Weather Prediction

In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import scipy
from scipy import stats
from scipy.stats import ttest_ind
from sklearn.preprocessing import StandardScaler,LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC
```

In [2]:
```
import pandas as pd
weather_df=pd.read_csv("project dataset weather.csv")
weather_df
```

Out[2]:

	date	precipitation	temp_max	temp_min	wind	weather
0	1/1/2012	0.0	12.8	5.0	4.7	drizzle
1	1/2/2012	10.9	10.6	2.8	4.5	rain
2	1/3/2012	0.8	11.7	7.2	2.3	rain
3	1/4/2012	20.3	12.2	5.6	4.7	rain
4	1/5/2012	1.3	8.9	2.8	6.1	rain
...	...	...	...	...	...	...
1456	12/27/2015	8.6	4.4	1.7	2.9	rain
1457	12/28/2015	1.5	5.0	1.7	1.3	rain
1458	12/29/2015	0.0	7.2	0.6	2.6	fog
1459	12/30/2015	0.0	5.6	-1.0	3.4	sun
1460	12/31/2015	0.0	5.6	-2.1	3.5	sun

1461 rows × 6 columns

In [8]:
```
weather_df.shape
```

Out[8]:
```
(1461, 6)
```

In [9]:
```
weather_df.head()
```

Out[9]:

	date	precipitation	temp_max	temp_min	wind	weather
0	1/1/2012	0.0	12.8	5.0	4.7	drizzle
1	1/2/2012	10.9	10.6	2.8	4.5	rain
2	1/3/2012	0.8	11.7	7.2	2.3	rain
3	1/4/2012	20.3	12.2	5.6	4.7	rain
4	1/5/2012	1.3	8.9	2.8	6.1	rain

In [10]:
```
weather_df.info
```

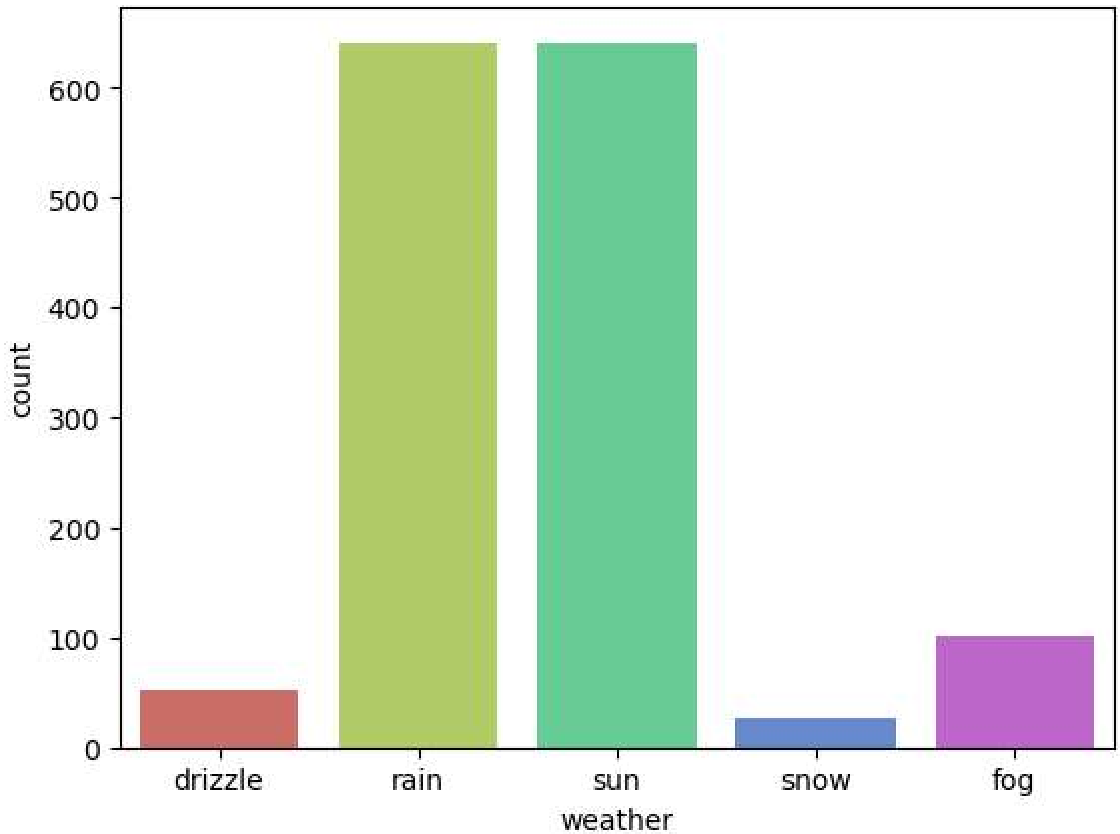
Out[10]:
```
<bound method DataFrame.info of              date  precipitation  temp_max  te
mp_min  wind  weather
0       1/1/2012            0.0      12.8       5.0   4.7  drizzle
1       1/2/2012           10.9      10.6       2.8   4.5     rain
2       1/3/2012            0.8      11.7       7.2   2.3     rain
3       1/4/2012           20.3      12.2       5.6   4.7     rain
4       1/5/2012            1.3       8.9       2.8   6.1     rain
...          ...            ...       ...       ...   ...      ...
1456  12/27/2015            8.6       4.4       1.7   2.9     rain
1457  12/28/2015            1.5       5.0       1.7   1.3     rain
1458  12/29/2015            0.0       7.2       0.6   2.6      fog
1459  12/30/2015            0.0       5.6      -1.0   3.4      sun
1460  12/31/2015            0.0       5.6      -2.1   3.5      sun

[1461 rows x 6 columns]>
```

In [11]:
```
weather_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1461 entries, 0 to 1460
Data columns (total 6 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   date           1461 non-null   object 
 1   precipitation  1461 non-null   float64
 2   temp_max       1461 non-null   float64
 3   temp_min       1461 non-null   float64
 4   wind           1461 non-null   float64
 5   weather        1461 non-null   object 
dtypes: float64(4), object(2)
memory usage: 68.6+ KB
```

In [11]:
```
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
sns.countplot(x="weather",data =weather_df,palette="hls")
```

Out[11]: <Axes: xlabel='weather', ylabel='count'>



In [13]:
```
#From the Above countplot the data set contains higher amount of data with the
#it also have some additionals like drizzle,snow and fog.
```

In [14]:
```
countrain=len(weather_df[weather_df.weather=="rain"])
countsun=len(weather_df[weather_df.weather=="sun"])
countdrizzle=len(weather_df[weather_df.weather=="drizzle"])
countsnow=len(weather_df[weather_df.weather=="snow"])
countfog=len(weather_df[weather_df.weather=="fog"])
print("Percent of Rain:{:2f}%".format((countrain/(len(weather_df.weather))*100
print("Percent of Sun:{:2f}%".format((countsun/(len(weather_df.weather))*100))
print("Percent of Drizzle:{:2f}%".format((countdrizzle/(len(weather_df.weather
print("Percent of Snow:{:2f}%".format((countsnow/(len(weather_df.weather))*100
print("Percent of Fog:{:2f}%".format((countfog/(len(weather_df.weather))*100))
```

```
Percent of Rain:43.874059%
Percent of Sun:43.805613%
Percent of Drizzle:3.627652%
Percent of Snow:1.779603%
Percent of Fog:6.913073%
```

NUMERICAL OR CONTINUOUS VARIABLES

Next we will explore the ***Continuous variables***

In [15]:
```
weather_df[["precipitation","temp_max","temp_min","wind"]].describe()
```

Out[15]:

	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

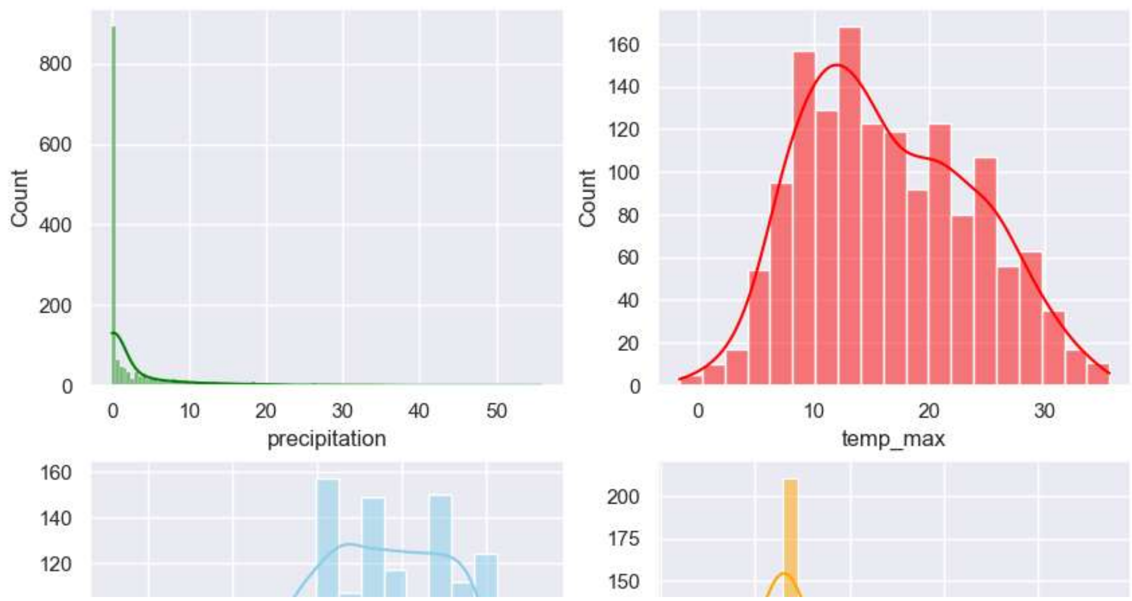
Distribution of numerical value using Histogram plot .

In [16]:
```
#From the above distribution it is clear that precipitation and wind are Posit

#And temp_min is Negatively skewed and both has some outliers.
```

In [17]:
```
#We can find the outliers in the dataset by using following plots:

 # 1.Hist plot
 # 2.Box plot
 # 4.Dist plot
# yet both box and violin plots are easier to handel with
```

In [18]:
```
import matplotlib.pyplot as plt
sns.set(style="darkgrid")
fig,axs=plt.subplots(2,2,figsize=(10,8))
sns.histplot(data=weather_df,x="precipitation",kde=True,ax=axs[0,0],color='gre
sns.histplot(data=weather_df,x="temp_max",kde=True,ax=axs[0,1],color='red')
sns.histplot(data=weather_df,x="temp_min",kde=True,ax=axs[1,0],color='skyblue'
sns.histplot(data=weather_df,x="wind",kde=True,ax=axs[1,1],color='orange')
```

Out[18]:
```
<Axes: xlabel='wind', ylabel='Count'>
```



BELOW DIAGRAM SHOWS THE EXACT OF HOW THE SKEWNESS LOOKS

HOW TO FIND THE OUTILERS OR SKEW IN DATA SET

In [19]:
```
![skw.png](attachment:395c4894-9fd5-4d09-b1ea-4b89be44c12d.png)
```

```
'[skw.png]' is not recognized as an internal or external command,
operable program or batch file.
```

HEATMAP

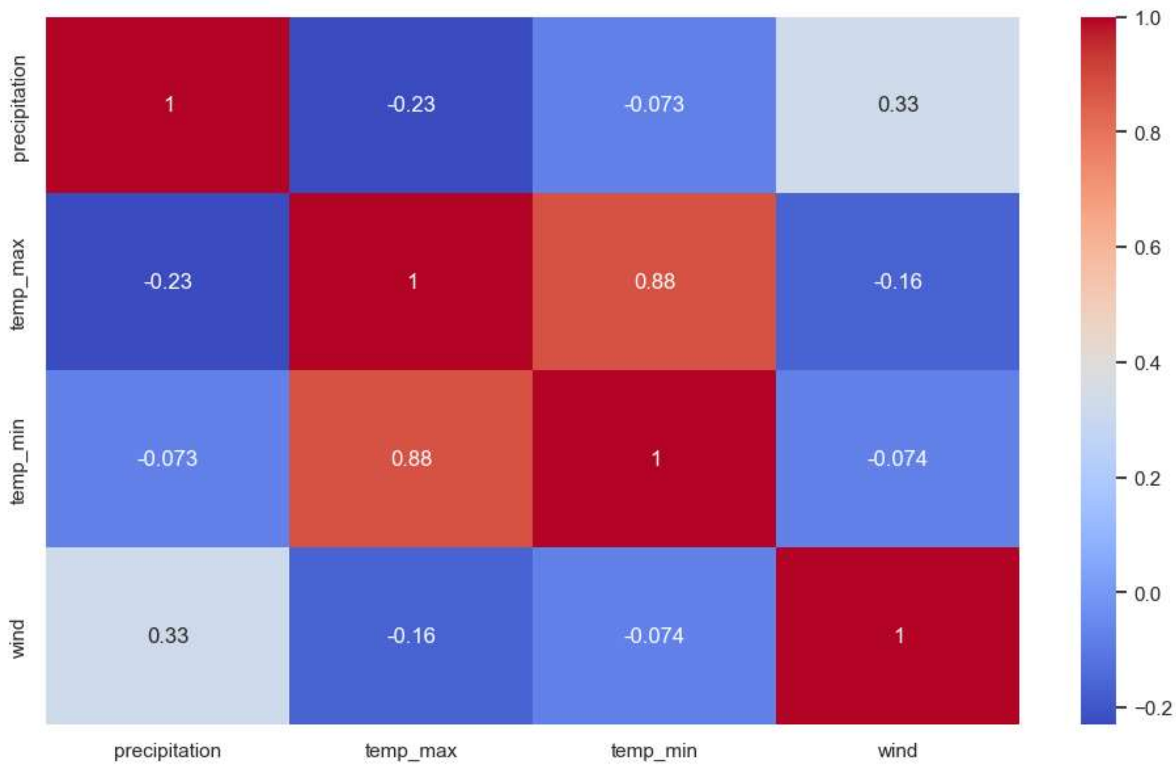
In [20]:
```
# Get the most important features
weather_df.corr()
```

Out[20]:

	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 [21]:
```
plt.figure(figsize=(12,7))
sns.heatmap(weather_df.corr(),annot=True,cmap= 'coolwarm')
```

Out[21]: <Axes: >

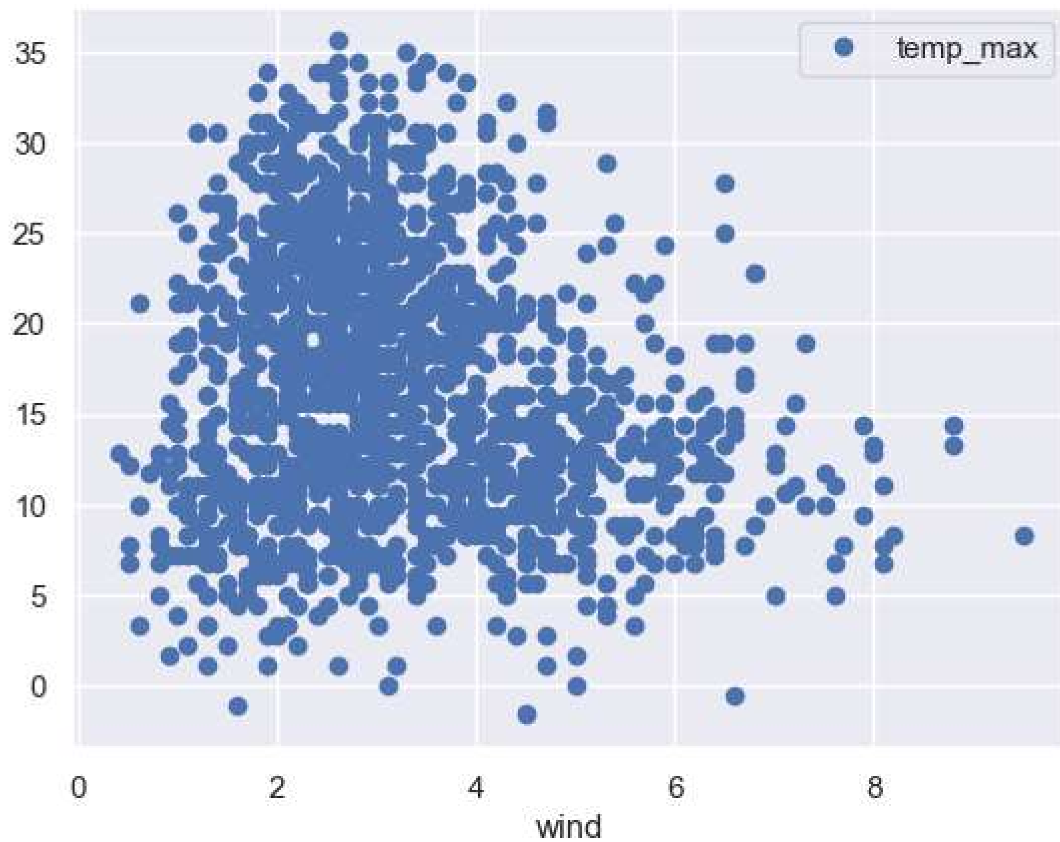


In [22]:
```
#There is a positive correlation between temp_max and temp_min.
```

Numerical - Numerical

In [23]:
```
weather_df.plot("wind","temp_max",style='o')
print("Pearson correlation:",weather_df["wind"].corr(weather_df["temp_max"]))
```

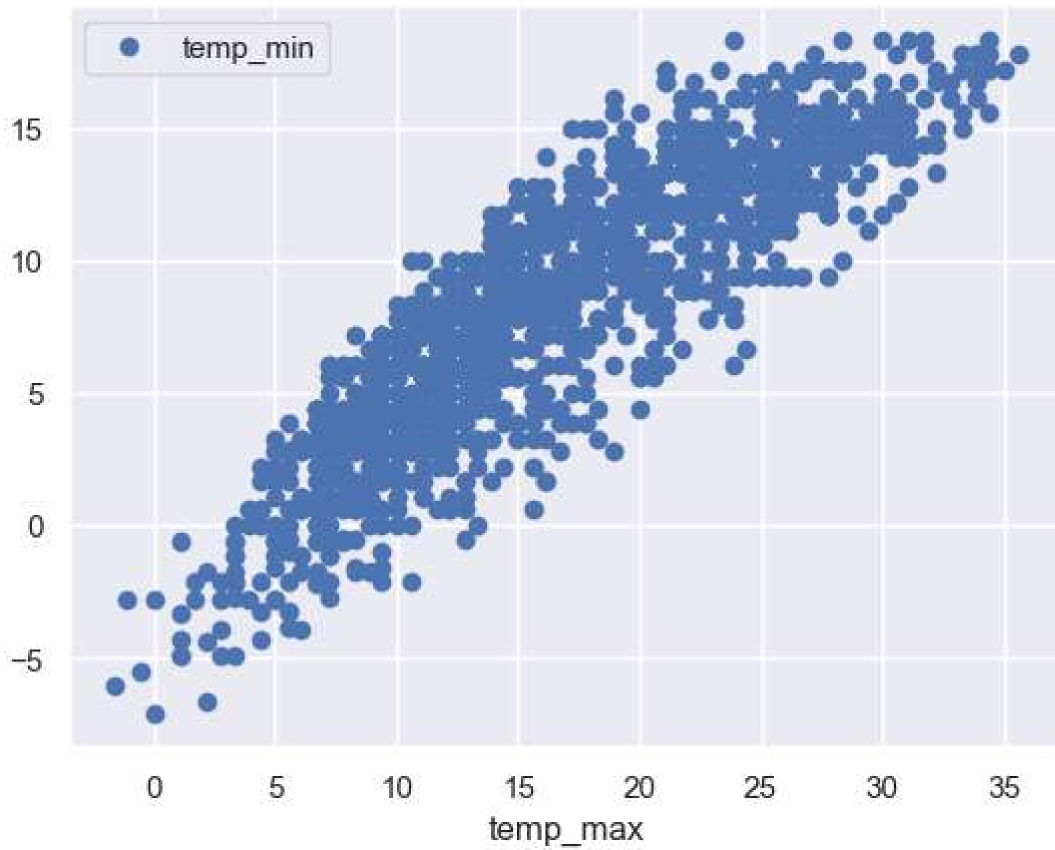
```
Pearson correlation: -0.1648566348749545
```



In [24]:
```
#As from the above result of T test and P value of 0 indicates that the Null h
#columns is rejected and the columns are Statistically significant
```

In [25]:
```
weather_df.plot("temp_max","temp_min",style='o')
```

Out[25]:
```
<Axes: xlabel='temp_max'>
```



NULL VALUES

data Cleaning

In [26]:
```
weather_df.isna().sum()
```

Out[26]:
```
date             0
precipitation    0
temp_max         0
temp_min         0
wind             0
weather          0
dtype: int64
```

In [27]:
```
#Checking for Null values in the data set
```

DATA PREPROCESSING:

In [28]:
```
# Drop Unnecessary Variables

#In this data set Date is a unnecessary variable as it does not affect the dat
```

In [29]:
```
weather_df=weather_df.drop(["date"],axis=1)
```

In [30]:
```
weather_df.shape
```

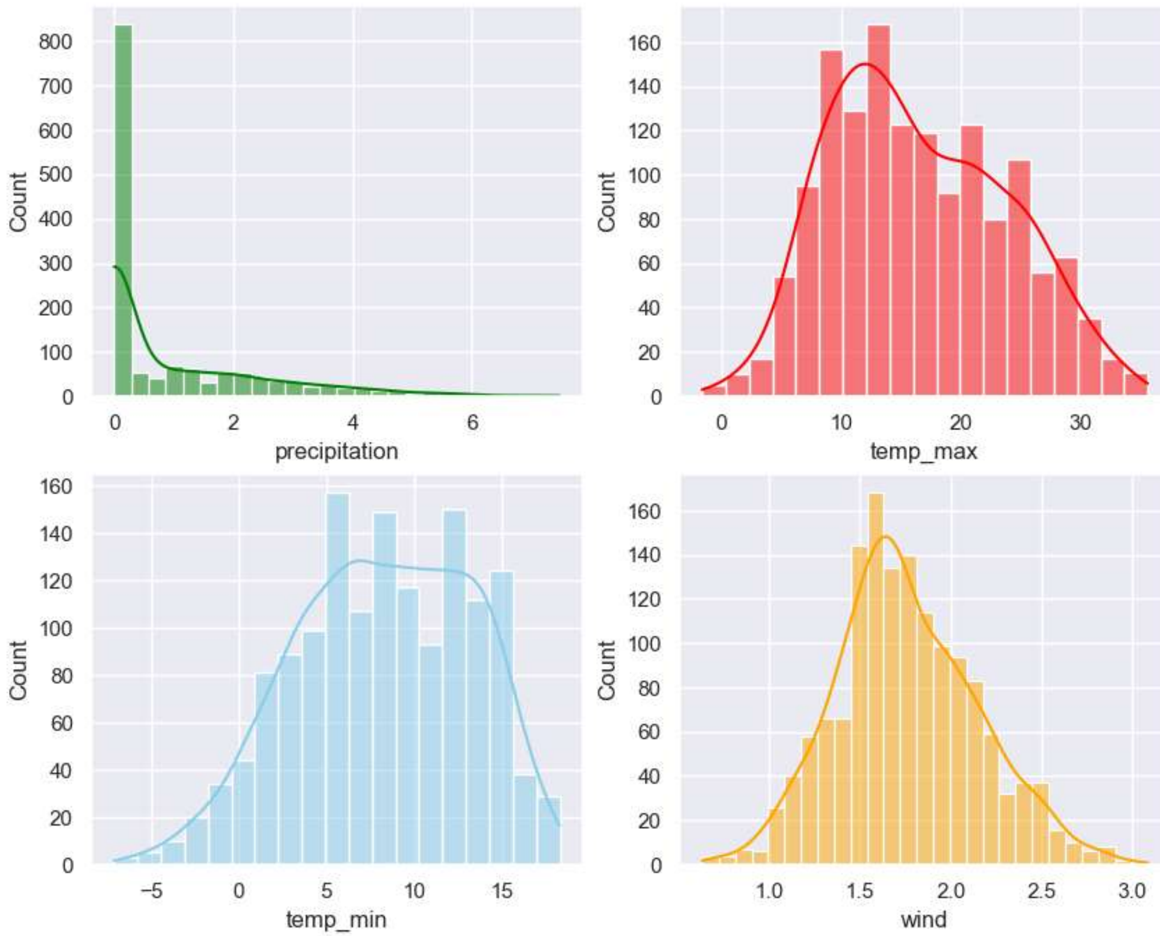
Out[30]:
```
(1461, 5)
```

Skewed Distribution Treatment

In [31]:
```
import numpy as np
weather_df.precipitation=np.sqrt(weather_df.precipitation)
weather_df.wind=np.sqrt(weather_df.wind)
```

In [32]:
```
sns.set(style="darkgrid")
fig,axs=plt.subplots(2,2,figsize=(10,8))
sns.histplot(data=weather_df,x="precipitation",kde=True,ax=axs[0,0],color='gre
sns.histplot(data=weather_df,x="temp_max",kde=True,ax=axs[0,1],color='red')
sns.histplot(data=weather_df,x="temp_min",kde=True,ax=axs[1,0],color='skyblue'
sns.histplot(data=weather_df,x="wind",kde=True,ax=axs[1,1],color='orange')
```

Out[32]: <Axes: xlabel='wind', ylabel='Count'>



In [33]:
```
weather_df.head()
```

Out[33]:

	precipitation	temp_max	temp_min	wind	weather
0	0.000000	12.8	5.0	2.167948	drizzle
1	3.301515	10.6	2.8	2.121320	rain
2	0.894427	11.7	7.2	1.516575	rain
3	4.505552	12.2	5.6	2.167948	rain
4	1.140175	8.9	2.8	2.469818	rain

Feature Scaling

In [34]:
```
# Scaling the weather variables using label Encoder
from sklearn.preprocessing import StandardScaler,LabelEncoder
lc=LabelEncoder()
weather_df["weather"]=lc.fit_transform(weather_df["weather"])
```

In [35]:
```
weather_df.head()
```

Out[35]:

	precipitation	temp_max	temp_min	wind	weather
0	0.000000	12.8	5.0	2.167948	0
1	3.301515	10.6	2.8	2.121320	2
2	0.894427	11.7	7.2	1.516575	2
3	4.505552	12.2	5.6	2.167948	2
4	1.140175	8.9	2.8	2.469818	2

splitting

In [36]:
```
#SPLITTING THE DATASET INTO DEPENDANT AND INDEPENDANT VARIABLES
```

In [37]:
```
x=((weather_df.loc[:,weather_df.columns!="weather"]).astype(int)).values[:,0:]
y=weather_df["weather"].values
```

In [38]:
```
weather_df.weather.unique()
```

Out[38]:
```
array([0, 2, 4, 3, 1])
```

In [41]:
```
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=
```

ALGORITHMS AND MODEL TRAINING:

K-NEAREST NEIGHBOR CLASSIFIER

In [42]:
```
from sklearn.neighbors import KNeighborsClassifier
knn=KNeighborsClassifier()
knn.fit(x_train,y_train)
print("KNN Accuracy:{:.2f}%".format(knn.score(x_test,y_test)*100))
```

```
KNN Accuracy:69.28%
```

SUPPORT VECTOR MACHINE - CLASSIFIER

In [43]:
```
from sklearn.svm import SVC
svm=SVC()
svm.fit(x_train,y_train)
print("SVM Accuracy:{:.2f}%".format(svm.score(x_test,y_test)*100))
```

```
SVM Accuracy:78.50%
```

In [ ]: