Rotman

INTRO TO PYTHON

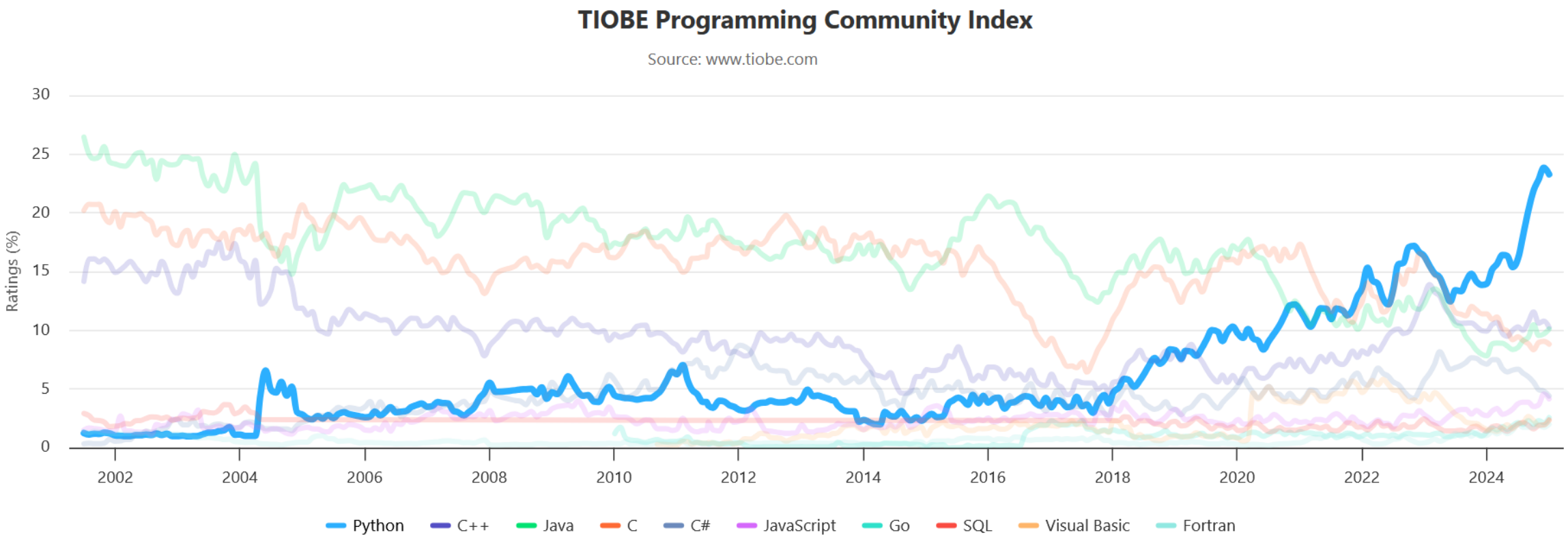
Basic Programming and Data Analysis

January 8, 2026 Prepared by Jay / MDAL (Built on Niti's past slides)

Website: https://rmdal.github.io/python-intro-2026-winter/

Rotman School of Management
UNIVERSITY OF TORONTO

Popularity of Python – Number 1



Ref. https://www.tiobe.com/tiobe-index/

What Can Python Do – Just About Anything

- Statistical analysis
- Machine learning / AI
- Data visualization
- Scientific computing

- Others
  - Scripting & automation
  - Web development
  - Systems testing & prototyping
  - Desktop applications

Install and Code in Python

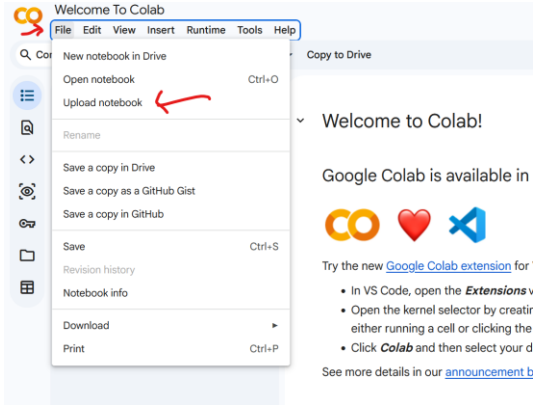
- Best Choice for Beginners: Notebook in the Cloud
  - Google Colab (**our choice today**)
  - Uoft JupyterHub (a good choice too)
    - use either *classic Jupyter Notebook* or *modern Jupyterlab* (both **2G memory limit**)

