McGill initiative in Computational Medicine

Workshop outline

Introduction to Python

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Registration link: https://forms.gle/4gX1jJ1Lr3v5Ct3K7

Hours of instruction: Friday, September 30, 2022, 10:00 to 14:00 (4 hours)

Prerequisites:

- No prior programming experience required.
- To be able to participate in the exercises, participants must either:
    - Have a Google Account (to run in-browser as a Colab notebook)
    - Have a local installation of Python and Jupyter notebooks. Microsoft Visual Studio Code with the Python extension installed can also be used to run the Notebook.

Summary:

In this workshop, you will be introduced to the basics of programming in Python. We will journey from a basic understanding of a computer into the world of functions and even some basics of object-oriented programming (OOP) and packages. By the end of this workshop, you will be able to write simple programs in Python, understand existing code and learn how to use new libraries.

Contents:

i. Integers and Floating-Point Numbers
ii. Booleans

c. Intro to Control Flow and Loops
i. Control Flow: the `if` Statement
ii. `while` Loops
iii. Basic `for` Loops

d. **Exercise:** Numbers and Loops

III. Module 3 – Strings (40 minutes)

a. String slicing
i. Accessing Individual Characters
ii. Accessing Substrings

b. String Operations and Methods
i. Concatenation
ii. Converting Strings to Numbers
iii. Finding a Substring
iv. Replacing Characters

c. String Iteration and the for Loop

d. **Exercise:** DNA transcription and mRNA processing

IV. Module 4 - Collection Types (45 minutes)

a. Tuples
i. Accessing Elements
ii. Tuple Unpacking

b. Lists
i. Length of a List
ii. List Slicing
iii. Adding Elements
iv. Removing Elements
v. List Iteration

c. Dictionaries
i. Key-Value Storage
ii. Accessing Elements
iii. Adding Keys
iv. Removing Keys
v. Dictionary Iteration

d. **Exercise:** Translation from mRNA to protein

V. Module 5 – Functions (35 minutes)

a. Intro to Functions
i. What is a Function?
ii. Function Parameters
iii. Return Values
iv. Documentation

b. **Exercise:** Write a function to perform transcription and translation

VI. Module 6 – Modules and Packages

a. Using Modules
   i. Importing a Module
   ii. Importing Specific Functions
b. Package Management
   i. Installing Packages using `conda` (and possibly `bioconda`)
   ii. Installing Packages from `pip`
   iii. Other Installation Tips
   iv. Reading Documentation

VII. Where to go from here (10 minutes)

a. Where to go for help
b. Closing remarks
   i. Really important: **Documentation**
   ii. Other important skills to learn: packages, markdown, GitHub

VIII. Extra Topics if Time Permits

a. Reading and Writing files
b. Recursive Functions