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 [2]:
```
import matplotlib
import matplotlib.pyplot as plt
```

In [3]:
```
import datetime
```

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

In [4]:
```
%matplotlib inline
```

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

In [5]:
```
import numpy as np
```

Let's make a quick plot:

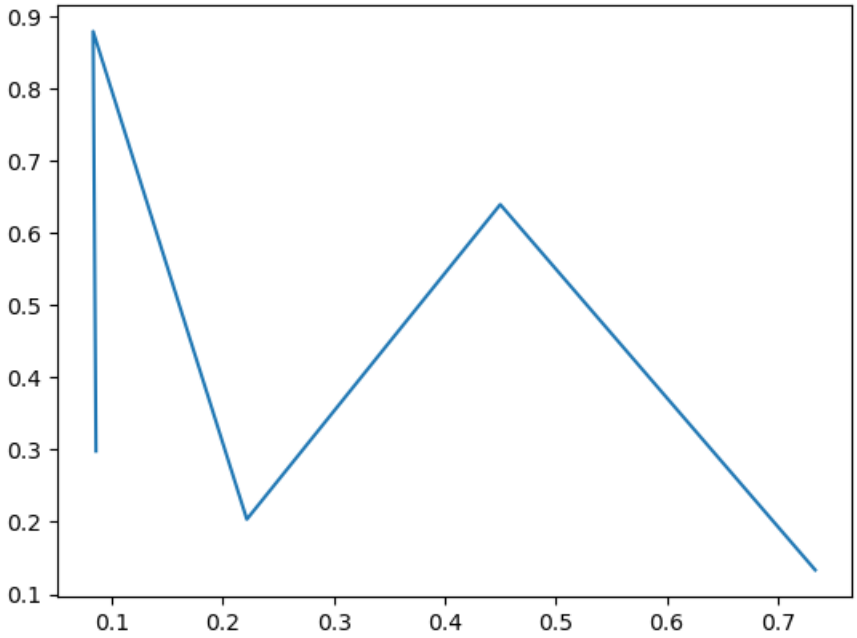
In [6]:
```
x = np.random.random(5)
x
```

Out[6]:
```
array([0.73395713, 0.44998354, 0.22150423, 0.08292652, 0.08549654])
```

In [7]:
```
y = np.random.random(5)
y
```

Out[7]:
```
array([0.13343308, 0.63934952, 0.20362141, 0.87885193, 0.29803932])
```

In [8]:
```
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 [9]:
```
import PIL.Image as Image
```

Week 02

In [10]:
```
import csv
import collections
```

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

In [11]:
```
import pandas as pd
```

Testing reading with pandas:

In [12]:
```
data = pd.read_csv("https://uiuc-ischool-dataviz.github.io/spring2019online/week02/building_inventory.csv")
```

In [13]:
```
data
```

Out[13]:

	Agency Name	Location Name	Address	City	Zip code	County	Congress Dist	Congressional Full Name	Rep Dist	Rep Full Name	...	Bldg Status	Year Acquired	Constr
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	
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	
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	
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	
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	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	
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	
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	
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	
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	
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	

8862 rows × 22 columns

In [14]:
```
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 [15]:
```
import ipywidgets
```

Test a widget:

In [16]:
```
ipywidgets.IntSlider()
```

0

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

In [17]:
```
from IPython.display import display
w = ipywidgets.IntSlider()
display(w)
```

