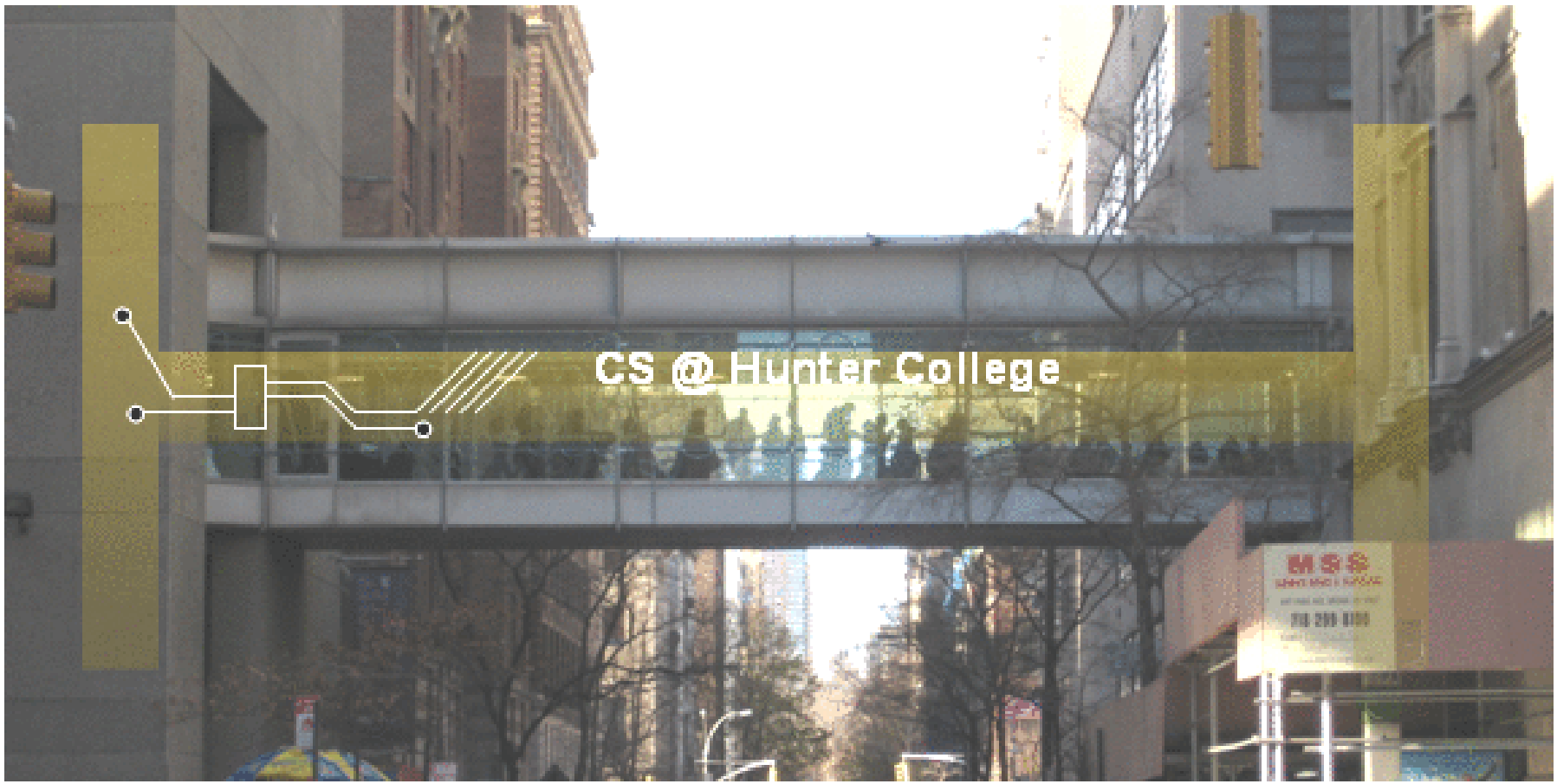
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Today's Topics

- Recap: Slicing & Images
- Introduction to Functions
- NYC Open Data
- Design Challenge

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- **Recap: Slicing & Images**
- Introduction to Functions
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Challenge: Cropping Images

Crop an image to select the top quarter (upper left corner)

Challenge: Cropping Images

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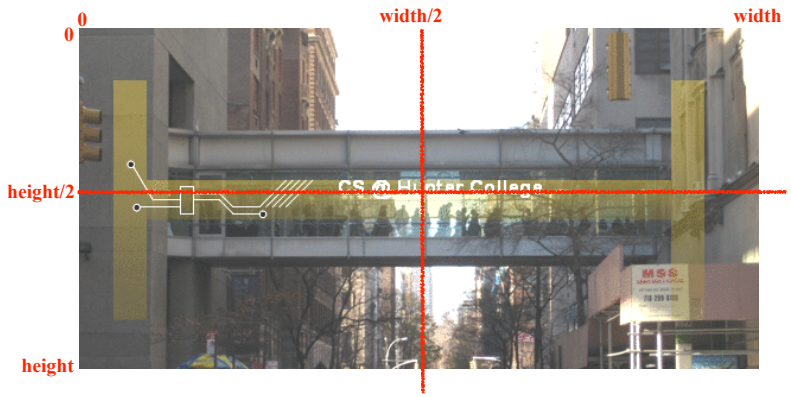

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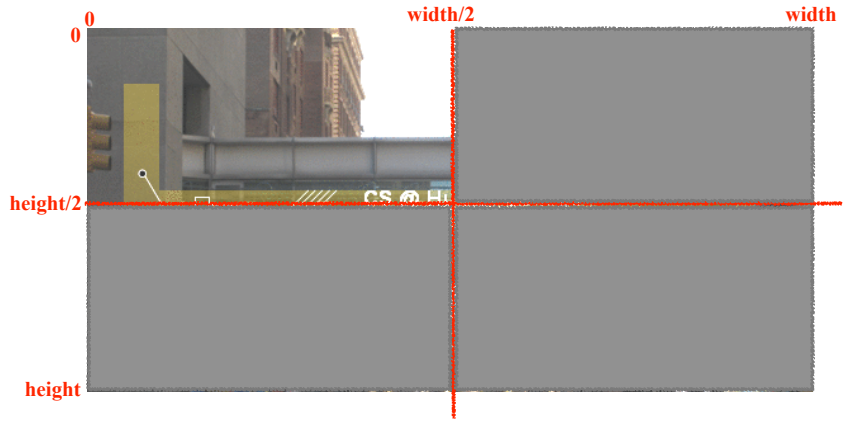

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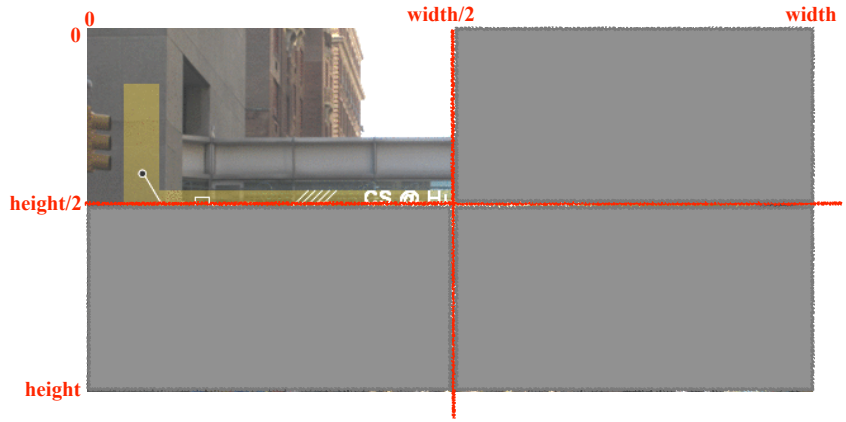

