

Introduction to Data Visualization with Matplotlib

Data visualization

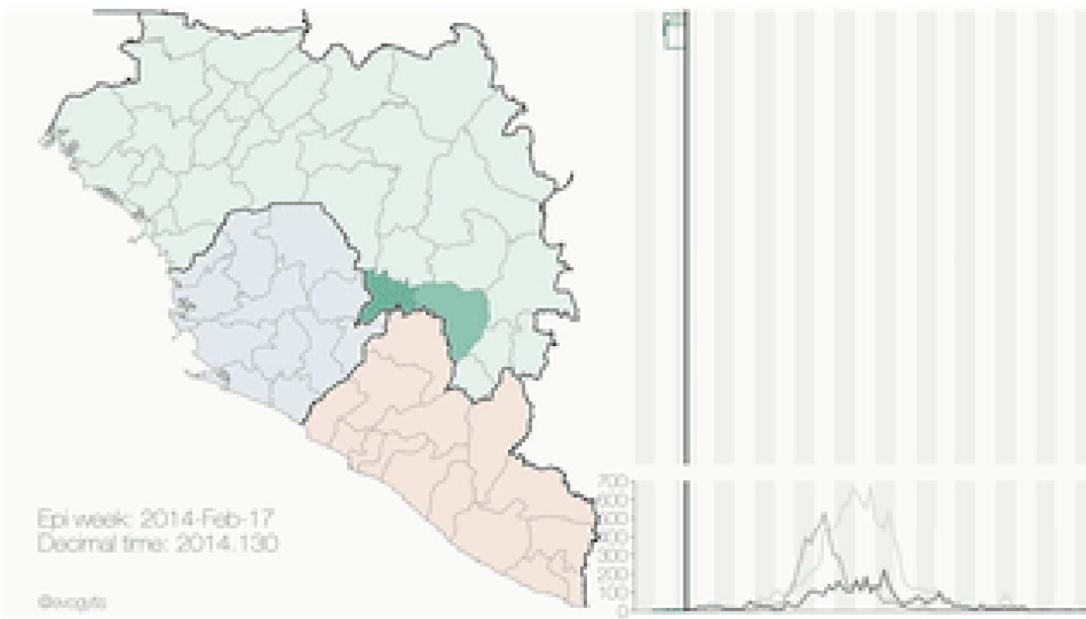


Image credit: [Gytis Dudas](#) and [Andrew Rambaut](#)

Introducing the pyplot interface

Introducing the pyplot interface

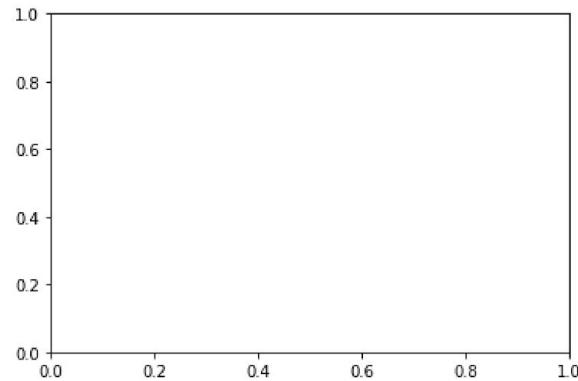
```
import matplotlib.pyplot as plt
```

Introducing the pyplot interface

```
import matplotlib.pyplot as plt  
fig, ax = plt.subplots()
```

Introducing the pyplot interface

```
import matplotlib.pyplot as plt  
fig, ax = plt.subplots()  
plt.show()
```



Adding data to axes

```
seattle_weather["MONTH"]
```

DATE

1 Jan
2 Feb
3 Mar
4 Apr
5 May
6 Jun
7 Jul
8 Aug
9 Sep
10 Oct
11 Nov
12 Dec

Name: MONTH, dtype: object

Adding data to axes

```
seattle_weather["MONTH"]
```

```
DATE  
1 Jan  
2 Feb  
3 Mar  
4 Apr  
5 May  
6 Jun  
7 Jul  
8 Aug  
9 Sep  
10 Oct  
11 Nov  
12 Dec
```

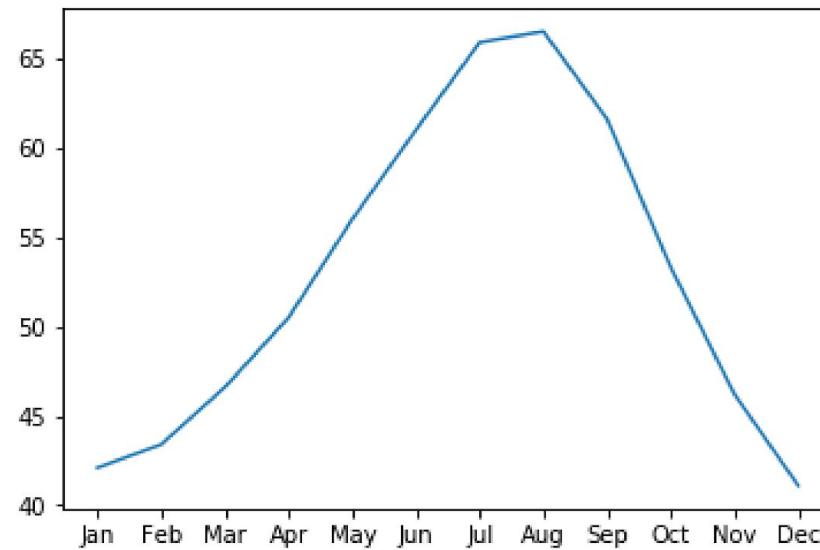
```
Name: MONTH, dtype: object
```

```
seattle_weather["MLY-TAVG-NORMAL"]
```

```
1 42.1  
2 43.4  
3 46.6  
4 50.5  
5 56.0  
6 61.0  
7 65.9  
8 66.5  
9 61.6  
10 53.3  
11 46.2  
12 41.1  
Name: MLY-TAVG-NORMAL, dtype: float64
```

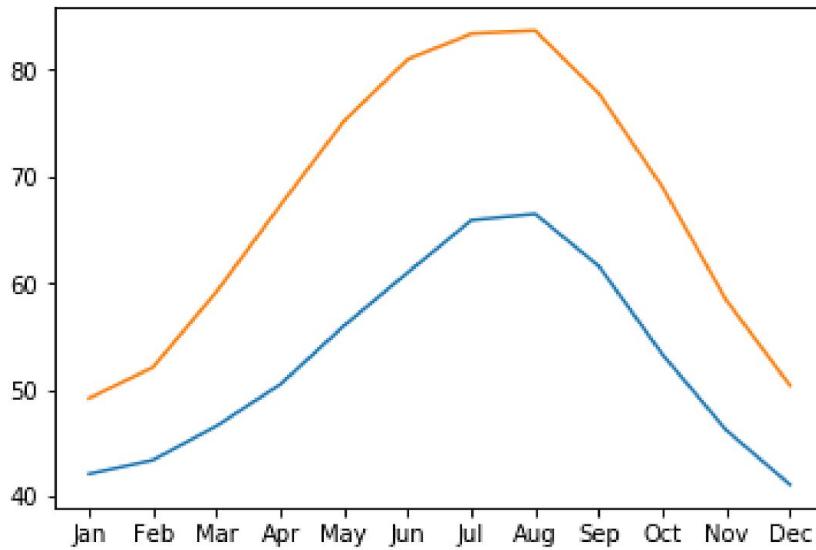
Adding data to axes

```
ax.plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-TAVG-NORMAL" ]  
plt.show()
```



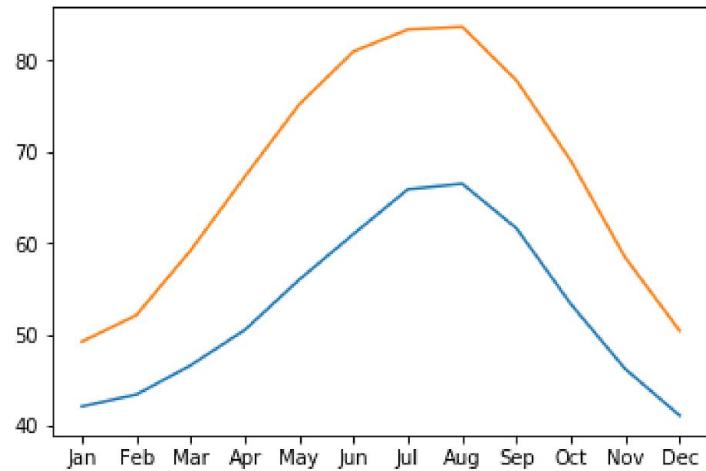
Adding more data

```
ax.plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-TAVG-NORMAL" ])
plt.show()
```



Putting it all together

```
fig, ax = plt.subplots()  
ax.plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-TAVG-NORMAL" ]  
ax.plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-TAVG-NORMAL" ])  
plt.show()
```

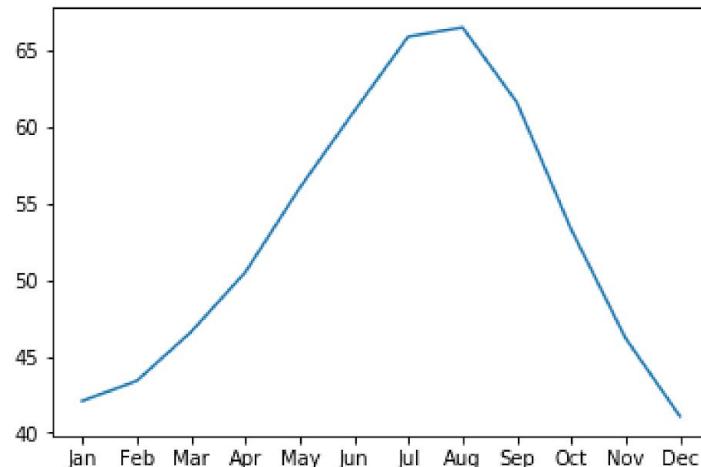


Practice making a
figure!

Customizing your plots

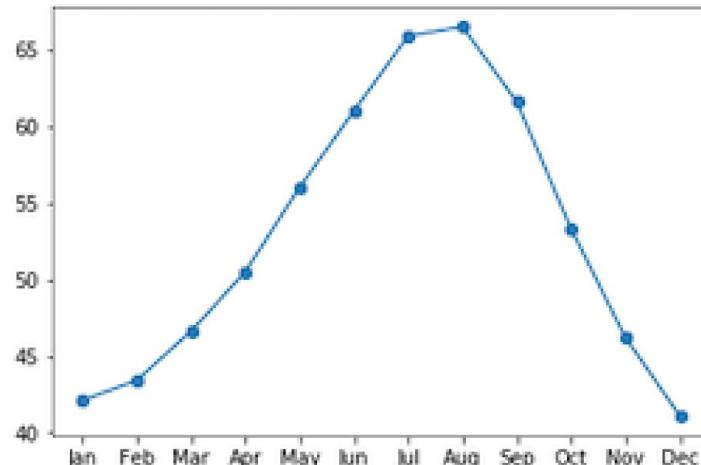
Customizing data appearance

```
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-PRCP-NORMAL" ])  
plt.show()
```



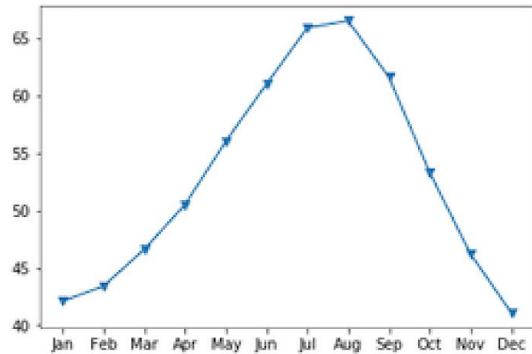
Adding markers

```
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-PRCP-NORMAL" ],  
        marker="o")  
plt.show()
```



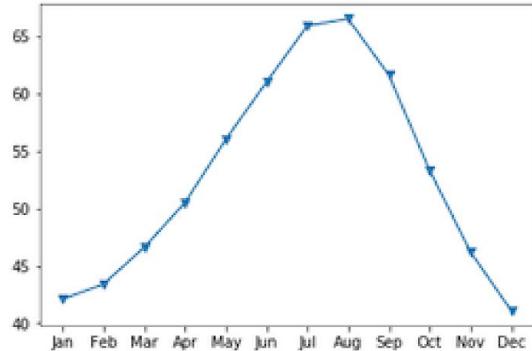
Choosing markers

```
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-PRCP-NORMAL" ],  
        marker="v")  
  
plt.show()
```



Choosing markers

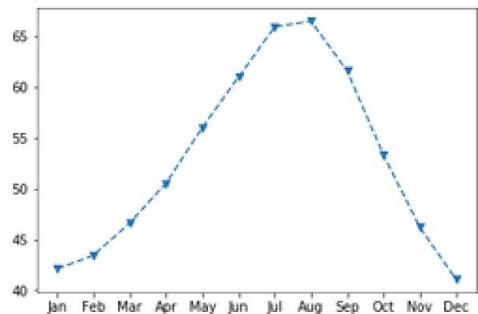
```
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-PRCP-NORMAL" ],  
        marker="v")  
  
plt.show()
```



https://matplotlib.org/api/markers_api.html

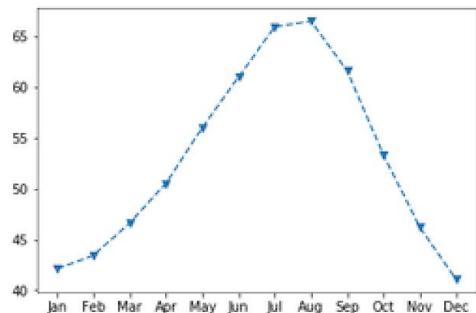
Setting the linestyle

```
fig, ax = plt.subplots()  
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-TAVG-NORMAL" ],  
        marker="v", linestyle="--")  
plt.show()
```



Setting the linestyle

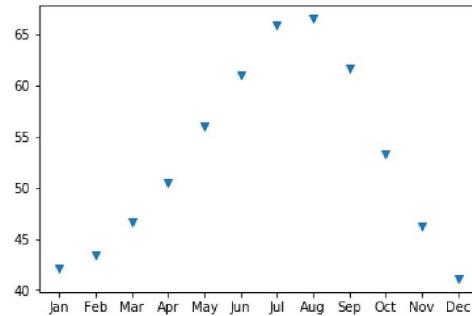
```
fig, ax = plt.subplots()  
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-TAVG-NORMAL" ],  
        marker="v", linestyle="--")  
plt.show()
```



https://matplotlib.org/gallery/lines_bars_and_markers/line_styles_reference.html

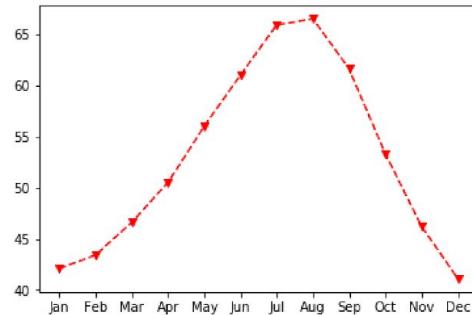
Eliminating lines with linestyle

```
fig, ax = plt.subplots()  
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-TAVG-NORMAL" ],  
        marker="v", linestyle="None")  
plt.show()
```



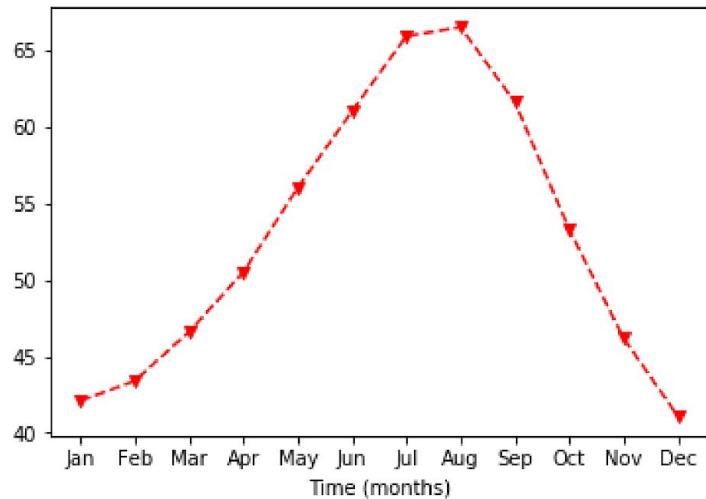
Choosing color

```
fig, ax = plt.subplots()  
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-TAVG-NORMAL" ],  
        marker="v", linestyle="--", color="r")  
plt.show()
```



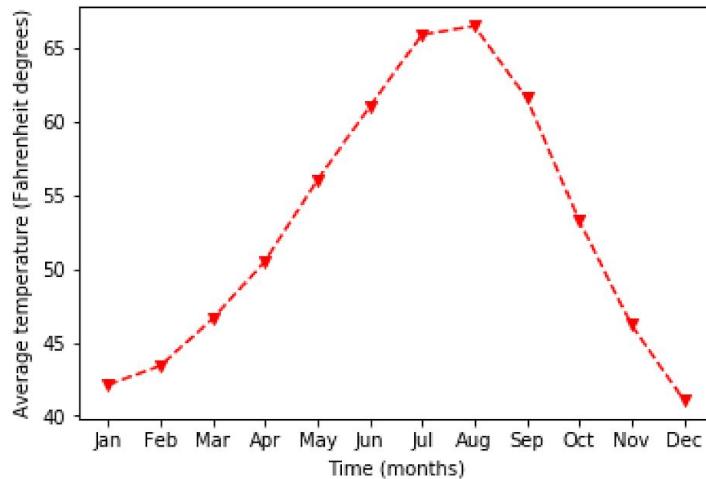
Customizing the axes labels

```
ax.set_xlabel("Time (months)")  
plt.show()
```



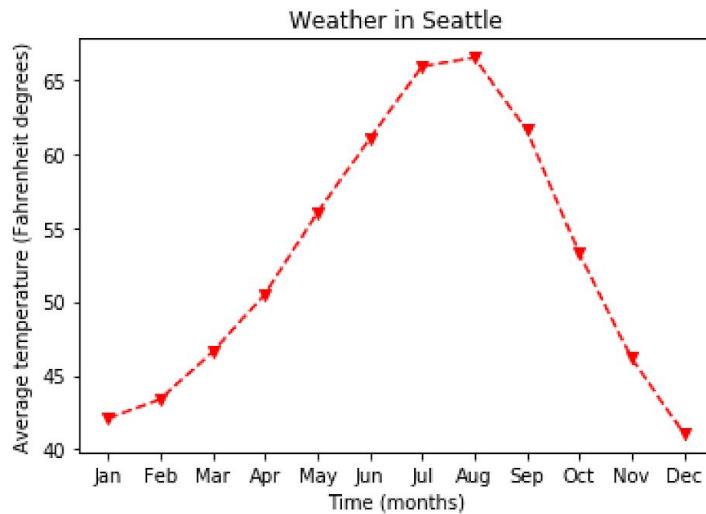
Setting the y axis label

```
ax.set_xlabel("Time (months)")  
ax.set_ylabel("Average temperature (Fahrenheit degrees)")  
plt.show()
```



Adding a title

```
ax.set_title("Weather in Seattle")  
plt.show()
```

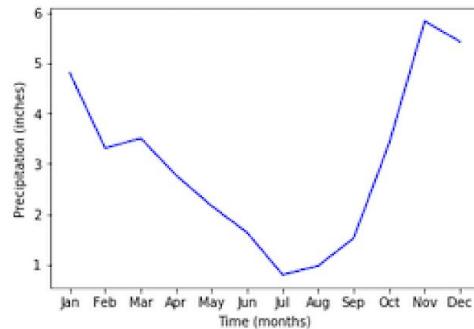


**Practice customizing
your plots!**

Small multiples

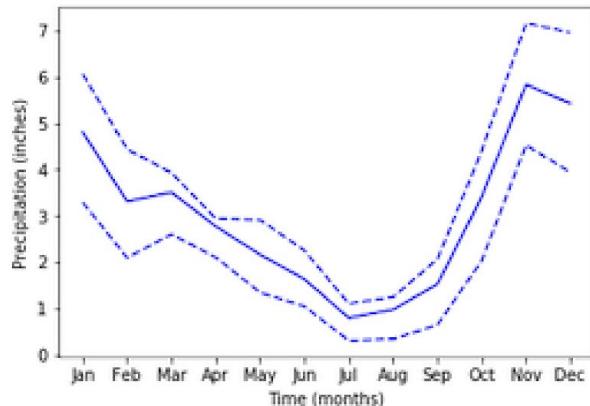
Adding data

```
ax.plot(seattle_weather[ "MONTH" ],  
        seattle_weather[ "MLY-PRCP-NORMAL" ],  
        color='b')  
ax.set_xlabel("Time (months)")  
ax.set_ylabel("Precipitation (inches)")  
plt.show()
```



Adding more data

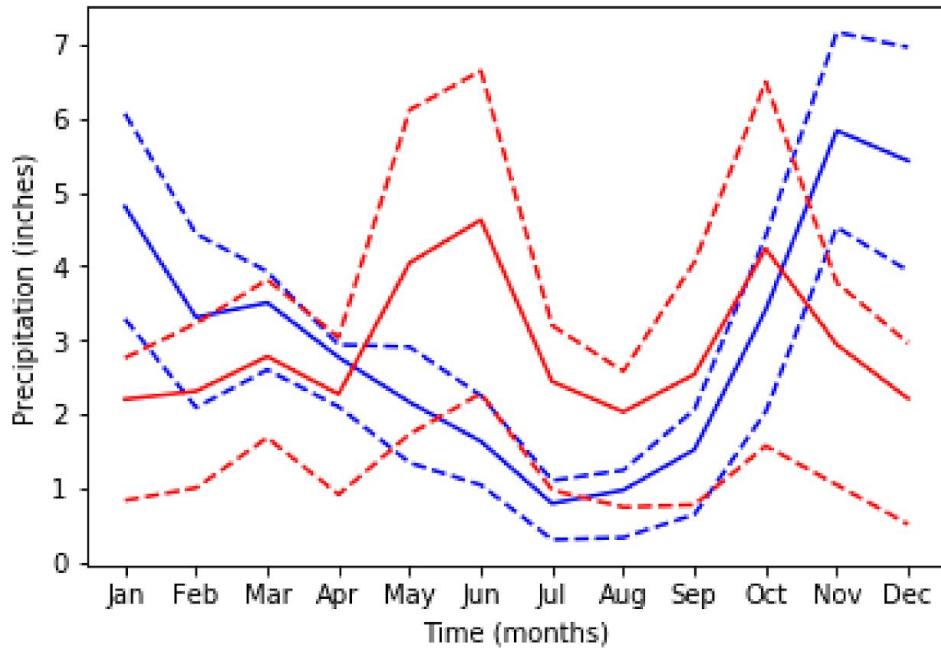
```
ax.plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-25PCTL" ],
        linestyle='--', color='b')
ax.plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-75PCTL" ],
        linestyle='--', color=color)
plt.show()
```



And more data

```
ax.plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-NORMAL" ],
        color='r')
ax.plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-25PCTL" ],
        linestyle='--', color='r')
ax.plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-75PCTL" ],
        linestyle='--', color='r')
plt.show()
```

Too much data!



Small multiples with plt.subplots

```
fig, ax = plt.subplots()
```

Small multiples with plt.subplots

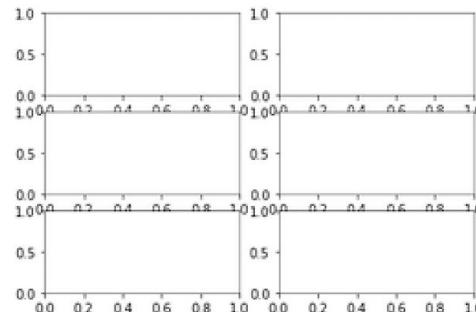
```
fig, ax = plt.subplots()
```

```
fig, ax = plt.subplots(3, 2)
```

Small multiples with plt.subplots

```
fig, ax = plt.subplots()
```

```
fig, ax = plt.subplots(3, 2)  
plt.show()
```



Adding data to subplots

```
ax.shape
```

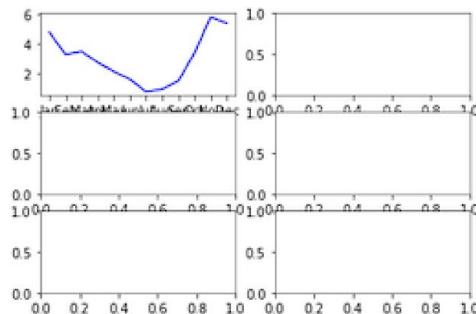
Adding data to subplots

```
ax.shape  
(3, 2)
```

Adding data to subplots

```
ax.shape  
(3, 2)
```

```
ax[0, 0].plot(seattle_weather[ "MONTH" ],  
               seattle_weather[ "MLY-PRCP-NORMAL" ],  
               color='b')  
plt.show()
```



Subplots with data

```
fig, ax = plt.subplots(2, 1)
```

Subplots with data

```
fig, ax = plt.subplots(2, 1)
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-NORMAL" ],
            color='b')
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-25PCTL" ],
            linestyle='--', color='b')
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-75PCTL" ],
            linestyle='--', color='b')
```

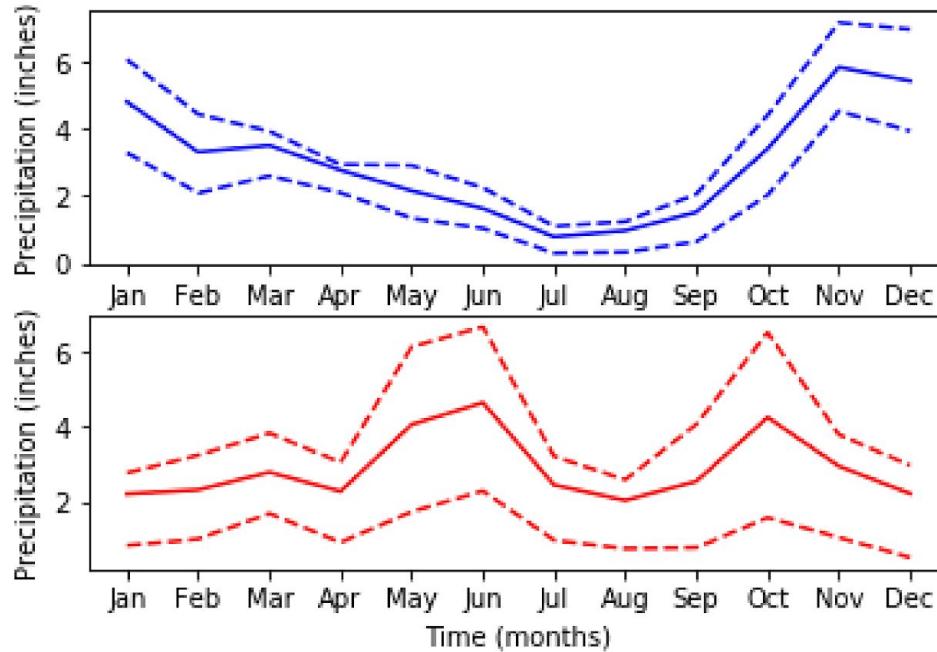
Subplots with data

```
fig, ax = plt.subplots(2, 1)
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-NORMAL" ],
            color='b')
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-25PCTL" ],
            linestyle='--', color='b')
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-75PCTL" ],
            linestyle='--', color='b')
ax[1].plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-NORMAL" ],
            color='r')
ax[1].plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-25PCTL" ],
            linestyle='--', color='r')
ax[1].plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-75PCTL" ],
            linestyle='--', color='r')
```

Subplots with data

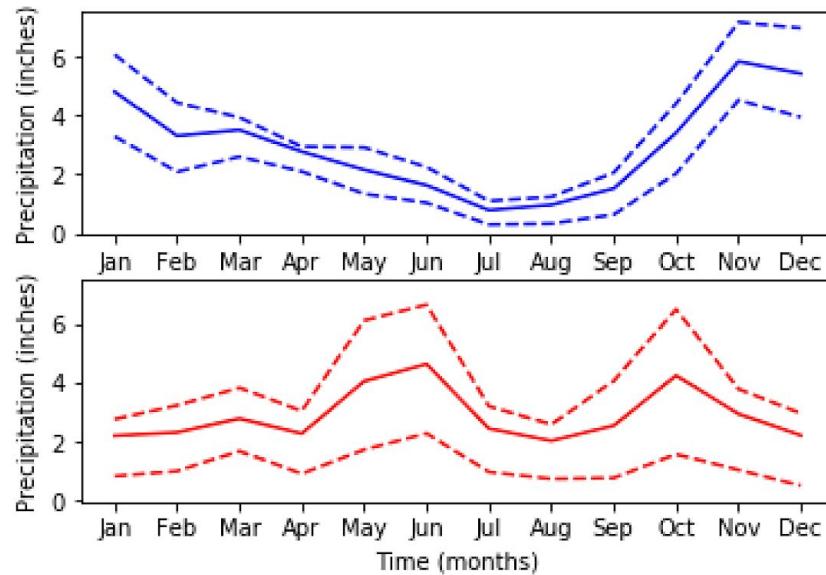
```
fig, ax = plt.subplots(2, 1)
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-NORMAL" ],
            color='b')
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-25PCTL" ],
            linestyle='--', color='b')
ax[0].plot(seattle_weather[ "MONTH" ], seattle_weather[ "MLY-PRCP-75PCTL" ],
            linestyle='--', color='b')
ax[1].plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-NORMAL" ],
            color='r')
ax[1].plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-25PCTL" ],
            linestyle='--', color='r')
ax[1].plot(austin_weather[ "MONTH" ], austin_weather[ "MLY-PRCP-75PCTL" ],
            linestyle='--', color='r')
ax[0].set_ylabel("Precipitation (inches)")
ax[1].set_ylabel("Precipitation (inches)")
ax[1].set_xlabel("Time (months)")
plt.show()
```

Subplots with data



Sharing the y-axis range

```
fig, ax = plt.subplots(2, 1, sharey=True)
```



Practice making
subplots!