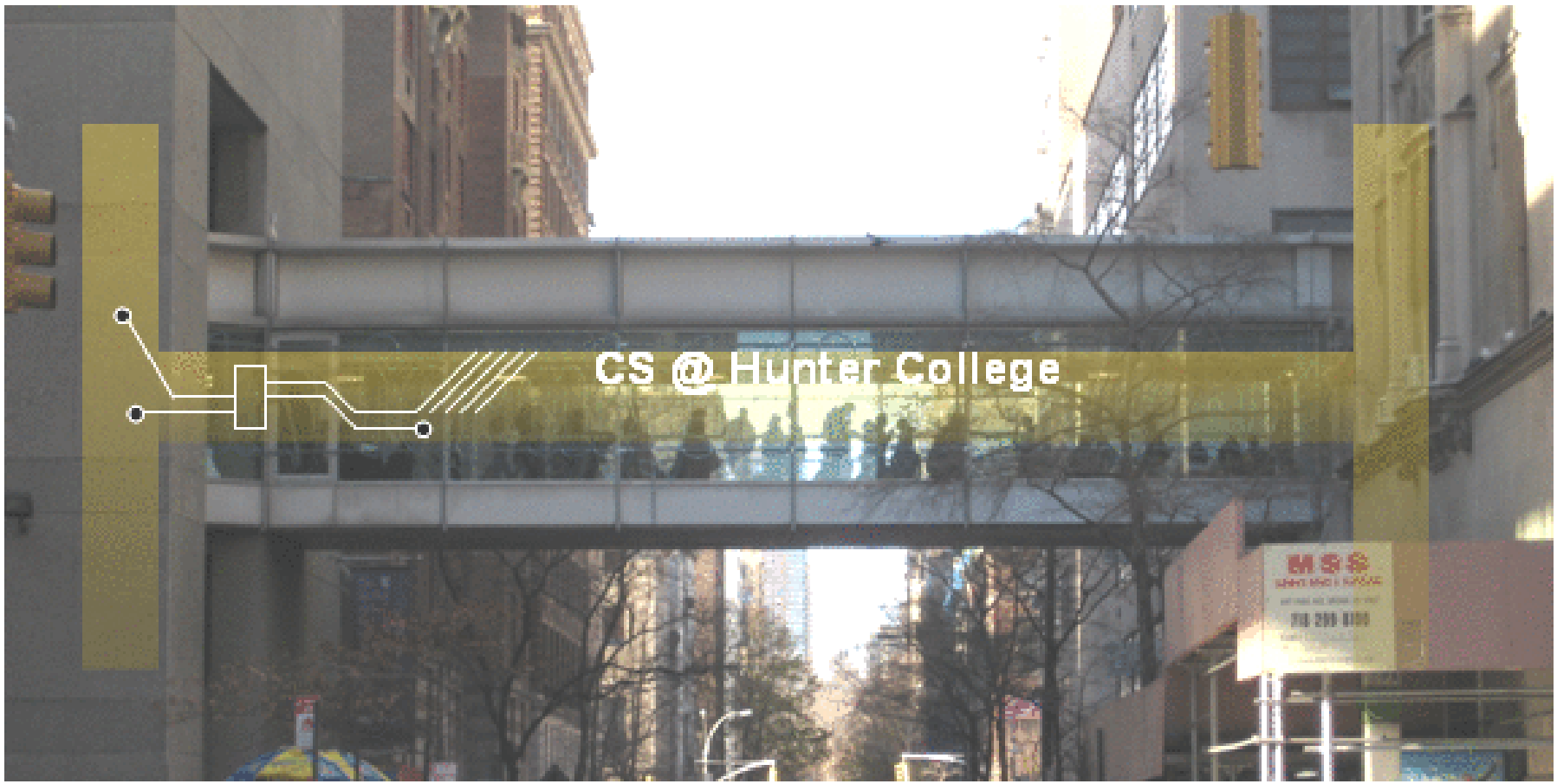
CSci 127: Introduction to Computer Science



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Today's Topics

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

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]:
        nums[i], nums[i+1] = nums[i+1], nums[i]
    i=i+1

print(nums)
```

Python Tutor

```
dist = int(input('Enter distance: '))
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```

(Demo with pythonTutor)