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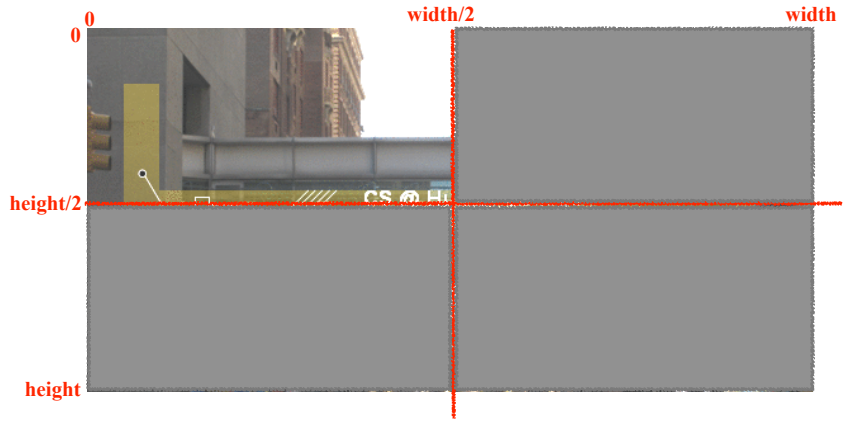

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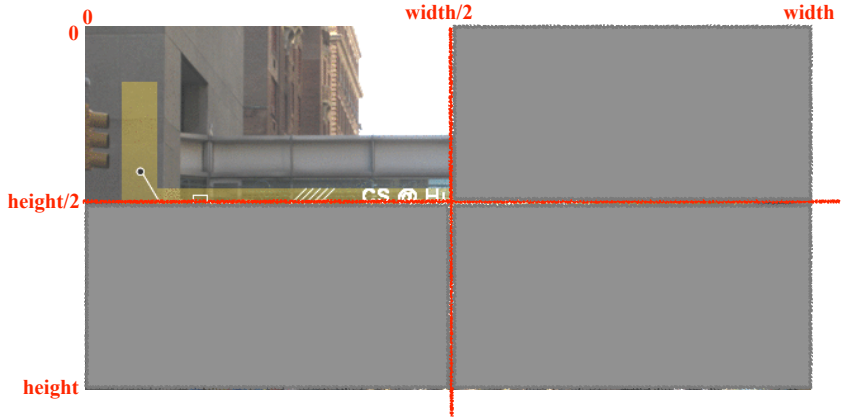

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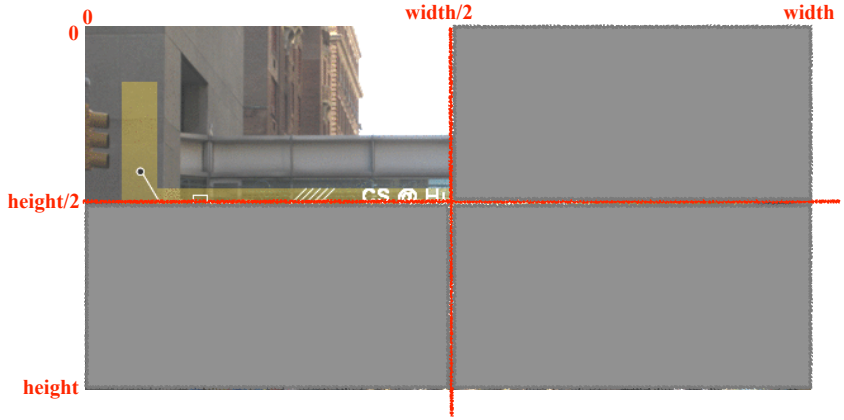

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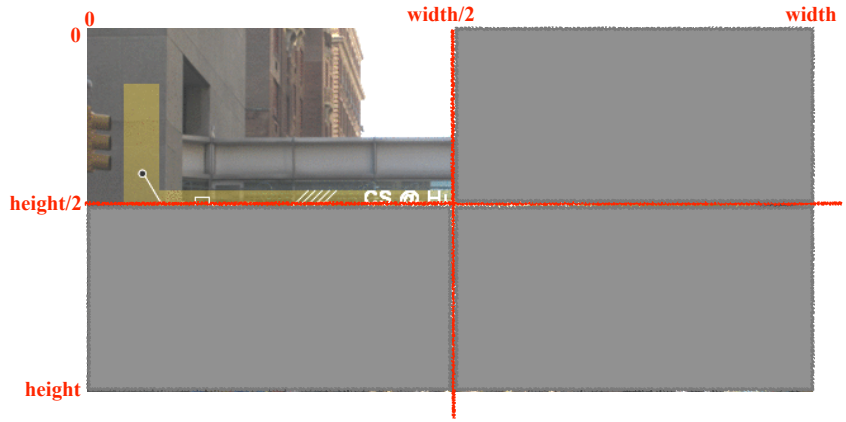

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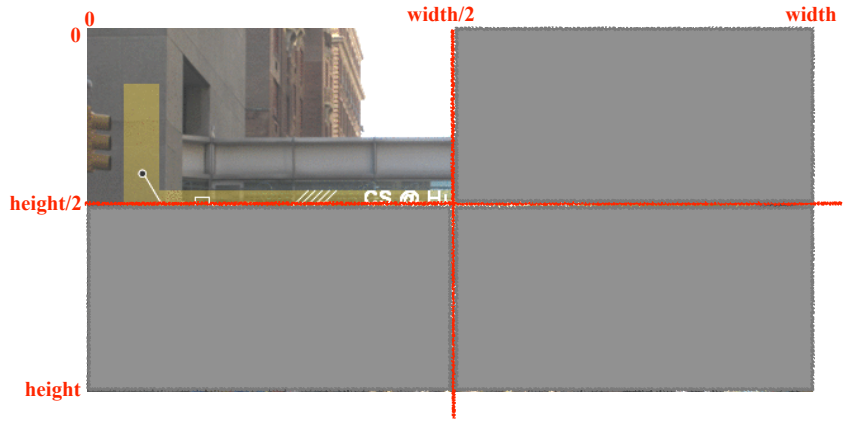

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```
#Name:  your name here
#Date:  October 2017
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#     says hello to the world!

def main():
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- Can write, or **define** your own functions, which are stored, until invoked or called.

"Hello, World!" with Functions

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Python Tutor

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(Demo with pythonTutor)

Challenge Problem:

Predict what the code will do:

```
def totalWithTax(food,tip):
    total = 0
    tax = 0.0875
    total = food + food * tax
    total = total + tip
    return(total)

lunch = float(input('Enter lunch total: '))
lTip = float(input('Enter lunch tip:' ))
lTotal = totalWithTax(lunch, lTip)
print('Lunch total is', lTotal)

dinner= float(input('Enter dinner total: '))
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(Demo with `pythonTutor`)

Input Parameters & Return Values

- Functions can have **input parameters**.

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- Functions can also **return values** to where it was called.

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Formal Parameters

Actual Parameters

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Challenge Problem:

Circle the actual parameters and underline the formal parameters:

```
def prob4():
    verse = "jam tomorrow and jam yesterday,"
    print("The rule is,")
    c = mystery(verse)
    w = enigma(verse,c)
    print(c,w)
def mystery(v):
    print(v)
    c = v.count("jam")
    return(c)
def enigma(v,c):
    print("but never", v[-1])
    for i in range(c):
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prob4()
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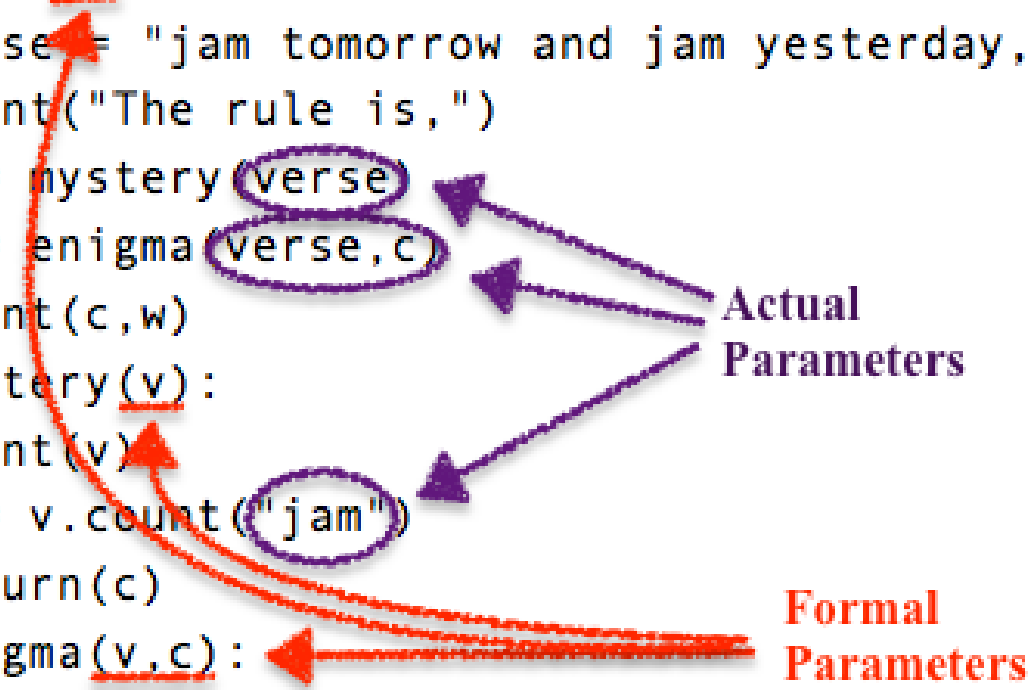

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#Greet loop example

def greetLoop(person):
    print("Greetings")
    for i in range(5):
        print("Hello", person)

greetLoop("Thomas")
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```
# From "Teaching with Python" by John Zelle

def happy():
    print("Happy Birthday to you!")

def sing(P):
    happy()
    happy()
    print("Happy Birthday dear " + P + "!")
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sing("Fred")
sing("Thomas")
sing("Hunter")
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Fill in the missing code:

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def monthString(monthNum):
    """
    Takes as input a number, monthNum, and
    returns the corresponding month name as a string.
    Example: monthString(1) returns "January".
    Assumes that input is an integer ranging from 1 to 12
    """

    monthString = ""

    ###################################
    ### FILL IN YOUR CODE HERE      ###
    ### Other than your name above, ###
    ### this is the only section    ###
    ### you change in this program. ###
    ###################################

    return(monthString)

def main():
    n = int(input('Enter the number of the month: '))
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    print('The month is', mString)
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IDLE

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- Used to collaborate on and share code, documents, etc.

Octocat

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- Also convenient place to host websites (i.e. `huntercsci127.github.io`).
- In Lab6 you set up github accounts to copy (**'clone'**) documents from the class repo. (More in future courses.)

Recap: Functions

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- You **call** or **invoke** a function by typing its name, followed by any inputs, surrounded by parenthesis: Example: `print("Hello", "World")`
- Can write, or **define** your own functions,

Recap: Functions

```
#Name:  your name here
#Date:  October 2017
#This program, uses functions,
#     says hello to the world!

def main():
     print("Hello, World!")

if __name__ == "__main__":
     main()
```

- Functions are a way to break code into pieces, that can be easily reused.
- You **call** or **invoke** a function by typing its name, followed by any inputs, surrounded by parenthesis: Example: `print("Hello", "World")`
- Can write, or **define** your own functions, which are stored, until invoked or called.

Today's Topics

- Recap: Slicing & Images
- Introduction to Functions
- **NYC Open Data**
- Design Challenge

Accessing Structured Data: NYC Open Data

- Freely available source of data.

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Accessing Structured Data: NYC Open Data

- Freely available source of data.
- Maintained by the NYC data analytics team.
- We will use several different ones for this class.
- Will use `pandas`, `pyplot` & `folium` libraries to analyze, visualize and map the data.
- Lab 7 covers accessing and downloading NYC OpenData datasets.

Example: OpenData Film Permits

Home Data About Learn

Film Permits

Permits are generally required when asserting the exclusive use of city property, like a sidewalk, a street, or a park. See http://www1.nyc.gov/site/mome/permits/when-permit-required.page

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455063	Shooting Permit	12/06/2018 07:00...	12/06/2018 09:00...	12/05/2018 12:36...	Mayor's Offic...	STARR AVENUE b...	Queens
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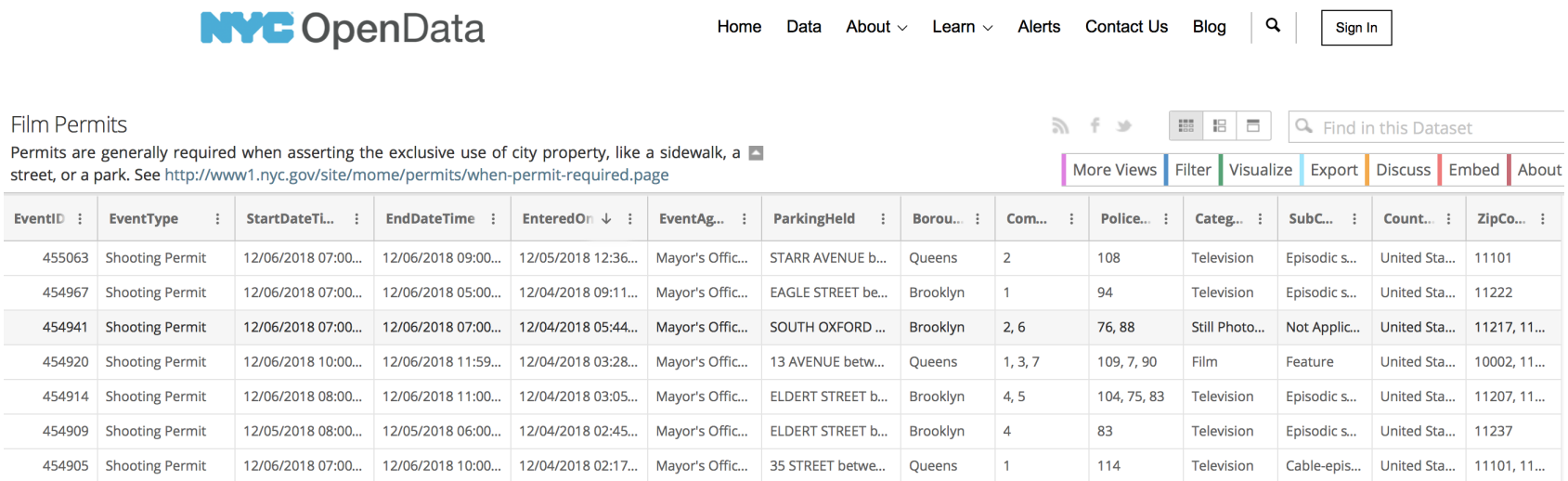

