DecessionTreeClassifier

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```
# Libraries
import pandas as pd
from time import time,ctime
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import train_test_split
from sklearn import metrics
import matplotlib.pyplot as plt
from sklearn.tree import plot_tree
import seaborn as sns
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix
```

```
print("Timestamp: "+ctime(time()))
```

```
Timestamp: Wed Feb 12 06:27:22 2025
```

```
df = pd.read_csv('diabetes.csv')
df.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               768 non-null    int64  
 1   Glucose                   768 non-null    int64  
 2   BloodPressure             768 non-null    int64  
 3   SkinThickness             768 non-null    int64  
 4   Insulin                   768 non-null    int64  
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64  
 8   Outcome                   768 non-null    int64  
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

Data Exploration and Preprocessing:

```
df.shape
```

```
(768, 9)
```

```
df.columns
```

```
Index(['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin',
       'BMI', 'DiabetesPedigreeFunction', 'Age', 'Outcome'],
      dtype='object')
```

```
df.describe()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
count	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000
mean	3.845052	120.894531	69.105469	20.536458	79.799479	31.992578	0.471876	33.240885	0.348958
std	3.369578	31.972618	19.355807	15.952218	115.244002	7.884160	0.331329	11.760232	0.476951
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.078000	21.000000	0.000000
25%	1.000000	99.000000	62.000000	0.000000	0.000000	27.300000	0.243750	24.000000	0.000000
50%	3.000000	117.000000	72.000000	23.000000	30.500000	32.000000	0.372500	29.000000	0.000000
75%	6.000000	140.250000	80.000000	32.000000	127.250000	36.600000	0.626250	41.000000	1.000000
max	17.000000	199.000000	122.000000	99.000000	846.000000	67.100000	2.420000	81.000000	1.000000

```
df.Outcome.value_counts()*100/len(df)
```

Outcome	count
0	65.104167
1	34.895833

dtype: float64

```
df.groupby('Outcome').mean()
```

Outcome	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
0	3.298000	109.980000	68.184000	19.664000	68.792000	30.304200	0.429734	31.190000
1	4.865672	141.257463	70.824627	22.164179	100.335821	35.142537	0.550500	37.067164

```
df.groupby('Outcome').agg(['mean','median'])
```

	Pregnancies		Glucose		BloodPressure		SkinThickness		Insulin		BMI		DiabetesPed
	mean	median	mean	median	mean	median	mean	median	mean	median	mean	median	mean
Outcome													
0	3.298000	2.0	109.980000	107.0	68.184000	70.0	19.664000	21.0	68.792000	39.0	30.304200	30.05	0.42973
1	4.865672	4.0	141.257463	140.0	70.824627	74.0	22.164179	27.0	100.335821	0.0	35.142537	34.25	0.55050

2. Handle missing values (if any) appropriately.

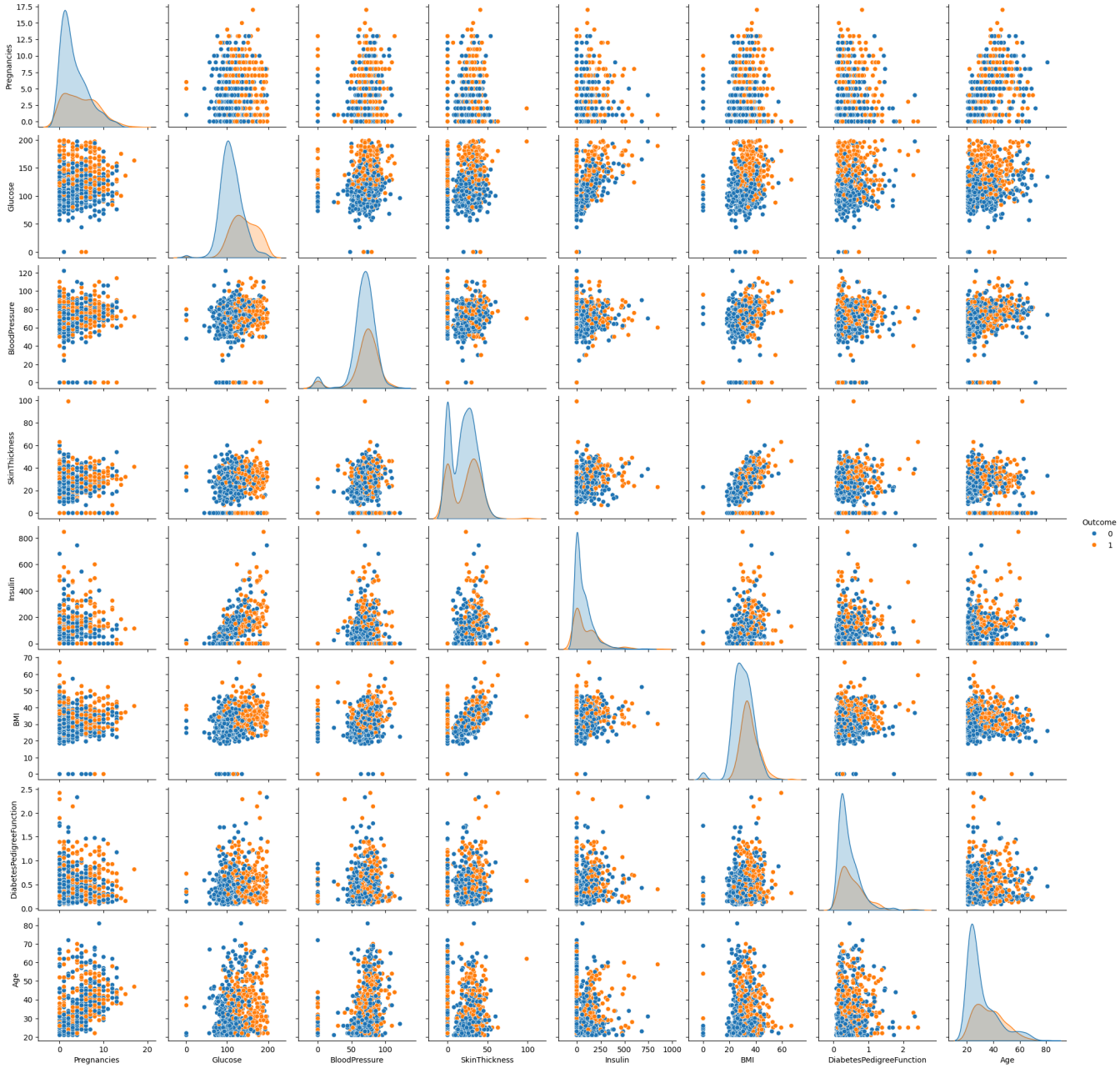
```
df.isnull().sum()
```

	0
Pregnancies	0
Glucose	0
BloodPressure	0
SkinThickness	0
Insulin	0
BMI	0
DiabetesPedigreeFunction	0
Age	0
Outcome	0

dtype: int64

```
sns.pairplot(df,hue='Outcome')
```

<seaborn.axisgrid.PairGrid at 0x79c5ba9d8a50>




```
corr = df.corr()
corr.style.background_gradient(cmap='coolwarm')
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
Pregnancies	1.000000	0.129459	0.141282	-0.081672	-0.073535	0.017683	-0.033523	0.544341
Glucose	0.129459	1.000000	0.152590	0.057328	0.331357	0.221071	0.137337	0.263514
BloodPressure	0.141282	0.152590	1.000000	0.207371	0.088933	0.281805	0.041265	0.239528
SkinThickness	-0.081672	0.057328	0.207371	1.000000	0.436783	0.392573	0.183928	-0.113970
Insulin	-0.073535	0.331357	0.088933	0.436783	1.000000	0.197859	0.185071	-0.042163
BMI	0.017683	0.221071	0.281805	0.392573	0.197859	1.000000	0.140647	0.036242
DiabetesPedigreeFunction	-0.033523	0.137337	0.041265	0.183928	0.185071	0.140647	1.000000	0.033561
Age	0.544341	0.263514	0.239528	-0.113970	-0.042163	0.036242	0.033561	1.000000
Outcome	0.221898	0.466581	0.065068	0.074752	0.130548	0.292695	0.173844	0.238356

Model Implementation:

```
from sklearn.neighbors import KNeighborsClassifier


X=df.drop('Outcome',axis=1)
X.head()
y=df['Outcome']

X_train, X_test, y_train, y_test = train_test_split(X, y,test_size=0.2,random_state=0)


from sklearn.preprocessing import StandardScaler
sc_x=StandardScaler()
X_train=sc_x.fit_transform(X_train)
X_test=sc_x.transform(X_test)


knn=KNeighborsClassifier(n_neighbors=5,metric='euclidean',p=2)
knn.fit(X_train,y_train)
```

```
KNeighborsClassifier
KNeighborsClassifier(metric='euclidean')
```

```
y_pred=knn.predict(X_test)
y_pred
```

```
array([1, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 1,
       1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 1, 1,
       1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,
       1, 0, 0, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1,
       0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

```
metrics.accuracy_score(y_test,y_pred)
mat = confusion_matrix(y_test, y_pred)
mat
target_names = ['Diabetes', 'Normal']
print(classification_report(y_test, y_pred, target_names=target_names))
```

```
              precision    recall  f1-score   support

        Diabetes       0.85      0.87      0.86       107
          Normal       0.68      0.64      0.66        47

        accuracy                           0.80       154
       macro avg       0.76      0.75      0.76       154
    weighted avg       0.80      0.80      0.80       154
```

```
knn=KNeighborsClassifier(n_neighbors=18,metric='euclidean',p=2)
knn.fit(X_train,y_train)
y_pred=knn.predict(X_test)
y_pred
knn.score(X_test,y_test)
from sklearn.metrics import confusion_matrix
mat = confusion_matrix(y_test, y_pred)
plt.figure(figsize=(10, 8))
sns.heatmap(mat, annot=True)
```

```
target_names = ['Diabetes', 'Normal']
print(classification_report(y_test, y_pred, target_names=target_names))
```

```
              precision    recall  f1-score   support

    Diabetes       0.83      0.92      0.87       107
      Normal       0.75      0.57      0.65        47

    accuracy                           0.81       154
   macro avg       0.79      0.75      0.76       154
weighted avg       0.81      0.81      0.80       154
```