0

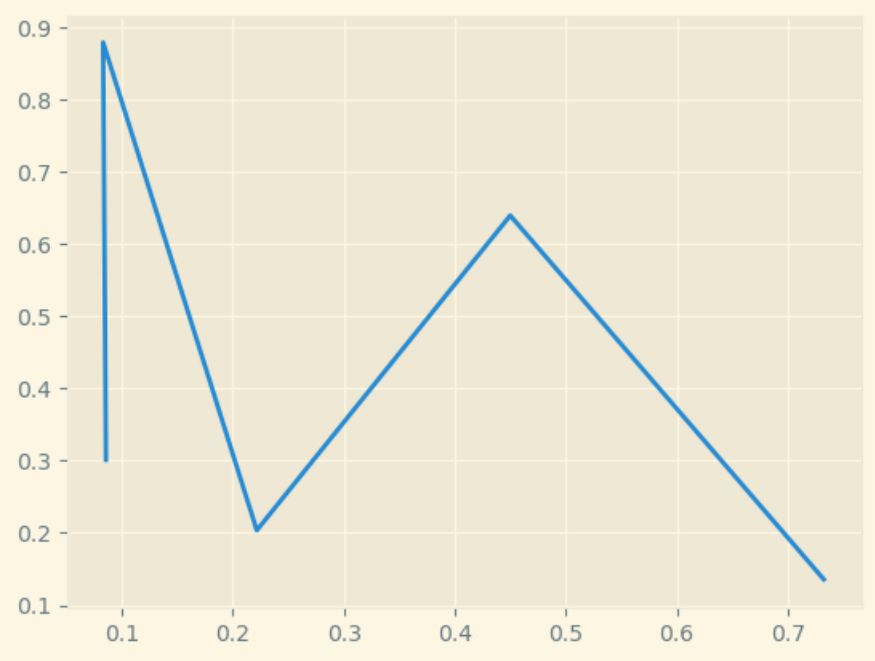
If it still doesn't work, you may have to install the jupyter notebook extensions by hand by uncommenting the below and then refreshing/restarting your jupyter notebook:

In [18]:
```
#!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
```

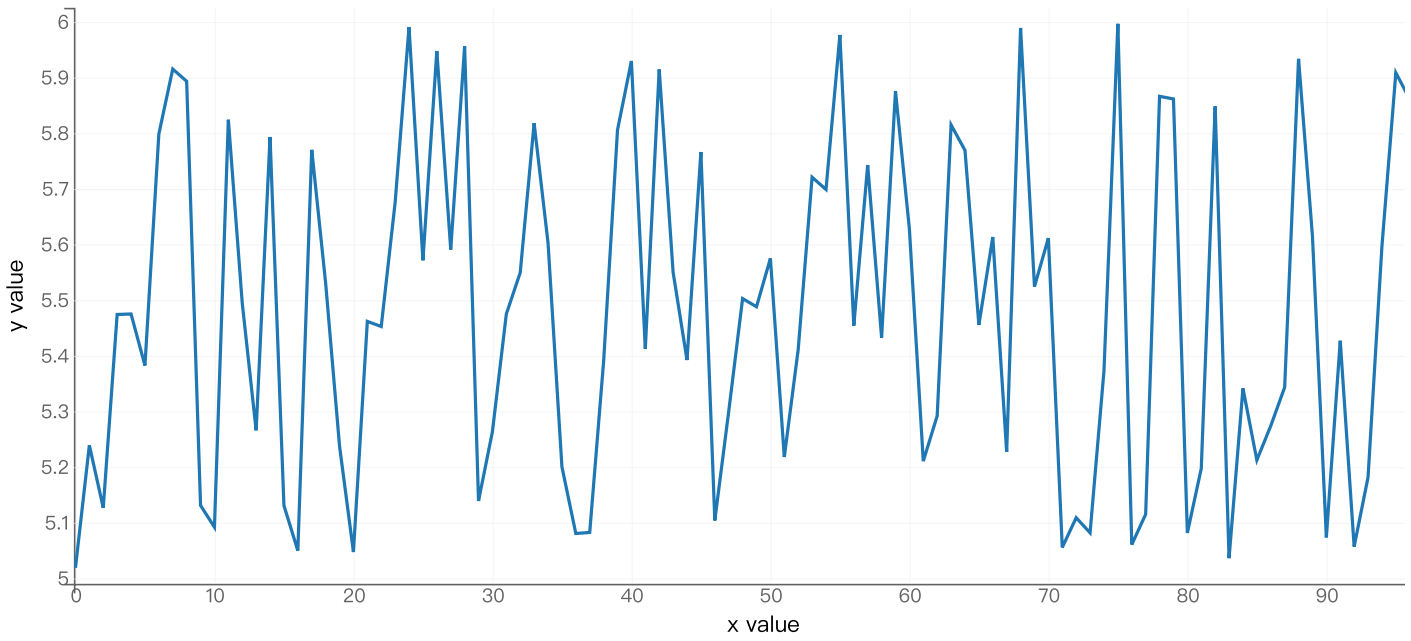
You may have to do:

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

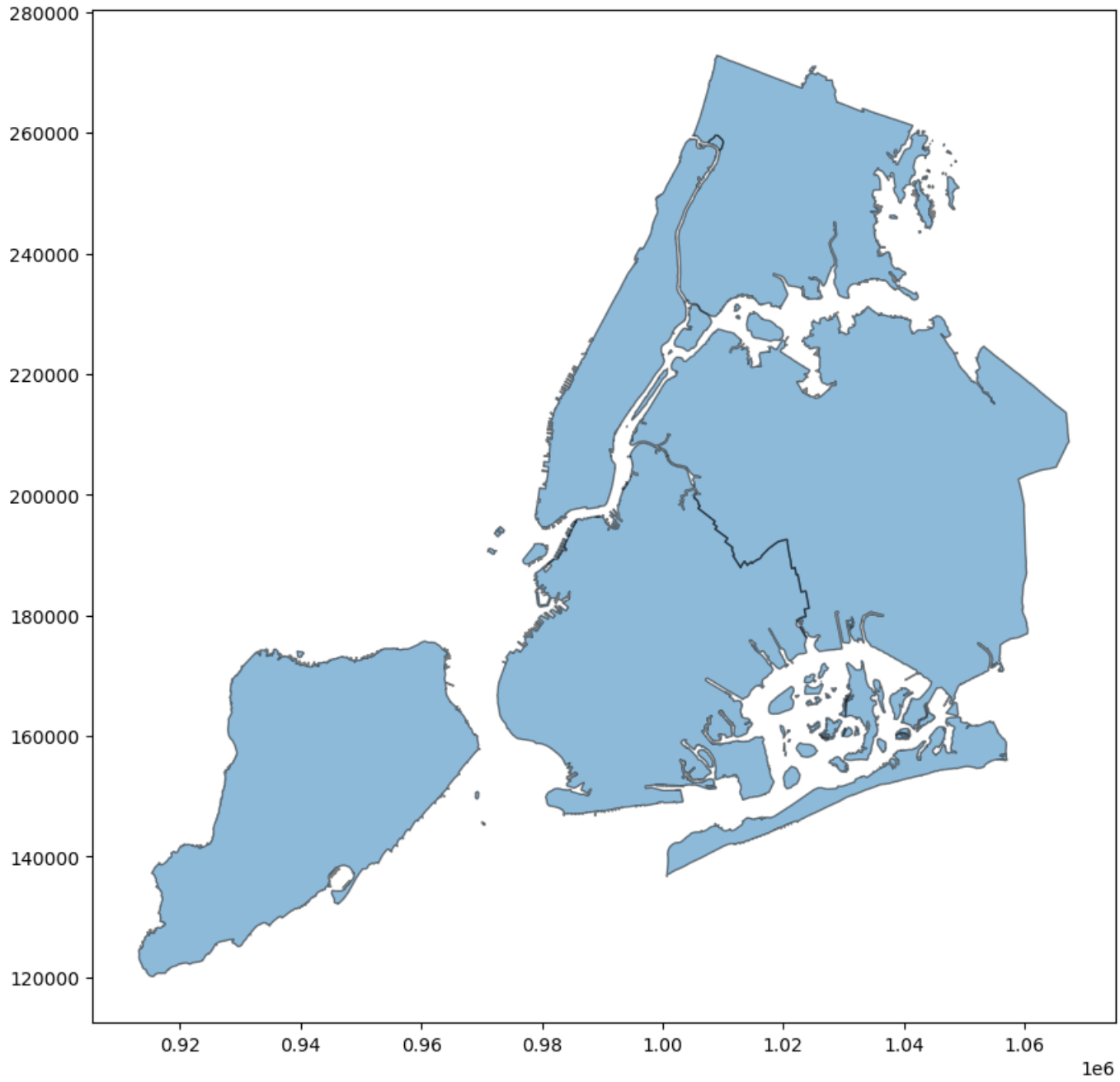
In [35]:
```
import requests
```

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

Make a test map:

