```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

data = pd.read_excel('climate_data.xlsx')
data
```

```
           Date  Average_temperature_Â°F  Average_humidity_%  \
0    2009-01-01                    37.8                  35
1    2009-01-02                    43.2                  32
2    2009-01-03                    25.7                  60
3    2009-01-04                     9.3                  67
4    2009-01-05                    23.5                  30
...         ...                     ...                 ...
3897 2020-07-24                    64.1                  62
3898 2020-07-25                    62.8                  60
3899 2020-07-26                    60.6                  68
3900 2020-07-27                    61.7                  64
3901 2020-07-28                    60.5                  61

      Average_dewpoint _Â°F  Average_barometer_in
Average_windspeed_mph  \
0                      12.7                  29.7
26.4
1                      14.7                  29.5
12.8
2                      12.7                  29.7
8.3
3                       0.1                  30.4
2.9
4                      -5.3                  29.9
16.7
...                     ...                   ...                    .
..
3897                   49.8                  29.6
3.6
3898                   48.1                  29.7
2.5
3899                   48.9                  29.8
1.7
3900                   47.4                  29.9
2.2
3901                   45.3                  29.7
4.0

      Average_gustspeed_mph  Average_direction_Â°deg
Rainfall_for_month_in  \
0                      36.8                     274
0.00
```

```
1                      18.0                      240
0.00
2                      12.2                      290
0.00
3                       4.5                       47
0.00
4                      23.1                      265
0.00
...                     ...                       ...
...
3897                    5.8                      240
0.24
3898                    4.0                      242
0.33
3899                    2.9                      357
0.33
3900                    4.0                       66
0.33
3901                    6.2                      248
0.35

      Rainfall_for_year_in  ...  Maximum_humidity_%  Minimum_humidity_
%  \
0                     0.00  ...                   4
27
1                     0.00  ...                   4
16
2                     0.00  ...                   8
35
3                     0.00  ...                   7
35
4                     0.00  ...                   5
13
...                    ...  ...                 ...                  ..
.
3897                  4.38  ...                  86
35
3898                  4.47  ...                  90
36
3899                  4.47  ...                  90
40
3900                  4.47  ...                  96
35
3901                  4.49  ...                  94
35

      Maximum_pressure  Minimum_pressure  Maximum_windspeed_mph  \
0               29.762            29.596                   41.4
1               29.669            29.268                   35.7
2               30.232            29.260                   25.3
```

```
3               30.566           30.227                   12.7
4               30.233           29.568                   38.0
...                ...              ...                    ...
3897            29.686           29.577                   15.0
3898            29.781           29.645                    8.1
3899            29.930           29.745                   11.5
3900            29.941           29.781                   13.8
3901            29.792           29.675                   17.3

      Maximum_gust_speed_mph  Maximum_heat_index_Â°F      Date1  Month
\
0                       59.0                    40.0 2009-01-01      1

1                       51.0                    52.0 2009-01-02      1

2                       38.0                    41.0 2009-01-03      1

3                       20.0                    32.0 2009-01-04      1

4                       53.0                    32.0 2009-01-05      1

...                      ...                     ...        ...    ...

3897                    25.3                    77.4 2020-07-24      7

3898                    17.3                    77.5 2020-07-25      7

3899                    15.0                    77.5 2020-07-26      7

3900                    18.4                    78.2 2020-07-27      7

3901                    26.5                    77.6 2020-07-28      7


     diff_pressure
0            0.166
1            0.401
2            0.972
3            0.339
4            0.665
...            ...
3897         0.109
3898         0.136
3899         0.185
3900         0.160
3901         0.117

[3902 rows x 22 columns]
```

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3902 entries, 0 to 3901
Data columns (total 22 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   Date                     3902 non-null   datetime64[ns]
 1   Average_temperature_Â°F  3902 non-null   float64
 2   Average_humidity_%       3902 non-null   int64
 3   Average_dewpoint _Â°F    3902 non-null   float64
 4   Average_barometer_in     3902 non-null   float64
 5   Average_windspeed_mph    3902 non-null   float64
 6   Average_gustspeed_mph    3902 non-null   float64
 7   Average_direction_Â°deg  3902 non-null   int64
 8   Rainfall_for_month_in    3902 non-null   float64
 9   Rainfall_for_year_in     3902 non-null   float64
 10  Maximum_temperature_Â°F  3902 non-null   float64
 11  Minimum_temperature_Â°F  3902 non-null   float64
 12  Maximum_humidity_%       3902 non-null   int64
 13  Minimum_humidity_%       3902 non-null   int64
 14  Maximum_pressure         3902 non-null   float64
 15  Minimum_pressure         3902 non-null   float64
 16  Maximum_windspeed_mph    3902 non-null   float64
 17  Maximum_gust_speed_mph   3902 non-null   float64
 18  Maximum_heat_index_Â°F   3902 non-null   float64
 19  Date1                    3902 non-null   datetime64[ns]
 20  Month                    3902 non-null   int64
 21  diff_pressure            3902 non-null   float64
dtypes: datetime64[ns](2), float64(15), int64(5)
memory usage: 670.8 KB
```

```
inp=data.drop(['Date1','Date','Rainfall_for_year_in'],axis=1)
inp
```

```
      Average_temperature_Â°F  Average_humidity_%  Average_dewpoint
_Â°F  \
0                        37.8                  35
12.7
1                        43.2                  32
14.7
2                        25.7                  60
12.7
3                         9.3                  67
0.1
4                        23.5                  30                    -
5.3
...                       ...                 ...                     .
..
3897                     64.1                  62
49.8
```

```
3898                      62.8                   60
48.1
3899                      60.6                   68
48.9
3900                      61.7                   64
47.4
3901                      60.5                   61
45.3

      Average_barometer_in  Average_windspeed_mph
Average_gustspeed_mph  \
0                     29.7                   26.4
36.8
1                     29.5                   12.8
18.0
2                     29.7                    8.3
12.2
3                     30.4                    2.9
4.5
4                     29.9                   16.7
23.1
...                    ...                    ...                    .
..
3897                  29.6                    3.6
5.8
3898                  29.7                    2.5
4.0
3899                  29.8                    1.7
2.9
3900                  29.9                    2.2
4.0
3901                  29.7                    4.0
6.2

      Average_direction_Â°deg  Rainfall_for_month_in
Maximum_temperature_Â°F  \
0                        274                   0.00
40.0
1                        240                   0.00
52.0
2                        290                   0.00
41.0
3                         47                   0.00
19.0
4                        265                   0.00
30.0
...                      ...                    ...
...
3897                     240                   0.24
74.9
```

```
3898                       242                    0.33
69.2
3899                       357                    0.33
71.9
3900                        66                    0.33
77.3
3901                       248                    0.35
75.6

      Minimum_temperature_Â°F  Maximum_humidity_%  Minimum_humidity_%
\
0                        34.0                   4                  27

1                        37.0                   4                  16

2                         6.0                   8                  35

3                         0.0                   7                  35

4                        15.0                   5                  13

...                       ...                 ...                 ...

3897                     55.3                  86                  35

3898                     55.1                  90                  36

3899                     50.5                  90                  40

3900                     43.6                  96                  35

3901                     46.0                  94                  35


      Maximum_pressure  Minimum_pressure  Maximum_windspeed_mph  \
0               29.762            29.596                   41.4
1               29.669            29.268                   35.7
2               30.232            29.260                   25.3
3               30.566            30.227                   12.7
4               30.233            29.568                   38.0
...                ...               ...                    ...
3897            29.686            29.577                   15.0
3898            29.781            29.645                    8.1
3899            29.930            29.745                   11.5
3900            29.941            29.781                   13.8
3901            29.792            29.675                   17.3

      Maximum_gust_speed_mph  Maximum_heat_index_Â°F  Month
diff_pressure
```

```
0                       59.0                     40.0      1
0.166
1                       51.0                     52.0      1
0.401
2                       38.0                     41.0      1
0.972
3                       20.0                     32.0      1
0.339
4                       53.0                     32.0      1
0.665
...                      ...                      ...    ...
...
3897                    25.3                     77.4      7
0.109
3898                    17.3                     77.5      7
0.136
3899                    15.0                     77.5      7
0.185
3900                    18.4                     78.2      7
0.160
3901                    26.5                     77.6      7
0.117

