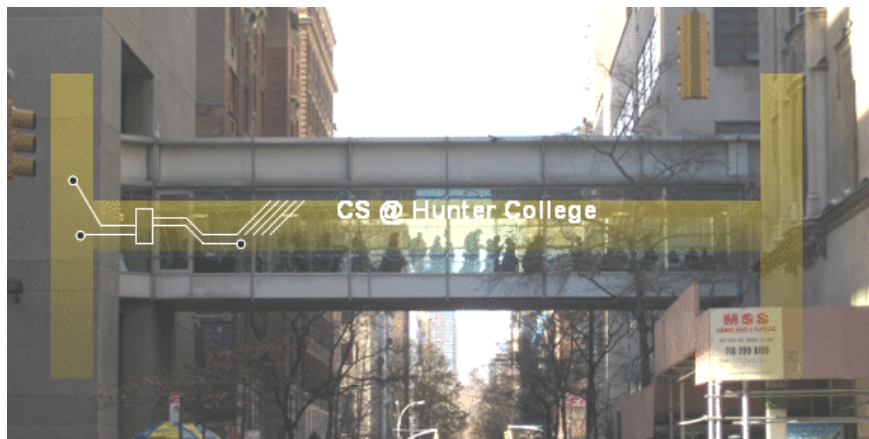


CSCI 127: Introduction to Computer Science



hunter.cuny.edu/csci

Today's Topics



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

Functions

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

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#Name: your name here
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Example: `print("Hello", "World")`

Functions

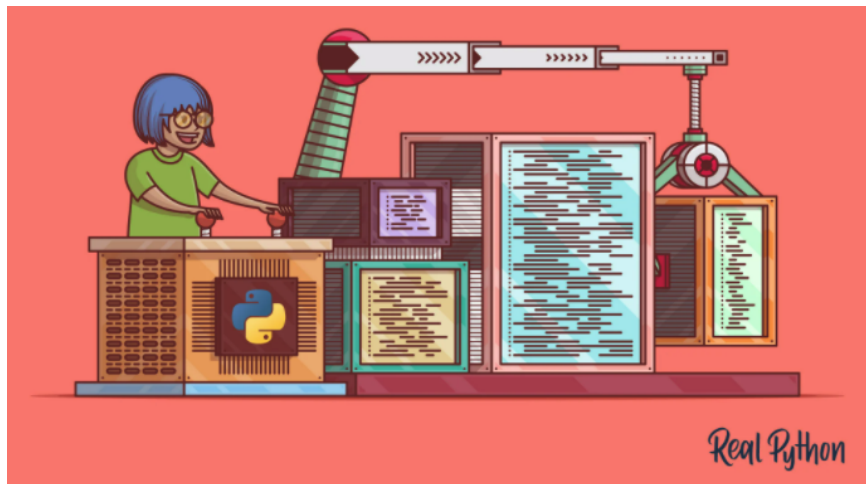
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- Functions are a way to break code into pieces, that can be easily reused.
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- Naming conventions same as variables
- You **call** or **invoke** a function by typing its name, followed by any inputs,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

Modularity



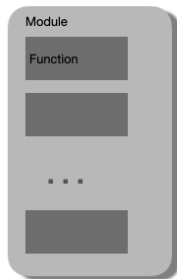
"Hello, World!" with Functions

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

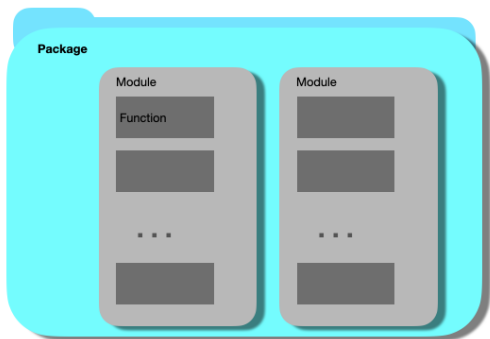
def main():
    print("Hello, World!")

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

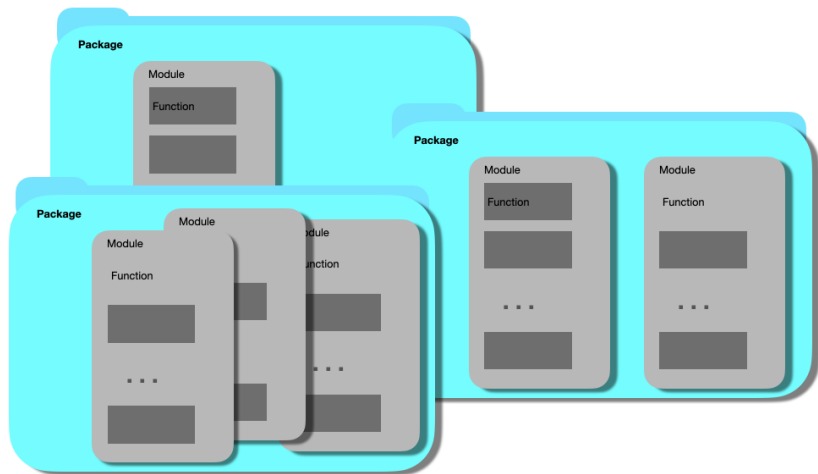
Modules and packages



Modules and packages



Modules and packages



Stand-alone program

```
Stand-alone program
#include mdl
[Redacted]
[Redacted]
...

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

Challenge: *Predict what the code will do*

```
def totalWithTax(food, tip):  
    tax = 0.1 * food  
    return(food + tax + tip)  
  
lunch = float(input("Enter lunch total: "))  
l_tip = float(input("Enter lunch tip: " ))  
l_total = totalWithTax(lunch, l_tip)  
print("Lunch total is", l_total)
```

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Scope

```
def eight():  
    x = 5+3  
    print(x)  
  
def nine():  
    x = "nine"  
    print(x)
```

- You can have multiple functions.

Scope

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- Each function defines the **scope** of its local variables

Scope

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```

- You can have multiple functions.
- Each function defines the **scope** of its local variables
- A variable defined inside a function is **local**, i.e. defined only inside that function.

Input Parameters & Return Values

- Functions can have **input parameters**.

```
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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- The “placeholders” in the function definition: **formal parameters**.

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Formal Parameters

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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: *Predict what the code will do:*

```
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.")
```

Challenge: *Predict what the code will do:*

```
def prob4():  
    verse = "jam tomorrow and jam yesterday,"  
    print("The rule is,")  
    c = mystery(verse)  
    w = enigma(verse,c)  
    print(c,w)
```

prob4()

GitHub

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



Octocat

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- Used to collaborate on and share code, documents, etc.
- Supporting Open-Source Software: original source code is made freely available and may be redistributed and modified.

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- More formally: `git` is a version control protocol for tracking changes and versions of documents.

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- GitHub provides hosting for repositories (**'repos'**) of code.
- Also a convenient place to host websites (e.g. `huntercsci127.github.io`).

Recap: Functions

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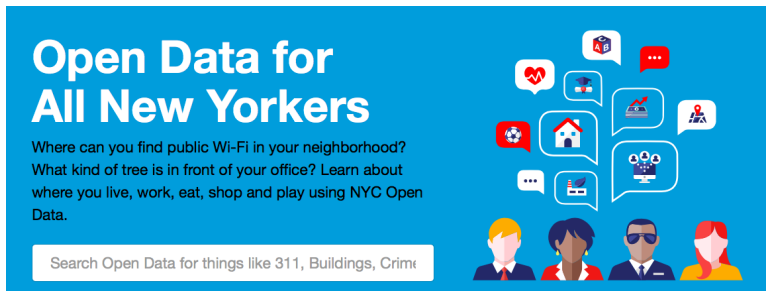
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Today's Topics



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

Accessing Structured Data: NYC Open Data

A promotional graphic for NYC Open Data. It features a blue background with the title "Open Data for All New Yorkers" in large white text. Below the title is a paragraph of text: "Where can you find public Wi-Fi in your neighborhood? What kind of tree is in front of your office? Learn about where you live, work, eat, shop and play using NYC Open Data." At the bottom left is a white search bar with the text "Search Open Data for things like 311, Buildings, Crim". On the right side, there are several speech bubbles containing icons for various data categories: a heart with a pulse line, a graduation cap, a house, a soccer ball, a bar chart with an upward arrow, a location pin, a group of people, and a Wi-Fi symbol. At the bottom right, there are four stylized human figures representing diverse people.

