In [75]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

import warnings
warnings.filterwarnings('ignore')
```

Loading the Data from the CSV file

In [2]:
```
mData = pd.read_csv('Data Sets/Rain in Australia/weatherAUS.csv')
#printing the shape of the dataset
print('The Shape of The Data ',mData.shape)
```

```
The Shape of The Data  (142193, 24)
```

Data Preprocessing

In [3]:
```
# getting some insights about the null values
mData.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 142193 entries, 0 to 142192
Data columns (total 24 columns):
Date             142193 non-null object
Location         142193 non-null object
MinTemp          141556 non-null float64
MaxTemp          141871 non-null float64
Rainfall         140787 non-null float64
Evaporation      81350 non-null float64
Sunshine         74377 non-null float64
WindGustDir      132863 non-null object
WindGustSpeed    132923 non-null float64
WindDir9am       132180 non-null object
WindDir3pm       138415 non-null object
WindSpeed9am     140845 non-null float64
WindSpeed3pm     139563 non-null float64
Humidity9am      140419 non-null float64
Humidity3pm      138583 non-null float64
Pressure9am      128179 non-null float64
Pressure3pm      128212 non-null float64
Cloud9am         88536 non-null float64
Cloud3pm         85099 non-null float64
Temp9am          141289 non-null float64
Temp3pm          139467 non-null float64
RainToday        140787 non-null object
RISK_MM          142193 non-null float64
RainTomorrow     142193 non-null object
dtypes: float64(17), object(7)
memory usage: 26.0+ MB
```

In [4]:
```
mData.count().sort_values()
```

Out[4]:
```
Sunshine          74377
Evaporation       81350
Cloud3pm          85099
Cloud9am          88536
Pressure9am      128179
Pressure3pm      128212
WindDir9am       132180
WindGustDir      132863
WindGustSpeed    132923
WindDir3pm       138415
Humidity3pm      138583
Temp3pm          139467
WindSpeed3pm     139563
Humidity9am      140419
RainToday        140787
Rainfall         140787
WindSpeed9am     140845
Temp9am          141289
MinTemp          141556
MaxTemp          141871
Date             142193
Location         142193
RISK_MM          142193
RainTomorrow     142193
dtype: int64
```

In [5]:
```
#droppig some columns from the data in which it has more than 10% null values
#dropping the date coulmen (is not helpful in clustering)
#dropping RISK_MM : https://www.kaggle.com/jsphyg/weather-dataset-rattle-package/discussion/78316
mDataDroped = mData.drop(columns=['Date','RISK_MM','Sunshine','Evaporation','Cloud3pm','Cloud9am','Pressure9am',
                          ,axis=1)

#dropping all rows with null values
mDataDroped = mDataDroped.dropna(how='any')

print('The Final Shape Of The Data: ',mDataDroped.shape)
```

```
The Final Shape Of The Data:  (121790, 16)
```

In [6]:
```
Y = mDataDroped.RainTomorrow
X = mDataDroped.drop(columns=['RainTomorrow'])
X.info()
```

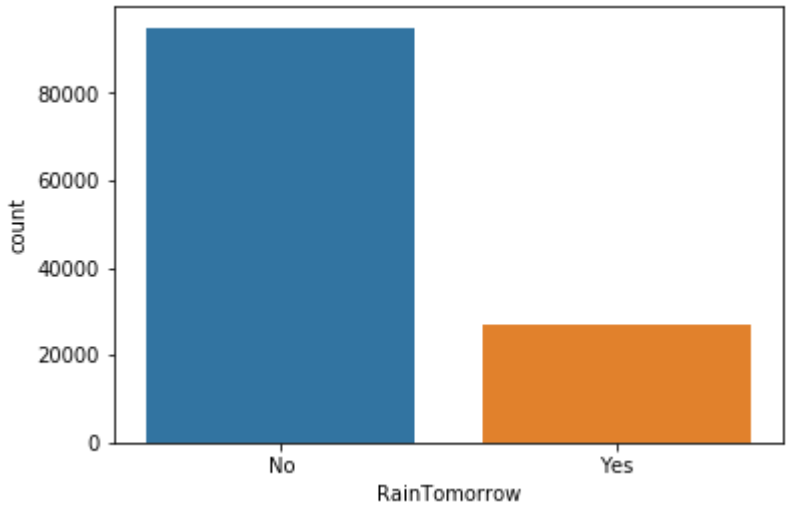
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 121790 entries, 0 to 142192
Data columns (total 15 columns):
Location         121790 non-null object
MinTemp          121790 non-null float64
MaxTemp          121790 non-null float64
Rainfall         121790 non-null float64
WindGustDir      121790 non-null object
WindGustSpeed    121790 non-null float64
WindDir9am       121790 non-null object
WindDir3pm       121790 non-null object
WindSpeed9am     121790 non-null float64
WindSpeed3pm     121790 non-null float64
Humidity9am      121790 non-null float64
Humidity3pm      121790 non-null float64
Temp9am          121790 non-null float64
Temp3pm          121790 non-null float64
RainToday        121790 non-null object
dtypes: float64(10), object(5)
memory usage: 14.9+ MB
```

Data Visualization

In [72]:
```
# Target Distribution
print(Y.value_counts())
sns.countplot(Y)
```

```
No     94906
Yes    26884
Name: RainTomorrow, dtype: int64
```

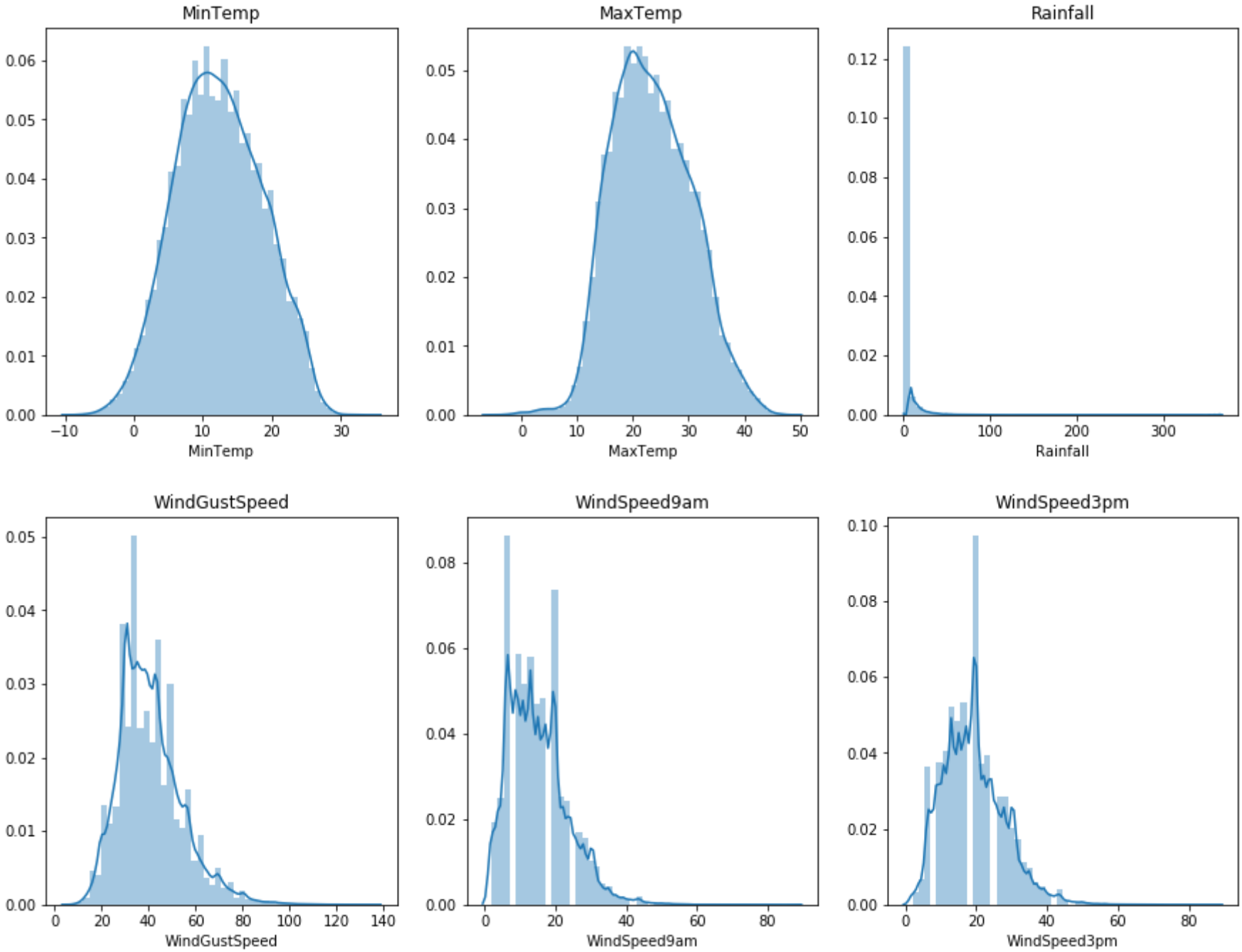
Out[72]: <matplotlib.axes._subplots.AxesSubplot at 0x1a23105be0>

