

# 风速数据 - 统计

---



## 加载数据

```
1 import pandas as pd
2 import datetime
```

```
1 data = pd.read_table('data/wind.data', sep='\s+',
    parse_dates=[[0, 1, 2]])
2 data.head()
```

```
1 <tr style="text-align: right;">
2   <th></th>
3   <th>Yr_Mo_Dy</th>
4   <th>RPT</th>
5   <th>VAL</th>
6   <th>ROS</th>
7   <th>KIL</th>
8   <th>SHA</th>
9   <th>BIR</th>
10  <th>DUB</th>
11  <th>CLA</th>
12  <th>MUL</th>
13  <th>CLO</th>
14  <th>BEL</th>
15  <th>MAL</th>
16 </tr>
```

```
1 <tr>
2   <th>0</th>
3   <td>2061-01-01</td>
4   <td>15.04</td>
5   <td>14.96</td>
6   <td>13.17</td>
7   <td>9.29</td>
8   <td>NaN</td>
9   <td>9.87</td>
10  <td>13.67</td>
11  <td>10.25</td>
12  <td>10.83</td>
13  <td>12.58</td>
14  <td>18.50</td>
15  <td>15.04</td>
16 </tr>
17 <tr>
18   <th>1</th>
19   <td>2061-01-02</td>
20   <td>14.71</td>
21   <td>NaN</td>
22   <td>10.83</td>
23   <td>6.50</td>
24   <td>12.62</td>
25   <td>7.67</td>
26   <td>11.50</td>
27   <td>10.04</td>
28   <td>9.79</td>
29   <td>9.67</td>
30   <td>17.54</td>
31   <td>13.83</td>
32 </tr>
33 <tr>
34   <th>2</th>
```

```
35      <td>2061-01-03</td>
36      <td>18.50</td>
37      <td>16.88</td>
38      <td>12.33</td>
39      <td>10.13</td>
40      <td>11.17</td>
41      <td>6.17</td>
42      <td>11.25</td>
43      <td>NaN</td>
44      <td>8.50</td>
45      <td>7.67</td>
46      <td>12.75</td>
47      <td>12.71</td>
48 </tr>
49 <tr>
50     <th>3</th>
51     <td>2061-01-04</td>
52     <td>10.58</td>
53     <td>6.63</td>
54     <td>11.75</td>
55     <td>4.58</td>
56     <td>4.54</td>
57     <td>2.88</td>
58     <td>8.63</td>
59     <td>1.79</td>
60     <td>5.83</td>
61     <td>5.88</td>
62     <td>5.46</td>
63     <td>10.88</td>
64 </tr>
65 <tr>
66     <th>4</th>
67     <td>2061-01-05</td>
68     <td>13.33</td>
```

```
69     <td>13.25</td>
70     <td>11.42</td>
71     <td>6.17</td>
72     <td>10.71</td>
73     <td>8.21</td>
74     <td>11.92</td>
75     <td>6.54</td>
76     <td>10.92</td>
77     <td>10.34</td>
78     <td>12.92</td>
79     <td>11.83</td>
80 </tr>
```

```
1 data.info()
```

```
1 <class 'pandas.core.frame.DataFrame'>
2 RangeIndex: 6574 entries, 0 to 6573
3 Data columns (total 13 columns):
4 Yr_Mo_Dy      6574 non-null datetime64[ns]
5 RPT           6568 non-null float64
6 VAL           6571 non-null float64
7 ROS           6572 non-null float64
8 KIL           6569 non-null float64
9 SHA           6572 non-null float64
10 BIR           6574 non-null float64
11 DUB           6571 non-null float64
12 CLA           6572 non-null float64
13 MUL           6571 non-null float64
14 CLO           6573 non-null float64
15 BEL           6574 non-null float64
16 MAL           6570 non-null float64
17 dtypes: datetime64[ns](1), float64(12)
18 memory usage: 667.8 KB
```

## 对日期数据进行分析

```
1 data.Yr_Mo_Dy.describe()
```

```
1 count          6574
2 unique          6574
3 top      1968-11-10 00:00:00
4 freq              1
5 first      1968-01-01 00:00:00
6 last       2067-12-31 00:00:00
7 Name: Yr_Mo_Dy, dtype: object
```

## 我们发现存在2067年？ 创建一个函数并用它去修复这个bug

```
1 def fix_century(x):  
2     year = x.year - 100 if x.year > 1989 else x.year  
3     return datetime.date(year, x.month, x.day)
```

```
1 data['Yr_Mo_Dy'] = data['Yr_Mo_Dy'].apply(fix_century)  
2 data = data.set_index('Yr_Mo_Dy')  
3 data.head(3)
```

```
1 <tr style="text-align: right;">
2   <th></th>
3   <th>RPT</th>
4   <th>VAL</th>
5   <th>ROS</th>
6   <th>KIL</th>
7   <th>SHA</th>
8   <th>BIR</th>
9   <th>DUB</th>
10  <th>CLA</th>
11  <th>MUL</th>
12  <th>CLO</th>
13  <th>BEL</th>
14  <th>MAL</th>
15 </tr>
16 <tr>
17   <th>Yr_Mo_Dy</th>
18   <th></th>
19   <th></th>
20   <th></th>
21   <th></th>
22   <th></th>
23   <th></th>
24   <th></th>
25   <th></th>
26   <th></th>
27   <th></th>
28   <th></th>
29   <th></th>
30 </tr>
```



```
1 <tr>
2   <th>1961-01-01</th>
3   <td>15.04</td>
4   <td>14.96</td>
5   <td>13.17</td>
6   <td>9.29</td>
7   <td>NaN</td>
8   <td>9.87</td>
9   <td>13.67</td>
10  <td>10.25</td>
11  <td>10.83</td>
12  <td>12.58</td>
13  <td>18.50</td>
14  <td>15.04</td>
15 </tr>
16 <tr>
17   <th>1961-01-02</th>
18   <td>14.71</td>
19   <td>NaN</td>
20   <td>10.83</td>
21   <td>6.50</td>
22   <td>12.62</td>
23   <td>7.67</td>
24   <td>11.50</td>
25   <td>10.04</td>
26   <td>9.79</td>
27   <td>9.67</td>
28   <td>17.54</td>
29   <td>13.83</td>
30 </tr>
31 <tr>
32   <th>1961-01-03</th>
33   <td>18.50</td>
34   <td>16.88</td>
```

```
35 <td>12.33</td>
36 <td>10.13</td>
37 <td>11.17</td>
38 <td>6.17</td>
39 <td>11.25</td>
40 <td>NaN</td>
41 <td>8.50</td>
42 <td>7.67</td>
43 <td>12.75</td>
44 <td>12.71</td>
45 </tr>
```

## 对应每一个location，一共有多少数据值缺失

```
1 data.isnull().sum()
```

```
1 RPT      6
2 VAL      3
3 ROS      2
4 KIL      5
5 SHA      2
6 BIR      0
7 DUB      3
8 CLA      2
9 MUL      3
10 CLO      1
11 BEL      0
12 MAL      4
13 dtype: int64
```

## 对应每一个location，一共有多少完整的数据值¶

```
1 data.shape[1] - data.isnull().sum()
```

```
1 RPT      6
2 VAL      9
3 ROS     10
4 KIL      7
5 SHA     10
6 BIR     12
7 DUB      9
8 CLA     10
9 MUL      9
10 CLO     11
11 BEL     12
12 MAL      8
13 dtype: int64
```

## 对于全体数据，计算风速的平均值

```
1 data.mean().mean()
```

```
1 10.227982360836924
```

## 创建一个名为loc\_stats的数据框去计算并存储每个location的风速最小值，最大值，平均值和标准差

```
1 loc_stats = pd.DataFrame()
2 loc_stats['min'] = data.min()
3 loc_stats['max'] = data.max()
4 loc_stats['mean'] = data.mean()
5 loc_stats['std'] = data.std()
6 loc_stats
```

```
1 <tr style="text-align: right;">
2   <th></th>
3   <th>min</th>
4   <th>max</th>
5   <th>mean</th>
6   <th>std</th>
7 </tr>
```

```
1 <tr>
2   <th>RPT</th>
3   <td>0.67</td>
4   <td>35.80</td>
5   <td>12.362987</td>
6   <td>5.618413</td>
7 </tr>
8 <tr>
9   <th>VAL</th>
10  <td>0.21</td>
11  <td>33.37</td>
12  <td>10.644314</td>
13  <td>5.267356</td>
14 </tr>
15 <tr>
16  <th>ROS</th>
17  <td>1.50</td>
18  <td>33.84</td>
19  <td>11.660526</td>
20  <td>5.008450</td>
21 </tr>
22 <tr>
23  <th>KIL</th>
24  <td>0.00</td>
25  <td>28.46</td>
26  <td>6.306468</td>
27  <td>3.605811</td>
28 </tr>
29 <tr>
30  <th>SHA</th>
31  <td>0.13</td>
32  <td>37.54</td>
33  <td>10.455834</td>
34  <td>4.936125</td>
```

```
35 </tr>
36 <tr>
37   <th>BIR</th>
38   <td>0.00</td>
39   <td>26.16</td>
40   <td>7.092254</td>
41   <td>3.968683</td>
42 </tr>
43 <tr>
44   <th>DUB</th>
45   <td>0.00</td>
46   <td>30.37</td>
47   <td>9.797343</td>
48   <td>4.977555</td>
49 </tr>
50 <tr>
51   <th>CLA</th>
52   <td>0.00</td>
53   <td>31.08</td>
54   <td>8.495053</td>
55   <td>4.499449</td>
56 </tr>
57 <tr>
58   <th>MUL</th>
59   <td>0.00</td>
60   <td>25.88</td>
61   <td>8.493590</td>
62   <td>4.166872</td>
63 </tr>
64 <tr>
65   <th>CLO</th>
66   <td>0.04</td>
67   <td>28.21</td>
68   <td>8.707332</td>
```

```
69     <td>4.503954</td>
70 </tr>
71 <tr>
72     <th>BEL</th>
73     <td>0.13</td>
74     <td>42.38</td>
75     <td>13.121007</td>
76     <td>5.835037</td>
77 </tr>
78 <tr>
79     <th>MAL</th>
80     <td>0.67</td>
81     <td>42.54</td>
82     <td>15.599079</td>
83     <td>6.699794</td>
84 </tr>
```

**创建一个名为day\_stats的数据框去计算并存储所有location的风速最小值，最大值，平均值和标准差**

```
1 day_stats = pd.DataFrame()
2 day_stats['min'] = data.min(axis=1)
3 day_stats['max'] = data.max(axis=1)
4 day_stats['mean'] = data.mean(axis=1)
5 day_stats['std'] = data.std(axis=1)
6 day_stats.head()
```

```
1 <tr style="text-align: right;">
2   <th></th>
3   <th>min</th>
4   <th>max</th>
5   <th>mean</th>
6   <th>std</th>
7 </tr>
8 <tr>
9   <th>Yr_Mo_Dy</th>
10  <th></th>
11  <th></th>
12  <th></th>
13  <th></th>
14 </tr>
```



```
1 <tr>
2   <th>1961-01-01</th>
3   <td>9.29</td>
4   <td>18.50</td>
5   <td>13.018182</td>
6   <td>2.808875</td>
7 </tr>
8 <tr>
9   <th>1961-01-02</th>
10  <td>6.50</td>
11  <td>17.54</td>
12  <td>11.336364</td>
13  <td>3.188994</td>
14 </tr>
15 <tr>
16  <th>1961-01-03</th>
17  <td>6.17</td>
18  <td>18.50</td>
19  <td>11.641818</td>
20  <td>3.681912</td>
21 </tr>
22 <tr>
23  <th>1961-01-04</th>
24  <td>1.79</td>
25  <td>11.75</td>
26  <td>6.619167</td>
27  <td>3.198126</td>
28 </tr>
29 <tr>
30  <th>1961-01-05</th>
31  <td>6.17</td>
32  <td>13.33</td>
33  <td>10.630000</td>
34  <td>2.445356</td>
```

## 对于每一个location，计算一月份的平均风速

```
1 data['date'] = data.index
2 data['year'] = data['date'].apply(lambda date: date.year)
3 data['month'] = data['date'].apply(lambda date: date.month)
4 data['day'] = data['date'].apply(lambda date: date.day)
5 january_winds = data.query('month == 1')
6 january_winds.loc[:, 'RPT':'MAL'].mean()
```

```
1 RPT      14.847325
2 VAL      12.914560
3 ROS      13.299624
4 KIL       7.199498
5 SHA      11.667734
6 BIR       8.054839
7 DUB      11.819355
8 CLA       9.512047
9 MUL       9.543208
10 CLO      10.053566
11 BEL      14.550520
12 MAL      18.028763
13 dtype: float64
```

## 对于数据记录按照年为频率取样

```
1 data.query('month == 1 and day == 1')
```

```
1 <tr style="text-align: right;">
2   <th></th>
3   <th>RPT</th>
4   <th>VAL</th>
5   <th>ROS</th>
6   <th>KIL</th>
7   <th>SHA</th>
8   <th>BIR</th>
9   <th>DUB</th>
10  <th>CLA</th>
11  <th>MUL</th>
12  <th>CLO</th>
13  <th>BEL</th>
14  <th>MAL</th>
15  <th>date</th>
16  <th>year</th>
17  <th>month</th>
18  <th>day</th>
19 </tr>
20 <tr>
21   <th>Yr_Mo_Dy</th>
22   <th></th>
23   <th></th>
24   <th></th>
25   <th></th>
26   <th></th>
27   <th></th>
28   <th></th>
29   <th></th>
30   <th></th>
31   <th></th>
32   <th></th>
33   <th></th>
34   <th></th>
```

```
35     <th></th>
```

```
36     <th></th>
```

```
37     <th></th>
```

```
38 </tr>
```

```
1 <tr>
2   <th>1961-01-01</th>
3   <td>15.04</td>
4   <td>14.96</td>
5   <td>13.17</td>
6   <td>9.29</td>
7   <td>NaN</td>
8   <td>9.87</td>
9   <td>13.67</td>
10  <td>10.25</td>
11  <td>10.83</td>
12  <td>12.58</td>
13  <td>18.50</td>
14  <td>15.04</td>
15  <td>1961-01-01</td>
16  <td>1961</td>
17  <td>1</td>
18  <td>1</td>
19 </tr>
20 <tr>
21   <th>1962-01-01</th>
22   <td>9.29</td>
23   <td>3.42</td>
24   <td>11.54</td>
25   <td>3.50</td>
26   <td>2.21</td>
27   <td>1.96</td>
28   <td>10.41</td>
29   <td>2.79</td>
30   <td>3.54</td>
31   <td>5.17</td>
32   <td>4.38</td>
33   <td>7.92</td>
34   <td>1962-01-01</td>
```

```
35      <td>1962</td>
36      <td>1</td>
37      <td>1</td>
38 </tr>
39 <tr>
40     <th>1963-01-01</th>
41     <td>15.59</td>
42     <td>13.62</td>
43     <td>19.79</td>
44     <td>8.38</td>
45     <td>12.25</td>
46     <td>10.00</td>
47     <td>23.45</td>
48     <td>15.71</td>
49     <td>13.59</td>
50     <td>14.37</td>
51     <td>17.58</td>
52     <td>34.13</td>
53     <td>1963-01-01</td>
54     <td>1963</td>
55     <td>1</td>
56     <td>1</td>
57 </tr>
58 <tr>
59     <th>1964-01-01</th>
60     <td>25.80</td>
61     <td>22.13</td>
62     <td>18.21</td>
63     <td>13.25</td>
64     <td>21.29</td>
65     <td>14.79</td>
66     <td>14.12</td>
67     <td>19.58</td>
68     <td>13.25</td>
```

69	<td>16.75</td>
70	<td>28.96</td>
71	<td>21.00</td>
72	<td>1964-01-01</td>
73	<td>1964</td>
74	<td>1</td>
75	<td>1</td>
76	</tr>
77	<tr>
78	<th>1965-01-01</th>
79	<td>9.54</td>
80	<td>11.92</td>
81	<td>9.00</td>
82	<td>4.38</td>
83	<td>6.08</td>
84	<td>5.21</td>
85	<td>10.25</td>
86	<td>6.08</td>
87	<td>5.71</td>
88	<td>8.63</td>
89	<td>12.04</td>
90	<td>17.41</td>
91	<td>1965-01-01</td>
92	<td>1965</td>
93	<td>1</td>
94	<td>1</td>
95	</tr>
96	<tr>
97	<th>1966-01-01</th>
98	<td>22.04</td>
99	<td>21.50</td>
100	<td>17.08</td>
101	<td>12.75</td>
102	<td>22.17</td>

103	<td>15.59</td>
104	<td>21.79</td>
105	<td>18.12</td>
106	<td>16.66</td>
107	<td>17.83</td>
108	<td>28.33</td>
109	<td>23.79</td>
110	<td>1966-01-01</td>
111	<td>1966</td>
112	<td>1</td>
113	<td>1</td>
114	</tr>
115	<tr>
116	<th>1967-01-01</th>
117	<td>6.46</td>
118	<td>4.46</td>
119	<td>6.50</td>
120	<td>3.21</td>
121	<td>6.67</td>
122	<td>3.79</td>
123	<td>11.38</td>
124	<td>3.83</td>
125	<td>7.71</td>
126	<td>9.08</td>
127	<td>10.67</td>
128	<td>20.91</td>
129	<td>1967-01-01</td>
130	<td>1967</td>
131	<td>1</td>
132	<td>1</td>
133	</tr>
134	<tr>
135	<th>1968-01-01</th>
136	<td>30.04</td>



137	<td>17.88</td>
138	<td>16.25</td>
139	<td>16.25</td>
140	<td>21.79</td>
141	<td>12.54</td>
142	<td>18.16</td>
143	<td>16.62</td>
144	<td>18.75</td>
145	<td>17.62</td>
146	<td>22.25</td>
147	<td>27.29</td>
148	<td>1968-01-01</td>
149	<td>1968</td>
150	<td>1</td>
151	<td>1</td>
152	</tr>
153	<tr>
154	<th>1969-01-01</th>
155	<td>6.13</td>
156	<td>1.63</td>
157	<td>5.41</td>
158	<td>1.08</td>
159	<td>2.54</td>
160	<td>1.00</td>
161	<td>8.50</td>
162	<td>2.42</td>
163	<td>4.58</td>
164	<td>6.34</td>
165	<td>9.17</td>
166	<td>16.71</td>
167	<td>1969-01-01</td>
168	<td>1969</td>
169	<td>1</td>
170	<td>1</td>

```
171 </tr>
172 <tr>
173   <th>1970-01-01</th>
174   <td>9.59</td>
175   <td>2.96</td>
176   <td>11.79</td>
177   <td>3.42</td>
178   <td>6.13</td>
179   <td>4.08</td>
180   <td>9.00</td>
181   <td>4.46</td>
182   <td>7.29</td>
183   <td>3.50</td>
184   <td>7.33</td>
185   <td>13.00</td>
186   <td>1970-01-01</td>
187   <td>1970</td>
188   <td>1</td>
189   <td>1</td>
190 </tr>
191 <tr>
192   <th>1971-01-01</th>
193   <td>3.71</td>
194   <td>0.79</td>
195   <td>4.71</td>
196   <td>0.17</td>
197   <td>1.42</td>
198   <td>1.04</td>
199   <td>4.63</td>
200   <td>0.75</td>
201   <td>1.54</td>
202   <td>1.08</td>
203   <td>4.21</td>
204   <td>9.54</td>
```

205	<td>1971-01-01</td>
206	<td>1971</td>
207	<td>1</td>
208	<td>1</td>
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1144	<td>16.29</td>
1145	<td>24.04</td>
1146	<td>12.79</td>
1147	<td>18.21</td>
1148	<td>19.29</td>
1149	<td>21.54</td>
1150	<td>17.21</td>
1151	<td>16.71</td>
1152	<td>17.83</td>
1153	<td>17.75</td>
1154	<td>25.70</td>
1155	<td>1978-12-01</td>
1156	<td>1978</td>

```
1157    <td>12</td>
1158    <td>1</td>
1159 </tr>
```

216 rows × 16 columns