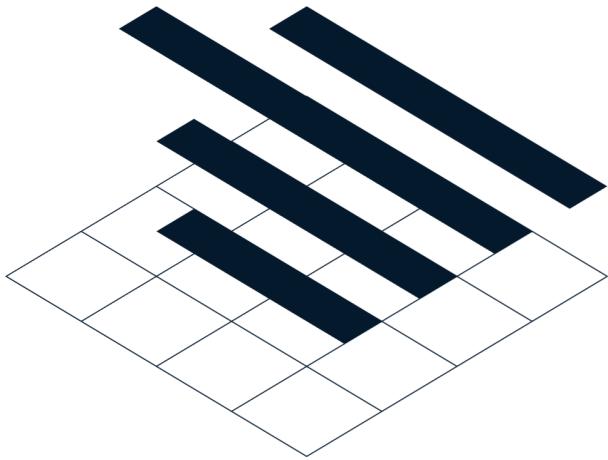
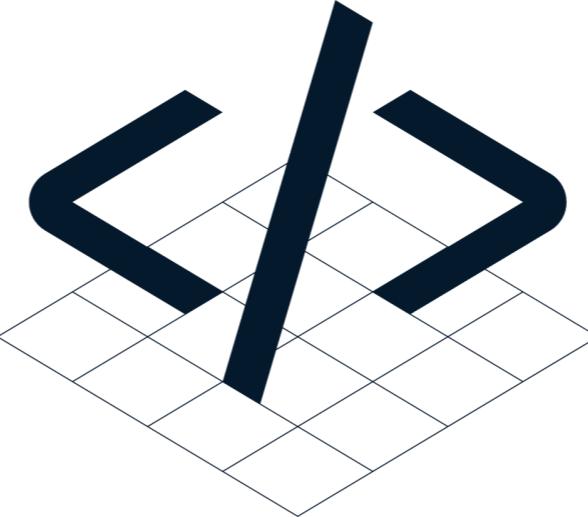


# Basic plots with Matplotlib

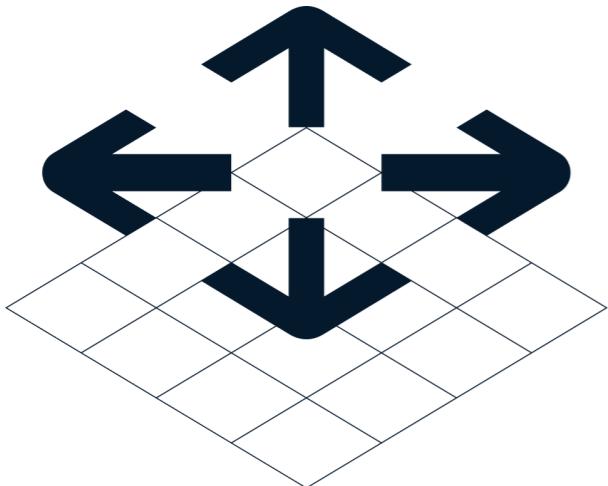
- Visualization



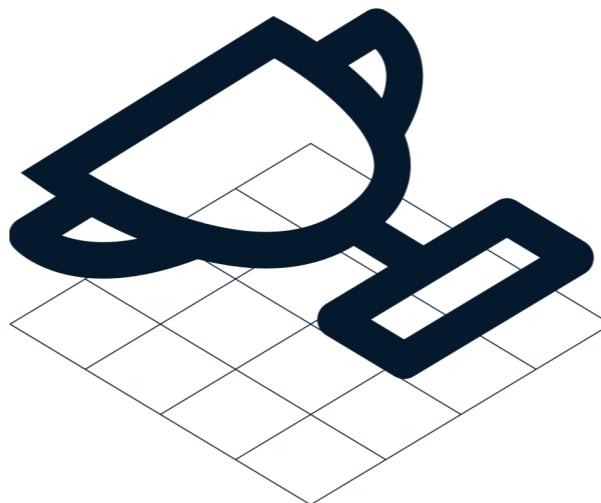
- Data Structure



- Control Structures

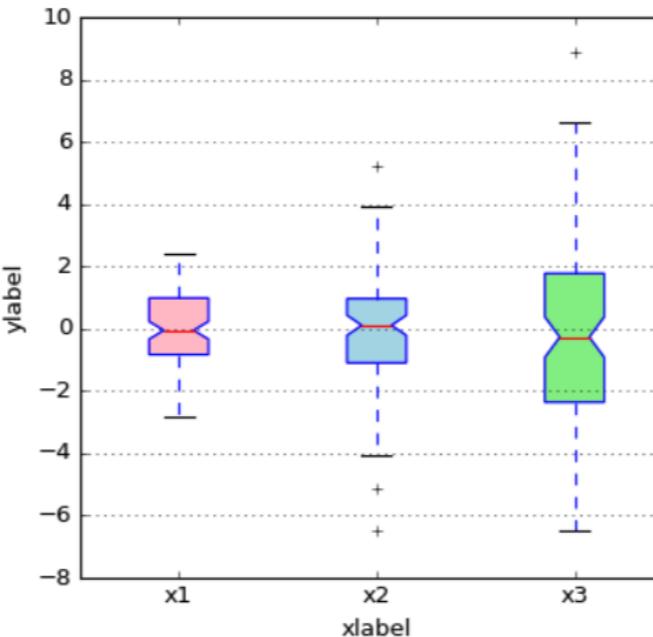
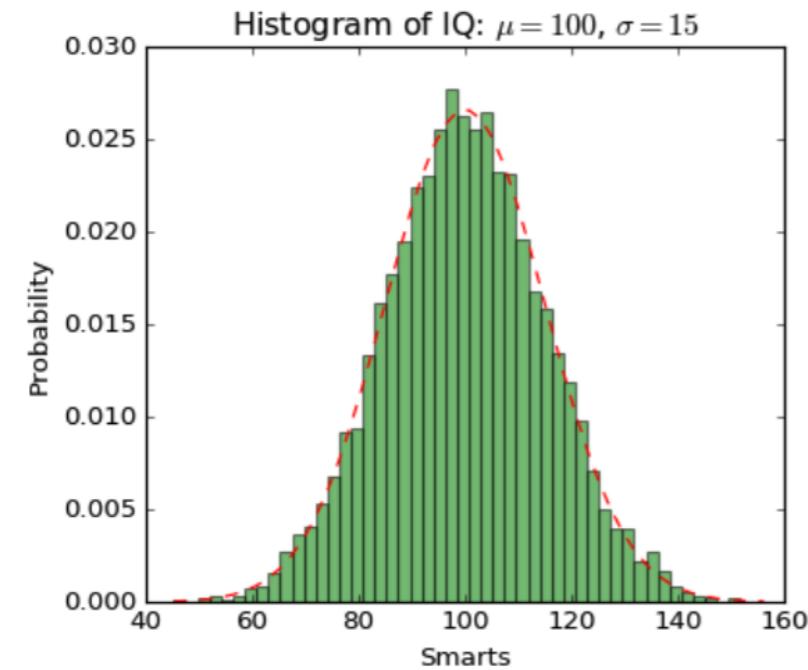


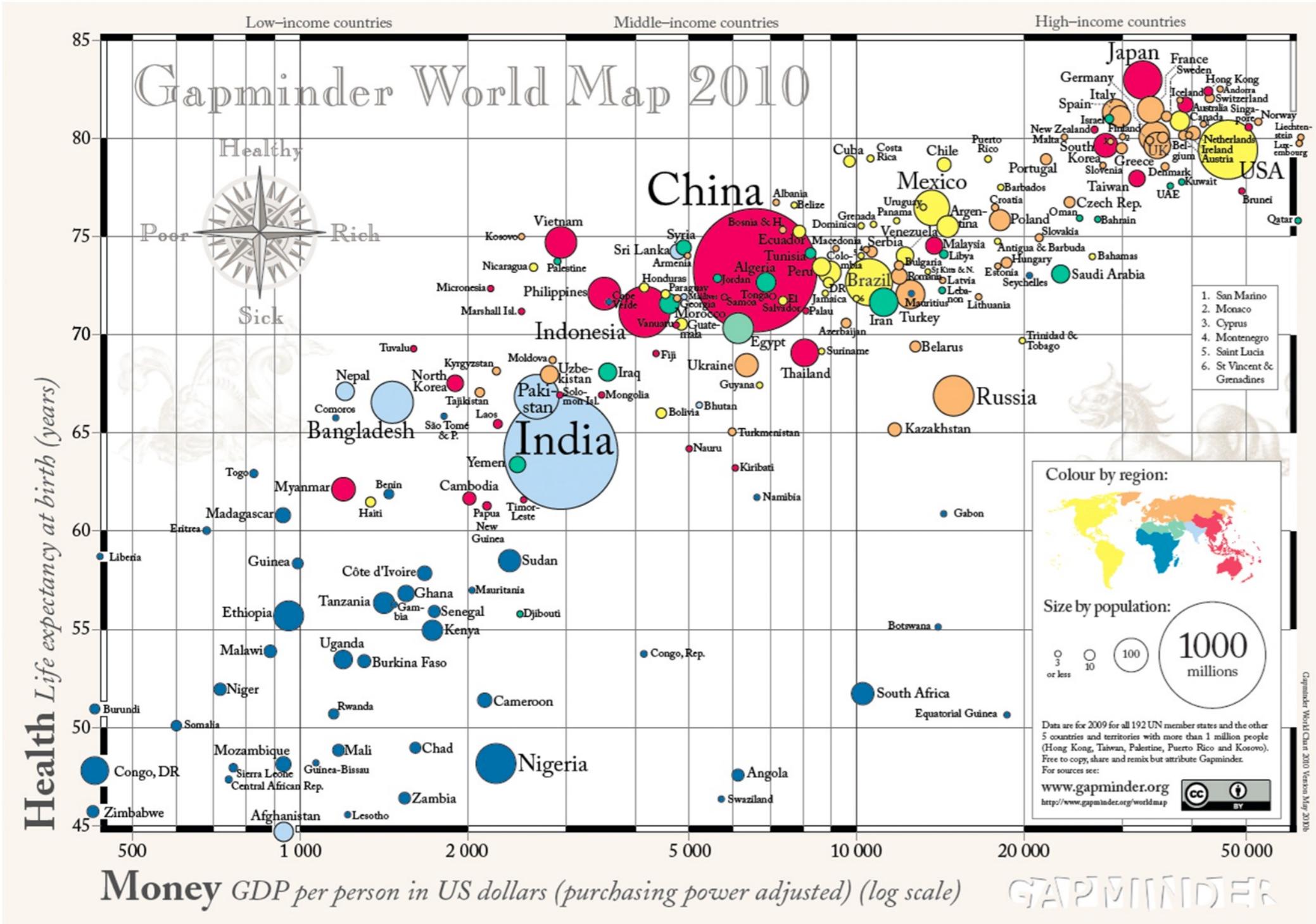
- Case Study



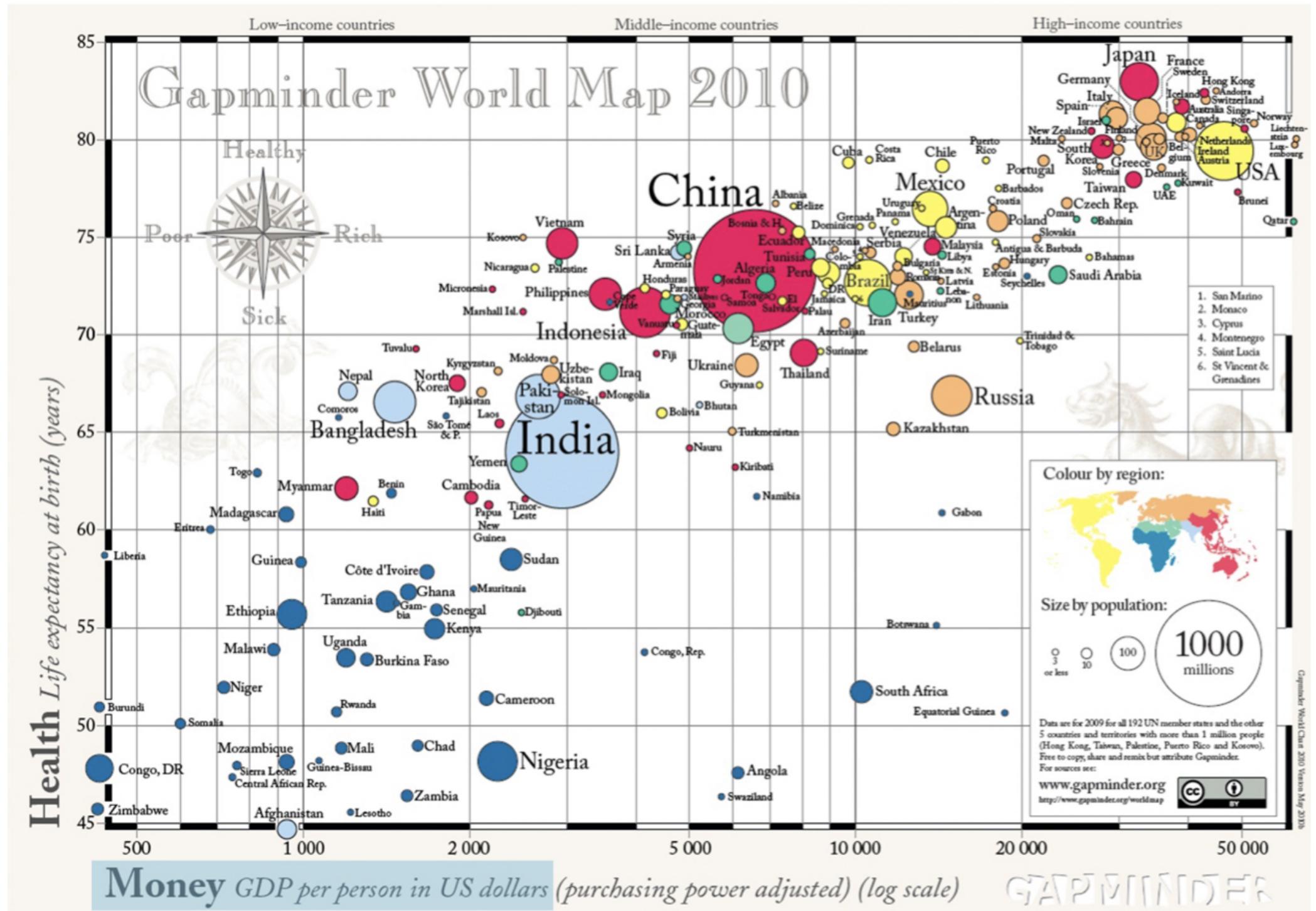
# Data visualization

- Very important in Data Analysis
  - Explore data
  - Report insights

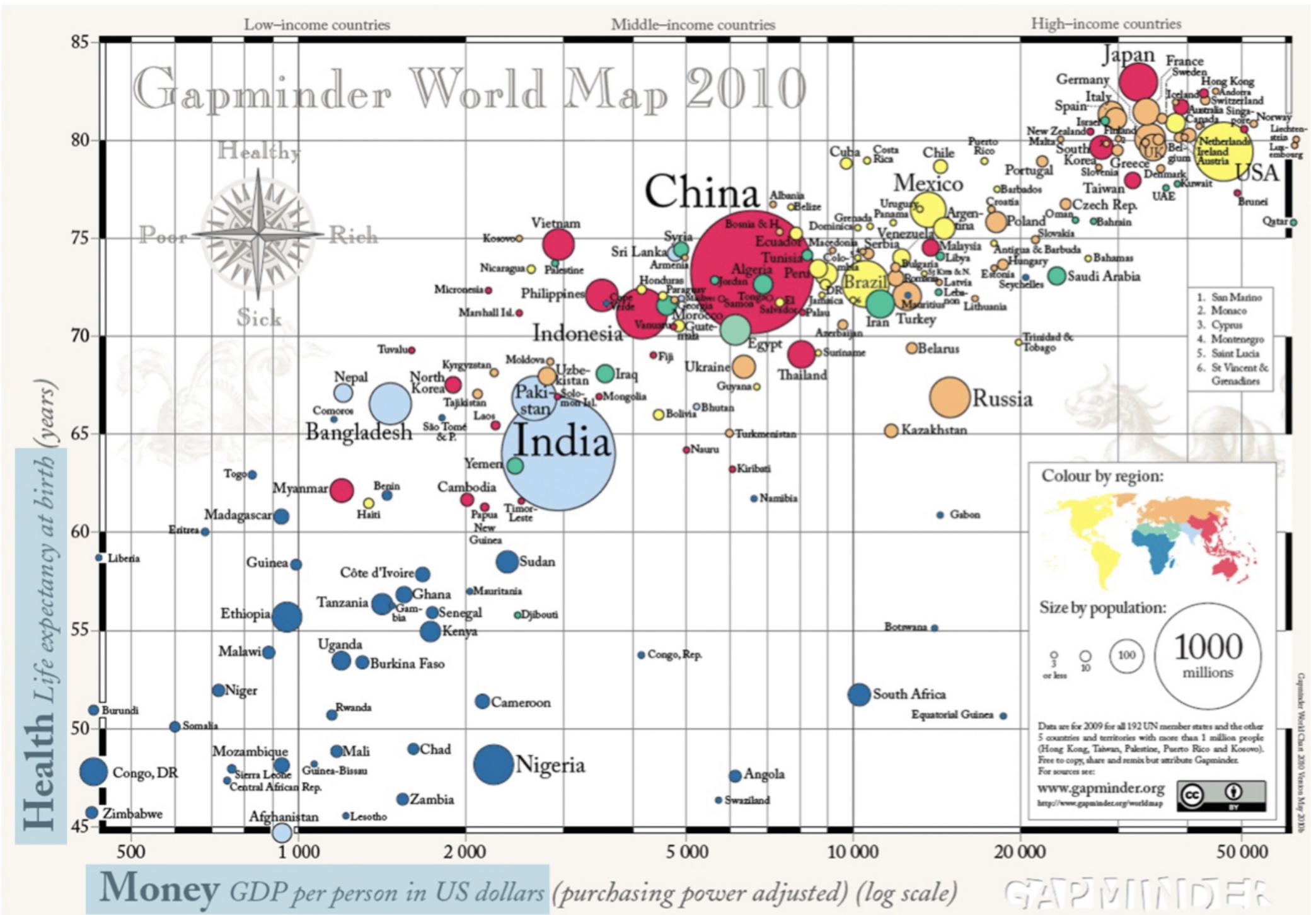




<sup>1</sup> Source: GapMinder, Wealth and Health of Nations



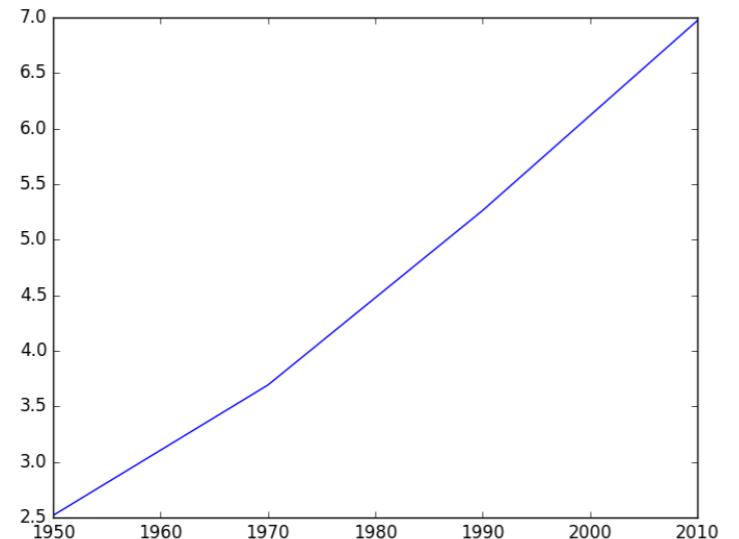
<sup>1</sup> Source: GapMinder, Wealth and Health of Nations



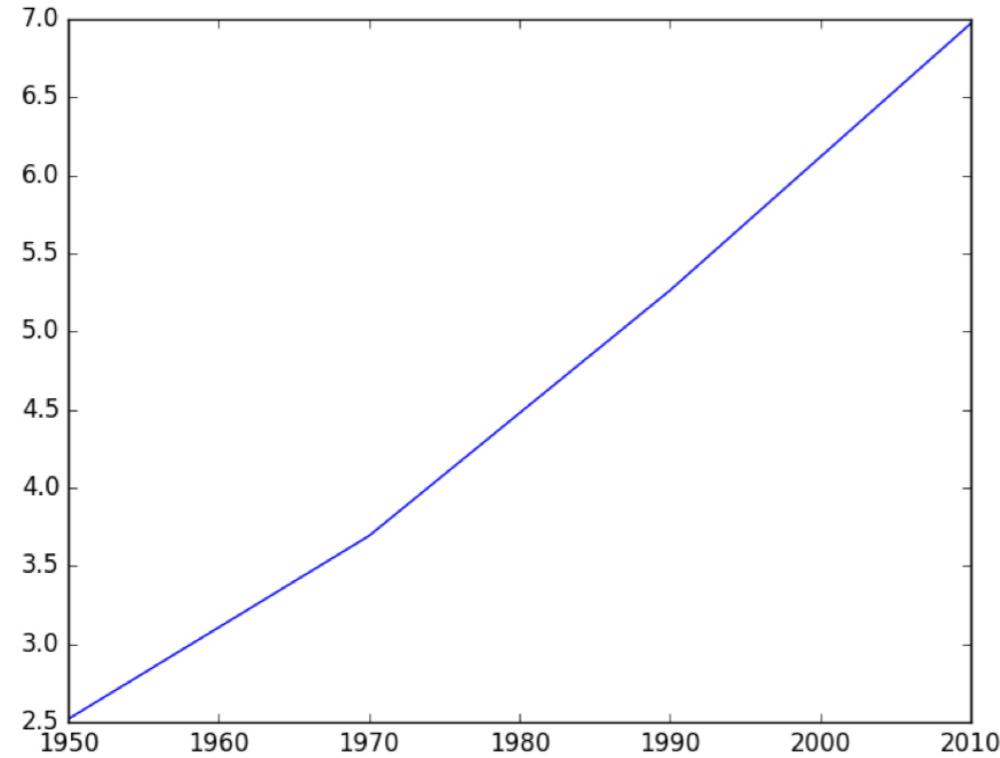
<sup>1</sup> Source: GapMinder, Wealth and Health of Nations

# Matplotlib

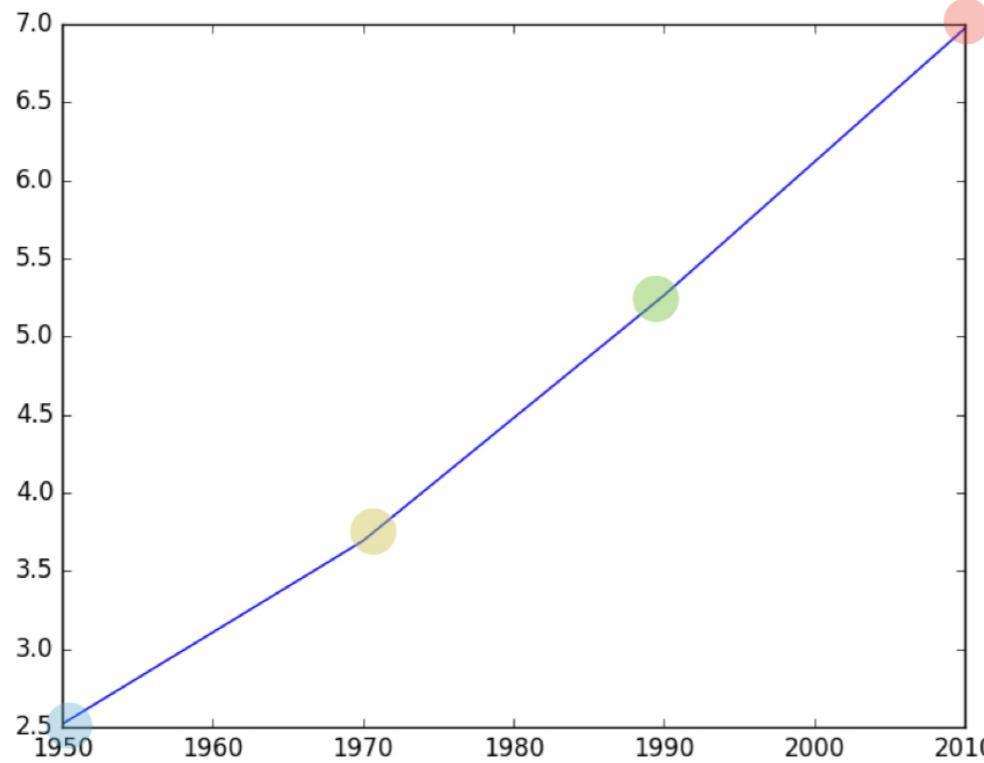
```
import matplotlib.pyplot as plt  
year = [1950, 1970, 1990, 2010]  
pop = [2.519, 3.692, 5.263, 6.972]  
plt.plot(year, pop)  
plt.show()
```



# Matplotlib



# Matplotlib



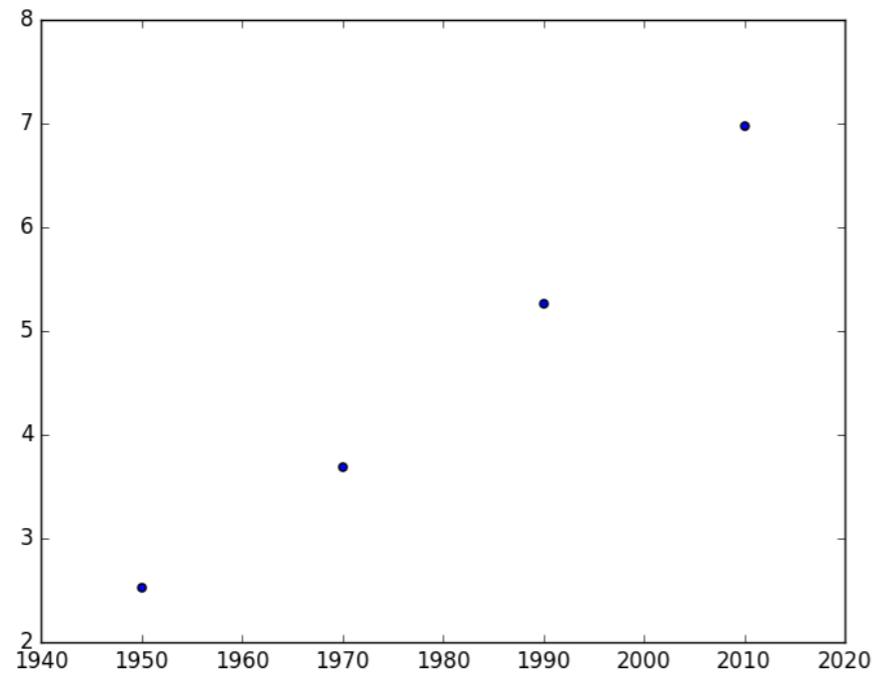
```
year = [1950 , 1970 , 1990 , 2010]  
pop = [2.519, 3.692, 5.263, 6.972]
```

# Scatter plot

```
import matplotlib.pyplot as plt  
year = [1950, 1970, 1990, 2010]  
pop = [2.519, 3.692, 5.263, 6.972]  
plt.plot(year, pop)  
plt.show()
```

# Scatter plot

```
import matplotlib.pyplot as plt  
year = [1950, 1970, 1990, 2010]  
pop = [2.519, 3.692, 5.263, 6.972]  
plt.scatter(year, pop)  
plt.show()
```



# **Let's practice!**

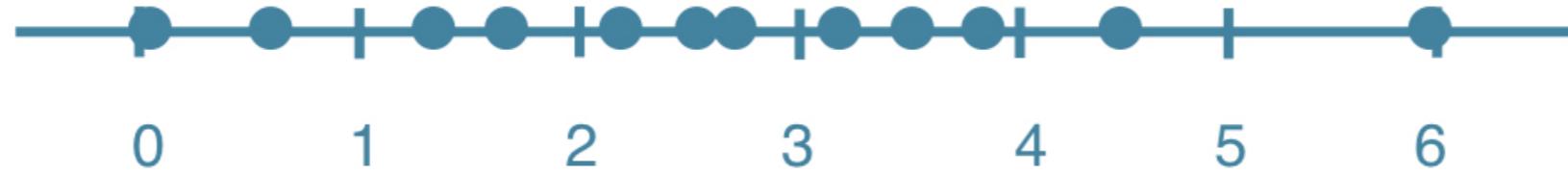
**INTERMEDIATE PYTHON**

# Histogram

- Explore dataset
- Get idea about distribution

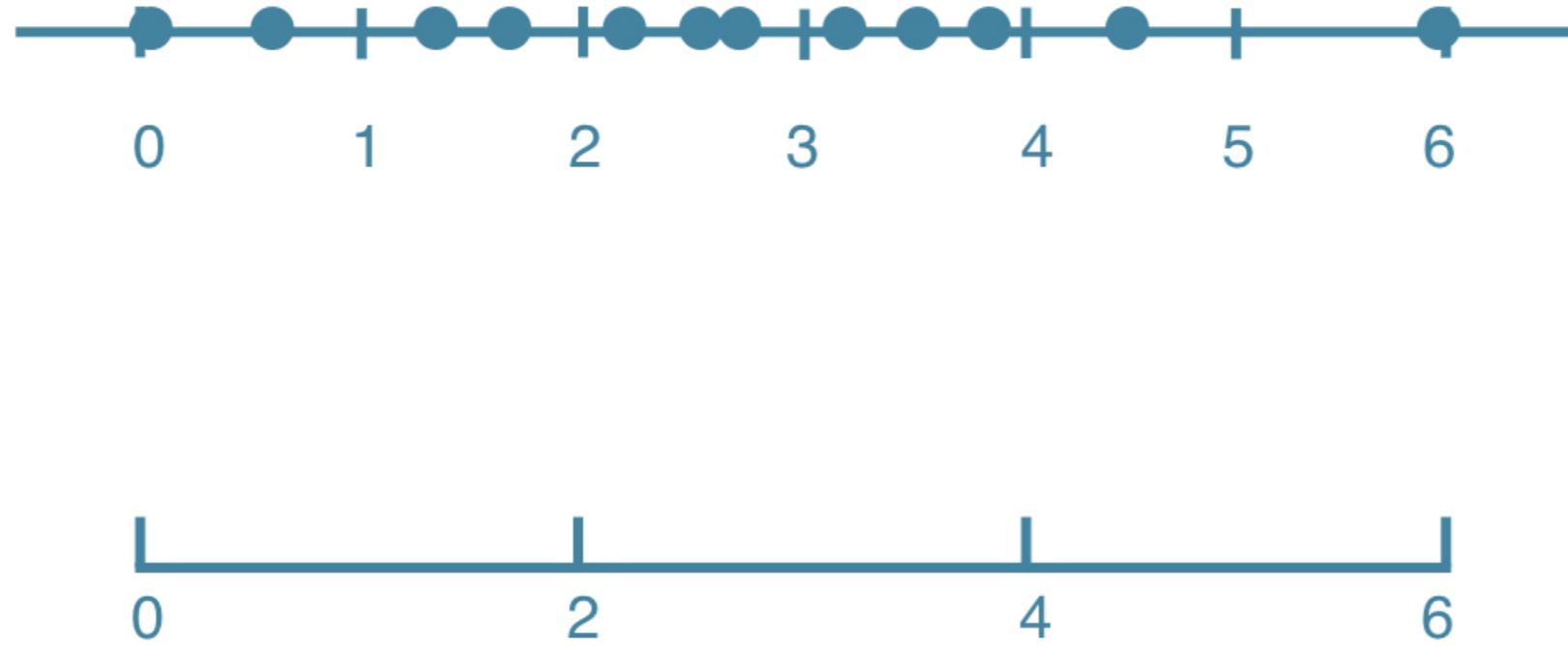
# Histogram

- Explore dataset
- Get idea about distribution



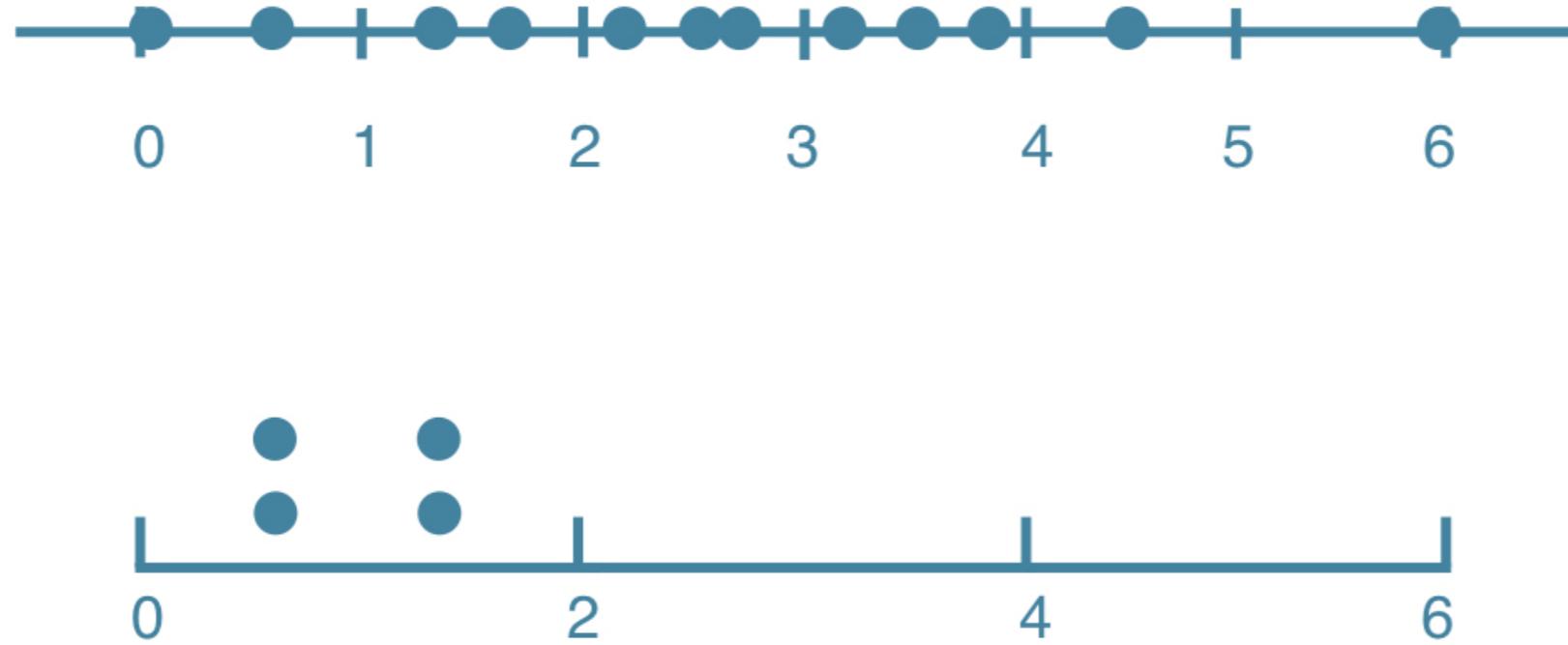
# Histogram

- Explore dataset
- Get idea about distribution



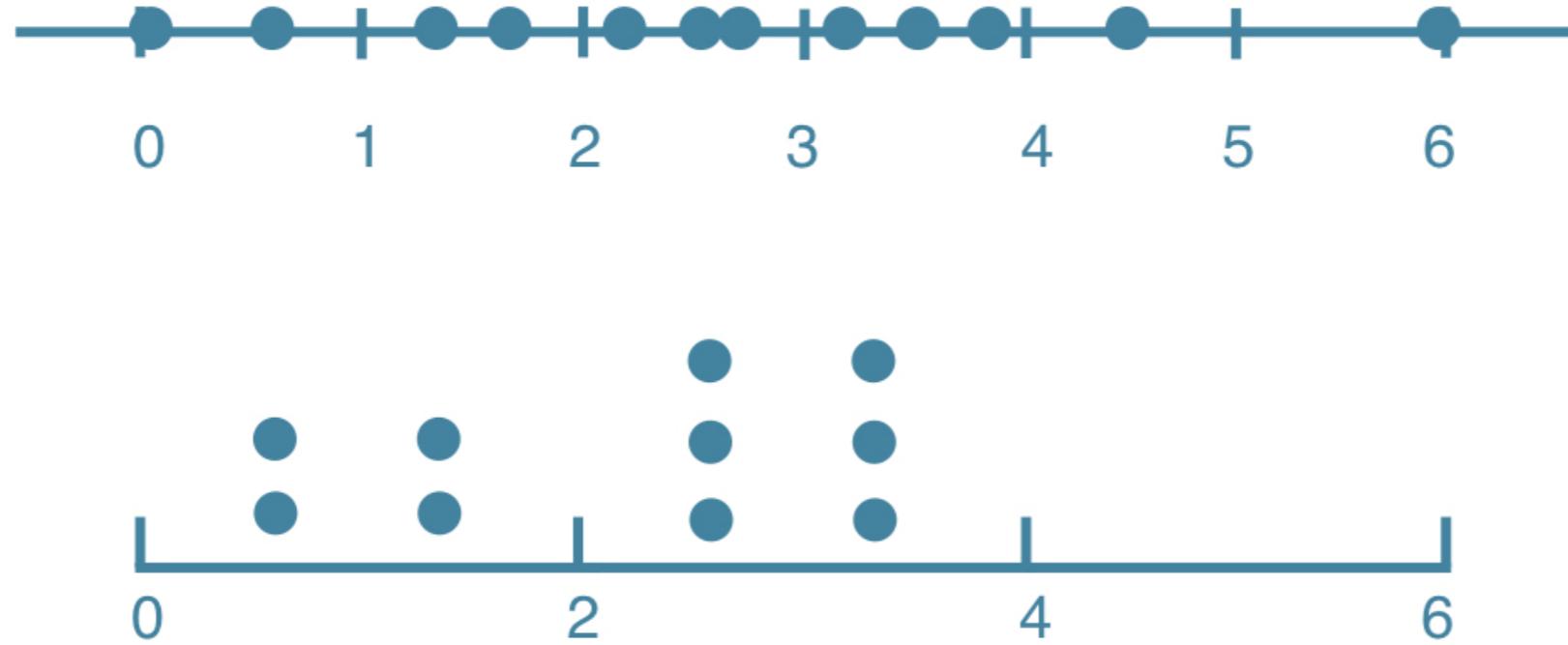
# Histogram

- Explore dataset
- Get idea about distribution



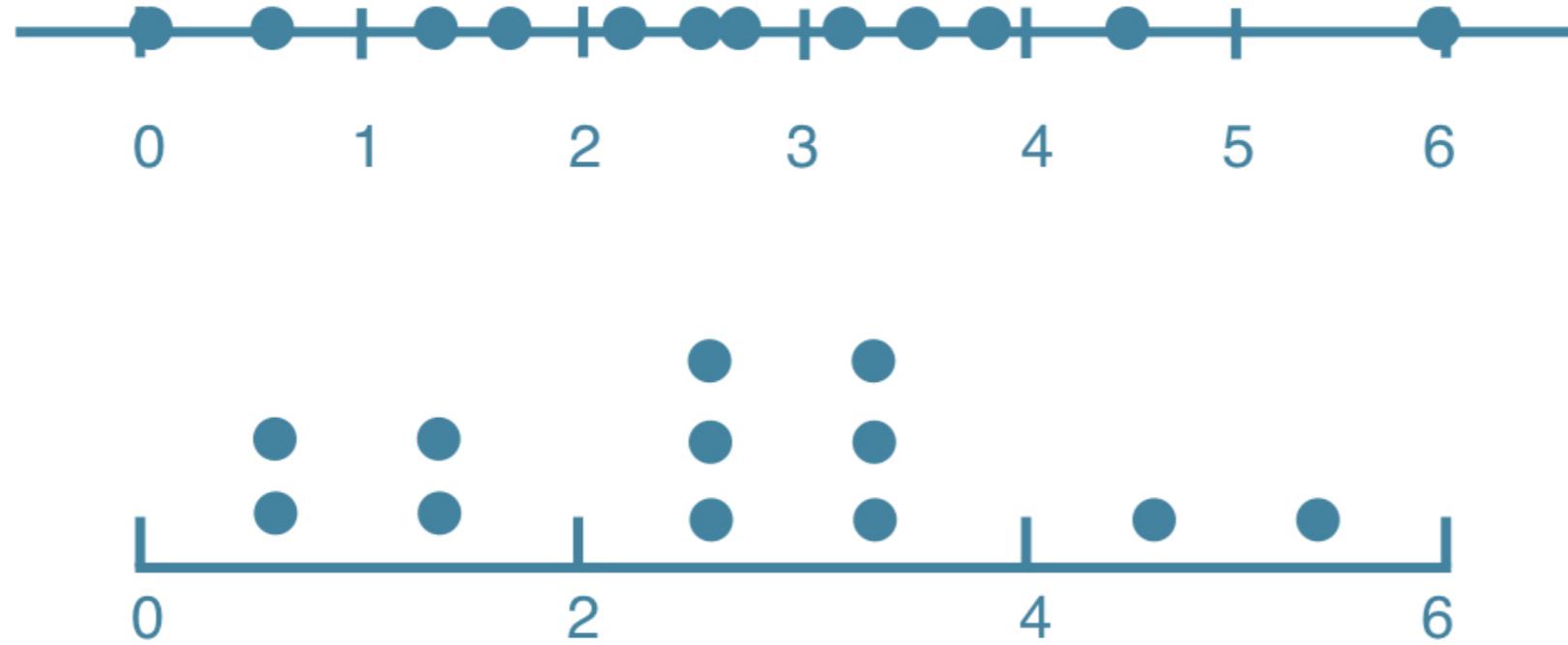
# Histogram

- Explore dataset
- Get idea about distribution



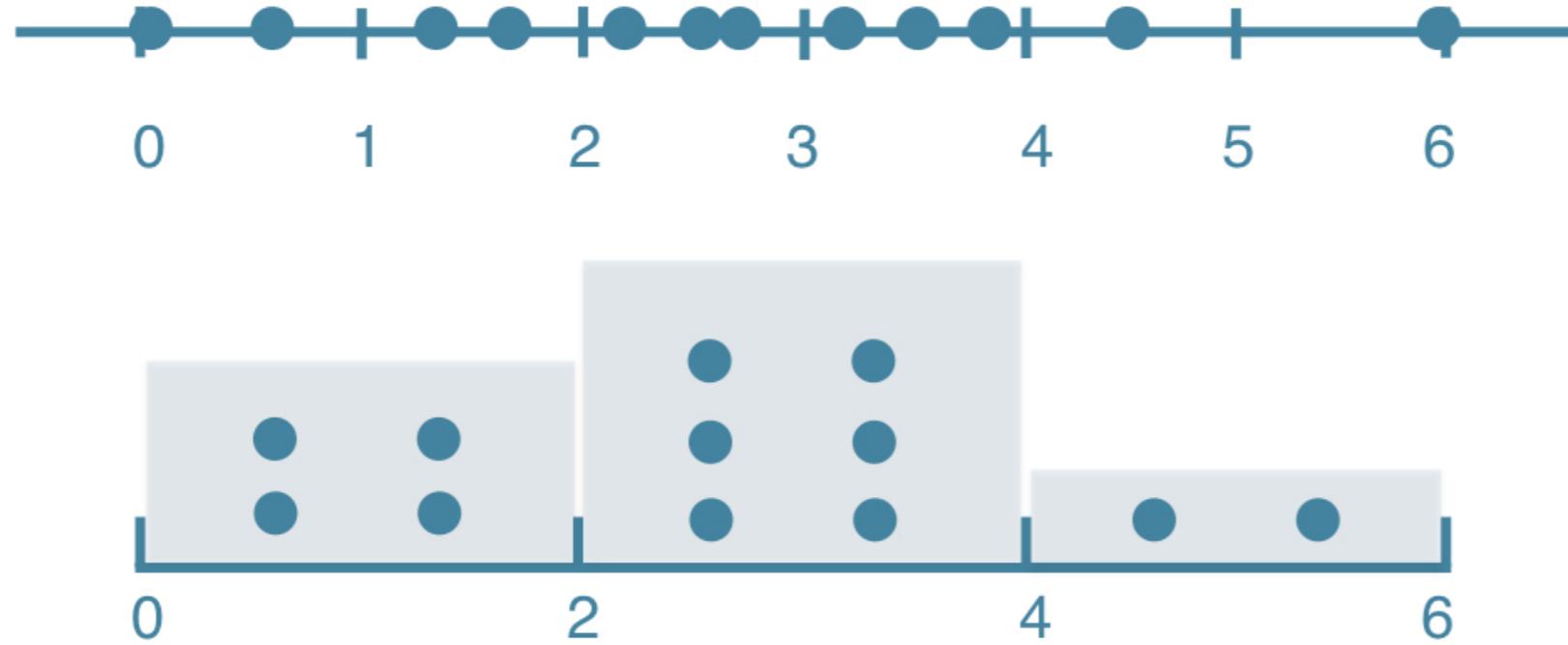
# Histogram

- Explore dataset
- Get idea about distribution



# Histogram

- Explore dataset
- Get idea about distribution



# Matplotlib

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

```
help(plt.hist)
```

```
Help on function hist in module matplotlib.pyplot:
```

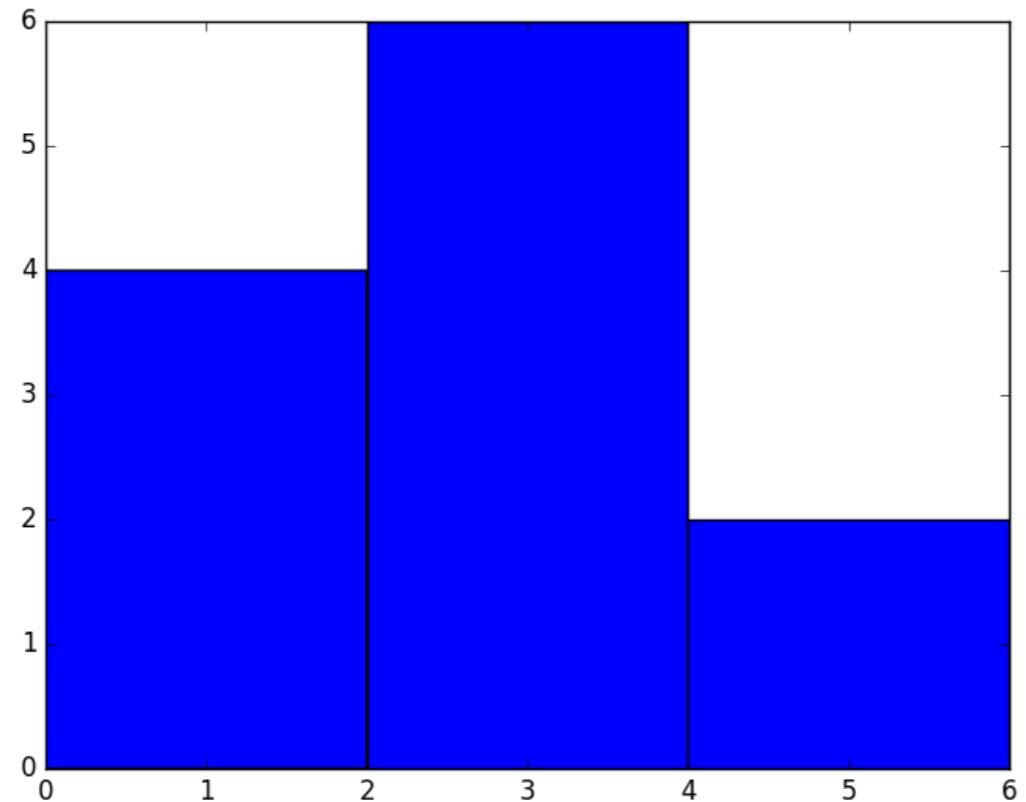
```
hist(x, bins=10, range=None, normed=False, weights=None,  
cumulative=False, bottom=None, histtype='bar', align='mid',  
orientation='vertical', rwidth=None, log=False, color=None,  
label=None, stacked=False, hold=None, data=None, **kwargs)
```

Plot a histogram.

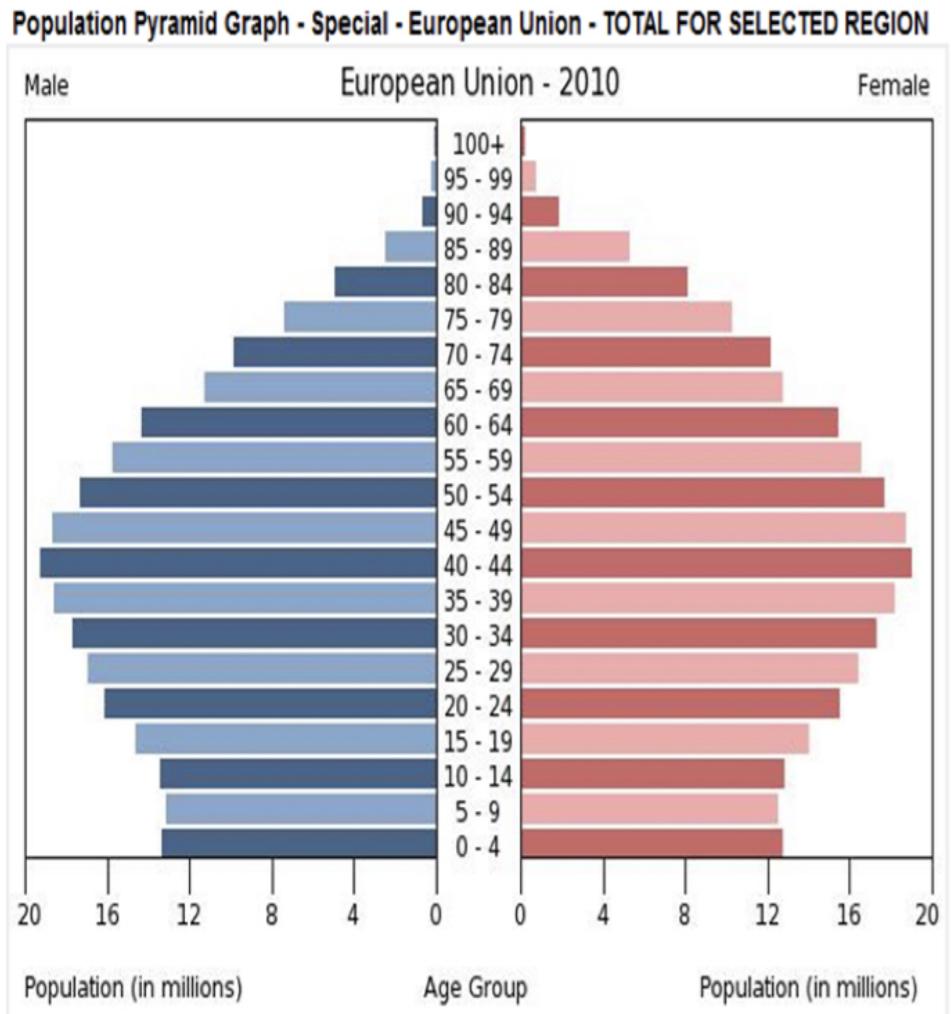
Compute and draw the histogram of `*x*`. The return value is a tuple `(*n*, *bins*, *patches*)` or `([*n0*, *n1*, ...], *bins*, [*patches0*, *patches1*, ...])` if the input contains multiple data.

# Matplotlib example

```
values = [0,0.6,1.4,1.6,2.2,2.5,2.6,3.2,3.5,3.9,4.2,6]  
plt.hist(values, bins=3)  
plt.show()
```

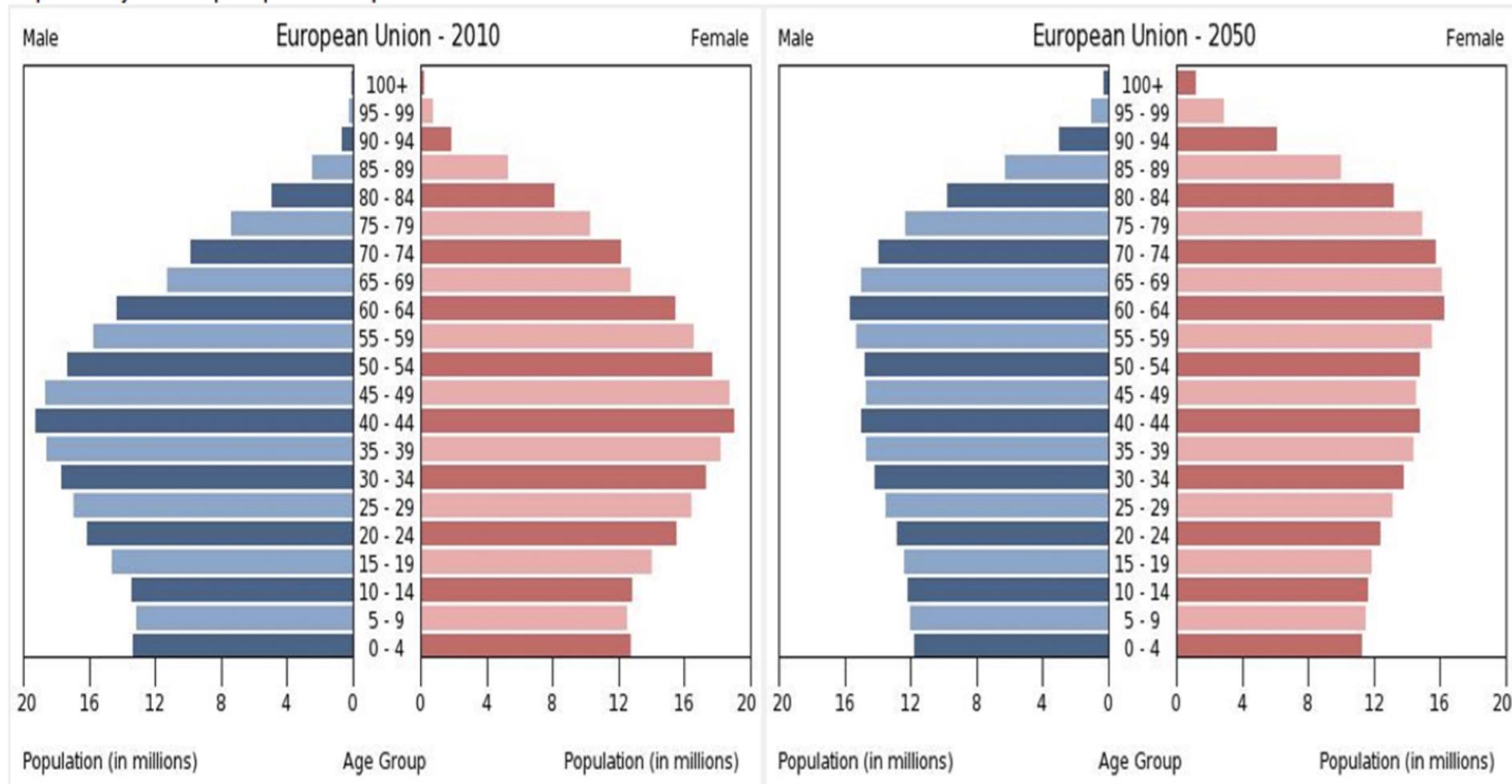


# Population pyramid



# Population pyramid

Population Pyramid Graph - Special - European Union - TOTAL FOR SELECTED REGION



# **Let's practice!**

**INTERMEDIATE PYTHON**

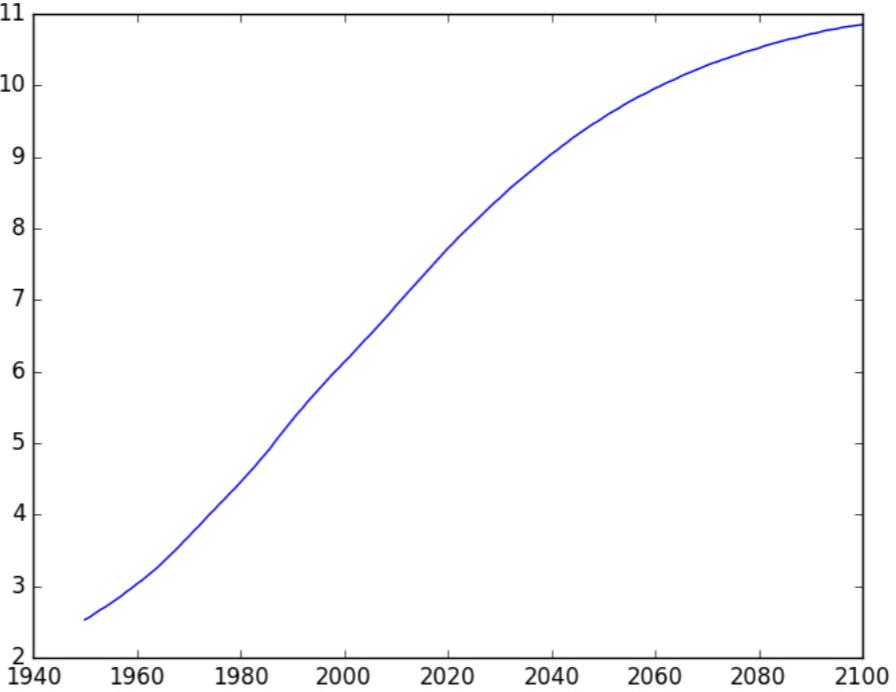
# Data visualization

- Many options
  - Different plot types
  - Many customizations
- Choice depends on
  - Data
  - Story you want to tell

# Basic plot

population.py

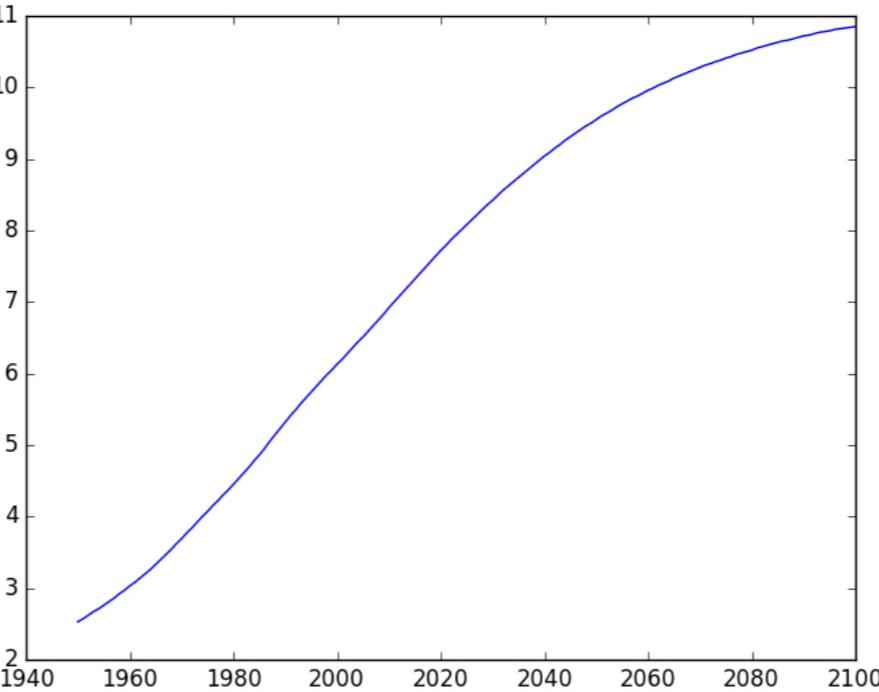
```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.show()
```



# Axis labels

population.py

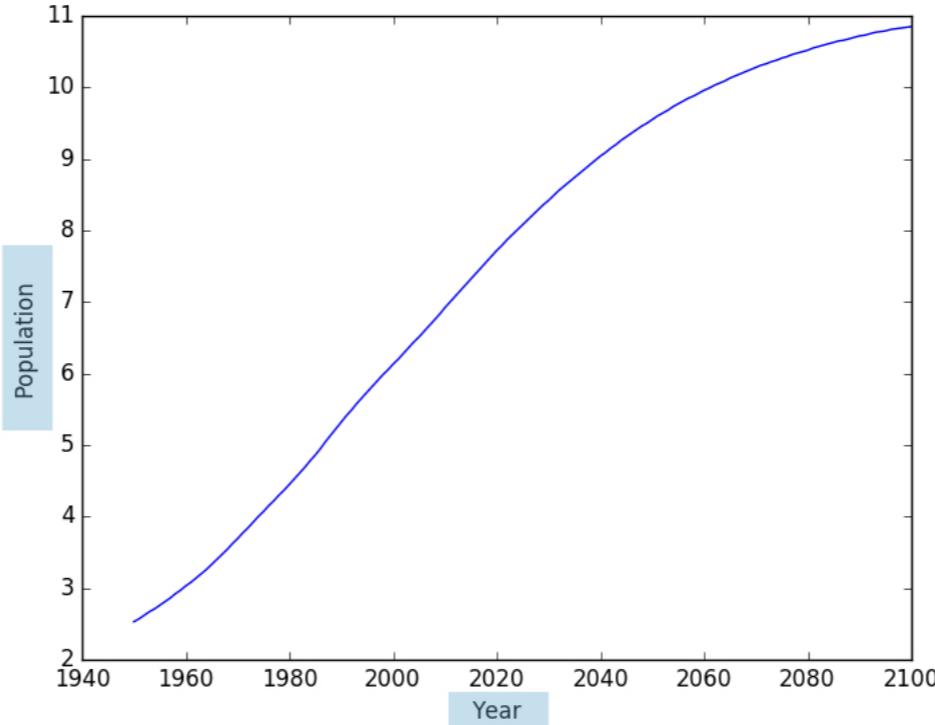
```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.xlabel('Year')  
plt.ylabel('Population')  
  
plt.show()
```



# Axis labels

population.py

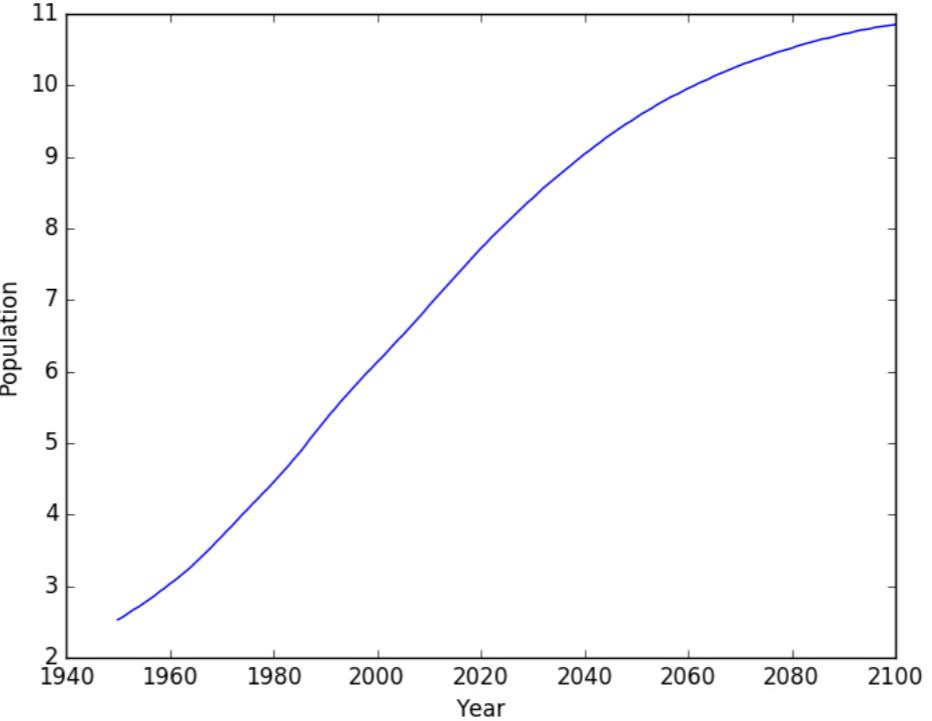
```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.xlabel('Year')  
plt.ylabel('Population')  
  
plt.show()
```



# Title

## population.py

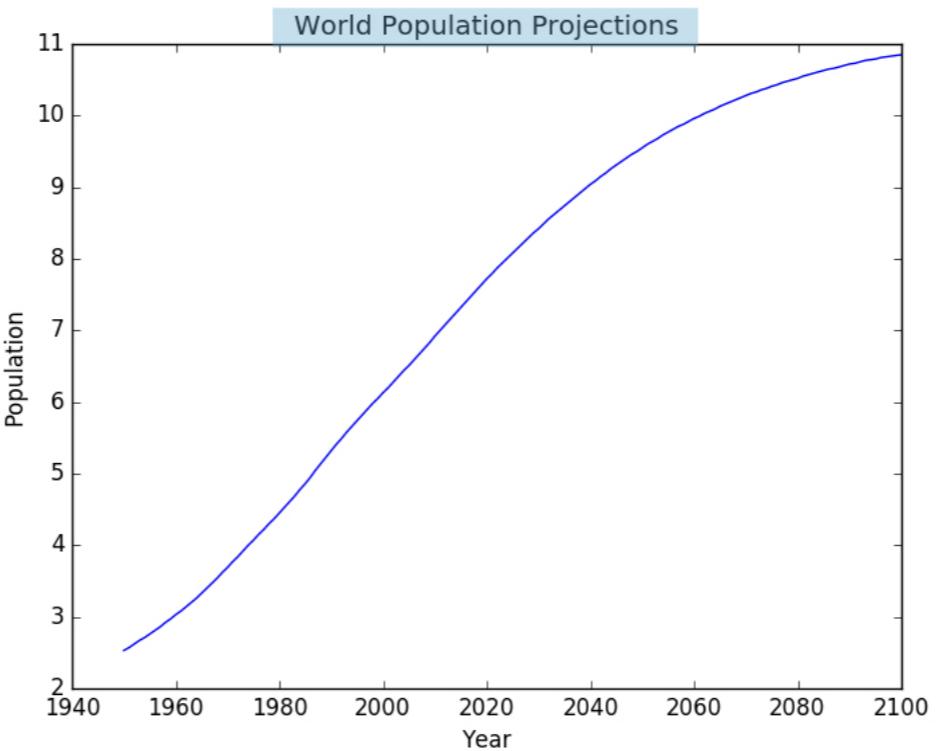
```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.xlabel('Year')  
plt.ylabel('Population')  
plt.title('World Population Projections')  
  
plt.show()
```



# Title

population.py

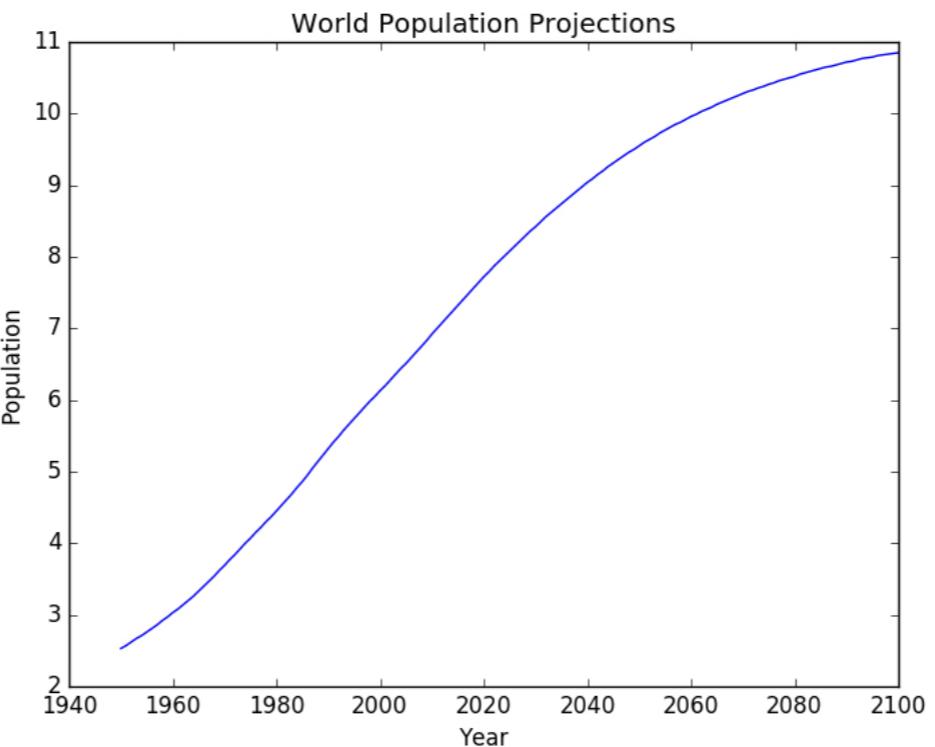
```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.xlabel('Year')  
plt.ylabel('Population')  
plt.title('World Population Projections')  
  
plt.show()
```



# Ticks

## population.py

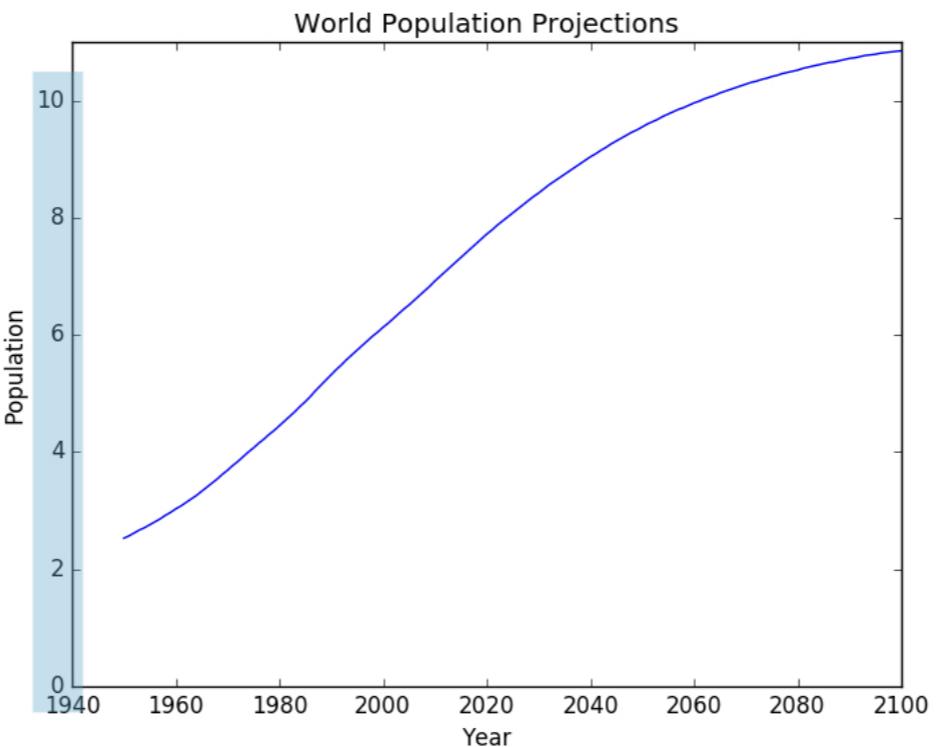
```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.xlabel('Year')  
plt.ylabel('Population')  
plt.title('World Population Projections')  
plt.yticks([0, 2, 4, 6, 8, 10])  
  
plt.show()
```



# Ticks

## population.py

```
import matplotlib.pyplot as plt  
year = [1950, 1951, 1952, ..., 2100]  
pop = [2.538, 2.57, 2.62, ..., 10.85]  
  
plt.plot(year, pop)  
  
plt.xlabel('Year')  
plt.ylabel('Population')  
plt.title('World Population Projections')  
plt.yticks([0, 2, 4, 6, 8, 10])  
  
plt.show()
```



# Ticks (2)

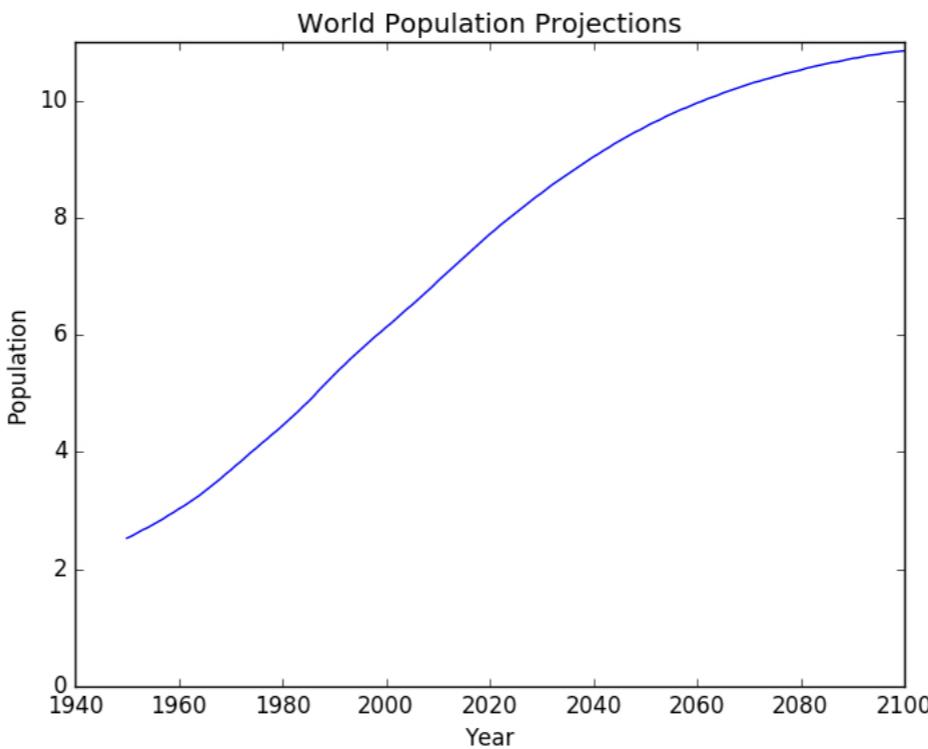
## population.py

```
import matplotlib.pyplot as plt
year = [1950, 1951, 1952, ..., 2100]
pop = [2.538, 2.57, 2.62, ..., 10.85]

plt.plot(year, pop)

plt.xlabel('Year')
plt.ylabel('Population')
plt.title('World Population Projections')
plt.yticks([0, 2, 4, 6, 8, 10],
           ['0', '2B', '4B', '6B', '8B', '10B'])

plt.show()
```



# Ticks (2)

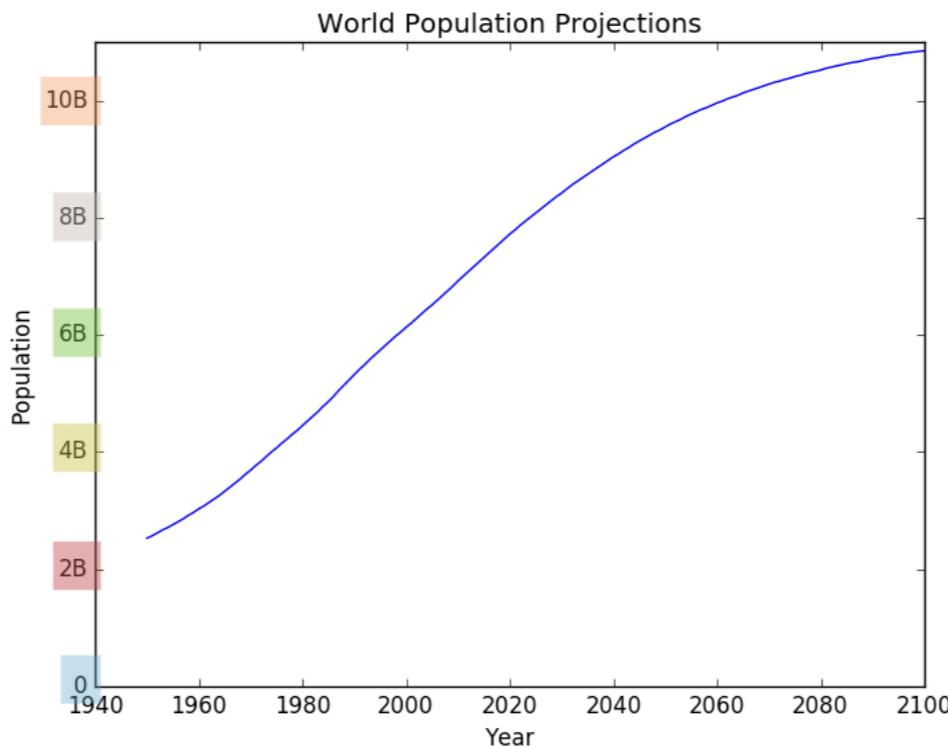
## population.py

```
import matplotlib.pyplot as plt
year = [1950, 1951, 1952, ..., 2100]
pop = [2.538, 2.57, 2.62, ..., 10.85]

plt.plot(year, pop)

plt.xlabel('Year')
plt.ylabel('Population')
plt.title('World Population Projections')
plt.yticks([0, 2, 4, 6, 8, 10],
           ['0', '2B', '4B', '6B', '8B', '10B'])

plt.show()
```



# Add historical data

## population.py

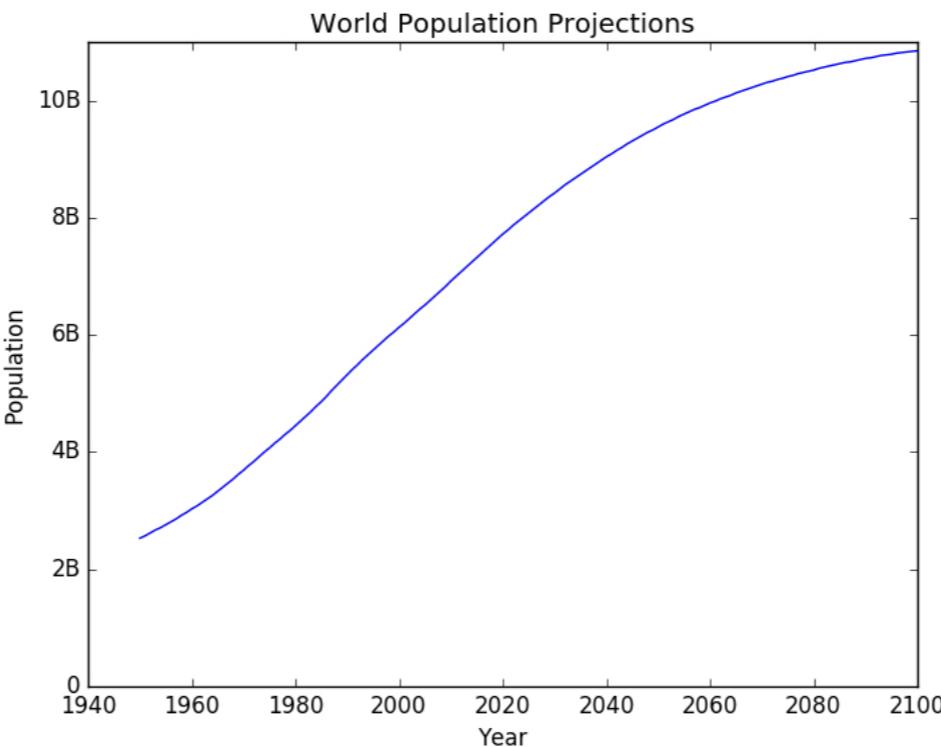
```
import matplotlib.pyplot as plt
year = [1950, 1951, 1952, ..., 2100]
pop = [2.538, 2.57, 2.62, ..., 10.85]

# Add more data
year = [1800, 1850, 1900] + year
pop = [1.0, 1.262, 1.650] + pop

plt.plot(year, pop)

plt.xlabel('Year')
plt.ylabel('Population')
plt.title('World Population Projections')
plt.yticks([0, 2, 4, 6, 8, 10],
           ['0', '2B', '4B', '6B', '8B', '10B'])

plt.show()
```



# Add historical data

population.py

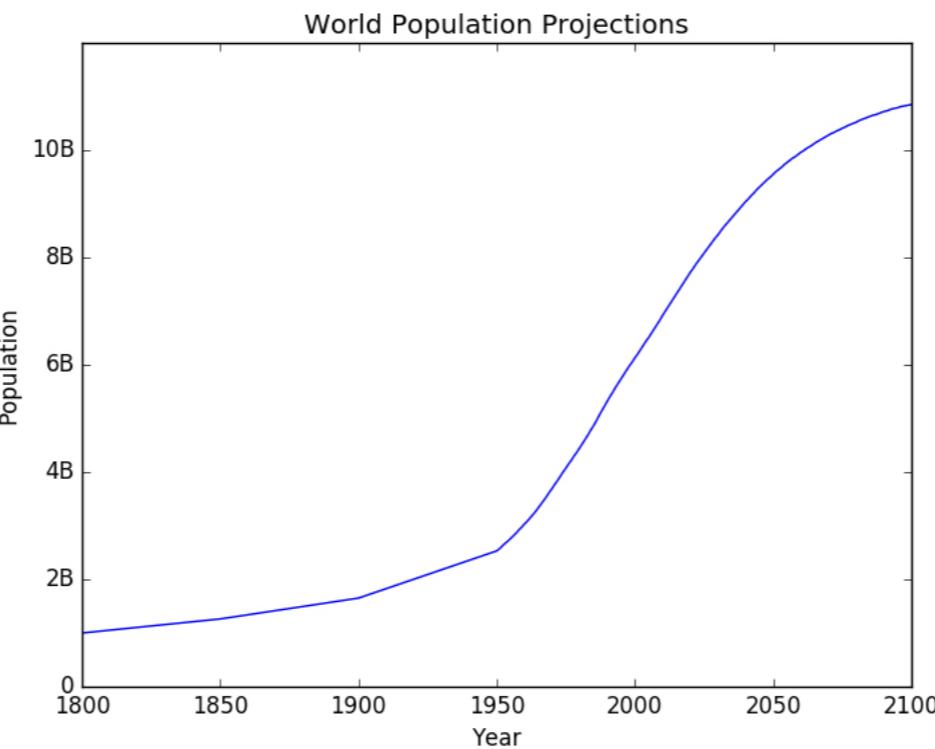
```
import matplotlib.pyplot as plt
year = [1950, 1951, 1952, ..., 2100]
pop = [2.538, 2.57, 2.62, ..., 10.85]

# Add more data
year = [1800, 1850, 1900] + year
pop = [1.0, 1.262, 1.650] + pop

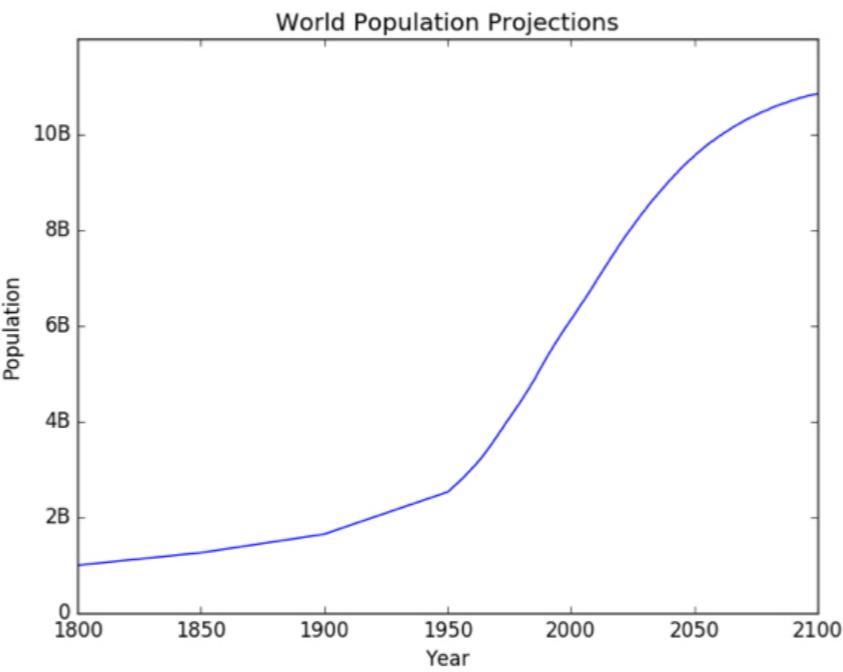
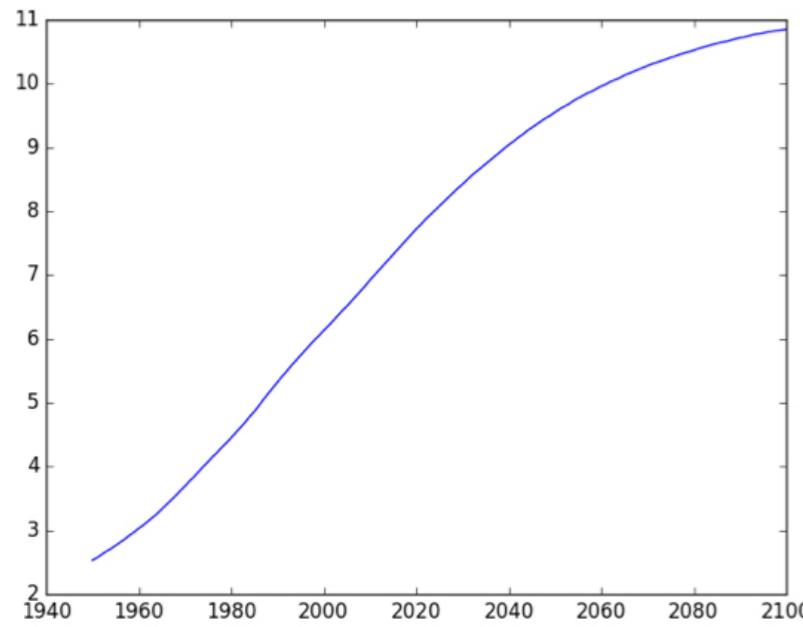
plt.plot(year, pop)

plt.xlabel('Year')
plt.ylabel('Population')
plt.title('World Population Projections')
plt.yticks([0, 2, 4, 6, 8, 10],
           ['0', '2B', '4B', '6B', '8B', '10B'])

plt.show()
```



# Before vs after



# **Let's practice!**

**INTERMEDIATE PYTHON**