

2/2/19 Class 1: Introduction

- **What is computer science?**
 - Merriam-Webster: a branch of science that deals with the theory of computation or the design of computers.
 - Dictionary.com: the science that deals with the theory and methods of processing information in digital computers, the design of computer hardware and software, and the applications of computers.
 - Our focus this term: Computer science is the **study of algorithms**
- **Algorithm**: A finite set of instructions that tell us what to do
 - Try coming up with an algorithm for making a PB&J sandwich
 - An algorithm is a set of instructions that
 1. That is well-ordered
 2. Unambiguous
 3. Computable: Something that can be effectively done, can effectively produce an output given the input
 4. It produces a final result
 5. Finishes/terminates in a finite amount of time
 - Doesn't have to involve a specific device, such as a computer - can be theoretical (=assuming we had the ability to perform these computations, what would be the set of instructions to solve this problem?)
- **Programming** = the implementation of an algorithm in a human-understandable language that is executable by a computer
 - What is an executable programming language?
 - Python is one
 - Means of communication
 - In programming languages, the two parties are human and computer: human gives a set of instructions to the computer
 - Programming languages are designed to be human-understandable (a computer, at the most basic level, only understands binary - on or off)
 - Compiler will translate our human-understandable code into machine code, which is composed of binary numbers that the computer can understand to produce the desired results
- First program: hello world
 - `print("hello world")`
 - save the text file as "hello.py"
 - .py is file extension for python files
 - can run on command line by typing `python hello.py`
 - We will use Spyder (launched via Anaconda) in this class
 - Console will show the results of your code in real-time
 - Editor allows you to edit or write .py files → Clicking on green arrow ("run") will show the results of that file in the console
- **Datatypes**: a set of values and operations that can be used on them
 - Integers (whole numbers) > addition, subtraction, etc.
 - Floating point numbers (decimal points) > addition, subtraction, etc.
 - Booleans (True/False) > negation, and/or
 - Strings (sequence of characters): concatenation, indexing

Assigning variables in Python: Use the '=' character

```
In[1]: a=3
```

```
In[2]: a
```

```
Out[2]: 3
```

- Let's do something useful with these datatypes! > Using **"operators"**

- o Integers, Floats

Arithmetic operators:

+ (addition), - (subtraction), / (division), // (floor division), %(modulus), *(exponent), *(multiplication)

Comparison operators:

== (equal), != (unequal), >, <, <=, >=

- o Booleans: **and**, **or**, **not**

and	True	False
True	True	False
False	False	False

or	True	False
True	True	True
False	True	False

not	
True	False
False	True

e.g. Run the following code and understand the output

```
m = 3
```

```
n = 5
```

```
b1 = m<n #True
```

```
b2 = m==n # False
```

```
print(b1 and b2) → False (True and False is False)
```

```
print(b1 or b2) → True (True or False is True)
```

```
print(not b1) → False (Opposite of True is False)
```