metrics import confusion_matrix, classification_report
```

[2]:
```
df = pd.read_csv('/kaggle/input/heartdiseasedata/heart_v2.csv')
```

[3]:
```
df.head()
```

[3]:
```
   age  sex   BP  cholestrol  heart disease
0   70    1  130         322              1
1   67    0  115         564              0
2   57    1  124         261              1
3   64    1  128         263              0
4   74    0  120         269              0
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 270 entries, 0 to 269
Data columns (total 5 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   age            270 non-null    int64
 1   sex            270 non-null    int64
 2   BP             270 non-null    int64
 3   cholestrol     270 non-null    int64
 4   heart disease  270 non-null    int64
dtypes: int64(5)
memory usage: 10.7 KB
```

[5]:
```
df.columns
```

```
[5]: Index(['age', 'sex', 'BP', 'cholestrol', 'heart disease'], dtype='object')
```

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

```
[6]:              age         sex          BP  cholestrol  heart disease
     count  270.000000  270.000000  270.000000  270.000000     270.000000
     mean    54.433333    0.677778  131.344444  249.659259       0.444444
     std      9.109067    0.468195   17.861608   51.686237       0.497827
     min     29.000000    0.000000   94.000000  126.000000       0.000000
     25%     48.000000    0.000000  120.000000  213.000000       0.000000
     50%     55.000000    1.000000  130.000000  245.000000       0.000000
     75%     61.000000    1.000000  140.000000  280.000000       1.000000
     max     77.000000    1.000000  200.000000  564.000000       1.000000
```

```
[7]: df.isnull().sum()
```

```
[7]: age              0
     sex              0
     BP               0
     cholestrol       0
     heart disease    0
     dtype: int64
```

```
[8]: df['heart disease'].value_counts()
```

```
[8]: heart disease
     0    150
     1    120
     Name: count, dtype: int64
```

```
[9]: df.shape
```

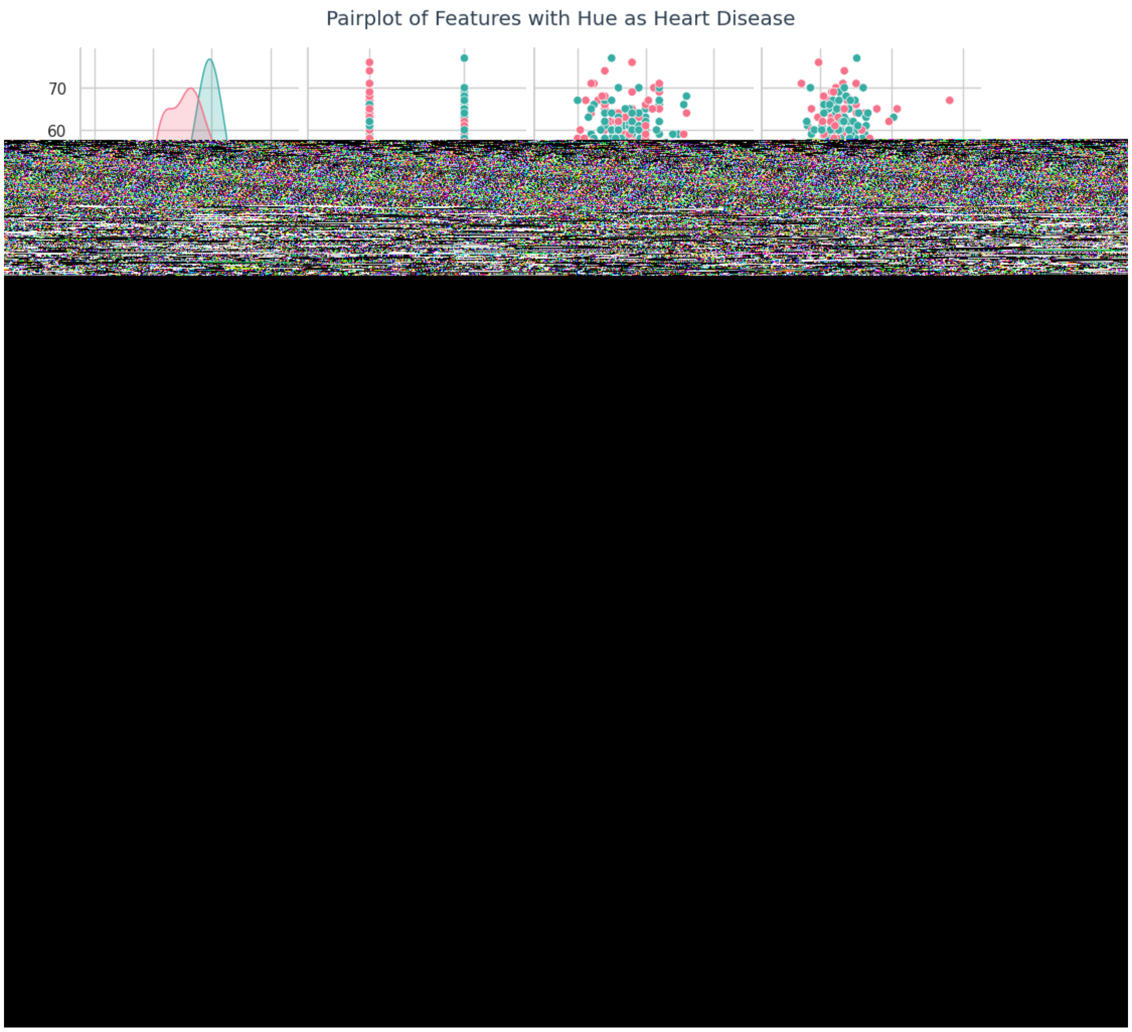
```
[9]: (270, 5)
```