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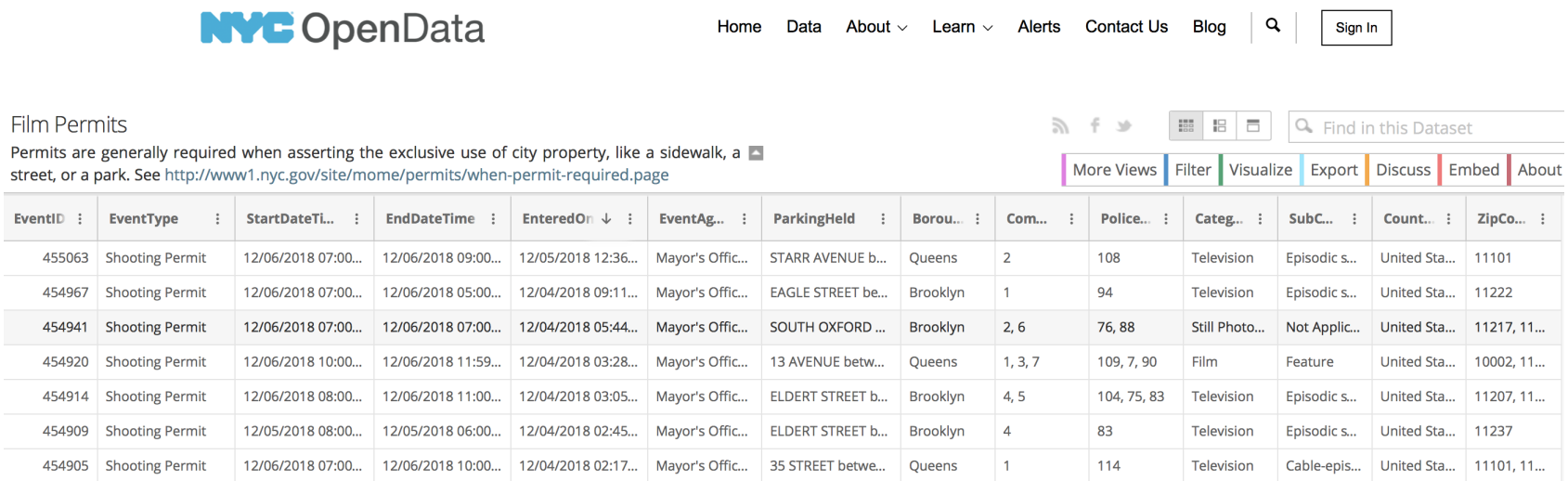
- What's the most popular street for filming?

Example: OpenData Film Permits



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- What's the most popular street for filming?
- What's the most popular borough?

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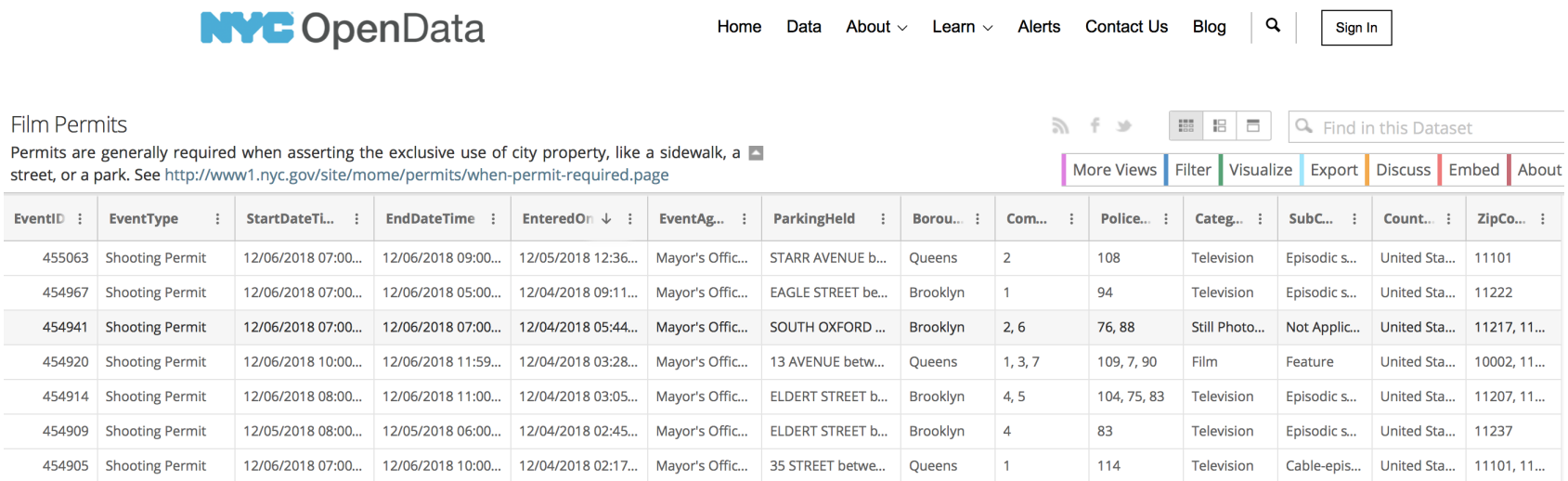

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- What's the most popular street for filming?
- What's the most popular borough?
- How many TV episodes were filmed?

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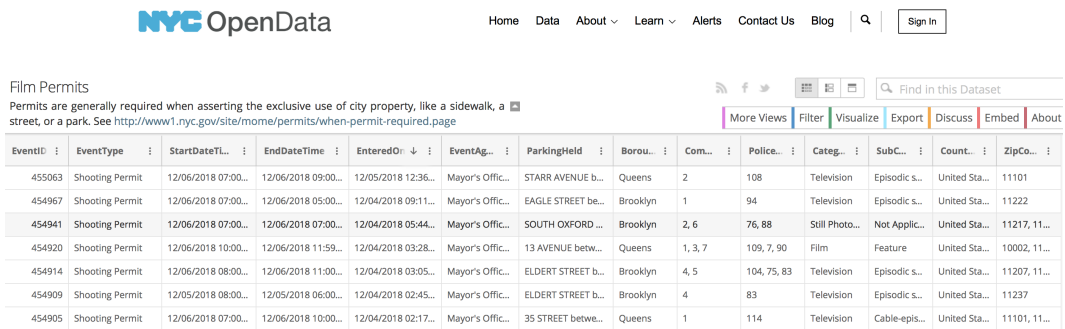

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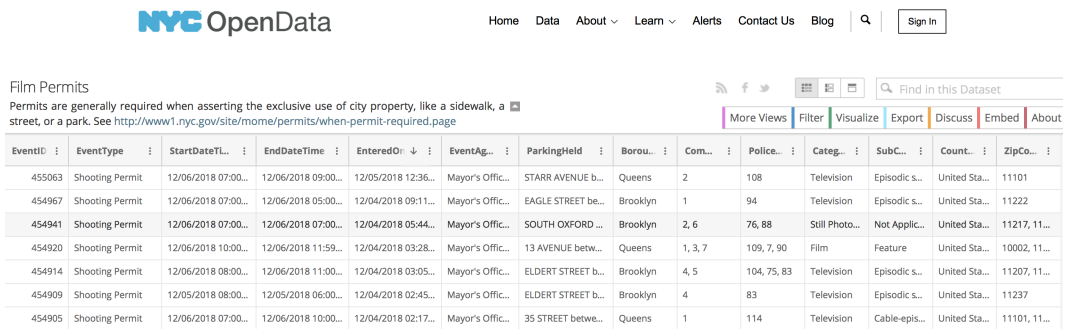

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#March 2019
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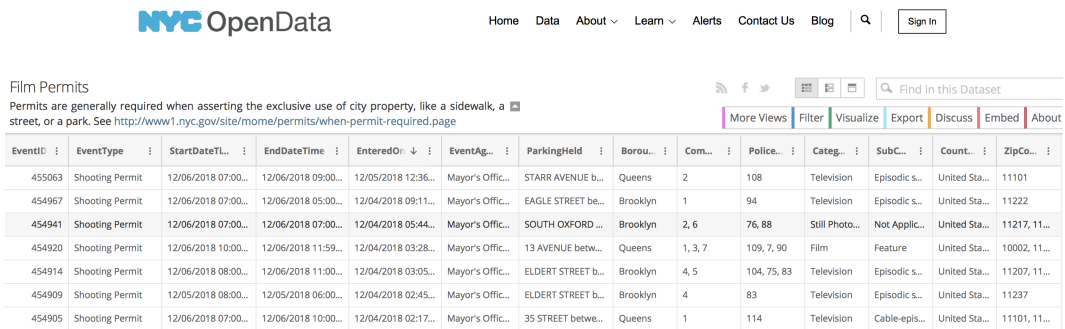

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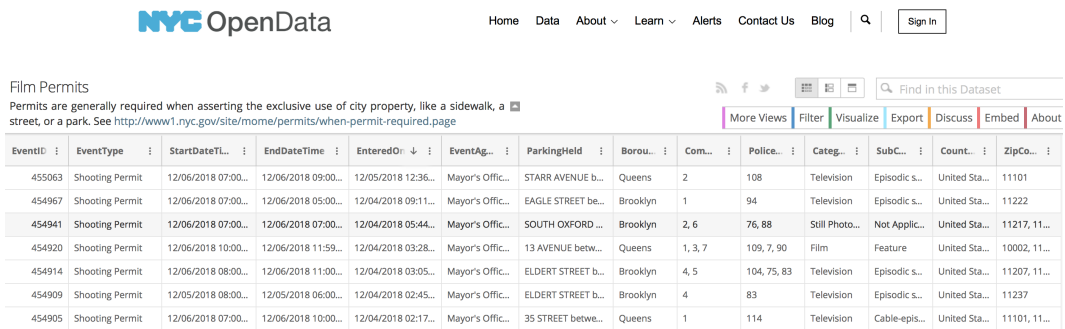

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print(tickets["ParkingHeld"]) #Print out streets (multiple times)
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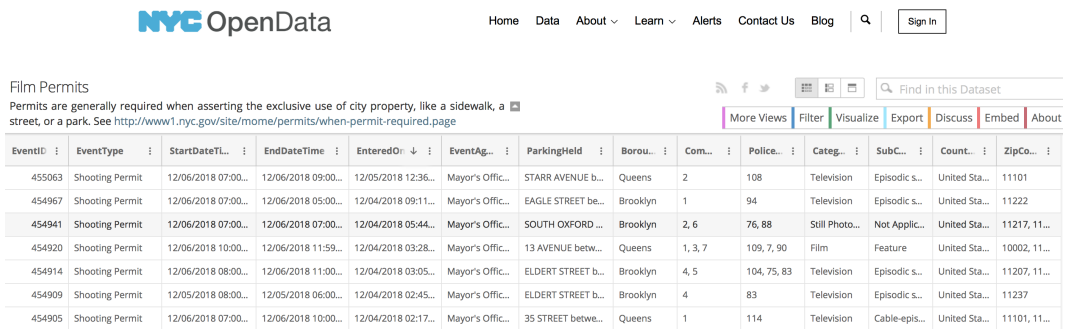

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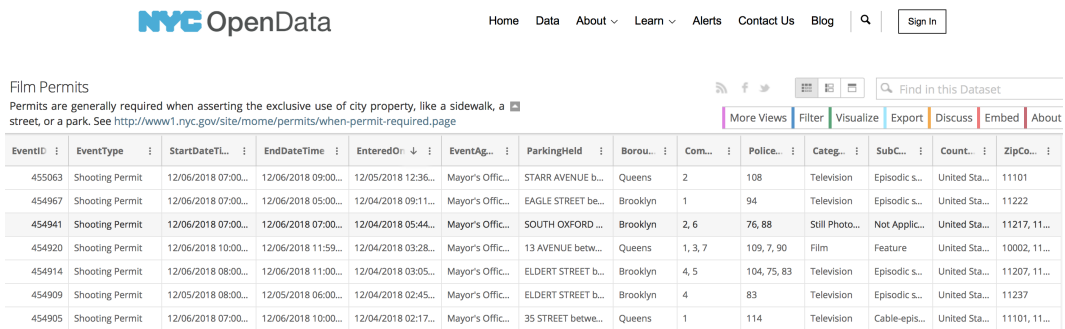

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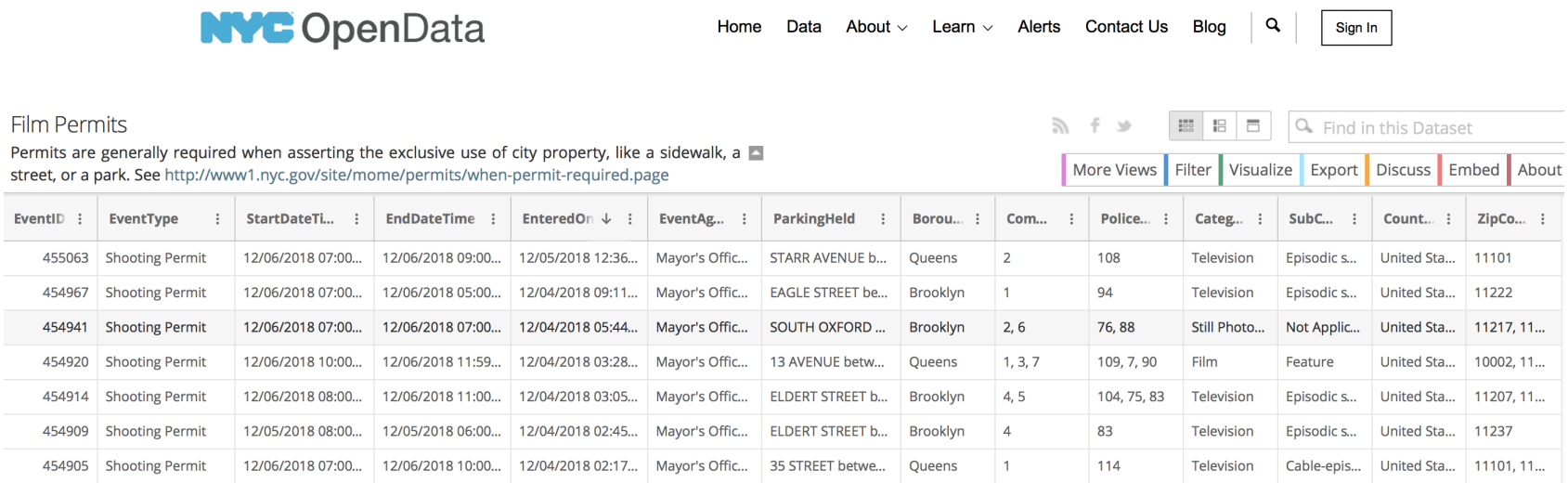
454920	Shooting Permit	12/06/2018 10:00...	12/06/2018 11:59...	12/04/2018 03:28...	Mayor's Offic...	13 AVENUE betw...	Queens	1, 3, 7	109, 7, 90	Film	Feature	United Sta...	10002, 11...
454914	Shooting Permit	12/06/2018 08:00...	12/06/2018 11:00...	12/04/2018 03:05...	Mayor's Offic...	ELDERT STREET b...	Brooklyn	4, 5	104, 75, 83	Television	Episodic s...	United Sta...	11207, 11...
454909	Shooting Permit	12/05/2018 08:00...	12/05/2018 06:00...	12/04/2018 02:45...	Mayor's Offic...	ELDERT STREET b...	Brooklyn	4	83	Television	Episodic s...	United Sta...	11237
454905	Shooting Permit	12/06/2018 07:00...	12/06/2018 10:00...	12/04/2018 02:17...	Mayor's Offic...	35 STREET betwe...	Queens	1	114	Television	Cable-epis...	United Sta...	11101, 11...

