```
In [55]: import numpy as np
   import pandas as pd
   import matplotlib.pyplot as plt
   import seaborn as sns
   from sklearn.ensemble import RandomForestClassifier
   from sklearn.model_selection import train_test_split
   from sklearn import tree
   from sklearn.metrics import accuracy_score
```

In [56]: data = pd.read_csv("seattle-weather.csv")
 data.head()

Out[56]:

	date	precipitation	temp_max	temp_min	wind	weather
0	2012-01-01	0.0	12.8	5.0	4.7	drizzle
1	2012-01-02	10.9	10.6	2.8	4.5	rain
2	2012-01-03	0.8	11.7	7.2	2.3	rain
3	2012-01-04	20.3	12.2	5.6	4.7	rain
4	2012-01-05	1.3	8.9	2.8	6.1	rain

In [40]: data.tail()

Out[40]:

	date	precipitation	temp_max	temp_min	wind	weather
1456	2015-12-27	8.6	4.4	1.7	2.9	rain
1457	2015-12-28	1.5	5.0	1.7	1.3	rain
1458	2015-12-29	0.0	7.2	0.6	2.6	fog
1459	2015-12-30	0.0	5.6	-1.0	3.4	sun
1460	2015-12-31	0.0	5.6	-2.1	3.5	sun

In [41]: data.info()

<class 'pandas.core.frame.DataFrame'> RangeIndex: 1461 entries, 0 to 1460 Data columns (total 6 columns): 1461 non-null object date precipitation 1461 non-null float64 temp_max 1461 non-null float64 temp_min 1461 non-null float64 wind 1461 non-null float64 weather 1461 non-null object dtypes: float64(4), object(2)

memory usage: 68.6+ KB

In [42]: data.isnull()

Out[42]:

	date	precipitation	temp_max	temp_min	wind	weather
0	False	False	False	False	False	False
1	False	False	False	False	False	False
2	False	False	False	False	False	False
3	False	False	False	False	False	False
4	False	False	False	False	False	False
1456	False	False	False	False	False	False
1457	False	False	False	False	False	False
1458	False	False	False	False	False	False
1459	False	False	False	False	False	False
1460	False	False	False	False	False	False

1461 rows × 6 columns

```
data.isnull().sum()
In [43]:
Out[43]: date
                           0
         precipitation
                           0
         temp_max
                           0
         temp_min
                           0
         wind
                           0
         weather
                           0
         dtype: int64
In [44]: data.columns
Out[44]: Index(['date', 'precipitation', 'temp_max', 'temp_min', 'wind', 'weather'], dty
         pe='object')
```

```
In [45]: data.describe()
```

Out[45]:

	precipitation	temp_max	temp_min	wind
count	1461.000000	1461.000000	1461.000000	1461.000000
mean	3.029432	16.439083	8.234771	3.241136
std	6.680194	7.349758	5.023004	1.437825
min	0.000000	-1.600000	- 7.100000	0.400000
25%	0.000000	10.600000	4.400000	2.200000
50%	0.000000	15.600000	8.300000	3.000000
75%	2.800000	22.200000	12.200000	4.000000
max	55.900000	35.600000	18.300000	9.500000

```
In [86]: data["temp_max"].count()
Out[86]: 1461
In [98]: data["temp_max"].max()
Out[98]: 35.6
In [99]: data["wind"].max()
```

```
Out[99]: 9.5
```