Indefinite Loops

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print('The distance entered is', dist)
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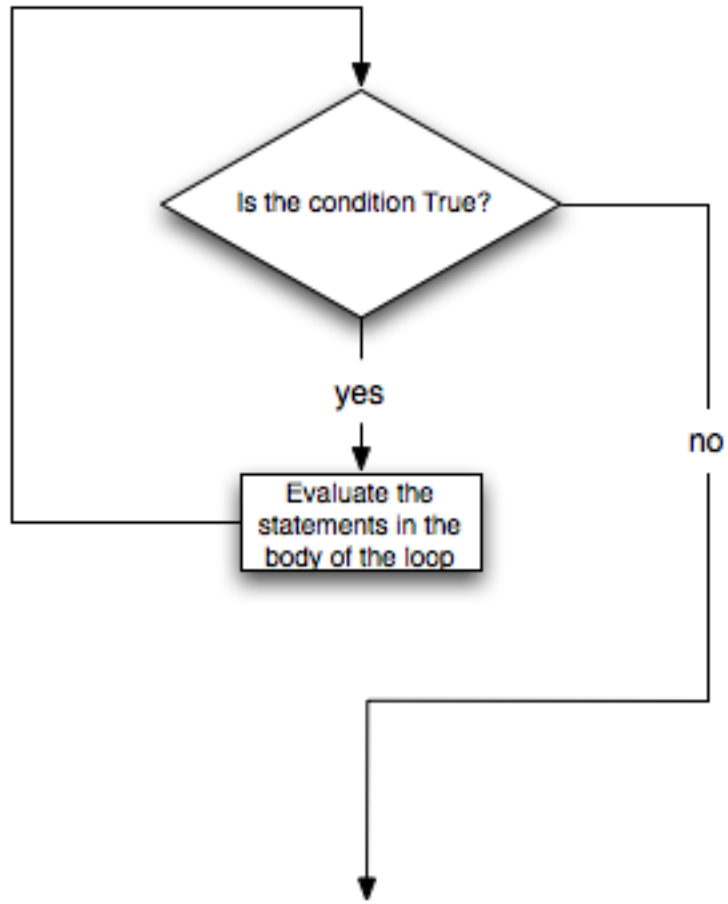

Indefinite Loops

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        nums[i], nums[i+1] = nums[i+1], nums[i]
    i=i+1

print(nums)
```

- 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:

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

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:
    - ★ Compare X to your variable.
    - ★ If better, update your variable to be X.

Design Question: Find Matching Initials

- 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`
  - while there are items in the list and not `found`
    - ★ 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

```
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.')
```

(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

- 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():




    return(num)
```

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



    return(num)
```

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:



    return(num)
```

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

```
import turtle
import random

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

for i in range(100):
  trey.forward(10)
  a = random.randrange(0,360,90)
  trey.right(a)
```

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

  `import random`

- Useful command to generate whole numbers:

  `random.randrange(start,stop,step)`

  which gives a number chosen randomly from the specified range.
- Useful command to generate real numbers:

  `random.random()`

  which gives a number chosen (uniformly) at random from [0.0,1.0).
- Very useful for simulations, games, and testing.

Trinket

```
import turtle
import random

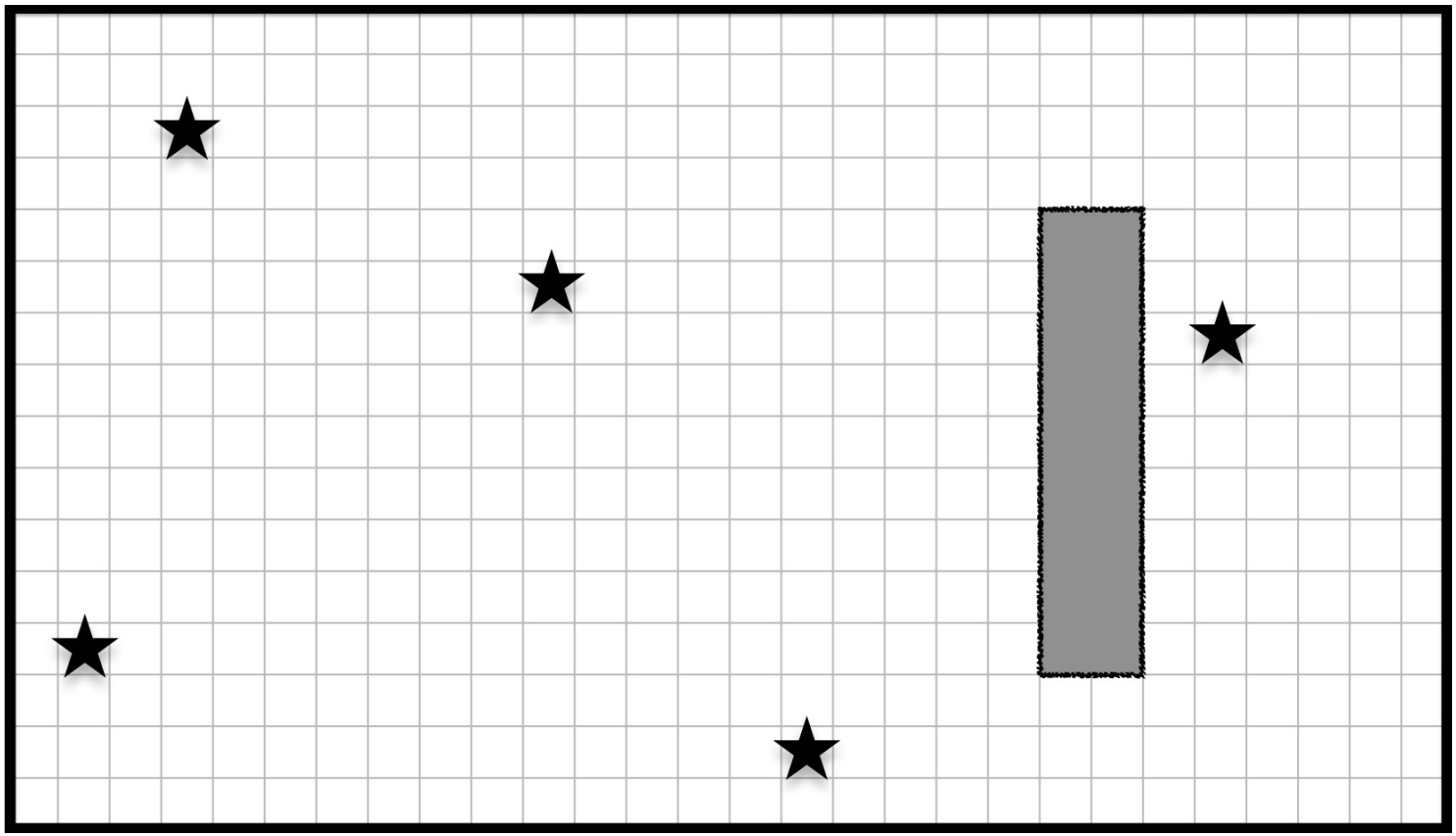
trey = turtle.Turtle()
trey.speed(10)

for i in range(100):
  trey.forward(10)
  a = random.randrange(0,360,90)
  trey.right(a)
```

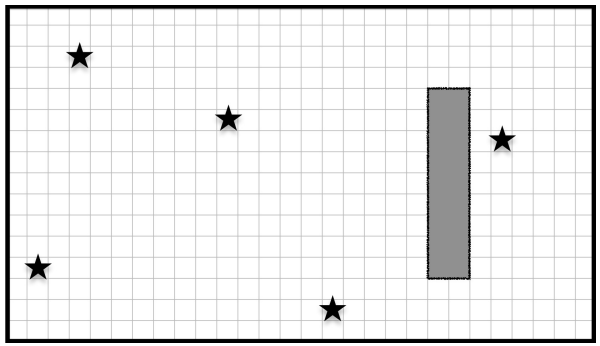
(Demo turtle random walk)

Design Challenge

Collect all five stars (locations randomly generated):

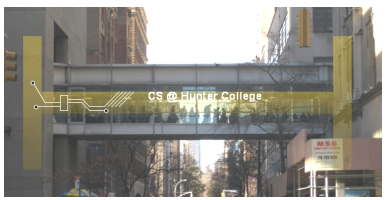


Design Challenge



- Possible approaches:
  - Randomly wander until all 5 collected, or
  - Start in one corner, and systematically visit every point.
- **Input:** The map of the 'world.'
- **Output:** Time taken and/or locations of the 5 stars.
- 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).
- Indefinite (while) loops allow you to repeat a block of code as long as a condition holds.
- Very useful for checking user input for correctness.
- Python's built-in random package has useful methods for generating random whole numbers and real numbers.
- To use, must include: `import random`.