

CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Announcements

- Please always read all Blackboard announcements



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sign in here:
<https://bit.ly/csci127Tutoring>
then join the session here:
<https://bit.ly/csci127TutoringSession>

Today's Topics



- Recap: Folium
- Indefinite loops
- Design Patterns: Max (Min)
- Design Challenge

Today's Topics



- **Recap: Folium**
- Indefinite loops
- Design Patterns: Max (Min)
- Design Challenge

Challenge:

What does this code do?

```
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')
```

Folium example

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Folium example

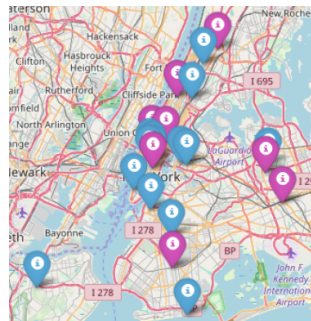
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Folium

- A module for making HTML maps.

Folium



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Folium

Folium



- A module for making HTML maps.
- It's a Python interface to the popular `leaflet.js`.
- Outputs `.html` files which you can open in a browser.
- An extra step:

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

Today's Topics



- Recap: Folium
- **Indefinite loops**
- Design Patterns: Max (Min)
- Design Challenge

Challenge:

- 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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Coding

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```
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```
    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  
  
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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:  
  
    return(num)
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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)
```

Indefinite Loops

```
#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)
```

Indefinite Loops

- Indefinite loops repeat as long as the condition is true.

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Indefinite Loops

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- Could execute the body of the loop zero times, 10 times, infinite number of times.

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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.

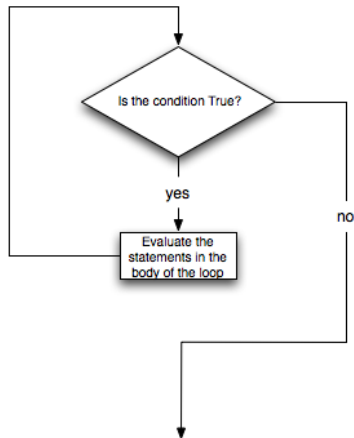
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Indefinite Loops

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    i=i+1
print(nums)
```



Challenge

Predict what this code does:

```
#Random search
import turtle
import random
tess = turtle.Turtle()
tess.color('steelBlue')
tess.shape('turtle')
tess.penup()
#Start off screen:
tess.goto(-250,-250)
#Remember: abs(x) < 25 means absolute value: -25 < x < 25
while abs(tess.xcor()) > 25 or abs(tess.ycor()) > 25:
    x = random.randrange(-200,200)
    y = random.randrange(-200,200)
    tess.goto(x,y)
    tess.stamp()
    print(tess.xcor(), tess.ycor())
print('Found the center!')
```

Trinket Demo

```
#Random search
import turtle
import random
tess = turtle.Turtle()
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print('Found the center!')
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(Demo with trinket)

Today's Topics



- Recap: Folium
- Indefinite loops
- **Design Patterns: Max (Min)**
- Design Challenge

Design Patterns

- A **design pattern** is a standard algorithm or approach for solving a common problem.



Design Patterns



- A **design pattern** is a standard algorithm or approach for solving a common problem.
- The pattern is independent of the programming language.

Design Patterns



- A **design pattern** is a standard algorithm or approach for solving a common problem.
- The pattern is independent of the programming language.
- Can think of as a master recipe, with variations for different situations.

Challenge:

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)
```

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)
```

(Demo with pythonTutor)

Max Design Pattern

- Set a variable to the smallest value.

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

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Max Design Pattern

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```

- Set a variable to the smallest value.
- Loop through the list,

Max Design Pattern

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- Set a variable to the smallest value.
- Loop through the list,
- If the current number is larger, update your variable.

Max Design Pattern

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

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- Set a variable to the smallest value.
- Loop through the list,
 - If the current number is larger, update your variable.
- Print/return the largest number found.

Max Design Pattern

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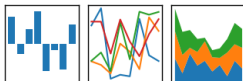
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- Set a variable to the smallest value.
- Loop through the list,
 - If the current number is larger, update your variable.
- Print/return the largest number found.
- Similar idea works for finding the minimum value.

Pandas: Minimum Values

pandas

$$y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$$

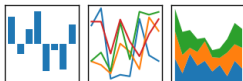


- In Pandas, lovely built-in functions:

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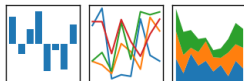


- In Pandas, lovely built-in functions:
 - ▶ `df.sort_values('First Name')` and
 - ▶ `df['First Name'].min()`

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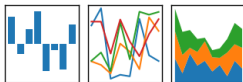


- In Pandas, lovely built-in functions:
 - ▶ `df.sort_values('First Name')` and
 - ▶ `df['First Name'].min()`
- What if you don't have a CSV and DataFrame, or data not ordered?

Design Question: Find first alphabetically

pandas

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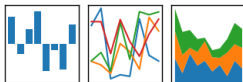


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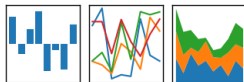


- What if you don't have a CSV and DataFrame, or data not ordered?
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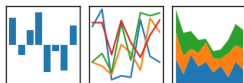


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 - ▶ Set a variable to worst value (i.e. `maxN = 0` or `first = "ZZ"`).

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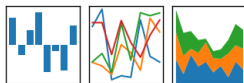


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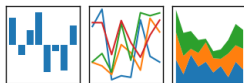


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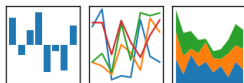


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 - ▶ For each item, X, in the list:
 - ★ Compare X to your variable.
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 - ▶ Print/return X.

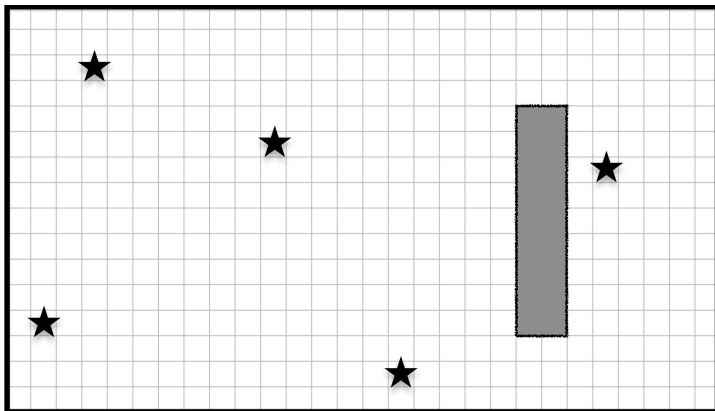
Today's Topics



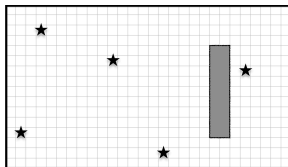
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- Design Patterns: Max (Min)
- **Design Challenge**

Design Challenge

Collect all five stars (locations randomly generated):

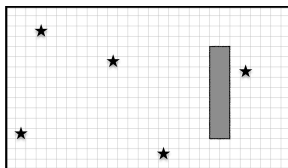


Design Challenge



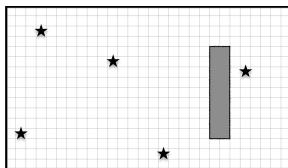
- Possible approaches:

Design Challenge



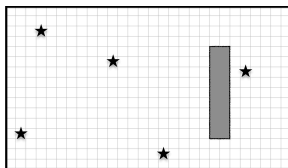
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 - ▶ Randomly wander until all 5 collected, or

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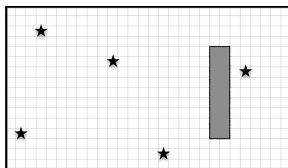
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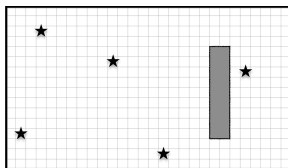
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- **Input:** The map of the 'world.'

Design Challenge



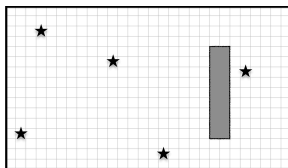
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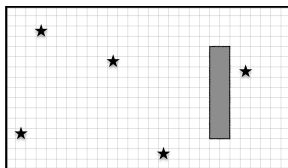
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- **Input:** The map of the 'world.'
- **Output:** Time taken and/or locations of the 5 stars.
- How to store locations? Use `numpy` array with -1 everywhere.

Design Challenge



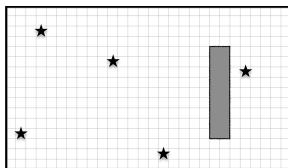
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- Possible algorithms: while `numStars < 5`:

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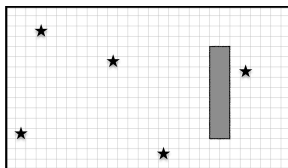
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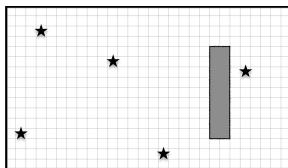
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- Possible algorithms: while `numStars < 5`:
 - ▶ Move forward.
 - ▶ If wall, mark 0 in map, randomly turn left or right.

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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`.

Design Challenge



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- **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.

Recap



- Quick recap of a Python library, `Folium` for creating interactive HTML maps.

Recap



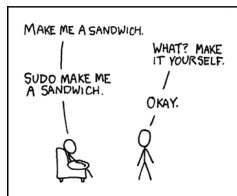
- Quick recap of a Python library, Folium for creating interactive HTML maps.
- More details on `while` loops for repeating commands for an indefinite number of times.

Recap



- Quick recap of a Python library, Folium for creating interactive HTML maps.
- More details on `while` loops for repeating commands for an indefinite number of times.
- Introduced the max design pattern.

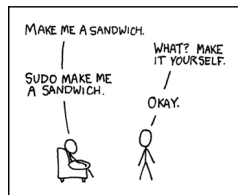
Final Exam Prep: UNIX



xkcd 149

- This course has three main themes:
 - ▶ Programming & Problem Solving

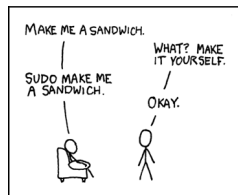
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xkcd 149

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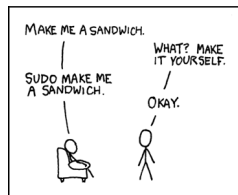
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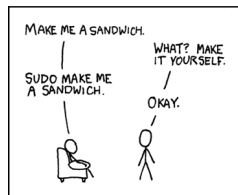
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xkcd 149

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- The operating system, Unix, is part of the second theme.

Final Exam Prep: UNIX

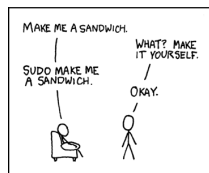


xkcd 149

- This course has three main themes:
 - ▶ Programming & Problem Solving
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- Unix commands in the weekly on-line labs

Final Exam Prep: UNIX

Unix commands in the weekly on-line labs:

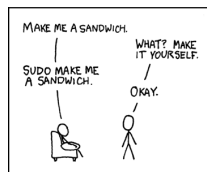


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Final Exam Prep: UNIX

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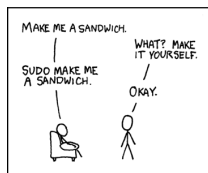


xkcd 149

Final Exam Prep: UNIX

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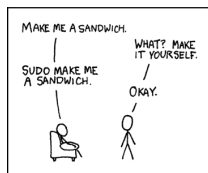


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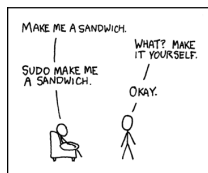


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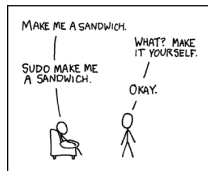


xkcd 149

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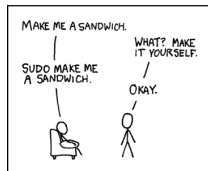


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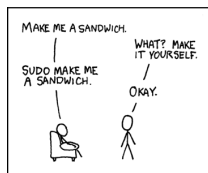


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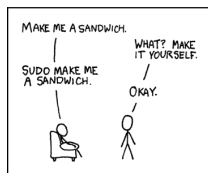


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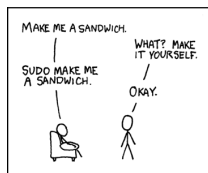


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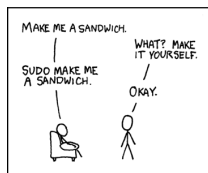


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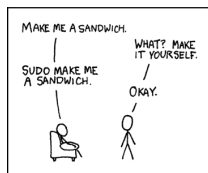


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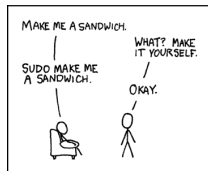


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- *Lab 13:* `man`, `more`, `w`



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Educational Psychology Study



- If you have consented to participate in the **Educational Psychology study**, please fill in the [3-question survey](#)
- Clickable link also below the video.
- Thank you for your participation!!!