Carbon + Google

Python

Fundamentals, Data Manipulation

Dart + Flutter

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Outline

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Basic Definitions in Python

- **Python** is a high-level, interpreted, and general-purpose programming language.
- **High-level** means that Python is designed to be easy to read and write.
- **Interpreted** means that Python code is executed line by line, rather than being compiled into machine code.
- **Weakly typed** means that Python does not require you to declare the type of a variable.
- **Multiparadigm** means that Python supports object-oriented, imperative, and functional programming styles.
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Popular Developer Tools

Virtual Environments

- **Virtual environments** are a way to create isolated spaces on your computer for Python projects.
- **Virtual environments** allow you to install packages and dependencies for a specific project without affecting other projects.
- **Virtual environments** are created using the venv module, which is included in the Python standard library.
- **Virtual environments** are activated using the source command in the terminal.
- **Virtual environments** are deactivated using the deactivate command in the terminal.

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Modules and Packages

- **Modules** are Python files that contain functions, classes, and variables.
- **Modules** are used to organize code and make it reusable.
- **Packages** are directories that contain Python files (modules).
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Dependencies Management

- **Dependencies** are external libraries or packages that your Python project relies on.
- **Dependencies** are traditionally managed using a pyproject.toml file, which lists the names and versions of the packages required by your project.
- **Dependencies** can be installed using the pip package manager, which is included with Python.
- Currently, the poetry package manager is recommended for managing dependencies in Python projects. It follows the PEP 508 standard for specifying dependencies.

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Jupyter Notebooks

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- **Jupyter Notebooks** are used for data cleaning, data transformation, statistical modeling, data visualization, machine learning, and more.
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Variables and Memory Management

Variables Definition

Variables are used to store data values. Python has no command for declaring a variable. A variable is created the moment you first assign a value to it.

Conditionals

Definition

Conditionals are used to execute different code blocks based on *different conditions*.

Nested Conditionals

Nested conditionals are conditionals that are *inside* other conditionals.

Elif Conditionals

Elif conditionals are used to check *multiple conditions*.

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Loops and Range

Loops Definition

Loops are used to execute a block of code *multiple times*.

Range Definition

The **range function** is used to generate a sequence of numbers.

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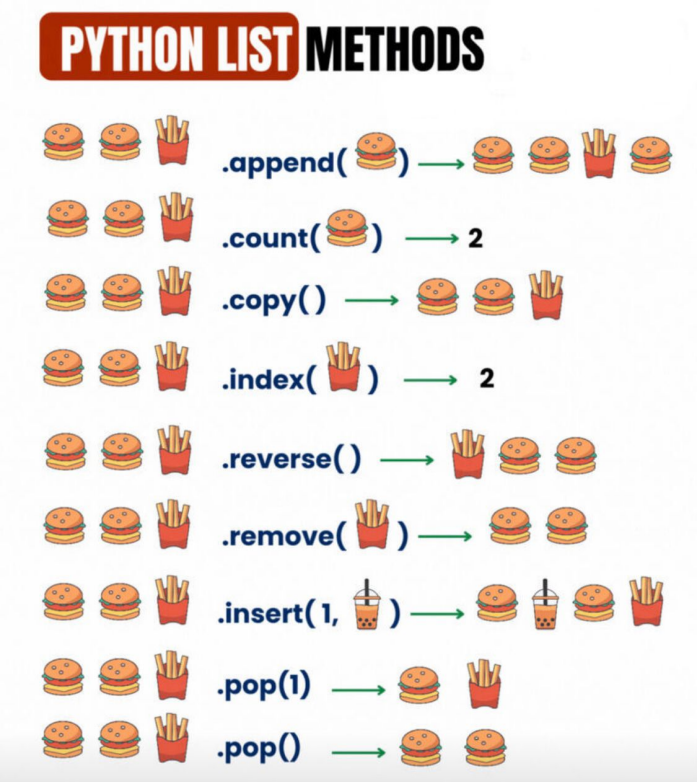
Lists

Definition

A **list** is a collection of items that are *ordered* and *changeable*. **Lists** are defined by enclosing the items in square brackets.



Dictionaries

Definition

A **dictionary** is a collection of items that are *unordered*, *changeable*, and *indexed*. Dictionaries are defined by enclosing the items in curly braces.

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Sets and Tuples

Definition Sets

A **set** is a collection of items that are *unordered* and *unindexed*. **Sets** are defined by enclosing the items in curly braces.

Definition Tuples

A **tuple** is a collection of items that are *ordered* and *unchangeable*. **Tuples** are defined by enclosing the items in parentheses.

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Lists Comprehensions

Definition

List comprehensions provide a concise way to create lists. Common applications are to make *new lists* where each element is the result of some operation applied to each member of another sequence or iterable, or to create a subsequence of those elements that satisfy a certain condition.

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Functions

Definition

A **function** is a block of code that only runs when it is called. You can pass data, known as parameters, into a function. A **function** can return data as a result.

Type of Functions

- **Built-in** Functions
- **User-defined** Functions
  - **Variadic** Functions
  - **Recursive** Functions

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Python Iterators

Definition

An **iterator** is an object that contains a *countable number of values*. An **iterator** is an object that can be iterated upon, meaning that you can traverse through all the values.

Maps

The **map function** is used to apply a function to *all the items* in an input list.

Filters

The **filter function** is used to *select items* from an input list that meet a certain condition.

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Lambda Functions

Definition

A **lambda function** is a small anonymous function. A **lambda function** can take any number of arguments, but can only have one expression.

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Classes and Objects

Definition

Python is an *object-oriented programming* language. Almost everything in Python is an **object**, with its *properties* and *methods*. A **class** is like an object constructor, or a "blueprint" for creating objects.

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Outline

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Numerical Python Library — Numpy

- **Numpy** is the core library for scientific computing in Python. It is the fundamental package for scientific computing with Python.
- **Numpy** is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays.
- **Numpy** was created by Travis Oliphant in 2005, and it is an open-source project. Currently, Numpy version 2.4 is available.

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Lineal Algebra with Numpy

- **Numpy** provides a comprehensive set of linear algebra functions.
- **Numpy** provides the functionality to create and manipulate matrices.
- **Numpy** provides the functionality to solve linear systems of equations.
- **Numpy** provides the functionality to calculate the determinant of a matrix.
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Vectorization with Numpy

- **Vectorization** is the process of converting an algorithm from operating on a single value at a time to operating on a set of values at one time.
- **Vectorization** is the process of replacing explicit loops with array expressions or matrix operations.
- The advantages of vectorization are speed and clarity. The disadvantages are memory and complexity.
- **Numpy** provides the functionality to vectorize operations on arrays.

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Typical Operations with Numpy

- **Numpy** provides the functionality to create and manipulate arrays.
- **Numpy** provides the functionality to perform element-wise operations on arrays. matrix operations on arrays.
- **Numpy** provides the functionality to perform linear algebra operations on arrays.
- **Numpy** provides the functionality to perform statistical operations on arrays.

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Introduction to Pandas

- **Pandas** is a fast, powerful, flexible, and easy-to-use open-source data manipulation and data analysis library built on top of the Python programming language.
- **Pandas** is a high-level data manipulation tool developed by Wes McKinney in 2008.
- **Pandas** is a fast and efficient data manipulation tool that is built on top of NumPy.
- **Pandas** is one of the most popular and widely-used data manipulation libraries in the world.

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The "Series" Data Structure

- A **Series** is a one-dimensional array-like object that contains a sequence of values and an associated array of data labels, called the index.
- The index of a **Series** is an array of labels that correspond to the values in the **Series**. The index of a **Series** is an optional parameter that defaults to a sequence of integers starting at zero.
- The **Series** object is a core data structure in **Pandas**.

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Querying a Series

- You could query a **Series** using indexing (boolean or fancy).
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The "DataFrame" Data Structure

- A **DataFrame** is a two-dimensional labeled data structure with columns of potentially different types.
- A **DataFrame** is a tabular data structure that is similar to a spreadsheet or a SQL table.
- A **DataFrame** is a core data structure in **Pandas**. It is a two-dimensional size-mutable data structure with labeled axes (rows and columns).
- A **DataFrame** is a container for Series objects.

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DataFrame Indexing and Loading

- You could index a **DataFrame** using column names.
- You could load a **DataFrame** from a CSV file.
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DateTime Handling in Pandas

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Missing Values in a DataFrame

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- You could fill missing values in a **DataFrame**. The fillna() method returns a **DataFrame** with missing values filled.
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Pandas Idioms

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- You could chain methods in **Pandas**.

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Thanks!

Questions?

Repo: *https://github.com/EngAndres/ud-public/tree/main/courses/data-analysis-programming*

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