INTRODUCTION AND PYTHON BASICS

CS 3030: Python

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UCCS University of Colorado Colorado Springs

This lesson

- Introduction
- Course description
- Syllabus
- Python basics

About me


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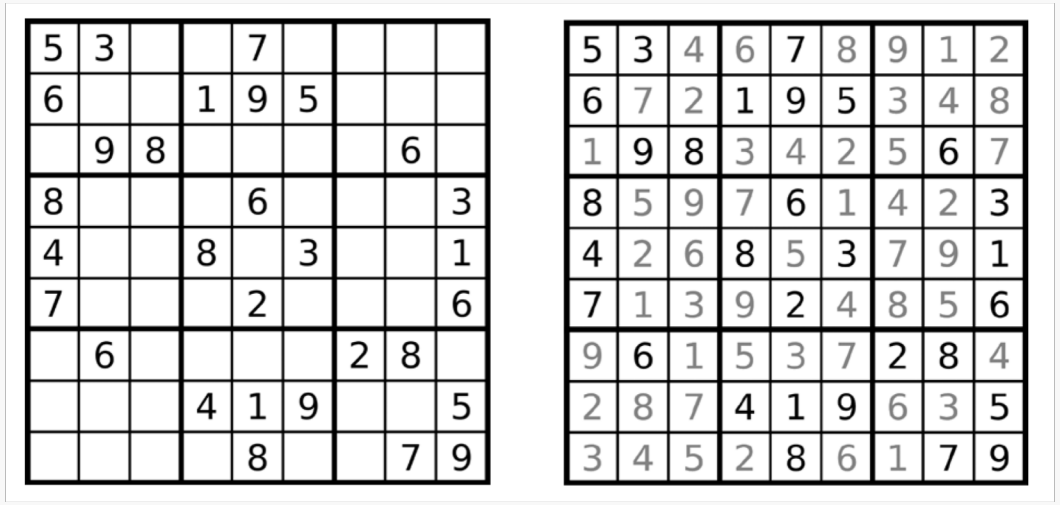
Why this course?

- Python is:
  - *High-level programming language*
  - *Active and supportive community*
  - *Extensive support libraries*
  - *Reliable and efficient*
  - *Accessible (easy to learn and use)*
  - *High demanded by companies*

- With python you are able to solve real-world problems with just a few concepts!

Programmers don’t need to know that much math

- Just because Sudoku involves numbers doesn’t mean you have to be good at math to figure out the solution. The same is true for programming.



5	3			7				
6			1	9	5			
	9	8					6	
8				6				3
4			8		3			1
7				2				6
	6					2	8	
			4	1	9			5
				8			7	9

5	3	4	6	7	8	9	1	2
6	7	2	1	9	5	3	4	8
1	9	8	3	4	2	5	6	7
8	5	9	7	6	1	4	2	3
4	2	6	8	5	3	7	9	1
7	1	3	9	2	4	8	5	6
9	6	1	5	3	7	2	8	4
2	8	7	4	1	9	6	3	5
3	4	5	2	8	6	1	7	9

- The more you program, the better you’ll become
- Programming is a creative task!

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Course content

- Python basics
- Advanced python concepts
- Examples of interview exercises
- Pattern matching with regular expressions
- Reading, writing and organizing files
- Web scraping
- Working with excel, word, pdf, csv and json files and data
- Keeping time, scheduling tasks, and launching programs
- Sending email and text messages
- Network fundamentals and socket programming (TCP/UDP)
- Scientific computing with NumPy
- Data visualization with matplotlib

Not everything in the book!

Course content examples – Python basics

- ```
  name = ''
  while name != ‘Damia':
      print('Please type your name.')
      name = input()
  print('Thank you!')
  ```
  ```

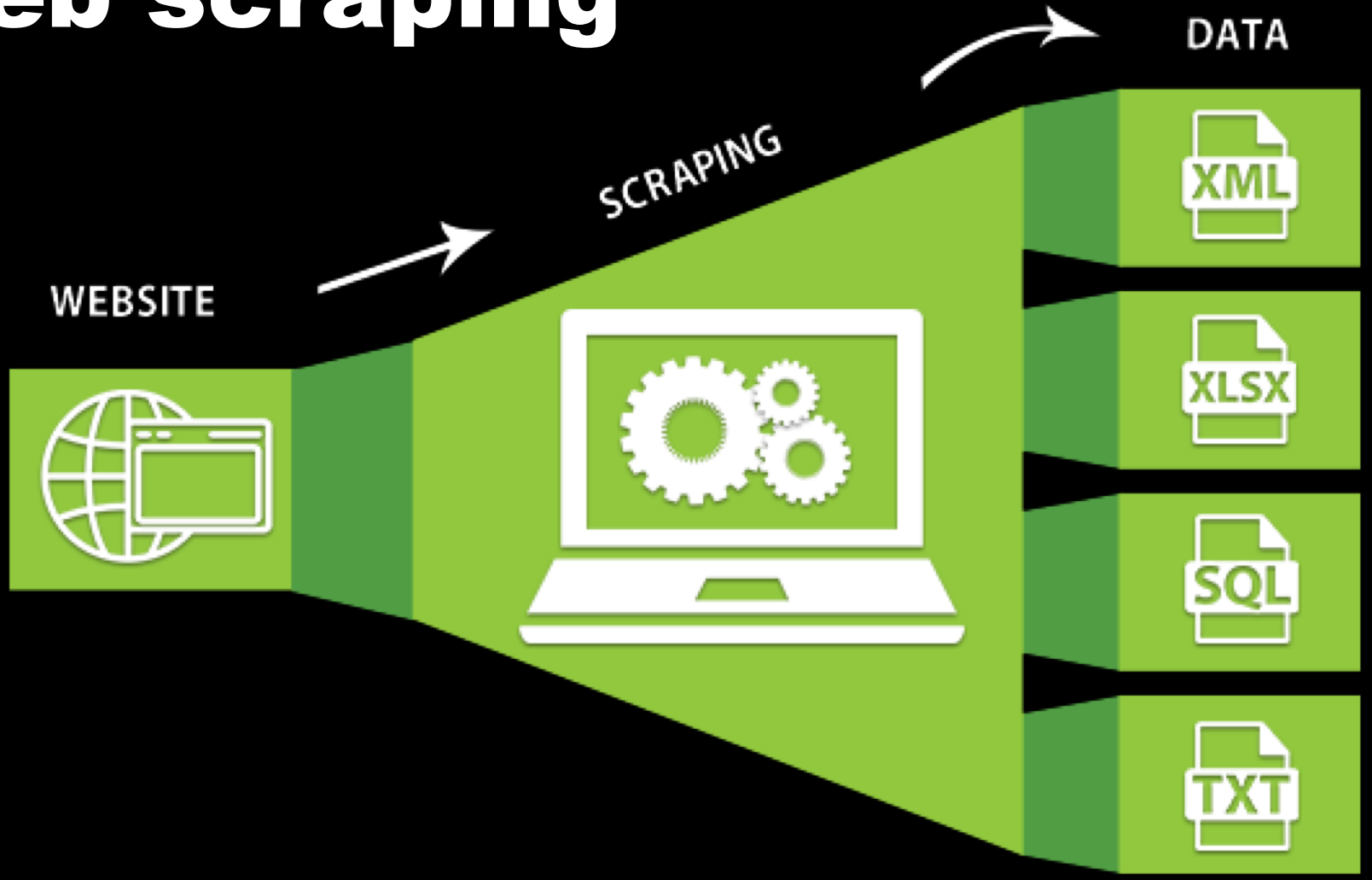
Course content examples – Advanced python

- *def my_decorator(func):*
  def wrapper():
  print("Something is happening before the function is called.")
  func()
  print("Something is happening after the function is called.")
  return wrapper

  @my_decorator
  def say_whee():
  print("Whee!")

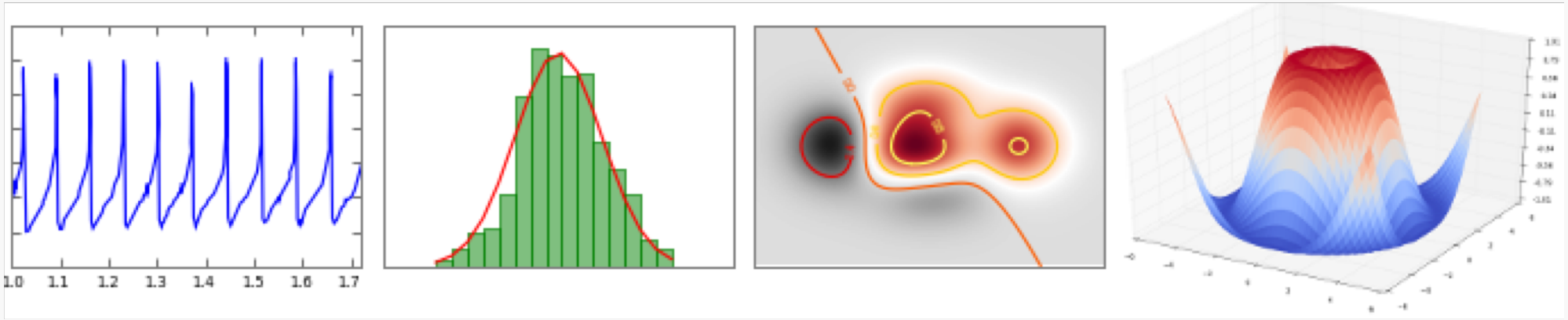
Course content examples – Interview exercises

Course content examples – Web scraping



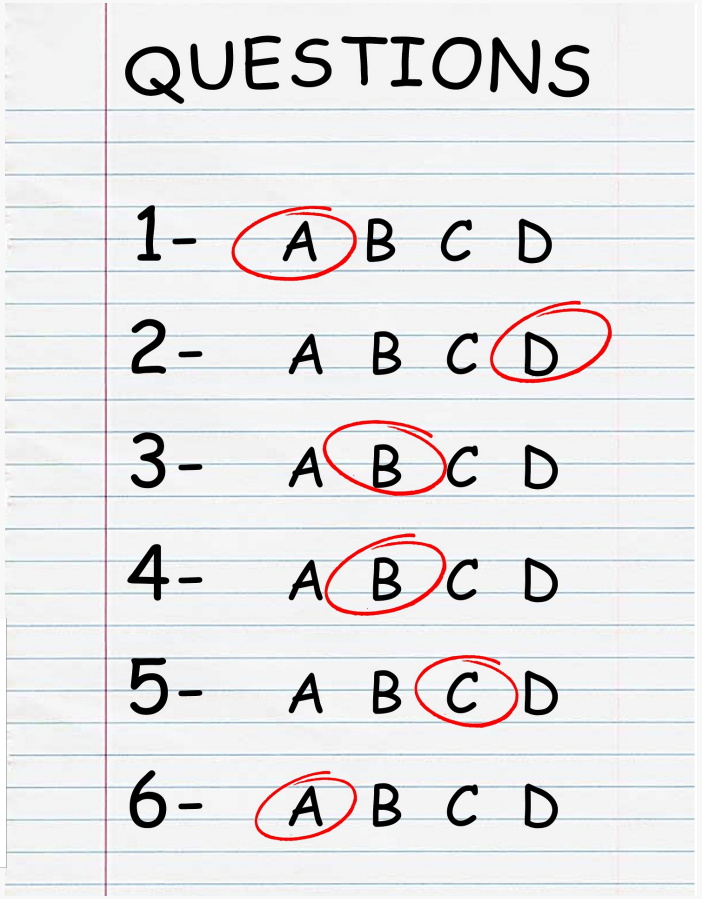
Course content examples – Send email and text messages

Course content examples – Data visualization with matplotlib



Quizzes

- Lessons topics
- Random days
- 5-10 minutes quiz of the past topics
- 10% of the mark
- Individual. Laptop not required.



4. What is printed by the Python code? Be careful: Note the backslashes:

```
print('how\nis it\nnow')
```

```
4. how
   is it
   now
```

Homework

Homework	Given	Due
Homework 1	January 22nd	Feb 3rd
Homework 2	January 29th	February 10th
Homework 3	February 5th	February 17th
Homework 4	February 12th	February 24th
Homework 5	February 19th	March 3rd
Homework 6	February 26th	April 10th
Homework 7	March 5th	March 17th
Homework 8	March 12nd	March 24th
Homework 9	April 2nd	April 21st
Homework 10	April 18th	May 5th

- 30% of the mark
- Individual.

Midterm

- March 21st – **Midterm**, 10% of the mark
- Individual.
- In-class.
- Laptop required.
- Exercises similar to quizzes and homework.

Interview exercises

- Examples of **interview exercises** asked by Google, Amazon, etc
- April 25th and 30th
- Individual.
- In-class.
- Laptop recommended.

Final exam

- Topics about lessons, interview exercises, quizzes and homework.
- May 9th – **Final exam**, 10% of the mark
- Individual.
- In-class.
- Laptop required.

Final project

- 40% of the mark
- Develop whatever you want! But in python.
- Groups of 2 or 3.
- One-page project proposal by March 21st
  - *You can send me the proposal before and start working once I accept it.*
- Demo and presentation between May 2nd - 16th
- 5 – 10 page paper

Grading

Category	Percentage
Homework	30%
Quizzes	10%
Final project	40%
Midterm	10%
Final exam	10%

Letter grade distribution			
>= 93.00	A	**73.00 - 76.99**	C
90.00 - 92.99	A-	**70.00 - 72.99**	C-
87.00 - 89.99	B+	**67.00 - 69.99**	D+
83.00 - 86.99	B	**63.00 - 66.99**	D
80.00 - 82.99	B-	**60.00 - 62.99**	D-
77.00 - 79.99	C+	**<= 59.99**	F

Cheating

- Plagiarism is a serious offense and all involved parties will be penalized according to the Academic Honesty Policy.
- I will report to the Dean's Office and they will decide.
  - *I will not be able to control the consequences.*
- If you copy something like a method, a class, etc. reference it!

Let’s start talking about python!

Python interpreter

- An interpreter is a program that reads and executes code.
- Python interpreter software reads source code (written in the Python language) and performs its instructions.

Source code

```
passwordFile = open('SecretPasswordFile.txt')
secretPassword = passwordFile.read()
print('Enter your password.')
typedPassword = input()
if typedPassword == secretPassword:
   print('Access granted')
   if typedPassword == '12345':
      print('That password is one that an idiot puts on their luggage.')
else:
   print('Access denied')
```

Interactive shell

- A shell is a program that lets you type instructions into the computer.
- Python's interactive shell lets you enter instructions for the Python interpreter software to run. The computer reads the instructions you enter and runs them immediately.
- From the Command Line (Windows) or Terminal (Mac) write:

  $ python

  >>> print('Hello world!')

  Hello world!

Virtual Environments

- What is a Virtual Environment?
  - Create an isolated environment for Python projects
  - Each project can have its own dependencies

- Why?
  - *Don't install all those packages (or modules) to your system*

- How?

  $ pip install venv *(or virtualenv)*

  $ python3 -m venv env

  $ source env/bin/actívate

  (env) $ deactivate

Try

$ which python

(env) $ which python

Python Software

They use the python interpreter!

Recommended:

- PyCharm Community Edition IDE
  - *https://www.jetbrains.com/pycharm/*

Others:

- Visual Studio IDE
- Sublime text + Command line
- IDLE (used in the book)
- Online Python Editor and IDE (https://repl.it/repls/ProfitableBurlywoodBracket)
- etc

Hardware
Any computer!

Python basics

- **Expression**
  - *Combinations of **values** and **operators** that can **evaluate** down to a single value*
  - *2 + 2*
  - *4 * 3*
  - *5 – 4 * (3 + 1)*
  - *2*

Python basics

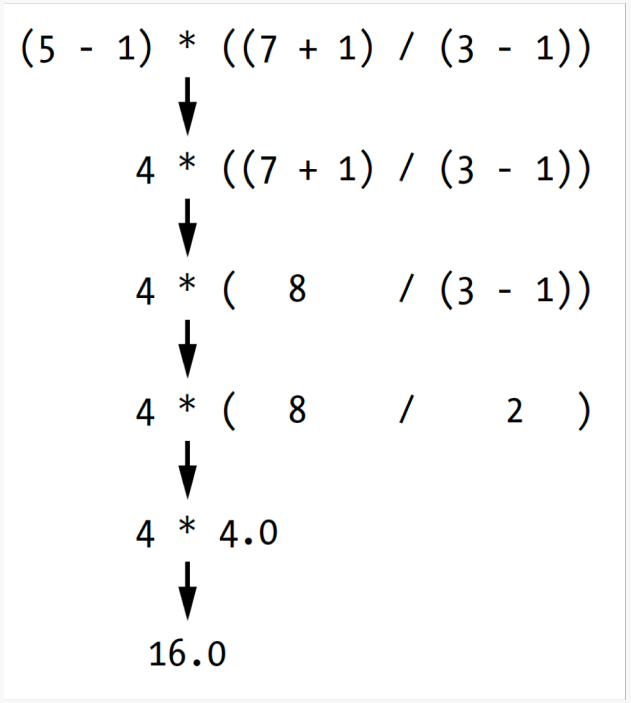
Operator	Operation	Example	Evaluates to...
**	Exponent	`2 ** 3`	8
%	Modulus/remainder	`22 % 8`	6
//	Integer division/floored quotient	`22 // 8`	2
/	Division	`22 / 8`	2.75
*	Multiplication	`3 * 5`	15
-	Subtraction	`5 - 2`	3
+	Addition	`2 + 2`	4

Python basics

- **Precedence**
  - *The ** operator is evaluated first;*
  - *the * , / , // , and % operators are evaluated next, from left to right;*
  - *the + and - operators are evaluated last (also from left to right).*
  - *You can use parentheses ( ) to override the usual precedence if you need to.*

Python basics

- **Precedence**
  - *Python will keep evaluating parts of the expression until it becomes a single value*



Python basics

- **Common data types**
  - *A data type is a category for values, and every value belongs to exactly one data type*
  - *The meaning of an operator may change based on the data types of the values next to it.*
  - *String replication operator*
    - 'Alice' * 5

Table 1-2: Common Data Types

Data type	Examples
Integers	`-2, -1, 0, 1, 2, 3, 4, 5`
Floating-point numbers	`-1.25, -1.0, --0.5, 0.0, 0.5, 1.0, 1.25`
Strings	`'a', 'aa', 'aaa', 'Hello!', '11 cats'`

Storing values in variables

- You'll store values in variables with an **assignment statement**. An assignment statement consists of a variable name, an equal sign (called the **assignment operator**), and the value to be stored.
- A variable is **initialized** (or created) the first time a value is stored in it
- **Overwriting** the variable -> When a variable is assigned a new value, the old value is forgotten. It doesn't matter the data type.
- **Multiple assignment**
  - *a = b = c = 1*
  - *a,b,c = 1,2,"john"*

Variable names

- 3 rules:
  - *It can be only one word.*
  - *It can use only letters, numbers, and the underscore (_) character.*
  - *It can't begin with a number.*

Valid variable names	Invalid variable names
`balance`	`current-balance` (hyphens are not allowed)
`currentBalance`	`current balance` (spaces are not allowed)
`current_balance`	`4account` (can't begin with a number)
`_spam`	`42` (can't begin with a number)
`SPAM`	`total_$um` (special characters like `$` are not allowed)
`account4`	`'hello'` (special characters like `'` are not allowed)

Variable names

- Variable names are **case-sensitive**
  - *spam , SPAM , Spam , and sPaM are four different variables.*
- It is a Python convention to start your variables with a lowercase letter.
- Descriptive names makes your code more readable.
- **Camelcase**
  - *lookLikeThis*
- **Underscores** (official Python code style)
  - *looking_like_this*
- It doesn’t matter which way, but be consistent in your code!

First program

- Ask the user for his name and age.
- Tell him:
  - *The length of his name*
  - *How old will be in a year (= age + 1)*

- https://repl.it/languages/python3

First program

- The **print()** function displays the string value inside the parentheses on the screen.
- The **input()** function waits for the user to type some text on the keyboard and press enter. Always returns a string.
- The **len()** function evaluates to the integer value of the number of characters in the string argument (or a variable containing a string).
  - *len('hello world') evaluates to 11*
- The **str()** function can be passed an integer value and will evaluate to a string value version of it.
  - *str(29) evaluates to '29'*
- The **int()** function can be passed an string value and will evaluate to a int value version of it.
  - *int('29') evaluates to 29*

Comments

- Python ignores comments, and you can use them to write notes or remind yourself what the code is trying to do.
- Any text for the rest of the line following a hash mark (#) is part of a comment.
  - *# This is a one line comment*
- Any text in between two delimiters (''') is part of a comment. Used to explain things in more detail.
  - '''

    This is a multiline comment.

    Second line.

    '''