```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import sys


data=pd.read_csv("fetal_health.csv")
data.head()
```

```
   baseline value  accelerations  fetal_movement  uterine_contractions
\
0           120.0          0.000             0.0                 0.000

1           132.0          0.006             0.0                 0.006

2           133.0          0.003             0.0                 0.008

3           134.0          0.003             0.0                 0.008

4           132.0          0.007             0.0                 0.008


   light_decelerations  severe_decelerations  prolongued_decelerations
\
0                0.000                   0.0                       0.0

1                0.003                   0.0                       0.0

2                0.003                   0.0                       0.0

3                0.003                   0.0                       0.0

4                0.000                   0.0                       0.0


   abnormal_short_term_variability
mean_value_of_short_term_variability  \
0                             73.0
0.5
1                             17.0
2.1
2                             16.0
2.1
3                             16.0
2.4
4                             16.0
2.4
```

```
   percentage_of_time_with_abnormal_long_term_variability  ...
histogram_min  \
0                                               43.0       ...
62.0
1                                                0.0       ...
68.0
2                                                0.0       ...
68.0
3                                                0.0       ...
53.0
4                                                0.0       ...
53.0

   histogram_max  histogram_number_of_peaks
histogram_number_of_zeroes  \
0          126.0                        2.0
0.0
1          198.0                        6.0
1.0
2          198.0                        5.0
1.0
3          170.0                       11.0
0.0
4          170.0                        9.0
0.0

   histogram_mode  histogram_mean  histogram_median
histogram_variance  \
0           120.0           137.0             121.0
73.0
1           141.0           136.0             140.0
12.0
2           141.0           135.0             138.0
13.0
3           137.0           134.0             137.0
13.0
4           137.0           136.0             138.0
11.0

   histogram_tendency  fetal_health
0                 1.0           2.0
1                 0.0           1.0
2                 0.0           1.0
3                 1.0           1.0
4                 1.0           1.0

[5 rows x 22 columns]
```

```
data['fetal_health'] = data['fetal_health'].replace(1.0,0)
data['fetal_health'] = data['fetal_health'].replace(2.0,0)
data['fetal_health'] = data['fetal_health'].replace(3.0,1)
data
```

```
      baseline value  accelerations  fetal_movement
uterine_contractions  \
0              120.0          0.000           0.000
0.000
1              132.0          0.006           0.000
0.006
2              133.0          0.003           0.000
0.008
3              134.0          0.003           0.000
0.008
4              132.0          0.007           0.000
0.008
...              ...            ...             ...
...
2121           140.0          0.000           0.000
0.007
2122           140.0          0.001           0.000
0.007
2123           140.0          0.001           0.000
0.007
2124           140.0          0.001           0.000
0.006
2125           142.0          0.002           0.002
0.008

      light_decelerations  severe_decelerations
prolongued_decelerations  \
0                   0.000                   0.0
0.0
1                   0.003                   0.0
0.0
2                   0.003                   0.0
0.0
3                   0.003                   0.0
0.0
4                   0.000                   0.0
0.0
...                   ...                   ...
...
2121                0.000                   0.0
0.0
2122                0.000                   0.0
0.0
2123                0.000                   0.0
0.0
```

```
2124                0.000                   0.0
0.0
2125                0.000                   0.0
0.0

      abnormal_short_term_variability
mean_value_of_short_term_variability  \
0                                  73.0
0.5
1                                  17.0
2.1
2                                  16.0
2.1
3                                  16.0
2.4
4                                  16.0
2.4
...                                 ...
...
2121                               79.0
0.2
2122                               78.0
0.4
2123                               79.0
0.4
2124                               78.0
0.4
2125                               74.0
0.4

      percentage_of_time_with_abnormal_long_term_variability  ...  \
0                                                    43.0       ...
1                                                     0.0       ...
2                                                     0.0       ...
3                                                     0.0       ...
4                                                     0.0       ...
...                                                    ...       ...
2121                                                 25.0       ...
2122                                                 22.0       ...
2123                                                 20.0       ...
2124                                                 27.0       ...
2125                                                 36.0       ...

      histogram_min  histogram_max  histogram_number_of_peaks  \
0              62.0          126.0                        2.0
1              68.0          198.0                        6.0
2              68.0          198.0                        5.0
3              53.0          170.0                       11.0
4              53.0          170.0                        9.0
...             ...            ...                        ...
```

```
2121          137.0          177.0                      4.0
2122          103.0          169.0                      6.0
2123          103.0          170.0                      5.0
2124          103.0          169.0                      6.0
2125          117.0          159.0                      2.0

      histogram_number_of_zeroes  histogram_mode  histogram_mean  \
0                            0.0           120.0           137.0
1                            1.0           141.0           136.0
2                            1.0           141.0           135.0
3                            0.0           137.0           134.0
4                            0.0           137.0           136.0
...                          ...             ...             ...
2121                         0.0           153.0           150.0
2122                         0.0           152.0           148.0
2123                         0.0           153.0           148.0
2124                         0.0           152.0           147.0
2125                         1.0           145.0           143.0

      histogram_median  histogram_variance  histogram_tendency
fetal_health
0                121.0                73.0                 1.0
0.0
1                140.0                12.0                 0.0
0.0
2                138.0                13.0                 0.0
0.0
3                137.0                13.0                 1.0
0.0
4                138.0                11.0                 1.0
0.0
...                ...                 ...                 ...
...
2121             152.0                 2.0                 0.0
0.0
2122             151.0                 3.0                 1.0
0.0
2123             152.0                 4.0                 1.0
0.0
2124             151.0                 4.0                 1.0
0.0
2125             145.0                 1.0                 0.0
0.0

[2126 rows x 22 columns]
```

```
X = data.drop('fetal_health', axis = 1)
```

```
y = data['fetal_health']
```

```
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=142)
x_train
```

```
      baseline value  accelerations  fetal_movement
uterine_contractions  \
199             120.0          0.000           0.013
0.000
340             133.0          0.000           0.000
0.000
440             142.0          0.001           0.003
0.001
1427            144.0          0.006           0.000
0.004
1015            139.0          0.007           0.000
0.005
...               ...            ...             ...
...
1420            142.0          0.006           0.000
0.007
1616            144.0          0.003           0.049
0.002
1050            125.0          0.007           0.000
0.005
511             154.0          0.007           0.001
0.002
277             123.0          0.001           0.000
0.004

      light_decelerations  severe_decelerations
prolongued_decelerations  \
199                 0.001                   0.0
0.000
340                 0.000                   0.0
0.000
440                 0.002                   0.0
0.000
1427                0.000                   0.0
0.000
1015                0.000                   0.0
0.000
...                   ...                   ...
...
1420                0.000                   0.0
0.000
1616                0.006                   0.0
0.001
1050                0.000                   0.0
```

```
0.000
511                 0.000                   0.0
0.000
277                 0.000                   0.0
0.000

      abnormal_short_term_variability
mean_value_of_short_term_variability  \
199                               53.0
0.7
340                               75.0
0.2
440                               55.0
1.3
1427                              39.0
1.0
1015                              38.0
0.9
...                                ...
...
1420                              42.0
1.0
1616                              66.0
3.4
1050                              26.0
1.3
511                               45.0
0.8
277                               54.0
0.5

      percentage_of_time_with_abnormal_long_term_variability  ...  \
199                                                    7.0       ...
340                                                   91.0       ...
440                                                   10.0       ...
1427                                                   5.0       ...
1015                                                   0.0       ...
...                                                    ...       ...
1420                                                   0.0       ...
1616                                                   0.0       ...
1050                                                   0.0       ...
511                                                    0.0       ...
277                                                    9.0       ...

      histogram_width  histogram_min  histogram_max  \
199              77.0           56.0          133.0
340               7.0          131.0          138.0
440             115.0           52.0          167.0
1427             43.0          136.0          179.0
1015             34.0          136.0          170.0
```

```
...              ...            ...           ...
