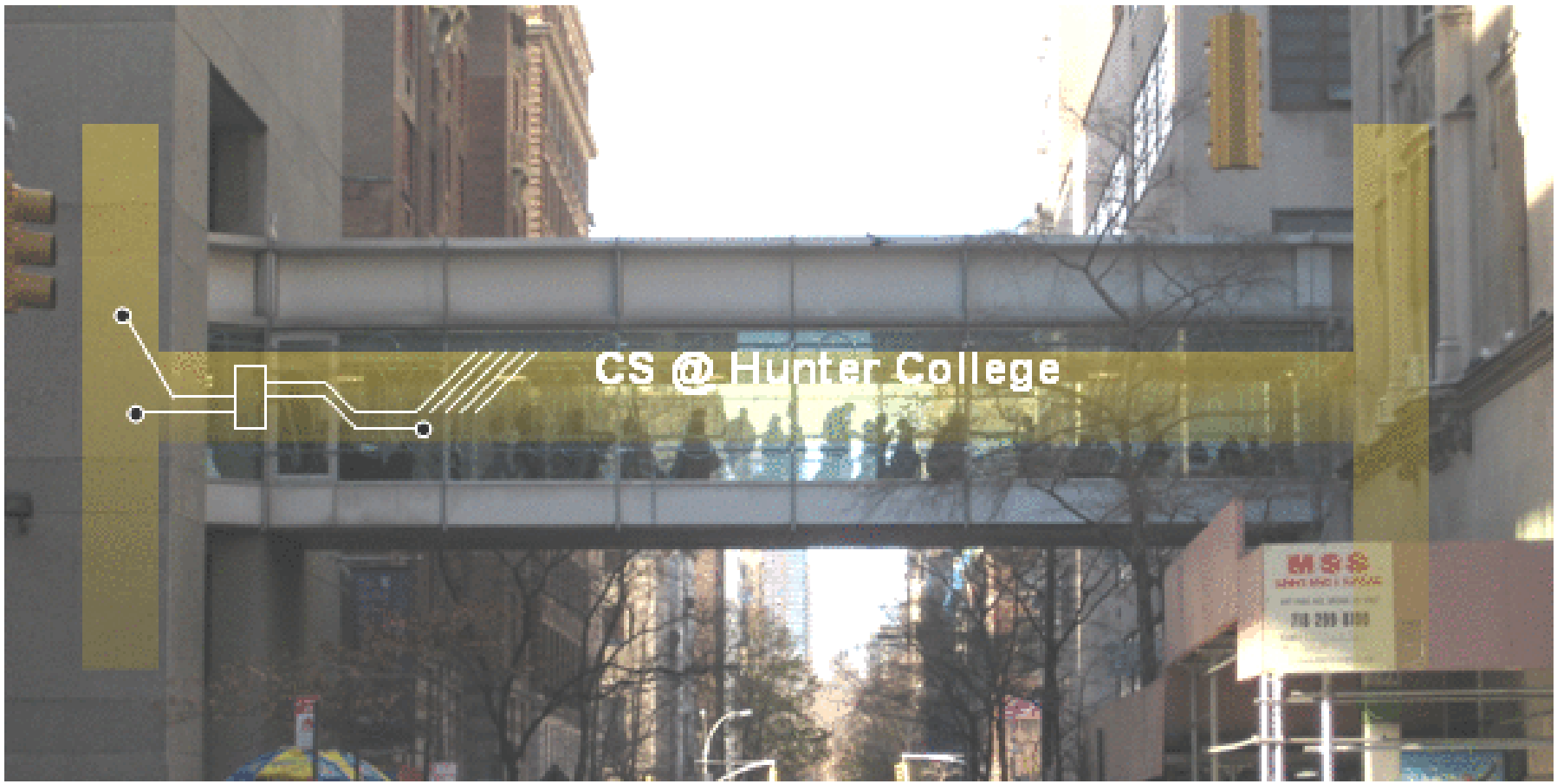
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Frequently Asked Questions

From email

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  Parenthesis ( ) generally follow function names, e.g. print().
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  e.g. (x == 2(y+3)) and (x <10)*
  We use square brackets [ ] to index or slice,
  i.e. take a piece, of a string, list or numpy array: my_string[2:5]

Today's Topics

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

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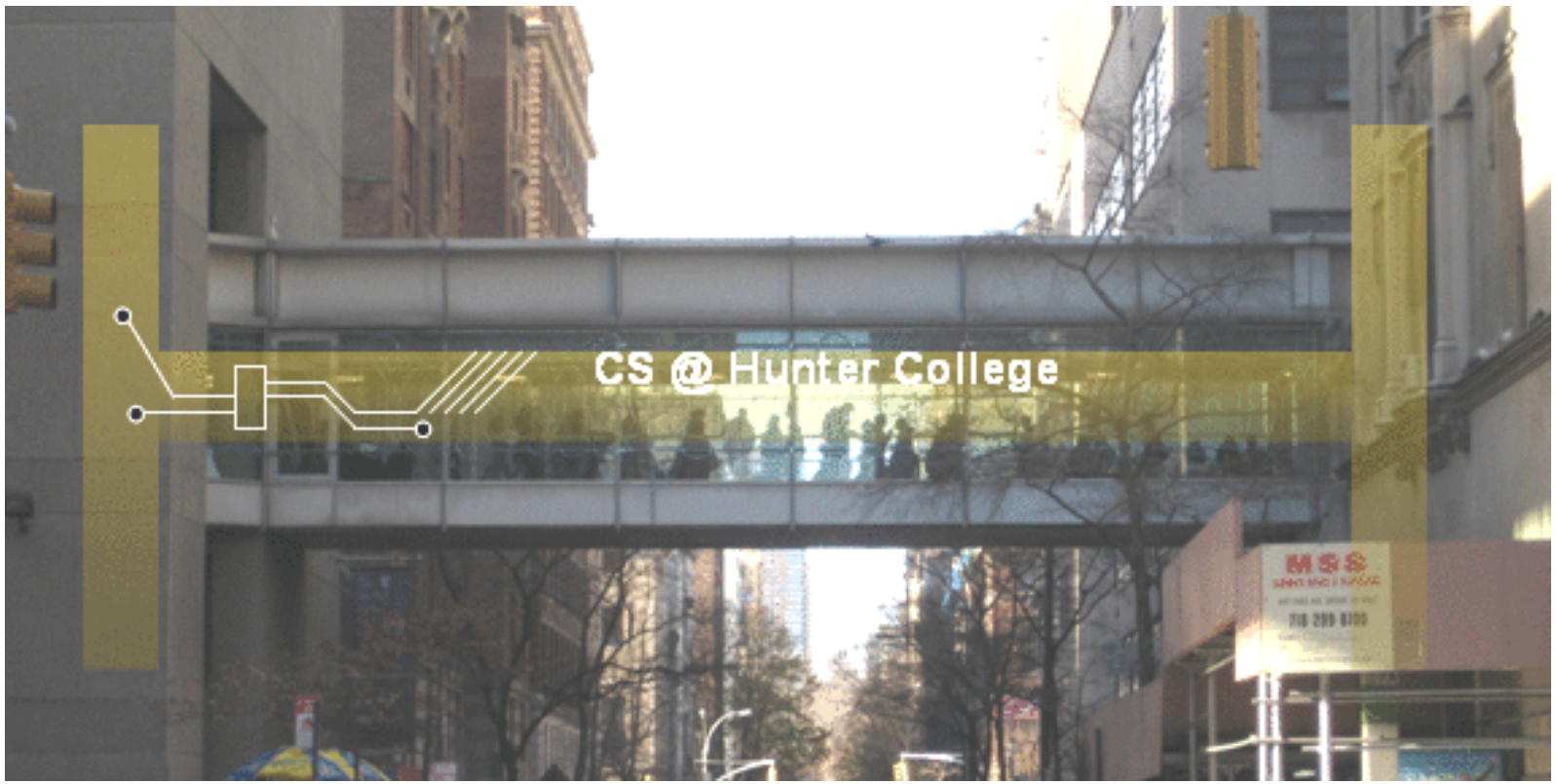
Challenge: Cropping Images

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



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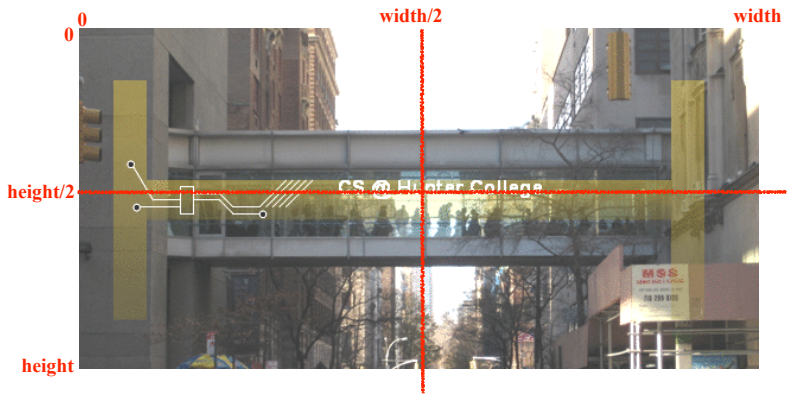

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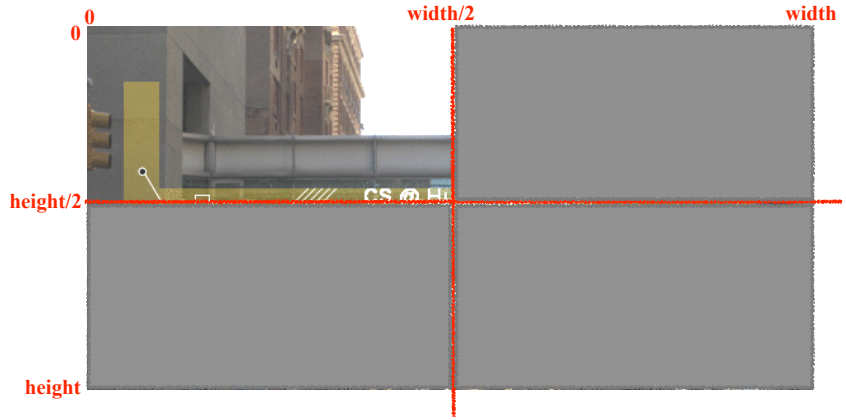

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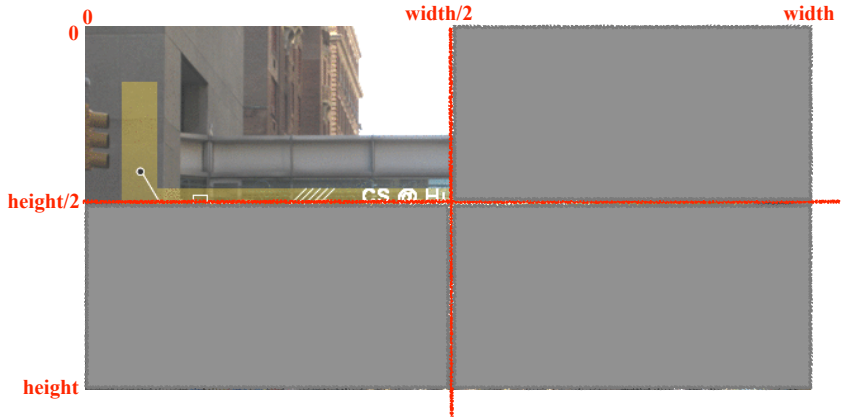

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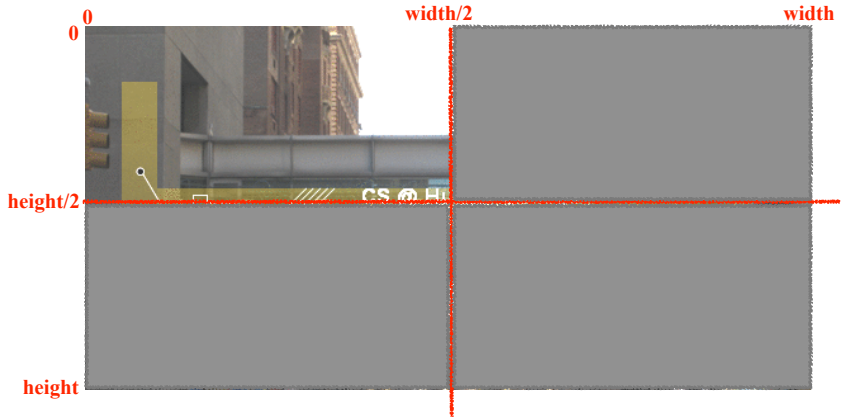

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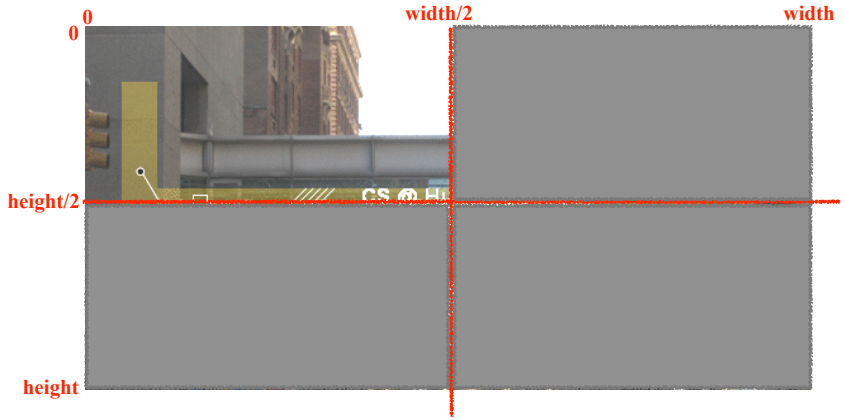

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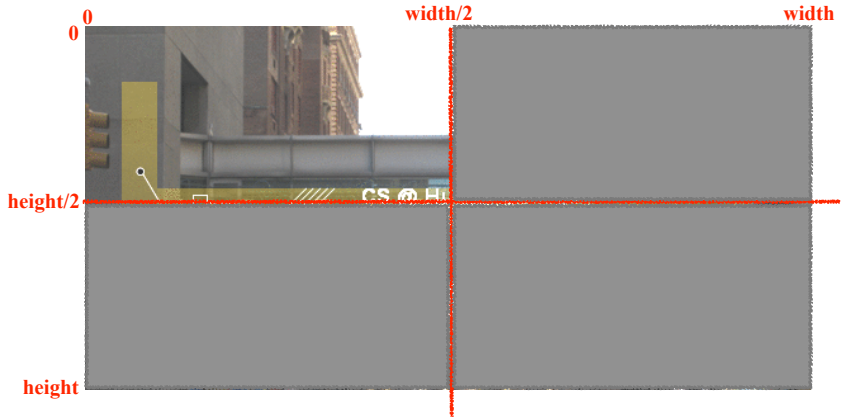

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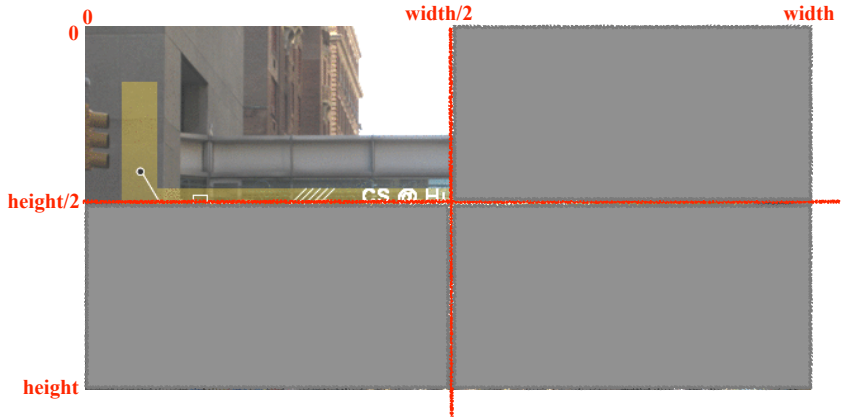

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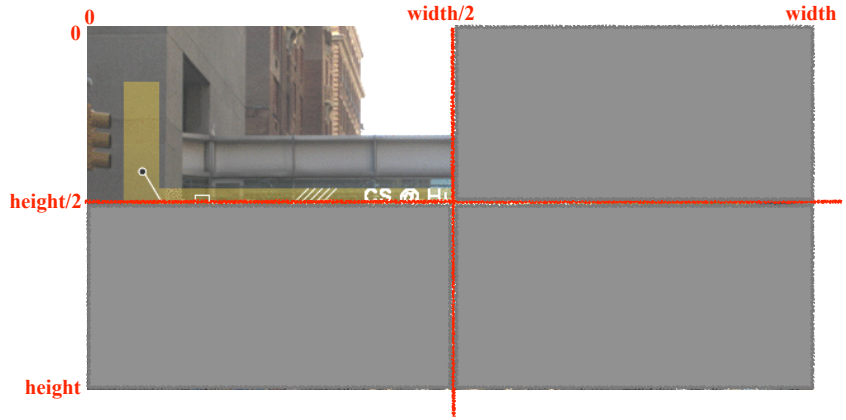

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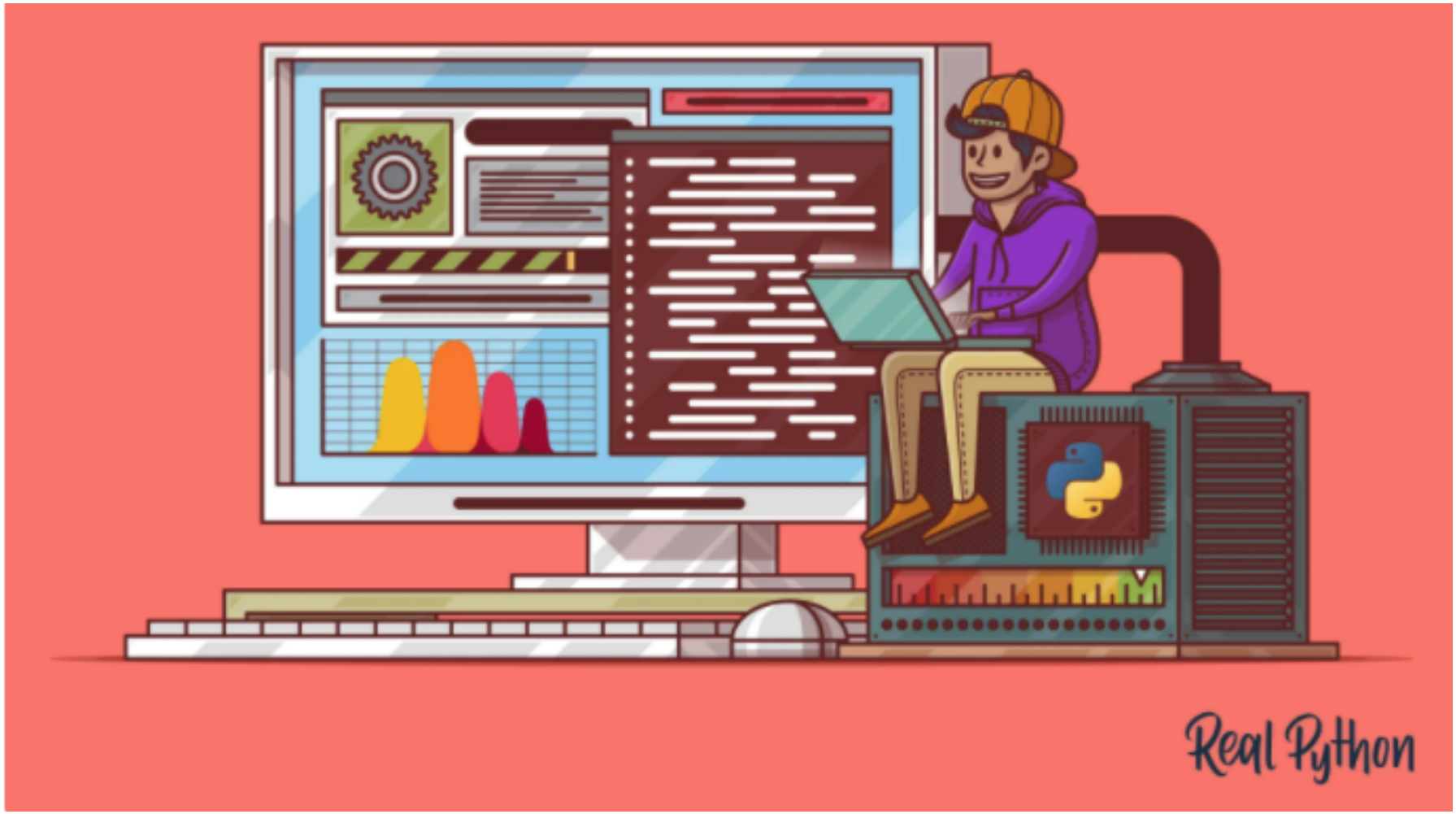
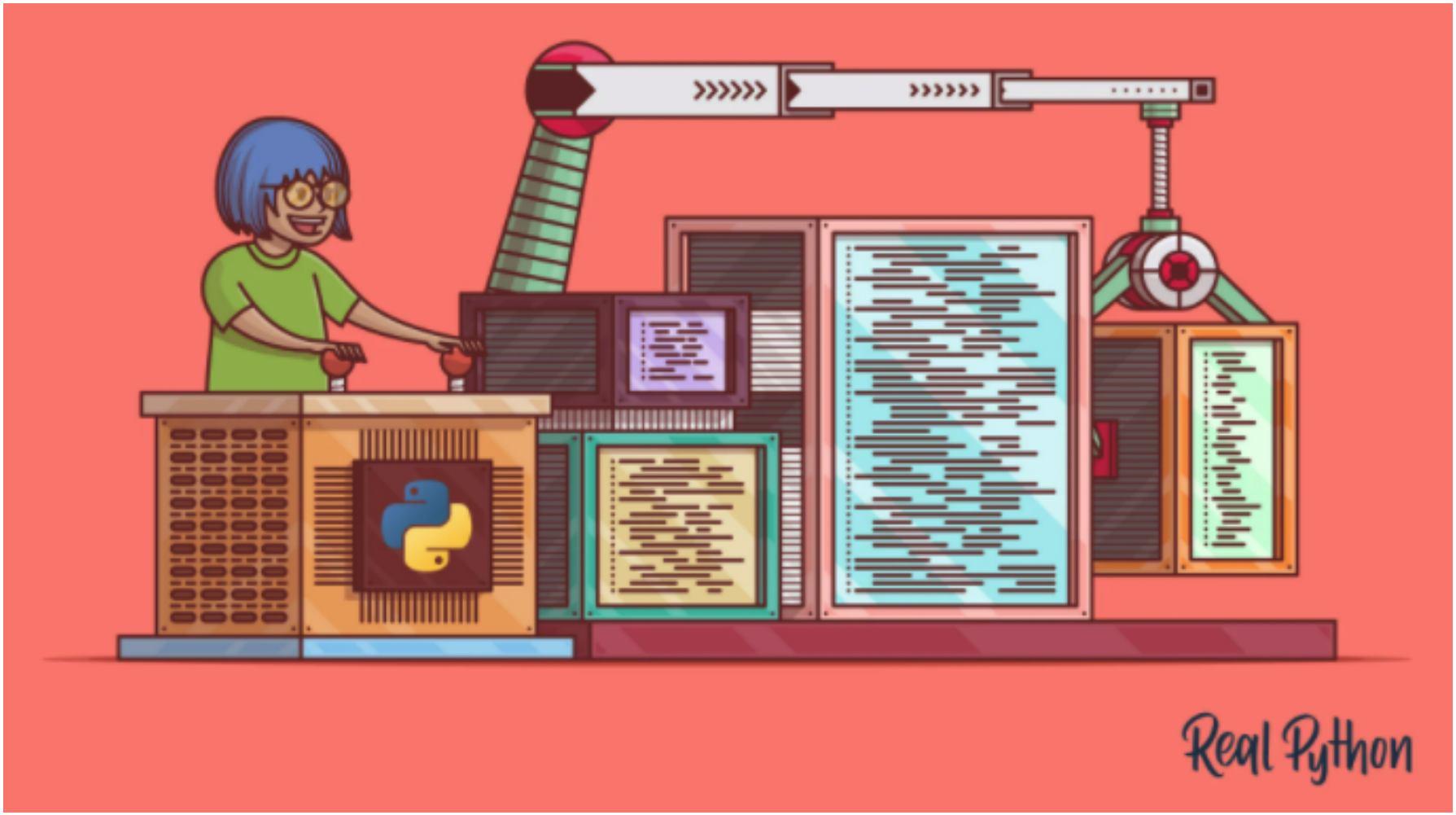
Scripts



Modularity



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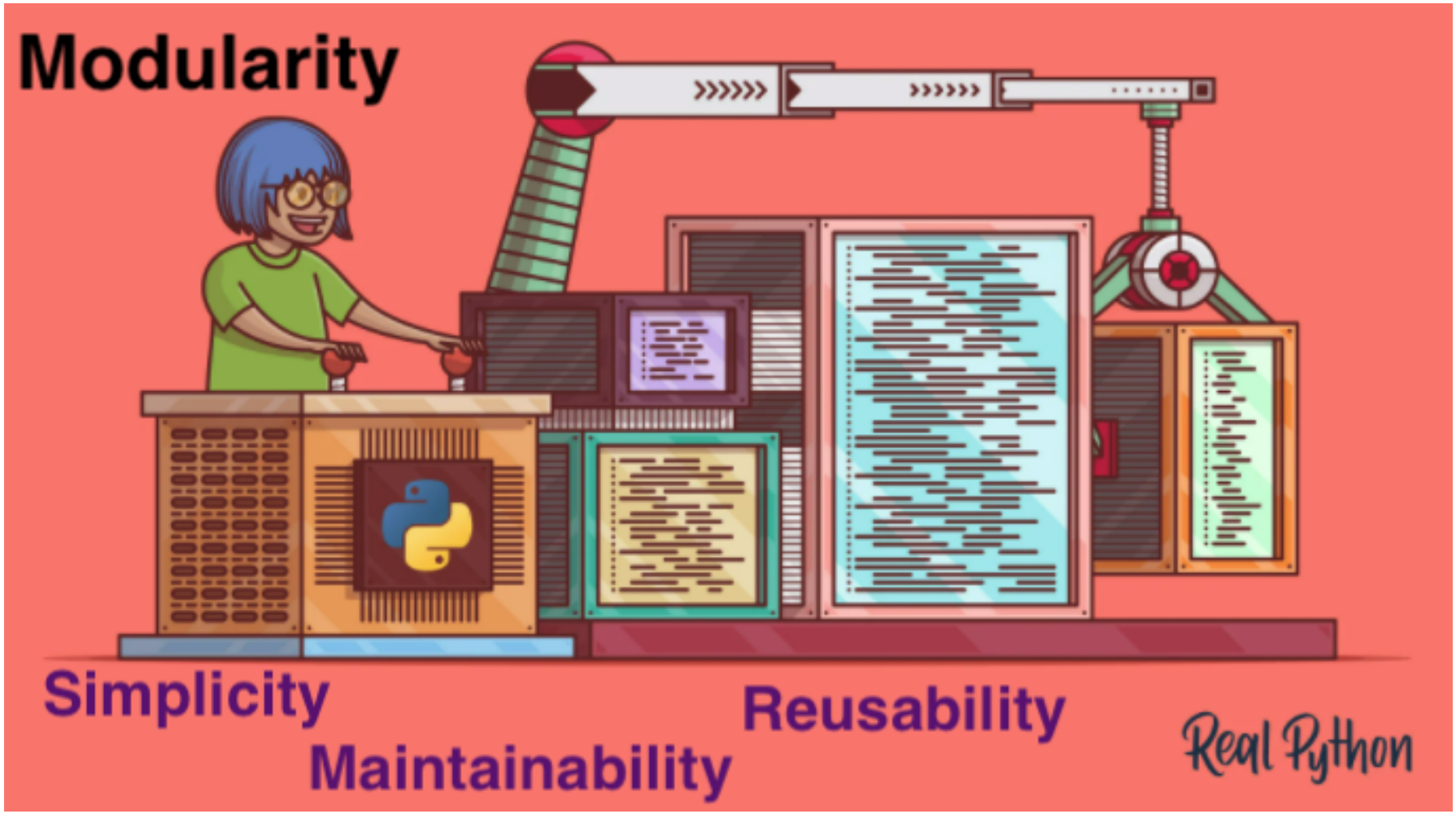
Modularity
Simplicity
Maintainability
Reusability
Real Python

Functions

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

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#Name:  your name here
#Date:  October 2017
#This program, uses functions,
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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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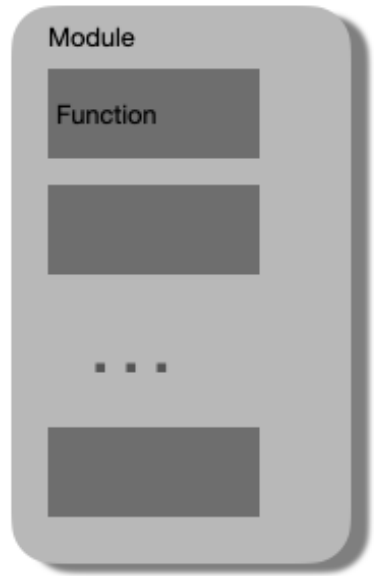
(Demo with pythonTutor)

functions - modules - packages



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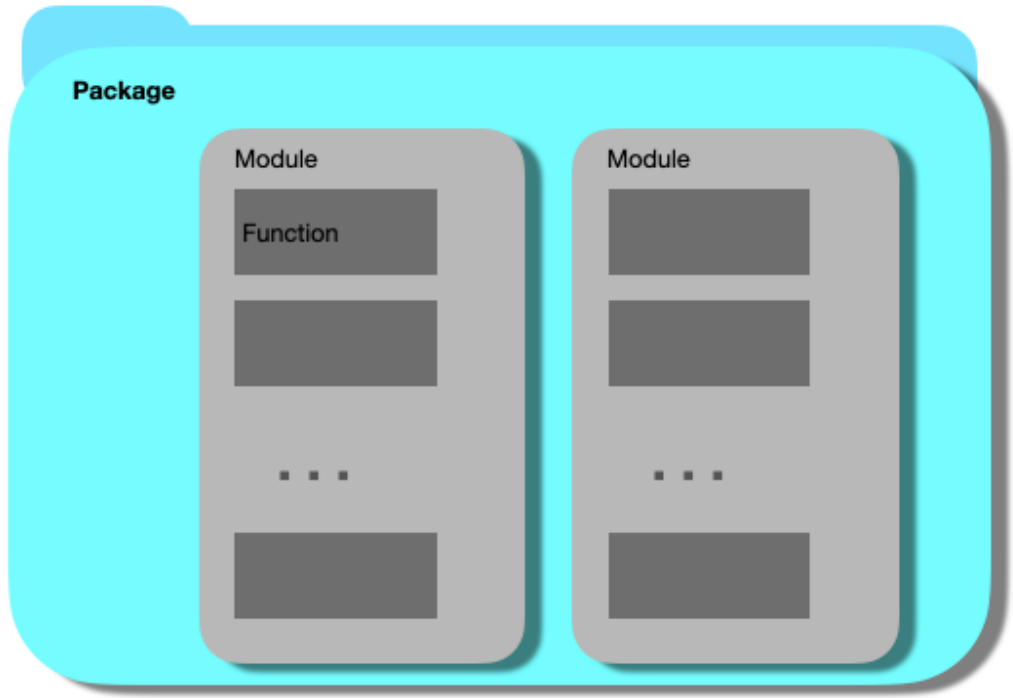

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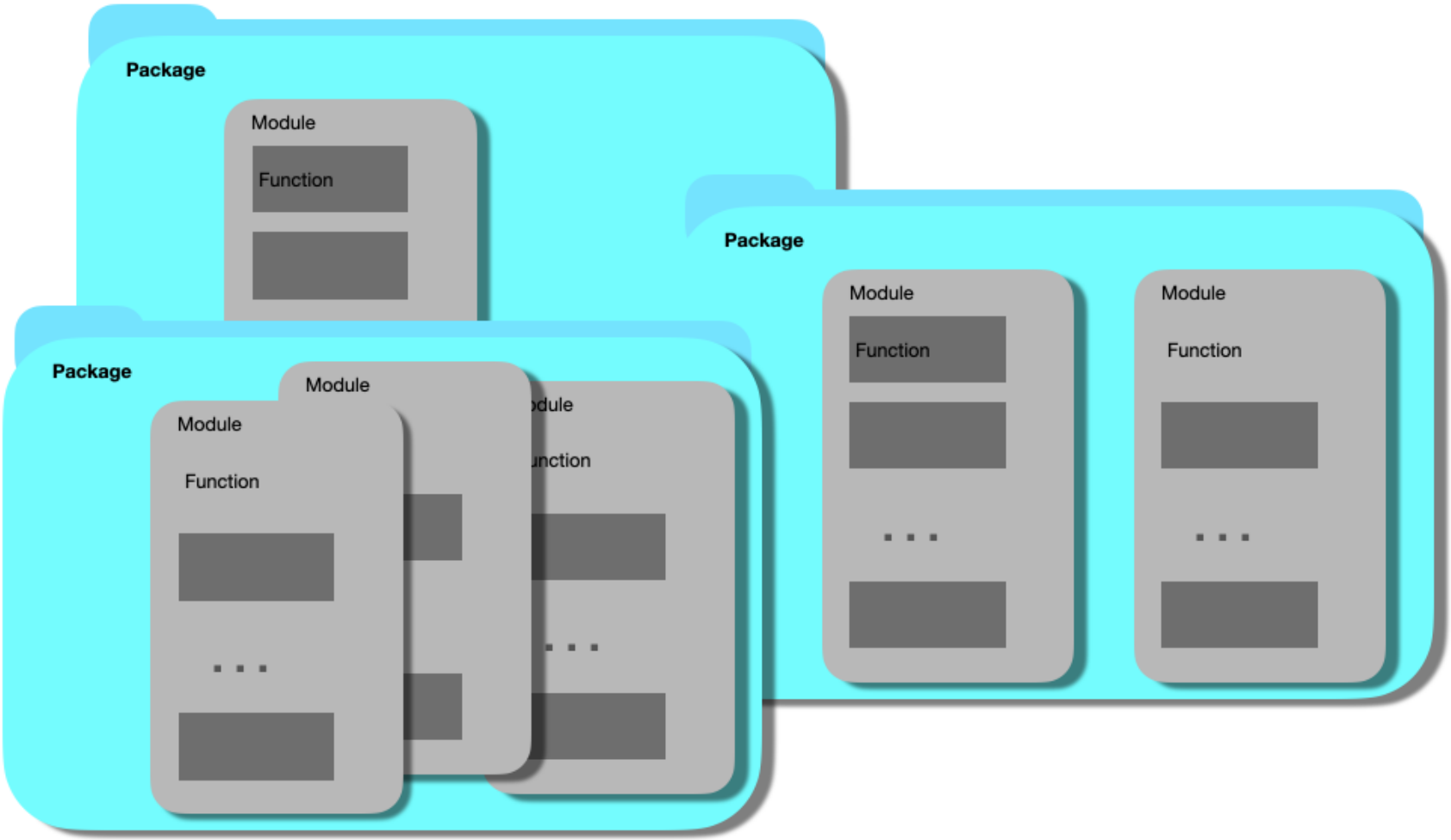
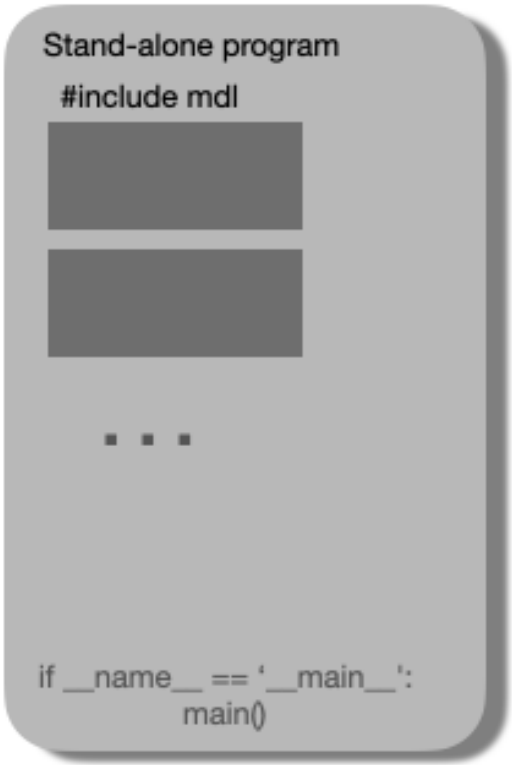


Stand-alone program



Challenge:

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)

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(Demo with `pythonTutor`)

Scope

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def nine():
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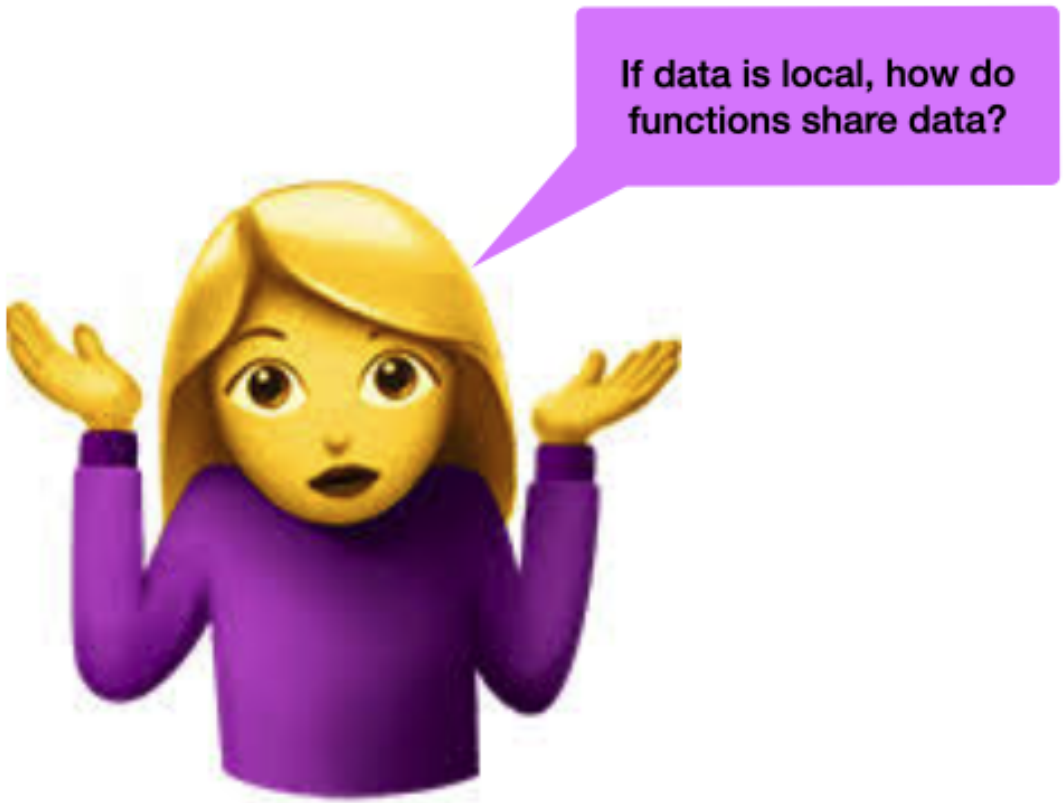
- Each function defines the **scope** of its local variables
- A variable defined inside a function is **local**, i.e. defined only inside that function.

Local Data?



Input Parameters & Return Values

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- The "placeholders" in the function definition: **formal parameters**.

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Formal Parameters

Actual Parameters

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- The ones in the function call: **actual parameters**.

Input Parameters & Return Values

```
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: '))
dTip = float(input('Enter dinner tip:' ))
dTotal = totalWithTax(dinner, dTip)
print('Dinner total is', dTotal)
```

Formal Parameters

Actual Parameters

- Functions can have **input parameters**.
- Surrounded by parentheses, both in the function definition, and in the function call (invocation).
- The "placeholders" in the function definition: **formal parameters**.
- The ones in the function call: **actual parameters**.
- Functions can also **return values** to where it was called.

Challenge:

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):
        print("jam")
    return("day.")
prob4()
```

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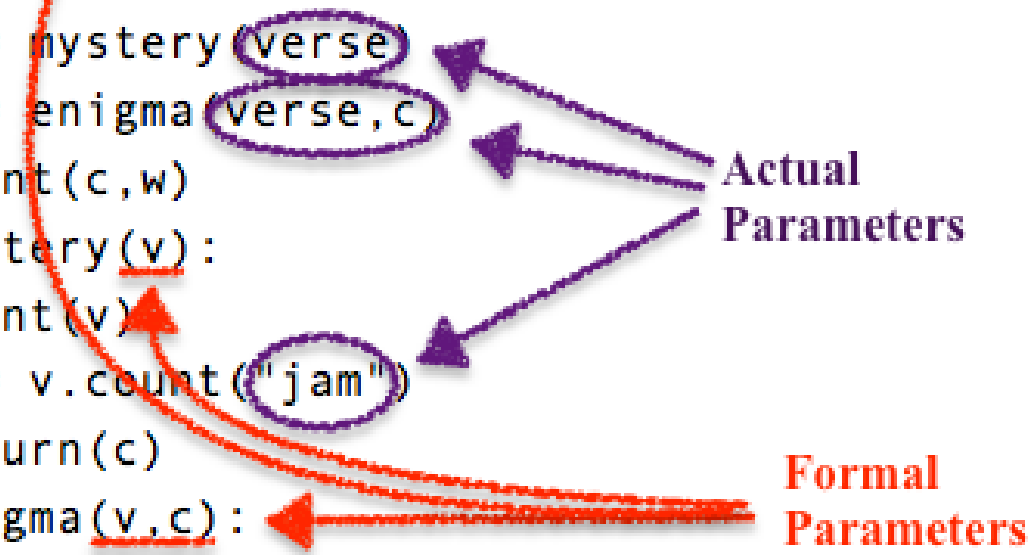

Challenge:

Predict what the code will do:

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Python Tutor

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```

(Demo with `pythonTutor`)

Challenge:

Predict what the code will do:

```
#Greet loop example

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

greetLoop("Thomas")
```

```
# From "Teaching with Python" by John Zelle

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

def sing(P):
    happy()
    happy()
    print("Happy Birthday dear " + P + "!")
    happy()


sing("Fred")
sing("Thomas")
sing("Hunter")
```

Python Tutor

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#Greet loop example

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sing("Fred")
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sing("Hunter")
```

(Demo with `pythonTutor`)

Challenge:

Fill in the missing code:

```
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: '))
    mString = monthString(n)
    print('The month is', mString)
```

IDLE

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def main():
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(Demo with IDLE)

Github

- 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

```
#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.

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- 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**

Accessing Structured Data: NYC Open Data

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- 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

EventID	EventType	StartDateTi...	EndDateTime	EnteredOn	EventAg...	ParkingHeld	Borou...
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
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
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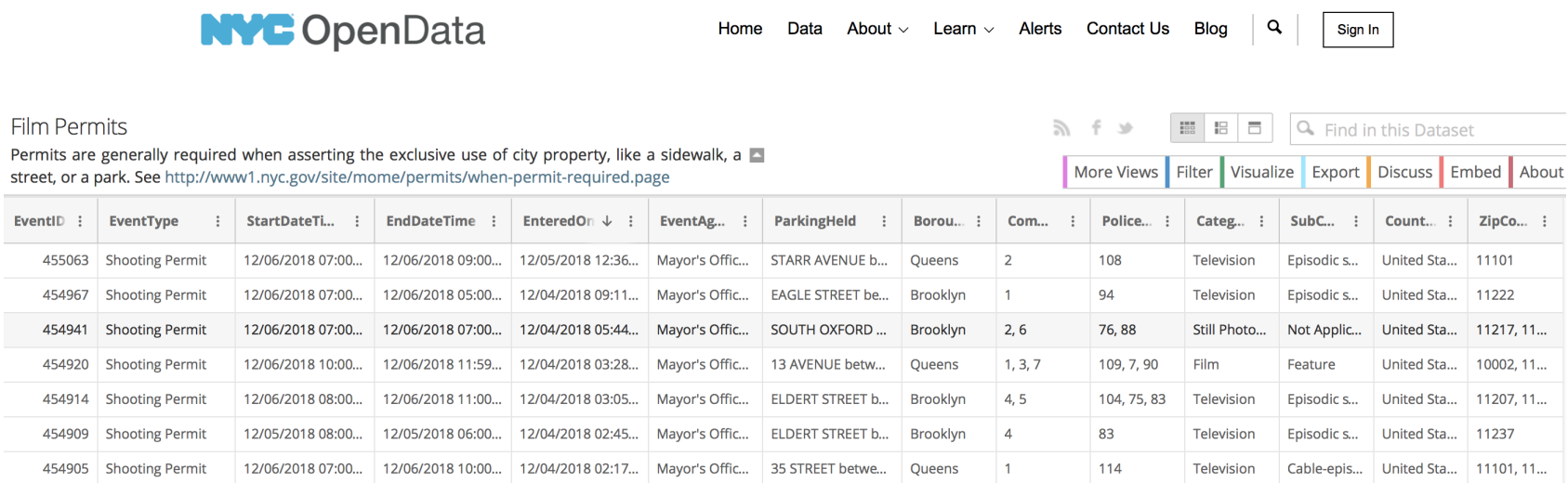
Example: OpenData Film Permits



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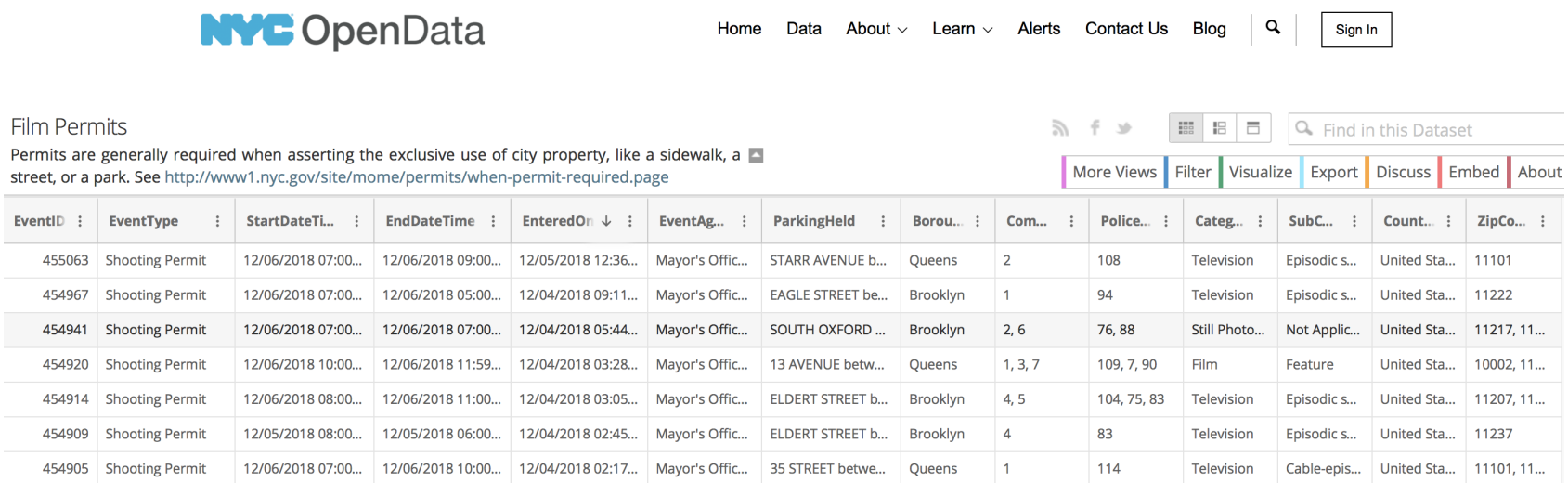
- What's the most popular street for filming?

Example: OpenData Film Permits



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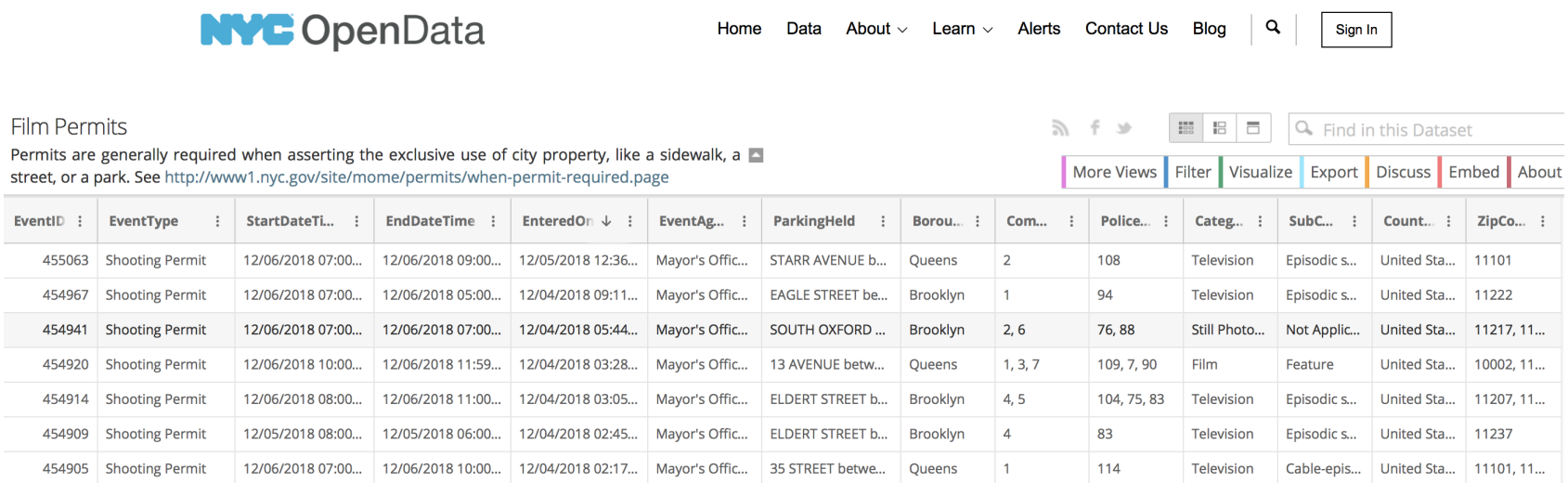
- What's the most popular street for filming?
- What's the most popular borough?

Example: OpenData Film Permits



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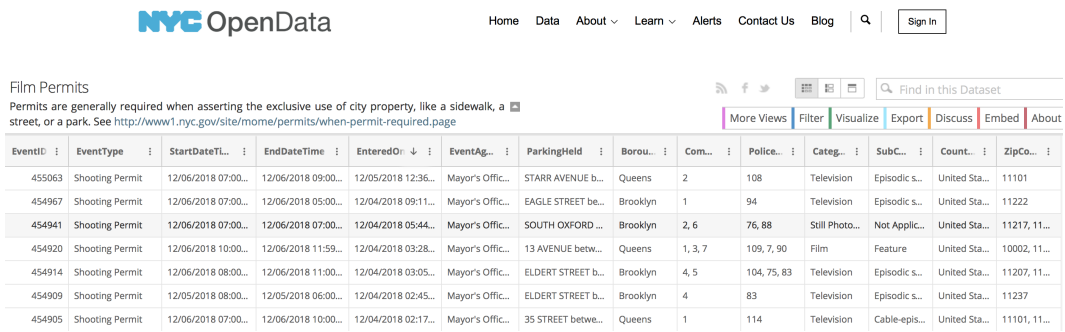
- What's the most popular street for filming?
- What's the most popular borough?
- How many TV episodes were filmed?

Example: OpenData Film Permits



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

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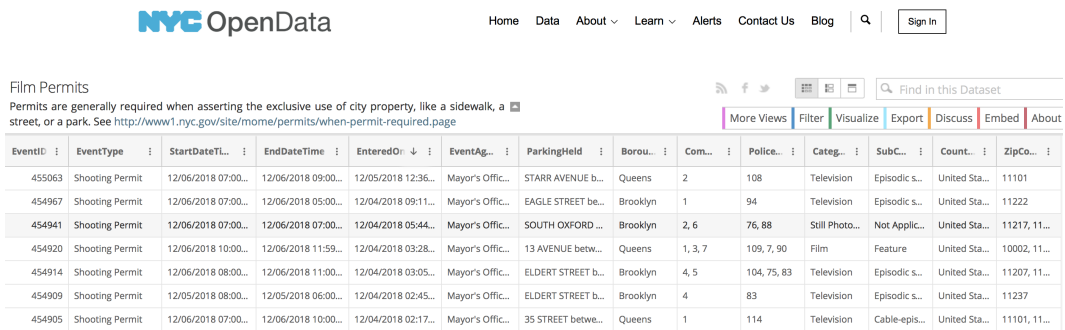

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- Python program:

```
#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
```

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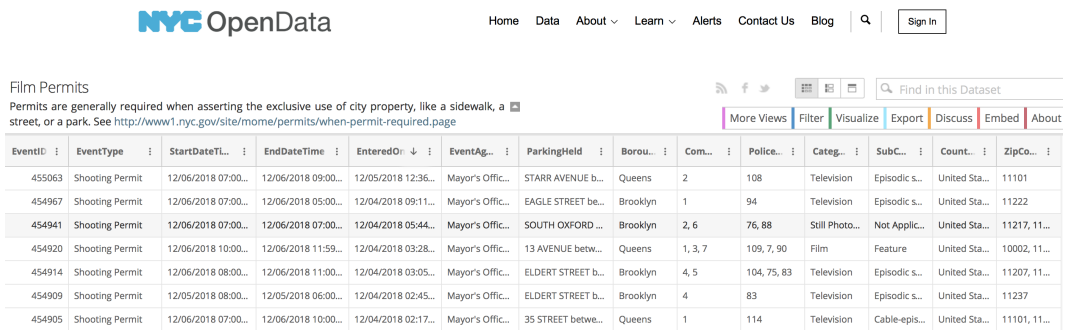

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print(tickets)                 #Print out the dataframe
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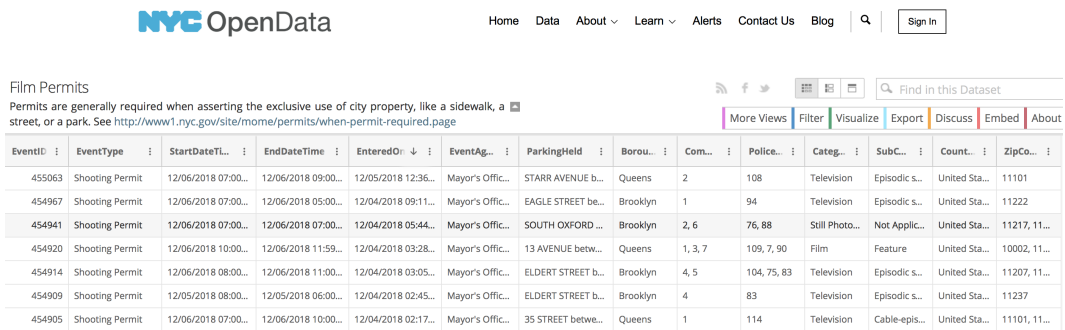

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#CSci 127 Teaching Staff
#March 2019
#OpenData Film Permits

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csvFile = "filmPermits.csv"    #Name of the CSV file
tickets = pd.read_csv(csvFile)#Read in the file to a dataframe
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print(tickets["ParkingHeld"]) #Print out streets (multiple times)
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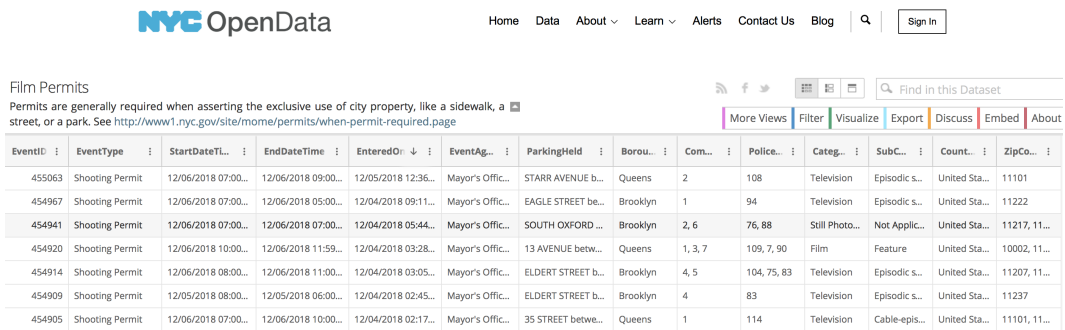
Example: OpenData Film Permits



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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	2	108	Television	Episodic s...	United Sta...	11101
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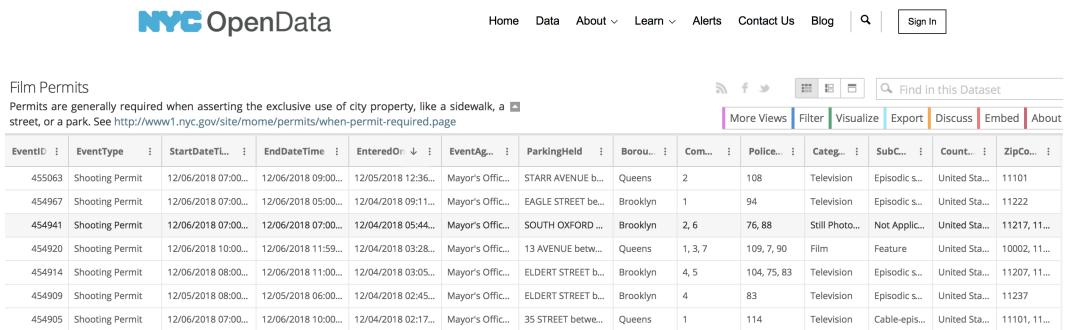

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print(tickets["ParkingHeld"].value_counts()) #Print out streets & number of times used
print(tickets["ParkingHeld"].value_counts()[:10])  #Print 10 most popular
```

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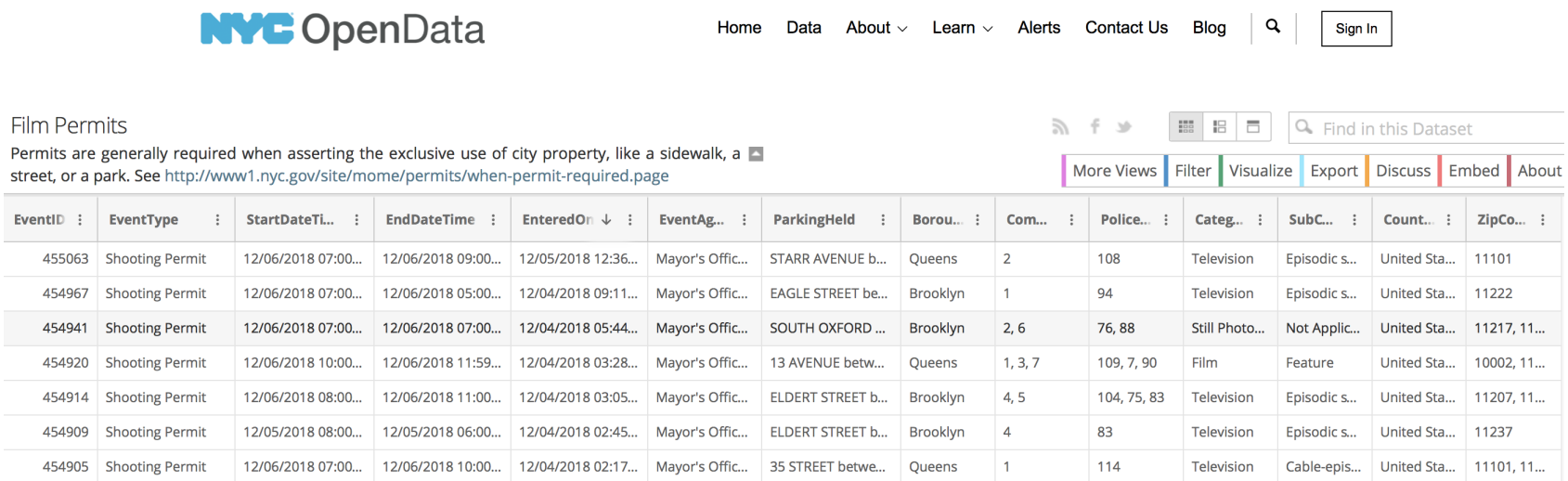

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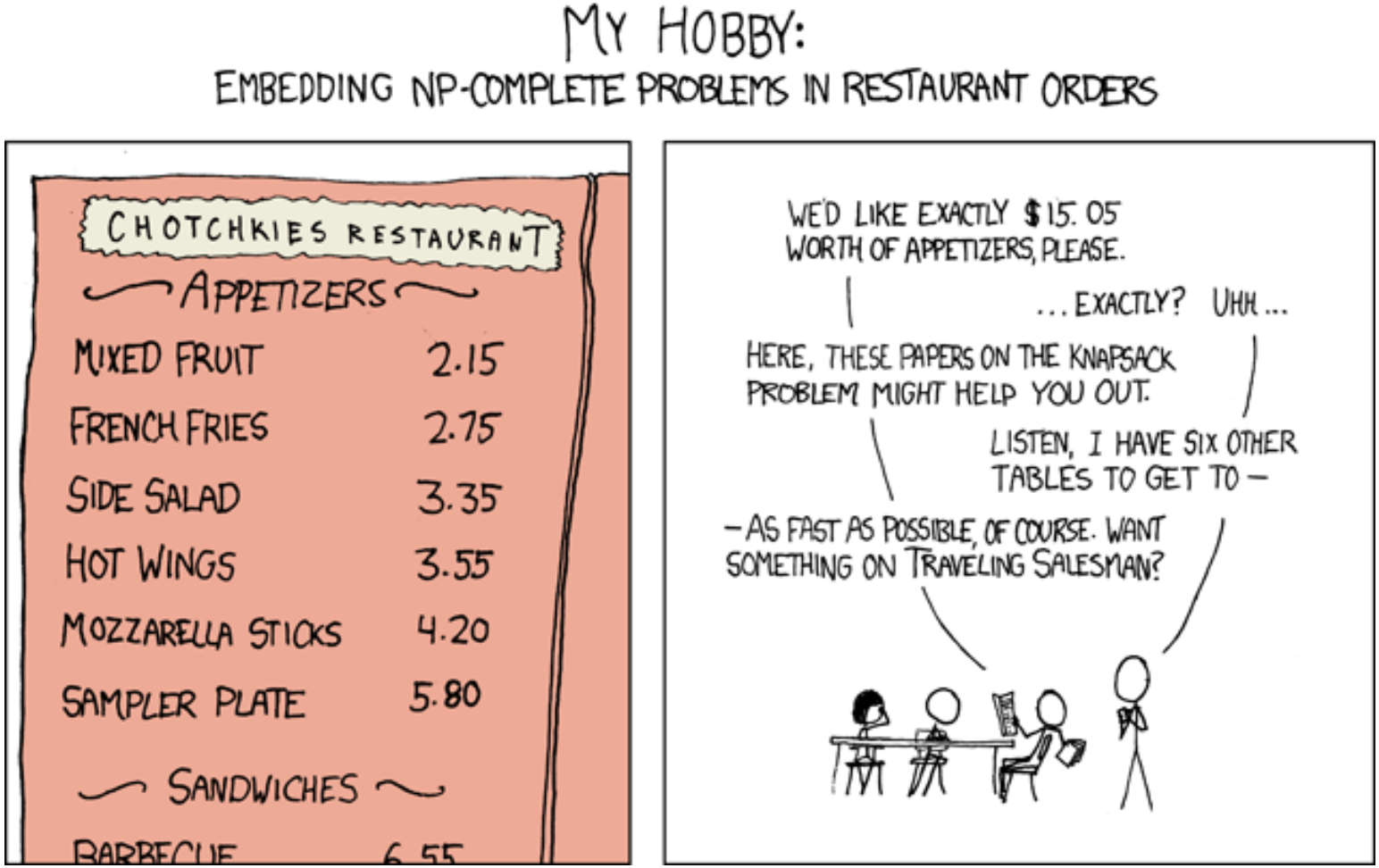
Can approach the other questions in the same way:

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

Design Challenge



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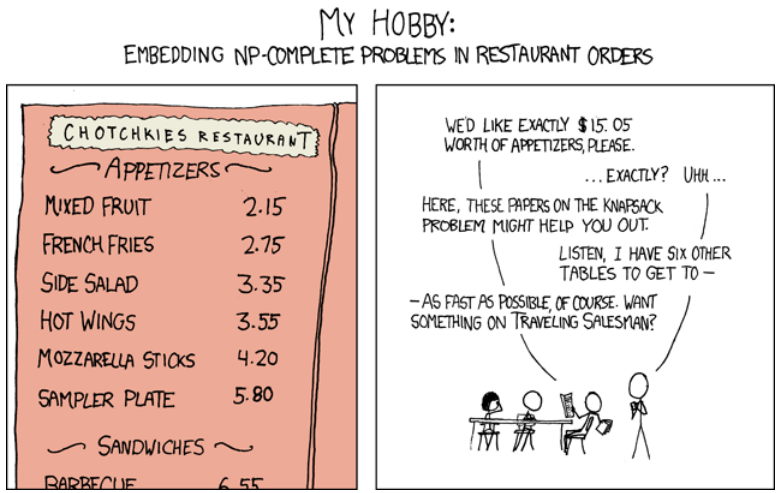

- Possible solutions:

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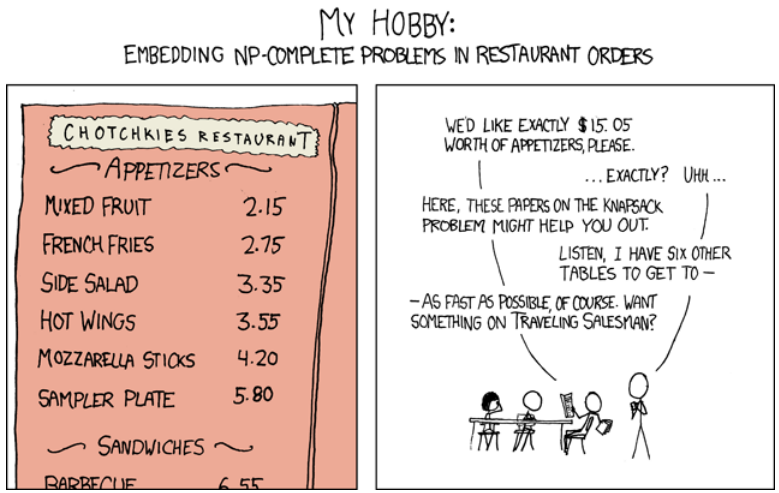

- Possible solutions:
  - 7 orders of mixed fruit, or

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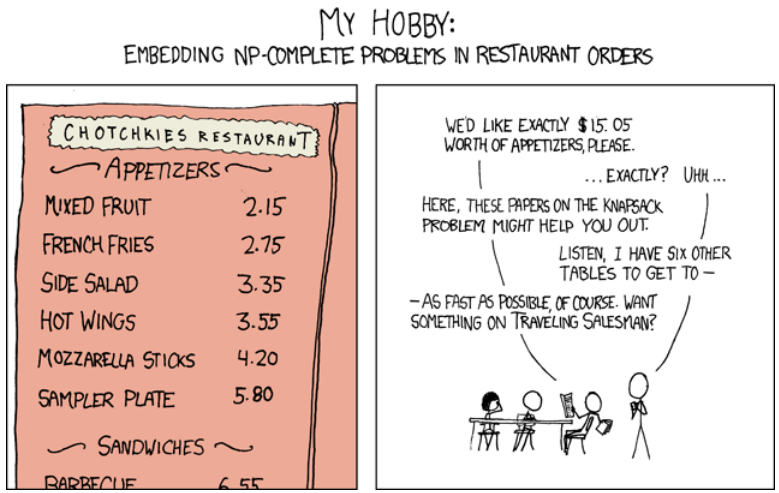

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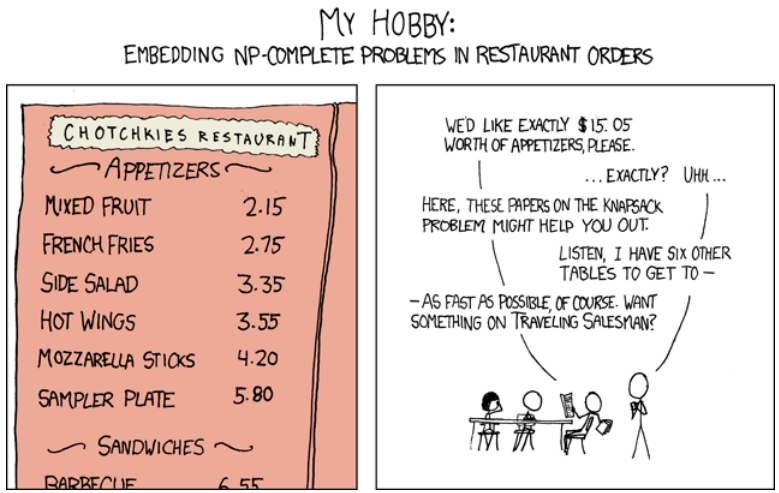

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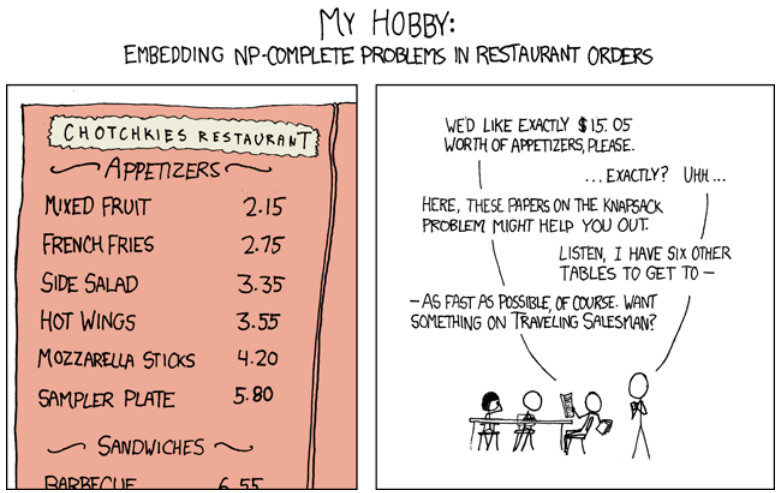

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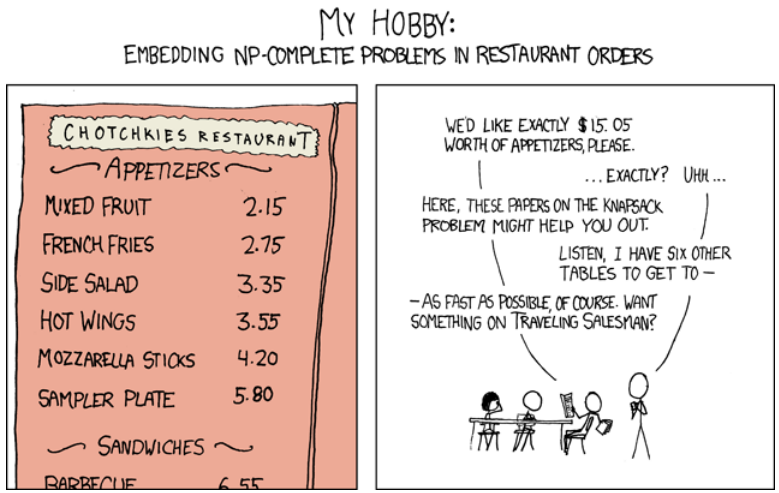

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- Possible algorithms: For each item on the list, divide total by price. If no remainder, return a list of that item. Repeat with two items, trying 1 of the first, 2 of the first, etc. Repeat with three items, etc.

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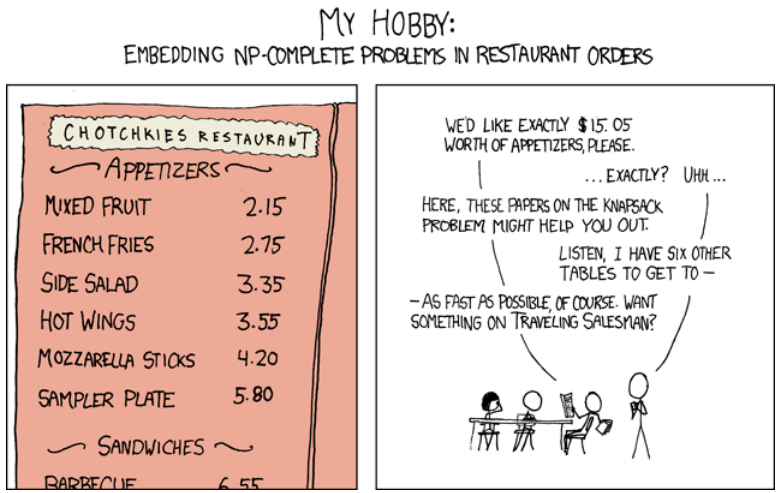

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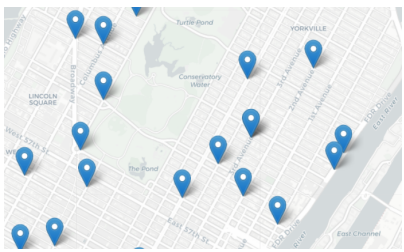
- "NP-Complete" problem: possible answers can be checked quickly, but not known how to compute quickly.

Recap



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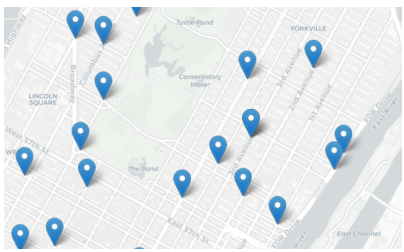

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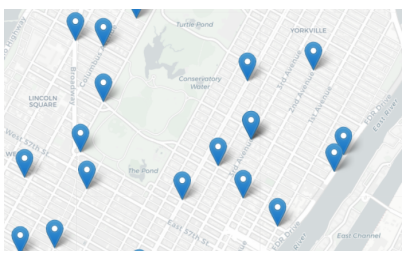

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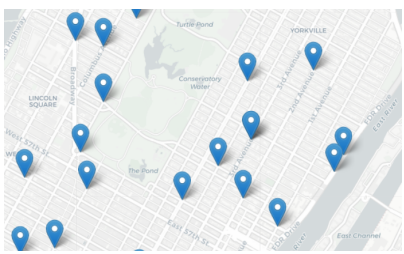

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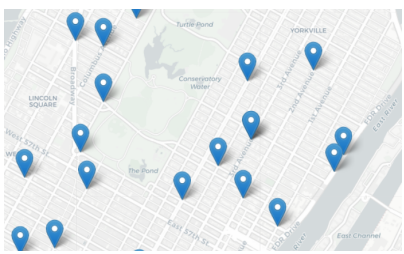

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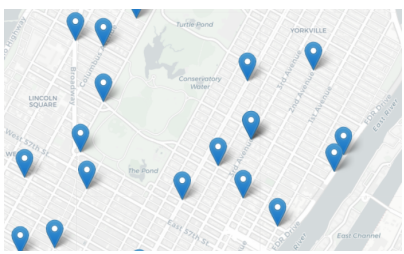

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- Accessing Formatted Data: NYC OpenData

Practice Quiz & Final Questions

```
#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()
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```
def totalWithTax(food,tip):
    total = 0
    tax = 0.0875
    total = food + food * tax
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    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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dTotal = totalWithTax(dinner, dTip)
print('Dinner total is', dTotal)
```

Formal Parameters

Actual 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)
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def enigma(v,c):
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- Lightning rounds:
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- Lightning rounds:
  - write as much you can for 60 seconds;
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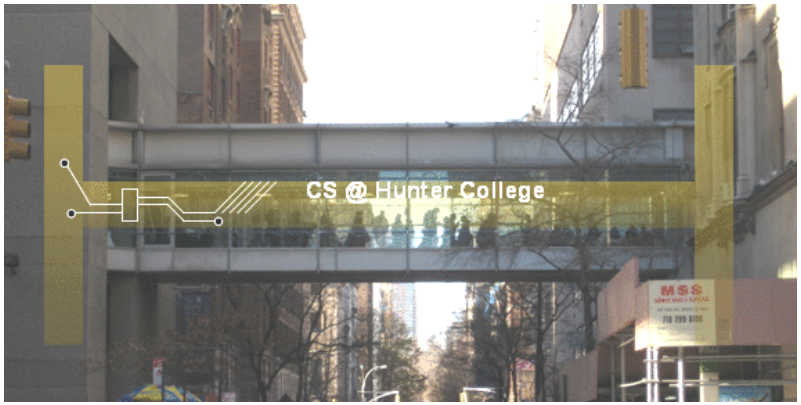
- Past exams are on the webpage (under Final Exam Information).
- Theme: Functions!
  Starting with Spring 19 V3, #4(b).

Weekly Reminders!



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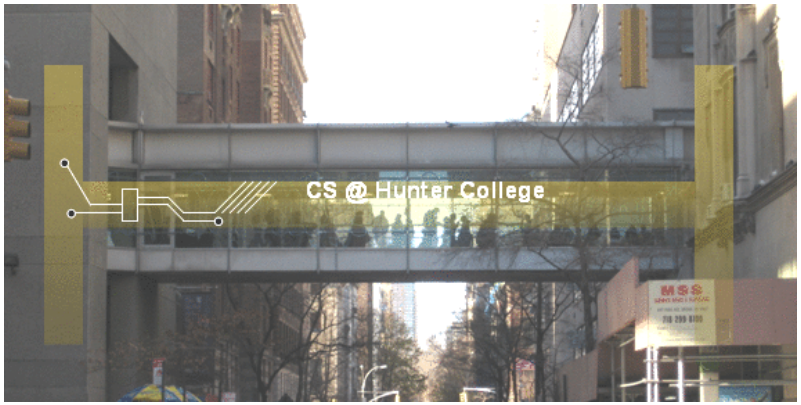

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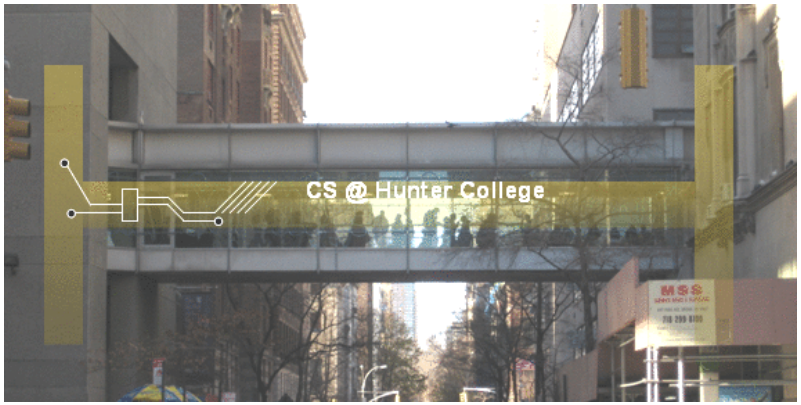

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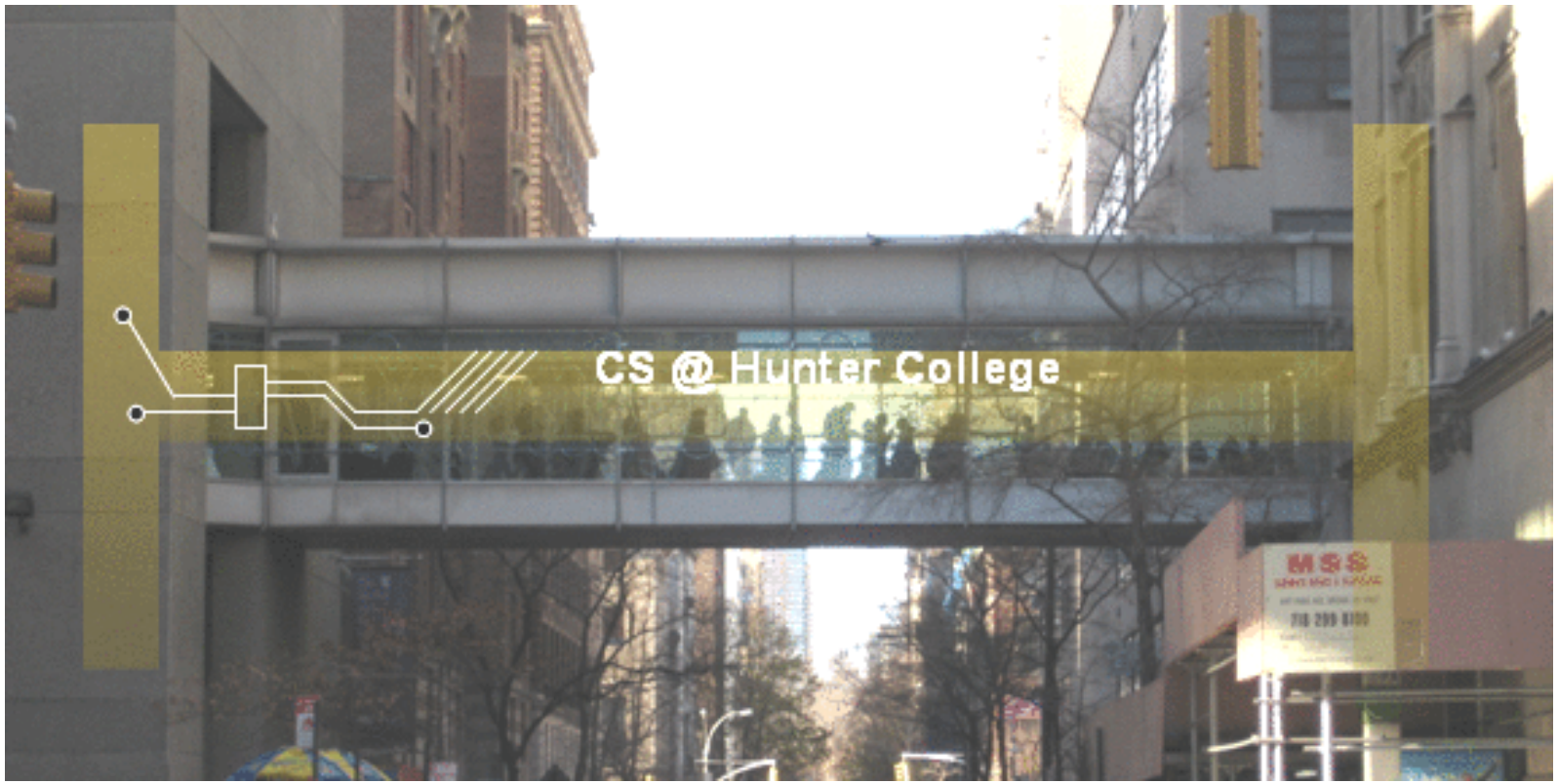
- If you need help, schedule an appointment for Tutoring in lab 1001E 11am-5pm
- Take the Lecture Preview on Blackboard on Monday (or no later than 10am on Tuesday)

Lecture Slips & Writing Boards



- Hand your lecture slip to a UTA.
- Return writing boards as you leave.