Necessary Packages By Week

Note: it is possible a few others might be added, but this should get you started.

PLEASE NOTE this is assuming you have installed Python & Jupyter Notebook using Anaconda. You are welcome to use JupyterLab instead of Jupyter Notebooks, however *we will not support JupyterLab ourselves in this class.*

See https://github.com/jnaiman/IS-452AO-Fall2019/blob/master/installation_directions.md (https://github.com/jnaiman/IS-452AO-Fall2019/blob/master/installation_directions.md) for more details about installing Anaconda (you can skip the PyCharm installation part).

Make sure you see the same plots as are saved in this plot - if something doesn't display this means something has gone wrong. Note: anything with randomly selected numbers will look a little different.

Please do not worry if you run into some things you have trouble installing -- we will help you debug in class!

Week01:

In [1]:
```
import matplotlib
import matplotlib.pyplot as plt
```

In [2]:
```
import datetime
```

The below is to make inline plots (you may not end up needing this!):

In [3]:
```
%matplotlib inline
```

The NumPy library is for numerical analysis and using vectors/matricies:

In [4]:
```
import numpy as np
```

Let's make a quick plot:

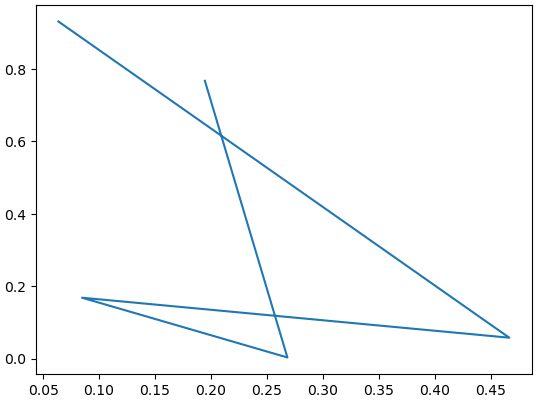
In [5]:
```
x = np.random.random(5)
x
```

Out[5]:
```
array([0.19454588, 0.26832527, 0.08476787, 0.46670928, 0.0635879 ])
```

In [6]:
```
y = np.random.random(5)
y
```

Out[6]:
```
array([0.7676606 , 0.00291443, 0.16808191, 0.05754839, 0.93155261])
```

In [7]:
```
plt.plot(x,y)
plt.show()
```



Your plot may look different since it is using different numbers!

This is a library for importing and manipulating images.

In [8]:
```
import PIL.Image as Image
```

Week 02

In [9]:
```
import csv
import collections
```

Note: the above should be already installed in your Python distribution.

In [10]:
```
import pandas as pd
```

Testing reading with pandas:

In [11]:
```
data = pd.read_csv("https://uiuc-ischool-dataviz.github.io/spring2019online/week02/building_inventory.csv")
```

In [12]:
```
data
```

Out[12]:

	Agency Name	Location Name	Address	City	Zip code	County	Congress Dist	Congressional Full Name	Rep Dist	Rep Full Name	...	Bldg Status	Year Acquired	Year Constructed	Square Footage	Total Floors	Floors Above Grade	Floors Below Grade	Usage Description	Usage Description 2	Usage Description 3
0	Department of Natural Resources	Anderson Lake Conservation Area - Fulton County	Anderson Lake C.a.	Astoria	61501	Fulton	17	Cheri Bustos	93	Hammond Norine K.	...	In Use	1975	1975	144	1	1	0	Unusual	Unusual	Not provided
1	Department of Natural Resources	Anderson Lake Conservation Area - Fulton County	Anderson Lake C.a.	Astoria	61501	Fulton	17	Cheri Bustos	93	Hammond Norine K.	...	In Use	2004	2004	144	1	1	0	Unusual	Unusual	Not provided
2	Department of Natural Resources	Anderson Lake Conservation Area - Fulton County	Anderson Lake C.a.	Astoria	61501	Fulton	17	Cheri Bustos	93	Hammond Norine K.	...	In Use	2004	2004	144	1	1	0	Unusual	Unusual	Not provided
3	Department of Natural Resources	Anderson Lake Conservation Area - Fulton County	Anderson Lake C.a.	Astoria	61501	Fulton	17	Cheri Bustos	93	Hammond Norine K.	...	In Use	2004	2004	144	1	1	0	Unusual	Unusual	Not provided
4	Department of Natural Resources	Anderson Lake Conservation Area - Fulton County	Anderson Lake C.a.	Astoria	61501	Fulton	17	Cheri Bustos	93	Hammond Norine K.	...	In Use	2004	2004	144	1	1	0	Unusual	Unusual	Not provided
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8857	Department of Transportation	Belvidere Maintenance Storage Facility - Boone...	9797 Illinois Rte. 76	Belvidere	61008	Boone	16	Adam Kinzinger	69	Sosnowski Joe	...	In Use	0	0	432	1	0	0	Storage	NaN	NaN
8858	Department of Transportation	Belvidere Maintenance Storage Facility - Boone...	9797 Illinois Rte 76	Belvidere	61008	Boone	16	Adam Kinzinger	69	Sosnowski Joe	...	In Use	0	0	330	1	0	0	Storage	NaN	NaN
8859	Department of Transportation	Quincy Maintenance Storage Facility	800 Koch's Lane	Quincy	62305	Adams	18	Darin M. LaHood	94	Frese Randy E.	...	In Use	0	1987	130	1	0	0	Storage	High Hazard	NaN
8860	Illinois Community College Board	Illinois Valley Community College - Oglesby	815 North Orlando Smith Avenue	Oglesby	61348	LaSalle	16	Adam Kinzinger	76	Long Jerry Lee	...	In Use	1971	1971	49552	1	1	0	Education	Education	Not provided
8861	Department of Military Affairs	Peoria Army Aviation Support Facility	2323 S. Airport Rd	Peoria	61607	Peoria	17	Cheri Bustos	92	Gordon-Booth Jehan	...	In Progress	0	2017	288	1	0	0	Utiility & Miscellan	Utiility & Miscellan	NaN

8862 rows × 22 columns

In [13]:
```
import scipy
import scipy.misc
import scipy.cluster
```

Week 03

Note: you may have to refresh your browser and/or close and reopen your notebook.

You may have to do this for a few of these packages (e.g. bqplot, pyodide, etc).

In [14]:
```
import ipywidgets
```

Test a widget:

In [15]:
```
ipywidgets.IntSlider()
```

50

If the above doesn't give you an interactive slider, you may want to try:

In [16]:
```
from IPython.display import display
w = ipywidgets.IntSlider()
display(w)
```

88

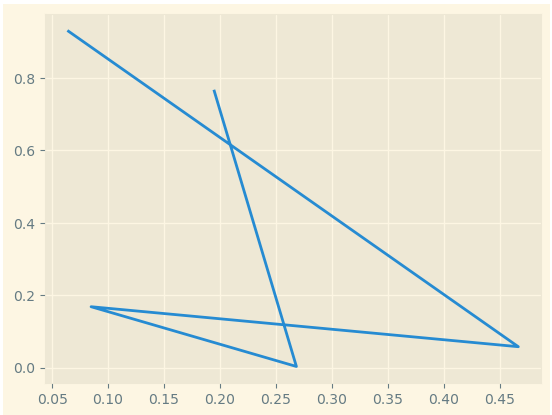
If it still doesn't work, you may have to install the jupyter notebook extensions by hand by uncommenting the below and then refreshing/restarting your jupyter notebook:

In [17]:
```
#!jupyter nbextension enable --py widgetsnbextension

### Note, you may have to use instead:
#!jupyter nbextension enable --py widgetsnbextension --sys-prefix
```

Also, try this interactive plot with a selectable dropdown menu.

In [19]:
```
@ipywidgets.interact(style = plt.style.available)
def make_plot(style):
    with plt.style.context(style):
        plt.plot(x,y)
```

style Solarize_Light2



In [20]:
```
import json
```

In [21]:
```
import palettable
```

In [22]:
```
from PIL import Image
```

In [23]:
```
import IPython.display
import io
from mpl_toolkits.mplot3d import Axes3D
import matplotlib.cm
import matplotlib.transforms as mpt
```

Week 04

In [24]:
```
import matplotlib.dates as mdates
```

In [25]:
```
import PIL.ImageFilter as ImageFilter
```

In [26]:
```
import bqplot
import numpy as np
```

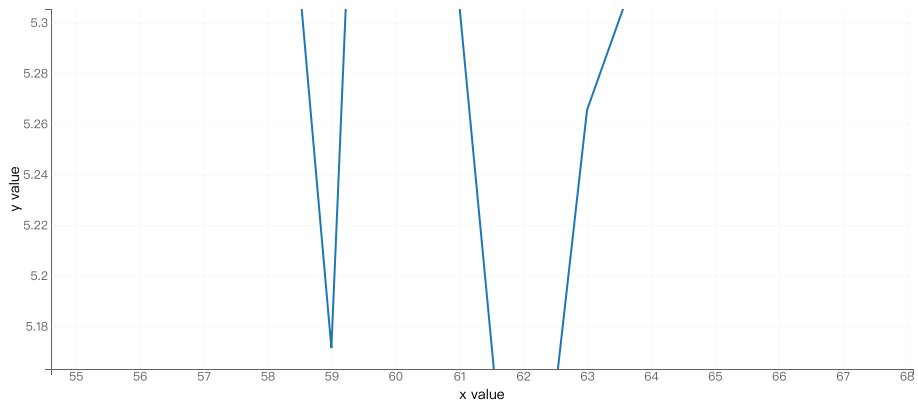
You may have to do:

In [27]:
```
#!jupyter nbextension enable --py bqplot

### or instead
#!jupyter nbextension enable --py widgetsnbextension --sys-prefix

#import bqplot
```

Note: it is possible you may have to refresh your browser or close and reopen anaconda and jupyter notebook after you install this.

Try out this interactive plot. You should be able to pan and zoom. Don't worry about the code right now, we'll get to it in week 03.

In [28]:
```
x = np.arange(100)
y = np.random.random(100) + 5

x_sc = bqplot.LinearScale()
y_sc = bqplot.LinearScale()

lines = bqplot.Lines(x = x, y = y, scales = {'x': x_sc, 'y': y_sc})

ax_x = bqplot.Axis(scale = x_sc, label = 'x value')
ax_y = bqplot.Axis(scale = y_sc, label = 'y value', orientation = 'vertical')

pz = bqplot.interacts.PanZoom( scales = {'x': [x_sc], 'y': [y_sc]} )
bqplot.Figure(marks = [lines], axes = [ax_x, ax_y], interaction = pz)
```



Note, if the above doesn't work you can try replacing:

```
bqplot.Figure(marks = [lines], axes = [ax_x, ax_y], interaction = pz)
```

with

```
display(bqplot.Figure(marks = [lines], axes = [ax_x, ax_y], interaction = pz))
```

Week 05

While not strictly the importing of libraries see if you get any weird errors when you run:

In [29]:
```
# %matplotlib notebook
# %pylab
# %matplotlib inline
```

In [30]:
```
import PIL.ImageFilter as ImageFilter
```

In [31]:
```
import h5py
```

In [32]:
```
import matplotlib.colors as colors
```

Week 06

In [33]:
```
import bqplot.market_map
```

In [34]:
```
import traitlets
```

Week 07

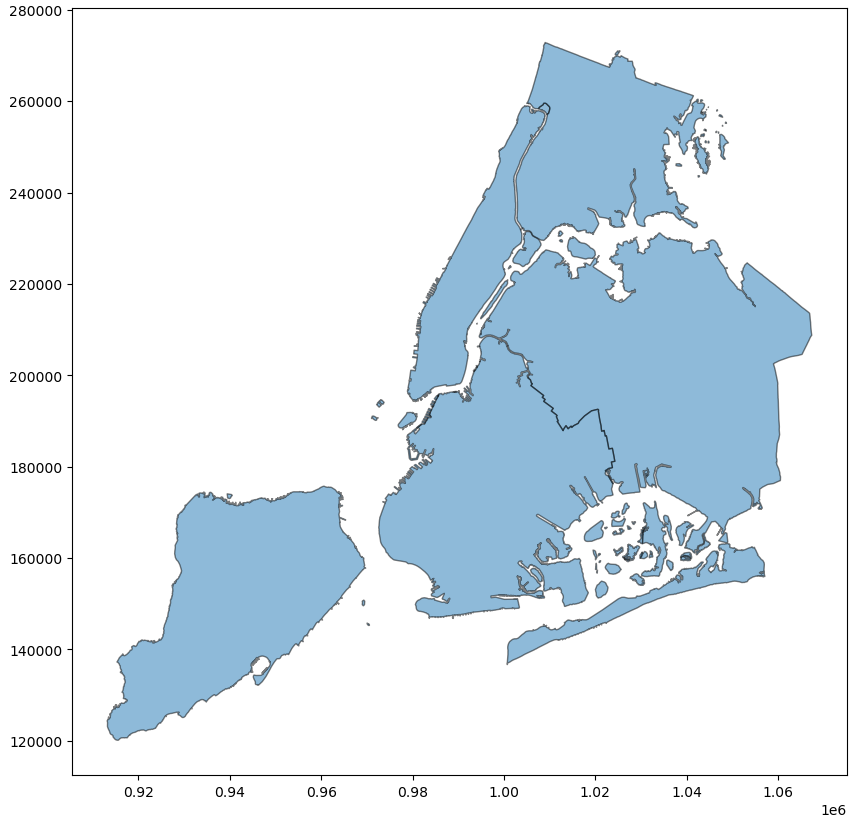
In [35]:
```
import requests
```

In [36]:
```
import geopandas
```

Make a test map:

In [37]:
```
df = geopandas.read_file(geopandas.datasets.get_path('nybb'))
```

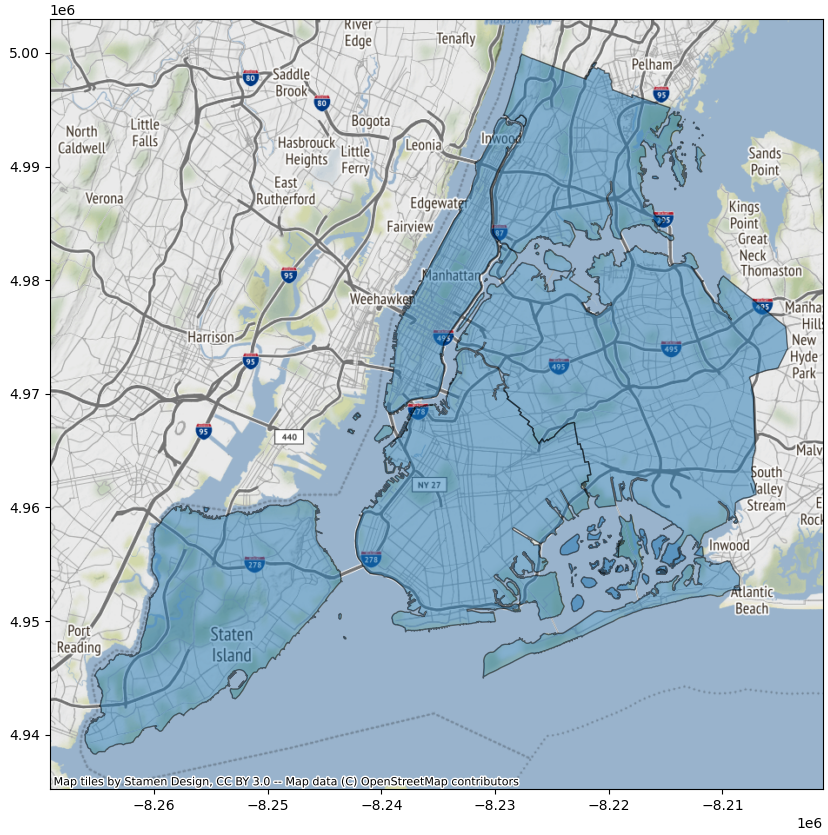
In [38]:
```
ax = df.plot(figsize=(10, 10), alpha=0.5, edgecolor='k')
```



In [39]:
```
import contextily as ctx
```

Make a test map with a background:

In [40]:
```
df = df.to_crs(epsg=3857)

ax = df.plot(figsize=(10, 10), alpha=0.5, edgecolor='k')
ctx.add_basemap(ax)
```



Week 08

Week 09

In [41]:
```
import bqplot.market_map
```

In [42]:
```
from webcolors import rgb_to_hex
```

In [43]:
```
import ipyleaflet
```

Try out the following (which may take some time to run):

In [44]:
```
import pandas as pd
# this may work...
#df = pd.read_excel('https://query.data.world/s/ivl45pdpubos6jpsii3djsjwm2pcjv', skiprows=5)

# NOTE!  If you get an error here about xlrd try:
df = pd.read_excel('https://query.data.world/s/ivl45pdpubos6jpsii3djsjwm2pcjv', skiprows=5, engine='openpyxl')

# if you get an SSL error try solutions posted here:
# https://stackoverflow.com/questions/44629631/while-using-pandas-got-error-urlopen-error-ssl-certificate-verify-failed-cert
```

In [45]:
```
df
```

3	001 - HEART TRANSPLANT OR IMPLANT OF HEART ASS...	50262	RONALD REAGAN U C L A MEDICAL CENTER	757 WESTWOOD PLAZA	LOS ANGELES	CA	90095	CA - Los Angeles	14	1.499044e+06	415968.785714	366608.928571
4	001 - HEART TRANSPLANT OR IMPLANT OF HEART ASS...	50441	STANFORD HOSPITAL	300 PASTEUR DRIVE	STANFORD	CA	94305	CA - San Mateo County	23	2.238699e+06	420865.478261	403453.652174
...	...	...	...	...	...	...	...	...	...	...	...	...
202651	988 - NON-EXTENSIVE O.R. PROC UNRELATED TO PRI...	520098	UNIVERSITY OF WI HOSPITALS & CLINICS AUTHORITY	600 HIGHLAND AVENUE	MADISON	WI	53792	WI - Madison	15	3.058027e+04	16574.533333	12450.466667
202652	988 - NON-EXTENSIVE O.R. PROC UNRELATED TO PRI...	520138	AURORA ST LUKES MEDICAL CENTER	2900 W OKLAHOMA AVE	MILWAUKEE	WI	53215	WI - Milwaukee	13	6.320408e+04	13649.846154	11114.615385
202653	989 - NON-EXTENSIVE O.R. PROC UNRELATED TO PRI...	170104	SHAWNEE MISSION MEDICAL CENTER	9100 W 74TH STREET	SHAWNEE MISSION	KS	66204	MO - Kansas City	13	2.636138e+04	6237.461538	5023.846154
202654	989 - NON-EXTENSIVE O.R. PROC UNRELATED TO PRI...	180088	NORTON HOSPITAL/NORTON MEDICAL PAVILIONS/KOSAI...	200 EAST CHESTNUT STREET	LOUISVILLE	KY	40202	KY - Louisville	13	2.433500e+04	7850.307692	6594.846154
202655	989 - NON-EXTENSIVE O.R. PROC UNRELATED TO PRI...	330101	NEW YORK-PRESBYTERIAN HOSPITAL	525 EAST 68TH STREET	NEW YORK	NY	10021	NY - Manhattan	13	3.483262e+04	12361.615385	10554.923077

202656 rows × 12 columns

Week 10

In [46]:
```
import yt
```

Week 11

Week 12

Week 13

In [47]:
```
"""
import numpy as np
import ipyvolume as ipv
V = np.zeros((128,128,128)) # our 3d array
# outer box
V[30:-30,30:-30,30:-30] = 0.75
V[35:-35,35:-35,35:-35] = 0.0
# inner box
V[50:-50,50:-50,50:-50] = 0.25
V[55:-55,55:-55,55:-55] = 0.0
ipv.quickvolshow(V, level=[0.25, 0.75], opacity=0.03, level_width=0.1, data_min=0, data_max=1)

"""
```

Out[47]:
```
'\nimport numpy as np\nimport ipyvolume as ipv\nV = np.zeros((128,128,128)) # our 3d array\n# outer box\nV[30:-30,30:-30,30:-30] = 0.75\nV[35:-35,35:-35,35:-35] = 0.0\n# inner box
\nV[50:-50,50:-50,50:-50] = 0.25\nV[55:-55,55:-55,55:-55] = 0.0\nipv.quickvolshow(V, level=[0.25, 0.75], opacity=0.03, level_width=0.1, data_min=0, data_max=1)\n\n'
```

Week 14

example from: https://blog.4dcu.be/programming/2021/05/03/Interactive-Visualizations.html (https://blog.4dcu.be/programming/2021/05/03/Interactive-Visualizations.html)

In [48]:
```
# test OS
import os
os.getcwd()
```

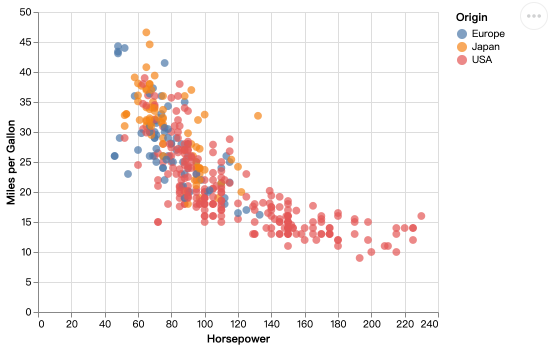
Out[48]:
```
'/Users/kevinjyx/Library/Mobile Documents/com~apple~CloudDocs/UIUC/2022 Fall/IS445/week01'
```

In [49]:
```
from vega_datasets import data

source = data.cars()
source.rename(columns={"Miles_per_Gallon":"Miles per Gallon"}, inplace=True)
```

In [50]:
```
import altair as alt

chart = alt.Chart(source).mark_circle(size=60).encode(
    x='Horsepower',
    y='Miles per Gallon',
    color='Origin',
    tooltip=['Name', 'Origin', 'Horsepower', 'Miles per Gallon']
).interactive()
```

In [51]:
```
chart
```

Out[51]:



In [52]:
```
# save chart
chart.properties(width='container').save("cars.json")
```

In [53]:
```
# print platform
import platform
p = platform.system() # 'Linux', 'Windows'/'Darwin'
print(p)
```

```
Darwin
```

In [54]:
```
# file name with extension
file_name = os.path.basename('./cars.json')

# file name
print(file_name)
```

```
cars.json
```

In [ ]:

In [ ]: