

Reminder: Did you install?
Anaconda Distribution for Python 2.7
<https://www.continuum.io/downloads>

Outline

Review

- Class survey
- **Anaconda** installation
- Homework review

Cool media art pieces

Code: Functions

- Python calculator
- (Simple Ciphers)

Prof. Angela Chang

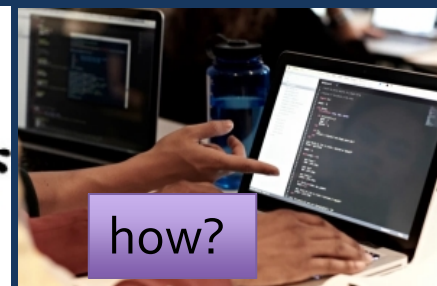
Lecture 2: Fundamentals

Fall 2017, Sep. 11, 2017

CODE, CULTURE, AND PRACTICE

```
function rand_range(maximum
    "use strict";
    return Math.floor(Math.
}
function choose(array) {
    "use strict";
    return array[rand_range
}
function
```

what?



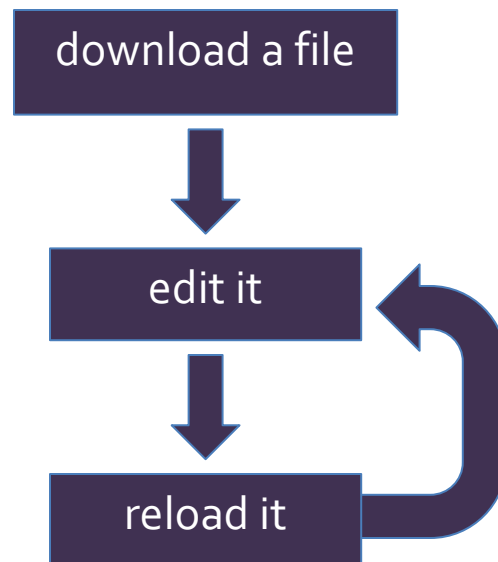
PROGRAMMING TOGETHER

THINKER → CREATE → FEEDBACK



Skill 1: Modifications

Modifying data is an easy, relatively harmless way to figuring out how a program works.



Programs do two things:

1. perform **calculations**
2. keep track of **data**

Which is which?

Recognizing data vs. code

Data

- Content

```
subjects = ['COUNT', 'STRANGER', 'LOOK', 'CHURCH', 'CASTLE', 'PICTURE',  
            'EYE', 'VILLAGE', 'TOWER', 'FARMER', 'WAY', 'GUEST', 'DAY',  
            'HOUSE', 'TABLE', 'LABOURER'],  
predicates = ['OPEN', 'SILENT', 'STRONG', 'GOOD', 'NARROW', 'NEAR',  
              'NEW', 'QUIET', 'FAR', 'DEEP', 'LATE', 'DARK', 'FREE',  
              'LARGE', 'OLD', 'ANGRY'],  
conjunctions = [' AND ', ' OR ', ' THEREFORE ', '. ', '. ', '. ', '. ', '. '],  
operators = ['A', 'EVERY', 'NO', 'NOT EVERY'];
```

Functions

- Instructions

```
function rand_range(maximum) {  
    "use strict";  
    return Math.floor(Math.random() * (maximum + 1));  
}  
function choose(array) {  
    "use strict";  
    return array[rand_range(array.length - 1)];  
}  
function phrase() {  
    "use strict";  
    var text = choose(operators) + ' ' + choose(subjects);  
    if (text === 'A EYE') {  
        text = 'AN EYE';  
    }  
    return text + ' IS ';  
}
```

from "Stochastic Texts"

Programming first steps

You know more than you think...

DATA

is the

stuff
content
nouns
information

that a program manipulates.

Ctrl + Shift + J or ⌘ + Option + J

- Stored as different types
- Numbers
 - Integers (no decimals)
 - 0, 1, 2, 3, -45, -1232
 - Floats (decimals)
 - 2.385, 1.41423, 3.14159...
- Strings (Sequences of chars)
 - "hello!"
 - Characters (single digits of text)
 - A,B,C,!, 3, #, _...
- Booleans (true or false)

Try out some arithmetic

Before you return, can you
guess the answer?

- $1 + 1$ ↵
- $5.23 + 2.0$ ↵
- $8.0 / 2.4$ ↵
- $9.4 * 10^4$ ↵
- $1 < 2$ ↵
- etc.

Programming first steps

Follow data through operations

CODE

are the

verbs
instructions
directions
operations

for manipulating data.

