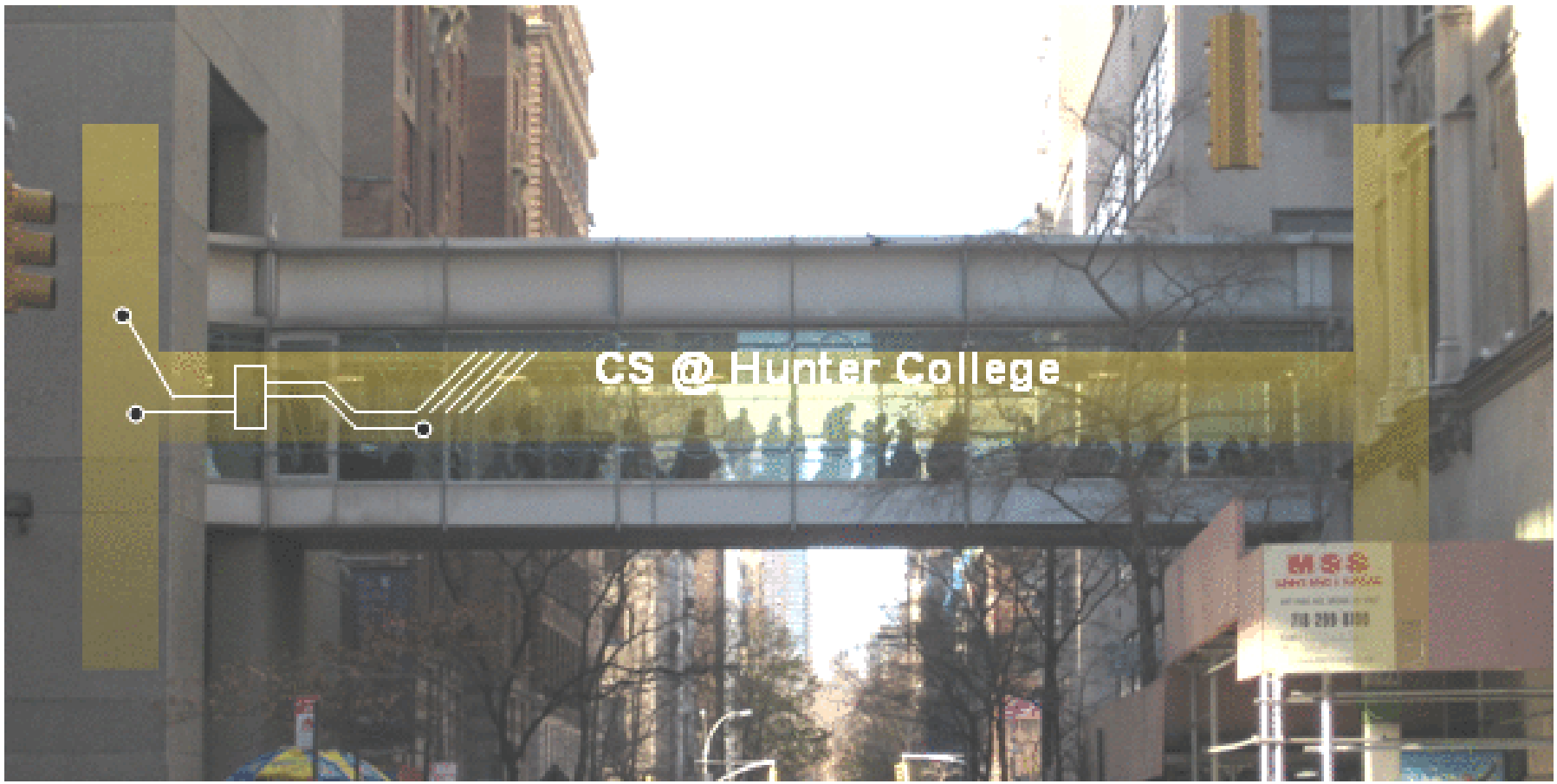
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Announcements

- Each lecture includes a survey of computing research and tech in NYC.

  Today: Keith Okrosy
  Career Development Services

Frequently Asked Questions

From lecture slips & recitation sections.

- Can you go through the OpenData challenge from last week?

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  Yes, you have to pass the final (60 out of 100 points) to the pass the class.

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  Yes, but check with your advisor that it is possible with your major and standing.
- To earn a Credit grade, what do I need?
  - *Final can replace missing lecture slips, lecture previews, code reviews, and quizzes. Programs are 30%.*
  - *You need to pass the final, which takes 60 out of 100 points.*
  - *To earn a CR grade, you need 70%.*
  - *Always good to aim a bit higher!*

Today's Topics

- More on Functions
- Recap: Open Data
- Top Down Design
- Github
- CS Survey: Career Services

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- **More on Functions**
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- Top Down Design
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Input Parameters & Return Values

- Functions can have **input parameters**.

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def totalWithTax(food,tip):
    total = 0
    tax = 0.0875
    total = food + food * tax
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    return(total)

lunch = float(input('Enter lunch total: '))
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Formal Parameters

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- Functions can also **return values** to where it was called.

In Pairs or Triples:

- What are the formal parameters? What is returned?

```
def enigma1(x,y,z):
    if x == len(y):
        return(z)
    elif x < len(y):
        return(y[0:x])
    else:
        s = cont1(z)
        return(s+y)
```

```
def cont1(st):
    r = ""
    for i in range(len(st)-1,-1,-1):
        r = r + st[i]
    return(r)
```

(a) `enigma1(7,"caramel","dulce de leche")`

Return: _____

(b) `enigma1(3,"cupcake","vanilla")`

Return: _____

(c) `enigma1(10,"pie","nomel")`

Return: _____

Python Tutor

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(Demo with pythonTutor)

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- When called, the actual parameter values are copied to the formal parameters.

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- All the commands inside the function are performed on the copies.

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Formal Parameters

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- The actual parameters do not change.

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- The time a variable exists is called its **scope**.

Input Parameters: What about Lists?

```
#Fall 2013 Final Exam, 5

def kuwae( inLst ):
    tot = 1
    for item in inLst:
        tot = tot * item
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def foo( inLst ):
    if ( inLst[-1] > inLst[0] ):
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foo( [2, 4, 6, 8] )

foo( [4002, 328, 457, 1] )
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- The actual parameters do not change, but the inside elements might.
- Easier to see with a demo.

Python Tutor

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(Demo with pythonTutor)

In Pairs or Triples:

```
def bar(n):
    if n <= 8:
        return 1
    else:
        return 0

def foo(l):
    n = bar(l[-1])
    return l[n]
```

- What are the formal parameters for the functions?
- What is the output of:

```
r = foo([1,2,3,4])
print("Return:  ", r)
```

- What is the output of:

```
r = foo([1024,512,256,128])
print("Return:  ", r)
```

Python Tutor

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def bar(n):
    if n <= 8:
        return 1
    else:
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def foo(l):
    n = bar(l[-1])
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(Demo with pythonTutor)

In Pairs or Triples:

Predict what the code will do:

```
#CSci 127 Teaching Staff
#Triangles two ways...
import turtle

def setUp(t, dist, col):
     t.penup()
     t.forward(dist)
     t.pendown()
     t.color(col)

def nestedTriangle(t, side):
     if side > 10:
          for i in range(3):
               t.forward(side)
               t.left(120)
          nestedTriangle(t, side/2)

def fractalTriangle(t, side):
     if side > 10:
          for i in range(3):
               t.forward(side)
               t.left(120)
               fractalTriangle(t, side/2)
```

```
def main():
     nessa = turtle.Turtle()
     setUp(nessa, 100, "violet")
     nestedTriangle(nessa, 160)

     frank = turtle.Turtle()
     setUp(frank, -100, "red")
     fractalTriangle(frank, 160)

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

IDLE

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(Demo with IDLE)

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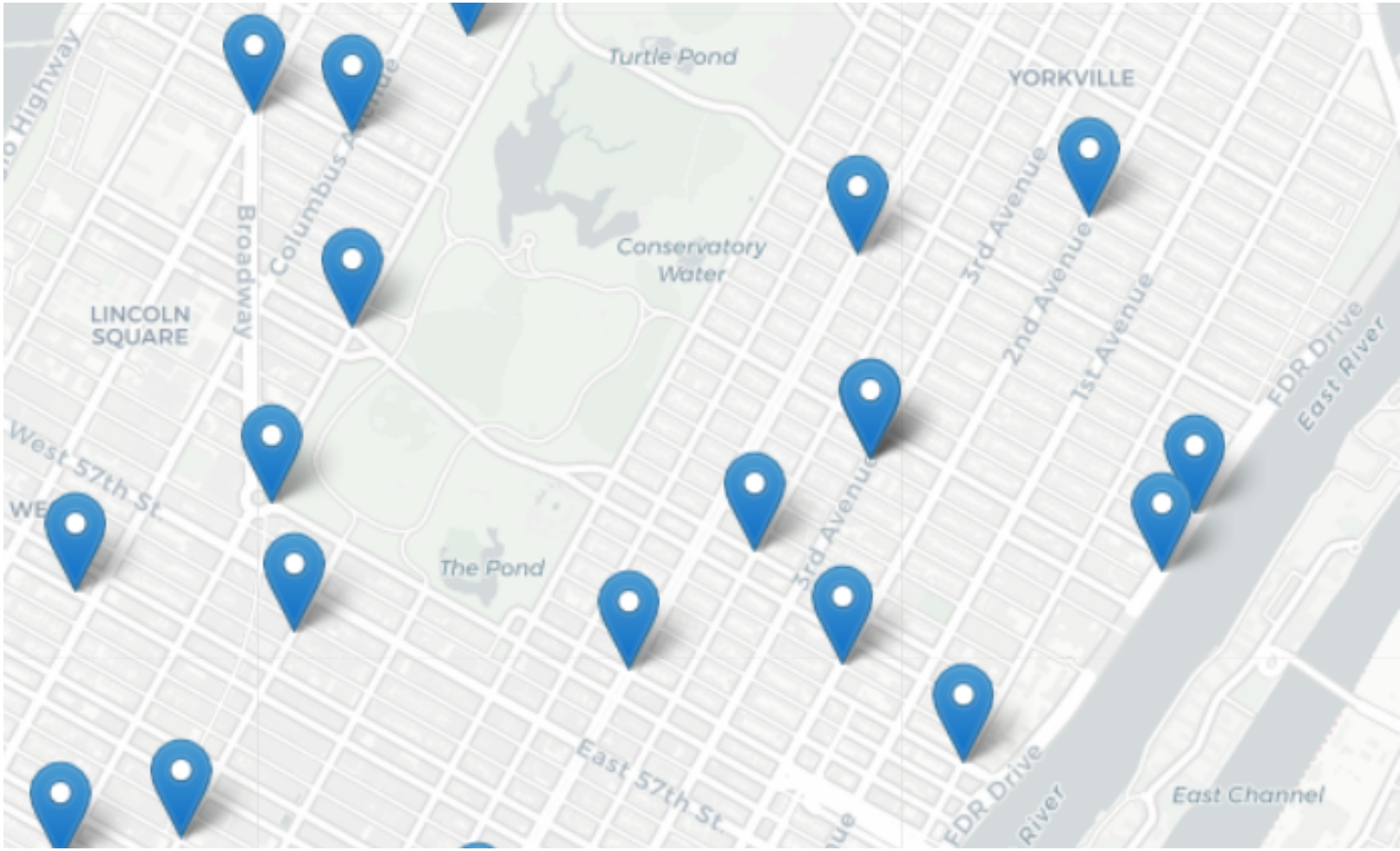
- Top Down Design
- Github
- CS Survey: Career Services

OpenData Design Question



Design an algorithm that finds the closest collision.

(Sample NYC OpenData collision data file on back of lecture slip.)

OpenData Design Question

Design an algorithm that uses NYC OpenData collision data and computes the closest collision to the location the user provides.

How to approach this:

- Create a "To Do" list of what your program has to accomplish.
- Read through the problem, and break it into "To Do" items.
- Don't worry if you don't know how to do all the items you write down.
- Example:
  1. Find data set (great place to look: NYC OpenData).
  2. Ask user for current location.
  3. Open up the CSV file.
  4. Check distance to each to user's location.
  5. Print the location with the smallest distance.

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- Let's use function names as placeholders for the ones we're unsure...

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Today's Topics

- More on Functions
- Recap: Open Data
- **Top Down Design**
- Github
- CS Survey: Career Services

Top-Down Design

- The last example demonstrates **top-down design**: breaking into subproblems, and implementing each part separately.

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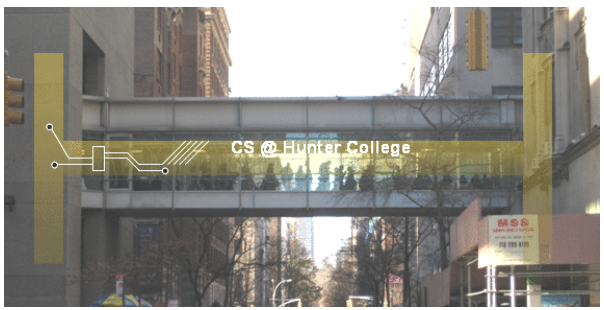

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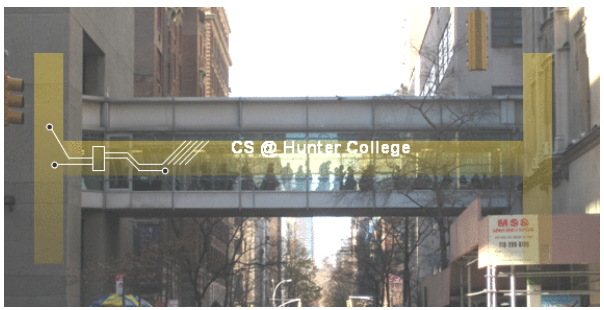

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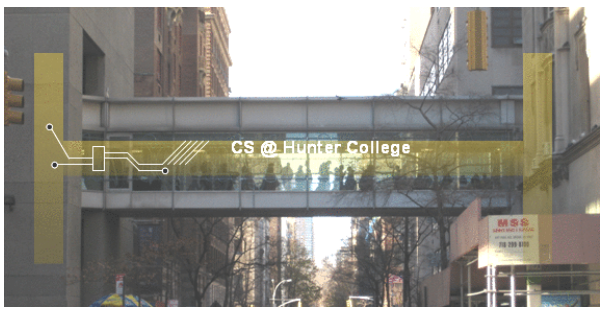

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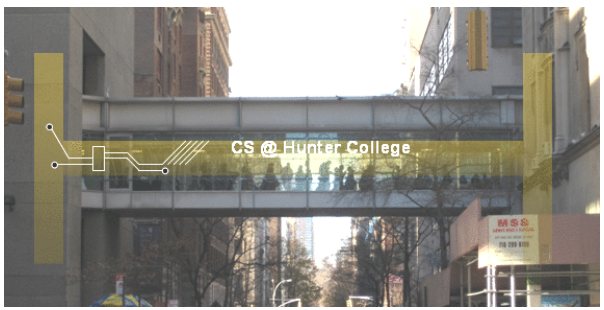

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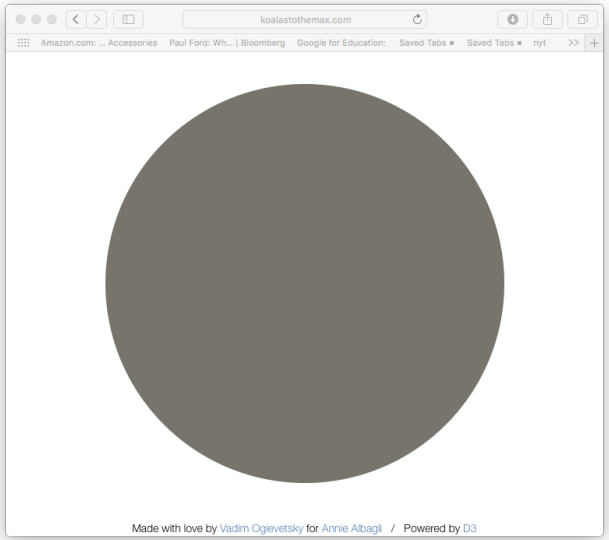
  - Translate list into function names & inputs/returns.
  - Implement the functions, one-by-one.
- Excellent approach since you can then test each part separately before adding it to a large program.
- Very common when working with a team: each has their own functions to implement and maintain.

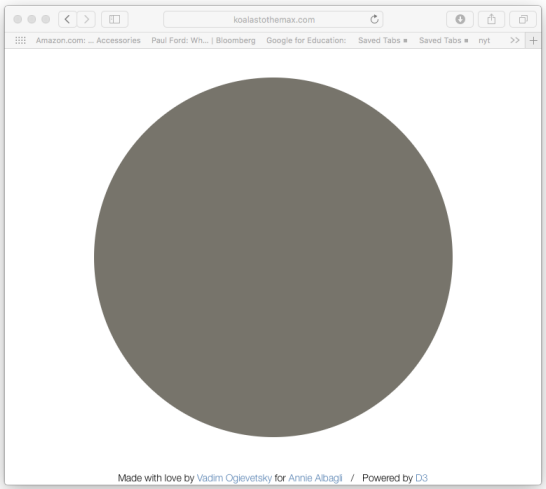
In Pairs or Triples:



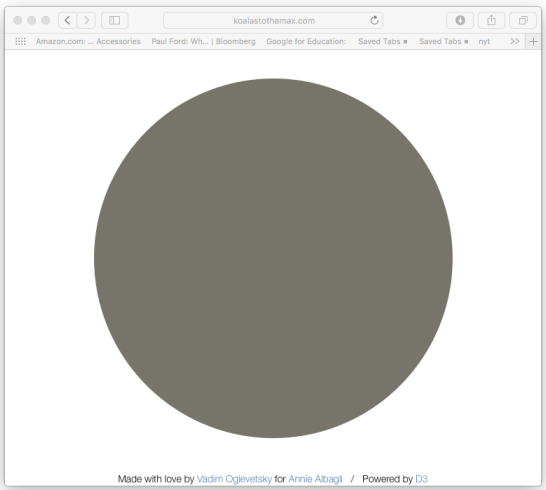
`http://koalastothemax.com`

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

Demo


koalastothemax.com
Made with love by Vadim Ogievetsky for Annie Albagli / Powered by D3

Demo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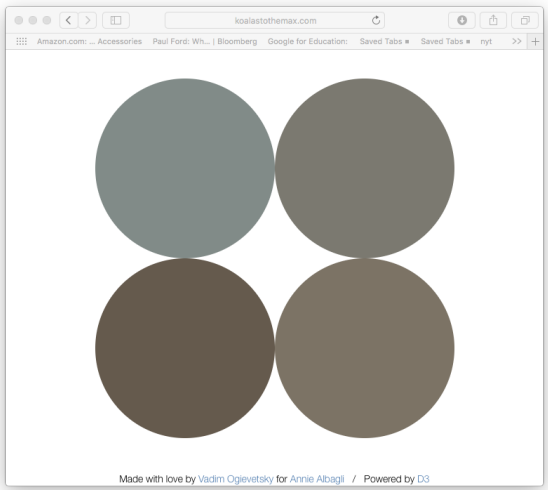
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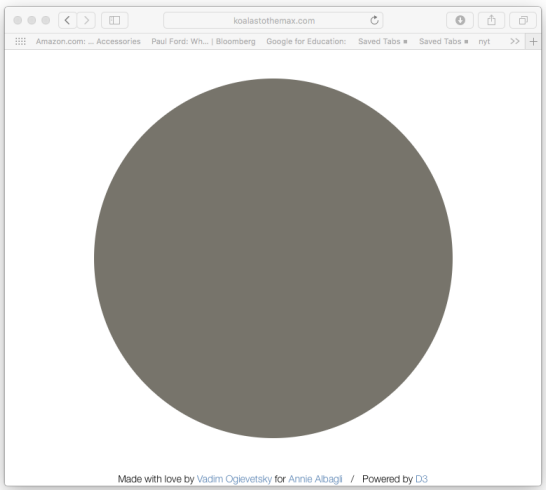
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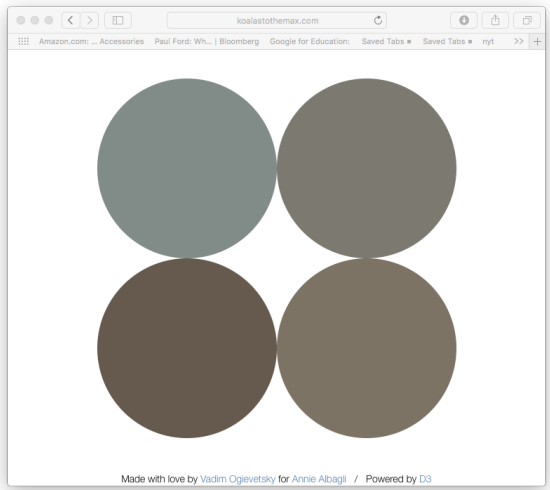
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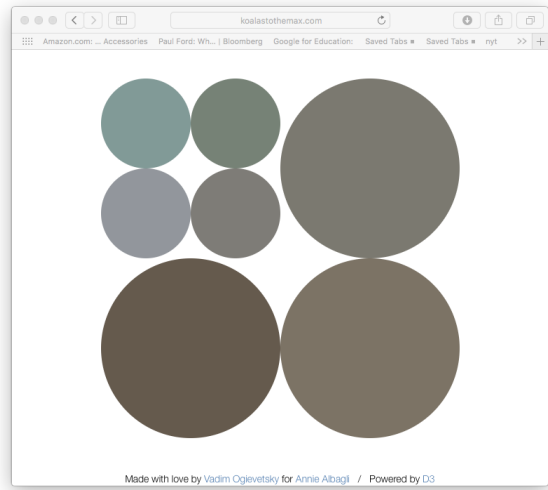
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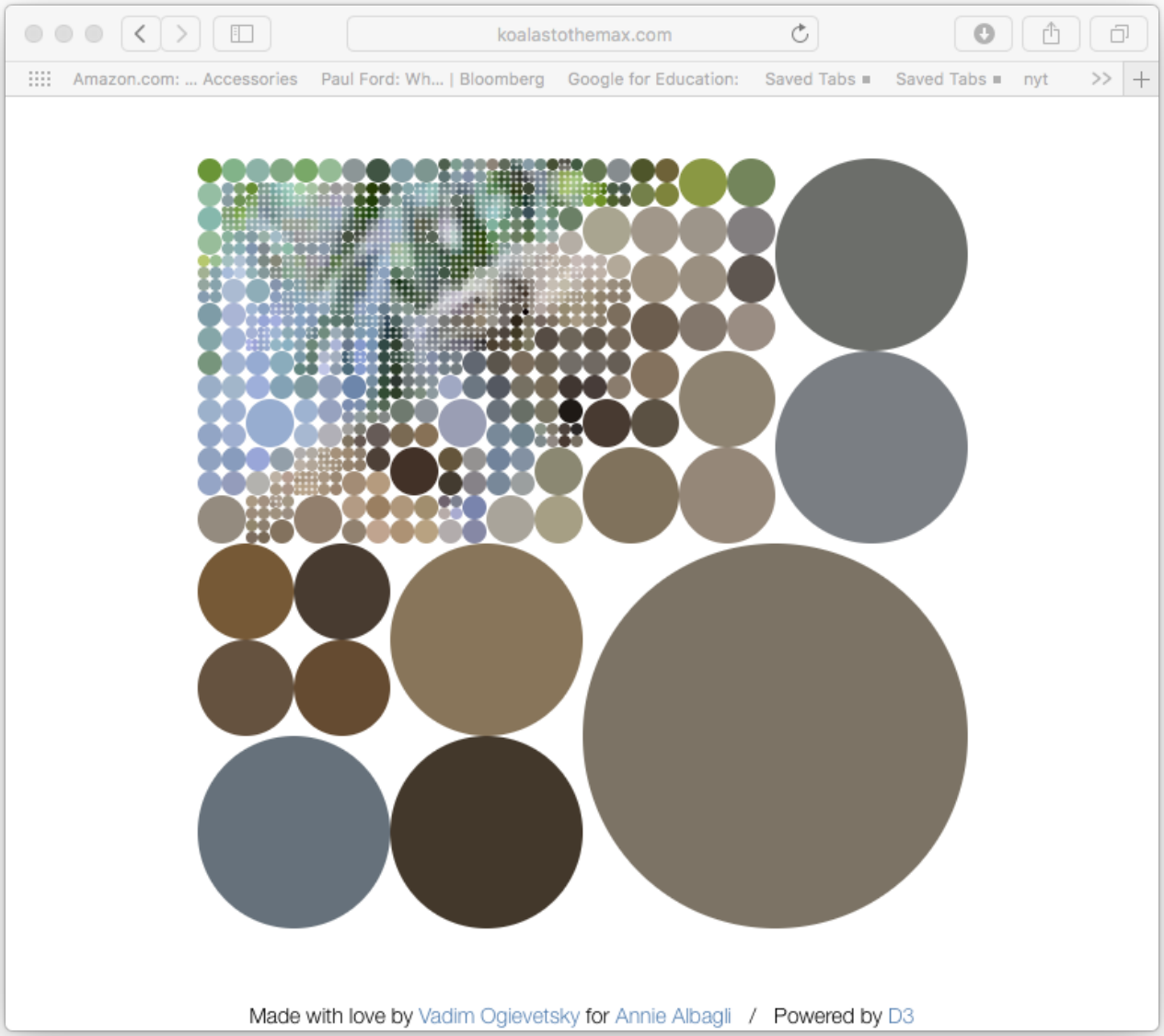
koalastothemax.com
Amazon.com: ... Accessories
Paul Ford: Wh... | Bloomberg
Google for Education:
Saved Tabs
Saved Tabs
nyt
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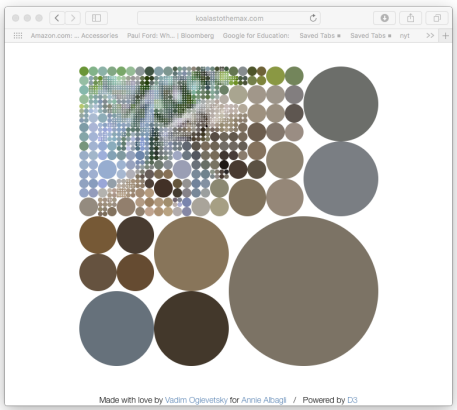
Design: Koalas to the Max



- **Input:** Image & mouse movements

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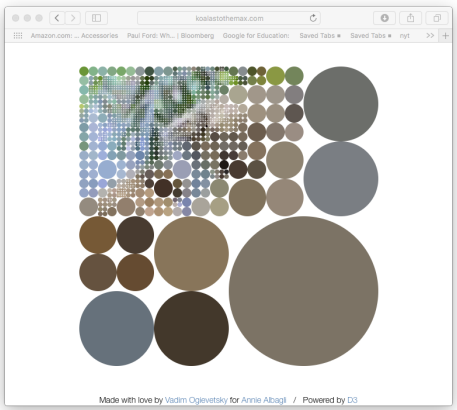

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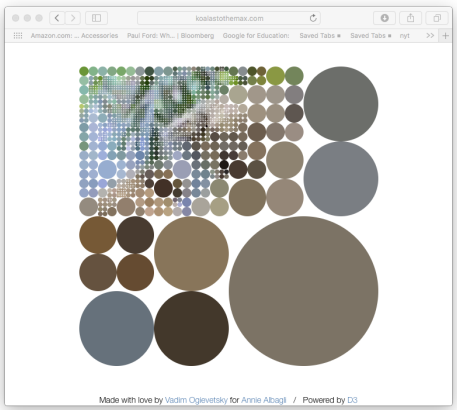

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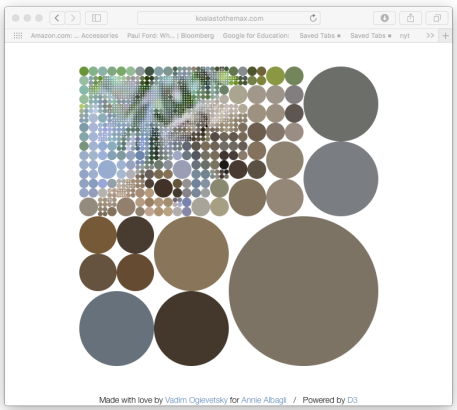

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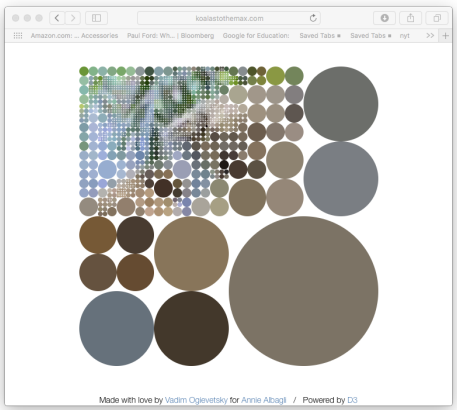

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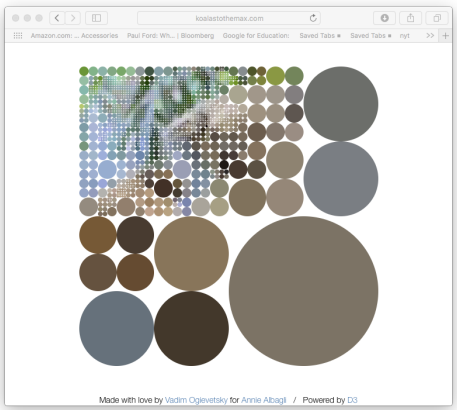

- **Input:** Image & mouse movements
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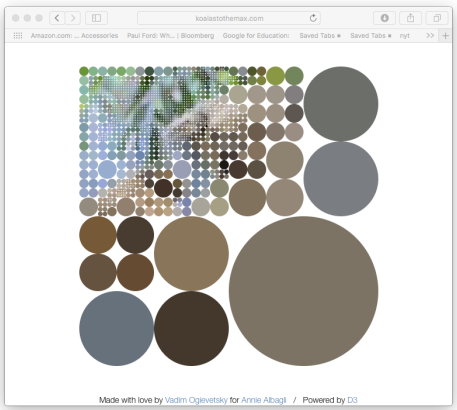

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Averaging `numpy` arrays

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- Recap: Open Data
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- **Github**
- CS Survey: Career Services

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Octocat

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- (Show github `csci127` github repo.)

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CS Survey Talk

Keith Okrosy
Career Development Services

Design Challenge

Job ID	Agency	Posting T	# O	Business Title	Civil Service	Title Cod	Level	Job Category	Full-	Sal
246814	DEPT OF INFO	External	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	
246814	DEPT OF INFO	Internal	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	
247320	DEPT OF ENVI	Internal	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	
247320	DEPT OF ENVI	External	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	
269885	DEPT OF ENVI	External	1	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	
269885	DEPT OF ENVI	Internal	1	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	
285120	NYC HOUSING	External	1	Deputy Director for Engineering	ADMINISTRA	10015	M3	Engineering,	P	
285120	NYC HOUSING	Internal	1	Deputy Director for Engineering	ADMINISTRA	10015	M3	Engineering,	P	
287202	DEPT OF ENVI	External	4	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	
287202	DEPT OF ENVI	Internal	4	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	

(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)

Find all current city job postings for internship positions.

Design Challenge

Job ID	Agency	Posting T	# O	Business Title	Civil Service	Title Cod	Level	Job Category	Full-	Salary Range	Salary Range
246814	DEPT OF INFO	External	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	100000	130000
246814	DEPT OF INFO	Internal	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	100000	130000
247320	DEPT OF ENVI	Internal	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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269885	DEPT OF ENVI	External	1	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
269885	DEPT OF ENVI	Internal	1	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
285120	NYC HOUSING	External	1	Deputy Director for Engineering	ADMINISTRA	10015	M3	Engineering,	P	115000	130000
285120	NYC HOUSING	Internal	1	Deputy Director for Engineering	ADMINISTRA	10015	M3	Engineering,	P	115000	130000
287202	DEPT OF ENVI	External	4	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.

Design Challenge

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246814	DEPT OF INFO	External	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	100000	130000
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247320	DEPT OF ENVI	Internal	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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285120	NYC HOUSING	External	1	Deputy Director for Engineering	ADMINISTRA	10015	M3	Engineering,	P	115000	130000
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287202	DEPT OF ENVI	External	4	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.

Design Challenge

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246814	DEPT OF INFO	External	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	100000	130000
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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
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- **Process:**

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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.
- **Process:**
  1. Open the file.

Design Challenge

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247320	DEPT OF ENVI	External	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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269885	DEPT OF ENVI	Internal	1	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
285120	NYC HOUSING	External	1	Deputy Director for Engineering	ADMINISTRA	10015	M3	Engineering,	P	115000	130000
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287202	DEPT OF ENVI	External	4	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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`(data.cityofnewyork.us/City-Government/NYC-Jobs/kpav-sd4t)`

- **Input:** CSV file from NYC OpenData.
- **Output:** A list of internships offered by the city.
- **Process:**
  1. Open the file.
  2. Select the rows that have "intern" in the business title.

Design Challenge

Job ID	Agency	Posting T	# O	Business Title	Civil Service	Title Cod	Level	Job Category	Full-	Salary Range	Salary Range
246814	DEPT OF INFO	External	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	100000	130000
246814	DEPT OF INFO	Internal	1	Senior Architect Cloud Infrastructure D	SENIOR IT AF	6800	0	Information	F	100000	130000
247320	DEPT OF ENVI	Internal	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
247320	DEPT OF ENVI	External	2	MECHANICAL ENGINEERING INTERN	MECHANICA	20403	0	Engineering,	F	52000	52000
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  2. Select the rows that have "intern" in the business title.
  3. Print out those rows.

Recap

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

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

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

if __name__ == "__main__":
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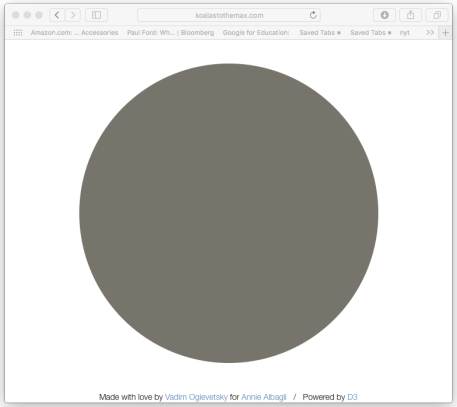
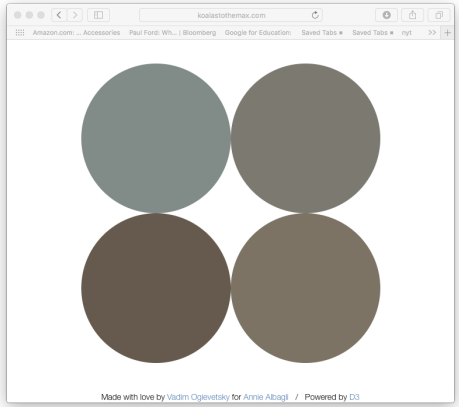
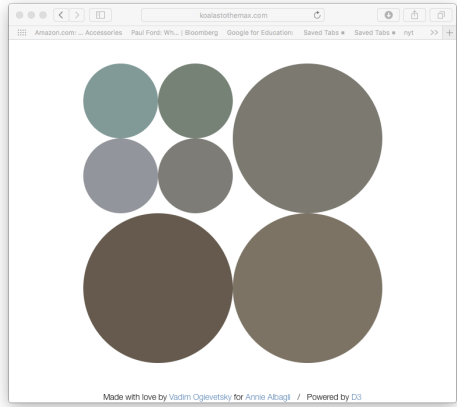
- Pass your lecture slips to the aisles for the UTAs to collect.

Practice Quiz & Final Questions







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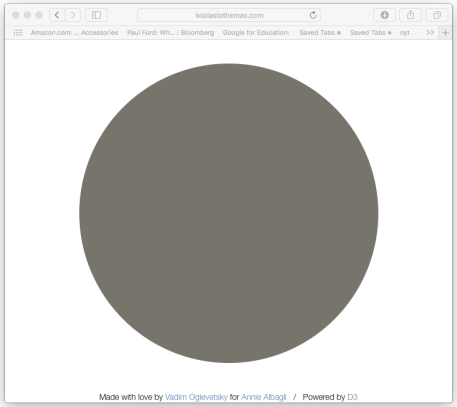
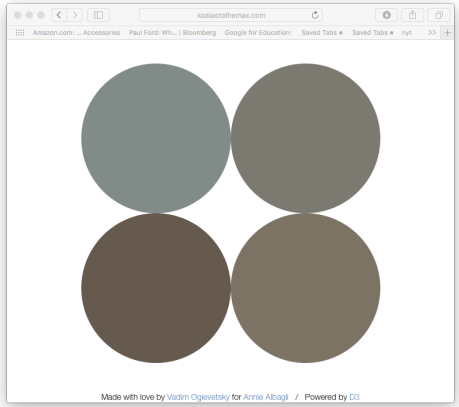
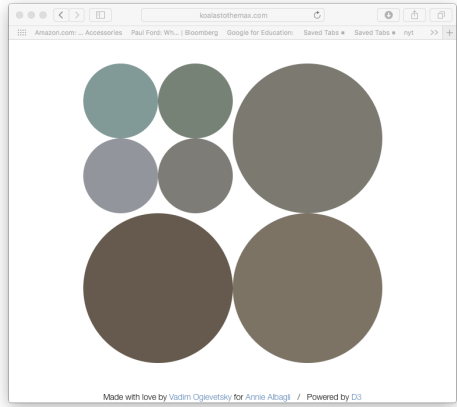
Practice Quiz & Final Questions







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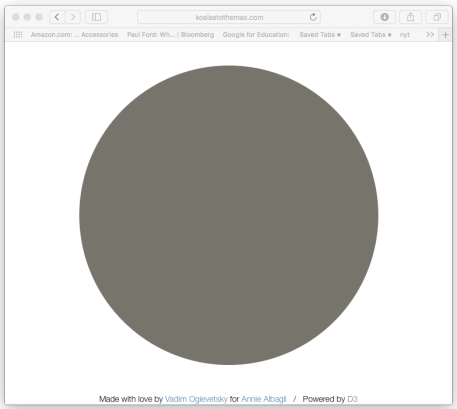

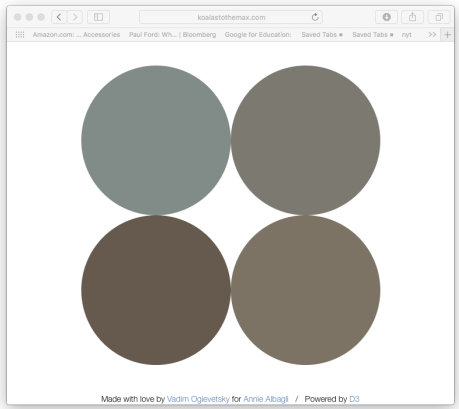

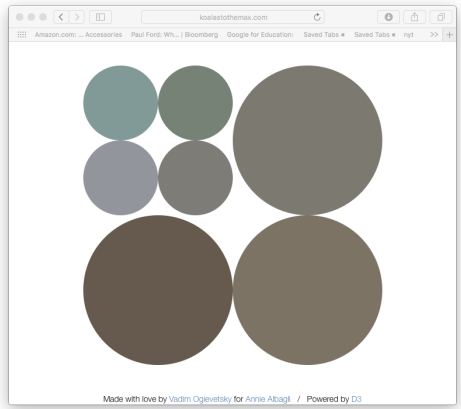

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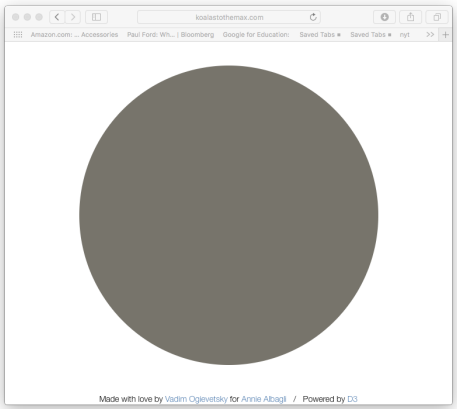

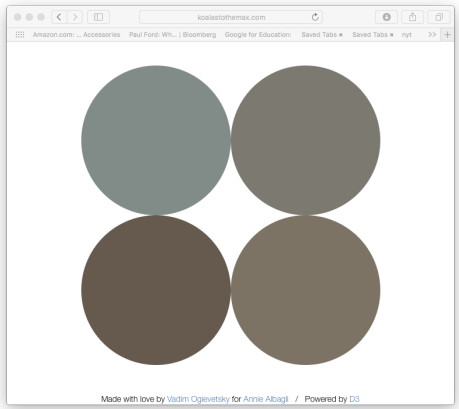

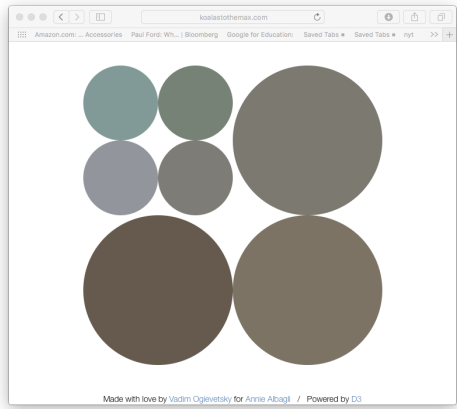

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  - write as much you can for 60 seconds;

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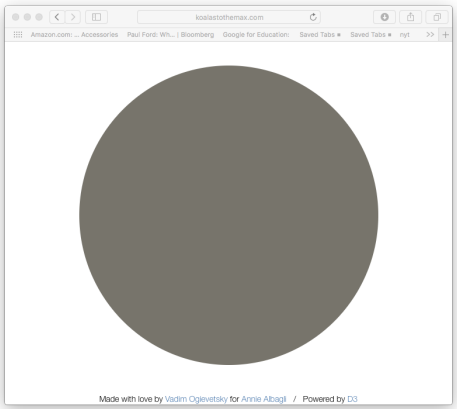

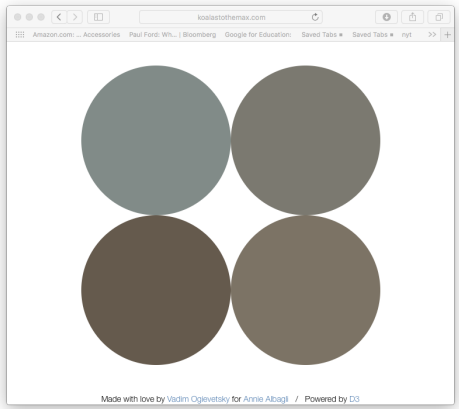

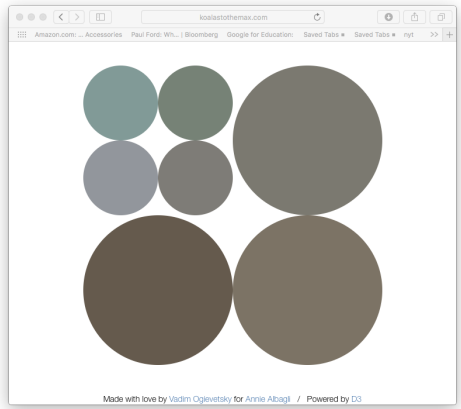

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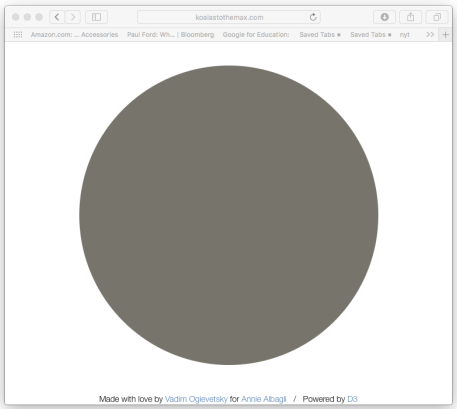

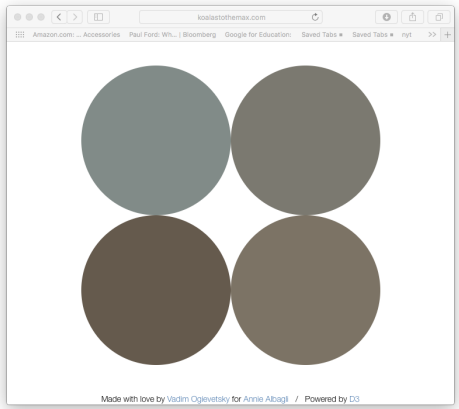

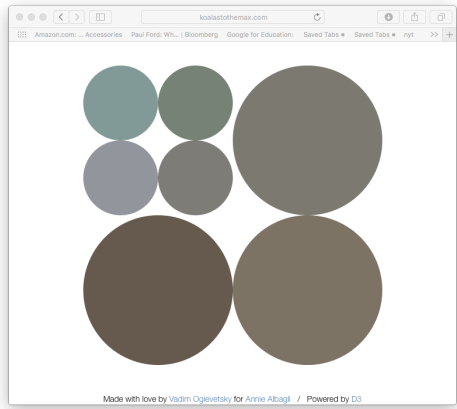

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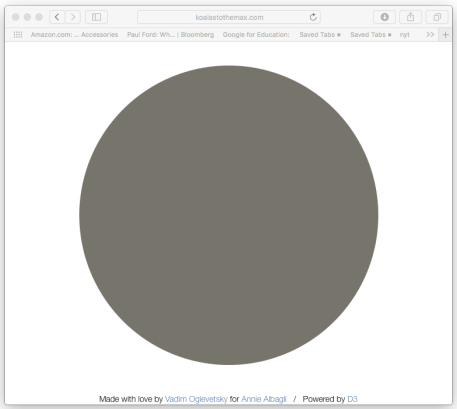

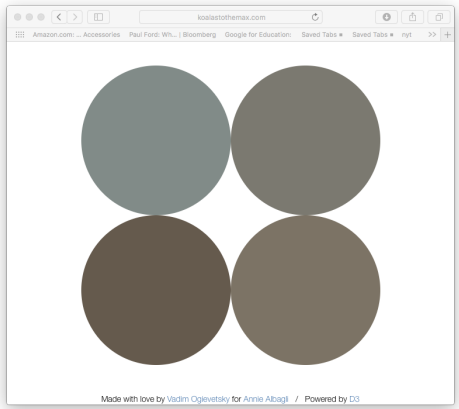

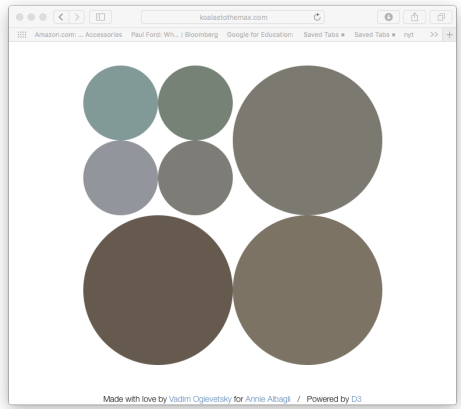

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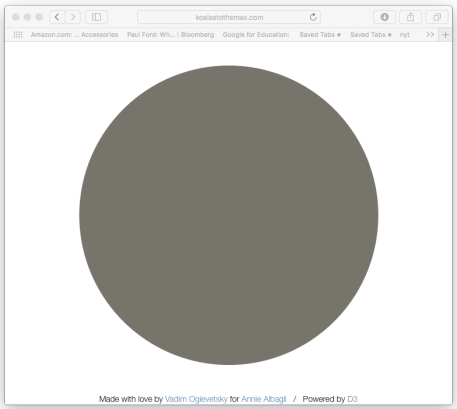
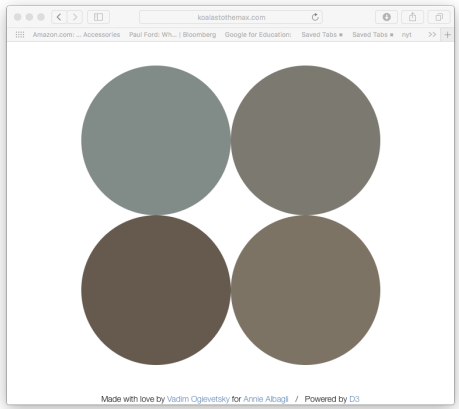
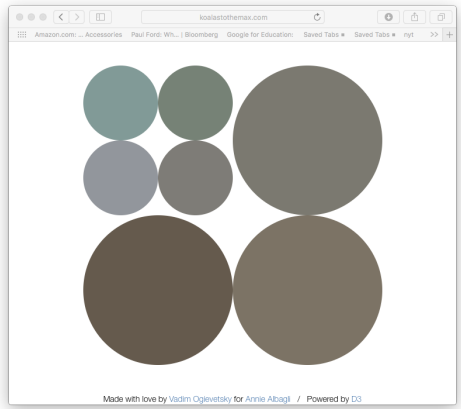
Practice Quiz & Final Questions







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- Theme: Functions! Starting with S18, V1, #4 and #7.

Final Exam: Spring 2018, Version 1, #4a

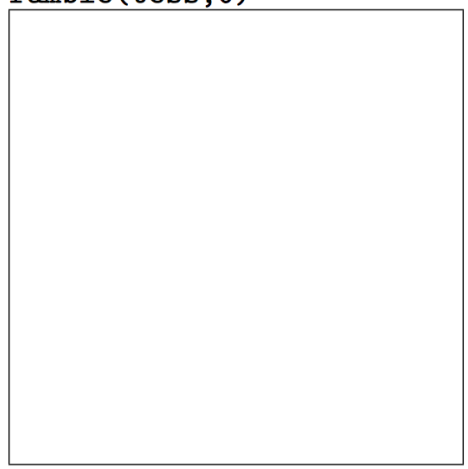
Name: **EmpID:** CSci 127 Final, S18, V1

4. (a) Draw the output for the function calls:

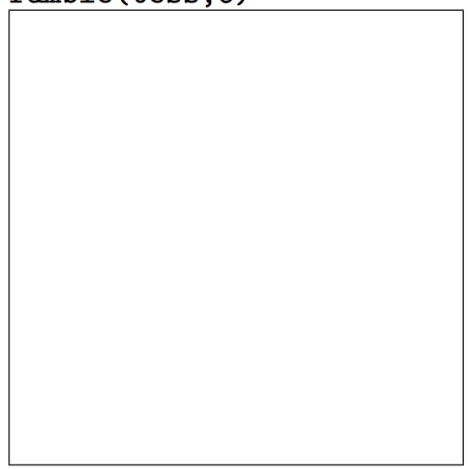
```
import turtle
tess = turtle.Turtle()
tess.shape("turtle")

def ramble(t,side):
    if side == 0:
        t.stamp()
    else:
        for i in range(side):
            t.forward(50)
            t.left(360/side)
```

i. `ramble(tess,0)`



ii. `ramble(tess,6)`



Final Exam: Spring 2018, Version 1, #4a

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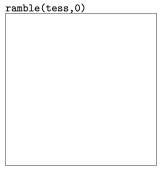

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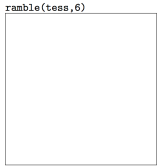

(Demo with `trinket`)

Final Exam: Spring 2018, Version 1, #4b

(b) For the following code:

```
def v1(vincent, munem):
    if vincent + munem > 0:
        return vincent
    else:
        return -1
```

```
def start():
    panda = 20
    minh = -30
    qiuqun = v1(panda,minh
    return qiuqun
```

i. What are the formal parameters for `v1()`:

ii. What are the formal parameters for `start()`:

iii. What does `start()` return:

Final Exam: Spring 2018, Version 1, #4b

(b) For the following code:

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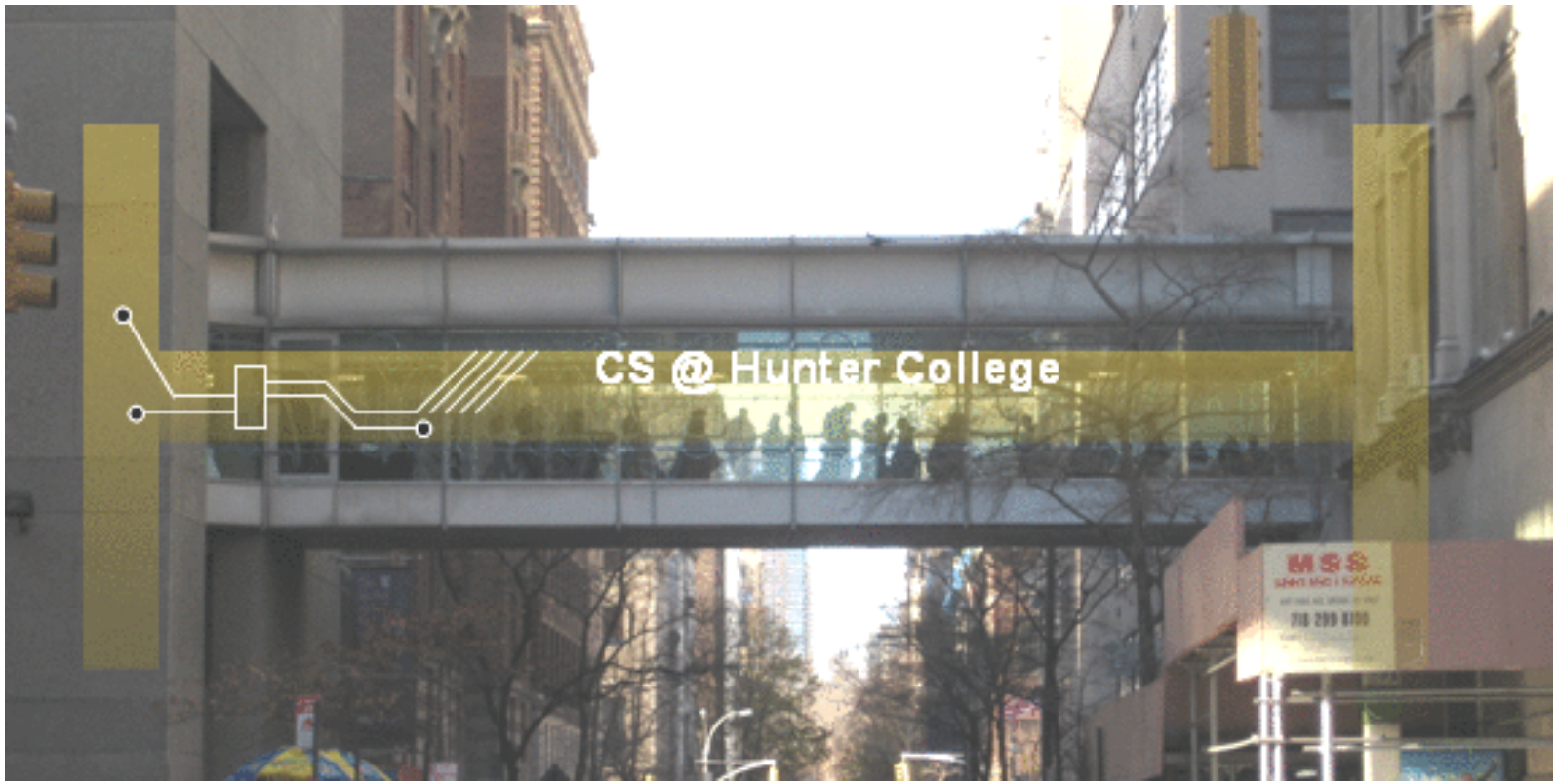
Writing Boards



- Return writing boards as you leave...