```
[10]: fig = px.histogram(df, x='age', nbins=20, title='Distribution of Age',␣
        ↪labels={'age': 'Age'}, template='plotly_dark')
      fig.show()
```

```
[11]: # Blood Pressure Distribution
      fig = px.bar(df, x='BP', title='Distribution of Blood Pressure', color='BP',␣
        ↪template='plotly_dark')
      fig.show()
```

```
[12]: sns.set_theme(style="whitegrid")
      sns.pairplot(df, hue='heart disease', palette='husl')
      plt.suptitle('Pairplot of Features with Hue as Heart Disease', y=1.02,␣
        ↪color='#2c3e50')
```

```
plt.show()
```



[13]:
```
# Putting feature variable to X
X = df.drop('heart disease',axis=1)

# Putting response variable to y
y = df['heart disease']
```

[14]:
```
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, train_size=0.7,␣
 ↪random_state=42)
```

[15]:
```
X_train.shape, X_test.shape
```

[15]:
```
((189, 4), (81, 4))
```

[16]:
```
from sklearn.tree import DecisionTreeClassifier
dt = DecisionTreeClassifier(max_depth=3)
dt.fit(X_train, y_train)
```

[16]:
```
DecisionTreeClassifier(max_depth=3)
```

[17]:
```
!pip install pydotplus
```

```
Collecting pydotplus
  Downloading pydotplus-2.0.2.tar.gz (278 kB)
                          278.7/278.7 kB
10.2 MB/s eta 0:00:00
  Preparing metadata (setup.py) … done
Requirement already satisfied: pyparsing>=2.0.1 in
/opt/conda/lib/python3.10/site-packages (from pydotplus) (3.0.9)
Building wheels for collected packages: pydotplus
  Building wheel for pydotplus (setup.py) … done
  Created wheel for pydotplus: filename=pydotplus-2.0.2-py3-none-any.whl
size=24552
sha256=2adebe2f32db61affe021d5838e3ea758fd01614e31717ada63c7dc85a3d5a6b
  Stored in directory: /root/.cache/pip/wheels/69/b2/67/08f0eef649af92df772c09f4
51558298e07fab1bc7cdf33db0
Successfully built pydotplus
Installing collected packages: pydotplus
Successfully installed pydotplus-2.0.2
```

[18]:
```
!pip install graphviz
```

```
Requirement already satisfied: graphviz in /opt/conda/lib/python3.10/site-
packages (0.20.1)
```

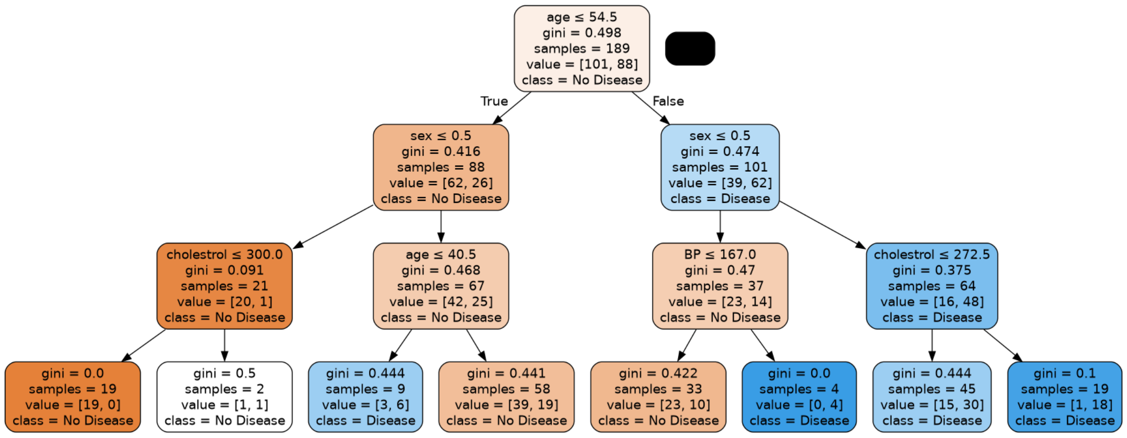
[19]:
```
from sklearn.tree import export_graphviz
import pydotplus, graphviz
from IPython.display import Image
from six import StringIO
```

[20]:
```
dot_data = StringIO()