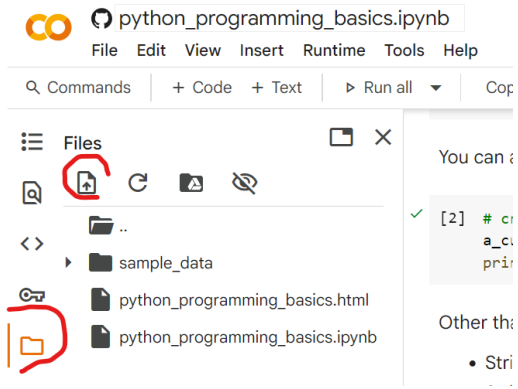
- Other Options
  - Local Notebook with Anaconda Python Distribution
    - Comes with a GUI launchpad, Jupyter Notebook, and many DS packages preinstalled
    - A large disk footprint (4.4G)
  - Official Python Distribution + a Code Editor (e.g. VS Code)
    - Install needed packages/libraries on your own
    - Work well with both pure Python code and Python notebooks

More on Notebook in the Cloud

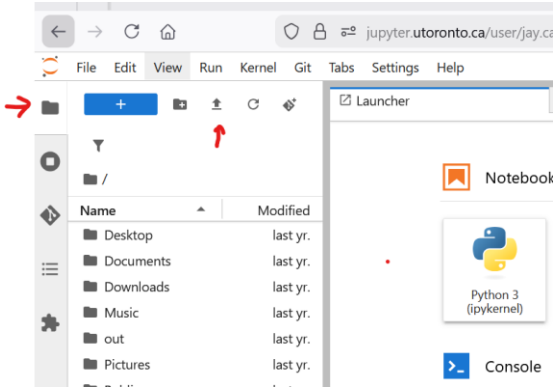
- Python Notebook (.ipynb) vs Python Script (.py)

- Google Colab or Jupyterlab at UofT JupyterHub
  - Upload a Notebook (e.g. assignment start-up code) and data





Colab



Jupyterlab

  - Download a Notebook (as .ipynb, .html or .pdf for assignment submission)
    - *File -> Download* (or *Save and Export Notebook As*)
    - Note that Colab only support .ipynb download

Plan

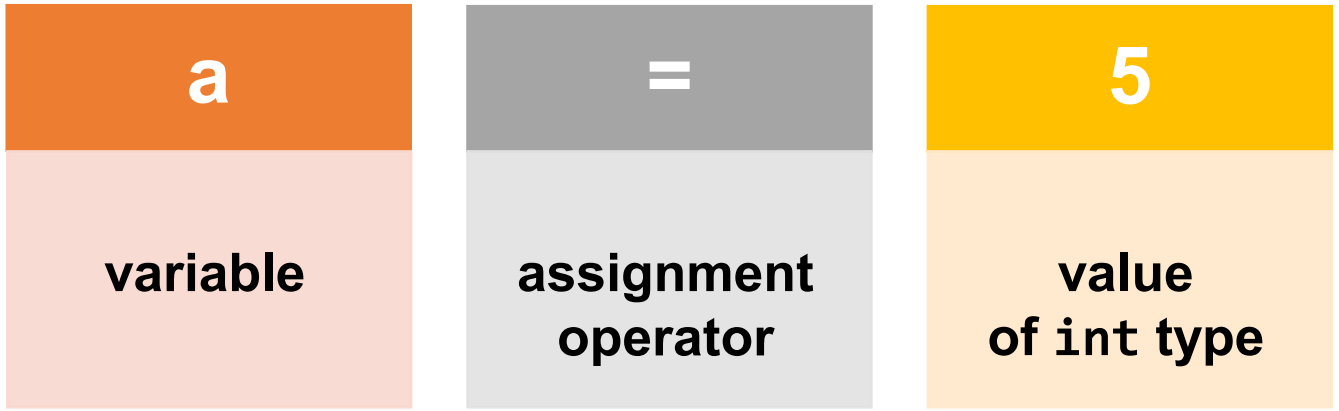
- Programming basics (notebook on workshop site)
  - Data structures (string, list, dictionary, etc.)
  - Programming structures (conditional, loop, etc.)
  - Functions (functions and methods)