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

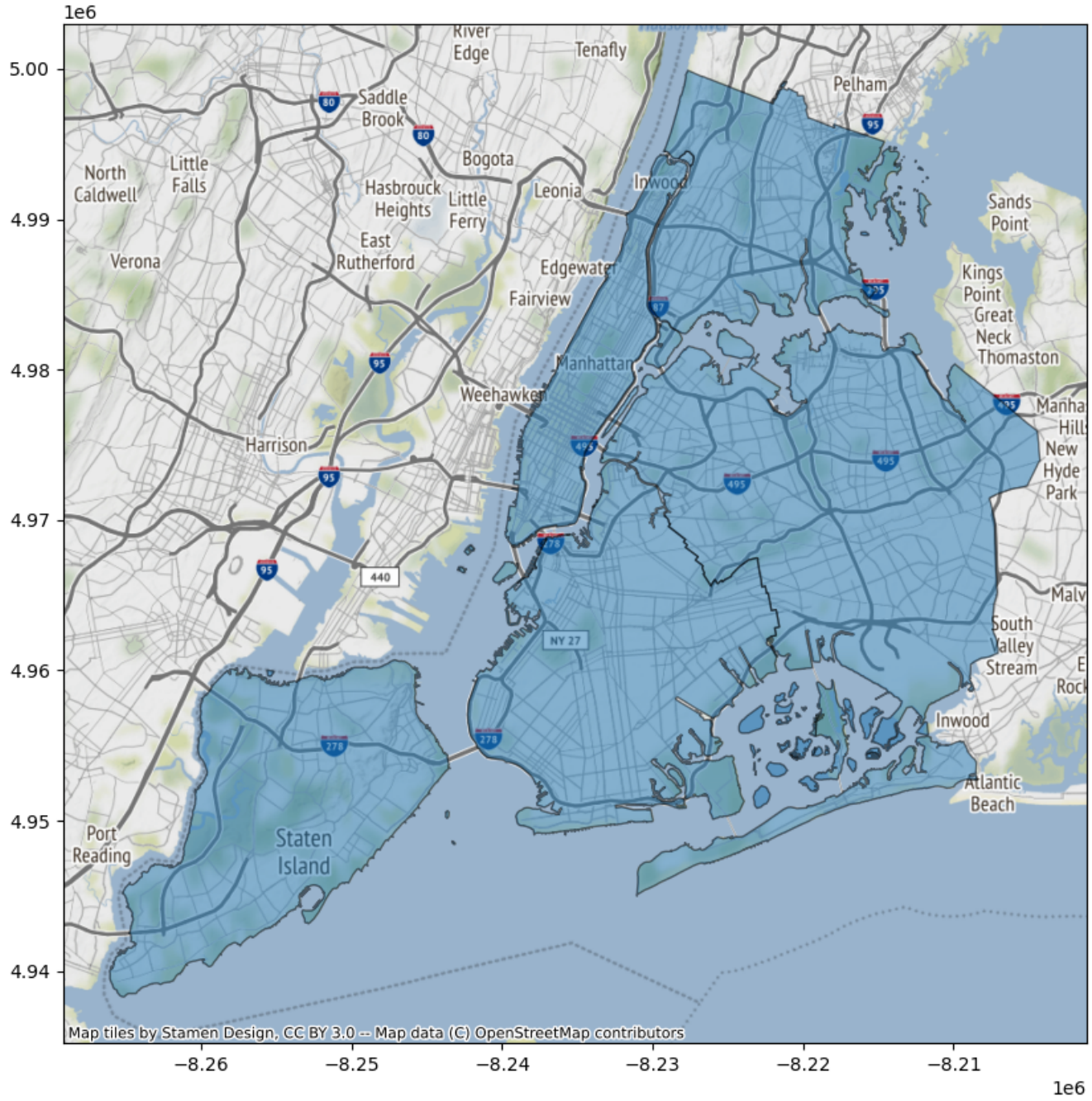
In [38]:
```
ax = df.plot(figsize=(10, 10), alpha=0.5, edgecolor='k')
```



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 [45]:
```
import ipyleaflet
```

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

In [49]:
```
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-ve
```

```
---------------------------------------------------------------------------
KeyboardInterrupt                         Traceback (most recent call last)
/var/folders/1g/rnqhj1zj4xzb9n1n2rshbfgw0000gn/T/ipykernel_65933/2984859994.py in <module>
      4
      5 # NOTE!  If you get an error here about xlrd try:
----> 6 df = pd.read_excel('https://query.data.world/s/ivl45pdpubos6jpsii3djsjwm2pcjv', skiprows=5, engine
='openpyxl')
      7
      8 # if you get an SSL error try solutions posted here:

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/pandas/util/_decorators.py in wrapper(*args, **kw
args)
    309                     stacklevel=stacklevel,
    310                 )
--> 311             return func(*args, **kwargs)
    312
    313         return wrapper

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/pandas/io/excel/_base.py in read_excel(io, sheet_
name, header, names, index_col, usecols, squeeze, dtype, engine, converters, true_values, false_values, sk
iprows, nrows, na_values, keep_default_na, na_filter, verbose, parse_dates, date_parser, thousands, commen
t, skipfooter, convert_float, mangle_dupe_cols, storage_options)
    393             skipfooter=skipfooter,
    394             convert_float=convert_float,
--> 395             mangle_dupe_cols=mangle_dupe_cols,
    396         )
    397     finally:

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/pandas/io/excel/_base.py in parse(self, sheet_nam
e, header, names, index_col, usecols, squeeze, converters, true_values, false_values, skiprows, nrows, na_
values, parse_dates, date_parser, thousands, comment, skipfooter, convert_float, mangle_dupe_cols, **kwds)
   1290             convert_float=convert_float,
   1291             mangle_dupe_cols=mangle_dupe_cols,
-> 1292             **kwds,
   1293         )
   1294

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/pandas/io/excel/_base.py in parse(self, sheet_nam
e, header, names, index_col, usecols, squeeze, dtype, true_values, false_values, skiprows, nrows, na_value
s, verbose, parse_dates, date_parser, thousands, comment, skipfooter, convert_float, mangle_dupe_cols, **k
wds)
    537                 sheet = self.get_sheet_by_index(asheetname)
    538
--> 539             data = self.get_sheet_data(sheet, convert_float)
    540             if hasattr(sheet, "close"):
    541                 # pyxlsb opens two TemporaryFiles

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/pandas/io/excel/_openpyxl.py in get_sheet_data(se
lf, sheet, convert_float)
    570         data: list[list[Scalar]] = []
    571         last_row_with_data = -1
--> 572         for row_number, row in enumerate(sheet.rows):
    573             converted_row = [self._convert_cell(cell, convert_float) for cell in row]
    574             while converted_row and converted_row[-1] == "":

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/openpyxl/worksheet/_read_only.py in _cells_by_row
(self, min_col, min_row, max_col, max_row, values_only)
     77                                     data_only=self.parent.data_only, epoch=self.parent.epoch,
     78                                     date_formats=self.parent._date_formats)
---> 79         for idx, row in parser.parse():
     80             if max_row is not None and idx > max_row:
     81                 break

~/opt/anaconda3/envs/DataViz/lib/python3.7/site-packages/openpyxl/worksheet/_reader.py in parse(self)
    142         it = iterparse(self.source) # add a finaliser to close the source when this becomes possib
le
```

```
    143
--> 144         for _, element in it:
    145             tag_name = element.tag
    146             if tag_name in dispatcher:

~/opt/anaconda3/envs/DataViz/lib/python3.7/xml/etree/ElementTree.py in iterator()
   1225                 if not data:
   1226                     break
-> 1227                 pullparser.feed(data)
   1228             root = pullparser._close_and_return_root()
   1229             yield from pullparser.read_events()

~/opt/anaconda3/envs/DataViz/lib/python3.7/xml/etree/ElementTree.py in feed(self, data)
   1267         if data:
   1268             try:
-> 1269                 self._parser.feed(data)
   1270             except SyntaxError as exc:
   1271                 self._events_queue.append(exc)

~/opt/anaconda3/envs/DataViz/lib/python3.7/xml/etree/ElementTree.py in feed(self, data)
   1628         """Feed encoded data to parser."""
   1629         try:
-> 1630             self.parser.Parse(data, 0)
   1631         except self._error as v:
   1632             self._raiseerror(v)

/Users/runner/miniforge3/conda-bld/python_1635226140987/work/Modules/pyexpat.c in StartElement()

~/opt/anaconda3/envs/DataViz/lib/python3.7/xml/etree/ElementTree.py in _start(self, tag, attr_list)
   1546         # is set, the attributes are reported as a list of alternating
   1547         # attribute name,value.
-> 1548         fixname = self._fixname
   1549         tag = fixname(tag)
   1550         attrib = {}

KeyboardInterrupt:
```

In [47]:
```
df
```

Out[47]:

	DRG Definition	Provider Id	Provider Name	Provider Street Address	Provider City	Provider State	Provider Zip Code	Hospital Referral Region (HRR) Description	Total Discharges	Average Covered Charges	Ave
0	001 - HEART TRANSPLANT OR IMPLANT OF HEART ASS...	10033	UNIVERSITY OF ALABAMA HOSPITAL	619 SOUTH 19TH STREET	BIRMINGHAM	AL	35233	AL - Birmingham	13	1.172866e+06	2518
1	001 - HEART TRANSPLANT OR IMPLANT OF HEART ASS...	30103	MAYO CLINIC HOSPITAL	5777 EAST MAYO BOULEVARD	PHOENIX	AZ	85054	AZ - Phoenix	20	4.375313e+05	2404
2	001 - HEART TRANSPLANT OR IMPLANT OF HEART	50108	SUTTER GENERAL HOSPITAL	2801 L STREET	SACRAMENTO	CA	95816	CA - Sacramento	25	8.156741e+05	2331

Week 10

In [48]:
```
import yt
```

Week 11

Week 12

Week 13

In [ ]:
```
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)
```

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 [50]:
```
# test OS
import os
os.getcwd()
```

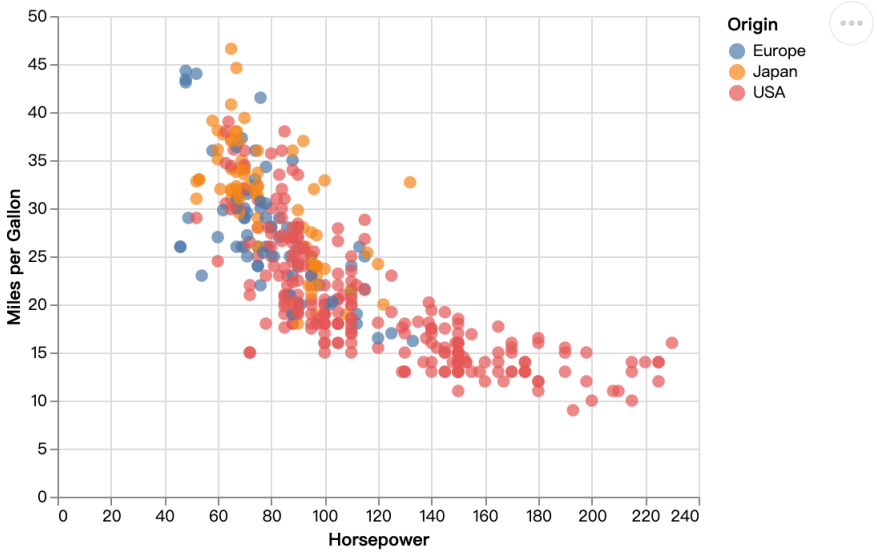
Out[50]:
```
'/Users/kevinjyx/Library/Mobile Documents/com~apple~CloudDocs/UIUC/2022 Fall/IS445/Week 01'
```

In [51]:
```
from vega_datasets import data

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

In [52]:
```
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 [53]:
```
chart
```

Out[53]:



In [54]:
```
# save chart
chart.properties(width='container').save("cars.json")
```

In [55]:
```
# print platform
import platform
p = platform.system() # 'Linux', 'Windows'/'Darwin'
print(p)
```

```
Darwin
```

In [56]:
```
# file name with extension
file_name = os.path.basename('./cars.json')

# file name
print(file_name)
```

```
cars.json
```

In [ ]:

In [ ]: