Learning Objective

- After finishing this course, you will:
  - Be able to explain what a programming language is, such as Python.
  - Understand the concept of variables.
  - Be able to define appropriate variables.
  - Understand the types of operations.
  - Be able to use operations for computation.
  - Understand the flow control such as branchings and repetitions.
  - Be able to write complex programs using flow controls.

Course Outline

- Introduction to Python Fundamentals
  - Module 1: Introduction to Python
  - Module 2: Variables and Operations
  - Module 3: Flow Control - Branching
  - Module 4: Flow Control - Repetition

Module 1: Introduction to Python

- Before we learn Python, we first need to know what are computers, and
- How do computers work.

Computers

- What are computers?
  - Electronic devices that compute data according to instructions.
  - Components:
    - CPU(Central Processing Unit),
    - Memory,
    - Storage,
    - Input/output devices.

Instructions

- What are the instructions?
  - Computers can only understand binary (0 and 1)
  - We cannot understand / use machine language directly.
  - We need high level languages that:
    - Similar to our natural language.
    - Can be converted to machine language.
- So we have Programming Languages.
  - A programming language is a vocabulary and set of grammatical rules for instructing a computer or computing device to perform specific tasks.

Python

- Python is a high-level general purpose programming language. Python consistently ranks as one of the most popular programming languages.
- Strength of Python (Why we use Python):
  - Smaller code length,
  - More friendly to beginners,
  - Extensive libraries (packages),
  - Best for Data Science!
- Python 3 is the current standard.

Python Environment

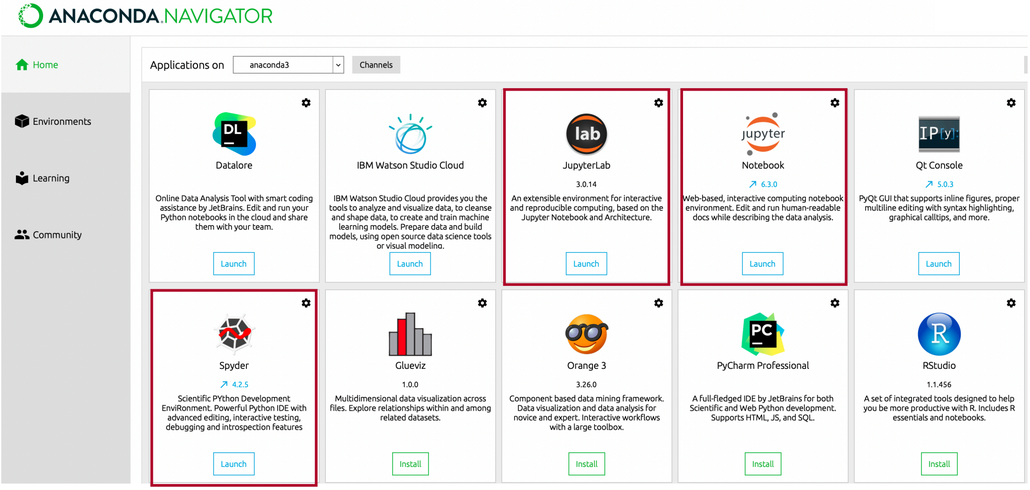
- To write and run Python programs, we need to setup Python environment.
  - We can use online environment to avoid installment and configuration (Recommend).
  - Or install a local IDE (Integrated Development Environment).

Google Colab

- Google Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser.
  - Zero configuration required.
  - Easy sharing.
  - Free with a Google Account.
  - Recommended for our specialization.

Anaconda

- You can install a local IDE, such as Anaconda
  - Run JupyterLab or Jupyter Notebook for Interactive Python Environment.
  - Run Spyder for script Python environment.



Google Colab

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What is Colaboratory?

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

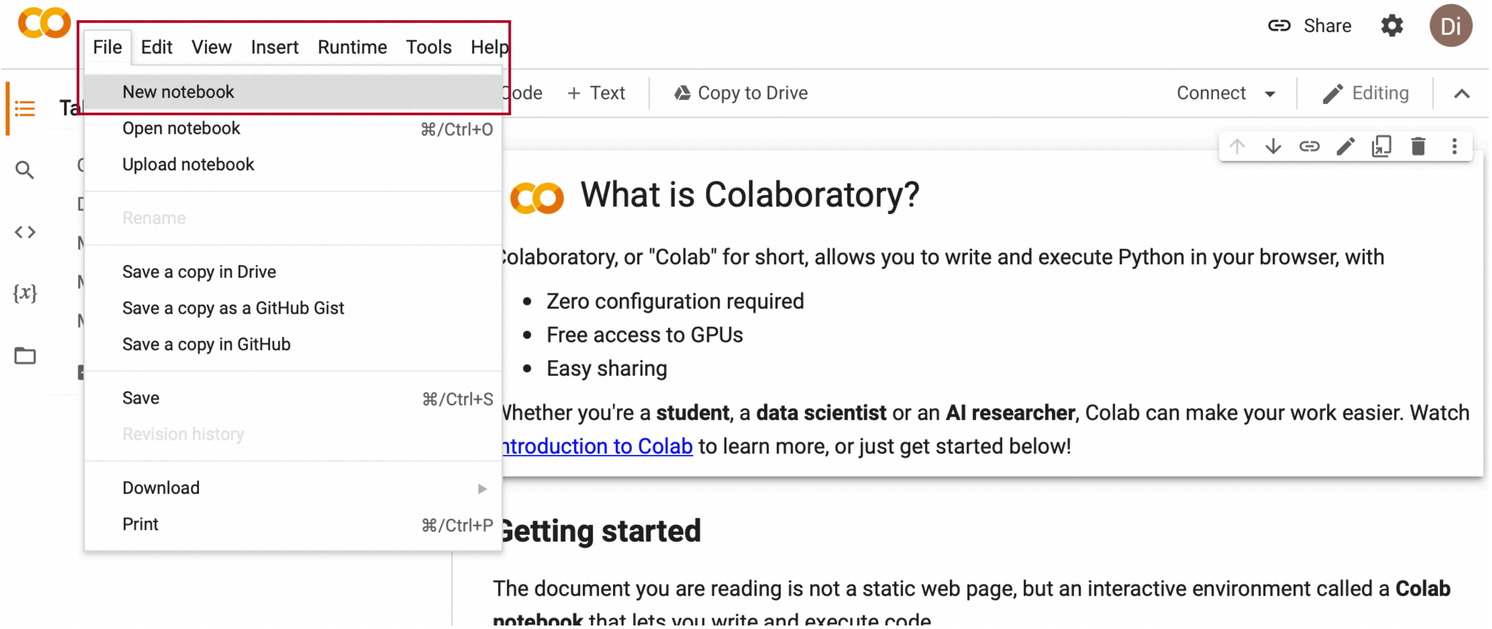
Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. Watch Introduction to Colab to learn more, or just get started below!

Getting started

The document you are reading is not a static web page, but an interactive environment called a **Colab notebook** that lets you write and execute code

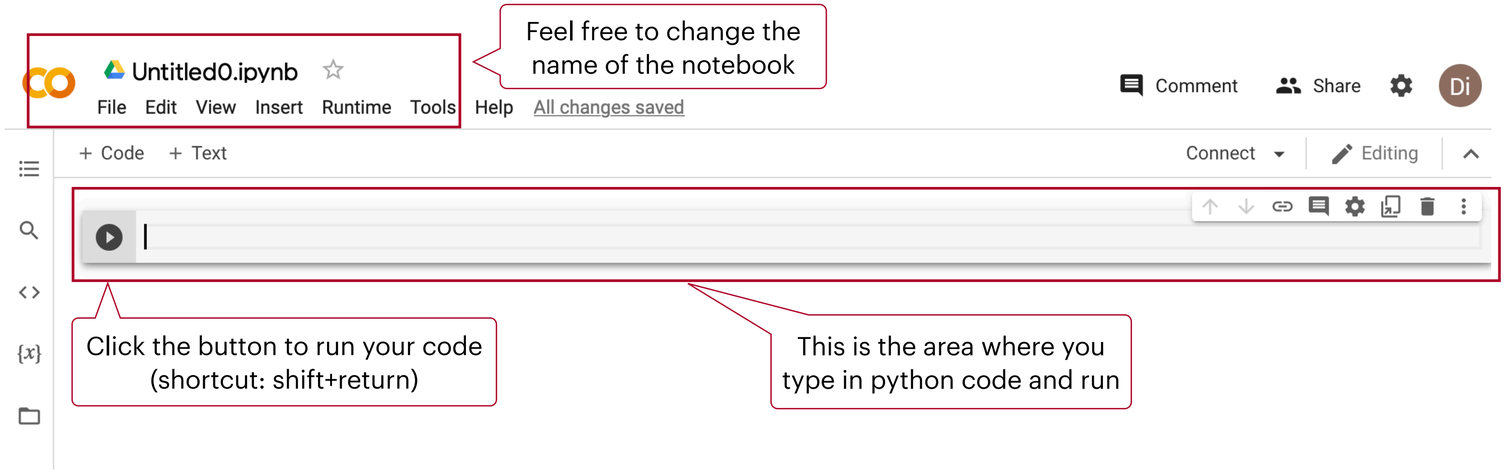
Google Colab

- Let’s create a new notebook
  - Click File, and Click New notebook



Google Colab

- Now we are ready to play!



Hello, world!

- Let’s write your first program
- Type in: print('Hello, world!')

```
print('Hello, world!')
```

- Click the button or shift+return to run

```
print('Hello, world!')
```

```
Hello, world!
```

- Congratulations! This is your first Python program!

print(‘Hello, world!’)

- Let’s look at this first program.
  - print is a keyword predefined by Python library for output.
  - () is indicating you are going to call a function.
  - 'Hello, world!' is the message you tell the function to print.

print(‘Hello, _____!’)

- Let’s play a little bit more with the message.
  - Now, you can insert a new line of code by click “+ Code”
  - Type: print('Hello, ____!') where the ____ is your first name.
    - For example, I will type: print('Hello, Di!')
  - Don’t forget there is a ' at the beginning before H, and there is a ' at the end after !
  - Run and see the result.

' and '

- Now you may have noticed that the ' and ' are crucial for the program - they wrap the message.
  - We can actually use " " or ' ' interchangeably.
  - If we start with ", we should end with "
  - If we start with ', we should end with '
  - Let's try to print another message: I'm OK!
  - Try use " " or ' ' to see which one worked.
  - print("I'm OK!")
  - print('I\'m OK!')

\ Escape

- Since the ' ' and " " we use to wrap messages are part of the Python syntax, when there are another ' or " in the message, Python will be confused.
  - We can use a different quotation to avoid this confusion.
  - We can also use a Escape mark \ to let Python know this character is something special

\ Escape

- \n Insert a new line
- \t Insert a tab
- \\ insert a \
- \" insert a "
- \' insert a '

More About Quotation Marks

- If you are going to print a message which has multiple lines, you can use triple quotation.
- In practice, triple quotations are used for commentaries and documentation.

Let’s Play in Colab

- Download the M1Lab1.ipynb file.
- Upload it to your Colab.
- Finish the tasks.
- Use the discussion board to ask for help.

Is It Too Easy?

- Let's add some spices.
- Now type in: print(input('What is your name?'))

```
print(input('What is your name?'))
```

- Run and see the result.
  - You will need to type your name; and the name will be printed out

```
print(input('What is your name?'))
...  What is your name? Di
```

```
print(input('What is your name?'))

What is your name?Di
Di
```

input(‘What is your name?’)

- Let’s look at this program.
  - input is a keyword predefined by Python library for input.
  - () is indicating you are going to call a function.
  - 'What is your name?' is the message as instruction for input.
  - The name you typed in, will be recorded for future computation.
  - In this program, the name will be used by print() and be displayed.

Let’s Play in Colab

- Download the M1Lab2.ipynb file.
- Upload it to your Colab.
- Finish the tasks.
- Use the discussion board to ask for help.

Hello, ____

- Let's revisit our first program.
  - Rather than type your name in the message directly, let's make it interactive.
  - We use input() to get the name, and use print() to print the name with the message.

```
print('Hello,', input('What is your name?'))
```

  - Run and see how the program works:

```
print('Hello,', input('What is your name?'))
What is your name? Di
```

```
print('Hello,', input('What is your name?'))
What is your name?Di
Hello, Di
```

print()

- Let’s revisit print().
  - You can have multiple messages in print()
  - Each message will be separated by ,
    - Such as print('message1', 'message2')

Let’s Play in Colab

- Download the M1Assignment1.ipynb file.
- Upload it to your Colab.
- Finish the tasks.
- Submit your assignment.
- Use the discussion board to ask for help.

Congratulations!

- You completed Module 1.
- Programming in Python is not that hard, right?
- We are going to learn more in next module and get more power unlocked!
- See you soon!