

```

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
##matplotlib inline

#Data Cleaning
dfnew = pd.read_csv("AirQualityodisha.csv",delimiter=',')
print(dfnew.head())
x=dfnew['PM 2.5'].isnull() # detects null value N/A
print(x.head(n=1000))
print(dfnew.isnull().sum())# finds per feature number of null values

median = dfnew['PM 2.5'].median()
updated = dfnew['PM 2.5'].fillna(median, inplace=False)
print (updated.head(n=1300))
print(dfnew.head(n=50))
so2_total=dfnew.groupby('City')
["S02"].sum().rename('S02_Total').reset_index()
df1 = dfnew.merge(so2_total)
print(so2_total.iloc[0:20,0])
print(df1.head(n=5))
dfnew["so2_total1"]=dfnew.groupby('City')["S02"].transform('sum')
#####df2 = df.merge(so2_total1)
print(dfnew.head(n=5))

```

Stn Code	Sampling Date	State	City	Location of Monitoring Station \
0	68	02-01-15	Odisha	Talcher T.T.P.S.Colony,
1	68	06-01-15	Odisha	Talcher T.T.P.S.Colony,
2	68	09-01-15	Odisha	Talcher T.T.P.S.Colony,
3	68	13-01-15	Odisha	Talcher T.T.P.S.Colony,
4	68	16-01-15	Odisha	Talcher T.T.P.S.Colony,

Agency	Type of Location	S02	N02
RSPM/PM10 \			
0 Odisha State Pollution Control Board	Industrial Area	11	24
143			
1 Odisha State Pollution Control Board	Industrial Area	10	23
133			
2 Odisha State Pollution Control Board	Industrial Area	8	25
125			
3 Odisha State Pollution Control Board	Industrial Area	10	25
137			
4 Odisha State Pollution Control Board	Industrial Area	9	26
186			

```

    PM 2.5
0    102.0
1     96.0
2    116.0
3    107.0
4    118.0
0      False
1      False
2      False
3      False
4      False

...
995    False
996    False
997    False
998    False
999    False

```

Name: PM 2.5, Length: 1000, dtype: bool

```

Stn Code          0
Sampling Date     0
State             0
City              0
Location of Monitoring Station 0
Agency           0
Type of Location  0
SO2               0
NO2               0
RSPM/PM10         0
PM 2.5            332

```

```

dtype: int64
0    102.0
1     96.0
2    116.0
3    107.0
4    118.0

```

```

...
1295    28.0
1296    32.0
1297    26.0
1298    28.0
1299    32.0

```

Name: PM 2.5, Length: 1300, dtype: float64

	Stn Code	Sampling Date	State	City	Location of Monitoring Station
0	68	02-01-15	Odisha	Talcher	T.T.P.S.Colony,
1	68	06-01-15	Odisha	Talcher	T.T.P.S.Colony,
2	68	09-01-15	Odisha	Talcher	T.T.P.S.Colony,

Talcher					
3	68	13-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
4	68	16-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
5	68	20-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
6	68	23-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
7	68	27-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
8	68	30-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
9	68	03-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
10	68	06-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
11	68	10-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
12	68	13-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
13	68	16-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
14	68	18-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
15	68	25-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
16	68	28-02-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
17	68	01-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
18	68	04-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
19	68	08-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
20	68	11-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
21	68	15-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
22	68	18-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
23	68	22-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
24	68	25-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
25	68	30-09-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
26	68	01-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
27	68	06-10-15	Odisha	Talcher	T.T.P.S.Colony,

Talcher					
28	68	09-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
29	68	13-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
30	68	16-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
31	68	20-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
32	68	23-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
33	68	27-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
34	68	30-10-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
35	68	03-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
36	68	06-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
37	68	10-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
38	68	13-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
39	68	17-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
40	68	20-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
41	68	24-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
42	68	27-11-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
43	68	01-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
44	68	04-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
45	68	08-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
46	68	11-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
47	68	15-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
48	68	18-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
49	68	22-12-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					

				Agency	Type of Location	S02	N02	\
0	Odisha	State	Pollution	Control Board	Industrial Area	11	24	
1	Odisha	State	Pollution	Control Board	Industrial Area	10	23	
2	Odisha	State	Pollution	Control Board	Industrial Area	8	25	

3	Odisha State Pollution Control Board	Industrial Area	10	25
4	Odisha State Pollution Control Board	Industrial Area	9	26
5	Odisha State Pollution Control Board	Industrial Area	10	23
6	Odisha State Pollution Control Board	Industrial Area	11	26
7	Odisha State Pollution Control Board	Industrial Area	11	26
8	Odisha State Pollution Control Board	Industrial Area	12	24
9	Odisha State Pollution Control Board	Industrial Area	8	24
10	Odisha State Pollution Control Board	Industrial Area	10	24
11	Odisha State Pollution Control Board	Industrial Area	9	25
12	Odisha State Pollution Control Board	Industrial Area	11	26
13	Odisha State Pollution Control Board	Industrial Area	10	25
14	Odisha State Pollution Control Board	Industrial Area	11	24
15	Odisha State Pollution Control Board	Industrial Area	12	26
16	Odisha State Pollution Control Board	Industrial Area	13	25
17	Odisha State Pollution Control Board	Industrial Area	9	24
18	Odisha State Pollution Control Board	Industrial Area	10	24
19	Odisha State Pollution Control Board	Industrial Area	11	24
20	Odisha State Pollution Control Board	Industrial Area	10	22
21	Odisha State Pollution Control Board	Industrial Area	8	22
22	Odisha State Pollution Control Board	Industrial Area	11	25
23	Odisha State Pollution Control Board	Industrial Area	10	24
24	Odisha State Pollution Control Board	Industrial Area	11	25
25	Odisha State Pollution Control Board	Industrial Area	8	25
26	Odisha State Pollution Control Board	Industrial Area	10	25
27	Odisha State Pollution Control Board	Industrial Area	9	24
28	Odisha State Pollution Control Board	Industrial Area	10	25
29	Odisha State Pollution Control Board	Industrial Area	10	25
30	Odisha State Pollution Control Board	Industrial Area	10	27
31	Odisha State Pollution Control Board	Industrial Area	12	25
32	Odisha State Pollution Control Board	Industrial Area	11	26
33	Odisha State Pollution Control Board	Industrial Area	10	22
34	Odisha State Pollution Control Board	Industrial Area	11	26
35	Odisha State Pollution Control Board	Industrial Area	11	25
36	Odisha State Pollution Control Board	Industrial Area	11	25
37	Odisha State Pollution Control Board	Industrial Area	10	25
38	Odisha State Pollution Control Board	Industrial Area	10	25
39	Odisha State Pollution Control Board	Industrial Area	10	25
40	Odisha State Pollution Control Board	Industrial Area	11	26
41	Odisha State Pollution Control Board	Industrial Area	10	25
42	Odisha State Pollution Control Board	Industrial Area	10	26
43	Odisha State Pollution Control Board	Industrial Area	12	25
44	Odisha State Pollution Control Board	Industrial Area	11	25
45	Odisha State Pollution Control Board	Industrial Area	11	27
46	Odisha State Pollution Control Board	Industrial Area	9	25
47	Odisha State Pollution Control Board	Industrial Area	10	24
48	Odisha State Pollution Control Board	Industrial Area	12	23
49	Odisha State Pollution Control Board	Industrial Area	11	26

RSPM/PM10 PM 2.5

0 143 102.0

1	133	96.0
2	125	116.0
3	137	107.0
4	186	118.0
5	178	153.0
6	171	146.0
7	161	137.0
8	158	127.0
9	207	152.0
10	208	125.0
11	192	96.0
12	186	110.0
13	180	118.0
14	186	99.0
15	171	119.0
16	169	108.0
17	68	47.0
18	79	52.0
19	76	57.0
20	76	49.0
21	36	17.0
22	83	61.0
23	76	43.0
24	94	69.0
25	89	63.0
26	70	57.0
27	90	78.0
28	112	92.0
29	95	73.0
30	103	87.0
31	95	69.0
32	90	65.0
33	99	74.0
34	106	86.0
35	101	68.0
36	99	56.0
37	151	81.0
38	153	79.0
39	97	49.0
40	136	72.0
41	132	70.0
42	145	76.0
43	106	61.0
44	151	87.0
45	137	79.0
46	167	83.0
47	198	98.0
48	177	92.0
49	202	104.0
0	Angul	

1 Balasore
 2 Berhampur
 3 Bhubaneswar
 4 Cuttack
 5 Kalinga Nagar
 6 Keonjhar
 7 Konark
 8 Paradeep
 9 Puri
 10 Rayagada
 11 Rourkela
 12 Sambalpur
 13 Talcher

Name: City, dtype: object

Stn Code	Sampling Date	State	City	Location of Monitoring
0	02-01-15	Odisha	Talcher	T.T.P.S.Colony,
1	06-01-15	Odisha	Talcher	T.T.P.S.Colony,
2	09-01-15	Odisha	Talcher	T.T.P.S.Colony,
3	13-01-15	Odisha	Talcher	T.T.P.S.Colony,
4	16-01-15	Odisha	Talcher	T.T.P.S.Colony,

Agency	Type of Location	S02	N02
0 Odisha State Pollution Control Board	Industrial Area	11	24
1 Odisha State Pollution Control Board	Industrial Area	10	23
2 Odisha State Pollution Control Board	Industrial Area	8	25
3 Odisha State Pollution Control Board	Industrial Area	10	25
4 Odisha State Pollution Control Board	Industrial Area	9	26

PM 2.5	S02_Total
0 102.0	1039
1 96.0	1039
2 116.0	1039
3 107.0	1039
4 118.0	1039

Stn Code	Sampling Date	State	City	Location of Monitoring
0	02-01-15	Odisha	Talcher	T.T.P.S.Colony,

1	68	06-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
2	68	09-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
3	68	13-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					
4	68	16-01-15	Odisha	Talcher	T.T.P.S.Colony,
Talcher					

		Agency	Type of Location	S02	N02
RSPM/PM10 \					
0	Odisha State Pollution Control Board	Industrial Area	11	24	
143					
1	Odisha State Pollution Control Board	Industrial Area	10	23	
133					
2	Odisha State Pollution Control Board	Industrial Area	8	25	
125					
3	Odisha State Pollution Control Board	Industrial Area	10	25	
137					
4	Odisha State Pollution Control Board	Industrial Area	9	26	
186					

	PM 2.5	so2_total1
0	102.0	1039
1	96.0	1039
2	116.0	1039
3	107.0	1039
4	118.0	1039

```
dataset1 = "weather_data_katraj.csv"
```

```
df1 = pd.read_csv(dataset1, header = 0)
```

```
df2 = pd.read_csv(dataset2, header = 0)
```

```
#df1.head()
```

```
df = pd.merge(df1, df2, on = 'timestamp')
```

```
df.head(10)
```

```
#data transformation new code
```

```
df = pd.read_csv("AirQualityodisha.csv",delimiter=';')
```

```
df = df.transpose()
```

```
print (df)
```

```
0 \
Stn Code,Sampling Date,State,City,Location of M... 68,02-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```



```
1      \
Stn Code,Sampling Date,State,City,Location of M... 68,06-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
2      \
Stn Code,Sampling Date,State,City,Location of M... 68,09-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
3      \
Stn Code,Sampling Date,State,City,Location of M... 68,13-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
4      \
Stn Code,Sampling Date,State,City,Location of M... 68,16-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
5      \
Stn Code,Sampling Date,State,City,Location of M... 68,20-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
6      \
Stn Code,Sampling Date,State,City,Location of M... 68,23-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
7      \
Stn Code,Sampling Date,State,City,Location of M... 68,27-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
8      \
Stn Code,Sampling Date,State,City,Location of M... 68,30-01-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
9      \
Stn Code,Sampling Date,State,City,Location of M... 68,03-02-
15,Odisha,Talcher,"T.T.P.S.Colony, Ta...
```

```
Stn Code,Sampling Date,State,City,Location of M...  ... \
```

2382 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,30-11-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2383 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,01-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2384 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,03-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2385 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,08-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2386 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,10-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2387 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,15-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2388 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,17-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2389 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,22-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2390 \

Stn Code,	Sampling Date,	State,	City,	Location of M...	819,26-12-15,Odisha,Kalinga Nagar,Roof of R0 0...
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2391

Stn Code,Sampling Date,State,City,Location of M... 819,29-12-15,Odisha,Kalinga Nagar,Roof of R0 0...

[1 rows x 2392 columns]

```
df1 = pd.read_csv("weather_data_katraj.csv")
print(list(df))
```

[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579,

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664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677,
678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691,
692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705,
706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719,
720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733,
734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747,
748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761,
762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775,
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```
df1.dtypes
```

```
timestamp    object  
aqi           int64  
h            float64  
no2           int64  
o3           int64  
pm25         int64
```

```
dtype: object
```

```
df_wna = df1.dropna(subset=[' pm25'])  
x=df1[' pm25'].isnull().sum()  
print("Total number of null values"+ str(x))
```

```
Total number of null values0
```