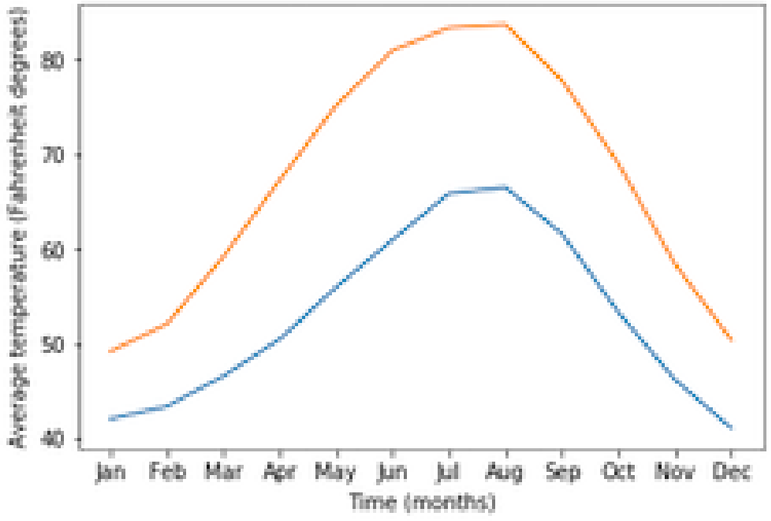
INTRODUCTION TO MATPLOTLIB

Preparing your figures to share with others

Ariel Rokem
Data Scientist

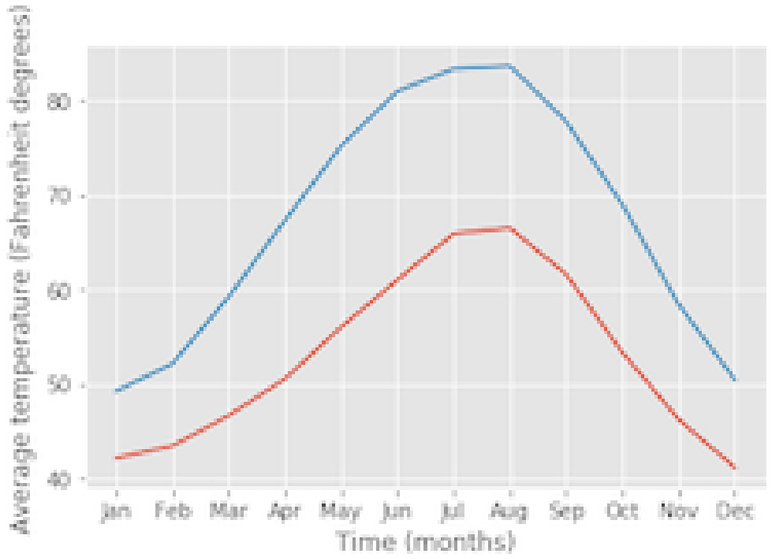
Changing plot style

```
import matplotlib.pyplot as plt
fig, ax = plt.subplots()
ax.plot(seattle_weather["MONTH"], seattle_weather["MLY-TAVG-NORMAL"])
ax.plot(austin_weather["MONTH"], austin_weather["MLY-TAVG-NORMAL"])
ax.set_xlabel("Time (months)")
ax.set_ylabel("Average temperature (Fahrenheit degrees)")
plt.show()
```



Choosing a style

```
plt.style.use("ggplot")

fig, ax = plt.subplots()
ax.plot(seattle_weather["MONTH"], seattle_weather["MLY-TAVG-NORMAL"])
ax.plot(austin_weather["MONTH"], austin_weather["MLY-TAVG-NORMAL"])
ax.set_xlabel("Time (months)")
ax.set_ylabel("Average temperature (Fahrenheit degrees)")
plt.show()
```



Back to the default

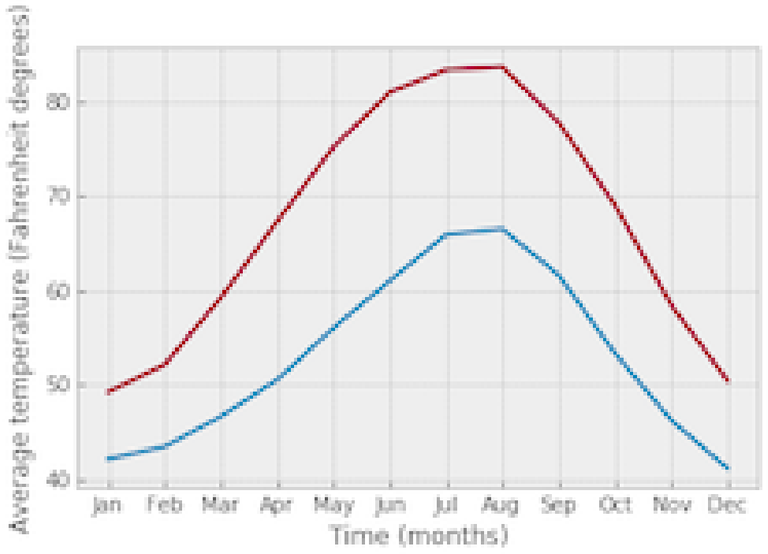
```
plt.style.use("default")
```

The available styles

https://matplotlib.org/gallery/style_sheets/style_sheets_reference.html

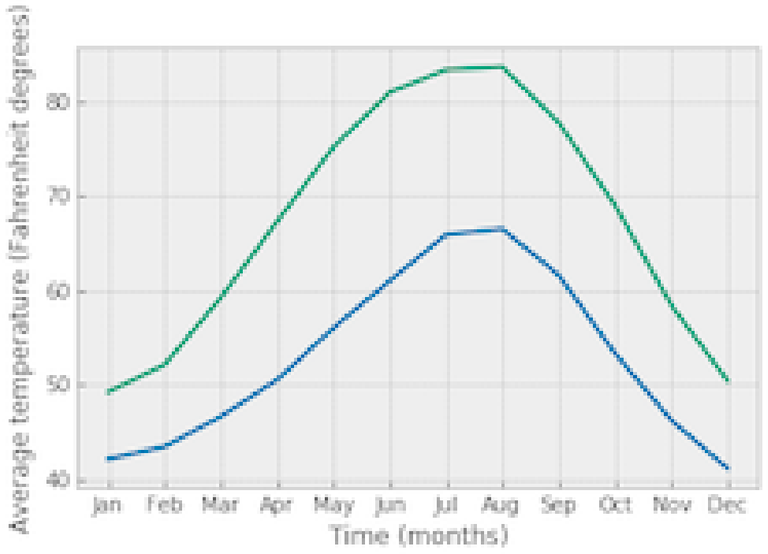
The "bmh" style

```
plt.style.use("bmh")

fig, ax = plt.subplots()
ax.plot(seattle_weather["MONTH"], seattle_weather["MLY-TAVG-NORMAL"])
ax.plot(austin_weather["MONTH"], austin_weather["MLY-TAVG-NORMAL"])
ax.set_xlabel("Time (months)")
ax.set_ylabel("Average temperature (Fahrenheit degrees)")
plt.show()
```



Seaborn styles

```
plt.style.use("seaborn-colorblind")

fig, ax = plt.subplots()
ax.plot(seattle_weather["MONTH"], seattle_weather["MLY-TAVG-NORMAL"])
ax.plot(austin_weather["MONTH"], austin_weather["MLY-TAVG-NORMAL"])
ax.set_xlabel("Time (months)")
ax.set_ylabel("Average temperature (Fahrenheit degrees)")
plt.show()
```



Guidelines for choosing plotting style

- Dark backgrounds are usually less visible
- If color is important, consider choosing colorblind-friendly options
  - "seaborn-colorblind" or "tableau-colorblind10"
- If you think that someone will want to print your figure, use less ink
- If it will be printed in black-and-white, use the "grayscale" style

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Practice choosing the right style for you!

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Sharing your visualizations with others

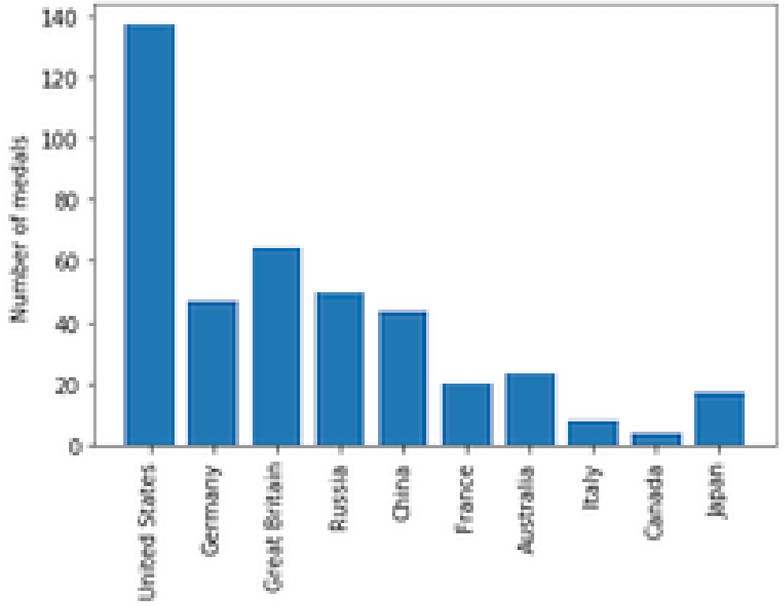
Ariel Rokem
Data Scientist

A figure to share

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

ax.bar(medals.index, medals["Gold"])
ax.set_xticklabels(medals.index, rotation=90)
ax.set_ylabel("Number of medals")

plt.show()
```



Saving the figure to file

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

ax.bar(medals.index, medals["Gold"])
ax.set_xticklabels(medals.index, rotation=90)
ax.set_ylabel("Number of medals")

fig.savefig("gold_medals.png")
```

```
ls
```

```
gold_medals.png
```

Different file formats

```
fig.savefig("gold_medals.jpg")
```

```
fig,savefig("gold_medals.jpg", quality=50)
```

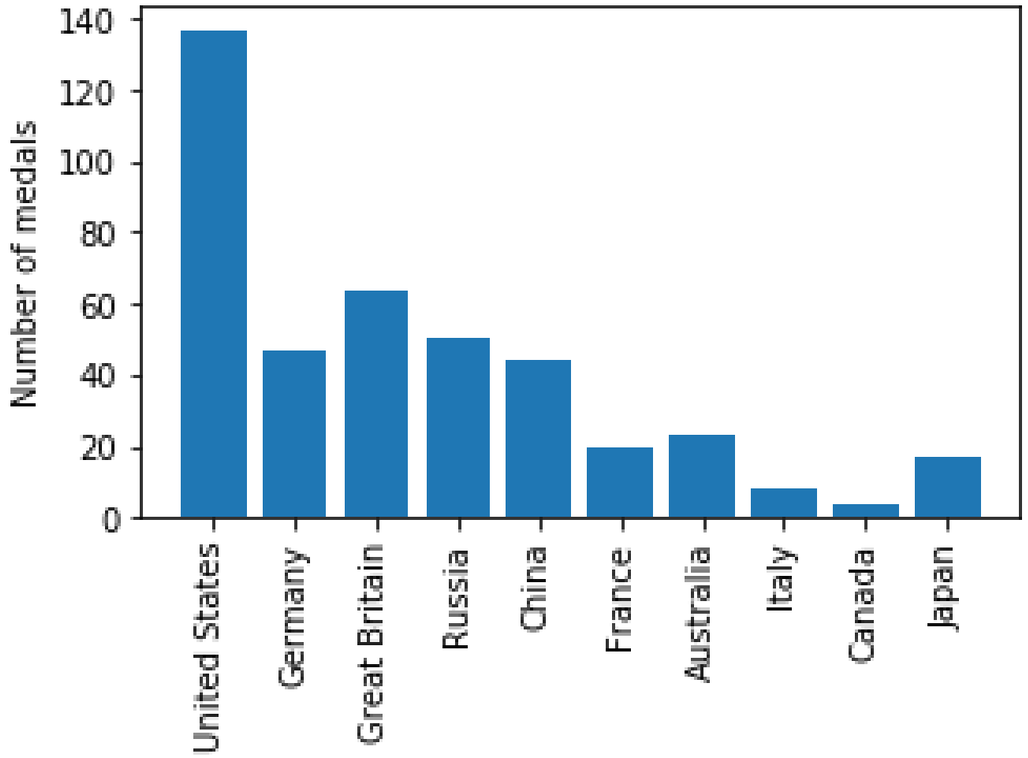
```
fig.savefig("gold_medals.svg")
```

Resolution

```
fig.savefig("gold_medals.png", dpi=300)
```

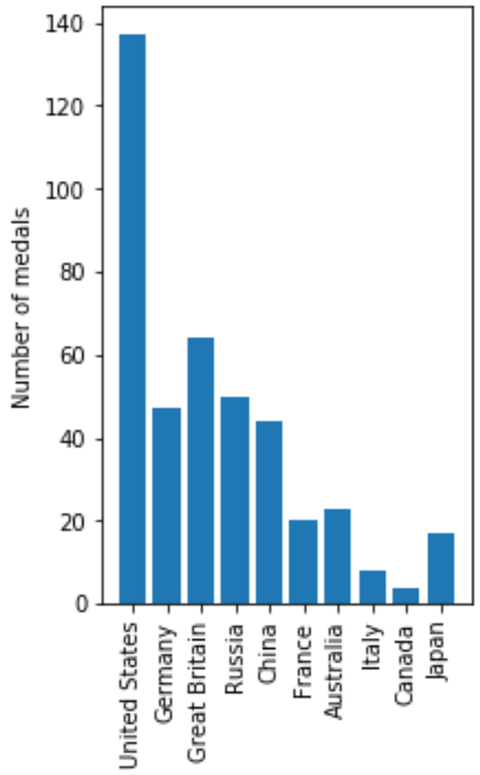
Size

```
fig.set_size_inches([5, 3])
```



Another aspect ratio

```
fig.set_size_inches([3, 5])
```



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Practice saving your visualizations!

INTRODUCTION TO MATPLOTLIB

Automating figures from data

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Why automate?

- Ease and speed
- Flexibility
- Robustness
- Reproducibility

How many different kinds of data?

```
summer_2016_medals["Sport"]
```

```
ID
62            Rowing
65         Taekwondo
73          Handball
3174          Boxing
3537        Wrestling
             ...
134759      Handball
134776     Wrestling
134857    Volleyball
135132    Volleyball
135205        Boxing
Name: Sport, Length: 976, dtype: object
```

Getting unique values of a column

```
sports = summer_2016_medals["Sport"].unique()

print(sports)
```

```
['Rowing' 'Taekwondo' 'Handball' 'Wrestling' 'Gymnastics' 'Swimming'
 'Basketball' 'Boxing' 'Volleyball' 'Athletics']
```

Bar-chart of heights for all sports

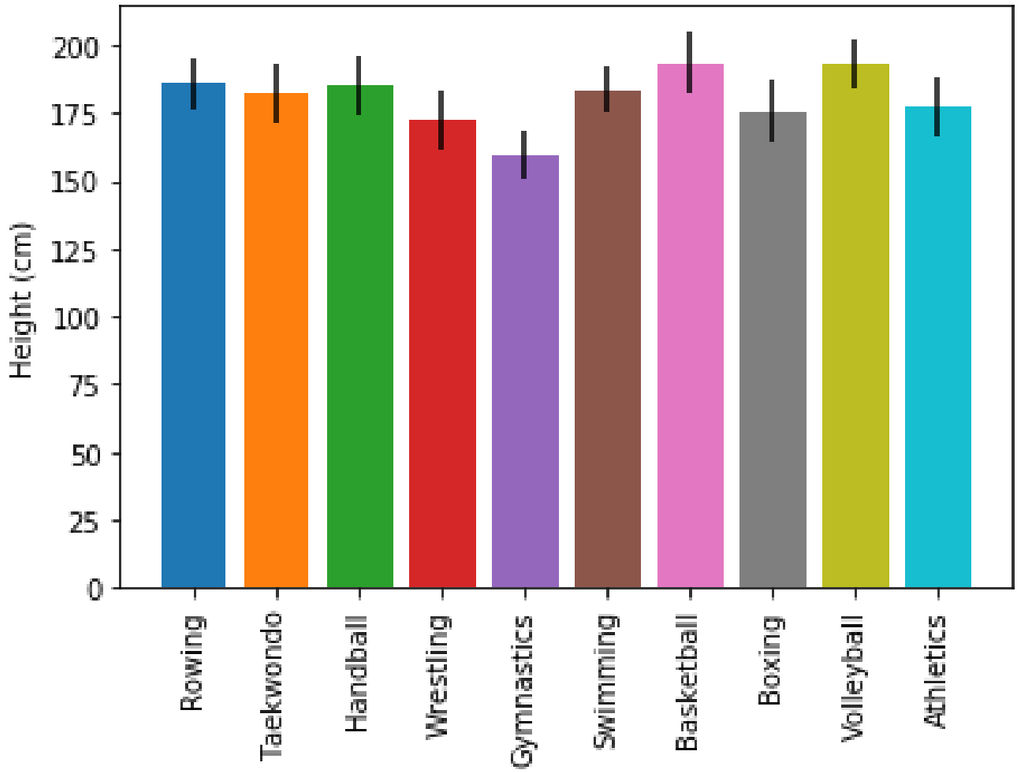
```
fig, ax = plt.subplots()

for sport in sports:
    sport_df = summer_2016_medals[summer_2016_medals["Sport"] == sport]

    ax.bar(sport, sport_df["Height"].mean(), yerr=sport_df["Height"].std())

ax.set_ylabel("Height (cm)")
ax.set_xticklabels(sports, rotation=90)
plt.show()
```

Figure derived automatically from the data



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Practice automating visualizations!

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Where to go next

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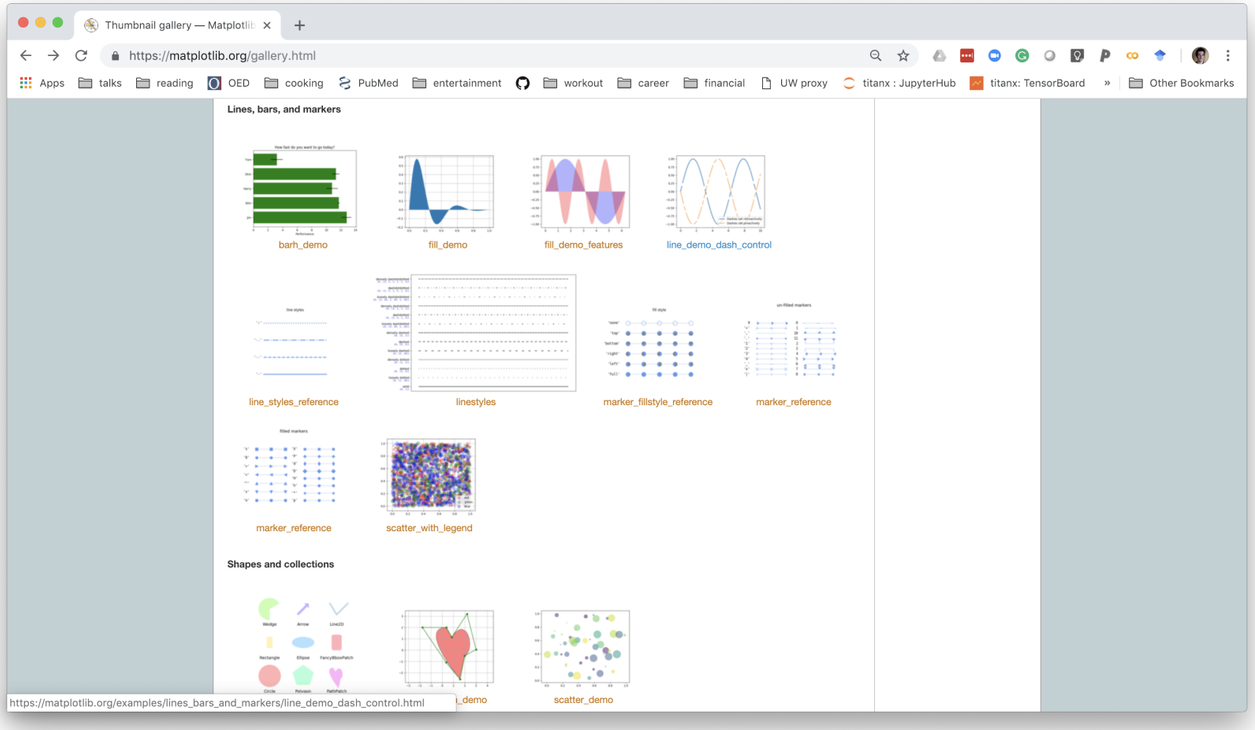
The Matplotlib gallery

https://matplotlib.org/gallery.html

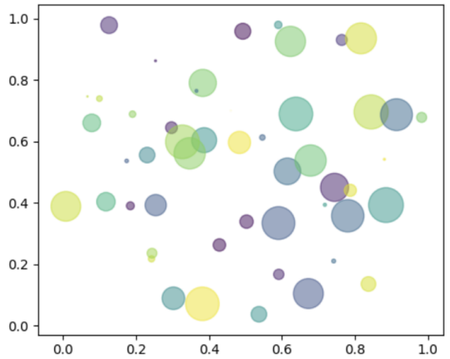
Gallery of examples



Example page with code

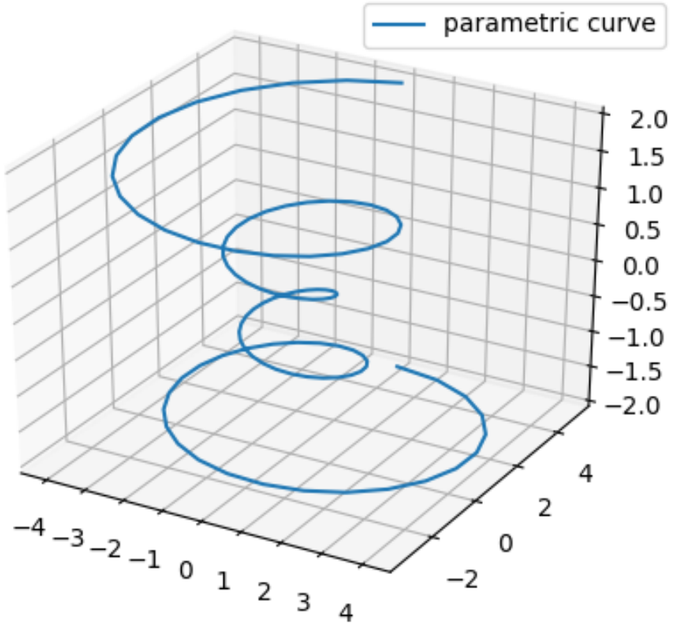
shapes_and_collections example code: scatter_demo.py

(Source code, png, pdf)



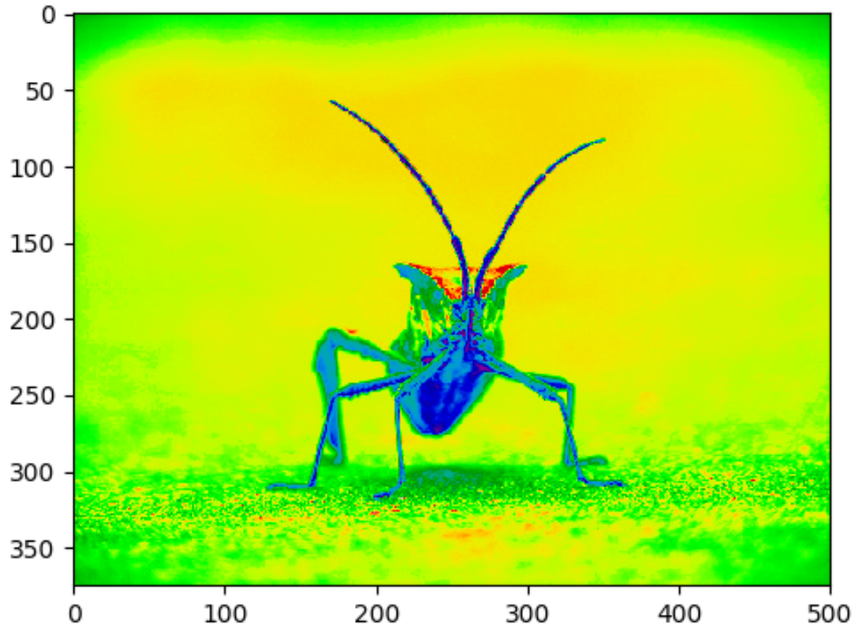

```
"""
Simple demo of a scatter plot.
"""
import numpy as np
import matplotlib.pyplot as plt


N = 50
x = np.random.rand(N)
y = np.random.rand(N)
colors = np.random.rand(N)
area = np.pi * (15 * np.random.rand(N))**2  # 0 to 15 point radii

plt.scatter(x, y, s=area, c=colors, alpha=0.5)
plt.show()
```

Plotting data in 3D



https://matplotlib.org/mpl_toolkits/mplot3d/tutorial.html

Visualizing images with pseudo-color



https://matplotlib.org/users/image_tutorial.html

Animations

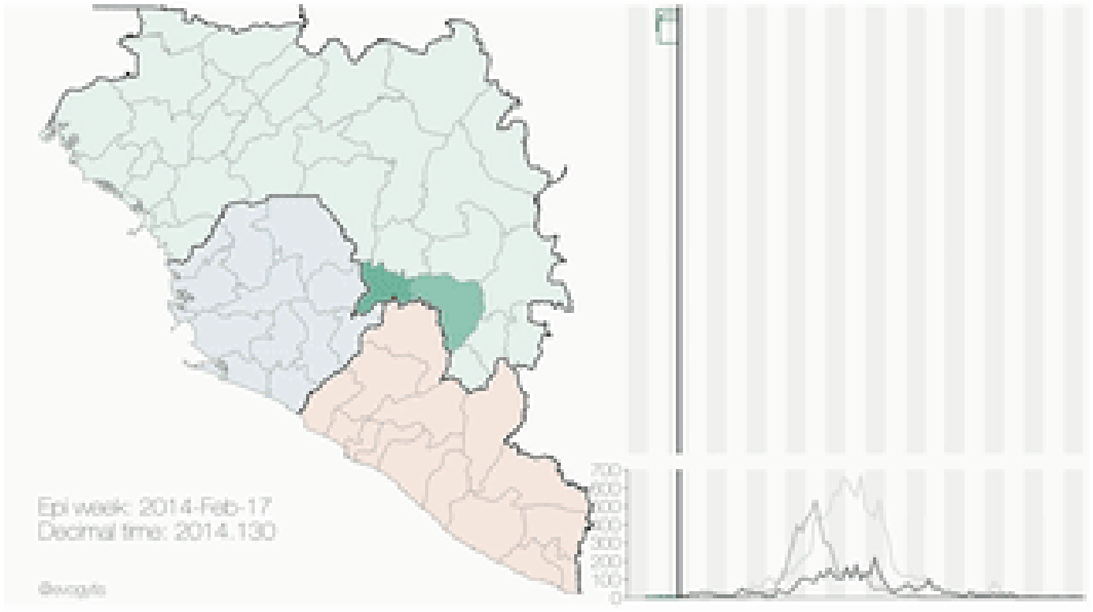
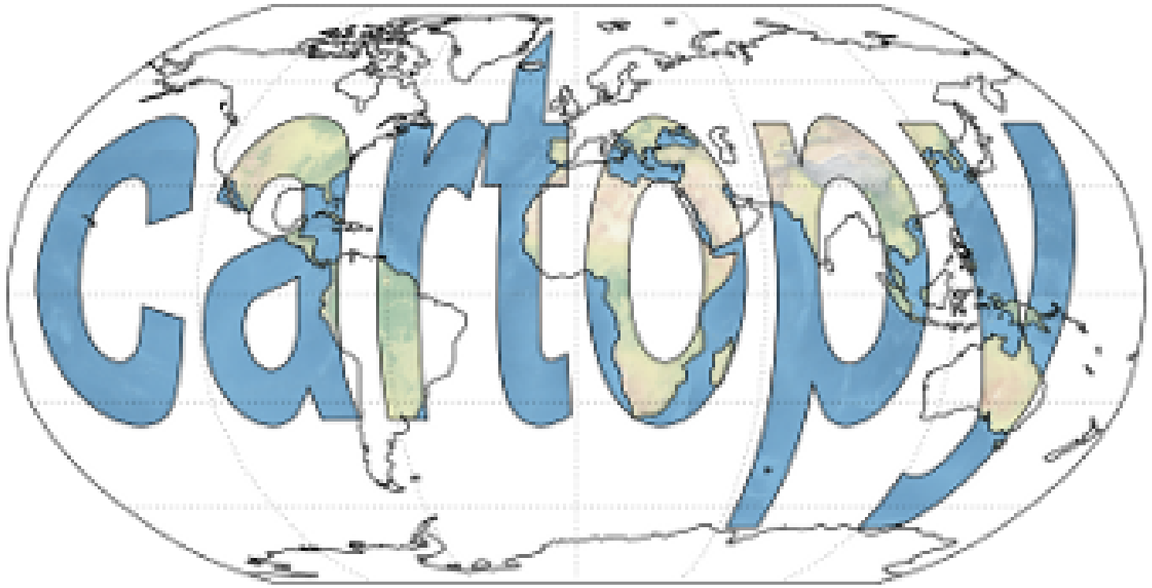


Image credit: Gytis Dudas and Andrew Rambaut

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

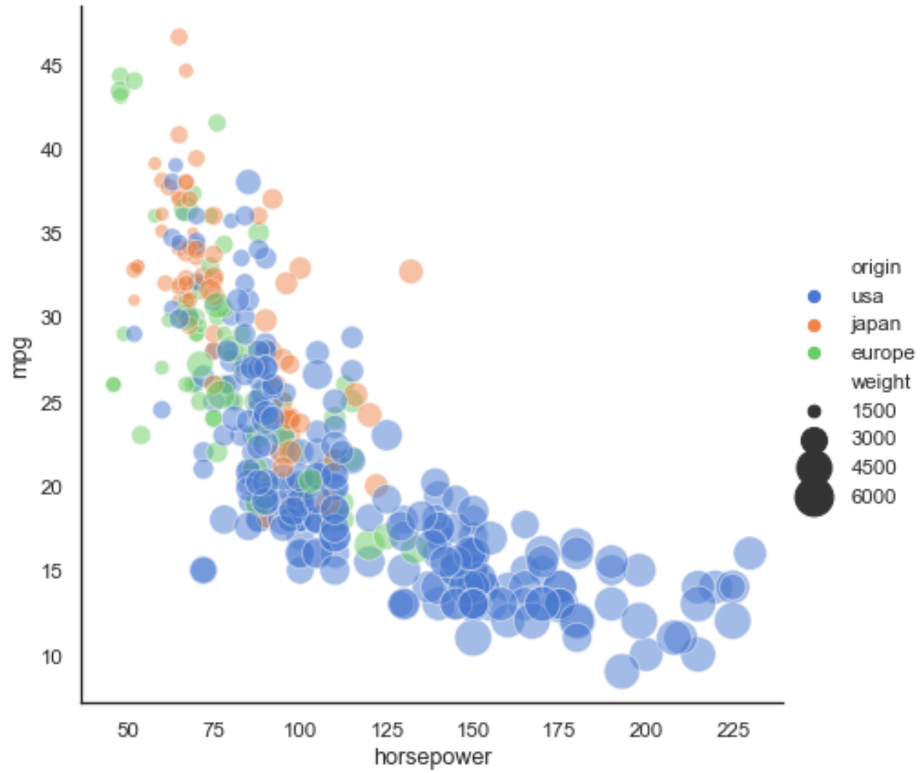
Using Matplotlib for geospatial data



https://scitools.org.uk/cartopy/docs/latest/

Pandas + Matplotlib = Seaborn

```
seaborn.relplot(x="horsepower", y="mpg", hue="origin", size="weight",
                sizes=(40, 400), alpha=.5, palette="muted",
                height=6, data=mpg)
```



Seaborn example gallery

https://seaborn.pydata.org/examples/index.html

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Good luck visualizing your data!