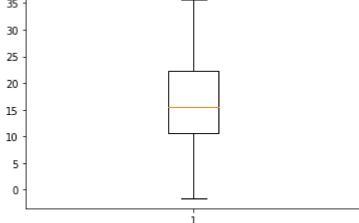
5.0

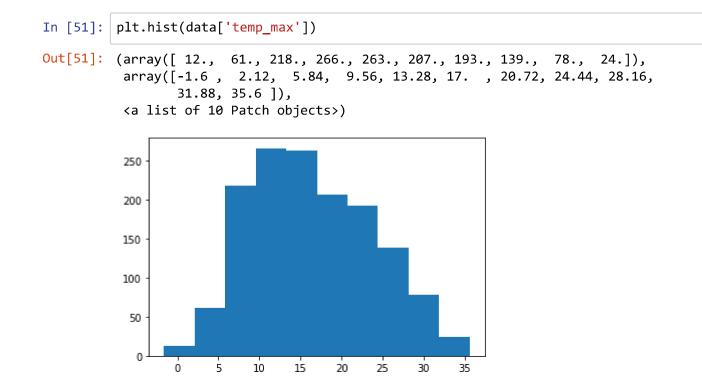
```
Out[103]: 1
                    10.6
           2
                    11.7
           3
                    12.2
           4
                     8.9
           5
                     4.4
           1452
                     5.0
           1453
                     5.6
           1454
                     5.0
           1456
                     4.4
```

1457

Name: temp_max, Length: 641, dtype: float64

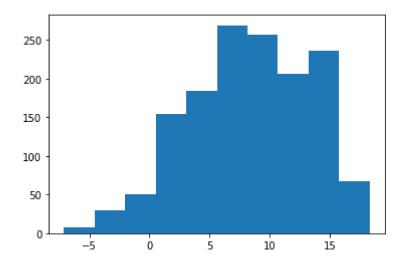
```
In [106]:
          x=data["wind"]
           y=data["weather"]=='rain'
           z=x[y]
Out[106]: 1
                   4.5
          2
                   2.3
          3
                   4.7
                   6.1
          4
          5
                   2.2
                  . . .
                   7.6
          1452
          1453
                   4.3
          1454
                   1.5
          1456
                   2.9
          1457
                   1.3
          Name: wind, Length: 641, dtype: float64
          data.duplicated().sum()
 In [46]:
 Out[46]: 0
          plt.boxplot(data["precipitation"])
 In [47]:
 Out[47]: {'whiskers': [<matplotlib.lines.Line2D at 0x1d121a80fc8>,
             <matplotlib.lines.Line2D at 0x1d121a80bc8>],
            'caps': [<matplotlib.lines.Line2D at 0x1d121a85c88>,
             <matplotlib.lines.Line2D at 0x1d121a85d88>],
            'boxes': [<matplotlib.lines.Line2D at 0x1d121a80948>],
            'medians': [<matplotlib.lines.Line2D at 0x1d121a85e08>],
            'fliers': [<matplotlib.lines.Line2D at 0x1d121a8ccc8>],
            'means': []}
                                     8
            50
                                     0
                                     o
            40
            30
            20
            10
            0
```





2

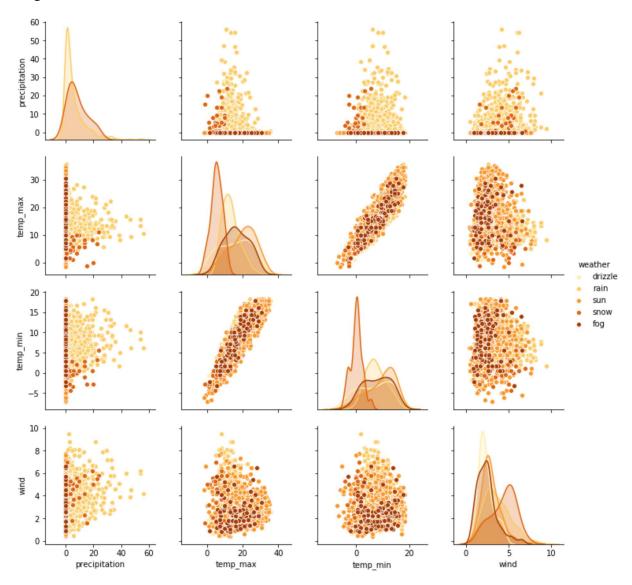
Out[52]: (array([8., 30., 50., 154., 184., 269., 257., 206., 236., 67.]), array([-7.1 , -4.56, -2.02, 0.52, 3.06, 5.6 , 8.14, 10.68, 13.22, 15.76, 18.3]), <a list of 10 Patch objects>)



```
In [53]: plt.figure(figsize=(10,5))
    sns.pairplot(data.drop('date',axis=1),hue='weather',palette="YlOrBr")
    plt.show()
```

C:\Users\Rgukt iiit\Anaconda3\anaconda\lib\site-packages\statsmodels\nonparamet
ric\kde.py:487: RuntimeWarning: invalid value encountered in true_divide
 binned = fast_linbin(X, a, b, gridsize) / (delta * nobs)
C:\Users\Rgukt iiit\Anaconda3\anaconda\lib\site-packages\statsmodels\nonparamet
ric\kdetools.py:34: RuntimeWarning: invalid value encountered in double_scalars
 FAC1 = 2*(np.pi*bw/RANGE)**2

<Figure size 720x360 with 0 Axes>

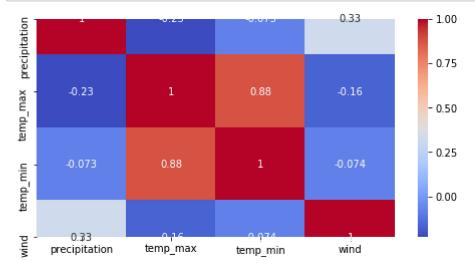


In [54]: data.corr()

Out[54]:

	precipitation	temp_max	temp_min	wind
precipitation	1.000000	-0.228555	-0.072684	0.328045
temp_max	-0.228555	1.000000	0.875687	-0.164857
temp_min	-0.072684	0.875687	1.000000	-0.074185
wind	0.328045	-0.164857	-0.074185	1.000000

In [19]: cor=data.corr()
 plt.figure(figsize=(8,4))
 sns.heatmap(cor,annot=True,cmap="coolwarm")
 plt.show()



 In [21]: x_test

Out[21]:

	precipitation	temp_max	temp_min	wind
530	0.0	20.0	12.2	3.7
657	0.0	10.6	7.8	1.4
459	8.4	14.4	10.0	3.0
279	0.0	23.9	7.8	5.1
656	0.0	12.8	7.2	1.2
440	4.3	10.6	4.4	6.4
634	0.0	17.2	7.2	2.2
494	0.0	22.8	10.0	1.3
61	2.0	6.7	3.9	5.1
517	0.0	22.8	12.2	2.5

293 rows × 4 columns

In [22]: x_train

Out[22]:

	precipitation	temp_max	temp_min	wind
646	6.9	13.9	7.8	3.0
92	0.0	16.7	4.4	3.1
818	14.0	11.7	7.2	5.1
302	10.9	15.6	10.0	4.9
1259	0.0	23.9	9.4	2.6
763	0.0	8.9	1.1	2.5
835	0.5	14.4	7.8	4.0
1216	0.0	18.3	8.9	3.7
559	0.0	26.1	11.1	3.1
684	3.0	10.6	7.2	6.0

1168 rows × 4 columns

```
In [23]:
         y_test
Out[23]: 530
                  sun
          657
                  sun
          459
                 rain
          279
                  sun
         656
                  sun
         440
                 rain
         634
                  sun
         494
                  sun
         61
                 rain
         517
                  sun
         Name: weather, Length: 293, dtype: object
         y_train
In [24]:
Out[24]: 646
                  rain
         92
                   sun
         818
                  rain
          302
                  rain
         1259
                   sun
                  . . .
         763
                   sun
         835
                  rain
         1216
                   sun
          559
                   sun
                  rain
         684
         Name: weather, Length: 1168, dtype: object
In [25]:
         print(x_train.shape)
          print(y_train.shape)
          print(x_test.shape)
          print(y_test.shape)
          (1168, 4)
          (1168,)
          (293, 4)
          (293,)
```

```
In [26]: model=tree.DecisionTreeClassifier()
    my_model=model.fit(x_train,y_train)
    y_pred=my_model.predict(x_test)
    y_pred
```

Out[26]: array(['sun', 'drizzle', 'rain', 'sun', 'drizzle', 'rain', 'rain', 'rain', 'sun', 'rain', 'drizzle', 'rain', 'sun', 'sun', 'drizzle', 'sun', 'drizzle', 'rain', 'rain', 'rain', 'rain', 'rain', 'sun', 'drizzle', 'sun', 'sun', 'rain', 'sun', 'sun', 'rain', 'rain', 'rain', 'rain', 'sun', 'rain', 'sun', 'rain', 'sun', 'rain', 'sun', 'rain', 'rain', 'drizzle', 'drizzle', 'drizzle', 'sun', 'sun', 'sun', 'sun', 'sun', 'rain', 'rain', 'drizzle', 'sun', 'rain', 'sun', 'sun', 'sun', 'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'rain', 'snow', 'rain', 'drizzle', 'fog', 'sun', 'sun', 'drizzle', 'rain', 'rain', 'sun', 'sun', 'rain', 'rain', 'drizzle', 'sun', 'rain', 'sun', 'sun', 'sun', 'rain', 'sun', 'rain', 'snow', 'sun', 'drizzle', 'sun', 'sun', 'rain', 'rain', 'sun', 'rain', 'rain', 'sun', 'rain', 'rain', 'fog', 'sun', 'rain', 'sun', 'rain', 'fog', 'sun', 'sun', 'sun', 'rain', 'rain', 'sun', 'rain', 'rain', 'sun', 'rain', 'ra 'sun', 'rain', 'rain', 'drizzle', 'sun', 'sun', 'sun', 'rain', 'rain', 'sun', 'drizzle', 'rain', 'rain', 'sun', 'fog', 'sun', 'sun', 'sun', 'rain', 'fog', 'rain', 'sun', 'sun', 'rain', 'sun', 'sun', 'drizzle', 'rain', 'fog', 'rain', 'rain', 'fog', 'rain', 'rain', 'fog', 'sun', 'rain', 'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'sun', 'sun', 'rain', 'fog', 'rain', 'drizzle', 'sun', 'rain', 'rain', 'rain', 'sun', 'sun', 'fog', 'sun', 'rain', 'rain', 'sun', 'drizzle', 'rain', 'sun', 'rain', 'rain', 'fog', 'sun', 'rain', 'rain', 'rain', 'drizzle', 'fog', 'drizzle', 'snow', 'rain', 'rain', 'rain', 'fog', 'sun', 'fog', 'rain', 'rain', 'rain', 'fog', 'sun', 'sun', 'rain', 'sun', 'sun', 'sun', 'rain', 'drizzle', 'drizzle', 'rain', 'rain', 'rain', 'rain', 'rain', 'fog', 'rain', 'rain', 'sun', 'rain', 'sun', 'rain', 'drizzle', 'rain', 'sun', 'fog', 'sun', 'sun', 'rain', 'snow', 'sun', 'sun', 'sun', 'sun', 'sun', 'rain', 'fog', 'sun', 'sun', 'fog', 'rain', 'sun', 'rain', 'drizzle', 'fog', 'sun', 'sun', 'rain', 'rain', 'drizzle', 'sun', 'rain', 'sun', 'rain', 'fog', 'rain', 'rain', 'rain', 'sun', 'sun', 'rain', 'sun', 'rain', 'fog', 'fog', 'rain', 'sun'], dtype=object)

```
In [27]: accuracy_score(y_pred,y_test)
```

Out[27]: 0.6996587030716723

```
In [28]: model_2=RandomForestClassifier()
    rmodel=model_2.fit(x_train,y_train)
    r_ypred=rmodel.predict(x_test)
    r_ypred
```

C:\Users\Rgukt iiit\Anaconda3\anaconda\lib\site-packages\sklearn\ensemble\fores t.py:245: FutureWarning: The default value of n_estimators will change from 10 in version 0.20 to 100 in 0.22.

"10 in version 0.20 to 100 in 0.22.", FutureWarning)

```
Out[28]: array(['sun', 'drizzle', 'rain', 'sun', 'fog', 'rain', 'rain', 'rain',
                 'sun', 'rain', 'sun', 'rain', 'sun', 'sun', 'drizzle', 'sun',
                 'fog', 'rain', 'rain', 'rain', 'rain', 'rain', 'sun',
                 'sun', 'sun', 'sun', 'rain', 'sun', 'rain', 'rain', 'rain',
                 'rain', 'sun', 'rain', 'sun', 'rain', 'sun', 'rain',
                 'rain', 'rain', 'sun', 'fog', 'drizzle', 'sun', 'sun', 'sun',
                 'sun', 'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'sun',
                 'rain', 'sun', 'sun', 'sun', 'fog', 'rain', 'sun', 'sun',
                 'sun', 'rain',
                                'rain', 'rain', 'rain', 'fog', 'sun', 'sun', 'sun',
                 'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'rain', 'rain', 'sun',
'sun', 'rain', 'sun', 'rain', 'sun', 'rain', 'sun', 'rain',
'rain', 'sun', 'sun', 'sun', 'rain', 'sun', 'sun', 'rain',
                 'rain', 'sun', 'rain', 'rain', 'sun', 'rain', 'sun', 'rain',
                 'sun', 'sun', 'sun', 'fog', 'rain', 'rain', 'sun', 'rain',
                 'rain', 'fog', 'rain', 'sun', 'sun', 'sun', 'rain', 'rain',
                 'rain', 'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'rain', 'sun', 'sun',
                 'sun', 'sun', 'sun', 'rain', 'fog', 'rain', 'sun', 'sun',
                 'rain', 'sun', 'sun', 'drizzle', 'rain', 'sun', 'rain', 'rain',
                 'fog', 'rain', 'rain', 'rain', 'sun', 'sun', 'sun', 'rain',
                 'rain', 'sun', 'sun', 'sun', 'sun', 'rain', 'sun',
                 'rain', 'sun', 'sun', 'rain', 'sun', 'sun', 'sun', 'sun',
                 'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'rain', 'rain', 'fog', 'sun', 'rain', 'rain', 'fog', 'sun', 'fog', 'rain',
                 'rain', 'rain', 'rain', 'fog', 'sun', 'sun', 'rain', 'rain',
                 'rain', 'fog', 'sun', 'sun', 'rain', 'sun', 'sun', 'sun',
                 'rain', 'sun', 'rain', 'rain', 'rain', 'rain', 'sun',
                                'rain', 'rain', 'sun', 'rain', 'sun', 'rain',
                        'fog',
                 'rain', 'sun', 'rain', 'sun', 'sun', 'sun', 'sun', 'rain',
                 'rain', 'sun', 'sun', 'sun', 'sun', 'sun', 'rain', 'fog',
                 'sun', 'sun', 'sun', 'rain', 'sun', 'fog', 'fog',
                 'sun', 'rain', 'rain', 'drizzle', 'sun', 'rain', 'sun', 'rain',
                 'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'rain', 'sun',
                 'rain', 'sun', 'rain', 'sun'], dtype=object)
```

```
In [29]: accuracy_score(r_ypred,y_test)
```

Out[29]: 0.7610921501706485

```
model 2=RandomForestClassifier(criterion='entropy',n estimators=100)
In [30]:
                                            rmodel=model_2.fit(x_train,y_train)
                                             r_ypred=rmodel.predict(x_test)
                                            r ypred
Out[30]: array(['sun', 'drizzle', 'rain', 'sun', 'fog', 'rain', 'rain', 'rain',
                                                                             'sun', 'rain', 'sun', 'rain', 'sun', 'sun', 'drizzle', 'sun',
                                                                            'fog', 'rain',
                                                                                                                                             'rain', 'rain', 'rain', 'rain', 'sun',
                                                                           'sun', 'sun', 'sun', 'rain', 'sun', 'rain', 'rain', 'rain', 'rain', 'sun', 'rain', 'sun', 'rain', 'sun', 'rain', 'sun', '
                                                                            'sun', 'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'sun',
                                                                           'rain', 'sun', 'sun', 'sun', 'fog', 'rain', 'sun', 'sun',
                                                                             'sun', 'rain', 'rain', 'rain', 'sun', 'sun', 'sun', 'sun',
                                                                           'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'rain', 'rain',
                                                                            'drizzle', 'sun', 'rain', 'sun', 'rain', 'sun', 'sun', 'rain',
                                                                             'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'rain', 'rain',
                                                                           'sun', 'rain', 'rain', 'rain', 'rain', 'sun', 'sun', 'rain',
                                                                           'sun', 'rain', 'sun', 'sun', 'sun', 'sun', 'rain', 'rain', 'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'sun', 'sun', 'sun', 'sun', 'rain', 'rain', 'rain', 'rain', 'sun', 
                                                                                                       'sun', 'rain', 'rain', 'sun', 'sun', 'rain', 'rain',
                                                                           'sun', 'sun', 'sun', 'sun', 'sun', 'rain', 'fog', 'rain',
                                                                            'sun', 'sun', 'rain', 'sun', 'drizzle', 'rain', 'sun',
                                                                           'rain', 'rain', 'fog', 'rain', 'rain', 'sun', 'sun', 'sun',
                                                                             'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'sun', 'sun',
                                                                           'rain', 'sun', 'rain', 'fog', 'sun', 'rain', 'rain', 'sun', 'sun'
                                                                            'rain', 'sun', 'sun', 'rain', 'rain', 'rain', 'sun', 'sun',
                                                                           'sun', 'snow', 'rain', 'rain', 'fog', 'sun', 'sun', 'rain',
                                                                                                            'rain', 'sun', 'sun', 'rain', 'sun', 'sun', 'sun',
                                                                           'sun', 'rain', 'sun', 'fog', 'rain', 'rain', 'rain', 'rain', 'rain', 'sun', 'rain', 'rain
                                                                                                                                              'sun', 'fog', 'rain', 'rain', 'rain', 'rain', 'sun',
                                                                           'rain', 'sun', 'rain', 'sun', 'sun', 'sun', 'sun', 'rain', 'rain', 'sun', 'sun', 'sun', 'sun', 'sun', 'fog',
                                                                            'sun', 'sun', 'sun', 'rain', 'sun', 'fog', 'sun',
                                                                            'sun', 'rain', 'rain', 'drizzle', 'sun', 'rain', 'sun', 'rain',
                                                                            'sun', 'rain', 'rain', 'sun', 'drizzle', 'sun', 'rain',
                                                                             'sun', 'rain', 'sun', 'rain', 'sun'], dtype=object)
In [31]: | accuracy score(r ypred,y test)
Out[31]: 0.764505119453925
In [32]: r_ypred=rmodel.predict([[0.5,29.0,26.0,14.0]])
                                            r_ypred
Out[32]: array(['rain'], dtype=object)
In [33]:
                                           r ypred=model.predict([[0,31.0,29.0,21.0]])
                                             r ypred
Out[33]: array(['fog'], dtype=object)
```

```
In [62]:
         r_ypred=model.predict([[5.4,31.5,28.0,28.0]])
         r_ypred
Out[62]: array(['rain'], dtype=object)
         r_ypred=model.predict([[0,8.3,2.8,4.1]])
In [36]:
         r_ypred
Out[36]: array(['fog'], dtype=object)
In [69]: | new_data=[[0.0,0.0,0.0,0.0]]
         precipitation=float(input("enter precipitation"))
         temp_max=float(input("enter max temperature"))
         temp min=float(input("enter min temperature"))
         wind=float(input("enter wind"))
         new_data=[[precipitation,temp_max,temp_min,wind]]
         if(temp_max==0 or temp_min==0 or wind==0):
             print('invalid')
         else:
              r_ypred=model.predict(new_data)
             print(r ypred)
         enter precipitation0
         enter max temperature0
         enter min temperature0
         enter wind0
         invalid
 In [ ]:
```