[3902 rows x 19 columns]
```

```
x=inp.drop(['Rainfall_for_month_in'],axis=1)
y=pd.DataFrame(inp.Rainfall_for_month_in)
```

```
from sklearn.model_selection  import train_test_split
x_train,x_test,y_train,y_test= train_test_split(x,y,test_size=0.30)
```

```
x_train
```

```
      Average_temperature_Â°F  Average_humidity_%  Average_dewpoint
_Â°F  \
2066                    40.0                  58
23.4
1781                    61.9                  67
50.0
1436                    68.2                  23
26.6
3541                    65.8                  54
44.0
783                     51.3                  51
28.5
...                      ...                 ...                   .
..
57                      26.7                  45
6.6
3404                    30.8                  56
15.0
```

```
3011                      35.9                    17                    -
7.1
2812                      64.4                    44
38.3
3054                      27.9                    34
1.2

      Average_barometer_in  Average_windspeed_mph
Average_gustspeed_mph  \
2066                  29.9                    2.8
4.7
1781                  29.8                    3.0
5.3
1436                  29.7                    4.4
7.0
3541                  29.8                    1.8
3.5
783                   29.7                    5.4
7.8
...                    ...                    ...                     .
..
57                    30.0                    9.8
14.7
3404                  30.2                    3.1
5.2
3011                  30.2                    0.0
0.0
2812                  29.7                    3.9
6.5
3054                  30.1                   13.7
19.4

      Average_direction_Â°deg  Maximum_temperature_Â°F  \
2066                     306                    58.5
1781                      72                    74.9
1436                     119                    82.6
3541                      53                    82.3
783                      272                    68.4
...                      ...                     ...
57                       278                    34.0
3404                     283                    44.6
3011                      73                    51.6
2812                     277                    79.8
3054                     283                    38.2

      Minimum_temperature_Â°F  Maximum_humidity_%  Minimum_humidity_%
\
2066                    23.9                   89                   21

1781                    53.9                   87                   43
```

```
1436                    46.1                  61                   9

3541                    45.2                  96                  19

783                     33.2                  92                  16

...                      ...                 ...                 ...

57                      18.0                   7                  25

3404                    13.1                  85                  23

3011                    13.8                  38                   8

2812                    23.6                  80                  17

3054                    10.5                  81                  19
```

```
      Maximum_pressure  Minimum_pressure  Maximum_windspeed_mph  \
2066             29.991            29.775                   17.3
1781             29.984            29.704                   11.5
1436             29.857            29.534                   19.6
3541             29.935            29.786                   12.7
783              30.037            29.293                   25.3
...                 ...               ...                    ...
57               30.475            29.753                   28.8
3404             30.321            30.184                   12.7
3011             30.449            29.974                    0.0
2812             29.884            29.610                   12.7
3054             30.368            29.842                   29.9

      Maximum_gust_speed_mph  Maximum_heat_index_Â°F  Month
diff_pressure
2066                    28.8                    58.5      4
0.216
1781                    17.3                    77.6      7
0.280
1436                    26.5                    80.1      6
0.323
3541                    19.6                    80.5      8
0.149
783                     34.5                    73.8      5
0.744
...                      ...                     ...    ...
...
57                      47.0                    34.0      2
0.722
```

```
3404                    17.3                    44.6      3
0.137
3011                     0.0                    51.6      1
0.475
2812                    19.6                    78.4      6
0.274
3054                    42.6                    38.2      2
0.526

[2731 rows x 18 columns]
```

x_test

```
      Average_temperature_Â°F  Average_humidity_%  Average_dewpoint
_Â°F  \
1724                    43.3                  58
28.8
2081                    35.5                  88
32.4
1697                    54.0                  23
16.4
2780                    47.4                  74
38.7
2061                    31.4                  87
28.0
...                      ...                 ...                    .
..
1927                    35.9                  51
18.9
1465                    63.2                  54
45.3
1299                    36.5                  23
1.2
3877                    62.2                  55
44.0
2059                    46.3                  37
15.5