- Download the data as a CSV file and store on your computer.
- Python program:

```
#CSci 127 Teaching Staff
#March 2019
#OpenData Film Permits

#Import pandas for reading and analyzing CSV data:
import pandas as pd
csvFile = "filmPermits.csv"   #Name of the CSV file
tickets = pd.read_csv(csvFile)#Read in the file to a dataframe
print(tickets)                #Print out the dataframe
print(tickets["ParkingHeld"]) #Print out streets (multiple times)
print(tickets["ParkingHeld"].value_counts()) #Print out streets & number of times used
print(tickets["ParkingHeld"].value_counts()[:10])  #Print 10 most popular
```

Example: OpenData Film Permits



EventID	EventType	StartDateTi...	EndDateTime	EnteredOn	EventAg...	ParkingHeld	Borou...	Com...	Police...	Categ...	SubC...	Count...	ZipCo...
455063	Shooting Permit	12/06/2018 07:00...	12/06/2018 09:00...	12/05/2018 12:36...	Mayor's Offic...	STARR AVENUE b...	Queens	2	108	Television	Episodic s...	United Sta...	11101
454967	Shooting Permit	12/06/2018 07:00...	12/06/2018 05:00...	12/04/2018 09:11...	Mayor's Offic...	EAGLE STREET be...	Brooklyn	1	94	Television	Episodic s...	United Sta...	11222
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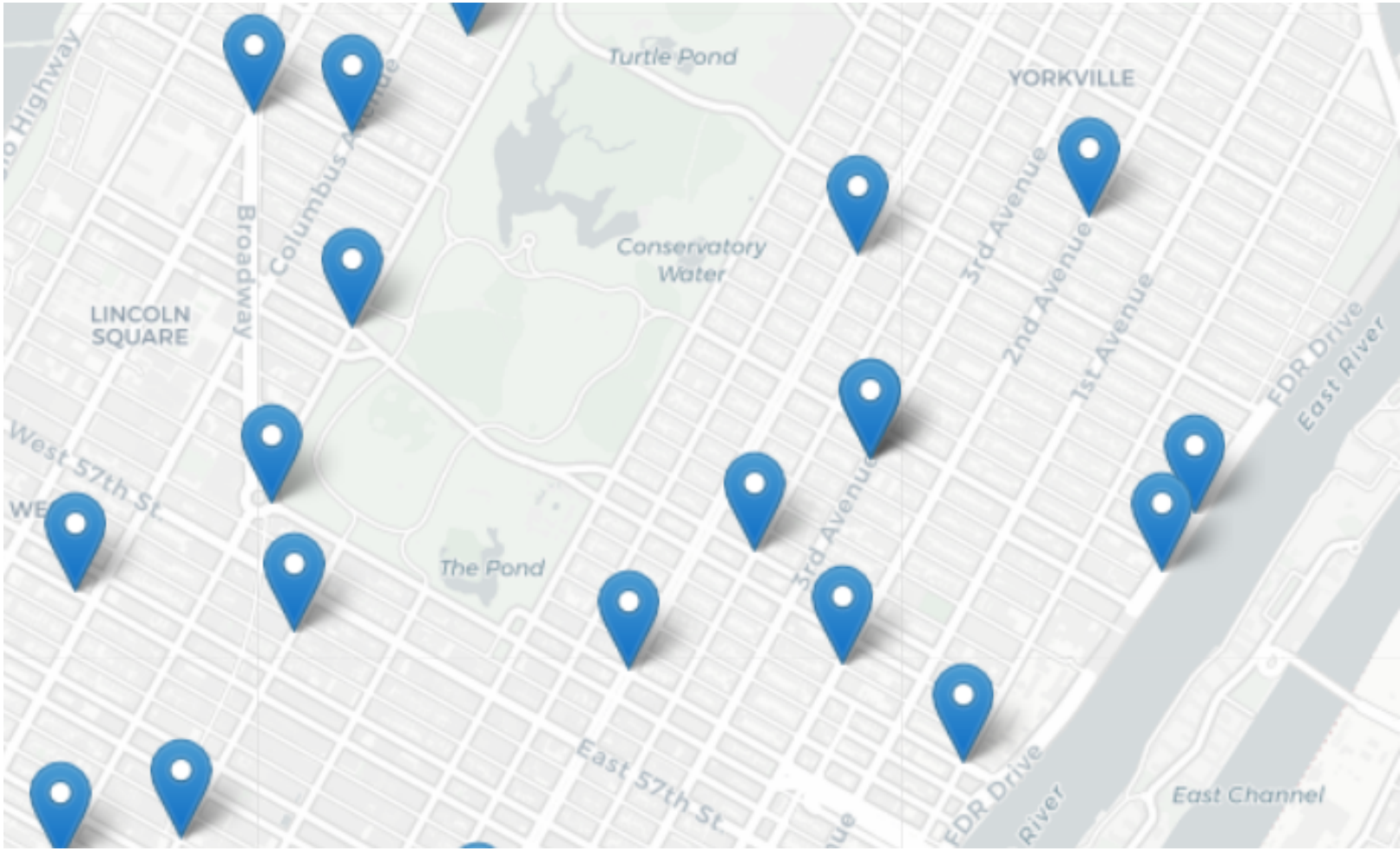
Can approach the other questions in the same way:

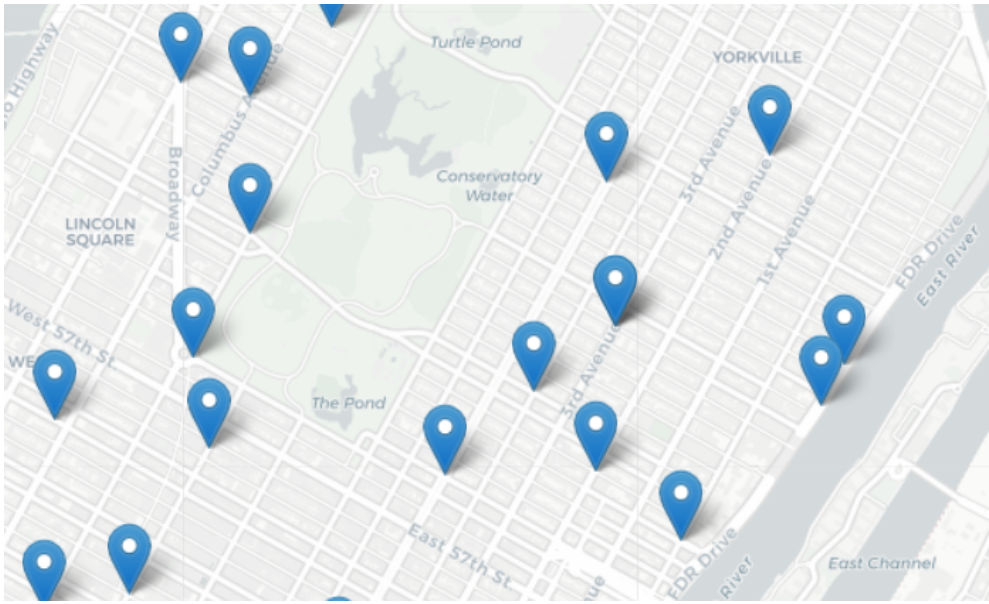
- What's the most popular street for filming?
- What's the most popular borough?
- How many TV episodes were filmed?

Design Question



Design an algorithm that finds the closest collision.

Design Question



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DATE	TIME	BOROUGH	ZIP CODE	LATITUDE	LONGITUDE	LOCATION	ON STREET N	CROSS STREE	OFF STREET I	NUMBER OF
12/31/16	9:56						2 AVENUE			0
12/31/16	9:55	BRONX	10462	40.83521	-73.85497	(40.8352098	UNIONPORT	OLMSTEAD AVENUE		0
12/31/16	9:50						JESUP AVENUE			0
12/31/16	9:40	BROOKLYN	11225	40.66911	-73.95335	(40.6691137	ROGERS AVE	UNION STREET		0
12/31/16	20:23	BROOKLYN	11209	40.62578	-74.02415	(40.6257805	80 STREET	5 AVENUE		0
12/31/16	20:20	QUEENS	11375	40.71958	-73.83977	(40.719584,	ASCAN AVEN	QUEENS BOULEVARD		0
12/31/16	20:15	BROOKLYN	11204				60 STREET	BAY PARKWAY		0
12/31/16	20:10			40.66479	-73.82047	(40.6647944, -73.8204653)				0
12/31/16	20:10						69 STREET	37 AVENUE		0
12/31/16	20:05	BRONX	10457	40.85429	-73.90026	(40.8542925	RYER AVENU	EAST 181 STREET		0

Design Question

Design an algorithm that uses NYC OpenData collision data and computes the closest collision to the location the user provides.

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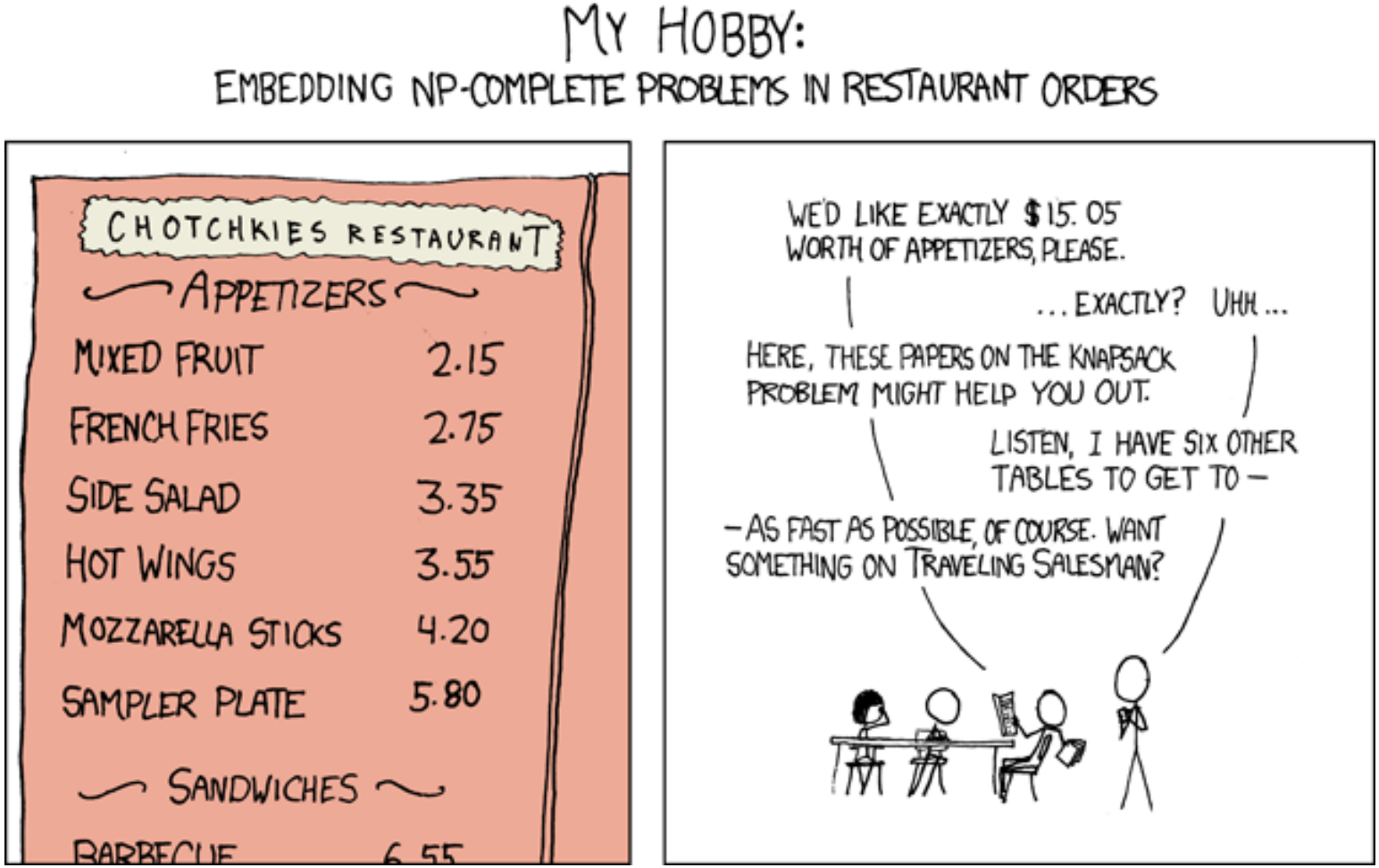
  5. Save the location with the smallest distance.

Today's Topics

- Recap: Slicing & Images
- Introduction to Functions
- NYC Open Data
- **Design Challenge**

Design Challenge



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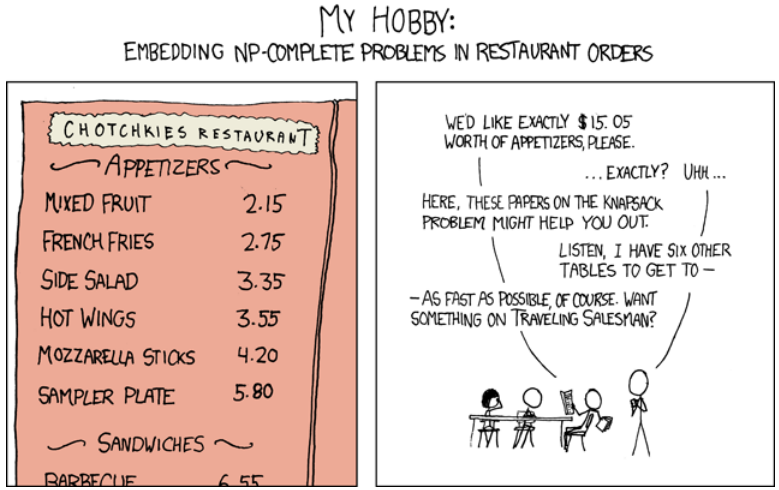
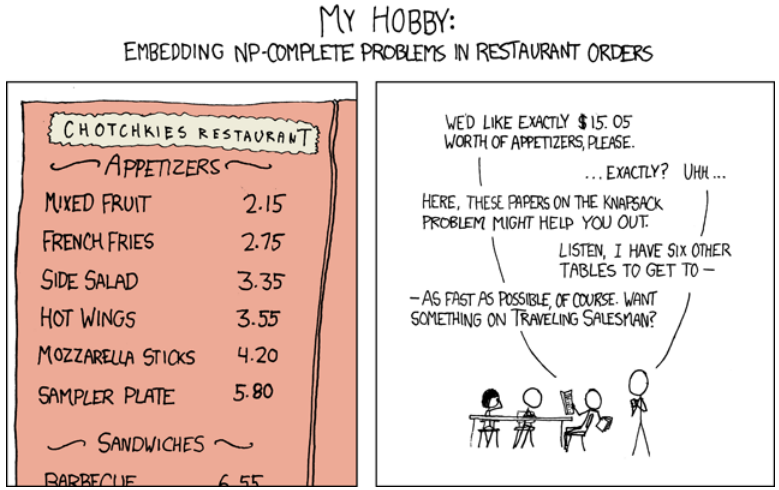


- Possible solutions:

Design Challenge



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  - 7 orders of mixed fruit, or

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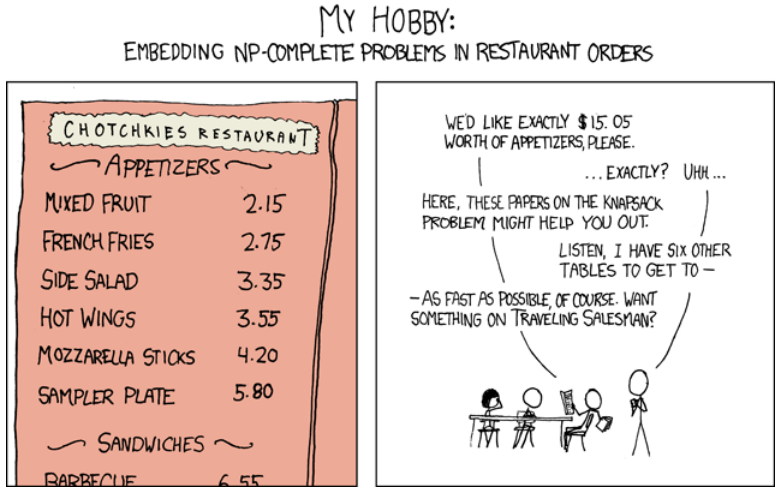

- Possible solutions:
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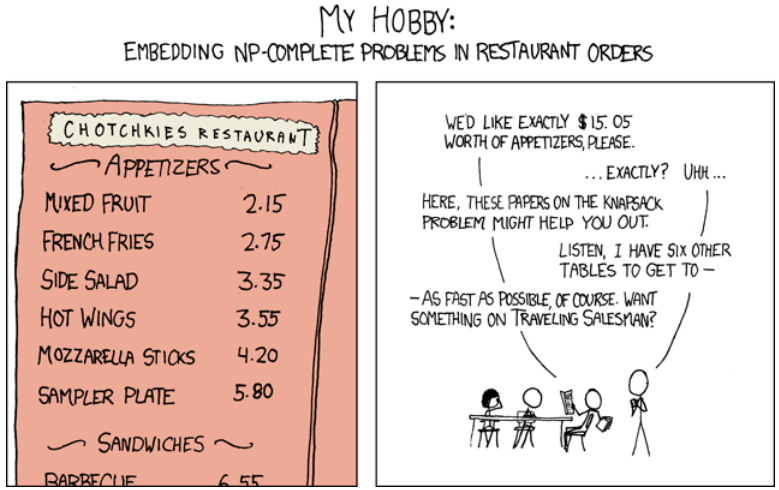
  - 2 orders hot wings, 1 order mixed fruit, and 1 sampler plate.

Design Challenge



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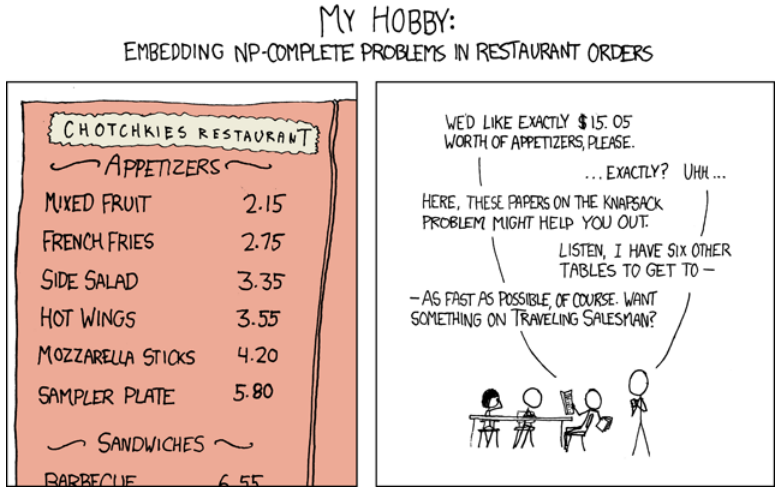

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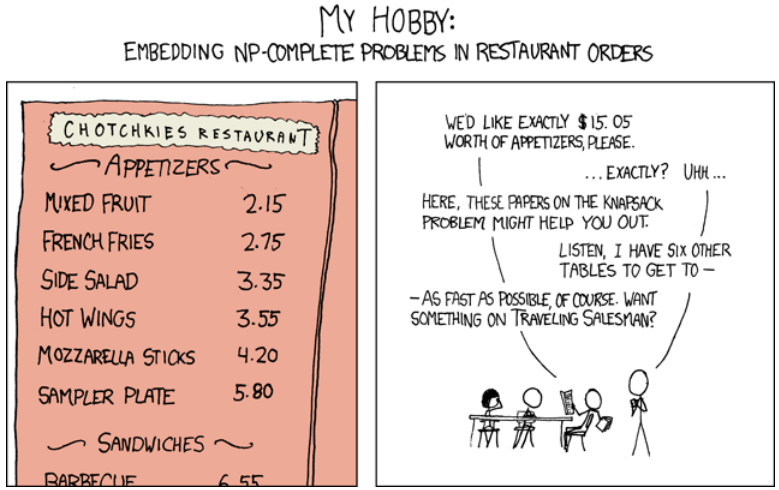

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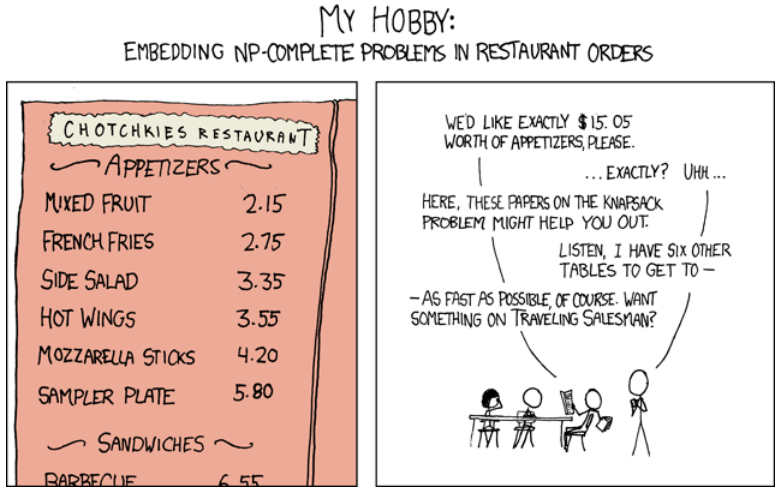

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- "NP-Complete" problem: possible answers can be checked quickly, but not known how to compute quickly.

Today's Topics

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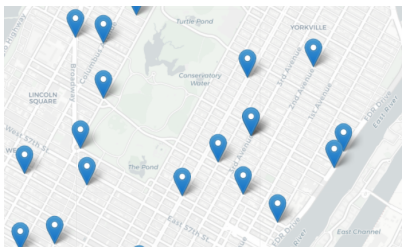
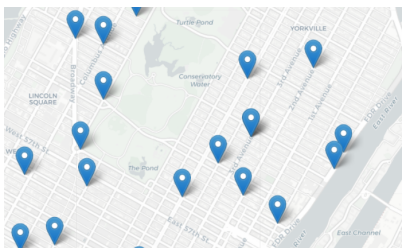
Recap

- Functions are a way to break code into pieces, that can be easily reused.



Recap



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- You **call** or **invoke** a function by typing its name, followed by any inputs, surrounded by parenthesis:

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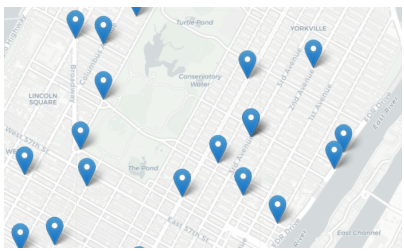

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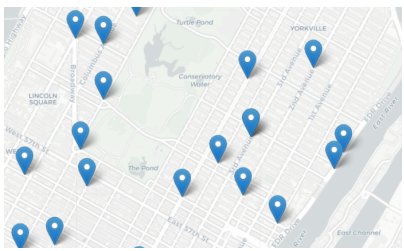

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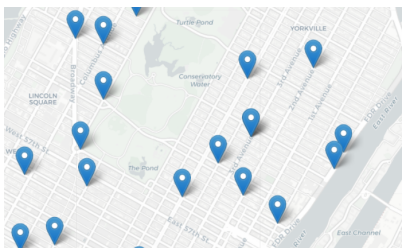

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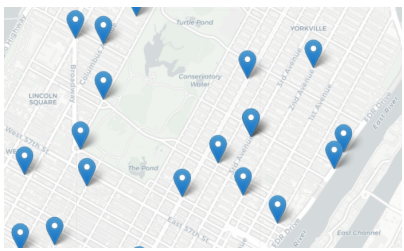

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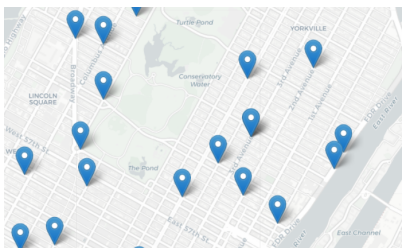

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- Log in to Gradescope for Quiz 7.