- Data analysis basics (notebook on workshop site)
  - Simple data processing (operations on 2D tables/dataframes)
  - Simple analysis on a stock price time series
  - Predict next-day stock price with a linear regression model

Basic Data Structure - 1

- What's data structure
  - a way of storing and organizing data/values of certain types

- Value, type, variable, and the assignment operator (=)



An assignment statement

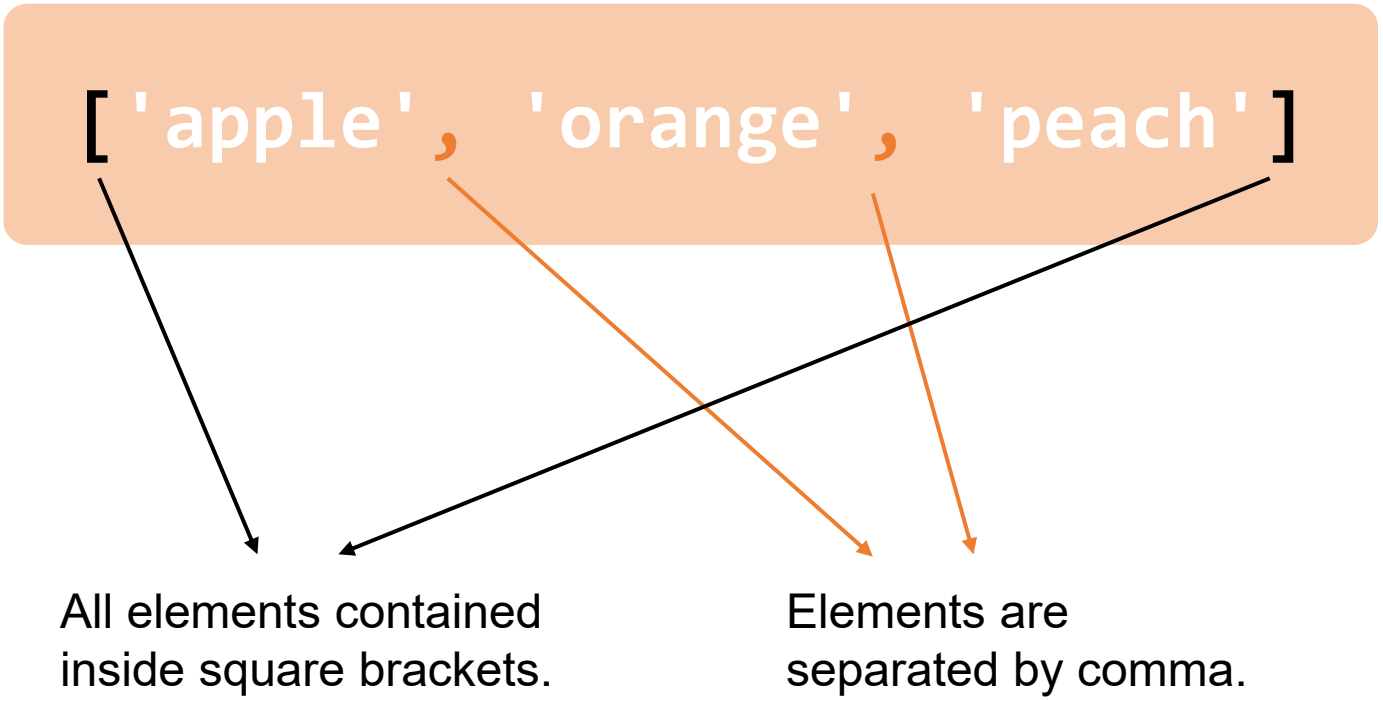
Basic Data Structure - 2

- Basic numeric types: `int`, `float`, `complex`

- String type (`str`)
  - String index
  - Methods associated with string object

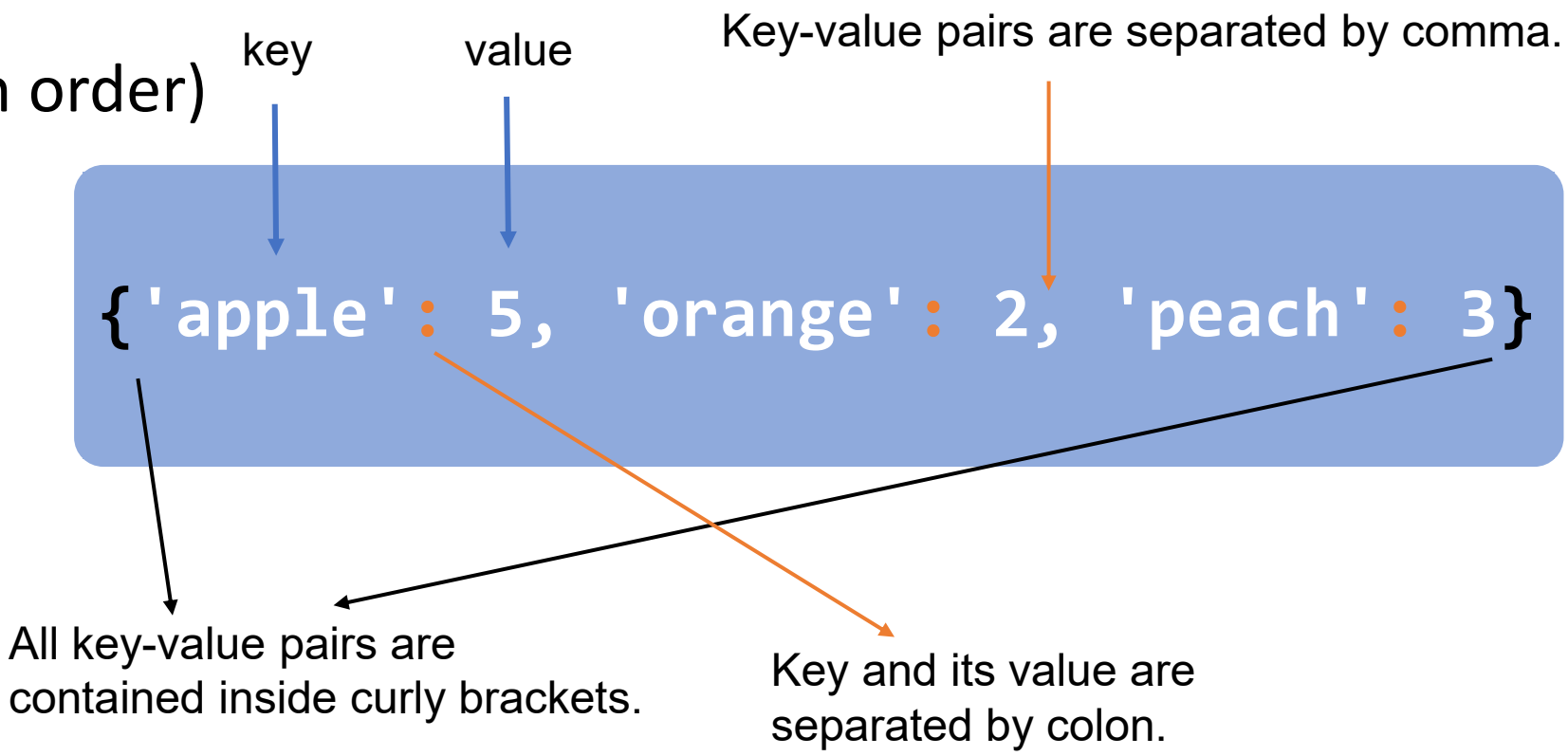
More DS Native to Python - List

- Mutable
- Ordered (Insertion order)
- Indexed

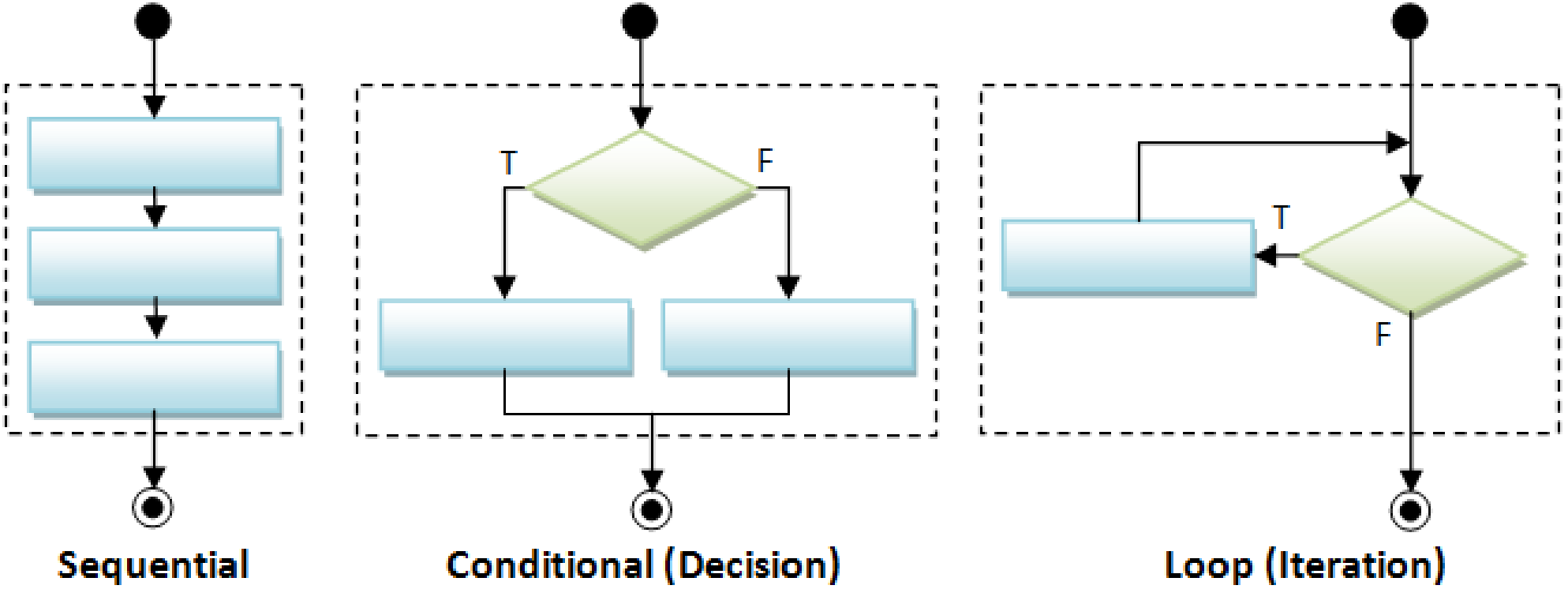


More DS Native to Python - Dictionary

- Mutable
- Ordered (Insertion order)
- Key-value pair

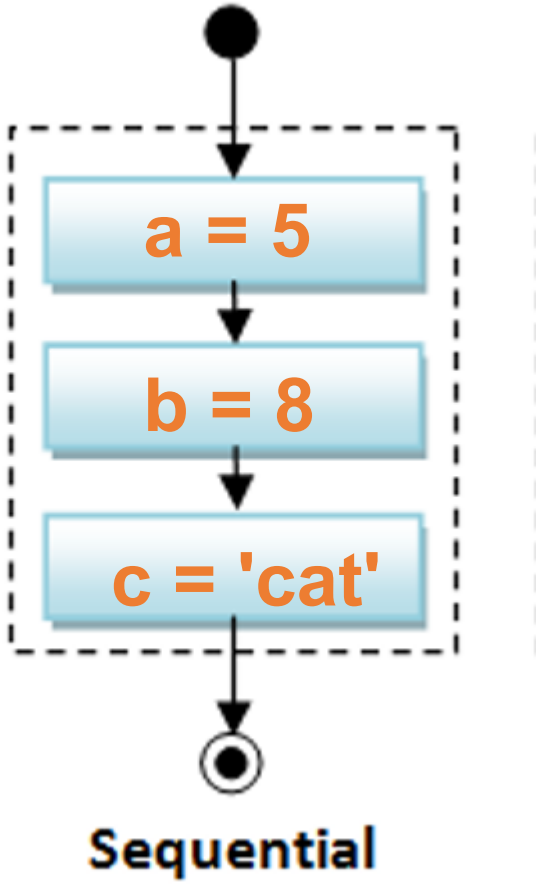


Programming Structures



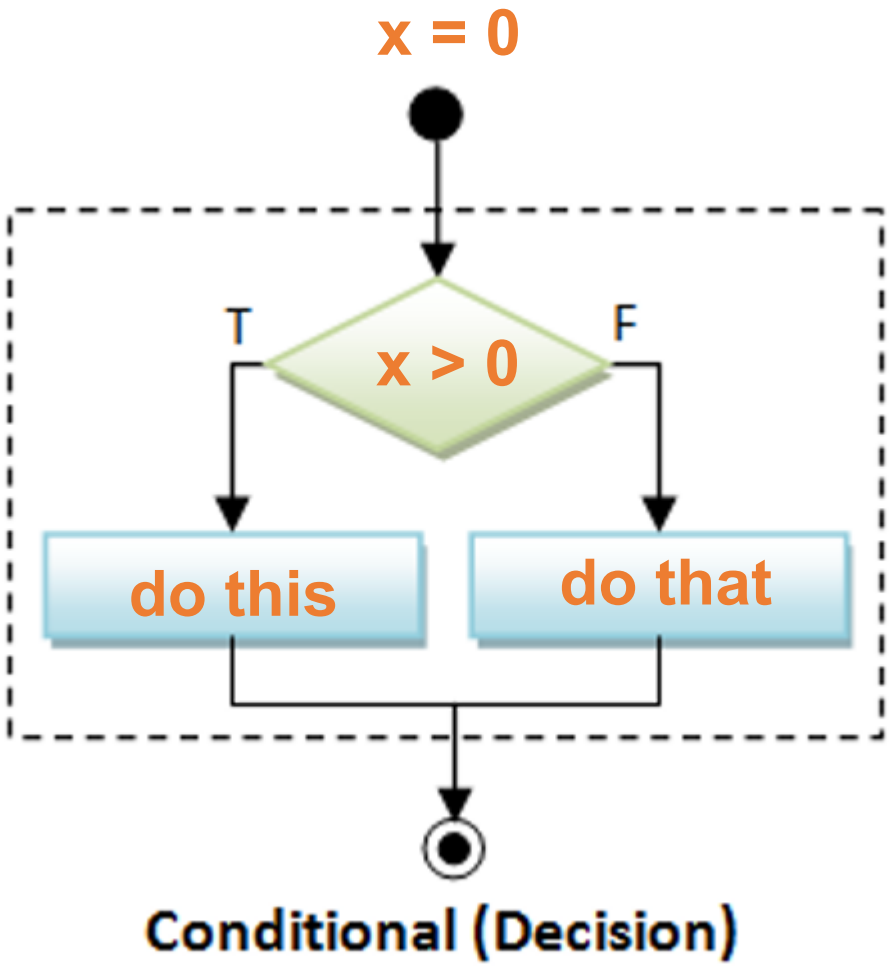
Sequential

- Code executes in sequence



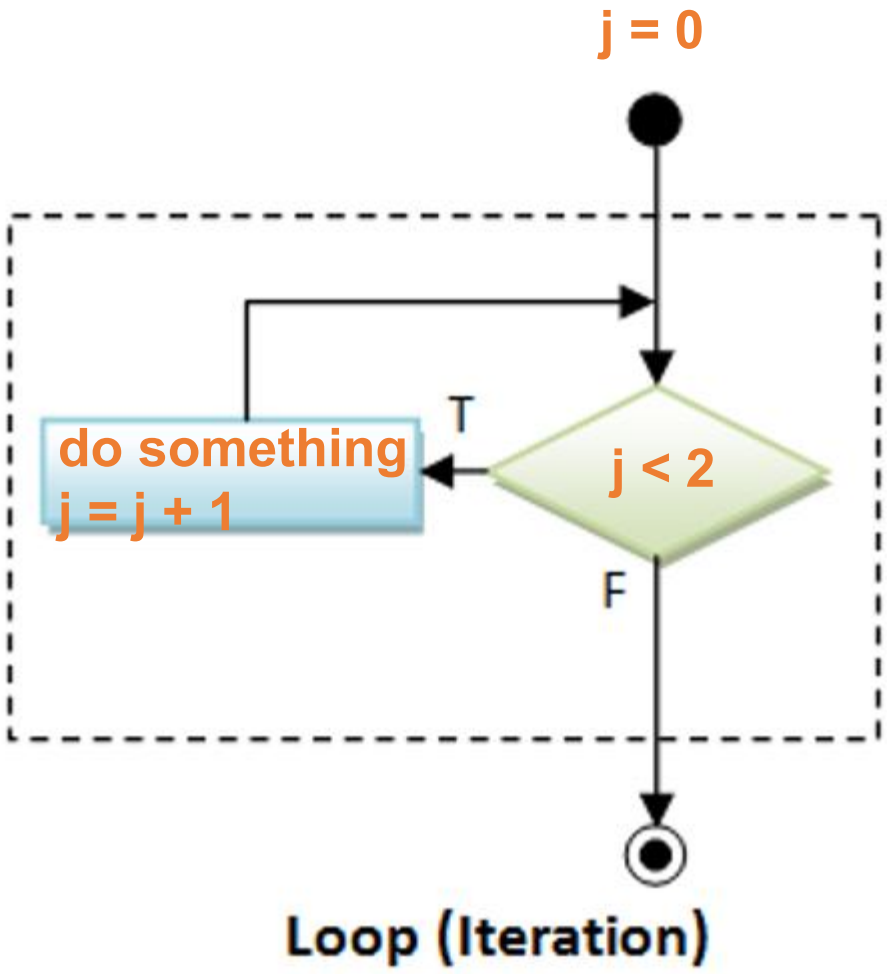
Conditional

- Whether a certain block of code is executed or not depends on whether a condition is satisfied.



