

Intro to Python (Part 1)

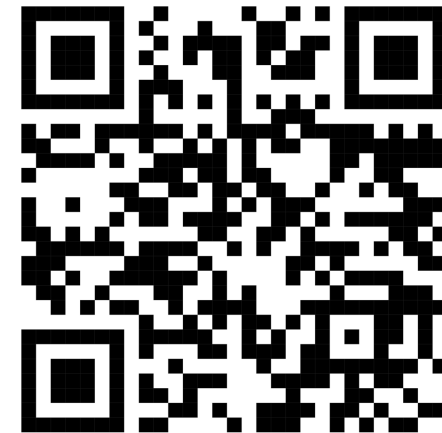
Workshop Lead: Benjamin Rudski

Date: February 20, 2024

Mission statement: deliver quality workshops designed to help biomedical researchers develop the skills they need to succeed.



Location: 740 Dr. Penfield
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Winter 2024 Workshop Series

Workshop	Date	Location	Registration
How to think in Code	Feb. 2 9AM-11AM	McIntyre Room 325	Open
Intro to UNIX and HPC	Feb. 7 9AM-1PM	McIntyre Room 325	Open
Git and GitHub	Feb. 9 1PM-5PM	Arts Room 150	Open
Intro to R (Part 1)	Feb. 14 9AM-1PM	Macdonald Engineering Building Room 10	Open
Data Analysis in R (Part 2)	Feb. 19 1PM-5PM	680 Sherbrooke Room 1279	Open
Intro to Python (Part 1)	Feb. 20 9AM-1PM	McIntyre Room 325	TBA
Data Analysis in Python (Part 2)	Feb. 23 1PM-5PM	Arts Room 150	TBA
Transcriptomics	TBA	TBA	TBA
Meta-analysis of Genetic Association Results	Mar. 13 10AM-12PM	Education Room 113	Open
WGS Data and Variant Calling	TBA	TBA	TBA
GWAS and PRS	TBA	TBA	TBA

<https://www.mcgill.ca/micm/training/workshops-series>

About me

- BSc from McGill in Hon. CS/Bio, Minor Math
- Third-year PhD student in Quantitative Life Sciences (QLS)
- Research on trabecular bone structure in the Reznikov Lab, McGill Bioengineering
 - 3D image processing and analysis
 - Programming is an almost-daily task in my life!

<https://github.com/bzrudski>

Outline

- 1. Module 1 – Introduction to Programming (30 minutes)**
 - a. Basic Concepts and Definitions
 - b. Welcome to Python
- 2. Module 2 – Python Basics (1 hour, 15 minutes)**
 - a. Foundations of Python - A Brief Overview of Types and Variables
 - b. Numbers and Comparisons
 - c. Intro to Control Flow and Loops (if, while and for)
 - d. Exercise**
- 3. Module 3 – Strings and Collections: An Object Primer (1 hour)**
 - a. Introducing the String!
 - b. Introduction to Tuples, Lists and Dictionaries
 - c. Exercise**
- 4. Module 4 – Modules and Packages (40 minutes)**
 - a. Using Modules
 - b. Package Management
 - c. Exercise**
- 5. Module 5 – Where to go from here (10 minutes)**
 - a. What to learn next? How?
 - b. How to get help and how not to get help?
 - c. Other cool programming topics

Module 1

Introduction to Programming

Module Outline

a. Basic Concepts and Definitions

a. What is a Computer?

b. What is a Program?

c. What are Programming Languages?

b. Welcome to Python

a. What is Python?

b. How to Install Python

c. Tools for Using Python

Basic Concepts and Definitions

- What is a computer?

Hard drive

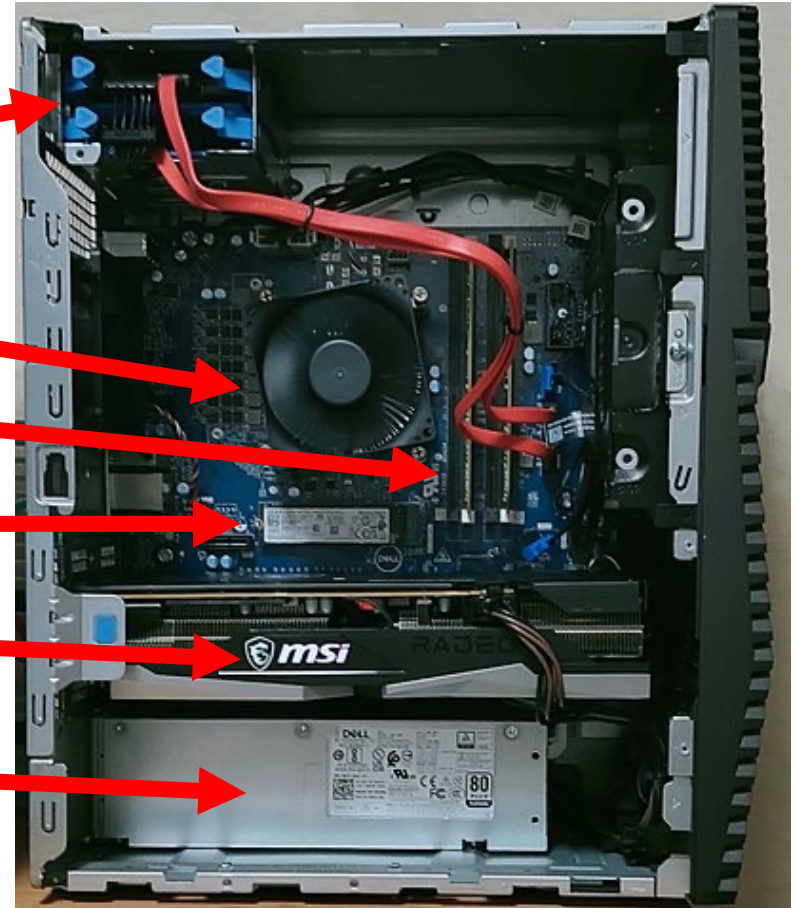
CPU

RAM

Motherboard

Graphics Card

Power Supply



[Dell G5 5000 motherboard.jpg](#), by [Project Kei](#), licensed under the Creative Commons [Attribution-Share Alike 4.0 International](#) license.

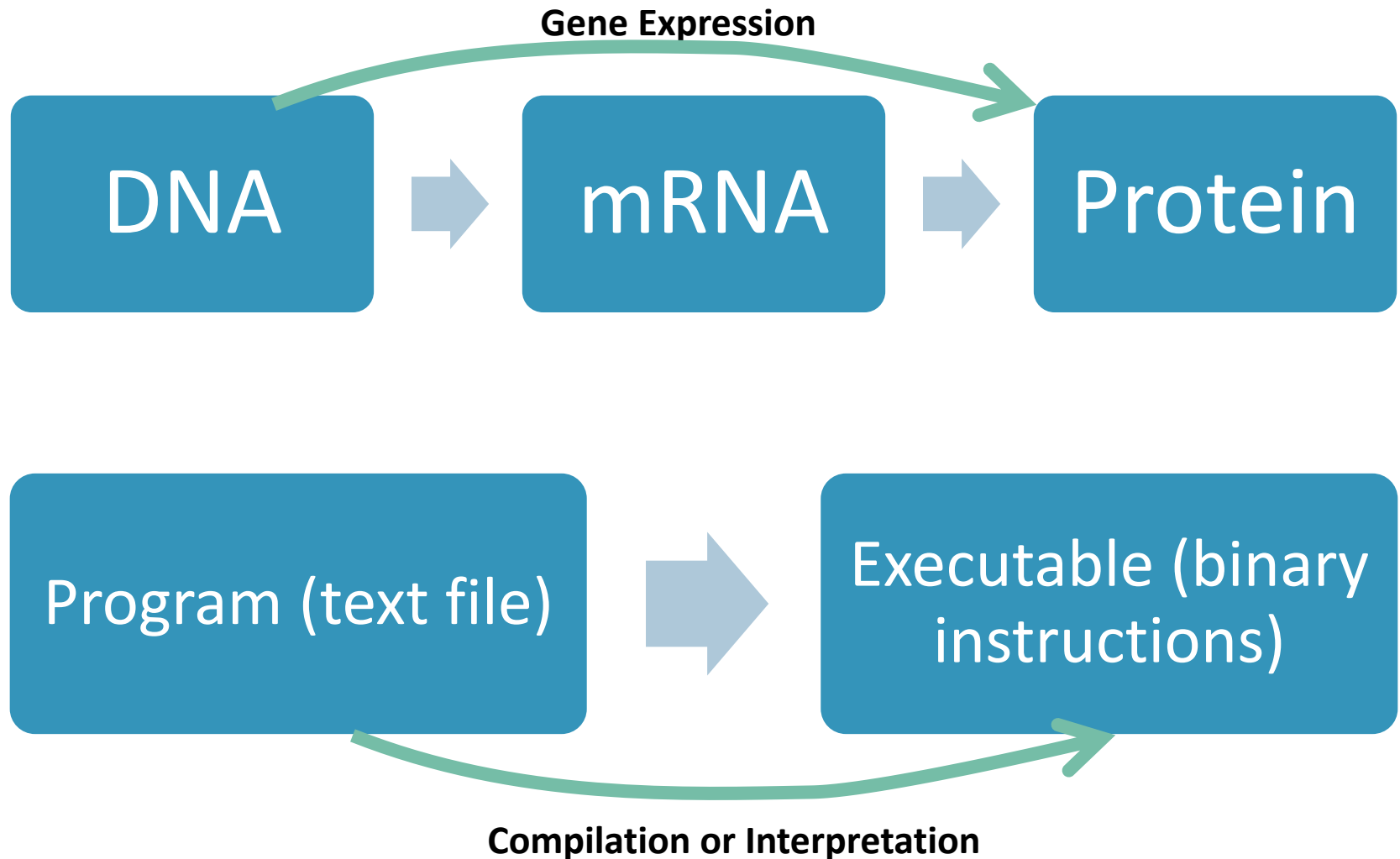
Basic Concepts and Definitions

- What is a computer?
 - RAM: memory – store data
 - CPU: processor – perform operations on data
- How do we tell it what operations to do on what data?...
- **Programming!**
- Program is a **text file** that contains instructions:
 - What operations to do
 - On what data

Basic Concepts and Definitions

- What is a program? – Instructions
- How do we write a program?
 - Using a **programming language**
- **Poll:** Who does the programming language help?
 - (a) The computer
 - (b) The programmer
 - (c) Nobody... it's a useless waste of time!
- Let's see why...

Basic Concepts and Definitions



Welcome to the Python Programming Language!



- For more history:
https://en.wikipedia.org/wiki/History_of_Python
- Introduced in 1991 by Guido van Rossum
- Features:
 - Free and Open Source
 - Interpreted
 - Object-Oriented
- <https://python.org>

Welcome to the Python Programming Language!

- Free and Open Source
 - Anyone can download, use, **modify and distribute** the Python programming language.
- Interpreted
 - Python scripts are run line-by-line
 - Can easily launch it from the command line and have access to **interactive shell**
- Object-Oriented
 - “Objects” – collections of data and manipulations that make it easier to represent the real world

Interactive Workshop!

- That's pretty much all that will be in the slides... For the rest, we'll go to a Jupyter Notebook:

To the repository!

To summarize

- ✓ Computers are machines that store data and perform operations.
- ✓ Data can be represented as numbers, strings or more complicated collections that can be processed using various functions.
- ✓ Packages and modules offer additional functionality not included by default.

Now you are ready to:

- Use variables and collections to represent data in Python code.
- Use control flow and loops to write powerful code.
- Use functions from existing packages and modules.

Acknowledgements

- Thank you to MiCM for giving me this opportunity and for helping me along the way.
- Thank you to the professors from the McGill School of Computer Science for helping me along my programming journey and for inspiring me to share my programming experience with others.
- Thank you to Professor Mathieu Blanchette, whose COMP 204 course helped introduce me to Python (back in Fall 2018).

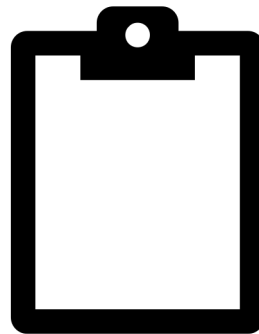
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