

Introduction to Python

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Outline

The following topics will be discussed in these four days.

- Introduction to Python Data Types.
- Object-oriented Programming in Python.
- File and Data I/O.
- Scientific computing using Numpy.
- Pandas for Data Analysis.
- Data Visualization using Matplotlib.
- Data Structures and Algorithms using Python.
- Abstract Data Structures using Python.
- Searching and sorting algorithms.
- Tree Data Structures using Python.
- Opportunities in Python.

Introduction to Python

- Python is a general-purpose, open-source, high-level, dynamically typed, and interpreted language.
- It has a very easy to understand syntax and easy prototyping ability.
- It has a gentle learning curve that helps a programmer to be productive at a very early stage of learning.
- It is relatively terse compared to other languages and requires comparatively a few lines of code that could take more number of lines of code in other languages to solve a similar problem.
- Python is currently being used in multiple areas of computer science such as web development, machine learning, Neural networks and also in Quantum computing.

Python versus Other Languages

- Python is generally slower compared to C, C++ for computationally intensive applications.
- Where it lacks in speed relatively, it gains in speed of development which helps a programmer experiment more.
- The standard Python interpreter is implemented in C and this implementation is called "CPython".
- Python interpreters are becoming faster and newer implementations such as "PyPy" are faster than the CPython implementation.

Python 2 versus Python 3

- Python 2 has been around for so long and comes as part of Linux and Apple machines.
- Python 3 is an improvement over Python 2, that has overcome many drawbacks of the language and is currently being widely adopted.
- The last version of Python 2, 2.7 is still supported and will be in general usage. However, it is the last of the series.
- Some of the most prominent changes seen in Python 3 are the print statement, string formatting, and use of the Unicode Standard for text data.

Let's write Our First Python Program

Now that we have learned what Python is about, let's go ahead and write our first Python program.

- Open a file in your machine using either using notepad or a text editor of your choice.
- Type `print("Hello World!!")` and save the file.
- Name the file as *first_program.py* and save it.
- Open the terminal/command prompt and navigate to the path where the *.py* file has been saved.
- Type the following command:
`python file_name.py` and hit enter and wait for the magic to happen.
- We have performed the first ritual of saying "Hello World!!" to our fellow programmers.

Anaconda and Jupyter

We will be practicing all the exercises on Jupyter Notebooks and we recommend that you have an Anaconda distribution installed on your machine before we go ahead. Here are a few useful links.

- Download anaconda at <https://www.continuum.io/downloads>
- Anaconda installation instructions <https://docs.continuum.io/anaconda/install/windows>
- The material for the discussion is available at <https://github.com/vivek14632/Python-Workshop>

How to start Jupyter Notebook

- Start Anaconda Prompt on your machine.
- Change directory to the folder containing the files downloaded from GitHub repository.
- Once, you are in the correct directory, type "jupyter notebook".
- The Jupyter Notebook should open on your browser at `http://localhost:8888/tree`
- Click new and choose Python (under Notebooks). You will see a new notebook open in a new window.
- Type the following line in the first cell "print('Hello World!!') " and click on the play button (or) click on Cell and choose run cells.
- You should see the message "Hello World!!" get printed right beneath the cell.
- You have written your first Python code on Jupyter Notebook now.

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The following are some of the features of Jupyter Notebook.

- In the drop down menu that reads "Code", we have other options such as
 - Code - To write executable code.
 - Markdown - To write text and explanations for the code.
 - Raw NBConvert - NB stands for NoteBook and it is used to present the content as it is without being modified.
 - Heading - Convert Text to heading.
 - For further detail on file format, please check <https://ipython.org/ipython-doc/3/notebook/nbformat.html>
- Start and stop program (interrupt kernel and play buttons)
- Save program in different formats (.ipynb,.py,.html)
- Run previously written python script
- Select python version from our different environments.
- To terminate Jupyter Notebook, we say CTRL+C/Cmd + C on the prompt.