CompSci 101
Introduction to Computer Science

	ABP	BlueEx	McDon	Loop	Panda	Nasher
Sam	0	3	5	0	-3	5
Chris	1	1	0	3	0	-3
Nat	-3	3	3	5	1	-1

November 30, 2017

Prof. Rodger

Announcements

- No more RQ!
- Assign 8 due Dec 5, Assign9 due Dec 8-11
- APT 8 due Dec 7
- Be a UTA – sign up – or Peer Tutor

- Today:
  - Review Recursion
  - Regular Expressions
  - Assignment 8 Recommender

Exam 2 Scores

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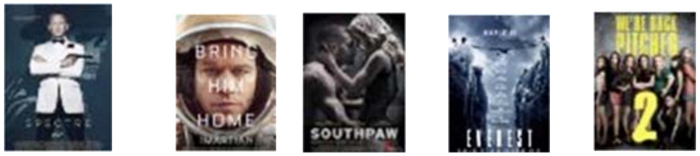
Assignment 8
From User Rating to Recommendations

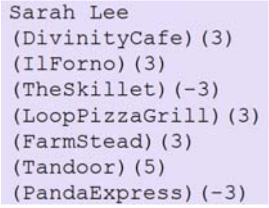


Spectre	Martian	Southpaw	Everest	PitchPerfect 2
3	-3	5	-2	-3
2	2	3	2	3
4	4	-2	1	-1

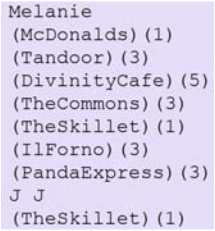
- **What should I choose to see?**
  - **What does this depend on?**
- **Who is most like me?**
  - **How do we figure this out**

ReadAllFood modules: Food Format

- All Reader modules return a tuple of strings: itemlist and dictratings dictionary



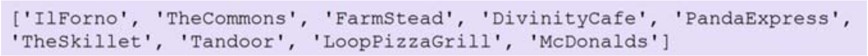
```
Sarah Lee
(DivinityCafe)(3)
(IlForno)(3)
(TheSkillet)(-3)
(LoopPizzaGrill)(3)
(FarmStead)(3)
(Tandoor)(5)
(PandaExpress)(-3)
```



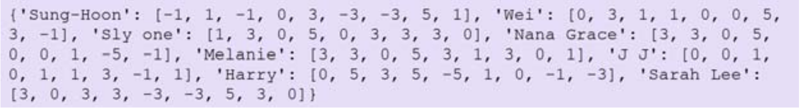
```
Melanie
(McDonalds)(1)
(Tandoor)(3)
(DivinityCafe)(5)
(TheCommons)(3)
(TheSkillet)(1)
(IlForno)(3)
(PandaExpress)(3)
J J
(TheSkillet)(1)
```

not
all
shown
…

- Translated to list and dictionary:



```
['IlForno', 'TheCommons', 'FarmStead', 'DivinityCafe', 'PandaExpress',
'TheSkillet', 'Tandoor', 'LoopPizzaGrill', 'McDonalds']
```



```
{'Sung-Hoon': [-1, 1, -1, 0, 3, -3, -3, 5, 1], 'Wei': [0, 3, 1, 1, 0, 0, 5,
3, -1], 'Sly one': [1, 3, 0, 5, 0, 3, 3, 3, 0], 'Nana Grace': [3, 3, 0, 5,
0, 0, 1, -5, -1], 'Melanie': [3, 3, 0, 5, 3, 1, 3, 0, 1], 'J J': [0, 0, 1,
0, 1, 1, 3, -1, 1], 'Harry': [0, 5, 3, 5, -5, 1, 0, -1, -3], 'Sarah Lee':
[3, 0, 3, 3, -3, -3, 5, 3, 0]}
```

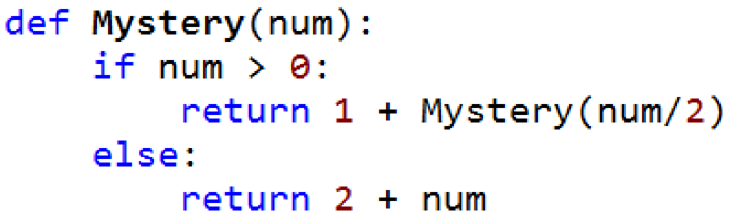
Follow 12-step process

- ReadFood first!
  - Read input and save it
  - Get list of restaurants – use that ordering! Set?
  - For each person
    - For each restaurant and its rating
      - Must find location of restaurant in itemlist
      - Then update appropriate counter
  - Print any structure you create to check it