export_graphviz(dt, out_file=dot_data, filled=True, rounded=True,
                feature_names=X.columns, class_names=['No Disease', 'Disease'],
                special_characters=True)

graph = pydotplus.graph_from_dot_data(dot_data.getvalue())
Image(graph.create_png())
```

[20]:



[21]:
```
y_train = dt.predict(X_train)
y_pred = dt.predict(X_test)
```

[22]:
```
from sklearn.metrics import classification_report,confusion_matrix,␣
  ↪accuracy_score
class_report = classification_report(y_test,y_pred)
print(class_report)
```

```
              precision    recall  f1-score   support

           0       0.66      0.71      0.69        49
           1       0.50      0.44      0.47        32

    accuracy                           0.60        81
   macro avg       0.58      0.58      0.58        81
weighted avg       0.60      0.60      0.60        81
```

[23]:
```
print(accuracy_score(y_test, y_pred))
```

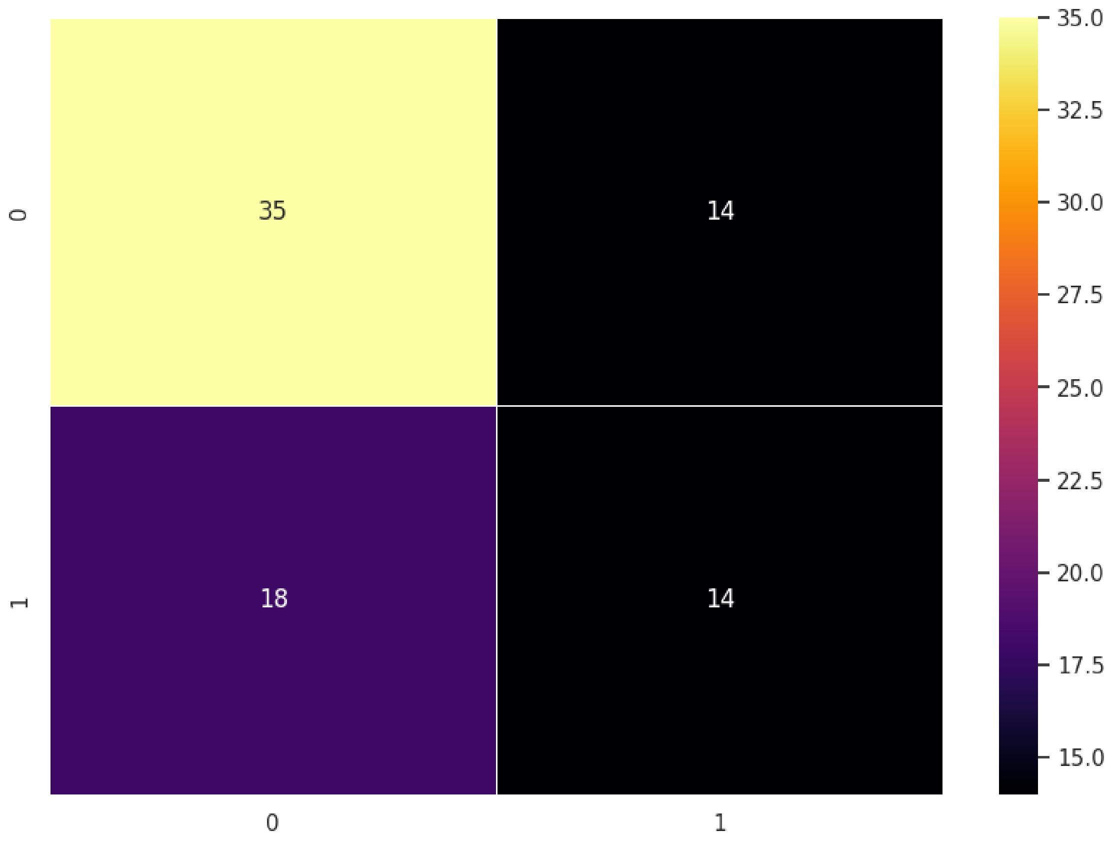
```
0.6049382716049383
```

[24]:
```
matrix=confusion_matrix(y_test,y_pred)
print(matrix)
```

```
[[35 14]
 [18 14]]
```

[25]:
```
plt.figure(figsize = (10,7))
sns.heatmap(matrix, annot=True, cmap='inferno', linewidths=.5, fmt='g')
```

[25]:
```
<Axes: >
```


35
14
18
14
0
1
0
1
35.0
32.5
30.0
27.5
25.0
22.5
20.0
17.5
15.0