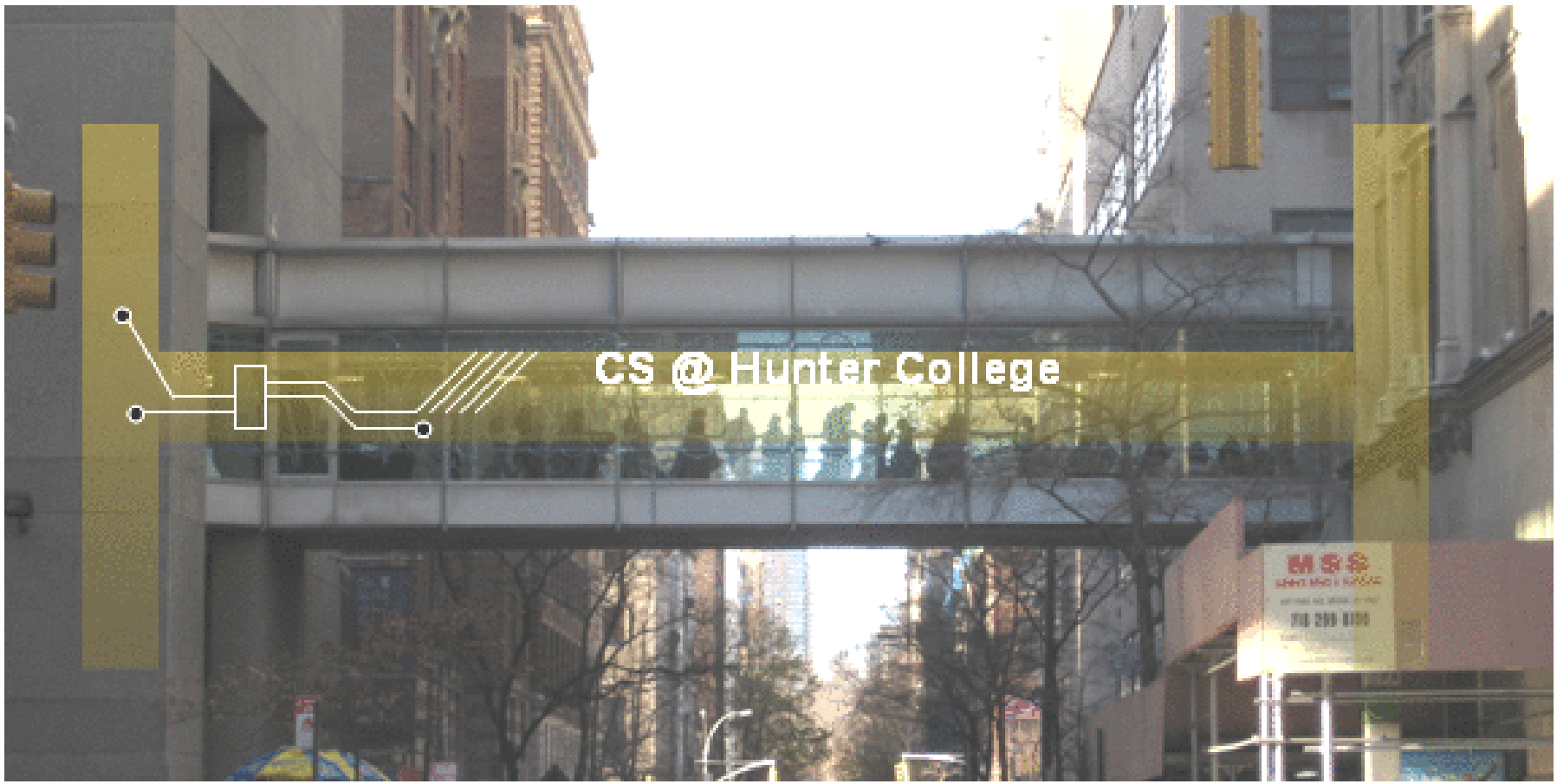
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

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  - Do the associated reading.
- Each lecture includes a survey of computing research and tech in NYC.

  Today: Prof. Susan Epstein
  Artificial Intelligence

Today's Topics

- Recap: folium & koalas
- Indefinite Loops
- Searching Data
- Random Numbers

folium

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- An extra step:

Write code. → *Run program.* → *Open .html in browser.*

From Last Time: folium example

What does this code do?

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import folium
import pandas as pd

cuny = pd.read_csv('cunyLocations.csv')
mapCUNY = folium.Map(location=[40.75, -74.125])

for index,row in cuny.iterrows():
    lat = row["Latitude"]
    lon = row["Longitude"]
    name = row["Campus"]
    if row["College or Institution Type"] == "Senior Colleges":
        collegeIcon = folium.Icon(color="purple")
    else:
        collegeIcon = folium.Icon(color="blue")
    newMarker = folium.Marker([lat, lon], popup=name, icon=collegeIcon)
    newMarker.add_to(mapCUNY)

mapCUNY.save(outfile='cunyLocationsSenior.html')
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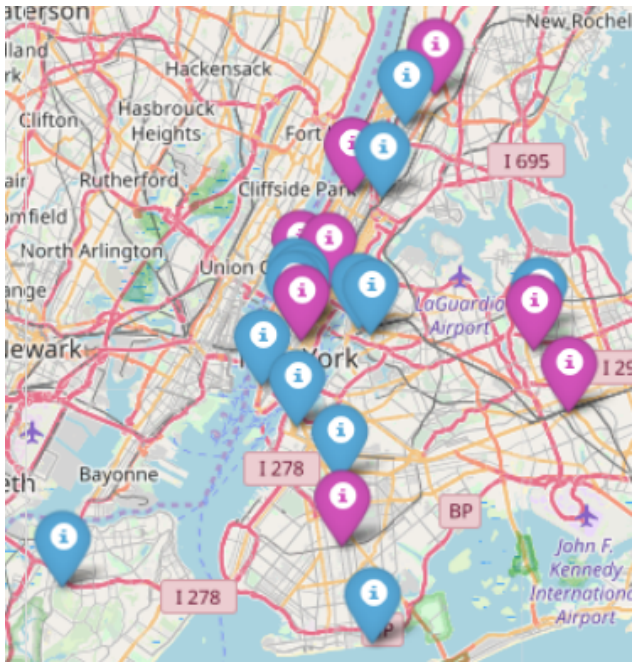

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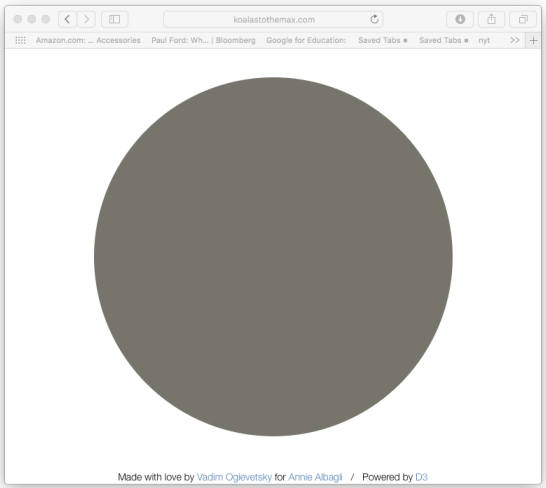

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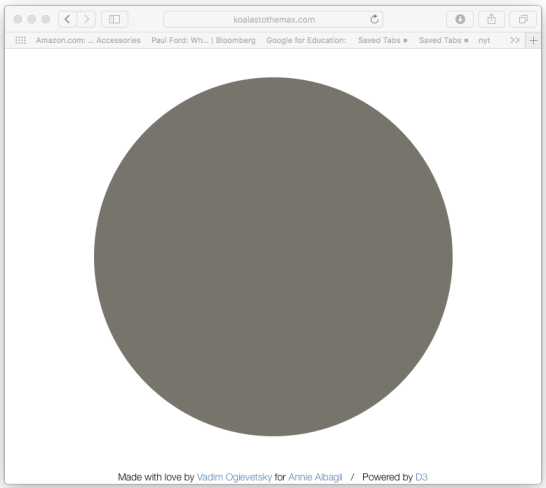

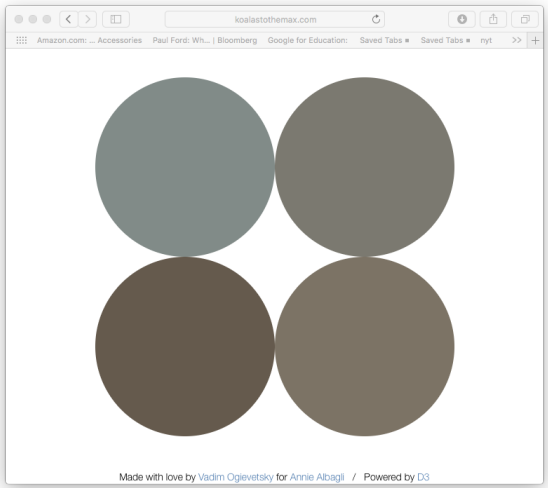

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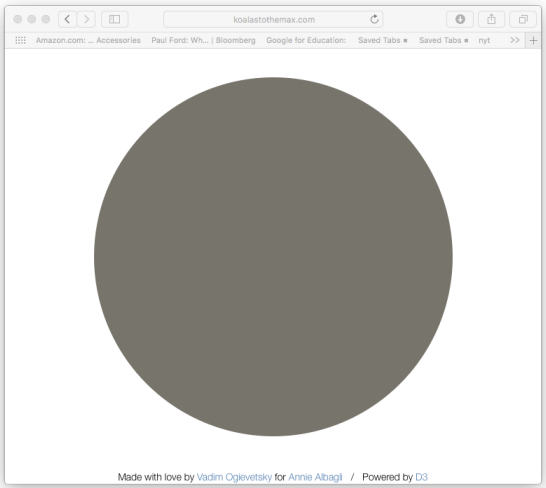

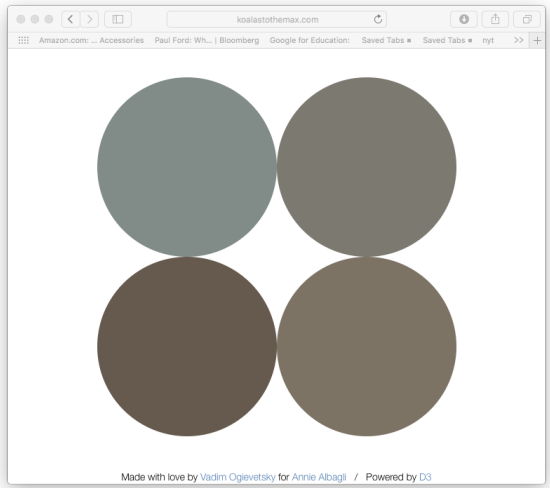

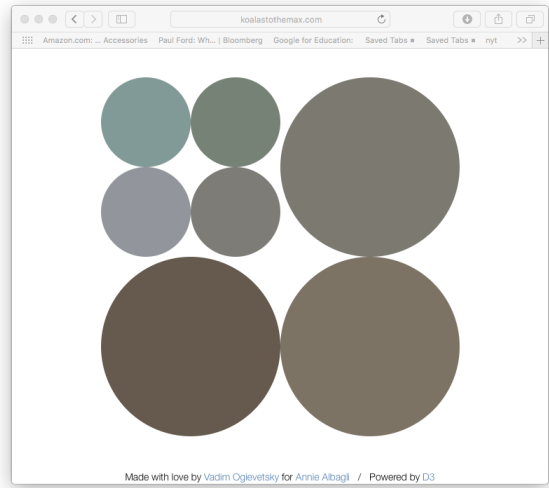

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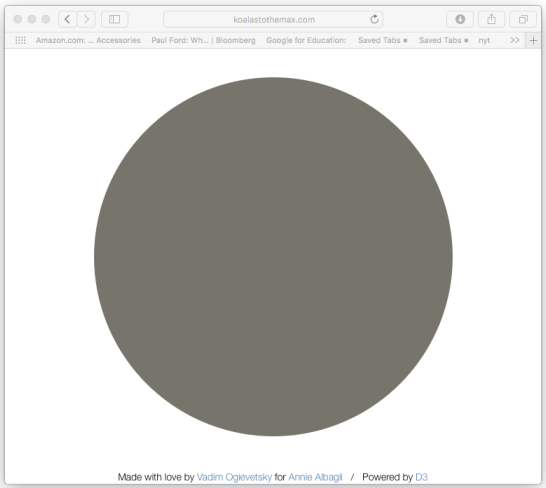

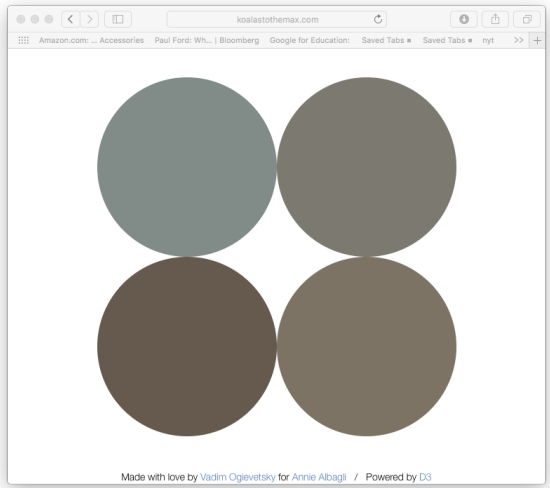

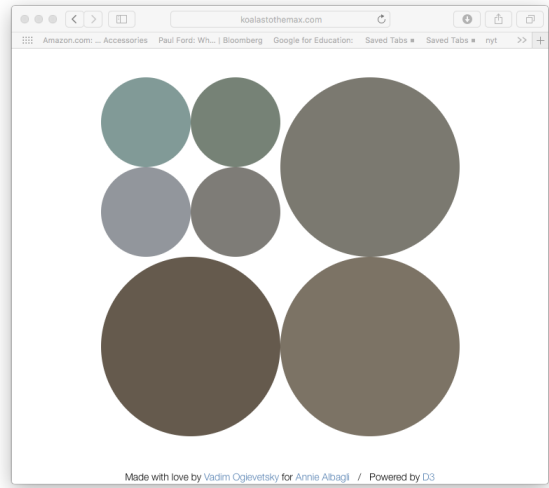

`http://koalastothemax.com`

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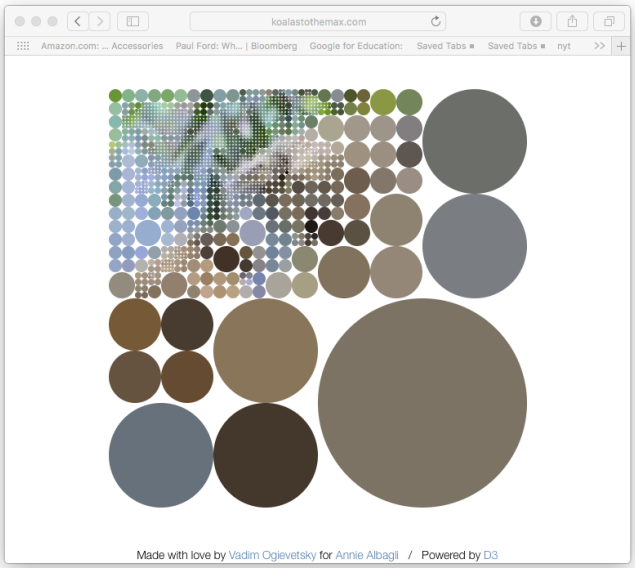

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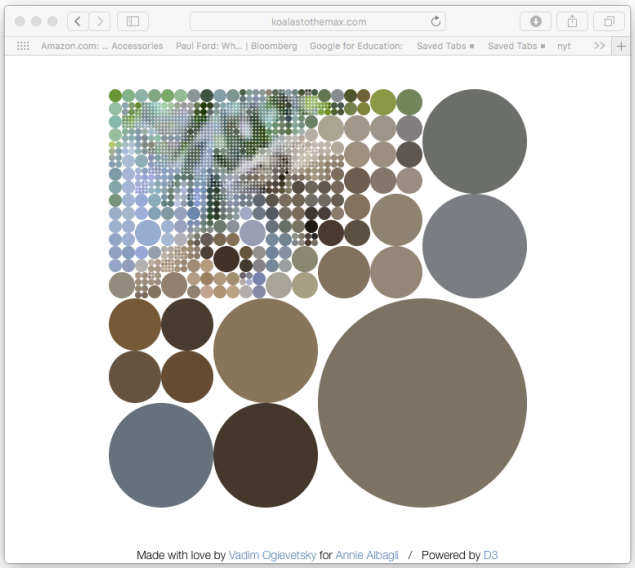

- Top-down design puzzle:
  - What does `koalastomax` do?
  - What does each circle represent?
- Write a high-level design for it.
- Translate into a `main()` with function calls.

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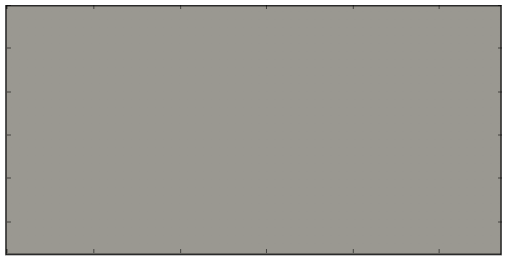

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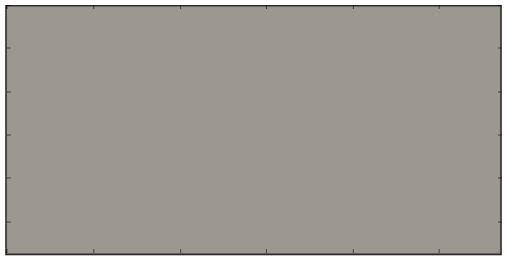

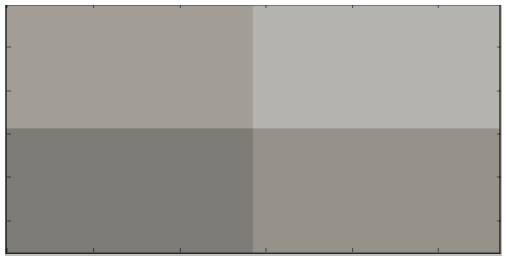

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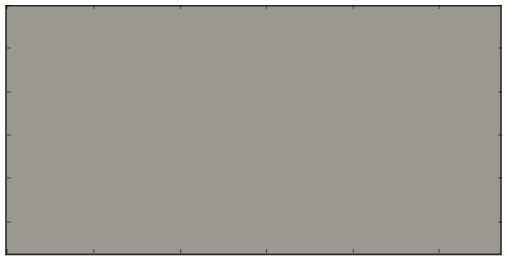
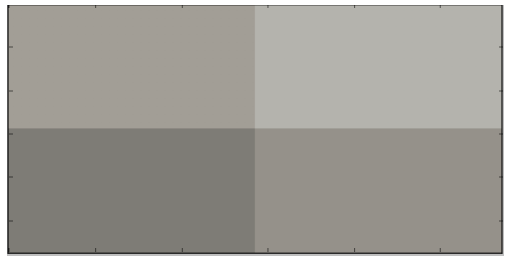
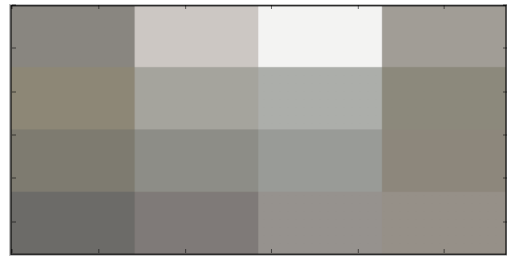

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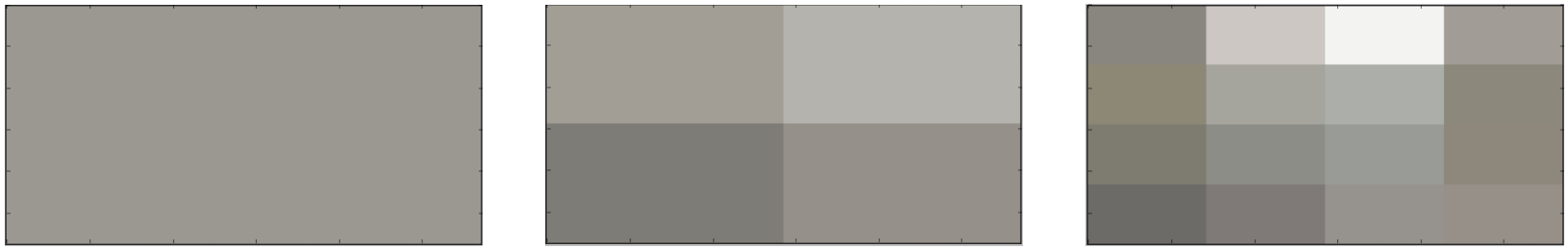

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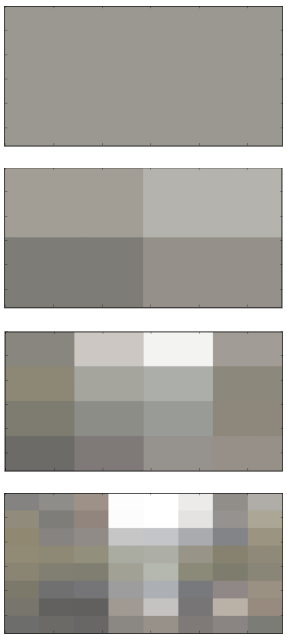

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70      inFile = input('Enter image file name: ')
71      img = plt.imread(inFile)
72
73      #Divides the image in 1/2, 1/4, 1/8, ... 1/2^8, and displays each:
74      for i in range(8):
75          img2 = img.copy()   #Make a copy to average
76          quarter(img2,i)     #Split in half i times, and average regions
77
78          plt.imshow(img2)    #Load our new image into pyplot
79          plt.show()          #Show the image (waits until closed to continue)
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81      #Shows the original image:
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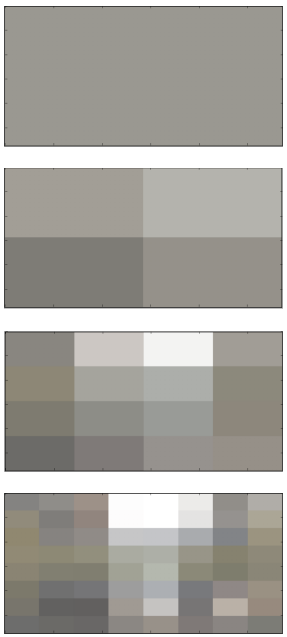

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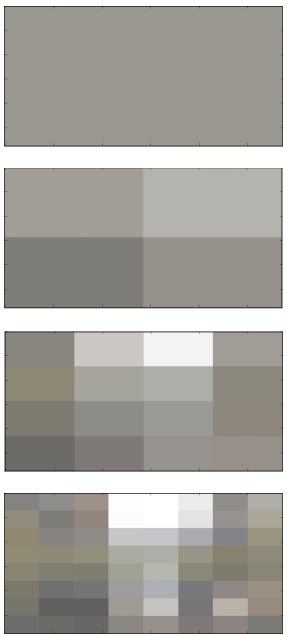

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- The `main()` is written for you.
- Only fill in two functions: `average()` and `setRegion()`.

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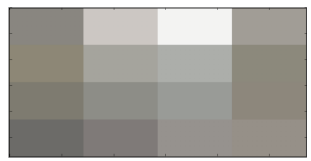
Process:






Get template from `github` → Fill in missing functions → Test locally idle3/python3 → Submit to Gradescope

In Pairs or Triples:

Predict what the code will do:

```
dist = int(input('Enter distance: '))
while dist < 0:
    print('Distances cannot be negative.')
    dist = int(input('Enter distance: '))

print('The distance entered is', dist)
```

```
#Spring 2012 Final Exam, #8

nums = [1,4,0,6,5,2,9,8,12]
print(nums)
i=0
while i < len(nums)-1:
    if nums[i] < nums[i+1]:
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Python Tutor

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(Demo with pythonTutor)

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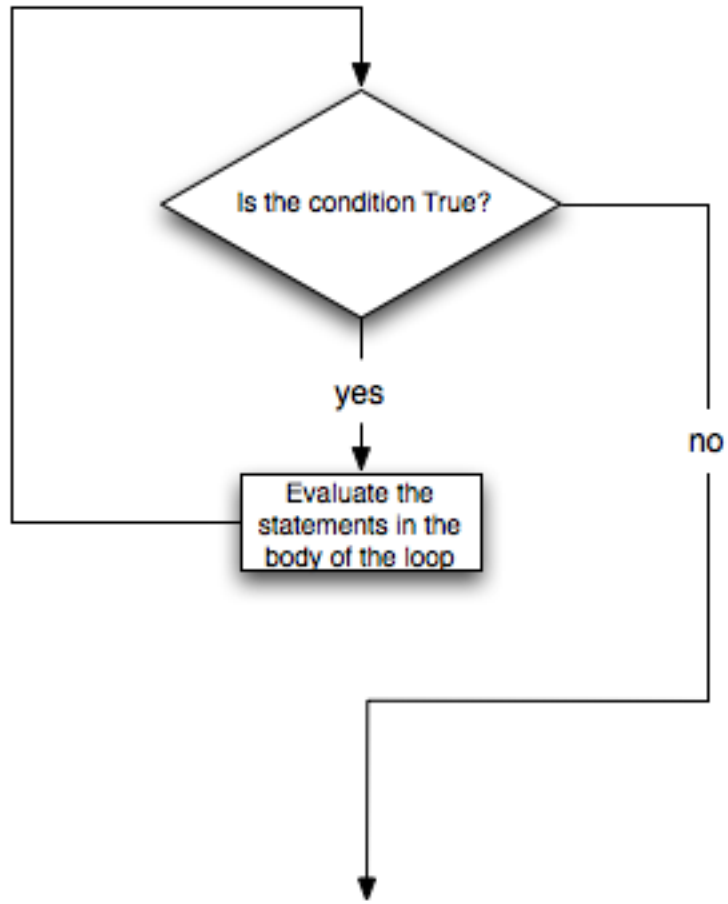

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- Indefinite loops repeat as long as the condition is true.
- Could execute the body of the loop zero times, 10 times, infinite number of times.
- The condition determines how many times.
- Very useful for checking input, simulations, and games.

In Pairs or Triples:

Answer the following questions on your lecture slip:

Of the students in the room,

- Whose name comes first alphabetically?
- Whose name comes last alphabetically?
- Is there someone in the room with your initials?

In Pairs or Triples:

Design a program that takes a CSV file and a set of initials:

- Whose name comes first alphabetically?
- Whose name comes last alphabetically?
- Is there someone in the room with your initials?

Design Question: Find first alphabetically

- In Pandas, lovely built-in functions:

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  - `df.sort_values('First Name')` and
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- In Pandas, lovely built-in functions:
  - `df.sort_values('First Name')` and
  - `df['First Name'].min()`
- What if you don't have a CSV and DataFrame, or data not ordered?

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  - Set a variable to worst value (i.e. `maxN = 0` or `first = "ZZ"`).

Design Question: Find first alphabetically

- What if you don't have a CSV and DataFrame, or data not ordered?
- Useful *Design Pattern*: min/max
  - Set a variable to worst value (i.e. `maxN = 0` or `first = "ZZ"`).
  - For each item, X, in the list:

Design Question: Find first alphabetically

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  - Set a variable to worst value (i.e. `maxN = 0` or `first = "ZZ"`).
  - For each item, X, in the list:
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    - ★ If better, update your variable to be X.

Design Question: Find Matching Initials

- How do we stop, if we find a match?

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- How do we stop, if we find a match?
- Change the loop to be indefinite (i.e. `while` loop):
  - Set a variable to `found = False`

Design Question: Find Matching Initials

- How do we stop, if we find a match?
- Change the loop to be indefinite (i.e. `while` loop):
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Design Question: Find Matching Initials

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    - ★ If item matches your value, set `found = True`

In Pairs or Triples:

- *Predict what the code will do:*

```
nums = [1,4,10,6,5,42,9,8,12]

maxNum = 0
for n in nums:
    if n > maxNum:
        maxNum = n
print('The max is', maxNum)
```

```
def search(nums, locate):
    found = False
    i = 0
    while not found and i < len(nums):
        print(nums[i])
        if locate == nums[i]:
            found = True
        else:
            i = i+1
    return(found)

nums= [1,4,10,6,5,42,9,8,12]
if search(nums,6):
    print('Found it! 6 is in the list!')
else:
    print('Did not find 6 in the list.')
```

Python Tutor

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nums = [1,4,10,6,5,42,9,8,12]

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(Demo with `pythonTutor`)

In Pairs or Triples:

- Write a function that asks a user for number after 2000 but before 2018. The function should repeatedly ask the user for a number until they enter one within the range and return the number.

Coding

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def getYear():
    num = 0
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Coding

- Write a function that asks a user for number after 2000 but before 2018. The function should repeatedly ask the user for a number until they enter one within the range and return the number.

```
def getYear():
    num = 0
    while num <= 2000 or num >= 2018:
        num = int(input('Enter a number > 2000 & < 2018'))

    return(num)
```

Python's random package

- Python has a built-in package for generating pseudo-random numbers.

```
import turtle
import random

trey = turtle.Turtle()
trey.speed(10)

for i in range(100):
  trey.forward(10)
  a = random.randrange(0,360,90)
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  which gives a number chosen (uniformly) at random from [0.0,1.0).
- Very useful for simulations, games, and testing.

Trinket

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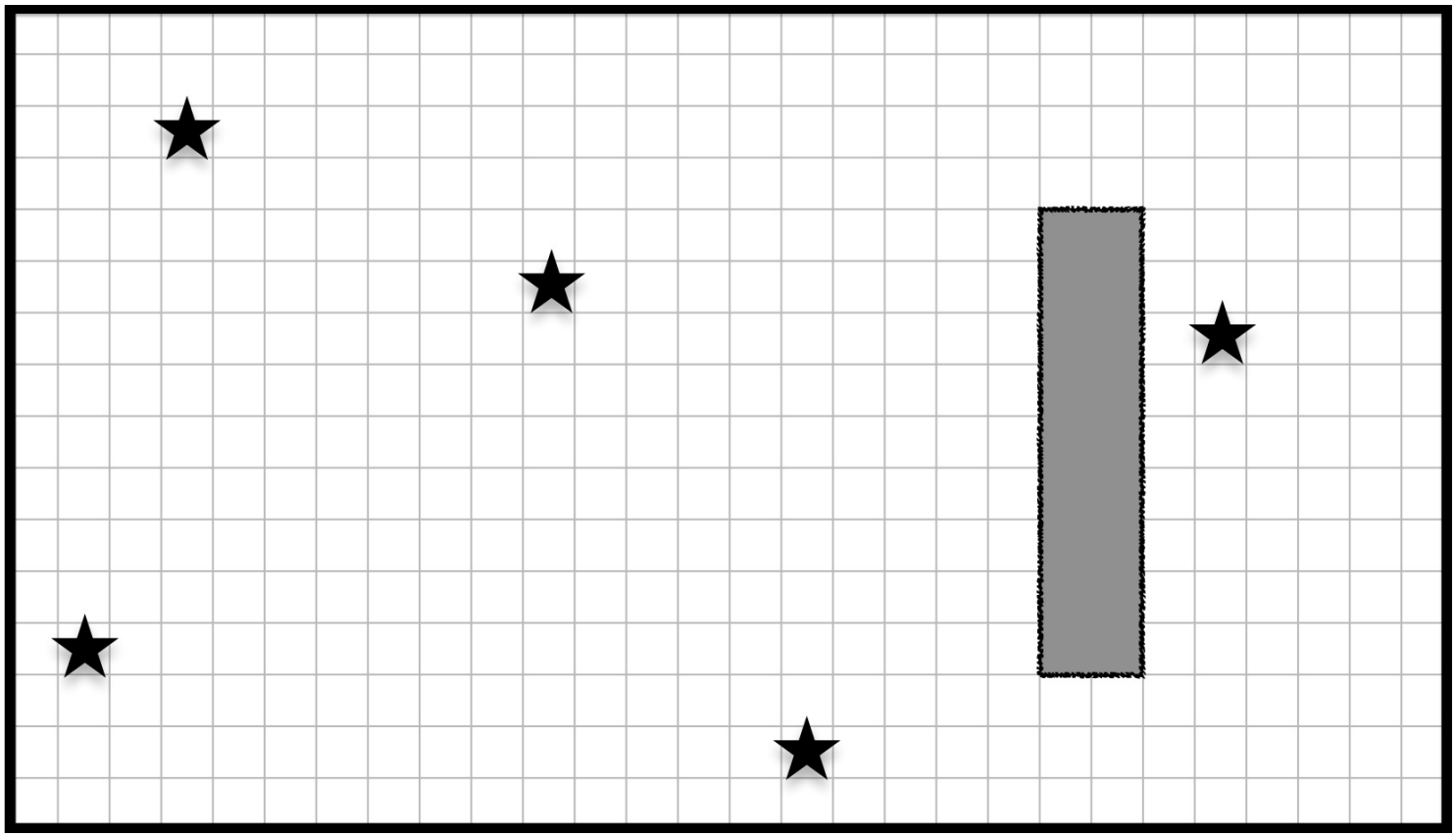
(Demo turtle random walk)

CS Survey Talk

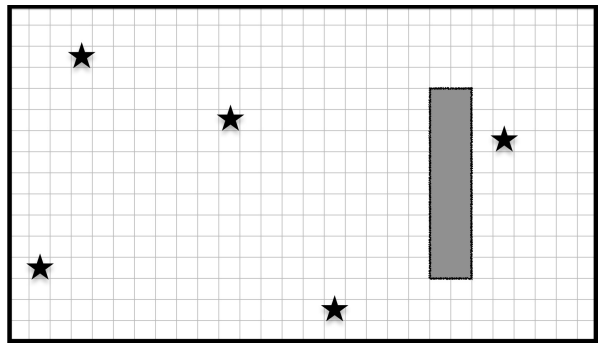
Prof. Susan Epstein
(Machine Learning)

Design Challenge

Collect all five stars (locations randomly generated):

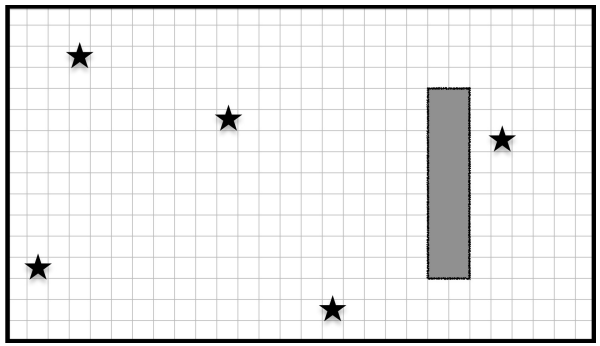


Design Challenge



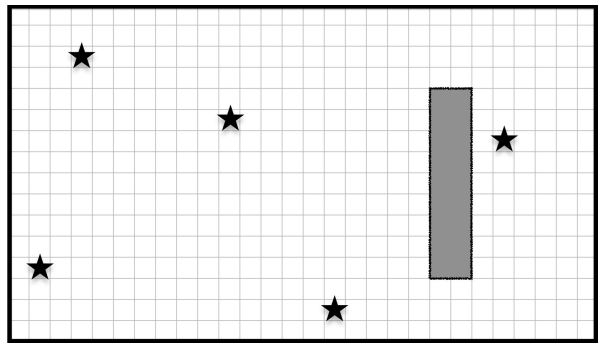
- Possible approaches:

Design Challenge



- Possible approaches:
  - Randomly wander until all 5 collected, or

Design Challenge



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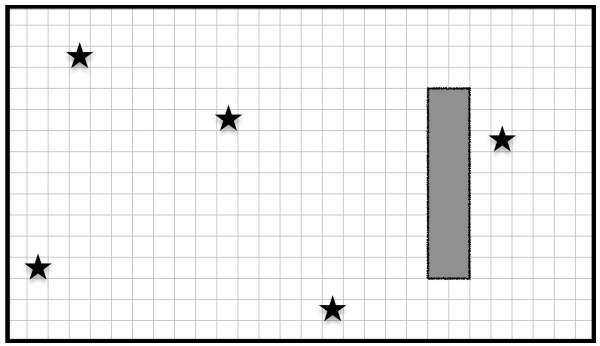

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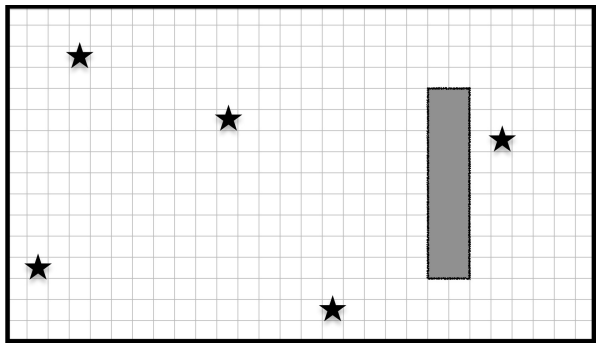

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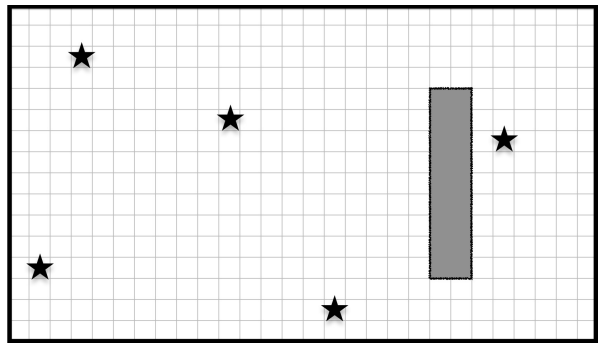

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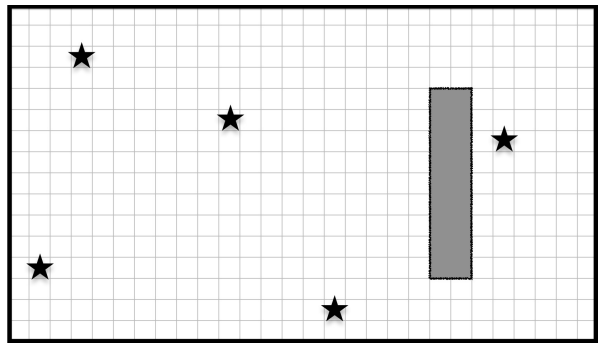

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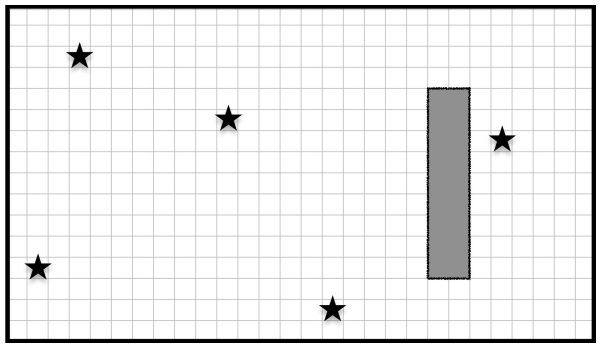

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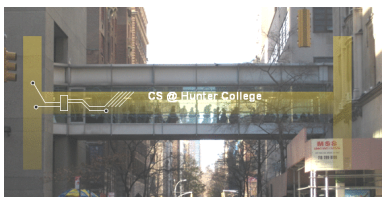
- How to store locations? Use `numpy` array with -1 everywhere.
- Possible algorithms: while numStars < 5:
  - Move forward.
  - If wall, mark 0 in map, randomly turn left or right.
  - If star, mark 1 in map and add 1 to numStars.
  - Otherwise, mark 2 in map that it's an empty square.
- If only turned left when you ran into a wall, what would happen?

Recap: Indefinite Loops & Random Numbers

- On lecture slip, write down a topic you wish we had spent more time (and why).



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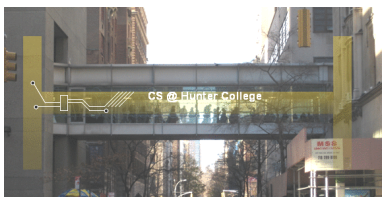

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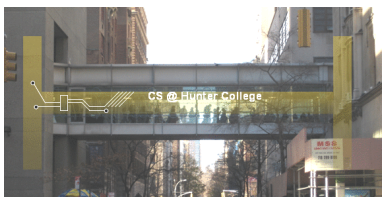

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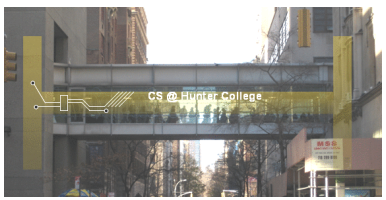

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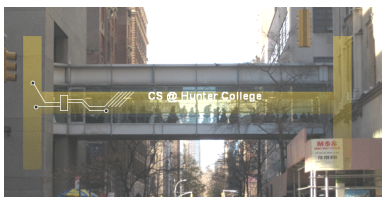

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Practice Quiz & Final Questions



- Lightning rounds:

Practice Quiz & Final Questions



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  - write as much you can for 60 seconds;

Practice Quiz & Final Questions



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- Continue from last time on the mock exam (on web page).