      Average_barometer_in  Average_windspeed_mph
Average_gustspeed_mph  \
1724                 29.7                    6.3
9.3
2081                 30.2                    2.2
4.1
1697                 29.8                   11.9
18.0
2780                 29.8                    3.1
5.1
2061                 30.1                    1.0
2.0
```

```
...                    ...                    ...                    .
..
1927                   30.0                    7.4
11.1
1465                   29.9                    0.7
1.0
1299                   30.1                   15.0
20.4
3877                   29.7                    3.9
6.1
2059                   29.8                    3.8
6.2

      Average_direction_Â°deg  Maximum_temperature_Â°F  \
1724                      239                    52.8
2081                       83                    45.7
1697                      247                    65.5
2780                      274                    63.4
2061                      114                    33.0
...                       ...                     ...
1927                      244                    49.3
1465                        0                    72.1
1299                      231                    43.3
3877                      306                    85.6
2059                      243                    66.0

      Minimum_temperature_Â°F  Maximum_humidity_%  Minimum_humidity_%
\
1724                    34.6                  88                  34

2081                    30.4                  93                  70

1697                    46.1                  36                  14

2780                    34.1                  91                  41

2061                    29.1                  94                  74

...                      ...                 ...                 ...

1927                    24.2                  67                  38

1465                    47.7                  90                  36

1299                    30.6                  29                  12

3877                    49.6                  81                  19

2059                    23.8                  74                   8
```

```
      Maximum_pressure  Minimum_pressure  Maximum_windspeed_mph  \
1724             29.782            29.594                   20.7
2081             30.234            30.074                   11.5
1697             29.916            29.585                   23.0
2780             29.981            29.618                   12.7
2061             30.198            29.920                   10.4
...                 ...               ...                    ...
1927             30.122            29.768                   26.5
1465             30.069            29.699                   12.7
1299             30.260            29.996                   28.8
3877             29.800            29.662                   25.3
2059             30.059            29.463                   19.6

      Maximum_gust_speed_mph  Maximum_heat_index_Â°F  Month
diff_pressure
1724                    27.6                    52.8      5
0.188
2081                    17.3                    45.7      5
0.160
1697                    40.3                    65.5      4
0.331
2780                    17.3                    63.4      5
0.363
2061                    11.5                    33.0      4
0.278
...                      ...                     ...    ...
...
1927                    46.0                    49.3     12
0.354
1465                    13.8                    78.3      8
0.370
1299                    39.1                    43.3      1
0.264
3877                    39.1                    82.5      7
0.138
2059                    27.6                    66.0      4
0.596

[1171 rows x 18 columns]

y_train

      Rainfall_for_month_in
2066                   1.65
1781                   0.38
1436                   0.02
3541                   0.07
783                    2.56
```

```
...                     ...
57                    0.03
3404                  0.69
3011                  0.00
2812                  0.63
3054                  0.18

[2731 rows x 1 columns]
```

y_test

```
      Rainfall_for_month_in
1724                   0.35
2081                   1.35
1697                   0.08
2780                   0.65
2061                   0.60
...                     ...
1927                   0.05
1465                   0.23
1299                   0.00
3877                   0.03
2059                   0.24

[1171 rows x 1 columns]
```

```
from sklearn.linear_model import LinearRegression
```

```
inp.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3902 entries, 0 to 3901
Data columns (total 19 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   Average_temperature_Â°F  3902 non-null   float64
 1   Average_humidity_%       3902 non-null   int64
 2   Average_dewpoint _Â°F    3902 non-null   float64
 3   Average_barometer_in     3902 non-null   float64
 4   Average_windspeed_mph    3902 non-null   float64
 5   Average_gustspeed_mph    3902 non-null   float64
 6   Average_direction_Â°deg  3902 non-null   int64
 7   Rainfall_for_month_in    3902 non-null   float64
 8   Maximum_temperature_Â°F  3902 non-null   float64
 9   Minimum_temperature_Â°F  3902 non-null   float64
 10  Maximum_humidity_%       3902 non-null   int64
 11  Minimum_humidity_%       3902 non-null   int64
 12  Maximum_pressure         3902 non-null   float64
 13  Minimum_pressure         3902 non-null   float64
 14  Maximum_windspeed_mph    3902 non-null   float64
 15  Maximum_gust_speed_mph   3902 non-null   float64
```

