In [127…
```
import pandas as pd
```

In [128…
```
df = pd.read_csv("golf_dataset_long_format.csv")
df.head(20)
```

Out[128…

	Temperature	Humidity	Wind	Outlook	Play
0	3.3	49	1	3	1
1	3.3	49	1	3	0
2	3.3	49	1	3	0
3	3.3	49	1	3	1
4	3.3	49	1	3	1
5	3.3	49	1	3	0
6	3.3	49	1	3	0
7	2.9	53	0	3	1
8	2.9	53	0	3	0
9	2.9	53	0	3	1
10	2.9	53	0	3	0
11	2.9	53	0	3	0
12	2.9	53	0	3	0
13	2.9	53	0	3	0
14	2.3	58	0	1	0
15	2.3	58	0	1	0
16	2.3	58	0	1	1
17	2.3	58	0	1	0
18	2.3	58	0	1	0
19	2.3	58	0	1	0

In [129…
```
cols = list(df.columns)
print(cols)
```

```
['Temperature', 'Humidity', 'Wind', 'Outlook', 'Play']
```

In [130…
```
df.shape
```

Out[130…
```
(7665, 5)
```

In [131…
```
corrmat = df.corr()
top_corr_features = corrmat.index
```

```
corrmat
```

Out[131…

	Temperature	Humidity	Wind	Outlook	Play
Temperature	1.000000	0.683181	-0.162446	-0.113775	-0.021652
Humidity	0.683181	1.000000	-0.115711	-0.139317	-0.096551
Wind	-0.162446	-0.115711	1.000000	-0.028279	-0.054290
Outlook	-0.113775	-0.139317	-0.028279	1.000000	0.068390
Play	-0.021652	-0.096551	-0.054290	0.068390	1.000000

In [132…

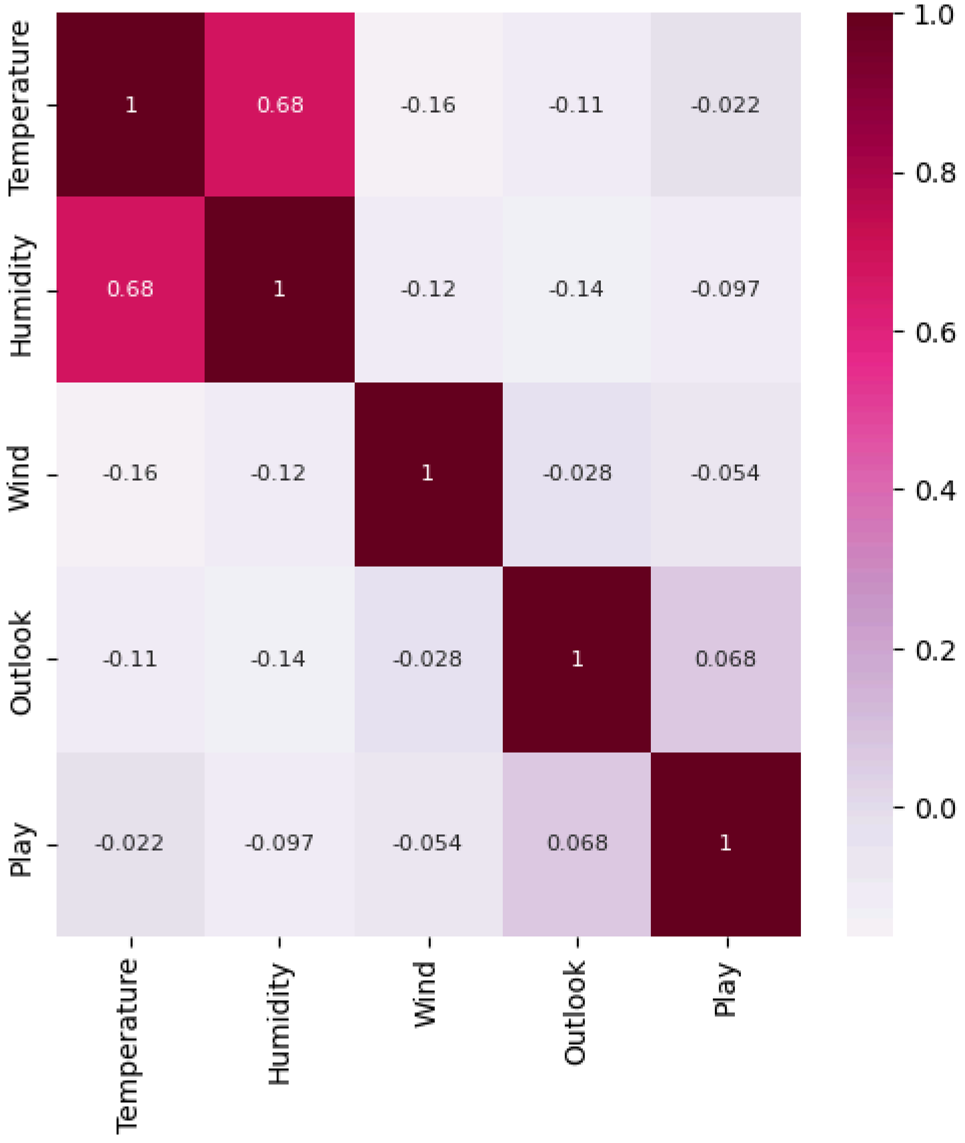
```
import matplotlib.pyplot as plt
import seaborn as sns
```

In [133…

```
plt.figure(figsize=(6,6))
sns.heatmap(df[top_corr_features].corr(),annot=True,cmap="PuRd", annot_kws={"fontsi
```

Out[133…

```
<Axes: >
```



In [134...
```
feature_cols= df.columns.drop(['Play'])
print(feature_cols)
```

```
Index(['Temperature', 'Humidity', 'Wind', 'Outlook'], dtype='object')
```

In [135...
```
feature_cols= ['Temperature','Humidity','Wind','Outlook']
print(feature_cols)
```

```
['Temperature', 'Humidity', 'Wind', 'Outlook']
```

In [136...
```
X = df[feature_cols]
X.head()
```

Out[136…

	Temperature	Humidity	Wind	Outlook
0	3.3	49	1	3
1	3.3	49	1	3
2	3.3	49	1	3
3	3.3	49	1	3
4	3.3	49	1	3

In [137…

```
y = df.Play
y.head()
```

Out[137…

```
0    1
1    0
2    0
3    1
4    1
Name: Play, dtype: int64
```

In [138…

```
from sklearn.model_selection import train_test_split
```

In [139…

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.25, random_
```

In [140…

```
len(y_train)
```

Out[140…

```
5748
```

In [141…

```
len(y_test)
```

Out[141…

```
1917
```

In [142…

```
from sklearn.tree import DecisionTreeClassifier
clf = DecisionTreeClassifier(criterion = "gini", max_depth=4)
```

In [143…

```
model= clf.fit(X_train, y_train)
```

In [144…

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

In [145…

```
len(y_pred)
```

Out[145…

```
1917
```

In [146…

```
len(y_test)
```

Out[146…

```
1917
```

In [147…

```
y = pd.DataFrame({"Actual": y_test, "Predicted": y_pred})
y.head()
```

Out[147…

	Actual	Predicted
1736	0	0
6056	0	0
7651	0	0
4467	1	0
7340	0	0

In [148…

```
y.tail()
```

Out[148…

	Actual	Predicted
2946	0	0
3208	1	0
526	0	0
5331	0	0
4745	0	0

In [149…

```
y.sample(10)
```

Out[149…

	Actual	Predicted
6543	0	0
4951	0	0
3015	0	0
4958	0	0
1452	0	0
593	0	0
5975	0	0
3653	0	0
7035	0	0
4233	0	0

In [150…

```
from sklearn import metrics
```

In [151…

```
c_mtrx = metrics.confusion_matrix(y_test, y_pred)
print("Confusion Matrix")
print(c_mtrx)
```

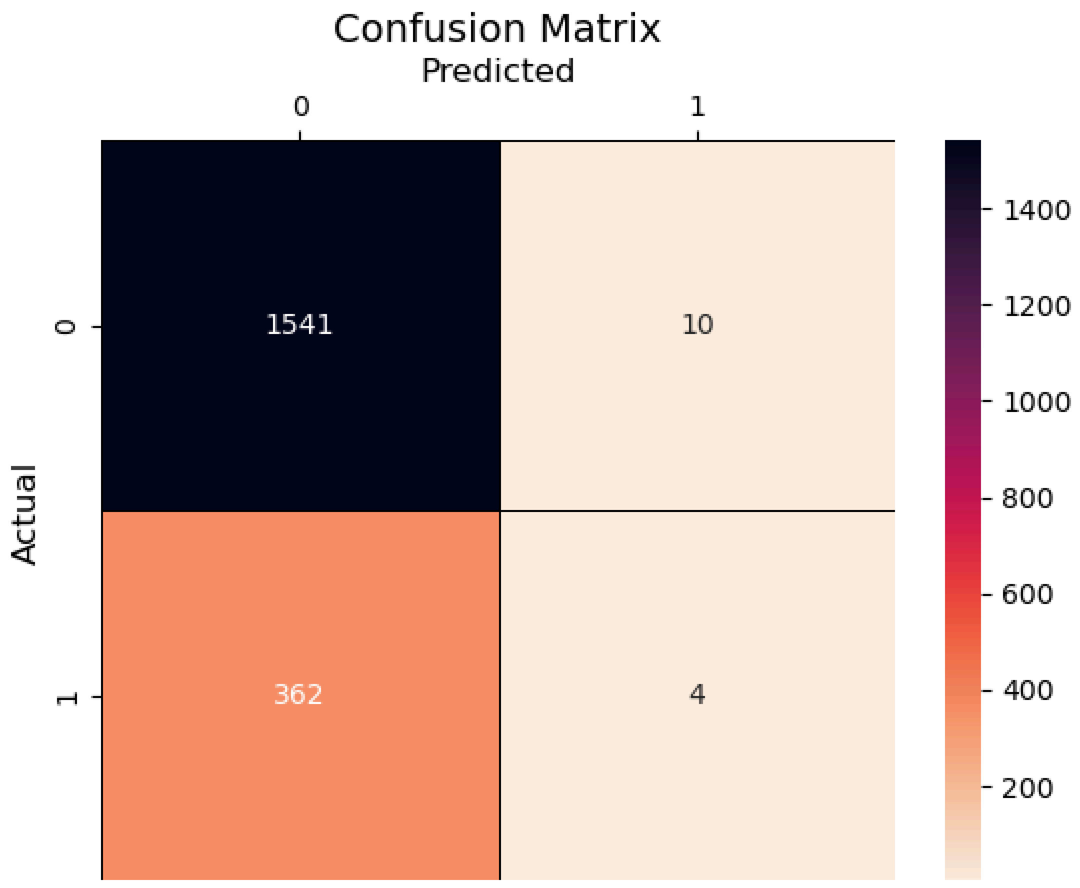
```
Confusion Matrix
[[1541   10]
 [ 362    4]]
```

In [152…

```
# Create the heatmap
ax = sns.heatmap(c_mtrx, annot=True, fmt='d', cbar=True, cmap="rocket_r", linewidth
# fmt='d' for integer format, using a colormap similar to the image

# Set predicted labels on top
ax.xaxis.tick_top() # Move the x-axis ticks (Predicted labels) to the top
ax.xaxis.set_label_position('top') # Move the x-axis label ('Predicted') to the top

# Set the axis labels and title
ax.set_xlabel('Predicted', fontsize=12)
ax.set_ylabel('Actual', fontsize=12)
ax.set_title('Confusion Matrix', fontsize=14)
```

Out[152…

```
Text(0.5, 1.0, 'Confusion Matrix')
```



In [153…

```
#[row, column]
#(Actual, Predict)
TN = c_mtrx[0, 0]
FP = c_mtrx[0, 1]
FN = c_mtrx[1, 0]
TP = c_mtrx[1, 1]

print("TN: ", TN, "\tFP: ", FP)
print("FN: ", FN, "\tTP: ", TP)
```

```
TN:  1541       FP:  10
FN:  362        TP:  4
```

In [47]:
```
print('Metrics computed from a confusion matrix')
print("Accuracy:\t", metrics.accuracy_score(y_test, y_pred))
print("Sensitivity:\t", metrics.recall_score(y_test, y_pred))
print("Specificity:\t",TN / (TN + FP))
print("Precision:\t", metrics.precision_score(y_test, y_pred))
print("Classification Eerror:", 1 - metrics.accuracy_score(y_test, y_pred))
print("False_Positive_Rate:", 1 - TN / (TN + FP))
```

```
Metrics computed from a confusion matrix
Accuracy:        0.8059467918622848
Sensitivity:     0.01092896174863388
Specificity:     0.9935525467440361
Precision:       0.2857142857142857
Classification Eerror: 0.1940532081377152
False_Positive_Rate: 0.006447453255963853
```

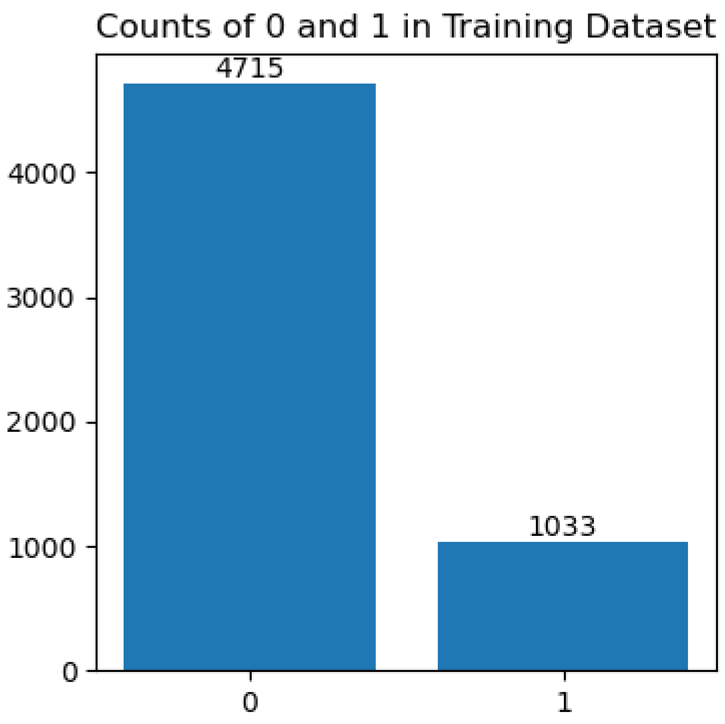
In [48]:
```
count0 = df['Play'][df.Play == 0].count()

count1 = df['Play'][df.Play == 1].count()

print("Actual Dataset")
print("0's:",count0)
print("1's:",count1)
```

```
Actual Dataset
0's: 6266
1's: 1399
```

In [49]:
```
Trcount0 = sum(y_train==0)
Trcount1 = sum(y_train==1)

print("Trained Dataset")
print("0's:",Trcount0)
print("1's:",Trcount1)
```

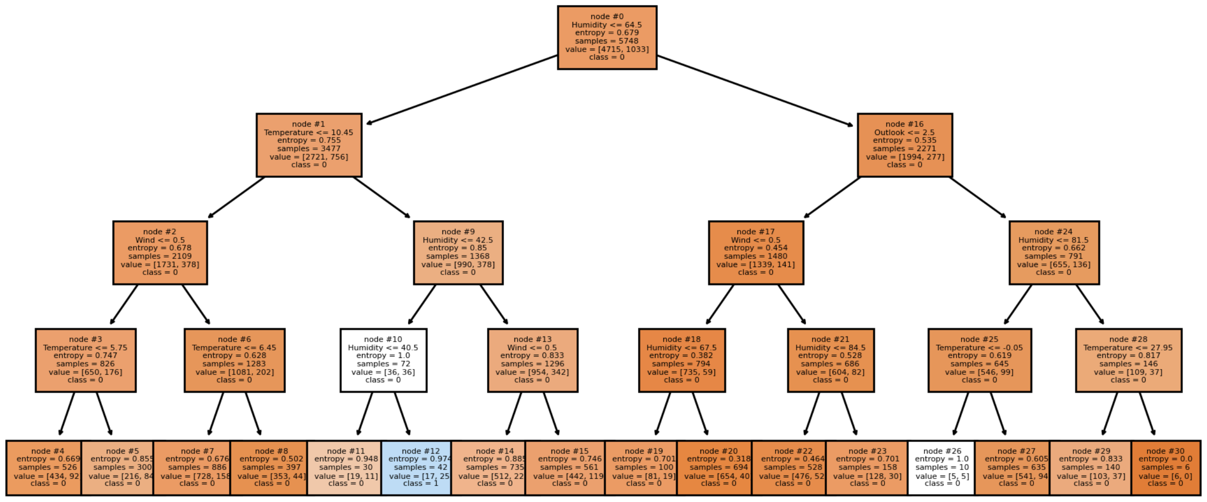
```
Trained Dataset
0's: 4715
1's: 1033
```

In [50]:
```
# Plotting the bar chart
labels = ['0', '1']
counts = [Trcount0, Trcount1]
plt.figure(figsize=(4,4))
plt.title('Counts of 0 and 1 in Training Dataset')
plt.bar(labels, counts)
# Add annotations to the bars
for i, count in enumerate(counts):
    plt.text(i, count, str(count), ha='center', va='bottom')

plt.show()
```



In [51]:
```
from sklearn import tree
```

In [52]:
```
# Plot the decision tree with customizations
plt.figure(figsize=(11, 5), dpi=200)
# plt.title("Decision Tree Visualization")
tree.plot_tree(clf, filled=True, feature_names=list(X_train.columns), class_names=[
                                    fontsize=4, max_depth=4, node_ids=True)

plt.show()
```



In [53]:
```
text_representation = tree.export_text(clf, feature_names=list(X_train.columns))
print(text_representation)
```

```
|--- Humidity <= 64.50
|   |--- Temperature <= 10.45
|   |   |--- Wind <= 0.50
|   |   |   |--- Temperature <= 5.75
|   |   |   |   |--- class: 0
|   |   |   |--- Temperature >  5.75
|   |   |   |   |--- class: 0
|   |   |--- Wind >  0.50
|   |   |   |--- Temperature <= 6.45
|   |   |   |   |--- class: 0
|   |   |   |--- Temperature >  6.45
|   |   |   |   |--- class: 0
|   |--- Temperature >  10.45
|   |   |--- Humidity <= 42.50
|   |   |   |--- Humidity <= 40.50
|   |   |   |   |--- class: 0
|   |   |   |--- Humidity >  40.50
|   |   |   |   |--- class: 1
|   |   |--- Humidity >  42.50
|   |   |   |--- Wind <= 0.50
|   |   |   |   |--- class: 0
|   |   |   |--- Wind >  0.50
|   |   |   |   |--- class: 0
|--- Humidity >  64.50
|   |--- Outlook <= 2.50
|   |   |--- Wind <= 0.50
|   |   |   |--- Humidity <= 67.50
|   |   |   |   |--- class: 0
|   |   |   |--- Humidity >  67.50
|   |   |   |   |--- class: 0
|   |   |--- Wind >  0.50
|   |   |   |--- Humidity <= 84.50
|   |   |   |   |--- class: 0
|   |   |   |--- Humidity >  84.50
|   |   |   |   |--- class: 0
|   |--- Outlook >  2.50
|   |   |--- Humidity <= 81.50
|   |   |   |--- Temperature <= -0.05
|   |   |   |   |--- class: 0
|   |   |   |--- Temperature >  -0.05
|   |   |   |   |--- class: 0
|   |   |--- Humidity >  81.50
|   |   |   |--- Temperature <= 27.95
|   |   |   |   |--- class: 0
|   |   |   |--- Temperature >  27.95
|   |   |   |   |--- class: 0
```

In [ ]:

In [ ]:

In [ ]:

In [ ]: