Tennis Play Prediction : Decision Tree ML Model : also known as

- ID3 (Iterative Dichotomiser 3)
- CART (Classification and Regression Trees)

In [ ]:
```
# Designed By : ALTAF HUSAIN DATA ANALYST
```

Import modules

In [2]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier,plot_tree
import warnings
warnings.filterwarnings('ignore')
print("All modules loaded succesfully")
```

```
All modules loaded succesfully
```

load data

In [3]:

```
import kagglehub

# Download latest version
path = kagglehub.dataset_download("fredericobreno/play-tennis")

print("Path to dataset files:", path)
```

```
Downloading from https://www.kaggle.com/api/v1/datasets/download/fredericobreno/play-tennis?dataset_version_number=1...
100%|████████████████████████████████████████████████████████████████████████████████| 337/337 [00:00<00:00, 94.7kB/s]
Extracting files...
Path to dataset files: C:\Users\SK COMPUTER\.cache\kagglehub\datasets\fredericobreno\play-tennis\versions\1
```

In [4]:

```
path
```

Out[4]:

```
'C:\\Users\\SK COMPUTER\\.cache\\kagglehub\\datasets\\fredericobreno\\play-tennis\\versions\\1'
```

In [5]:

```
import os
file_path = path + '/'+os.listdir(path)[0]
```

In [6]:

```
file_path
```

```
Out[6]: 'C:\\Users\\SK COMPUTER\\.cache\\kagglehub\\datasets\\fredericobreno\\play-tennis\\versions\\1/play_tennis.csv'
```

```
In [7]: df = pd.read_csv(file_path)
```

```
In [8]: df.pop('day')
        df
```

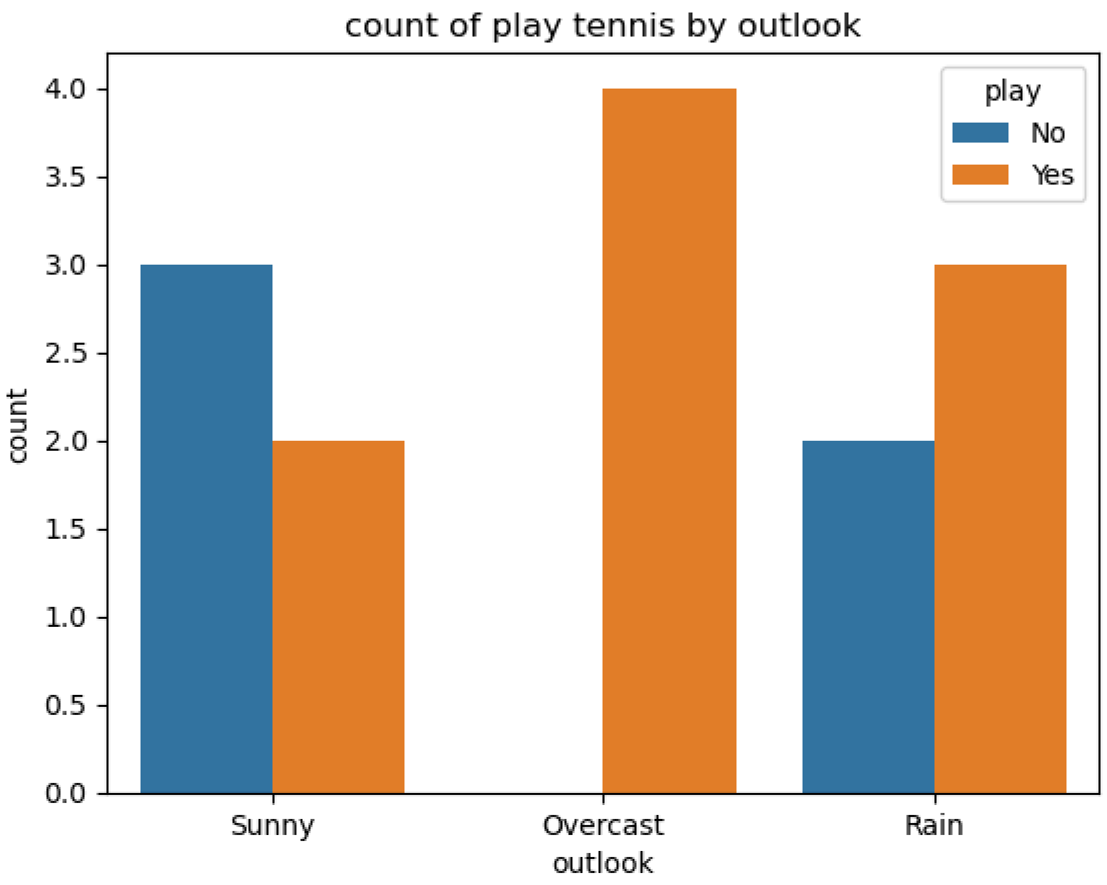
Out[8]:

	outlook	temp	humidity	wind	play
0	Sunny	Hot	High	Weak	No
1	Sunny	Hot	High	Strong	No
2	Overcast	Hot	High	Weak	Yes
3	Rain	Mild	High	Weak	Yes
4	Rain	Cool	Normal	Weak	Yes
5	Rain	Cool	Normal	Strong	No
6	Overcast	Cool	Normal	Strong	Yes
7	Sunny	Mild	High	Weak	No
8	Sunny	Cool	Normal	Weak	Yes
9	Rain	Mild	Normal	Weak	Yes
10	Sunny	Mild	Normal	Strong	Yes
11	Overcast	Mild	High	Strong	Yes
12	Overcast	Hot	Normal	Weak	Yes
13	Rain	Mild	High	Strong	No

EDA

```
In [9]: plt.title('count of play tennis by outlook')
        sns.countplot(df,x = 'outlook', hue = 'play')
```

```
plt.show()
```



In [10]:

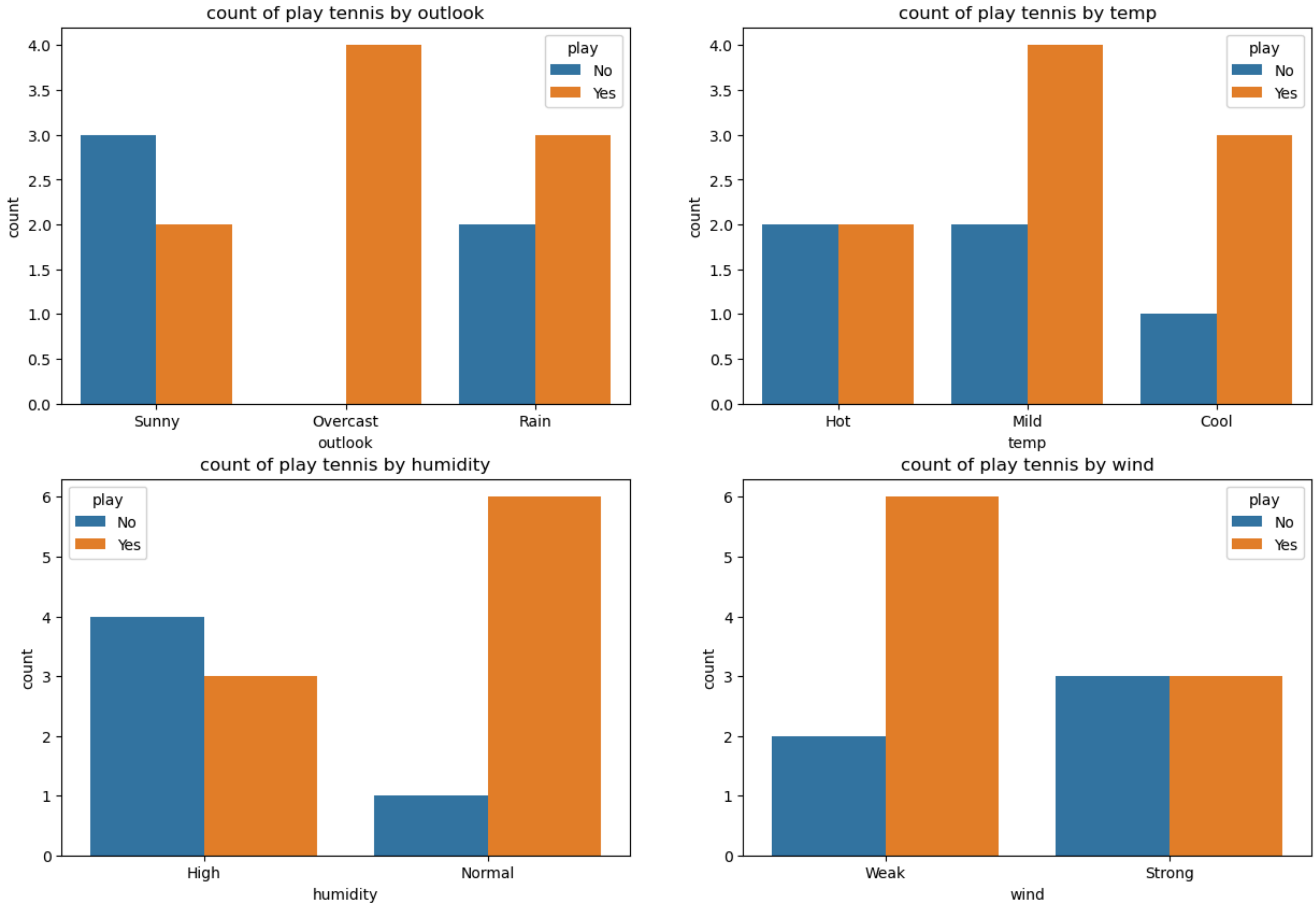
```
x_col = df.columns[:-1]
x_col
```

Out[10]:

```
Index(['outlook', 'temp', 'humidity', 'wind'], dtype='object')
```

In [11]:

```
plt.figure(figsize = (15,10))
for  i,j in enumerate(x_col):
  plt.subplot(2,2,i+1)
  plt.title(f'count of play tennis by {j}')
  sns.countplot(df,x = j,hue = 'play')
plt.show()
```


count of play tennis by outlook

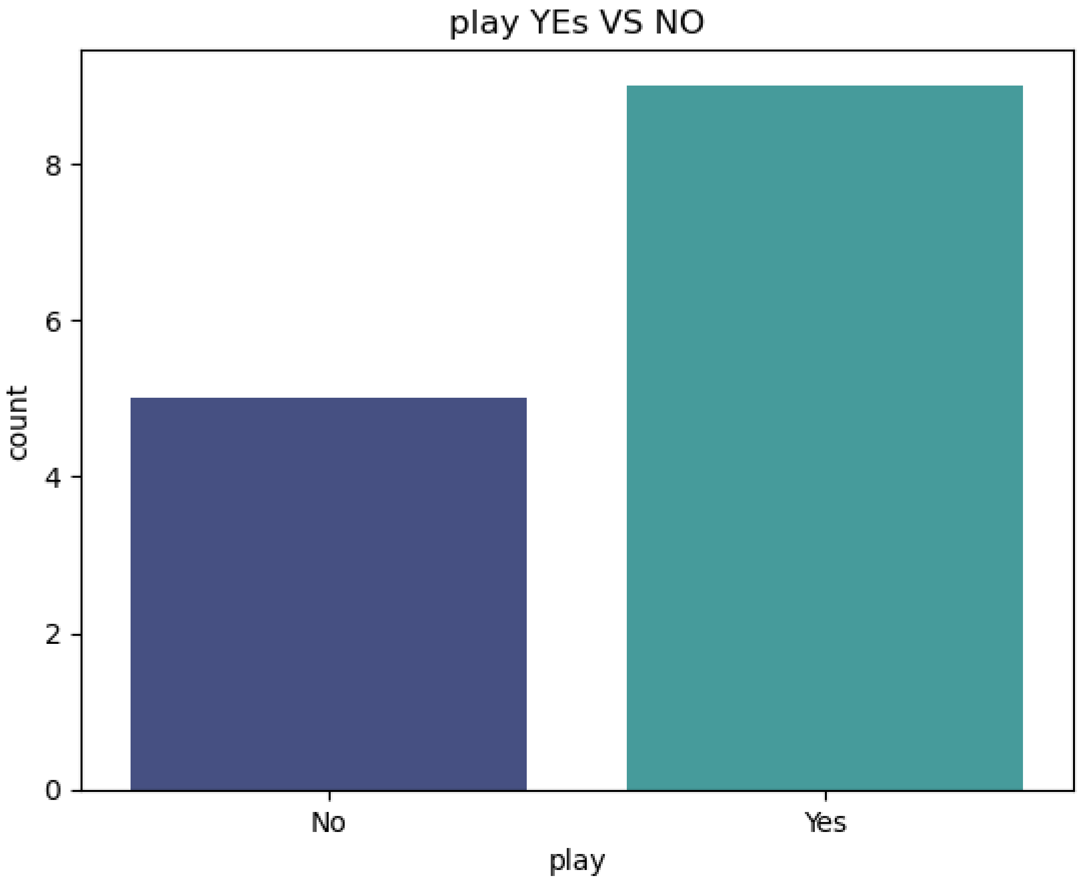
count of play tennis by temp

count of play tennis by humidity

count of play tennis by wind

In [12]:

```
plt.title('play YEs VS NO')
sns.countplot(df,x = 'play', hue = 'play',palette=sns.color_palette('mako',2))
plt.show()
```



```
In [13]: df.shape
```

```
Out[13]: (14, 5)
```

Data Preprocessiong

```
In [14]: X = pd.get_dummies(df.iloc[:,:-1],drop_first = True,dtype = int)
```

```
In [15]: X
```

Out[15]:

	outlook_Rain	outlook_Sunny	temp_Hot	temp_Mild	humidity_Normal	wind_Weak
0	0	1	1	0	0	1
1	0	1	1	0	0	0
2	0	0	1	0	0	1
3	1	0	0	1	0	1
4	1	0	0	0	1	1
5	1	0	0	0	1	0
6	0	0	0	0	1	0
7	0	1	0	1	0	1
8	0	1	0	0	1	1
9	1	0	0	1	1	1
10	0	1	0	1	1	0
11	0	0	0	1	0	0
12	0	0	1	0	1	1
13	1	0	0	1	0	0

In [16]:

```
y = df['play'].map({'No':0,'Yes':1})
y
```

Out[16]:

```
0     0
1     0
2     1
3     1
4     1
5     0
6     1
7     0
8     1
9     1
10    1
11    1
12    1
13    0
Name: play, dtype: int64
```

In [17]:

```
X.shape
```

Out[17]:

```
(14, 6)
```

In [18]:

```
y.shape
```

Out[18]:

```
(14,)
```

Train test Split

In [19]:

```
X_train, X_test, y_train, y_test = train_test_split(X,y,test_size = 0.2,random_state=42)
```

In [20]:

```
print(X_train.shape)
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(11, 6)
(3, 6)
(11,)
(3,)
```

Model Building

In [21]:
```
model = DecisionTreeClassifier()
```

In [22]:
```
model.fit(X_train,y_train)
```

Out[22]:
```
▾ DecisionTreeClassifier

DecisionTreeClassifier()
```

In [23]:
```
y_pred = model.predict(X_test)
```

In [24]:
```
compare_df = pd.DataFrame({'Actyal Y':y_test,'Predicted Y':y_pred})
```

In [25]:
```
model.score(X_test,y_test)
```

Out[25]:
```
0.3333333333333333
```

Multiple Model Evalution

In [26]:
```
model_dict = {'Model No':[],'Model Brain':[],'Model score':[]}

for i in range(1,3000+1):
    X_train, X_test, y_train, y_test = train_test_split(X,y,test_size = 0.2,random_state=i)
    model = DecisionTreeClassifier()
    model.fit(X_train,y_train)
    y_pred = model.predict(X_test)
    score = model.score(X_test,y_test)

    model_dict['Model No'].append(i)
    model_dict['Model Brain'].append(model)
    model_dict['Model score'].append(score)
    print(f'checking {i} <> score : {score*100}')
    if score *100 >=90:
      print('Model Developed successfully!!')
```

```
        break
    display(clear = True)
```

```
checking 3 <> score : 100.0
Model Developed successfully!!
```

In [27]:
```
all_model_df = pd.DataFrame(model_dict)
```

In [28]:
```
all_model_df
```

Out[28]:

	Model No	Model Brain	Model score
0	1	DecisionTreeClassifier()	0.333333
1	2	DecisionTreeClassifier()	0.333333
2	3	DecisionTreeClassifier()	1.000000

In [29]:
```
final_model_df= all_model_df[all_model_df['Model score'] == all_model_df['Model score'] .max()]
```

In [30]:
```
final_model_df
```

Out[30]:

	Model No	Model Brain	Model score
2	3	DecisionTreeClassifier()	1.0

In [31]:
```
final_model = final_model_df['Model Brain'].values[0]
```

In [32]:
```
final_model
```

Out[32]:

```
▾ DecisionTreeClassifier
DecisionTreeClassifier()
```

In [33]:
```
final_model.score(X_test,y_test)
```

Out[33]:
```
1.0
```

In [34]:

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

In [35]:

```
from sklearn.metrics import confusion_matrix, classification_report
```

In [36]:

```
cm = confusion_matrix(y_test,y_pred)
cm
```

Out[36]:

```
array([[2, 0],
       [0, 1]])
```

In [37]:

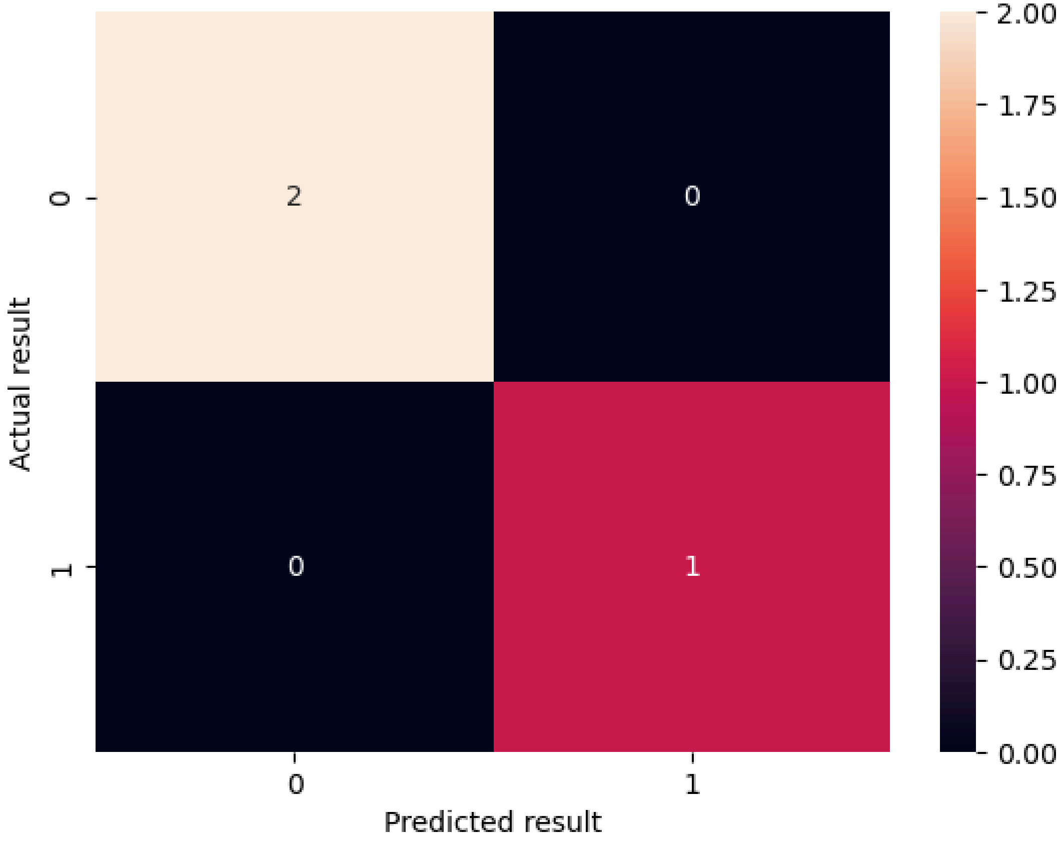
```
cm.ravel()
```

Out[37]:

```
array([2, 0, 0, 1])
```

In [38]:

```
sns.heatmap(cm,annot =True)
plt.xlabel('Predicted result')
plt.ylabel('Actual result')
plt.show()
```



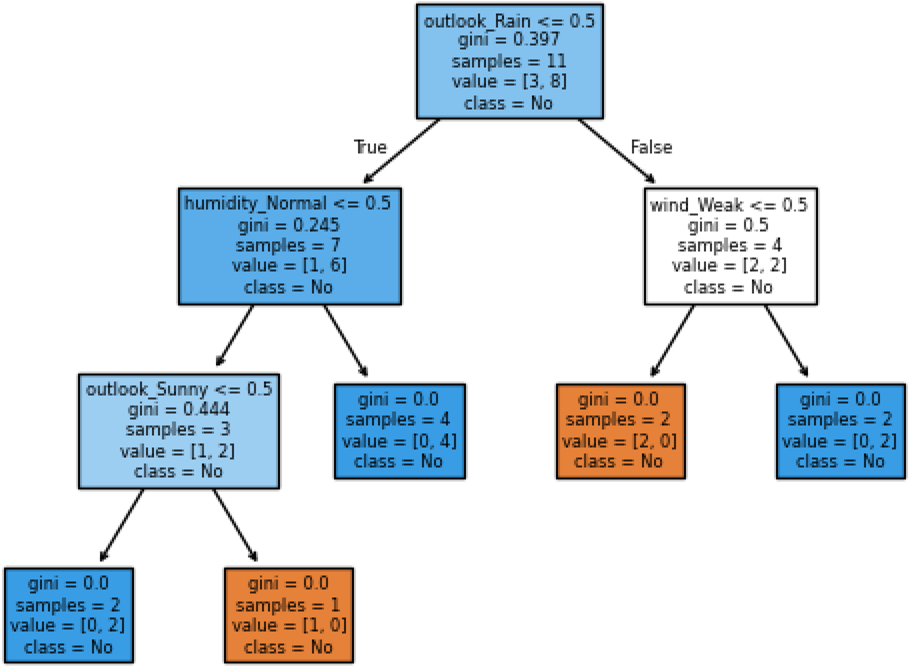
In [39]:
```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       1.00      1.00      1.00         2
           1       1.00      1.00      1.00         1

    accuracy                           1.00         3
   macro avg       1.00      1.00      1.00         3
weighted avg       1.00      1.00      1.00         3
```

In [40]:
```
plt.title('Dicision tree model')
plot_tree(final_model,class_names=df['play'],filled = True,feature_names= X.columns)
plt.show()
```



In [41]:

```
# iris,cancer,wineQuality,digits
```

Predict user input Value

In [42]:

```
df.iloc[:,:-1].sample()
```

Out[42]:

	outlook	temp	humidity	wind
9	Rain	Mild	Normal	Weak

In [43]:

```
for i in df:
  print(df[i].unique())
  print('--------------')
```

```
['Sunny' 'Overcast' 'Rain']
--------------
['Hot' 'Mild' 'Cool']
--------------
['High' 'Normal']
--------------
['Weak' 'Strong']
--------------
['No' 'Yes']
--------------
```

In [45]:

```
outlook = input("Enter Outlook (Sunny/Overcast/Rain): ").capitalize()
temp = input("Enter Temperature (Hot/Mild/Cool): ").capitalize()
humidity = input("Enter Humidity (High/Normal): ").capitalize()
wind = input("Enter Wind (Weak/Strong): ").capitalize()

all_features = pd.DataFrame([[outlook, temp, humidity, wind]],
                            columns=df.iloc[:, :-1].columns,
                            index=[df.shape[0]])

final_features = pd.DataFrame (pd.get_dummies(pd.concat([df.iloc[:, :-1], all_features], axis=0),
                                drop_first=True,dtype = int).iloc[-1, :]).T

final_ans = model.predict(final_features)
print('Tennis Play NO ❌')if final_ans == 0 else print('Tennis Play YES ✅')
```

```
Tennis Play YES ✅
```

In [ ]:

```
# Designed By : ALTAF HUSAIN DATA ANALYST
```