1420            97.0           74.0         171.0
1616           113.0           67.0         180.0
1050            87.0           79.0         166.0
511             47.0          142.0         189.0
277             29.0          116.0         145.0

      histogram_number_of_peaks  histogram_number_of_zeroes
histogram_mode  \
199                         6.0                         0.0
123.0
340                         1.0                         0.0
133.0
440                        12.0                         3.0
148.0
1427                        1.0                         0.0
157.0
1015                        1.0                         0.0
144.0
...                         ...                         ...
...
1420                        6.0                         0.0
148.0
1616                        7.0                         0.0
141.0
1050                        4.0                         0.0
131.0
511                         2.0                         1.0
161.0
277                         4.0                         0.0
126.0

      histogram_mean  histogram_median  histogram_variance
histogram_tendency
199            121.0             123.0                 3.0
1.0
340            134.0             135.0                 0.0
0.0
440            143.0             147.0                17.0
1.0
1427           157.0             157.0                 4.0
0.0
1015           146.0             146.0                 4.0
-1.0
...              ...               ...                 ...
...
1420           148.0             149.0                 5.0
1.0
1616           110.0             147.0                89.0
1.0
```

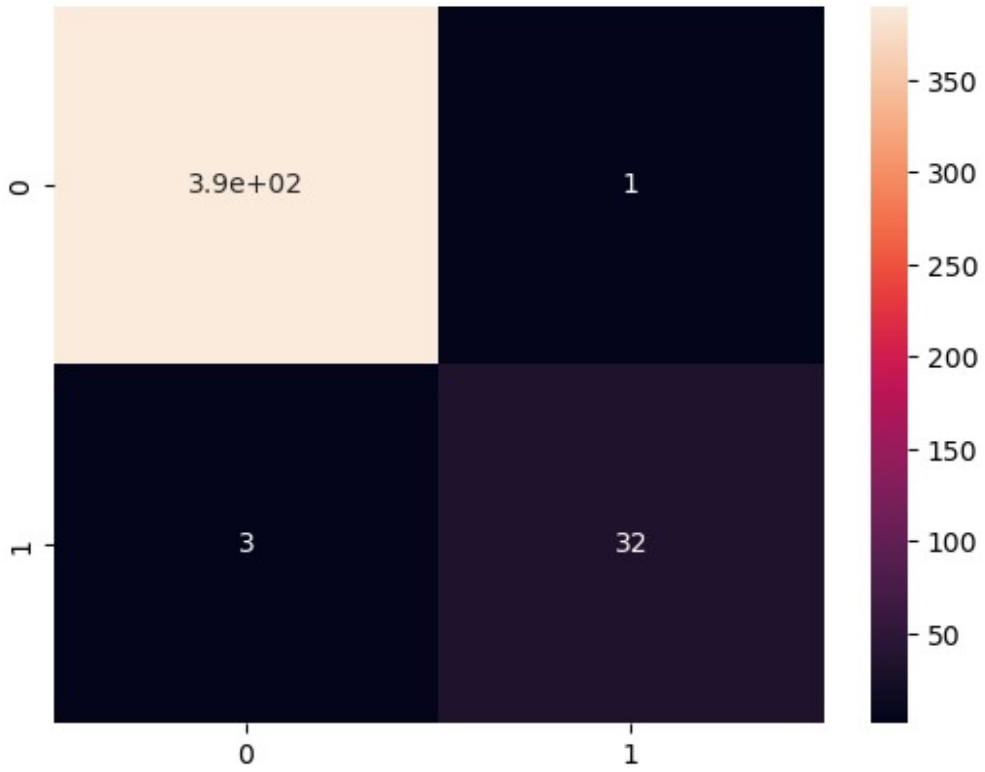
```
1050           133.0            132.0                11.0
0.0
511            166.0            165.0                10.0
0.0
277            128.0            129.0                 3.0
0.0

[1700 rows x 21 columns]
```

```
from sklearn.tree import DecisionTreeClassifier # Import Decision Tree
Classifier
from sklearn.model_selection import train_test_split # Import
train_test_split function
from sklearn import metrics #Import scikit-learn metrics module for
accuracy calculation

# Create Decision Tree classifer object
clf = DecisionTreeClassifier()

# Train Decision Tree Classifer
clf = clf.fit(x_train,y_train)

#Predict the response for test dataset
y_pred = clf.predict(x_test)
```

print("Accuracy:",metrics.accuracy_score(y_test, y_pred))

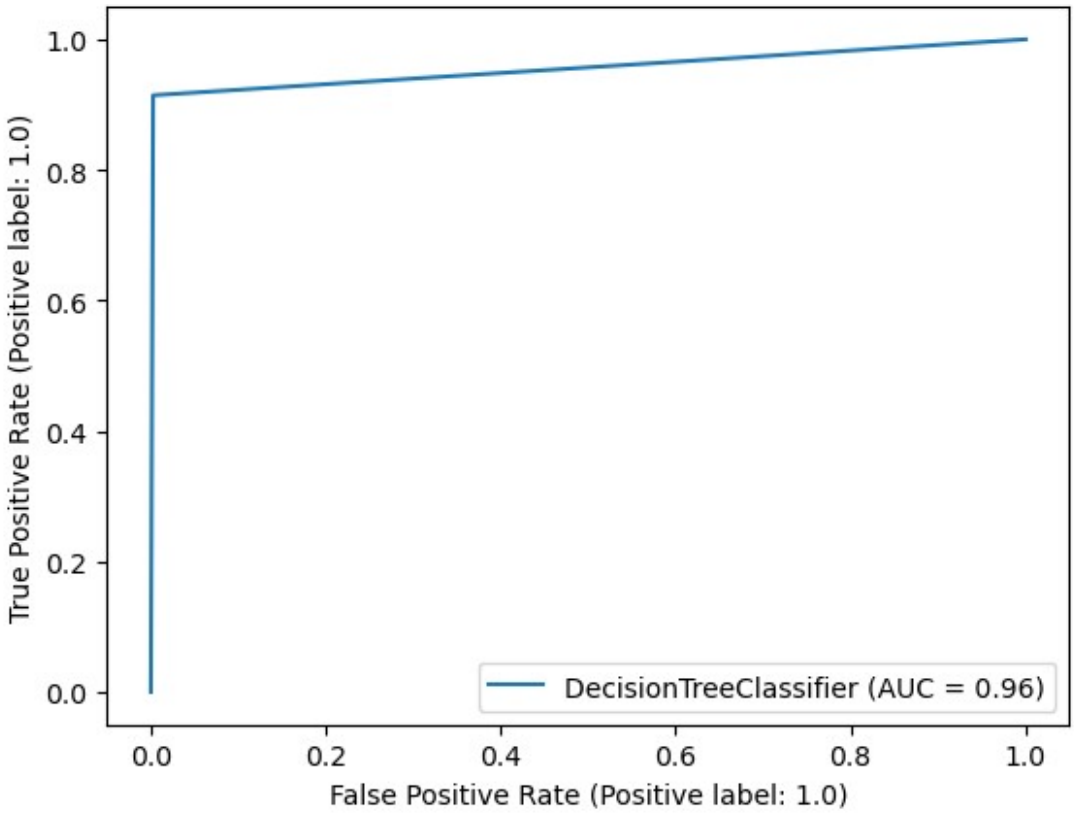
```
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score

cm = confusion_matrix(y_test, y_pred)

sns.heatmap(cm, annot=True)
print(accuracy_score(y_test, y_pred_))
```

```
0.9906103286384976
```




```
from sklearn import  metrics
metrics.plot_roc_curve(clf, x_test, y_test)
plt.show()
```

```
/Users/caramatthews/opt/anaconda3/lib/python3.9/site-packages/
sklearn/utils/deprecation.py:87: FutureWarning: Function
plot_roc_curve is deprecated; Function :func:`plot_roc_curve` is
deprecated in 1.0 and will be removed in 1.2. Use one of the class
methods: :meth:`sklearn.metric.RocCurveDisplay.from_predictions`
or :meth:`sklearn.metric.RocCurveDisplay.from_estimator`.
  warnings.warn(msg, category=FutureWarning)
```




```
from sklearn.metrics import classification_report
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

         0.0       0.99      1.00      0.99       391
         1.0       0.97      0.91      0.94        35

    accuracy                           0.99       426
   macro avg       0.98      0.96      0.97       426
weighted avg       0.99      0.99      0.99       426
```