- 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.

Today's Topics



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

Images and Arrays

```
import matplotlib.pyplot as plt
import numpy as np
height= 20
width = 30

#An image is an array with height, width and
#depth 3 for the red, green, and blue channels
img = np.zeros((height, width, 3))
img[:height//2, :width//2, 0] = 1 #upper left corner
```

Images and Arrays (cont.)

```
img[height//2:, :width//2, 1] = 1 #lower left corner
```

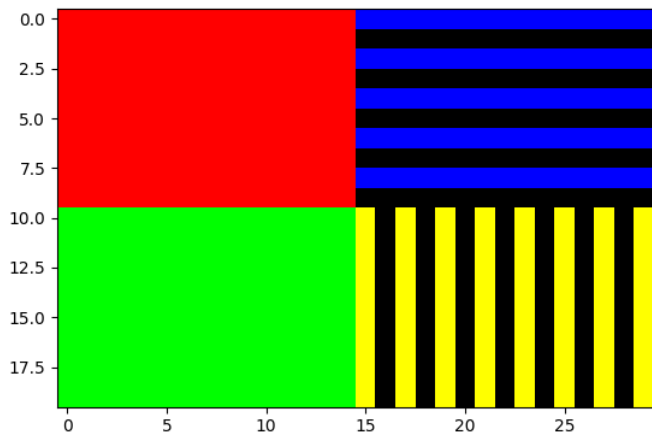
```
img[:height//2:2, width//2:, 2] = 1 #upper right corner
```

```
img[height//2:, width//2::2, :2] = 1 #lower right corner
```

```
plt.imshow(img)
```

```
plt.show()
```

output for the above program

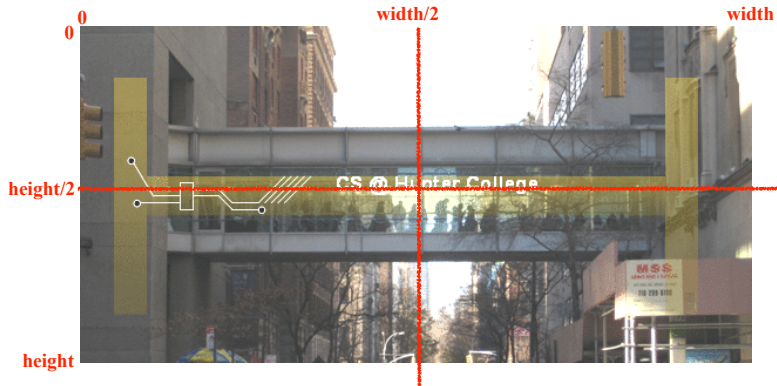


Review: Cropping Images

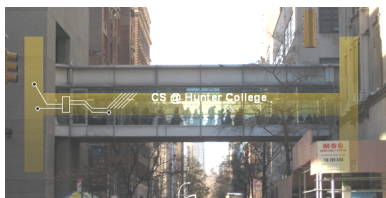
```
import matplotlib.pyplot as plt
import numpy as np
img = plt.imread('csBridge')
plt.imshow(img)
plt.show()
height = img.shape[0]
width = img.shape[1]
img2 = img[:height//2, :width//2]
plt.imshow(img2)
plt.show()
```



Review: Cropping Images



Weekly Reminders!



Before next lecture, don't forget to:

- Work on this week's Online Lab
- Schedule an appointment to take the Quiz in lab 1001G Hunter North
- If you haven't already, schedule an appointment to take the Code Review (**one every week**) in lab 1001G Hunter North
- Submit this week's programming assignments
- If you need help, schedule an appointment for Tutoring in lab 1001G 11:30am-5:30pm
- Take the Lecture Preview on Blackboard on Monday (or no later than 10:15am on Tuesday)

Lecture Slips & Writing Boards



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