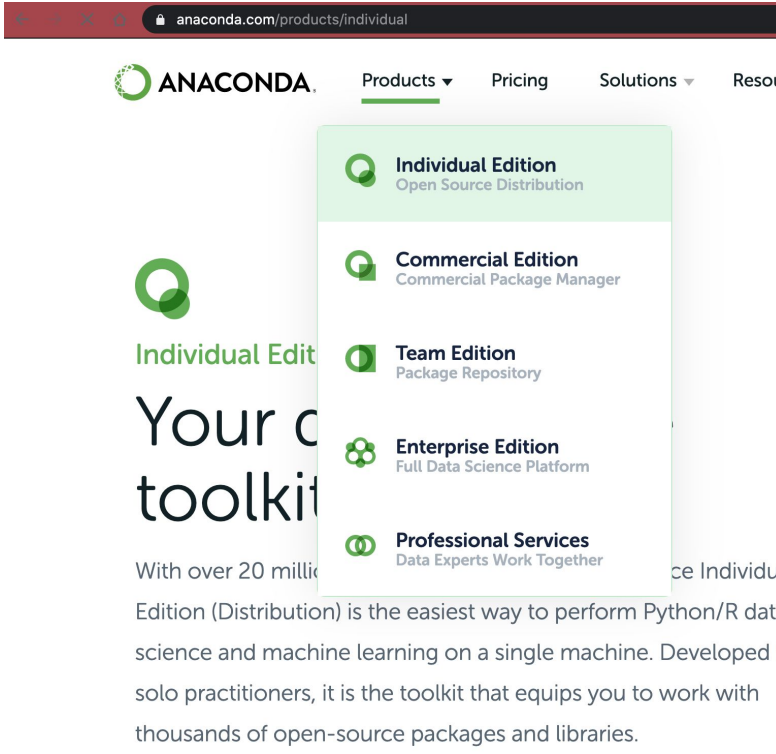
Installing Spyder/Anaconda

Head onto https://www.anaconda.com/.

On the products drop down menu click on individual edition.

Click download and select the **Graphical installer** that fits your computer.

Click on the package installer in your downloads and let it download! Make sure to read and follow the installer's instructions.



Coding Basics

Charosa, EWH, SASE Labs

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Next General Meeting
Oct 19th
7-8pm

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What is Charosa?

We are a student group at the University of Minnesota whose goal is to facilitate and encourage students to follow their passions in research, healthcare, and medicine. Gain hands-on research and engineering experience with a dynamic team seeking to solve problems at the interface of healthcare, medicine, and research.

What is SASE?

- Society of Asian Scientists and Engineers
- Professional development events with sponsors such as Cargill, Epic, CH Robinson
- SASE Labs works on a year-long project and holds workshops like these!

What is Coding?

- Giving people instructions (Algorithms)
  - Instead of people, you're giving a computer instructions
    - In the computer's language
      - Which is very picky

Data

What is data?

- Integers
  - 4, 3, 2, 24
- Strings
  - “Hi”, “I am coding”, “1”
- Floats
  - 1.0, 2.42
- Boolean
  - True, False
- List
  - [1, 2, 3], [“hi”, 2, False]
- Tuple
  - (1,2,3)
  - Like Lists except it’s immutable

Literals

- A literal is data that stands for itself. Examples:

4

3.1415926

'This is literally a string'

False

Variables

- Named items that store some value
- Under the hood: a pointer to some place in memory to store some value

toy='Buzz Lightyear'

price=29.99

budget=90

inBudget=price<=budget

We can show you this on Spyder...

Input and print

- input(prompt_string) takes in a prompt string (optional), returns whatever string the user inputs
- Unlike print, input only takes in ONE string
- print(output_string)
    - Have multiple outputs using string concatentation
        - Use +
        - print(“Hi “ + name)

Type Conversions

- input() only returns strings, even when the user types in only digits
- What if you want to do math with the input?
- int(x) converts x to an integer
  - If x is a float, this truncates the value (rounds down to the nearest integer)
  - If x is a string, this only works if the string is only digits
  - If x is a boolean, you get 1 for True or 0 for False
- float(x) converts x to a floating point number
- str(x) converts x to a string

Operators

- Special functions bound to a symbol (+, -, *, /, etc.), that don't use normal function syntax
- To compute a^b in Python, use a ** b
- This can be used to compute square roots: a ** 0.5
- You can to calculator things. Hooray?

Quick note: If, elif, and else

We want a code to run only if a certain statement is fulfilled. Remember code is read from top to bottom.

if statement 1:
    Block 1 code
elif statement 2:
    Block 2 code **runs only if the previous if statement is false**
else:
    Block 3 code **runs only if the previous if statement and elif statement is false**

Either Block 1 code runs **or** Block 2 code runs **or** Block 3 code runs.

Notice the colon!

Operators on Strings??

Which of the following produce errors?

- 'Five' + 3
- 'Five' + 'Three'
- 'Five' * 3
- 'Five' * 'Three'

Arrays

Lists in python:

- [1,2,3]
- len([1,2,3]) → 3

Indexing (Subscripting)

- Get one element out of a sequence
- Elements order given by their index, starts at 0
- If seq is a sequence, then seq[0] is the first element, seq[1] is the second element, etc.
- seq[len(seq) - 1] is the last element

```
index    0    1      2         3     4
seq = ['ele', 6, [5, 2, 6], True, 0.56]
```

Indexing (Subscripting)

- `vals = [False, [3, 4.5, []], 'word']`
- What do the following evaluate to?
  - `len(vals)`
  - `vals[0]`
  - `len(vals[0])`
  - `vals[-2]`
  - `len(vals[-1])`
  - `vals[3]`
  - `vals[1.5]`
  - `vals[-4]`
  - `vals[-1][1]`
  - `vals[1][-1]`

Indexing (Subscripting)

- `vals = [False, [3, 4.5, []], 'word']`
- What do the following evaluate to?
  - `len(vals)` -> `3`
  - `vals[0]` -> `False`
  - `len(vals[0])` -> `TypeError: object of type 'bool' has no len()`
  - `vals[-2]` -> `[3, 4.5, []]`
  - `len(vals[-1])` -> `4`
  - `vals[3]` -> `IndexError: list index out of range`
  - `vals[1.5]` -> `TypeError: list indices must be integers, not float`
  - `vals[-4]` -> `IndexError: list index out of range`
  - `vals[-1][1]` -> `'o'`
  - `vals[1][-1]` -> `[]`

Indexing (Subscripting)

- `vals = [False, [3, 4.5, []], 'word']`
- What do the following evaluate to?
  - `len(vals)` -> 3
  - `vals[0]` -> False
  - `len(vals[0])` -> TypeError: object of type 'bool' has no len()
  - `vals[-2]` -> [3, 4.5, []]
  - `len(vals[-1])` -> 4
  - `vals[3]` -> IndexError: list index out of range
  - `vals[1.5]` -> TypeError: list indices must be integers, not float
  - `vals[-4]` -> IndexError: list index out of range
  - `vals[-1][1]` -> 'o'
  - `vals[1][-1]` -> []

List slicing

How do we get only certain items from the list?

List_name[start_index:end_index]

- Start_index is inclusive and end_index is exclusive
- vals = [False, [3, 4.5, []], 'word',43]
  - Vals[1:3]
    - [[3, 4.5, []], 'word']

Applying calculations on a list?

You need loops!

- While loop (while a certain condition is met)
- For loop (for the entire dataset)

While loops

We keep running a set of lines while a condition is met

While ___:

    ____

The statement after the while must be true to continue

For loops

We keep running a set of lines for a SPECIFIC amount of time

```
For i in [1,2,3,4]:
        print(i)
```

```
For i in range(start_index, stop_index, step):
        print(i)
```

range() provides a list of numbers starting with start_index and ending before stop_index (exclusive), and step gives the spacing between each item in the list.

range(1,8,2) → [1,3,5,7]
range(8) → [0,1,2,3,4,5,6,7]

Note: It automatically starts at 0.

User-Defined Function Syntax

- Wait wait wait. What is a function?
  - Output = function(input)
  - We can create functions!
- Starts with function signature
  - def function_name(parameter1, parameter2):
- Everything tabbed in one step is inside the function
- As soon as a line occurs that is not tabbed in, the function is ended
- If you want the function to output something:
  - Use return()

User defined functions

Let’s create a function that provides a string that contains the complementary DNA strand of the inputted DNA strand.

Libraries

Libraries are large classes. They are cookie cutters for certain items, including arrays.

- Pandas
- Numpy
  - python library used for working with arrays (2D list, or table).
  - Quickstart tutorial — NumPy v1.20.dev0 Manual

We will get to these later...

- Sklearn
- Scikit

To Learn More

https://python.swaroopch.com/

Pandas

Pandas...actually

It’s better to show than tell....

10 minutes to pandas — pandas 1.1.2 documentation

More On Python

- For more on the basics https://python.swaroopch.com/
- Google Python tutorial to find more comprehensive walkthroughs

Acknowledgements

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