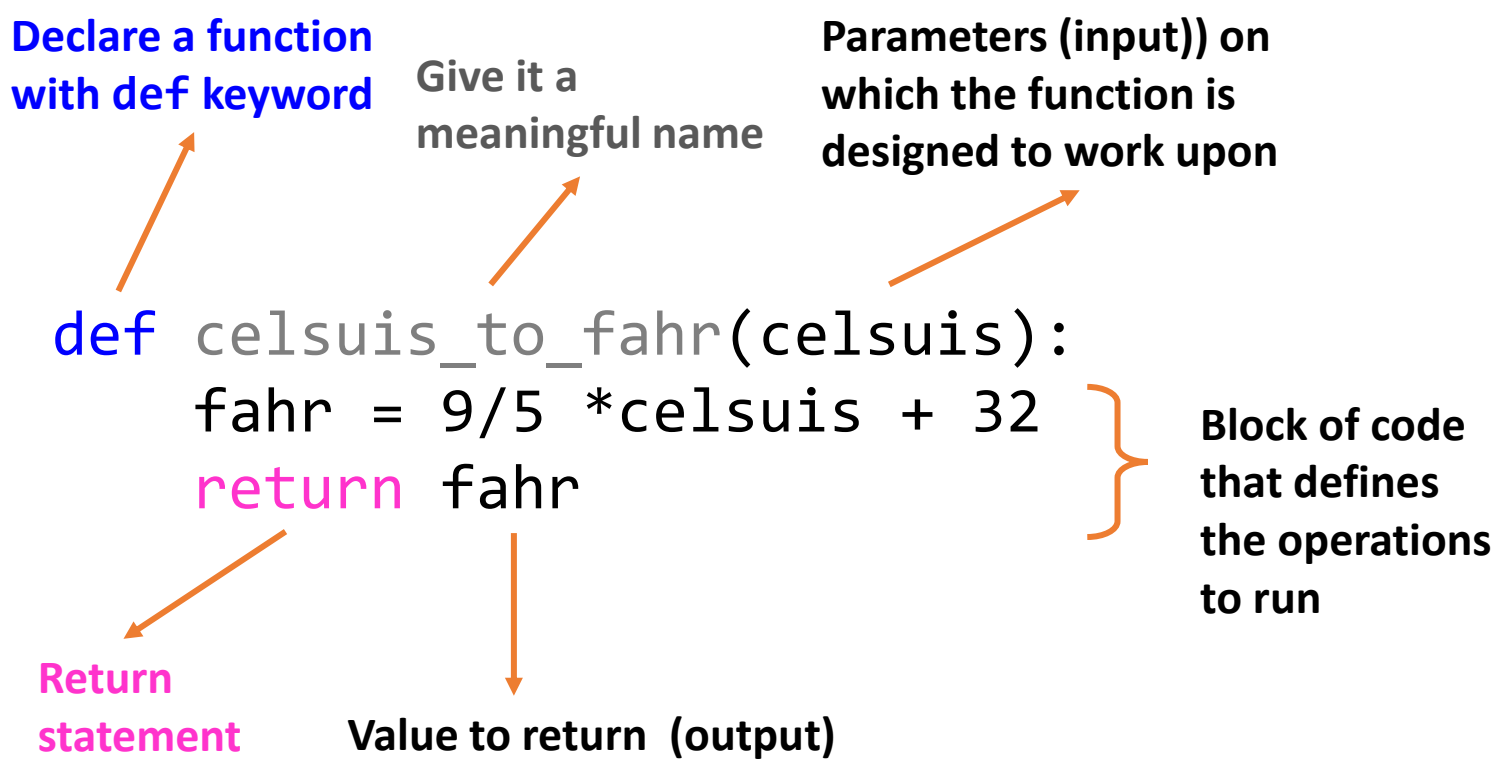
Iterative

- A block of code repeatedly executed for either identical tasks or similar tasks



Function – Custom Functions

- What's a function
  - a logical block of code
  - input -> output
- Why write functions
  - Reusability
  - Abstraction
  - Maintainability



Other Functions

- Built-in functions

- A method is
  - A functions associated with an object (an instance of a class)
  - Accessed using the dot operator (`.`)

```
# create a list
num_list = [4, 8, 10, 15]

# print() and sum() are
# built-in functions
print(sum(num_list))

# remove is a method associated
# with a list object
num_list.remove(10)
print(num_list)
```

Functions/Methods From Other Packages

- Third-party packages/libraries offer functions for various of tasks

- Useful data science packages
  - numpy: operating on vectors and matrices/arrays.
  - pandas: processing 2D tables (dataframes).
  - matplotlib: plotting.
  - scikit-learn: machine learning.

```
# import the numpy module
import numpy as np

# create a 2x3 array
# array() is a function provided by numpy
ar = np.array([[1, 2, 3],
               [4, 5, 6]])

# print the array
print(ar)

# find the largest element in the array
# max() is a method associated with the array object
print(ar.max())

# find the array's shape
# shape is an attribute of the array object;
# it's not a method or function
print(ar.shape)
```

Data Analysis Basics

- Let’s walk through the notebook together
  - Simple data processing (operations on 2D tables/dataframes)
  - Simple analysis on a stock price time series
  - Predict next-day stock price with a linear regression model