Recursion Review

- Function calls a clone of itself
  - Smaller problem
  - Must be a way out of recursion

Mystery Recursion bit.ly/101f17-1130-1



```
def Mystery(num):
    if num > 0:
        return 1 + Mystery(num/2)
    else:
        return 2 + num
```

Review: Recursion to find ALL files in a folder

- A folder can have sub folders and files
- A file cannot have sub files

```
def visit(dirname):
  for inner in dirname:
     if isdir(inner):
        visit(inner)
     else:
        print name(inner), size(inner)
```

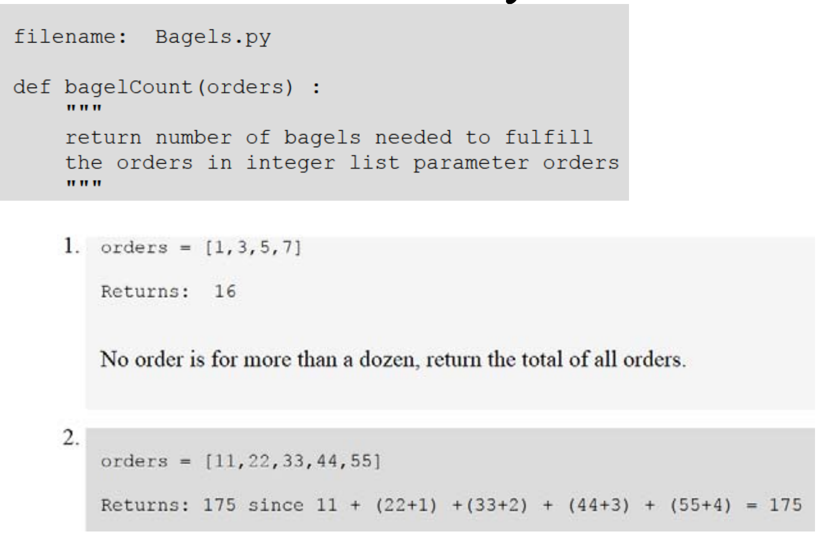
Is that a directory?

If not a directory, it will be a file

Something Recursion
bitly/101f17-1130-2

```
def Something(data):
    # data is a list of integers
    if len(data) == 0:
        return 0
    if data[0]%2 == 0:  # it is even
        return data[0] + Something(data[1:])
    else:
        return Something(data[1:])
```

Revisit the APT Bagels Recursively



```
filename:  Bagels.py

def bagelCount(orders) :
    """
    return number of bagels needed to fulfill
    the orders in integer list parameter orders
    """
```

1. orders = [1,3,5,7]

   Returns: 16

   No order is for more than a dozen, return the total of all orders.

2. orders = [11,22,33,44,55]

   Returns: 175 since 11 + (22+1) +(33+2) + (44+3) + (55+4) = 175

APT Bagels Recursively
bit.ly/101f17-1130-3

A)

```
def bagelCount(orders):
    if len(orders) > 0:
        return orders[0]/12 + orders[0] + bagelCount(orders[1:])
    else:
        return 0
```

B)

```
def bagelCount(orders):
    if len(orders) > 0:
        return orders[-1]/12 + orders[-1] + bagelCount(orders[:-1])
    else:
        return 0
```

C)

```
def bagelCount(orders):
    return orders[0] + orders[0]/12 + bagelCount(orders[1:])
```

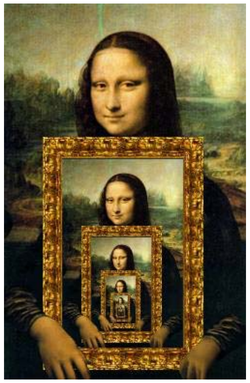
D)

```
def bagelCount(orders):
    if len(orders)>1:
        return orders[1] + orders[1]/12 + bagelCount(orders[2:])
    else:
        return bagelCount(orders[0])
```

Recursion in Pictures

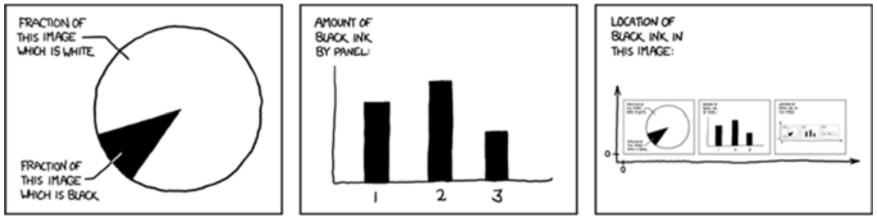
- http://xkcd.com/543/

HAPPY VALENTINE'S DAY.
-xkcd



More: Recursion in Pictures

- http://xkcd.com/688/


FRACTION OF THIS IMAGE WHICH IS WHITE
FRACTION OF THIS IMAGE WHICH IS BLACK
AMOUNT OF BLACK INK BY PANEL:
1
2
3
LOCATION OF BLACK INK IN THIS IMAGE:
0

What is Computer Science?

- … "it is the study of automating algorithmic processes that scale."
  - https://en.wikipedia.org/wiki/Computer_science
- If you need to find one email address on a webpage, you don't need computer science
  - If you need to scrape every email address, that number in the 10's to 100's, you could use help

How do you solve a problem like …

- How many words end in "aria"?
  - Start with "aria"? Contain "aria"?
  - Why would you care about this?
- Can you find ola@cs.duke.edu, susan.rodger@duke.edu, and andrew.douglas.hilton@gmail.com when searching through a webpage source?
  - What is the format of a "real" email address?

Examples of regex's at work

- What do aria$ and ^aria and aria share?
  - – Answers to previous question
- What about the regex .+@.+
  - – Turns out that . has special meaning in regex, so does +, so do many characters
- We'll use a module RegexDemo.py to check
  - – Uses the re Python library
  - – Details won't be tested, regex knowledge will

Regex expressions

- Regex parts combined in powerful ways
  - – Each part of a regex "matches" text, can extract matches using programs and regex library
  - – ^ is start of word/line, $ is end
- Expressions that match single characters:

A, a, 9 or …	Any character matches itself
.	Matches any character
\w	Matches alphanumeric and _
\d	Matches digit
\s	Matches whitespace

Regex expressions

- Repeat and combine regex parts
  - – * means 0 or more occurrences/repeats
  - – + means 1 or more occurrences/repeats
  - – ? Means (after * or +) to be *non-greedy*
- Expressions match more than one character

[a-zAB]	Brackets create character class
(regex)	Tag or group a regex
\1 or \2	Matches previously grouped regex
{1} or {n}	Repeat regex 1 or n times

Regex examples tried and explained

- Five letter words ending in p? Starts 'd'?
  - – `^\w\w\w\wp$` but not `....p$`
- Seven letter words, or seven ending with 'z'
  - – Difference between `^\w{7}$` and `^\w{7}`
- Words that start with a consonant:
  - – `^[^aeiou]` double meaning of ^

Regex examples tried and explained

- Five letter words ending in p? Starts 'd'?
  - `^\w\w\w\wp$` but not `....p$`
- Seven letter words, or seven ending with 'z'
  - Difference between `^\w{7}$` and `^\w{7}`
- Start and end with the same two letters like sense and metronome, decipher this:
  - `^(\w\w).*\1$`
- Start and end with three letters reversed, like despised and foolproof?

Summary of Regular Expressions

regex	*purpose*	*regex*	*purpose*
`.`	any character	`*`	zero or more of previous regex
`\w`	any alphanumeric character (and _)	`+`	one or more of previous regex
`\s`	any whitespace character	`*? or +?`	non-greedy version of either * or +
`\d`	any digit character	`()`	tag/group a regular expression
`[]`	character class, e.g., [A-Z] or [aeiou]	`\1, \2, ..`	match numbered tagged/grouped regex
`{n}`	n occurrences of preceding regex	`^`	beginning of line/string
`[^...]`	not the characters in the class, e.g., [^aeiou]	`$`	end of line/string

Regex Questions
bit.ly/101f17-1130-4