- Variables
- Language (syntax)
- Operators and operands
- Functions
- Flow of execution (logic)
 - Iteration
 - loops

Type into console

```
false
> var x = 5
> var y = 2
> x * y
> var z = x + y
> z
> x > y
> y > z

> var drawCat = function () {
    console.log(" =^.= ")
}

> drawCat()

//Draw many cats using a function!
> var drawCats = function (howManyTimes) {
    for (var i = 0; i < howManyTimes; i++) {
        console.log( drawCat() );
    }
};

> drawCats(10)
```

Recognizing patterns

name of data to
keep track of

Look closely at the text

end of
statement



```
var ownedby = ['his', 'joe's', 'ann\'s'];
```

```
> var ownedby = [ 'his', "joe's", 'ann\'s'];  
> ownedby  
< ► (3) ["his", "joe's", "ann's"]
```

- Strings (text) can be replaced, as long as you stay within matching delimiters
 - arrays use [], strings match quotes ``, ""
- Semicolons ; end statements

If something went wrong, just UNDO!

Beyond changing data

I know what you did this weekend...

- adding a new variable
- changing the speed
- editing the template

correctly citing original pieces

```
> 2) Is there a convention for citing exploratory programming works (e.g.  
> modifications to your computational poems)?
```

```
Oh, I forgot to say about that -- the strikeouts thing is just a Taroko  
Gorge convention/joke. If you have free software that you modify, you're  
in most cases supposed to leave the copyright notice intact, so someone  
could look there to see where the program came from. Otherwise you can  
just say "based on" and name the work, or something like that, and perhaps  
a link if it's something on the Web. Here's how I've done it:
```

http://nickm.com/poems/use_of_dust.html

```
See the right-hand side.
```

Functions

instructions bundled to

- Manipulate data fast
- Perform calculations repeatedly

[illegible]

Function template

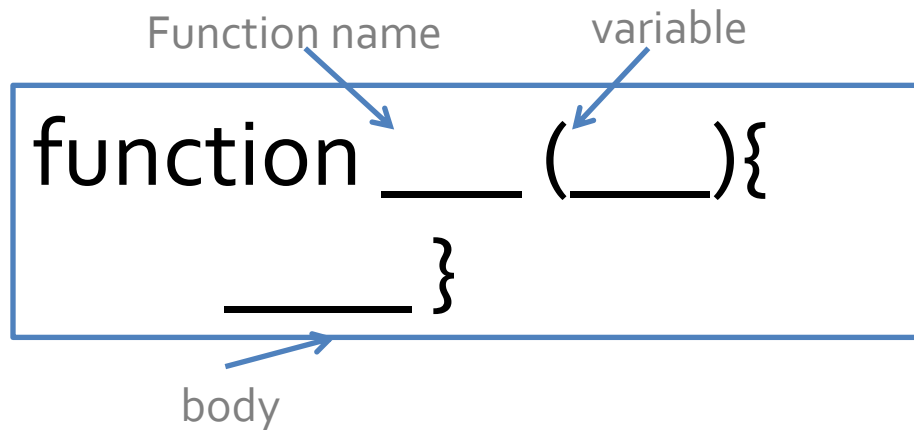
functions are a way to give a name to “operating on data”

Javascript

- `Math.floor(Math.random()*len);`
- `setInterval(update, 500)`

give me the lower integer closest to a random number picked based on a number len

perform the update function every 500 milliseconds



functions exist throughout all different programming languages. Later, you'll see that this template for declaring a function is recognizable across languages.

JavaScript coding issues

Issues that people ran into:

- Saved file as text, unable to run. Needed to save as *.html
 - (Make file extensions visible in your OS so you know you're in the right format)
- Saving the file after its been run will cause the html to contain static text from the JavaScript output. Need to save "link as" so you get just the bare html code.
- Not matching all parenthesis, curly brackets, and quotes.
- Not ending all statements with a semicolon.
- That's why we're moving to python– so we don't have to worry so much about syntax.



Hello Python!

```
$ ipython notebook
```

1. launch iPython/Jupyter notebook
2. Create a new notebook

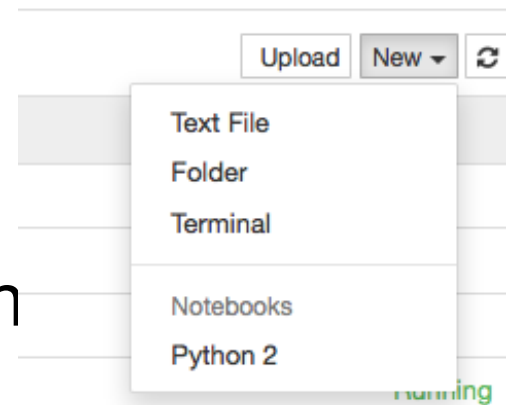
Go to the upper right, select "New"
select Python 2 notebook

3. Play with arithmetic comman

2 + 2 ↵

Subtract, multiply

Apply to strings?



Did you install Python 3 version of anaconda by accident?

→ go to terminal, type

conda install python 2.7

To execute a line of code, press
(Shift + enter)

To execute and add a new cell,
(Option + enter)

Class Participation

- Get into groups and work together through class2.ipynb
- Talk through each section with group as assigned

Bin	Ben	Chance
Nathan	Sandra	KC
Katja	David	Sam

Laura	Bitsy	Rey
Derek	Isaac	Alexis
RyanM	Trevor	RyanL

Jude	Victoria
Evan	Alex
Sienna	Chloe
	Cameron

Download class2.ipynb from
Lecture 2 on Canvas.

Upload class2.ipynb from
the class files into
your jupyter notebook

remember to press
SHIFT + ENTER to process
each cell

Upload

New ▾



class2.ipynb

Experience errors

messages from the program about what it doesn't understand

- Enter `2 +` ↵

```
2 +
```

```
File "<ipython-input-1-2b0d43f017d6>", line 1
```

```
2 +
```

```
^
```

```
SyntaxError: invalid syntax
```

- Error messages

can help you be more specific

Programming errors:

unintentional – does not do what you intend

invalid – functionally incorrect (syntax)

Which are easier for the compiler/
interpreter to detect? -- Invalid errors

Function templates

JavaScript uses “function” keyword, while Python uses “def” to define a function

JavaScript

Function name

arguments

```
function ____ (____){  
    ____  
}
```

body

The diagram shows the JavaScript function syntax: `function ____ (____){` followed by an indented `____` and a closing brace `}`. A light blue box encloses the entire function definition. Three blue arrows point from labels to parts of the code: 'Function name' points to the first underscore, 'arguments' points to the second underscore, and 'body' points to the indented line.

Python

Function name

arguments

```
def ____ (____):  
    ____
```

body

The diagram shows the Python function syntax: `def ____ (____):` followed by an indented `____`. Three blue arrows point from labels to parts of the code: 'Function name' points to the first underscore, 'arguments' points to the second underscore, and 'body' points to the indented line.

Javascript has lots of “syntactic sugar” – parenthesis show which lines are subordinate.

In Python, indentations show which lines belong together.

JavaScript

vs.

Python

```
1 //comments in JavaScript
2 /* this a multiline
3 comment */
4
5 //variables
6 var _____ = _____;
7
8 //javascript function
9 function _____(_____){
10 | _____
11 }
12
13 //list
14 [_____, _____];
15
16 //strings
17 ''
18
19 //if-then tests > < >= <=
20
21 if (___test___){
22 | _____;
23 }else{
24 | _____;
25 }
26
27 //boolean
28 true
29 false
30
31 // Draw as many cats as you want!
32 var drawCats = function (howManyTimes) {
33 for (var i = 0; i < howManyTimes; i++) {
34 | console.log(i + " =^.^=");
35 } };
36
37 //call a function
38 drawCats(10); //Put any number here instead of 10.
39
```

```
1 #comment in Python
2 """ multiline
3 comments
4 """
5
6 #variables
7 _____ = _____
8
9 #python function
10 def _____(_____):
11 | _____
12
13
14 #list
15 [_____, _____]
16
17 #strings
18 ''
19 """
20
21 # if-then tests > < >= <=
22 if (___test___):
23 | _____
24 else:
25 | _____
26
27 #boolean
28 true
29 false
30
31 # Draw as many cats as you want
32 def drawCats( howManyTimes ):
33 | for i in range(howManyTimes):
34 | | print str(i) + "=^.^="
35
36
37 #Call a function
38 drawCats(10) #change 10 to any positive integer
39
```

n
o
t
e

Class exercise

- Double double function

```
def double(sequence):
```

TBA in Class 3

what does it do? run it in the notebook with different inputs.

The basics of coding

more on Wednesday...

DATA

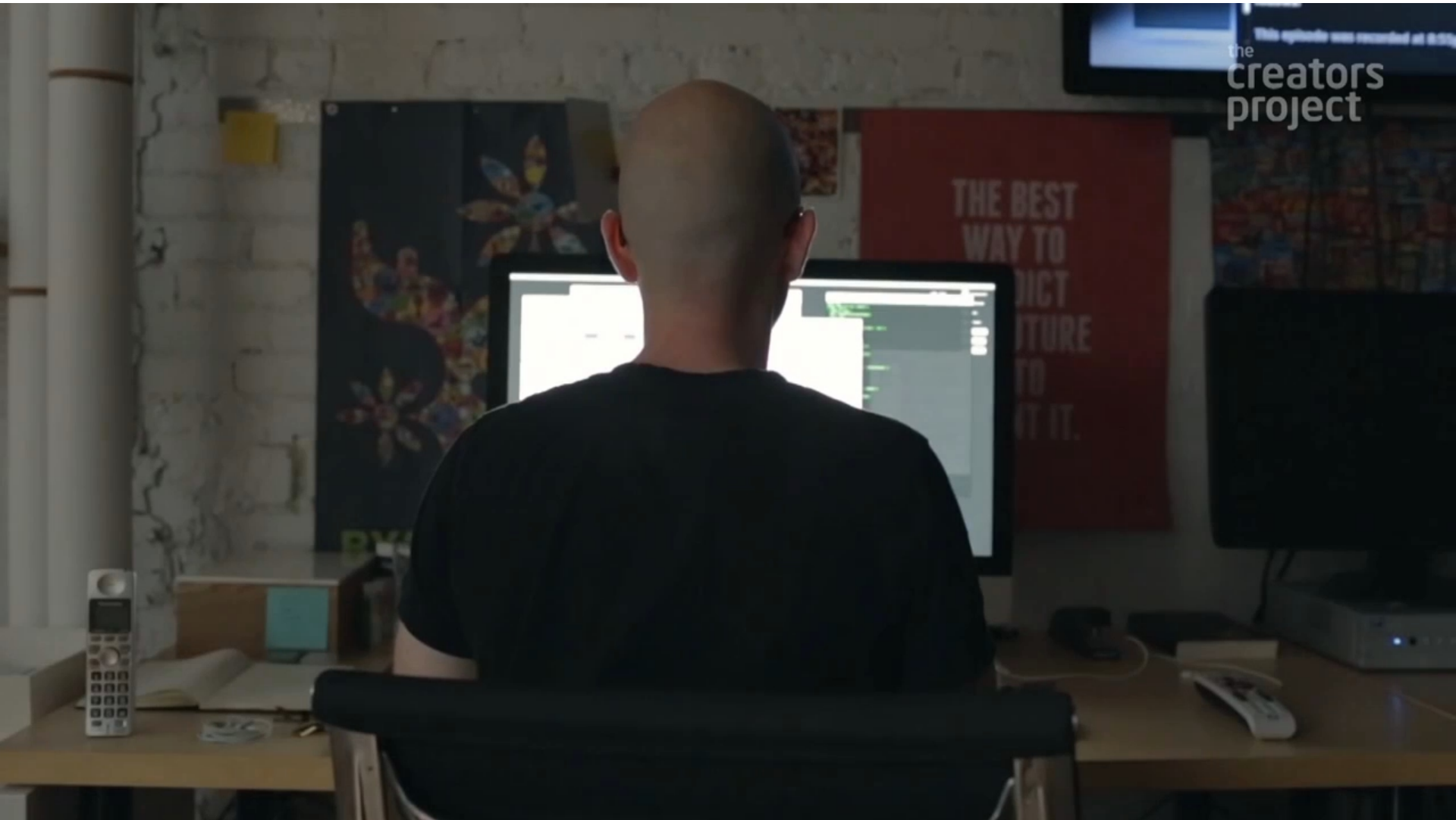
- Numbers
 - Integers 0, 1, 2, 3, -1232
 - Floats 2.385, 1.41423, 3.14159
- Letters A,B,C, d...
 - Strings, "hello."
 - " "
- Booleans (true, false)

INSTRUCTIONS

- Variables
- Language (syntax)
- Operators and operands
- Functions
- Flow of execution (logic)
 - Iteration
 - loops

SosoLimited's message

<https://youtu.be/6OohdcsgyiE?t=46s>



Summary today

- Data vs. Code, Data types, function templates
- Looking at functions in Javascript
- Introduction to Jupyter notebook, Python 2.7
 - Read error messages for clues
- Messages from the homework
- Culture: SoSoLimited informing the public
- Class Participation exercise
 - Upload your class2.ipynb file in progress <http://bit.ly/Class2Fall2017>
 - See last line in file for instructions on how to locate the file
 - Put your name at the top, add a comment about group members
 - We'll continue on Wednesday.