```
 16  Maximum_heat_index_Â°F   3902 non-null   float64
 17  Month                   3902 non-null   int64
 18  diff_pressure           3902 non-null   float64
dtypes: float64(14), int64(5)
memory usage: 579.3 KB
```

```
climate_data=LinearRegression().fit(x,y)
```

```
climate_data.intercept_
```

```
array([-6.09778175])
```

```
climate_data.coef_
```

```
array([[ 0.02565462,  0.01041539,  0.00079678,  0.22629473,
0.00572873,
         0.00093015,  0.00029235, -0.00979376, -0.0015815 ,
0.00254745,
        -0.00071048, -0.04316419, -0.00908918, -0.00054699, -
0.00060757,
         0.00216876, -0.01001971, -0.034075  ]])
```

```
predicted=pd.DataFrame(climate_data.predict(x),columns=['prediction'])
predicted
```

```
      prediction
0       0.237557
1       0.114381
2       0.083658
3      -0.005864
4      -0.129851
...          ...
3897    0.920055
3898    0.948590
3899    0.995271
3900    0.897185
3901    0.862269

[3902 rows x 1 columns]
```

```
predicted_data=pd.concat([y,x,predicted],axis=1)
predicted_data=predicted_data.dropna()
```

```
predicted_data
```

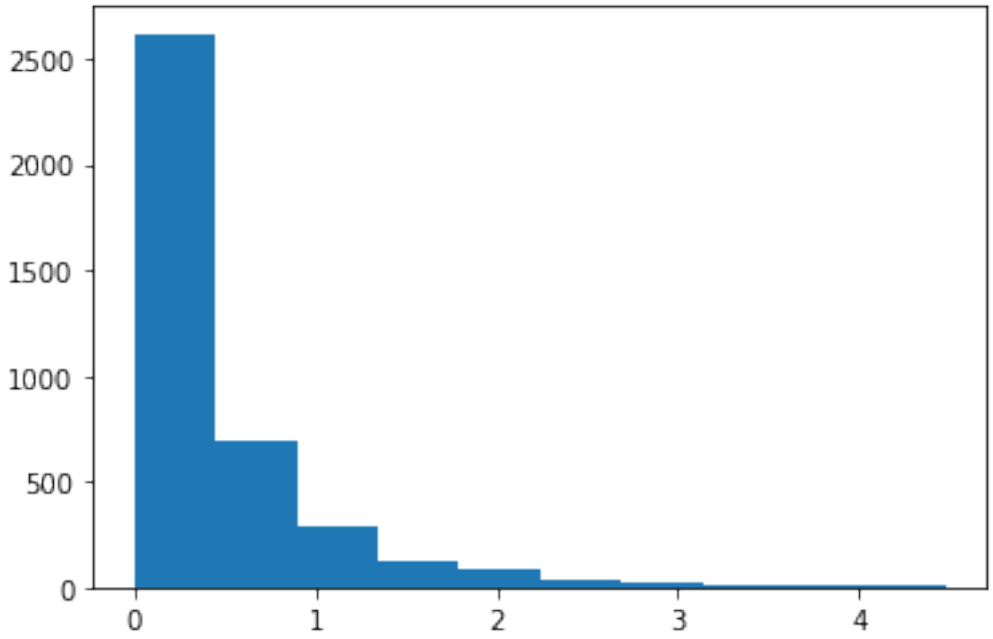
```
      Rainfall_for_month_in  Average_temperature_Â°F
Average_humidity_%  \
0                      0.00                    37.8
35
1                      0.00                    43.2
32
2                      0.00                    25.7
```

```
60
3                       0.00                        9.3
67
4                       0.00                       23.5
30
...                      ...                        ...                   .
..
3897                    0.24                       64.1
62
3898                    0.33                       62.8
60
3899                    0.33                       60.6
68
3900                    0.33                       61.7
64
3901                    0.35                       60.5
61

      Average_dewpoint _Â°F  Average_barometer_in
Average_windspeed_mph  \
0                       12.7                    29.7
26.4
1                       14.7                    29.5
12.8
2                       12.7                    29.7
8.3
3                        0.1                    30.4
2.9
4                       -5.3                    29.9
16.7
...                      ...                     ...                   .
..
3897                    49.8                    29.6
3.6
3898                    48.1                    29.7
2.5
3899                    48.9                    29.8
1.7
3900                    47.4                    29.9
2.2
3901                    45.3                    29.7
4.0

      Average_gustspeed_mph  Average_direction_Â°deg
Maximum_temperature_Â°F  \
0                       36.8                      274
40.0
1                       18.0                      240
52.0
2                       12.2                      290
```

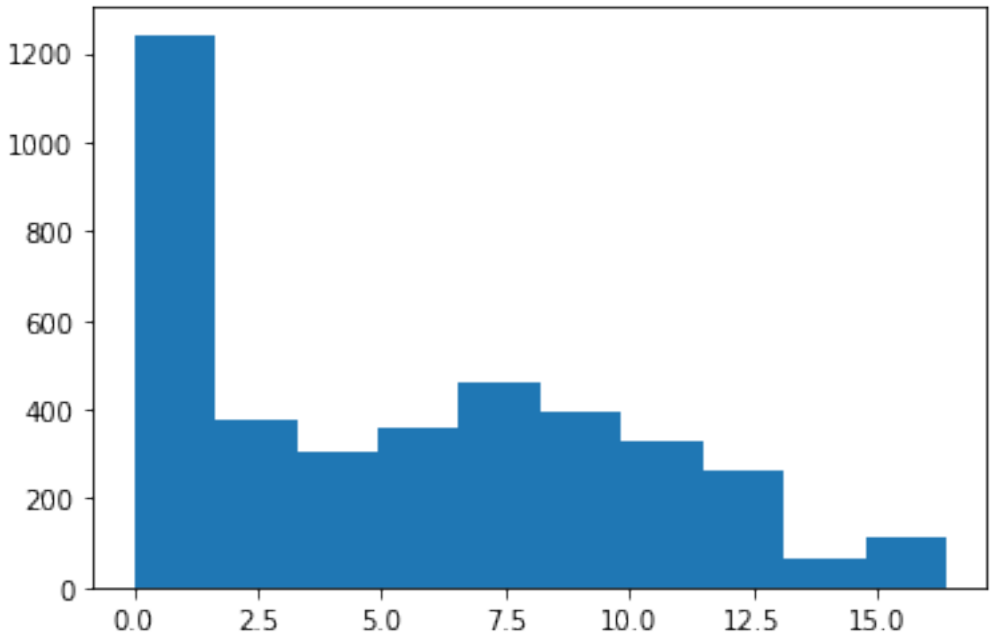
```
41.0
3                      4.5                       47
19.0
4                     23.1                      265
30.0
...                    ...                       ...
...
3897                   5.8                       240
74.9
3898                   4.0                       242
69.2
3899                   2.9                       357
71.9
3900                   4.0                        66
77.3
3901                   6.2                       248
75.6

      Minimum_temperature_Â°F  Maximum_humidity_%  Minimum_humidity_%
\
0                       34.0                   4                  27

1                       37.0                   4                  16

2                        6.0                   8                  35

3                        0.0                   7                  35

4                       15.0                   5                  13

...                      ...                 ...                 ...

3897                    55.3                  86                  35

3898                    55.1                  90                  36

3899                    50.5                  90                  40

3900                    43.6                  96                  35

3901                    46.0                  94                  35


      Maximum_pressure  Minimum_pressure  Maximum_windspeed_mph  \
0               29.762            29.596                   41.4
1               29.669            29.268                   35.7
2               30.232            29.260                   25.3
3               30.566            30.227                   12.7
4               30.233            29.568                   38.0
```

```
...                ...              ...                    ...
3897            29.686           29.577                   15.0
3898            29.781           29.645                    8.1
3899            29.930           29.745                   11.5
3900            29.941           29.781                   13.8
3901            29.792           29.675                   17.3

      Maximum_gust_speed_mph  Maximum_heat_index_Â°F  Month
diff_pressure  \
0                       59.0                   40.0      1
0.166
1                       51.0                   52.0      1
0.401
2                       38.0                   41.0      1
0.972
3                       20.0                   32.0      1
0.339
4                       53.0                   32.0      1
0.665
...                      ...                    ...    ...
...
3897                    25.3                   77.4      7
0.109
3898                    17.3                   77.5      7
0.136
3899                    15.0                   77.5      7
0.185
3900                    18.4                   78.2      7
0.160
3901                    26.5                   77.6      7
0.117

      prediction
0       0.237557
1       0.114381
2       0.083658
3      -0.005864
4      -0.129851
...          ...
3897    0.920055
3898    0.948590
3899    0.995271
3900    0.897185
3901    0.862269

[3902 rows x 20 columns]
```

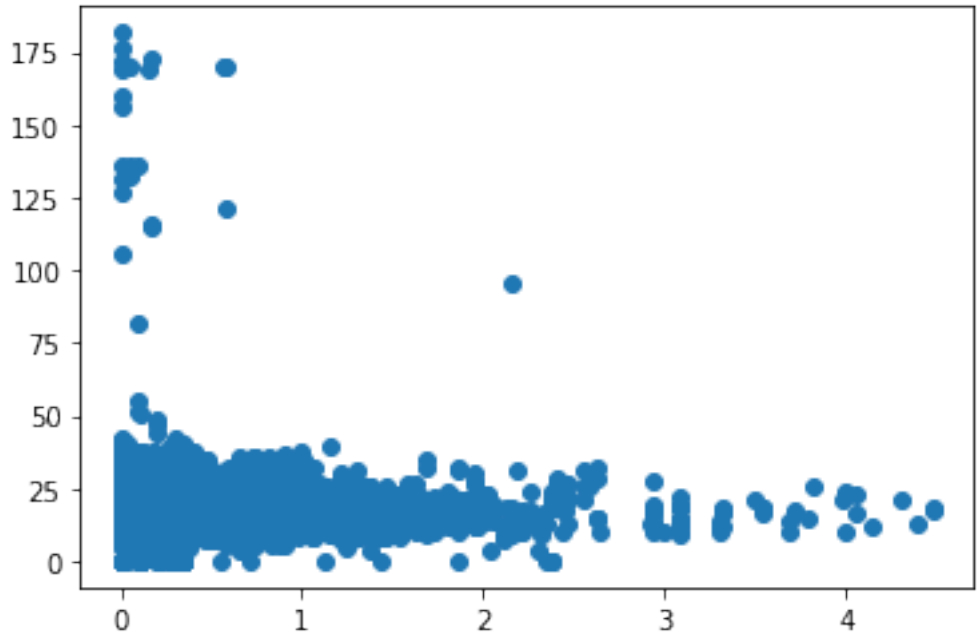
```
plt.hist(predicted_data.Rainfall_for_month_in)
plt.show()
```



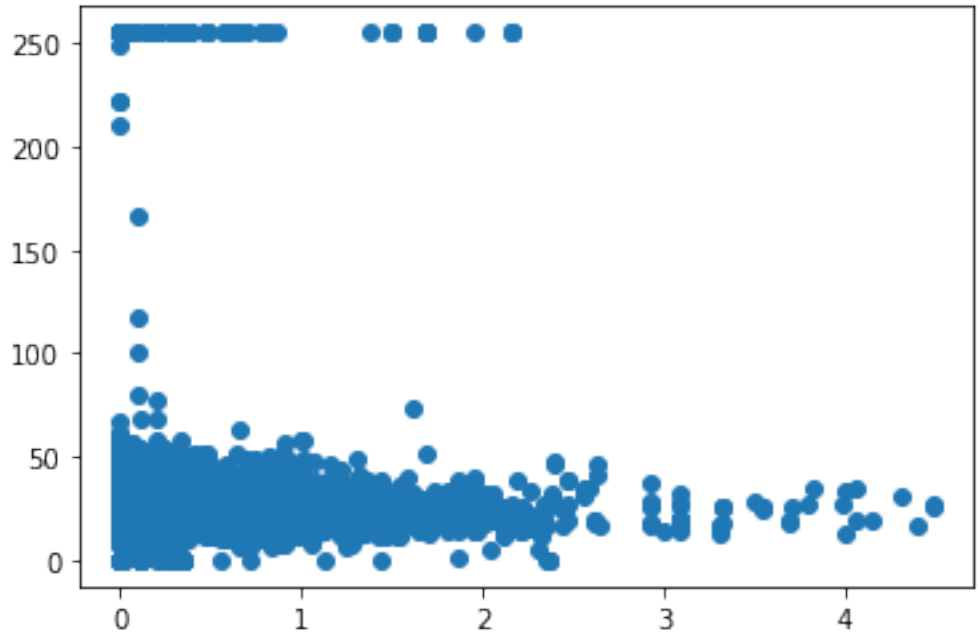

```
plt.hist(data.Rainfall_for_year_in)
plt.show()
```



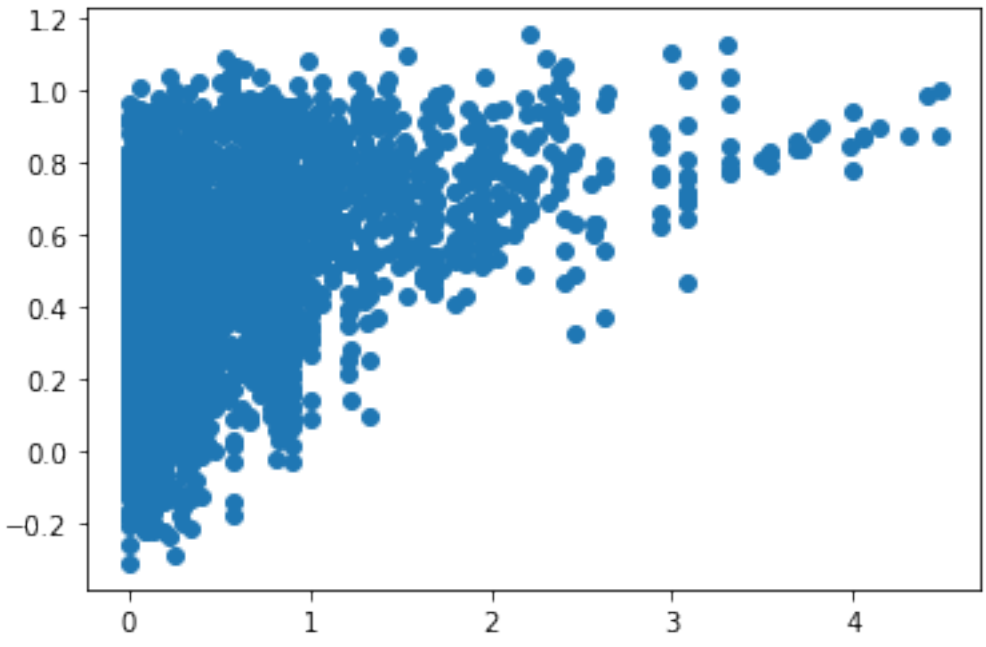

```
plt.scatter(predicted_data.Rainfall_for_month_in,predicted_data.Maximu
m_windspeed_mph)
plt.show()
```




```
plt.scatter(predicted_data.Rainfall_for_month_in,predicted_data.Maximu
m_gust_speed_mph)
plt.show()
```




```
plt.scatter(predicted_data.Rainfall_for_month_in,predicted_data.predic
tion)
plt.show()
```


1.2
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
1
2
3
4