Lecture 13: Visualizations

CS 51P

March 5, 2026

Logistics

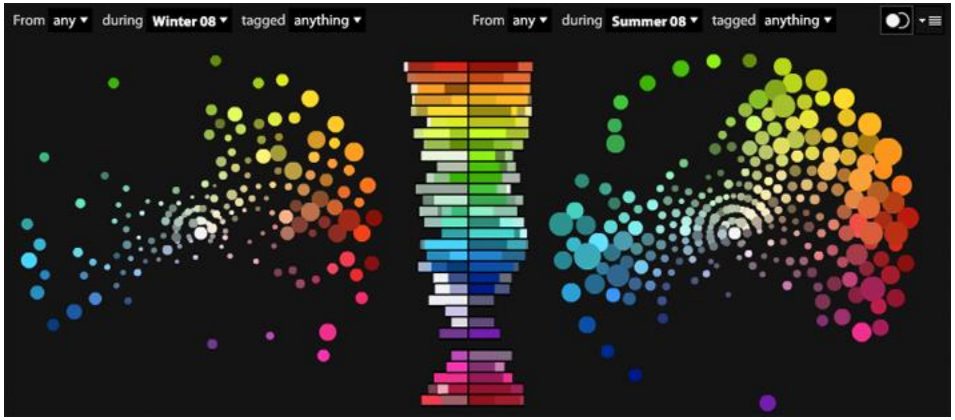
- A6 is due on Monday (last assignment!)

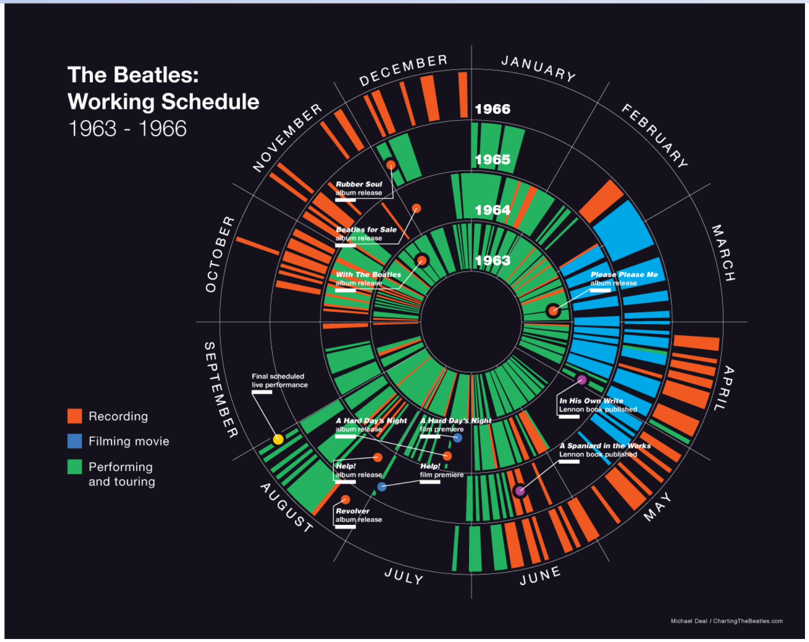
- Review session next Tuesday (Dr. Dave)

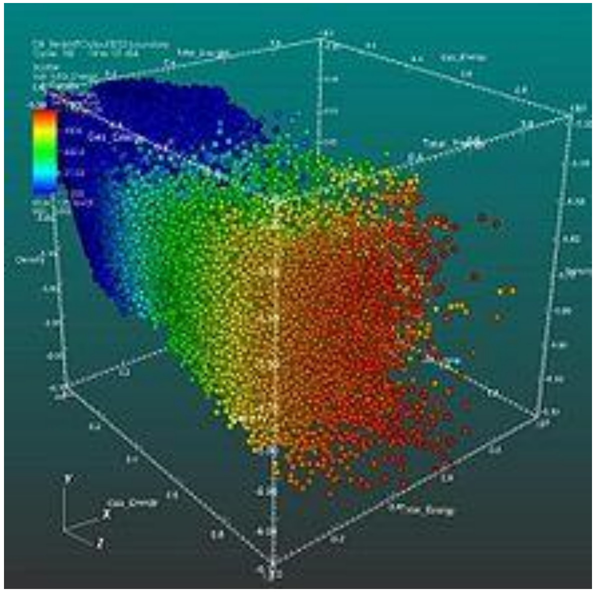
- Final Exam is next Thursday (Mar. 12), in class
  - pen and paper exam
  - 75 minutes
  - covers everything through today
  - one page of notes (double-sided) allowed

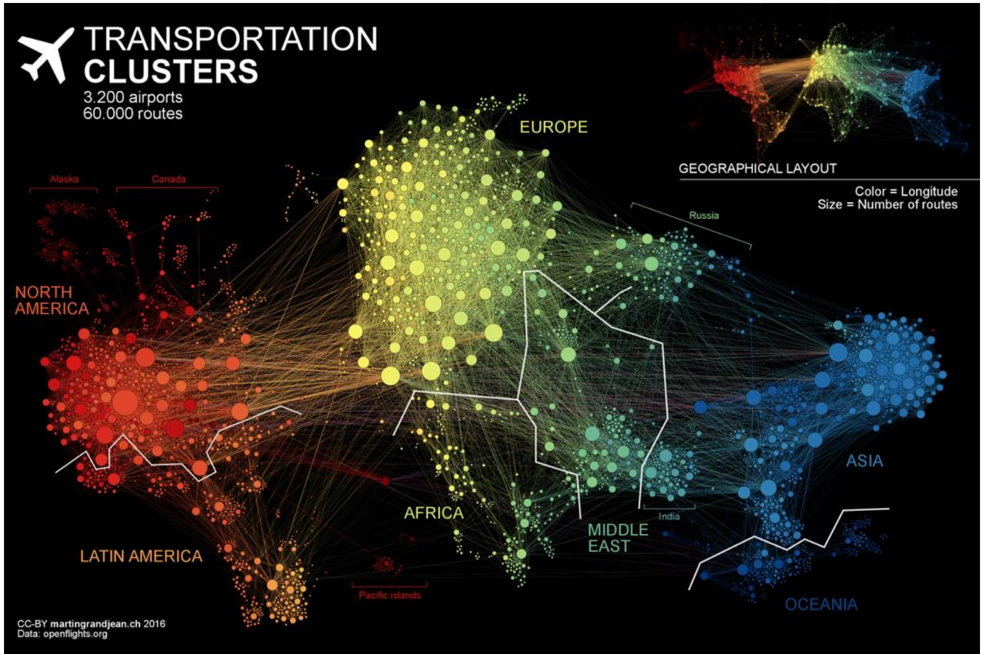
  - examples and exercises from class make good study materials
  - section 1 also has exercises posted on their page ("practice problems")
  - textbook also has good practice problems (online, linked from website)

Data Visualization





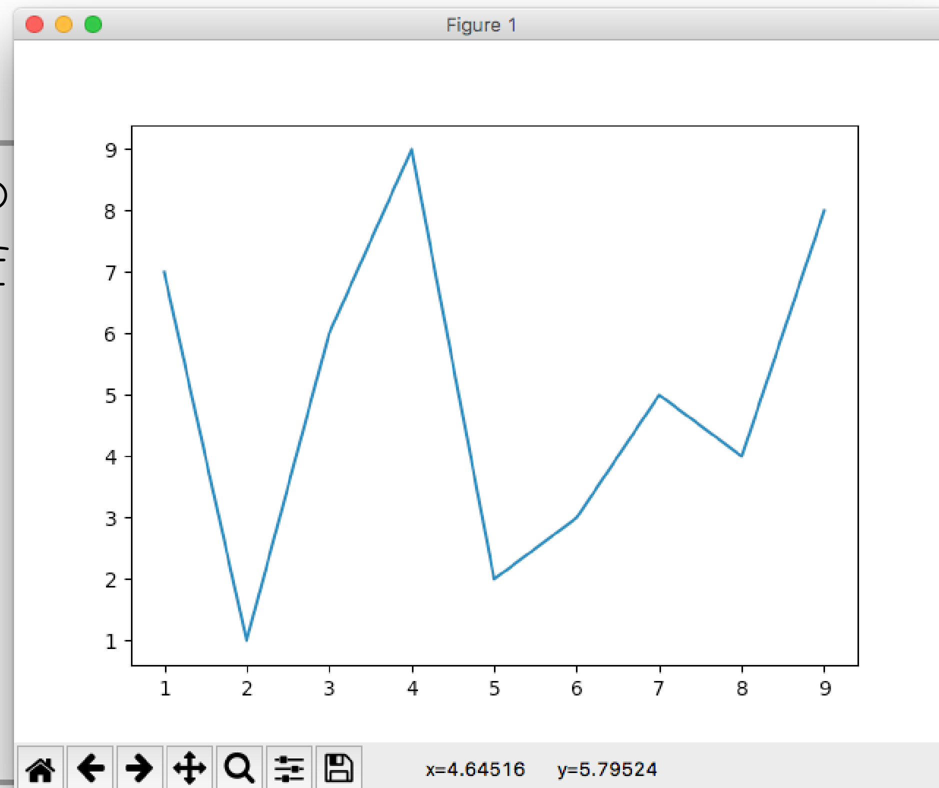




Data Visualization

- matplotlib
  - https://matplotlib.org/index.html
  - based on Matlab
  - `pip3 install matplotlib`

```
import matplotlib.pyplo
from random import shuf

x = list(range(1,10))
y = x.copy()
shuffle(y)
plt.plot(x, y)
plt.show()
```



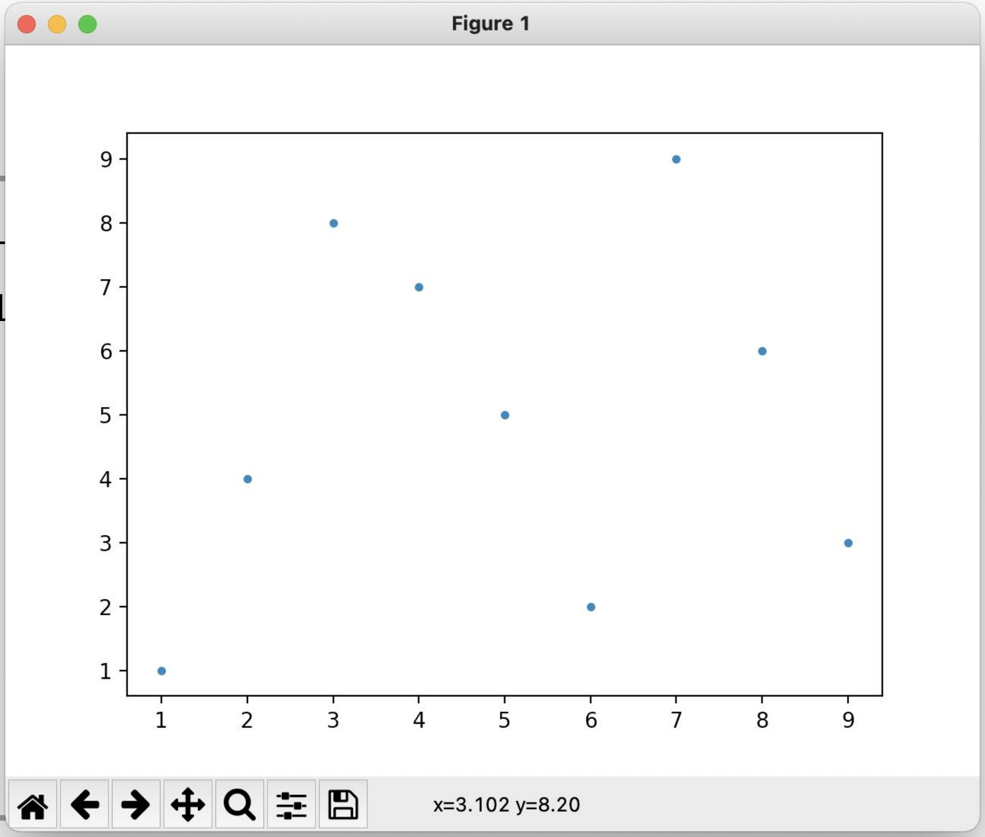
Exercise 1

- Generate a line graph showing the powers of 2 from 1, 2, 4, 8, … 1024

Scatter Plots

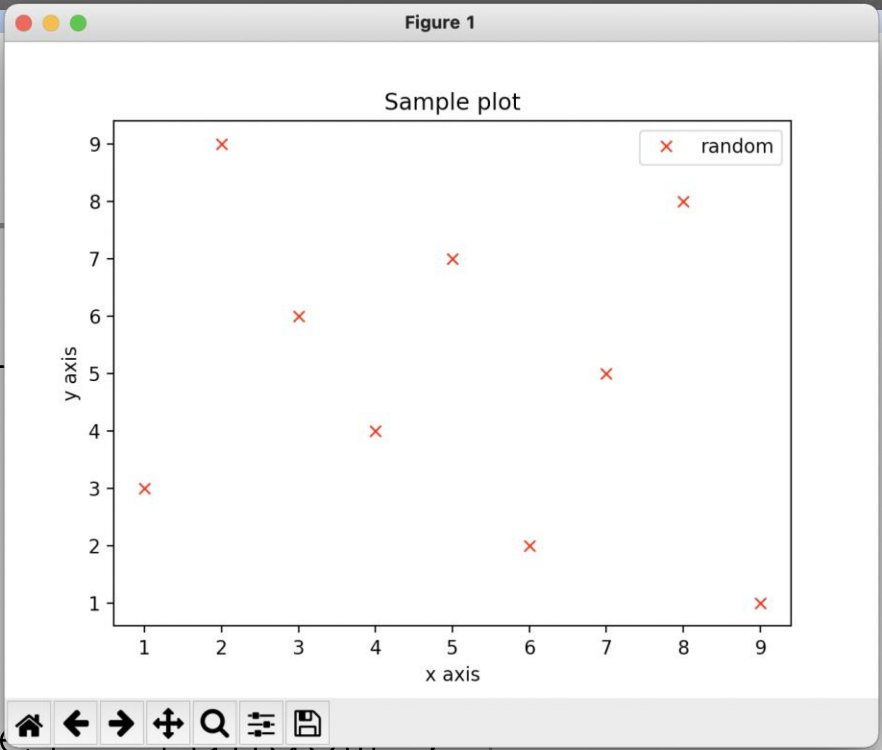
- matplotlib
  - https://matplotlib.org/index.html
  - based on Matlab

```
import matplotlib.pypl
from random import shu

x = list(range(1, 10))
y = x.copy()
shuffle(y)
plt.plot(x, y, '.')
plt.show()
```



Customizing

```
import matplotlib.pyplot
from random import shuffl

x = list(range(1, 10))
y = x.copy()
shuffle(y)
plt.plot(x, y, 'rx' , labe

plt.xlabel("x axis")
plt.ylabel("y axis")
plt.title("Sample plot")
plt.legend()

plt.show()
```

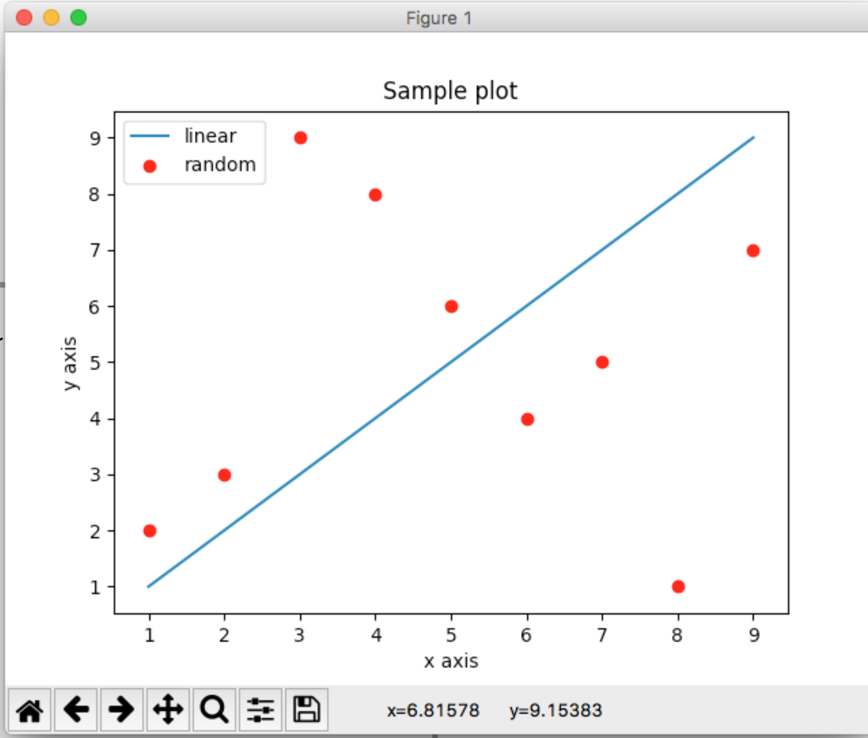


Exercise 2

- Modify your plot of the powers of 2 from 1, 2, 4, 8, … 1024 to include axis labels, a title, and a legend.

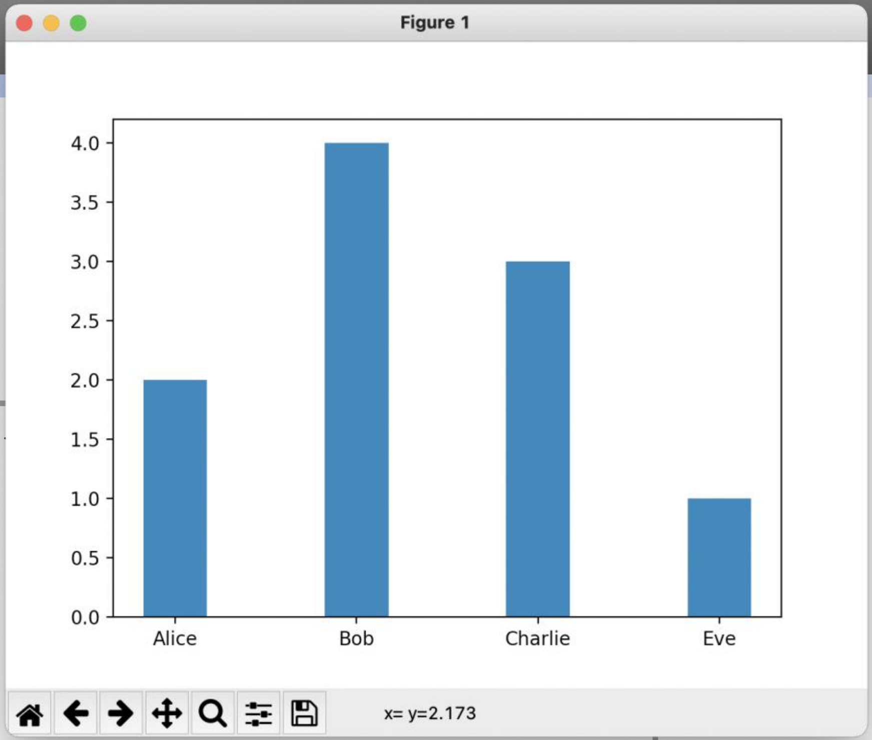
Multiple Datasets

```
import matplotlib.pyplot as plt
from random import shuffle

x = list(range(1,10))
y = x.copy()
shuffle(y)
plt.plot(x, x, label="linear")
plt.plot(x, y, 'r.', label="random")

plt.xlabel("x axis")
plt.ylabel("y axis")
plt.title("Sample plot")
plt.legend()

plt.show()
```



INTERMISSION…

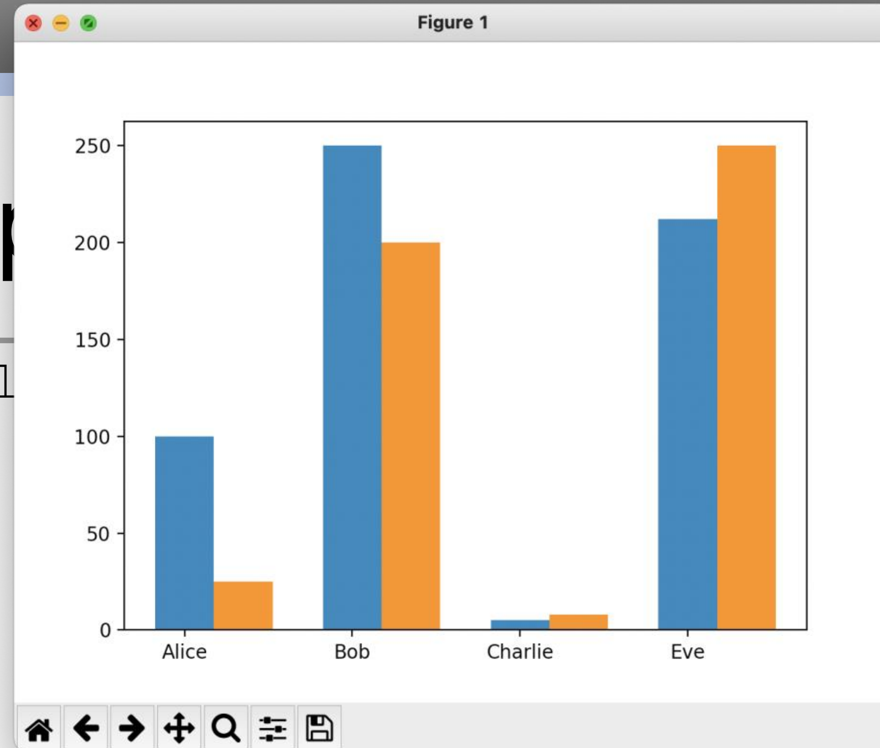
Bar Graphs




```
import matplotlib.pyplot as pl
from random import shuffle

x = list(range(1, 5))
y = x.copy()
shuffle(y)
bar_width = .35

plt.bar(x, y, bar_width)
plt.xticks(x, ('Alice', 'Bob', 'Charlie', 'Eve'))

plt.show()
```

Bar Graphs w/ Multi

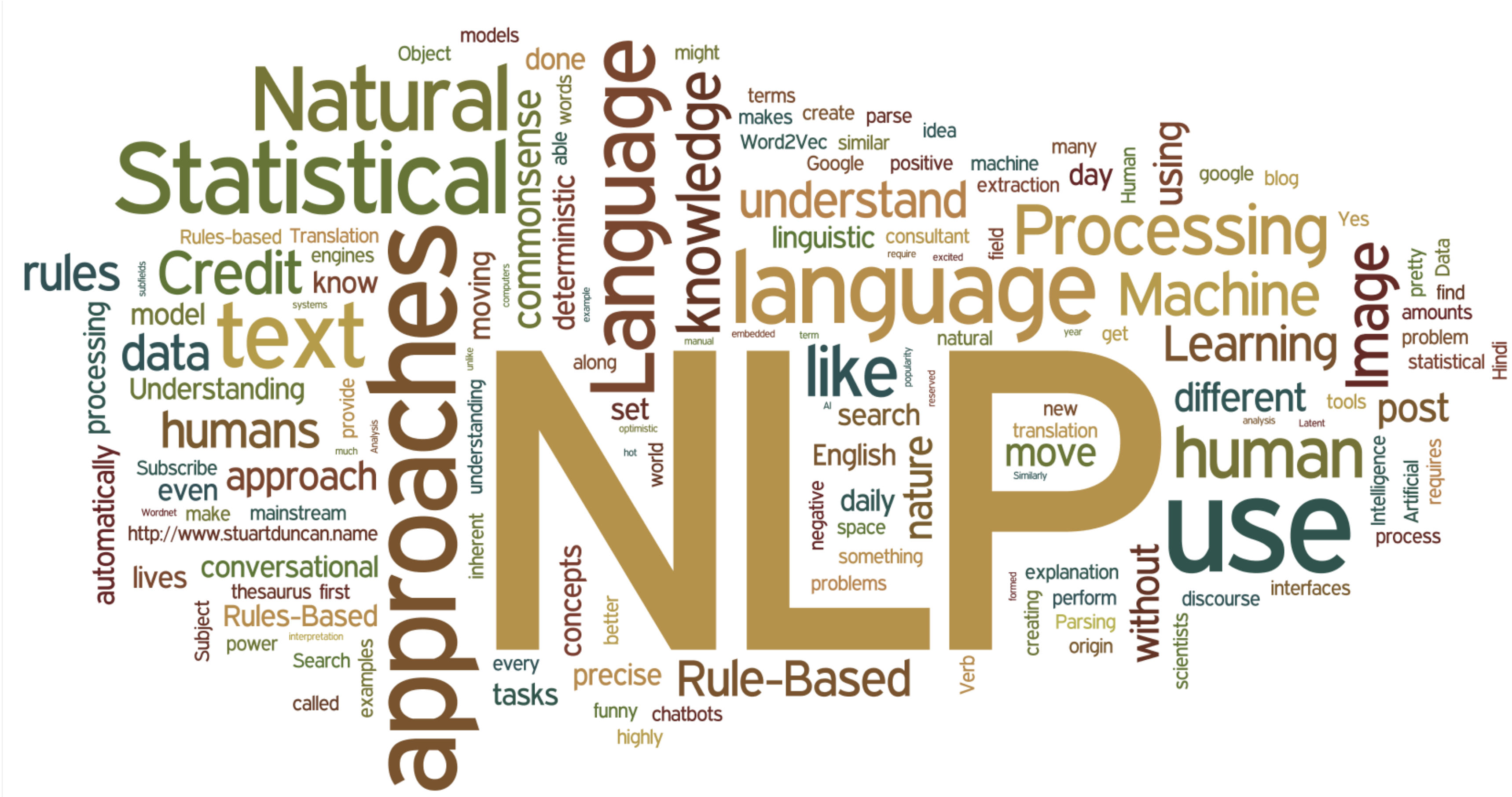
```
import matplotlib.pyplot as pl
from random import shuffle

x = list(range(0, 4))
y1 = [100, 250, 5, 212]
bar_width = .35

x2 = [x[0] + bar_width, x[1] + bar_width, x[2] +
bar_width, x[3] + bar_width]
y2 = [25, 200, 8, 250]

plt.bar(x, y1, bar_width)
plt.bar(x2, y2, bar_width)
plt.xticks(x, ('Alice', 'Bob', 'Charlie', 'Eve'))

plt.show()
```



Exercise 3

- Generate a bar graph of the powers of 2 from 1, 2, 4, 8, … 1024

Exercise 4: Visualizing Text Files



In groups of 2-4, pick one of the datasets from A4-A6 and generate visualization(s) that tell us something interesting about that dataset.