

PROJECT

DATA ANALYSIS OF WEATHER DATA

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In [39]: import pandas as pd
import numpy as np

In [61]: data=pd.read_csv("C:\Users\Nmeqra\Downloads\11. Weather Data.csv")

In [41]: data.head()

Out[41]:
   Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  Weather
0   1/3/2012 0:00    -1.8             -3.9        86              4          8.0   101.24    Fog
1   1/5/2012 1:00    -1.8             -3.7        87              4          8.0   101.24    Fog
2   1/5/2012 2:00    -1.8             -3.4        88              7          4.0   101.26  Freezing Drizzle,Fog
3   1/5/2012 3:00    -1.5             -3.2        89              6          4.0   101.27  Freezing Drizzle,Fog
4   1/5/2012 4:00    -1.5             -3.3        88              7          4.8   101.23    Fog

In [5]: data.shape

Out[5]: (8784, 8)

There are 8784 rows and 8 columns.

In [47]: # To check the missing values
data.isnull().sum()

Out[47]:
Date/Time      0
Temp_C         0
Dew Point Temp_C  0
Rel Hum_%      0
Wind Speed_kmh  0
Visibility_km   0
Press_kPa      0
weather_condition  0
dtype: int64

There are no missing values in the data set.

In [48]: data.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 8784 entries, 0 to 8783
Data columns (total 8 columns):
#   Column                Non-Null Count  Dtype
---  --
0   Date/Time              8784 non-null    object
1   Temp_C                8784 non-null    float64
2   Dew Point Temp_C      8784 non-null    float64
3   Rel Hum_%             8784 non-null    int64
4   Wind Speed_kmh        8784 non-null    int64
5   Visibility_km          8784 non-null    float64
6   Press_kPa             8784 non-null    float64
7   weather_condition     8784 non-null    object
dtypes: float64(4), int64(2), object(2)
memory usage: 549.1+ KB

In [49]: # To get the summary of each variable
data.describe()

Out[49]:
      Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa
count  8784.000000      8784.000000      8784.000000      8784.000000      8784.000000      8784.000000
mean    8.798144      2.555204      67.431094      14.945469      27.664447      101.051623
std    11.687883      10.883072      16.918881      8.688066      12.622688      0.844005
min     -23.300000     -28.500000     18.000000      0.000000      0.200000      97.520000
25%     0.100000     -5.900000     56.000000      9.000000      24.100000     100.560000
50%     9.300000     3.300000     68.000000     13.000000     25.000000     101.070000
75%    18.800000     11.800000     81.000000     20.000000     25.000000     101.590000
max    33.000000     24.400000     100.000000     83.000000     48.300000     103.650000

In [50]: # To get the column names
data.columns

Out[50]: Index(['Date/Time', 'Temp_C', 'Dew Point Temp_C', 'Rel Hum_%',
        'Wind Speed_kmh', 'Visibility_km', 'Press_kPa', 'weather_condition'],
        dtype='object')

In [51]: # To get the data types of variables
data.dtypes

Out[51]:
Date/Time      object
Temp_C         float64
Dew Point Temp_C  float64
Rel Hum_%      int64
Wind Speed_kmh  int64
Visibility_km   float64
Press_kPa      float64
weather_condition  object
dtype: object

In [52]: data.nunique()

Out[52]:
Date/Time      8784
Temp_C         533
Dew Point Temp_C  489
Rel Hum_%       83
Wind Speed_kmh  34
Visibility_km    24
Press_kPa       518
weather_condition  50
dtype: int64

In [11]: data.dtypes

Out[11]:
Date/Time      object
Temp_C         float64
Dew Point Temp_C  float64
Rel Hum_%      int64
Wind Speed_kmh  int64
Visibility_km   float64
Press_kPa      float64
Weather        object
dtype: object

In [53]: data.count()

Out[53]:
Date/Time      8784
Temp_C         8784
Dew Point Temp_C  8784
Rel Hum_%      8784
Wind Speed_kmh  8784
Visibility_km    8784
Press_kPa       8784
weather_condition  8784
dtype: int64

In [54]: data.agg(['count', 'size', 'nunique'])

Out[54]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  weather_condition
count      8784      8784              8784      8784              8784      8784      8784      8784
size       8784      8784              8784      8784              8784      8784      8784      8784
nunique     8784      533              489      83              34      24      518      50

In [55]: data["Visibility_km"].unique()

Out[55]: array([ 8.,  4.,  4.8,  6.4,  1.2, 12.9, 16.1, 25., 19.3, 24.1,  9.7,
        11.3, 48.3,  3.2,  2.8,  2.4,  2.,  0.8,  0.6,  1.,  1.6,  3.6,
        0.2,  0.4])

In [56]: data["Visibility_km"].value_counts()

Out[56]:
25.0    3324
48.3     2814
24.1    1921
19.3      281
16.1      224
9.7       181
12.9      174
6.4       129
8.0       122
4.8        79
4.0        55
2.4        50
3.2         42
11.3        36
2.0         28
1.2         28
1.6         25
0.6         16
2.8         15
1.0         11
3.6          1
0.2           8
0.8           7
0.4           3
Name: Visibility_km, dtype: int64

In [57]: # To Find the all unique "Wind Speed" values in india
data["Wind Speed_kmh"].unique()

Out[57]: array([ 4,  7,  6,  9, 15, 13, 20, 22, 19, 24, 30, 38, 35, 39, 32, 33, 26, 44,
        43, 48, 87, 28, 17, 11,  0, 83, 70, 57, 46, 41, 52, 50, 63, 54,  2],
        dtype=int64)

In [58]: data["Wind Speed_kmh"].nunique()

Out[58]: 34

In [62]: # Number of times the weather is cloudy, clear, snow etc..
data.weather.value_counts()

Out[62]:
Mainly Clear      2196
Mostly Cloudy     2089
Cloudy            1728
Clear             1326
Snow              399
Rain              386
Rain Showers     188
Fog              150
Rain,Fog         116
Drizzle,Fog      89
Snow Showers     61
Drizzle          40
Snow,Fog         16
Snow,Blowing Snow  19
Rain,Snow        18
Haze             16
Thunderstorms,Rain Showers  16
Drizzle,Snow,Fog  15
Freezing Rain    14
Freezing Drizzle,Snow  11
Freezing Drizzle  7
Snow,Ice Pellets  6
Freezing Drizzle,Fog  6
Snow,Haze        5
Freezing Fog     4
Rain,Snow,Ice Pellets  4
Moderate Snow    4
Freezing Rain,Fog  4
Snow Showers,Fog  4
Freezing Drizzle,Haze  3
Thunderstorms,Rain  3
Rain,Haze        3
Thunderstorms,Rain Showers,Fog  3
Drizzle,Snow     2
Moderate Snow,Blowing Snow  2
Thunderstorms    2
Freezing Rain,Haze  2
Rain Showers,Snow Showers  2
Snow Pellets     1
Moderate Rain,Fog  1
Thunderstorms,Heavy Rain Showers  1
Freezing Rain,Ice Pellets,Fog  1
Rain,Ice Pellets  1
Rain,Snow Grains  1
Rain Showers,Fog  1
Thunderstorms,Rain,Fog  1
Thunderstorms,Moderate Rain Showers,Fog  1
Rain,Snow,Fog    1
Freezing Rain,Snow Grains  1
Drizzle,Ice Pellets,Fog  1
Name: weather, dtype: int64

In [63]: #using filtering
data[data["weather"]=="Clear"]

Out[63]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  Weather
67   1/3/2012 19:00    -16.9             -24.8        50              24          25.0   101.74    Clear
114   1/5/2012 18:00    -7.1             -14.4        56              11          25.0   100.71    Clear
115   1/5/2012 19:00    -9.2             -15.4        61              7           25.0   100.80    Clear
116   1/5/2012 20:00    -9.8             -15.7        62              9           25.0   100.83    Clear
117   1/5/2012 21:00    -9.0             -14.8        63              13          25.0   100.83    Clear
...
8646  12/26/2012 6:00    -13.4             -14.8        89              4          25.0   102.47    Clear
8698  12/28/2012 10:00    -6.1             -8.6        82              19          24.1   101.27    Clear
8713  12/29/2012 1:00    -11.9            -13.6        87              11          25.0   101.31    Clear
8714  12/29/2012 2:00    -11.8            -13.1        90              13          25.0   101.33    Clear
8756  12/30/2012 2:00    -13.8            -16.5        80              24          25.0   101.52    Clear

1326 rows x 8 columns

In [42]: #using filtering
data[data["weather"]=="Clear*"]

Out[42]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  Weather
67   1/3/2012 19:00    -16.9             -24.8        50              24          25.0   101.74    Clear
114   1/5/2012 18:00    -7.1             -14.4        56              11          25.0   100.71    Clear
115   1/5/2012 19:00    -9.2             -15.4        61              7           25.0   100.80    Clear
116   1/5/2012 20:00    -9.8             -15.7        62              9           25.0   100.83    Clear
117   1/5/2012 21:00    -9.0             -14.8        63              13          25.0   100.83    Clear
...
8646  12/26/2012 6:00    -13.4             -14.8        89              4          25.0   102.47    Clear
8698  12/28/2012 10:00    -6.1             -8.6        82              19          24.1   101.27    Clear
8713  12/29/2012 1:00    -11.9            -13.6        87              11          25.0   101.31    Clear
8714  12/29/2012 2:00    -11.8            -13.1        90              13          25.0   101.33    Clear
8756  12/30/2012 2:00    -13.8            -16.5        80              24          25.0   101.52    Clear

1326 rows x 8 columns

In [21]: data[data.Weather=="Snow"].count()

Out[21]:
Date/Time      390
Temp_C         390
Dew Point Temp_C  390
Rel Hum_%      390
Wind Speed_kmh  390
Visibility_km   390
Press_kPa      390
Weather        390
dtype: int64

In [22]: data.groupby("Weather").get_group("Snow")

Out[22]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  Weather
55   1/3/2012 7:00    -14.0             -19.5        63              19          25.0   100.95    Snow
84   1/4/2012 12:00    -13.7             -21.7        51              11          24.1   101.25    Snow
86   1/4/2012 14:00    -11.3             -19.0        53              7           19.3   100.97    Snow
87   1/4/2012 15:00    -10.2             -16.3        61              11          9.7   100.89    Snow
88   1/4/2012 16:00    -8.4             -15.5        61              13          19.3   100.79    Snow
...
8779  12/31/2012 19:00    0.1             -2.7        81              30          9.7   100.13    Snow
8780  12/31/2012 20:00    0.2             -2.4        83              24          9.7   100.03    Snow
8781  12/31/2012 21:00    -0.5             -1.5        93              28          4.8   99.95    Snow
8782  12/31/2012 22:00    -0.2             -1.8        89              28          9.7   99.91    Snow
8783  12/31/2012 23:00    0.0             -2.1        86              30          11.3   99.89    Snow

390 rows x 8 columns

In [24]: #ine number of times when the wind speed exactly 4 km/h
data[data["Wind Speed_kmh"]==4]

Out[24]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  Weather
0   1/1/2012 0:00    -1.8             -3.9        86              4          8.0   101.24    Fog
1   1/1/2012 1:00    -1.8             -3.7        87              4          8.0   101.24    Fog
96   1/5/2012 0:00    -8.8             -11.7        79              4          9.7   100.32    Snow
101  1/5/2012 5:00    -7.0             -9.5        82              4          4.0   100.19    Snow
146  1/7/2012 2:00    -8.1             -11.1        79              4          19.3   100.15    Cloudy
...
8768  12/31/2012 8:00    -8.6             -10.3        87              4          3.2   101.14    Snow Showers
8769  12/31/2012 9:00    -8.1             -9.6        89              4          2.4   101.09    Snow
8770  12/31/2012 10:00    -7.4             -8.9        89              4          6.4   101.05    Snow,Fog
8772  12/31/2012 12:00    -5.8             -7.5        88              4          12.9   100.78    Snow
8773  12/31/2012 13:00    -4.6             -6.6        86              4          12.9   100.63    Snow

474 rows x 8 columns

In [25]: data[data["Wind Speed_kmh"]==4].count()

Out[25]:
Date/Time      474
Temp_C         474
Dew Point Temp_C  474
Rel Hum_%      474
Wind Speed_kmh  474
Visibility_km   474
Press_kPa      474
Weather        474
dtype: int64

In [28]: data.Visibility_km.describe()

Out[28]:
count      8784.000000
mean       27.664447
std       12.622688
min         0.200000
25%       24.100000
50%       25.000000
75%       25.000000
max       48.300000
Name: Visibility_km, dtype: float64

In [44]: #rename the column name weather of dataframe to weather_condition
data.rename(columns = {'weather':'weather_condition'},inplace = True)
data.columns

Out[44]: Index(['Date/Time', 'Temp_C', 'Dew Point Temp_C', 'Rel Hum_%', 'Wind Speed_kmh', 'Visibility_km', 'Press_kPa', 'weather_condition'],
        dtype='object')

In [35]: #Find the all instance when wind speed above 24 km and visibility is 25
data[(data["Wind Speed_kmh"]>24) & (data["Visibility_km"]==25)]

Out[35]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  weather_condition
23   1/1/2012 23:00    5.3              2.0        79              30          25.0   99.31    Cloudy
24   1/2/2012 0:00    5.2              1.5        77              35          25.0   99.26    Rain Showers
25   1/2/2012 1:00    4.6              0.0        72              39          25.0   99.26    Cloudy
26   1/2/2012 2:00    3.9              -0.9        71              32          25.0   99.26    Mostly Cloudy
27   1/2/2012 3:00    3.7              -1.5        69              33          25.0   99.30    Mostly Cloudy
...
8705  12/28/2012 17:00    -8.6             -12.0       76              26          25.0   101.34    Mainly Clear
8753  12/30/2012 17:00    -12.1            -15.8        74              28          25.0   101.26    Mainly Clear
8755  12/30/2012 19:00    -13.4            -16.5        77              26          25.0   101.47    Mainly Clear
8759  12/30/2012 23:00    -12.1            -15.1        78              28          25.0   101.52    Mostly Cloudy

In [36]: #Find the all instance where weather is clear and humidity above 50
data[(data["weather_condition"]=="Clear") & (data["Rel Hum_%"]>50)]

Out[36]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa  weather_condition
114   1/5/2012 18:00    -7.1             -14.4        56              11          25.0   100.71    Clear
115   1/5/2012 19:00    -9.2             -15.4        61              7           25.0   100.80    Clear
116   1/5/2012 20:00    -9.8             -15.7        62              9           25.0   100.83    Clear
117   1/5/2012 21:00    -9.0             -14.8        63              13          25.0   100.83    Clear
241  1/11/2012 1:00    -10.7            -17.8        56              17          25.0   101.48    Clear
...
8646  12/26/2012 6:00    -13.4             -14.8        89              4          25.0   102.47    Clear
8698  12/28/2012 10:00    -6.1             -8.6        82              19          24.1   101.27    Clear
8713  12/29/2012 1:00    -11.9            -13.6        87              11          25.0   101.31    Clear
8714  12/29/2012 2:00    -11.8            -13.1        90              13          25.0   101.33    Clear
8756  12/30/2012 2:00    -13.8            -16.5        80              24          25.0   101.52    Clear

In [45]: #Minimum and maximum of each column against each weather condition
data.groupby("weather_condition").min()

Out[45]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa
weather_condition
Clear      1/11/2012 1:00    -23.3             -28.5        20              0          11.3   99.52
Cloudy     1/1/2012 17:00    -21.4             -26.8        18              0          11.3   98.39
Drizzle    1/23/2012 21:00    1.1             -0.2        84              0          6.4   97.84
Drizzle,Fog  1/27/2012 20:00    0.0             -1.6        85              0          10.0   98.65
Drizzle,Ice Pellets,Fog  12/17/2012 5:00    0.4             -0.7        92              20          4.0   100.79
Drizzle,Snow  12/17/2012 15:00    0.8              0.1        92              9          9.7   100.63
Drizzle,Snow,Fog  12/18/2012 6:00    0.3             -0.1        92              7          2.4   97.79
Fog      1/1/2012 0:00    -16.0             -17.2        80              0          0.2   98.31
Freezing Drizzle  1/13/2012 10:00    -9.0             -12.2        78              6          4.8   98.44
Freezing Drizzle,Fog  1/1/2012 2:00    -6.4             -9.0        82              6          3.6   98.74
Freezing Drizzle,Haze  2/1/2012 11:00    -5.8             -8.3        81              9          2.0   100.28
Freezing Drizzle,Snow  1/13/2012 3:00    -8.3             -10.4        79              6          2.4   99.19
Freezing Rain  1/22/2012 6:00    -19.0             -22.9        71              0          0.2   101.97
Freezing Rain,Fog  1/17/2012 18:00    -6.1             -8.7        82              7          2.8   98.32
Freezing Rain,Haze  2/1/2012 14:00    -4.9             -7.5        82              6          2.0   100.34
Freezing Rain,Ice Pellets,Fog  12/17/2012 9:00    -2.6             -3.7        92              28          8.0   100.95
Freezing Rain,Snow Grains  1/13/2012 9:00    -5.0             -7.3        84              32          4.8   98.56
Haze      1/22/2012 12:00    -11.5             -16.0        68              0          4.8   100.35
Mainly Clear  1/10/2012 11:00    -22.8             -28.0        20              0          12.9   98.67
Moderate Rain,Fog  12/10/2012 9:00    1.7              0.8        94              17          6.4   99.98
Moderate Rain,Snow  1/1/2012 15:00    -6.3             -7.6        83              26          0.6   99.88
Moderate Rain,Snow,Blowing Snow  12/27/2012 9:00    -5.5             -6.6        92              39          0.6   100.50
Mostly Cloudy  1/1/2012 16:00    -23.2             -28.5        18              0          11.3   98.36
Rain      1/1/2012 18:00    0.3              -0.7        40              0          4.0   97.52
Rain Showers  1/1/2012 22:00    1.6             -7.2        37              0          6.4   98.51
Rain Showers,Fog  10/20/2012 3:00    12.8              12.1        96              13          6.4   99.83
Rain Showers,Snow Showers  11/4/2012 8:00    2.1             -1.8        75              17          19.3   101.09
Rain,Fog     1/23/2012 18:00    0.0             -1.2        83              0          2.0   98.61
Rain,Haze    3/13/2012 7:00    4.0              1.0        81              7          4.0   100.50
Rain,Ice Pellets  12/18/2012 5:00    0.8             -0.6        92              24          9.7   100.12
Rain,Snow    1/10/2012 5:00    0.6             -1.7        81              13          2.4   98.18
Rain,Snow Grains  12/21/2012 0:00    1.9             -2.1        75              26          25.0   100.60

In [46]: data.groupby("weather_condition").max()

Out[46]:
      Date/Time  Temp_C  Dew Point Temp_C  Rel Hum_%  Wind Speed_kmh  Visibility_km  Press_kPa
weather_condition
Clear      9/9/2012 5:00    32.8             20.4        99              33          48.3   103.63
Cloudy     9/30/2012 23:00    30.5             22.6        99              54          48.3   103.65
Drizzle    9/30/2012 2:00    18.8             17.7        96              30          25.0   101.06
Drizzle,Fog  9/30/2012 2:00    19.9             19.1        100              28          9.7   102.07
Drizzle,Ice Pellets,Fog  12/17/2012 5:00    0.4             -0.7        92              20          4.0   100.79
Drizzle,Snow  12/18/2012 18:00    1.2              0.2        95              19          11.3   101.15
Drizzle,Snow,Fog  12/22/2012 3:00    1.1              0.6        98              32          9.7   100.15
Fog      9/22/2012 0:00    20.8             19.6        100              22          9.7   103.04
Freezing Drizzle  2/1/2012 5:00    -2.3             -3.3        93              26          12.9   101.02
Freezing Drizzle,Fog  12/10/2012 13:00    -0.3             -2.3        94              33          8.0   101.27
Freezing Drizzle,Haze  2/1/2012 13:00    -5.0             -7.7        83              11          4.0   100.36
Freezing Drizzle,Snow  3/2/2012 12:00    -3.3             -4.6        94              24          12.9   101.18
Freezing Rain  3/12/2012 6:00    -0.1             -0.3        99              9          0.8   102.05
Freezing Rain,Fog  2/1/2012 7:00    0.3             -1.7        92              28          16.1   101.80
Freezing Rain,Haze  12/17/2012 1:00    0.1             -0.9        93              26          9.7   101.01
Freezing Rain,Snow  2/1/2012 15:00    -4.9             -7.4        83              9          2.8   100.41
Freezing Rain,Ice Pellets,Fog  12/17/2012 3:00    -2.8             -3.7        92              28          8.0   100.95
Freezing Rain,Snow Grains  1/13/2012 9:00    -5.0             -7.3        84              32          4.8   98.56
Haze      3/13/2012 23:00    14.1             11.1        86              17          9.7   102.97
Mainly Clear  9/9/2012 9:00    33.0             21.2        99              63          48.3   103.59
Moderate Rain,Fog  12/10/2012 9:00    1.7              0.8        94              17          6.4   99.98
Moderate Snow  12/27/2012 9:00    -4.9             -6.7        93              39          0.8   100.67
Moderate Snow,Blowing Snow  12/27/2012 12:00    -5.4             -6.4        93              41          0.6   100.64
Mostly Cloudy  9/9/2012 2:00    32.4             24.4        100              83          48.3   103.65
Rain      9/5/2012 2:00    22.8             20.4        99              52          48.3   102.26
Rain Showers  9/8/2012 16:00    26.4             23.0        97              41          48.3   102.31
Rain Showers,Fog  10/20/2012 3:00    12.8              12.1        96              13          6.4   99.83
Rain Showers,Snow Showers  12/5/2012 10:00    2.2             -1.2        78              28          24.1   101.11
Rain,Fog     9/30/2012 23:00    21.7             19.5        100              46          9.7   101.77
Rain,Haze    3/13/2012 9:00    5.5             2.9        86              17          9.7   100.61
Rain,Ice Pellets  12/18/2012 5:00    0.6             -0.6        92              24          9.7   100.12
Rain,Snow    4/23/2012 3:00    1.7              0.5        94              52          25.0   101.07
Rain,Snow Grains  12/21/2012 0:00    1.9             -2.1        75              26          25.0   100.60
Rain,Snow,Fog  12/28/2012 21:00    0.8              0.3        96              9          6.4   100.73

In [ ]:
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