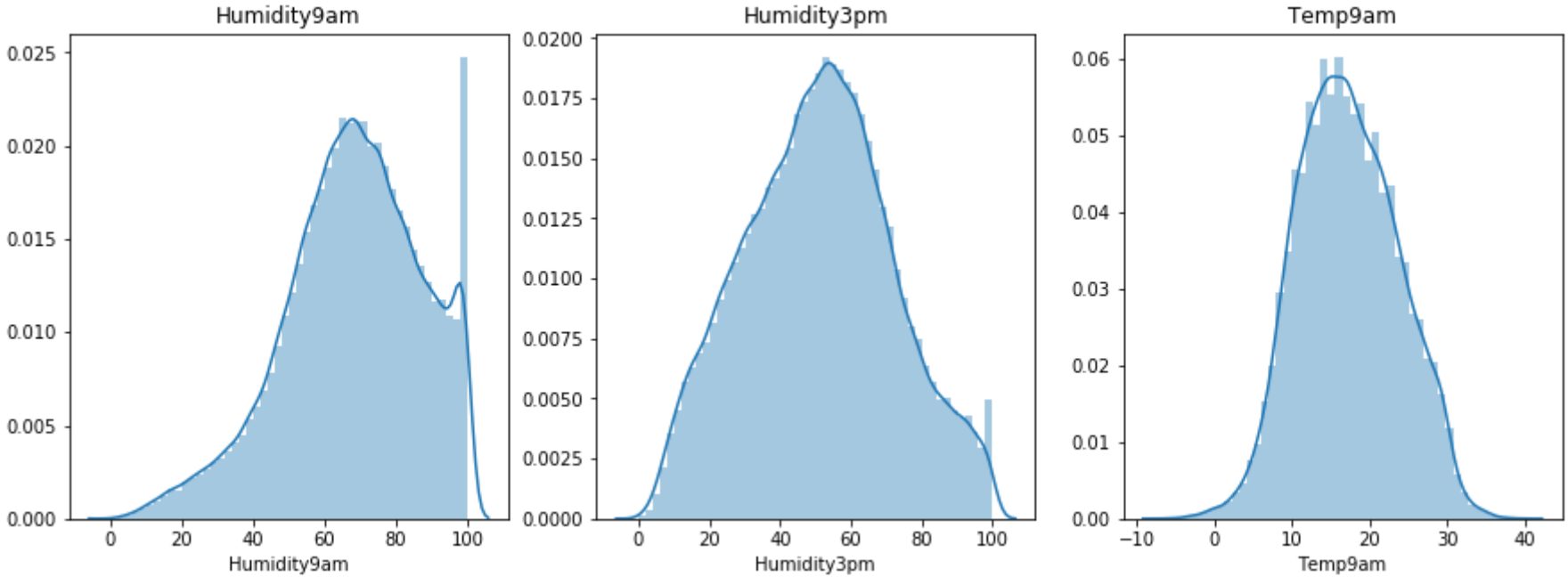


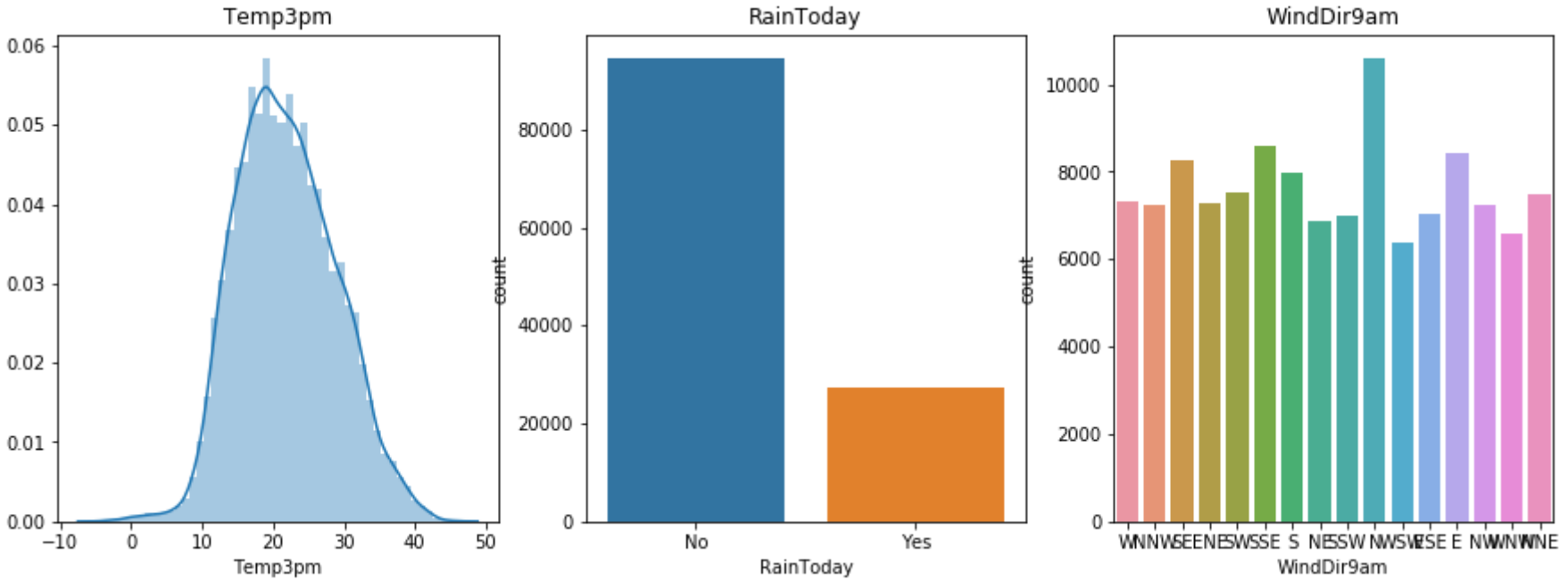
In [76]:
```
#histogram for all features
plt.figure(1,figsize=[15,5])
plt.subplot(1,3,1)
sns.distplot(X.MinTemp)
plt.title("MinTemp")


plt.figure(1,figsize=[15,5])
plt.subplot(1,3,2)
sns.distplot(X.MaxTemp)
plt.title("MaxTemp")

plt.figure(1,figsize=[15,5])
plt.subplot(1,3,3)
sns.distplot(X.Rainfall)
plt.title("Rainfall")

plt.figure(2,figsize=[15,5])
plt.subplot(1,3,1)
sns.distplot(X.WindGustSpeed)
plt.title("WindGustSpeed")


plt.figure(2,figsize=[15,5])
plt.subplot(1,3,2)
sns.distplot(X.WindSpeed9am)
plt.title("WindSpeed9am")


plt.figure(2,figsize=[15,5])
plt.subplot(1,3,3)
sns.distplot(X.WindSpeed3pm)
plt.title("WindSpeed3pm")

plt.figure(3,figsize=[15,5])
plt.subplot(1,3,1)
sns.distplot(X.Humidity9am)
plt.title("Humidity9am")


plt.figure(3,figsize=[15,5])
```

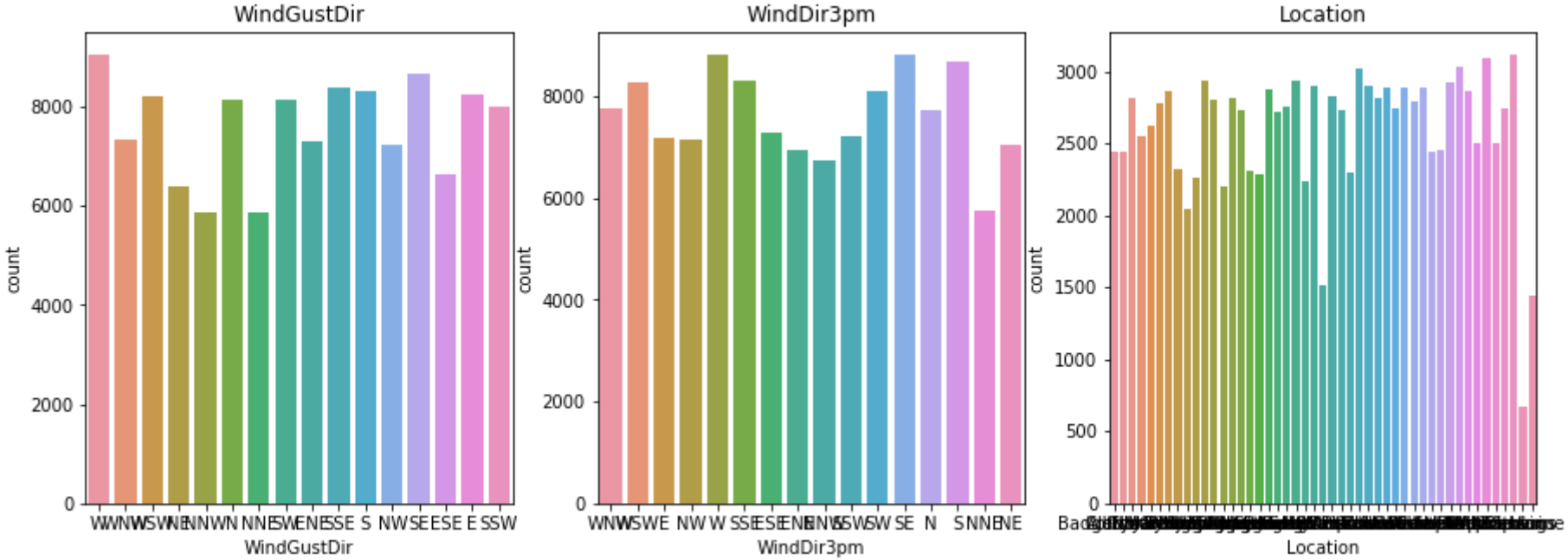
```
plt.subplot(1,3,2)
sns.distplot(X.Humidity3pm)
plt.title("Humidity3pm")


plt.figure(3,figsize=[15,5])
plt.subplot(1,3,3)
sns.distplot(X.Temp9am)
plt.title("Temp9am")

plt.figure(4,figsize=[15,5])
plt.subplot(1,3,1)
sns.distplot(X.Temp3pm)
plt.title("Temp3pm")

plt.figure(4,figsize=[15,5])
plt.subplot(1,3,2)
sns.countplot(X["RainToday"])
plt.title("RainToday")

plt.figure(4,figsize=[15,5])
plt.subplot(1,3,3)
sns.countplot(X["WindDir9am"])
plt.title("WindDir9am")


plt.figure(5,figsize=[15,5])
plt.subplot(1,3,1)
sns.countplot(X["WindGustDir"])
plt.title("WindGustDir")

plt.figure(5,figsize=[15,5])
plt.subplot(1,3,2)
sns.countplot(X["WindDir3pm"])
plt.title("WindDir3pm")

plt.figure(5,figsize=[15,5])
plt.subplot(1,3,3)
sns.countplot(X["Location"])
plt.title("Location")
```

Out[76]: Text(0.5,1,'Location')




Humidity9am
Humidity9am
Humidity3pm
Humidity3pm
Temp9am
Temp9am


Temp3pm
Temp3pm
RainToday
count
No
Yes
RainToday
WindDir9am
count
WindDir9am

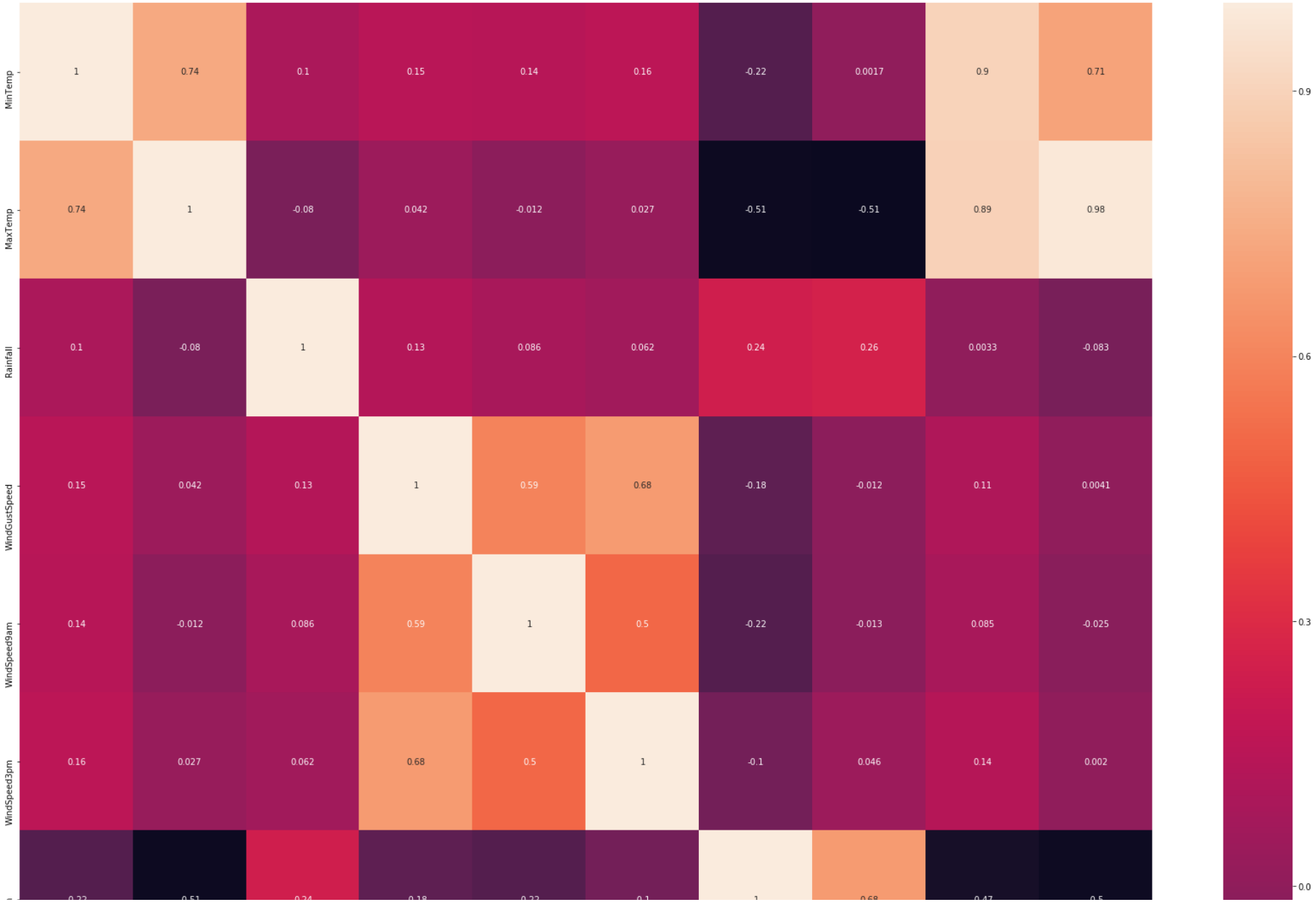

WindGustDir
count
WindGustDir
WindDir3pm
count
WindDir3pm
Location
count
Location

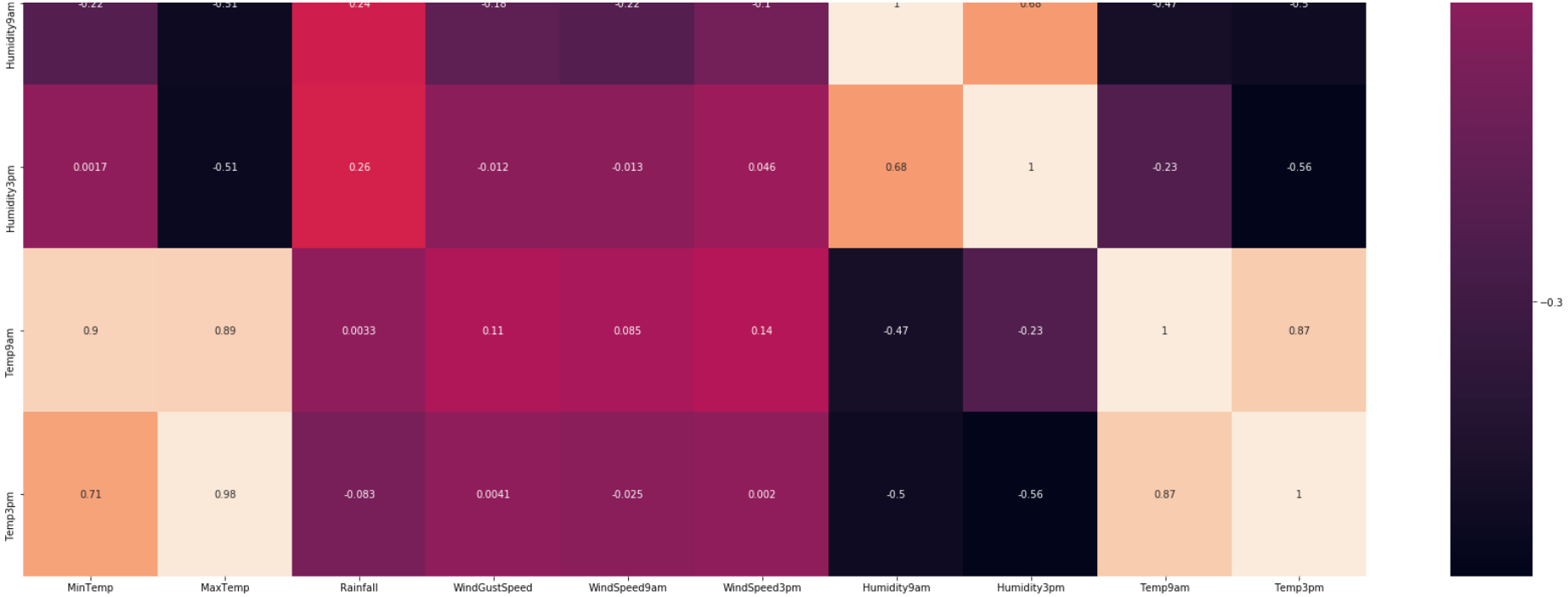
In [12]:
```
#information about each numeric features
print(X.describe())
```

```
             MinTemp        MaxTemp       Rainfall  WindGustSpeed  \
count  121790.000000  121790.000000  121790.000000  121790.000000
mean       12.392117      23.442506       2.356095      40.686542
std         6.336322       7.140863       8.482433      13.390520
min        -8.500000      -4.800000       0.000000       7.000000
25%         7.800000      18.100000       0.000000      31.000000
50%        12.200000      23.000000       0.000000      39.000000
75%        17.000000      28.500000       0.800000      48.000000
max        33.900000      48.100000     367.600000     135.000000

        WindSpeed9am  WindSpeed3pm    Humidity9am    Humidity3pm  \
count  121790.000000  121790.00000  121790.000000  121790.000000
mean       15.029888      19.20739      67.685705      50.798990
std         8.321005       8.58712      19.058076      20.939237
min         2.000000       2.00000       0.000000       0.000000
25%         9.000000      13.00000      56.000000      36.000000
50%        13.000000      19.00000      69.000000      51.000000
75%        20.000000      24.00000      82.000000      65.000000
max        87.000000      87.00000     100.000000     100.000000

             Temp9am        Temp3pm
count  121790.000000  121790.000000
mean       17.219650      21.913225
std         6.455551       7.006987
min        -7.200000      -5.400000
25%        12.500000      16.800000
50%        16.900000      21.400000
75%        21.800000      26.800000
max        40.200000      46.700000
```

In [85]:
```
plt.figure(figsize=[30,30])
sns.heatmap(X.corr(), annot = True)
```

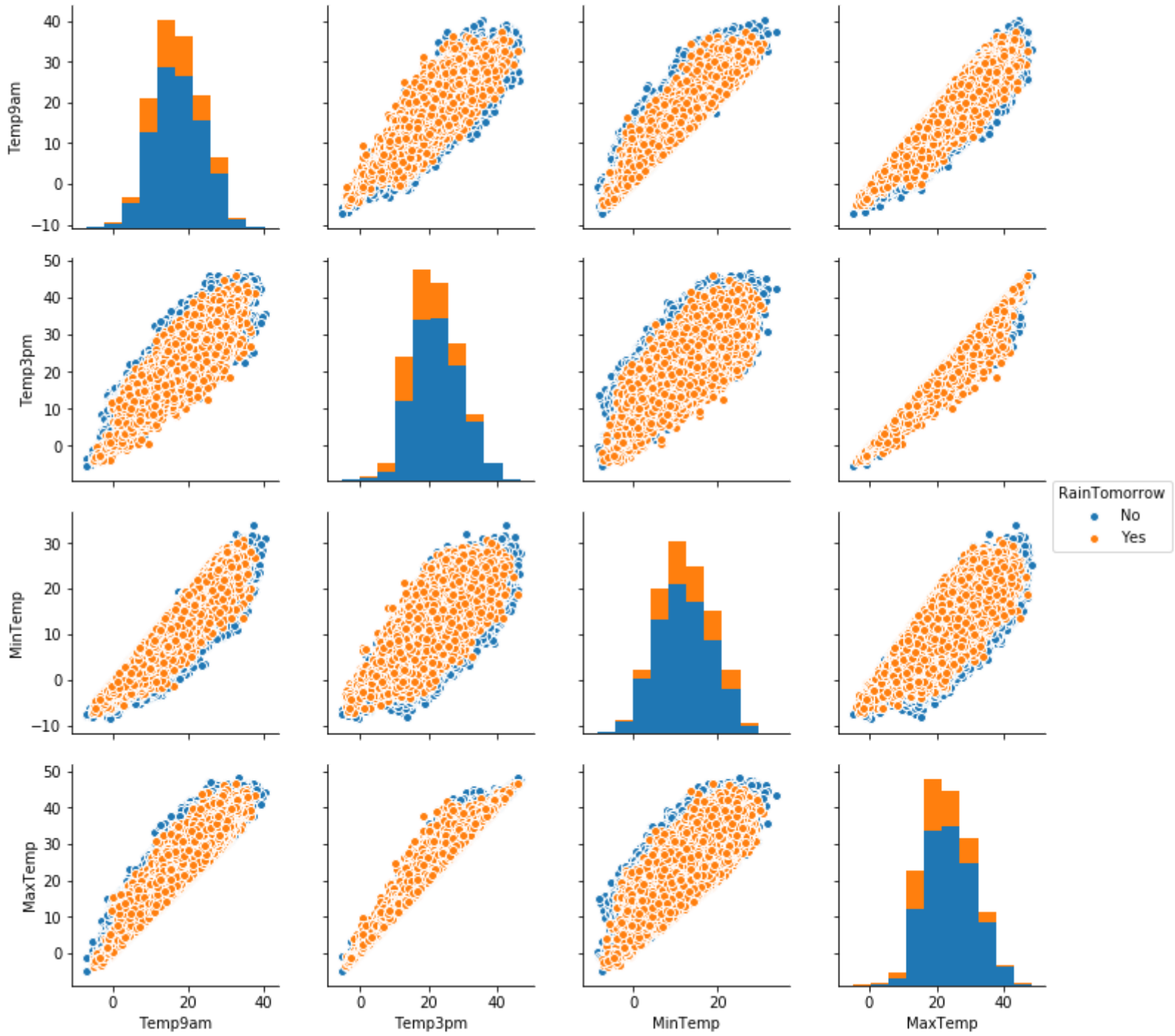
Out[85]: <matplotlib.axes._subplots.AxesSubplot at 0x1a230a0c18>




Humidity9am
Humidity3pm
Temp9am
Temp3pm
0.0017
-0.51
0.26
-0.012
-0.013
0.046
0.68
1
-0.23
-0.56
0.9
0.89
0.0033
0.11
0.085
0.14
-0.47
-0.23
1
0.87
0.71
0.98
-0.083
0.0041
-0.025
0.002
-0.5
-0.56
0.87
1
MinTemp
MaxTemp
Rainfall
WindGustSpeed
WindSpeed9am
WindSpeed3pm
Humidity9am
Humidity3pm
Temp9am
Temp3pm
−0.3

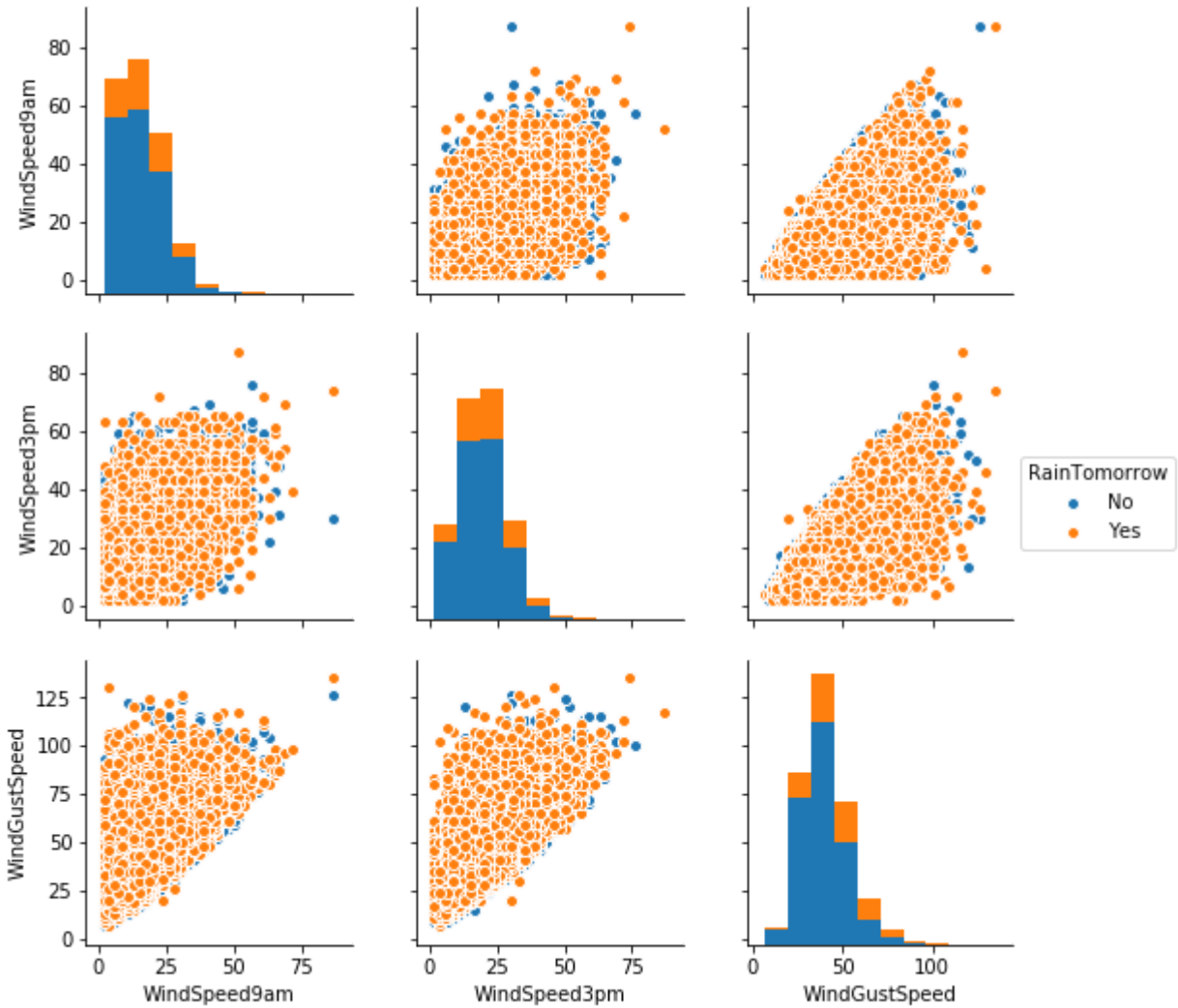
In [80]:
```
sns.pairplot(mDataDroped[["Temp9am", "Temp3pm", "MinTemp","MaxTemp","RainTomorrow"]],hue='RainTomorrow')
```

Out[80]:
```
<seaborn.axisgrid.PairGrid at 0x1a21128ef0>
```


Temp9am
Temp3pm
MinTemp
MaxTemp
RainTomorrow
No
Yes

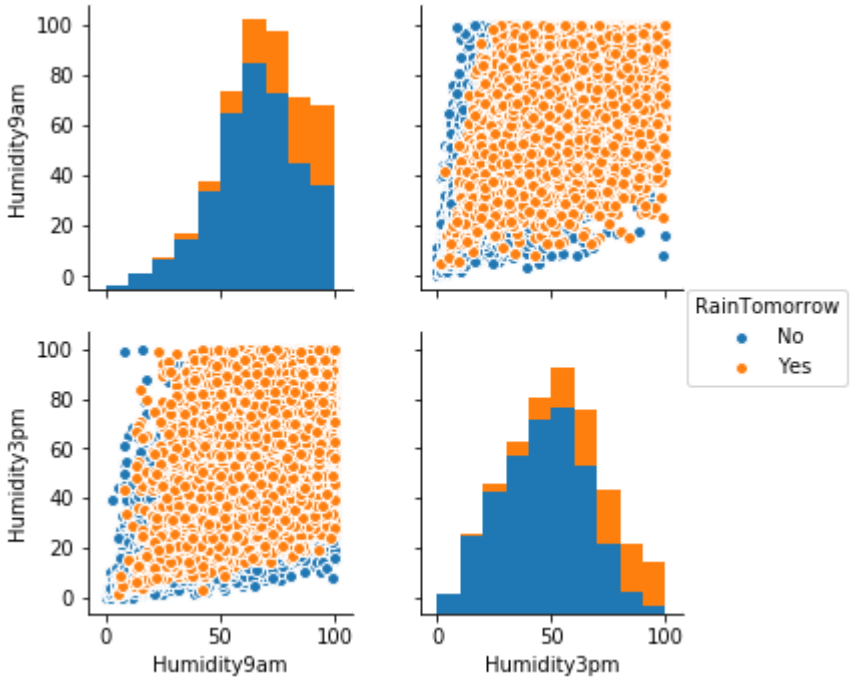
In [82]:
```
sns.pairplot(mDataDroped[["WindSpeed9am", "WindSpeed3pm",'WindGustSpeed',"RainTomorrow"]],hue='RainTomorrow')
```

Out[82]: <seaborn.axisgrid.PairGrid at 0x1a303c8978>



In [83]:
```
sns.pairplot(mDataDroped[["Humidity9am", "Humidity3pm","RainTomorrow"]],hue='RainTomorrow')
```

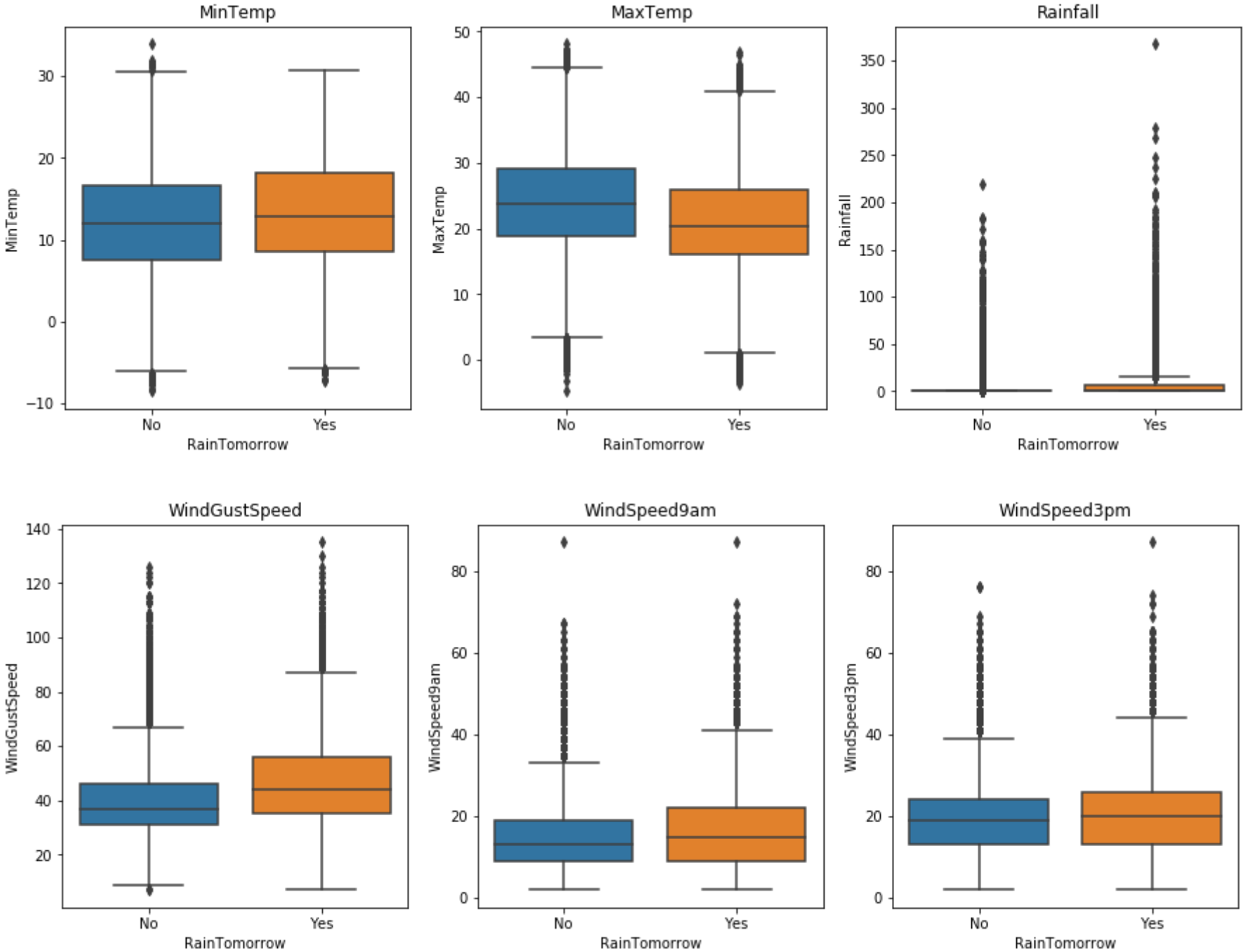
Out[83]:
```
<seaborn.axisgrid.PairGrid at 0x1a32156b00>
```

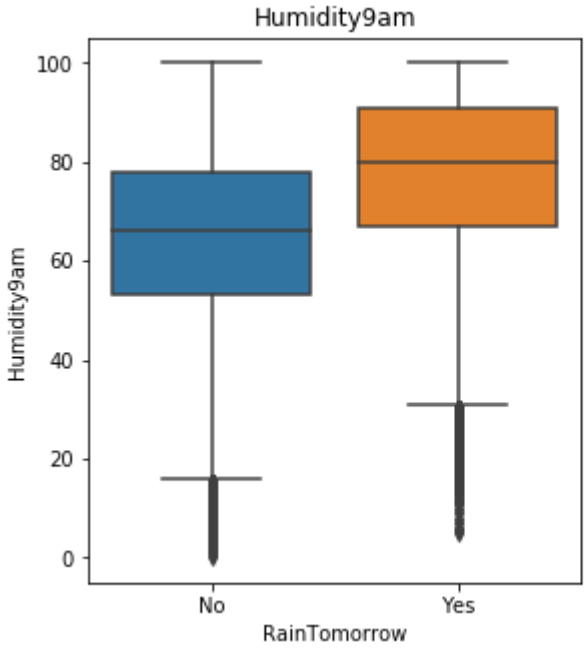


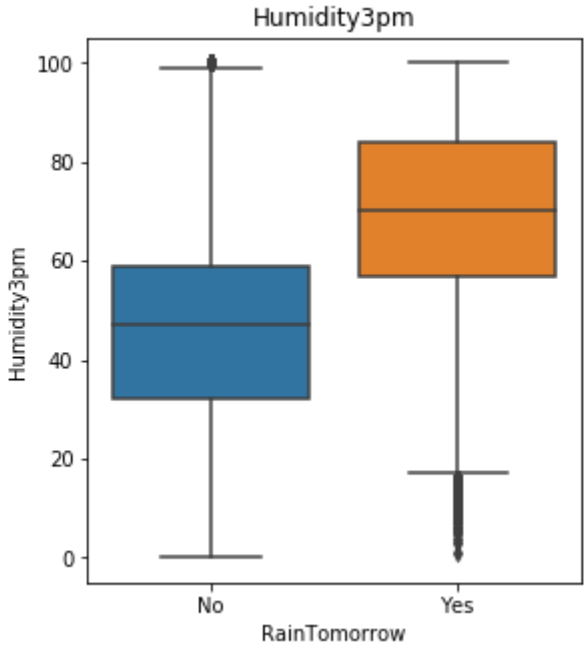
In [64]:
```
#histogram for numeric attributes
plt.figure(1,figsize=[15,5])
plt.subplot(1,3,1)
sns.boxplot(x = Y, y = X['MinTemp'])
plt.title("MinTemp")


plt.figure(1,figsize=[15,5])
plt.subplot(1,3,2)
sns.boxplot(x = Y, y = X['MaxTemp'])
plt.title("MaxTemp")

plt.figure(1,figsize=[15,5])
plt.subplot(1,3,3)
sns.boxplot(x = Y, y = X['Rainfall'])
plt.title("Rainfall")

plt.figure(2,figsize=[15,5])
plt.subplot(1,3,1)
sns.boxplot(x = Y, y = X['WindGustSpeed'])
plt.title("WindGustSpeed")


plt.figure(2,figsize=[15,5])
plt.subplot(1,3,2)
sns.boxplot(x = Y, y = X['WindSpeed9am'])
plt.title("WindSpeed9am")


plt.figure(2,figsize=[15,5])
plt.subplot(1,3,3)
sns.boxplot(x = Y, y = X['WindSpeed3pm'])
plt.title("WindSpeed3pm")

plt.figure(3,figsize=[15,5])
plt.subplot(1,3,1)
sns.boxplot(x = Y, y = X['Humidity9am'])
plt.title("Humidity9am")


plt.figure(3,figsize=[15,5])
```

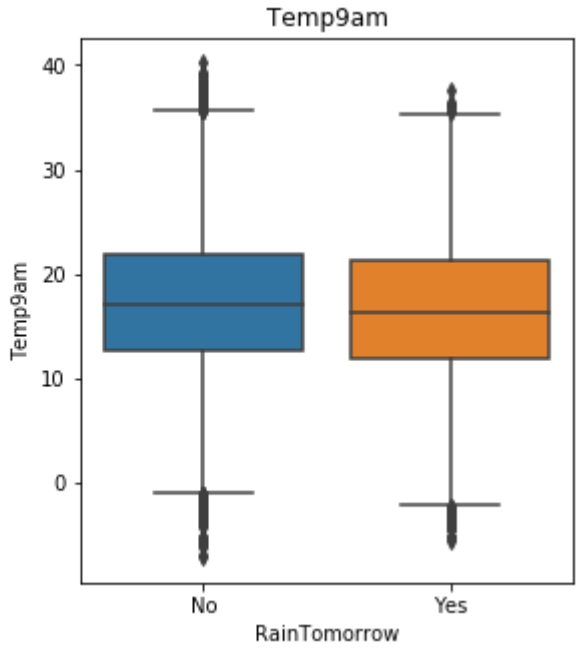
```
plt.subplot(1,3,2)
sns.boxplot(x = Y, y = X['Humidity3pm'])
plt.title("Humidity3pm")


plt.figure(3,figsize=[15,5])
plt.subplot(1,3,3)
sns.boxplot(x = Y, y = X['Temp9am'])
plt.title("Temp9am")

plt.figure(4,figsize=[15,5])
plt.subplot(1,3,1)
sns.boxplot(x = Y, y = X['Temp3pm'])
plt.title("Temp3pm")
```

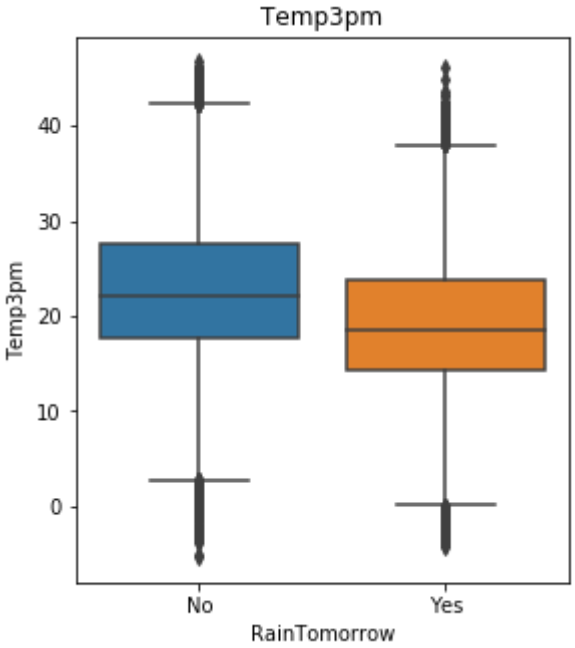
Out[64]: Text(0.5,1,'Temp3pm')


MinTemp
MinTemp
RainTomorrow
No
Yes
MaxTemp
MaxTemp
RainTomorrow
No
Yes
Rainfall
Rainfall
RainTomorrow
No
Yes
WindGustSpeed
WindGustSpeed
RainTomorrow
No
Yes
WindSpeed9am
WindSpeed9am
RainTomorrow
No
Yes
WindSpeed3pm
WindSpeed3pm
RainTomorrow
No
Yes


Humidity9am
Humidity9am
100
80
60
40
20
0
No
Yes
RainTomorrow

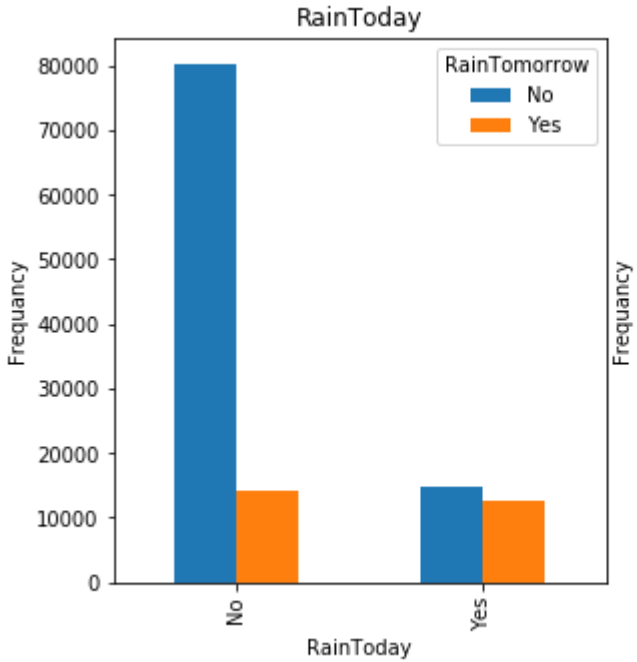

Humidity3pm
Humidity3pm
100
80
60
40
20
0
No
Yes
RainTomorrow

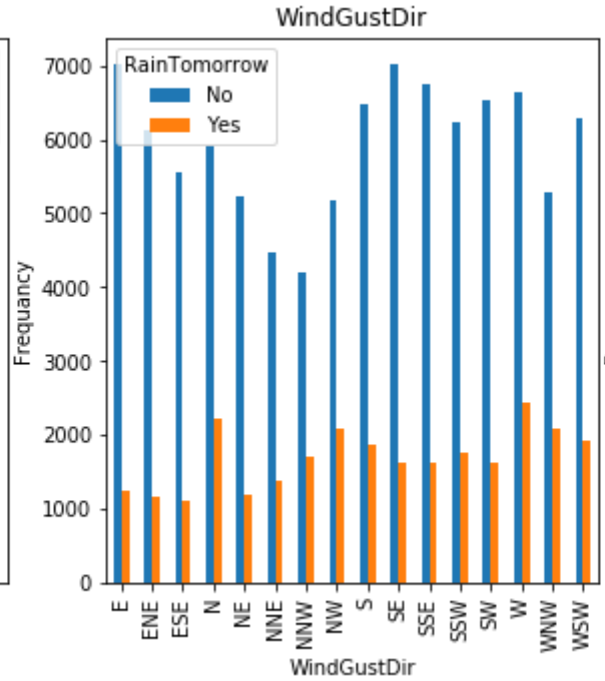

Temp9am
Temp9am
40
30
20
10
0
No
Yes
RainTomorrow

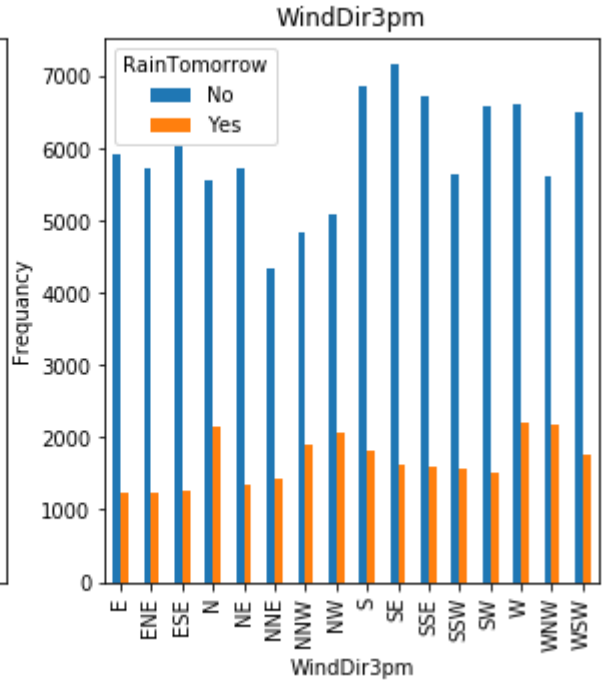

Temp3pm
Temp3pm
40
30
20
10
0
No
Yes
RainTomorrow

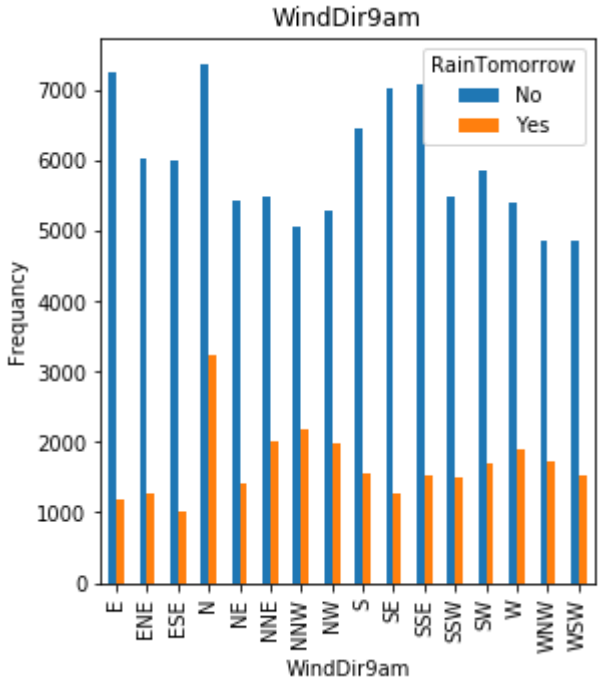
In [63]:
```
plt.figure(4,figsize=[15,5])
ax=plt.subplot(1,3,1)
pd.crosstab(X.RainToday,Y).plot(kind="bar",ax=ax)
plt.title("RainToday")
plt.ylabel('Frequancy')


plt.figure(4,figsize=[15,5])
ax=plt.subplot(1,3,2)
pd.crosstab(X.WindGustDir,Y).plot(kind="bar",ax=ax)
plt.title("WindGustDir")
plt.ylabel('Frequancy')




plt.figure(4,figsize=[15,5])
ax=plt.subplot(1,3,3)
pd.crosstab(X.WindDir3pm,Y).plot(kind="bar",ax=ax)
plt.title("WindDir3pm")
plt.ylabel('Frequancy')

plt.figure(5,figsize=[15,5])
ax=plt.subplot(1,3,1)
pd.crosstab(X.WindDir9am,Y).plot(kind="bar",ax=ax)
plt.title("WindDir9am")
plt.ylabel('Frequancy')

plt.figure(6,figsize=[15,5])
ax=plt.subplot(1,1,1)
pd.crosstab(X.Location,Y).plot(kind="bar",ax=ax)
plt.title("Location")
plt.ylabel('Frequancy')
```

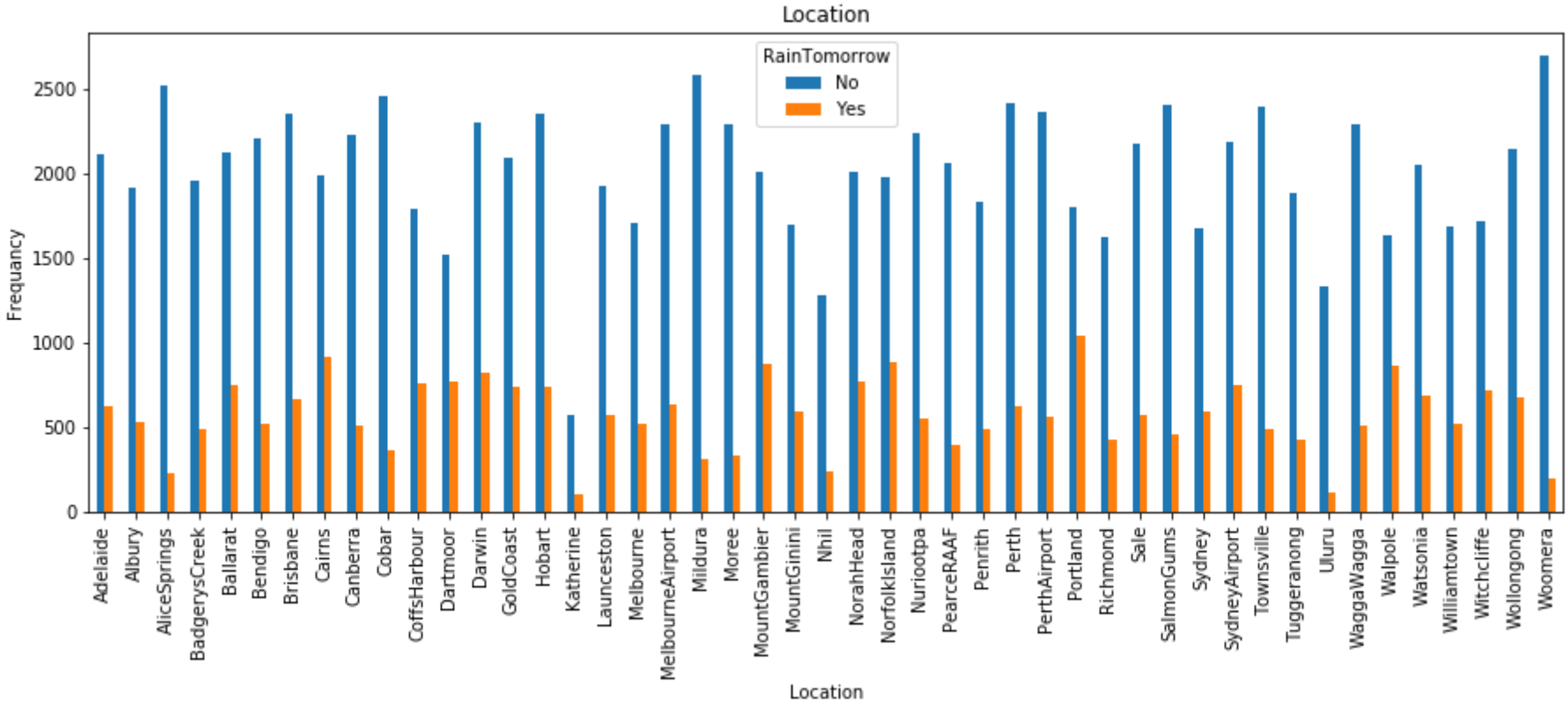
Out[63]:
```
Text(0,0.5,'Frequancy')
```


RainToday
RainTomorrow
No
Yes
Frequancy
RainToday


WindGustDir
RainTomorrow
No
Yes
Frequancy
E
ENE
ESE
N
NE
NNE
NNW
NW
S
SE
SSE
SSW
SW
W
WNW
WSW
WindGustDir


WindDir3pm
RainTomorrow
No
Yes
Frequancy
E
ENE
ESE
N
NE
NNE
NNW
NW
S
SE
SSE
SSW
SW
W
WNW
WSW
WindDir3pm


WindDir9am
RainTomorrow
No
Yes
Frequancy
E
ENE
ESE
N
NE
NNE
NNW
NW
S
SE
SSE
SSW
SW
W
WNW
WSW
WindDir9am


Location
RainTomorrow
No
Yes
Frequancy
2500
2000
1500
1000
500
0
Adelaide
Albury
AliceSprings
BadgerysCreek
Ballarat
Bendigo
Brisbane
Cairns
Canberra
Cobar
CoffsHarbour
Dartmoor
Darwin
GoldCoast
Hobart
Katherine
Launceston
Melbourne
MelbourneAirport
Mildura
Moree
MountGambier
MountGinini
Nhil
NorahHead
NorfolkIsland
Nuriootpa
PearceRAAF
Penrith
Perth
PerthAirport
Portland
Richmond
Sale
SalmonGums
Sydney
SydneyAirport
Townsville
Tuggeranong
Uluru
WaggaWagga
Walpole
Watsonia
Williamtown
Witchcliffe
Wollongong
Woomera
Location

In [ ]: