Wide vs. Long Format Data

About the data

In this notebook, we will be using daily temperature data from the National Centers for Environmental Information (NCEI) API. We will use the Global Historical Climatology Network - Daily (GHCND) data set for the Boonton 1 station (GHCND:USC00280907); see the documentation here.

Note: The NCEI is part of the National Oceanic and Atmospheric Administration (NOAA) and, as you can see from the URL for the API, this resource was created when the NCEI was called the NCDC. Should the URL for this resource change in the future, you can search for the NCEI weather API to find the updated one.

```python
import matplotlib.pyplot as plt
import pandas as pd

wide_df = pd.read_csv('data/wide_data.csv', parse_dates=['date'])
long_df = pd.read_csv(
    'data/long_data.csv',
    usecols=['date', 'datatype', 'value'],
    parse_dates=['date']
)[['date', 'datatype', 'value']] # sort columns
```

Wide format

Our variables each have their own column:

```python
wide_df.head(6)
```

```
        date  TMAX  TMIN  TOBS
0 2018-10-01  21.1   8.9  13.9
1 2018-10-02  23.9  13.9  17.2
2 2018-10-03  25.0  15.6  16.1
3 2018-10-04  22.8  11.7  11.7
4 2018-10-05  23.3  11.7  18.9
5 2018-10-06  20.0  13.3  16.1
```

Describing all the columns is easy:

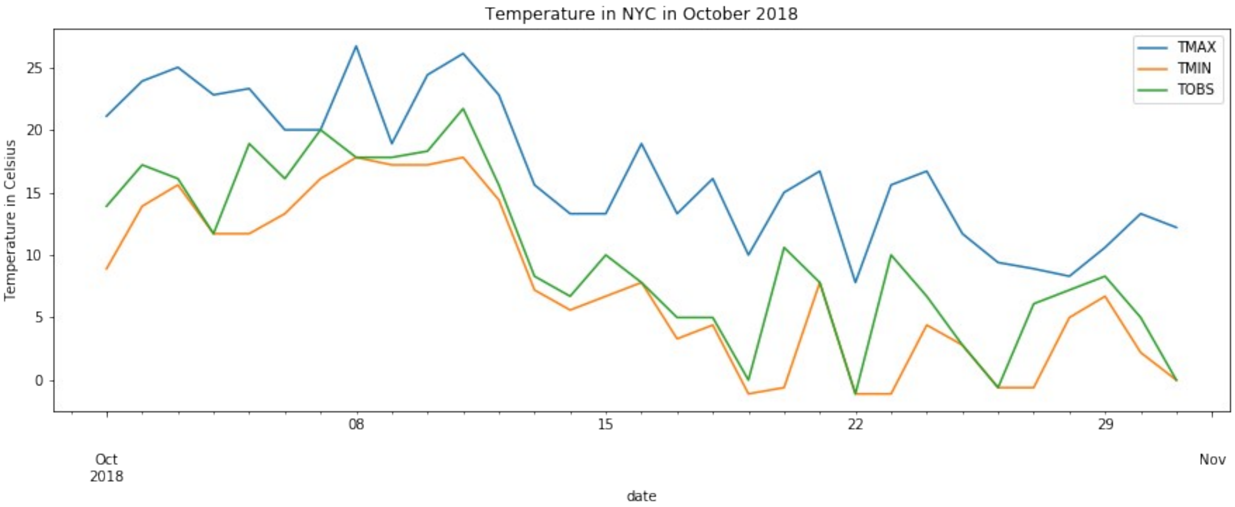
```python
wide_df.describe(include='all')
```

```
                       date       TMAX       TMIN       TOBS
count                    31  31.000000  31.000000  31.000000
unique                   31        NaN        NaN        NaN
top     2018-10-01 00:00:00        NaN        NaN        NaN
```

```
freq                        1        NaN        NaN        NaN
first    2018-10-01 00:00:00        NaN        NaN        NaN
last     2018-10-31 00:00:00        NaN        NaN        NaN
mean                      NaN  16.829032   7.561290  10.022581
std                       NaN   5.714962   6.513252   6.596550
min                       NaN   7.800000  -1.100000  -1.100000
25%                       NaN  12.750000   2.500000   5.550000
50%                       NaN  16.100000   6.700000   8.300000
75%                       NaN  21.950000  13.600000  16.100000
max                       NaN  26.700000  17.800000  21.700000
```

Easy to graph with `pandas` (covered in chapter 5):

```
wide_df.plot(
    kind='line', y=['TMAX', 'TMIN', 'TOBS'], x='date',
    title='Temperature in NYC in October 2018',
    figsize=(15, 5)
).set_ylabel('Temperature in Celsius')
plt.show()
```



Long format

Our variable names are now in the `datatype` column and their values are in the `value` column. We now have 3 rows for each date, since we have 3 different `datatypes`:

```
long_df.head(6)

        date datatype  value
0 2018-10-01     TMAX   21.1
1 2018-10-01     TMIN    8.9
2 2018-10-01     TOBS   13.9
3 2018-10-02     TMAX   23.9
```

```
4 2018-10-02     TMIN   13.9
5 2018-10-02     TOBS   17.2
```

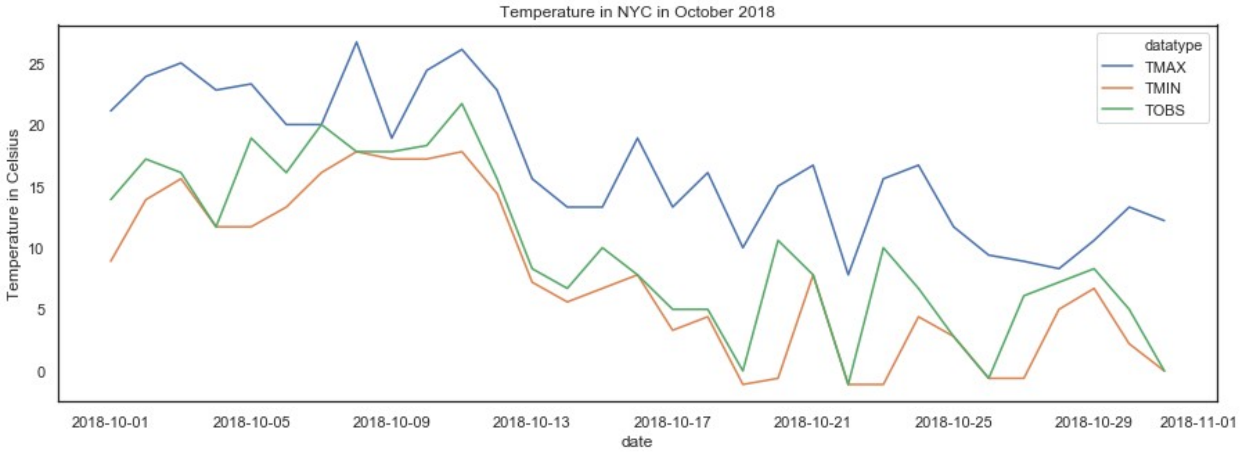
Since we have many rows for the same date, using `describe()` is not trivial anymore:

```
long_df.describe(include='all')
```

```
                       date datatype      value
count                    93       93  93.000000
unique                   31        3        NaN
top     2018-10-01 00:00:00     TOBS        NaN
freq                      3       31        NaN
first   2018-10-01 00:00:00      NaN        NaN
last    2018-10-31 00:00:00      NaN        NaN
mean                    NaN      NaN  11.470968
std                     NaN      NaN   7.362354
min                     NaN      NaN  -1.100000
25%                     NaN      NaN   6.700000
50%                     NaN      NaN  11.700000
75%                     NaN      NaN  17.200000
max                     NaN      NaN  26.700000
```

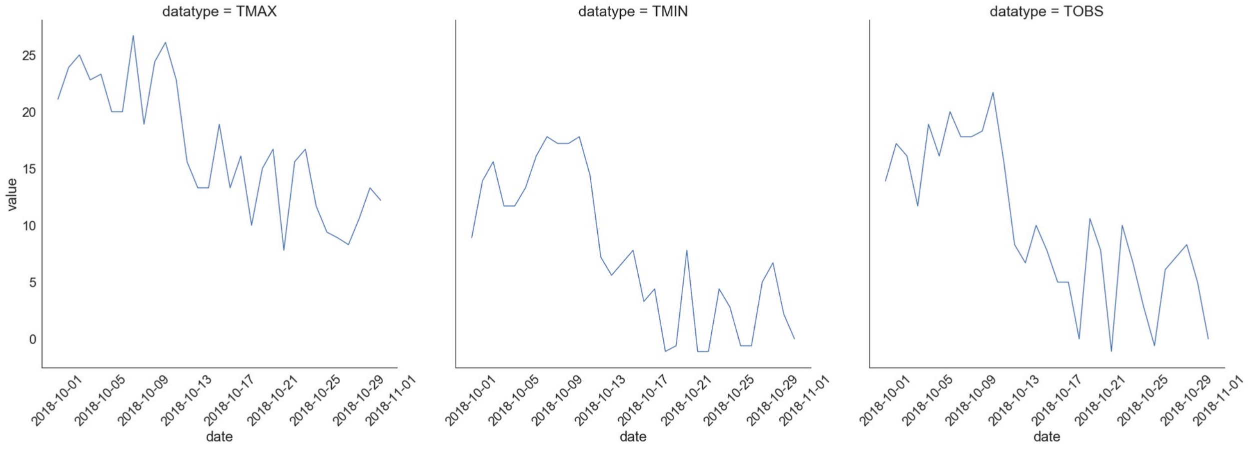
Plotting long format data in `pandas` can be rather tricky. Instead we use `seaborn` (covered in chapter 6):

```
import seaborn as sns

sns.set(rc={'figure.figsize':(15, 5)}, style='white')

ax = sns.lineplot(data=long_df, hue='datatype', y='value', x='date')
ax.set_ylabel('Temperature in Celsius')
ax.set_title('Temperature in NYC in October 2018')
plt.show()
```



With long data and `seaborn`, we can easily facet our plots:

```
sns.set(rc={'figure.figsize':(20, 10)}, style='white', font_scale=2)

g = sns.FacetGrid(long_df, col="datatype", height=10)
g = g.map(plt.plot, "date", "value")
g.set_titles(size=25)
g.set_xticklabels(rotation=45)
plt.show()
```


datatype = TMAX
datatype = TMIN
datatype = TOBS
value
date