

```
In [56]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt

%matplotlib notebook

import seaborn as sns
```

```
In [65]: plt.style.use("seaborn-colorblind")
```

```
In [66]: data = pd.read_csv("C:/Users/VARUN/Desktop/AirPollution/Dataset/cpcb_dly_aq_karnataka-2011.csv")
```

```
In [67]: data.head()
```

Out[67]:

	Stn Code	Sampling Date	State	City/Town/Village/Area	Location of Monitoring Station	Agency	Type of Location	SO2	NO2	RSPM/PM10	SPM
0	77	1/11/2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	14.866667	28.30	257	NaN
1	77	13/01/2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	17.425000	31.65	551	NaN
2	77	18/01/2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	20.000000	32.00	356	NaN
3	77	24/01/2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	16.000000	30.00	159	NaN
4	77	31/01/2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	16.000000	31.00	52	NaN

```
In [68]: dates = ['-'.join(i.split('/')[1:]) for i in data['Sampling Date']]
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```
In [69]: data['Sampling Date'] = dates
```

```
In [70]: for i in range(len(data['City/Town/Village/Area'])):
if data['City/Town/Village/Area'][i] != 'Bangalore':
data.drop(i, inplace = True)
```

```
In [71]: data.head()
```

Out[71]:

	Stn Code	Sampling Date	State	City/Town/Village/Area	Location of Monitoring Station	Agency	Type of Location	SO2	NO2	RSPM/PM10	SPM
0	77	11-2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	14.866667	28.30	257	NaN
1	77	01-2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	17.425000	31.65	551	NaN
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4	77	01-2011	Karnataka	Bangalore	Graphite India, White Field Road, Bangalore	Karnataka State Pollution Control Board	Industrial Area	16.000000	31.00	52	NaN

```
In [72]: data = data.groupby("Sampling Date").mean()
data
```

Out[72]:

	Stn Code	SO2	NO2	RSPM/PM10	SPM
Sampling Date					
01-2011	389.600000	11.142500	23.265000	137.000000	NaN
02-2011	493.800000	9.600000	21.200000	84.200000	NaN
03-2011	598.000000	8.166667	19.000000	44.000000	NaN
04-2011	409.240000	21.600000	30.640000	98.600000	NaN
05-2011	378.428571	20.250000	31.071429	110.464286	NaN
06-2011	383.368421	9.947368	24.921053	85.394737	NaN
07-2011	338.642857	14.666667	28.523810	76.357143	NaN
08-2011	341.166667	13.966667	27.766667	81.800000	NaN
09-2011	376.380952	13.761905	27.095238	76.571429	NaN
1-2011	418.625000	13.750000	27.875000	97.750000	NaN
10-2011	354.704918	16.344262	31.786885	95.409836	NaN
11-2011	365.370370	15.219753	32.005556	109.666667	NaN
12-2011	358.311475	15.065574	28.704918	95.311475	NaN
2-2011	372.375000	14.750000	29.500000	86.187500	NaN
3-2011	350.733333	13.866667	33.000000	75.533333	NaN
4-2011	428.285714	15.857143	27.928571	79.642857	NaN
5-2011	366.000000	18.571429	28.142857	95.214286	NaN
6-2011	402.444444	11.777778	24.000000	91.666667	NaN
7-2011	402.000000	14.888889	27.055556	102.388889	NaN
8-2011	382.470588	12.823529	27.529412	93.058824	NaN

9-2011 352.769231 18.076923 31.000000 99.846154 NaN

```
In [73]: data = data.groupby("Sampling Date").mean().drop("SPM", axis=1)
```

```
In [74]: data
```

```
Out[74]:
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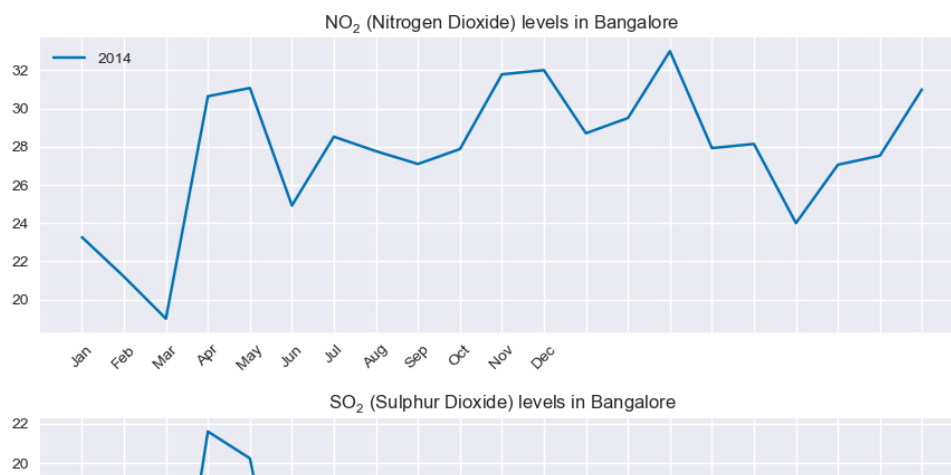
	Stn Code	SO2	NO2	RSPM/PM10
Sampling Date				
01-2011	389.600000	11.142500	23.265000	137.000000
02-2011	493.800000	9.600000	21.200000	84.200000
03-2011	598.000000	8.166667	19.000000	44.000000
04-2011	409.240000	21.600000	30.640000	98.600000
05-2011	378.428571	20.250000	31.071429	110.464286
06-2011	383.368421	9.947368	24.921053	85.394737
07-2011	338.642857	14.666667	28.523810	76.357143
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7-2011	402.000000	14.888889	27.055556	102.388889
8-2011	382.470588	12.823529	27.529412	93.058824
9-2011	352.769231	18.076923	31.000000	99.846154

```
In [75]: plt.figure(figsize=(9, 7))
plt.subplot(211)
plt.cla()
plotter = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep',
           'Oct', 'Nov', 'Dec']
x = np.arange(0, len(data["NO2"]), 1)
ax = plt.gca()
ax.plot(x, data["NO2"])
ax.spines['top'].set_visible(False)
ax.spines['right'].set_visible(False)
ax.set_xticks(x)
plt.xticks(rotation=45)
plt.subplots_adjust(bottom=0.2)
plt.legend([2014], loc=2)
plt.title("$\mathrm{NO}_2$ (Nitrogen Dioxide) levels in Bangalore")
ax.set_xticklabels(plotter)

plt.subplot(212)
plt.cla()
plotter = ['Jan', 'Feb', 'Mar', 'Apr', 'May', 'Jun', 'Jul', 'Aug', 'Sep',
           'Oct', 'Nov', 'Dec']
x = np.arange(0, len(data["SO2"]), 1)
ax = plt.gca()
ax.plot(x, data["SO2"])
ax.spines['top'].set_visible(False)
ax.spines['right'].set_visible(False)
ax.set_xticks(x)
plt.xticks(rotation=45)
plt.title("$\mathrm{SO}_2$ (Sulphur Dioxide) levels in Bangalore")
ax.set_xticklabels(plotter)

plt.tight_layout()
# plt.show()
```

Figure 1




$$x = y = 23.0548$$

In []: