



Lecture # 2.1

Introduction to Python

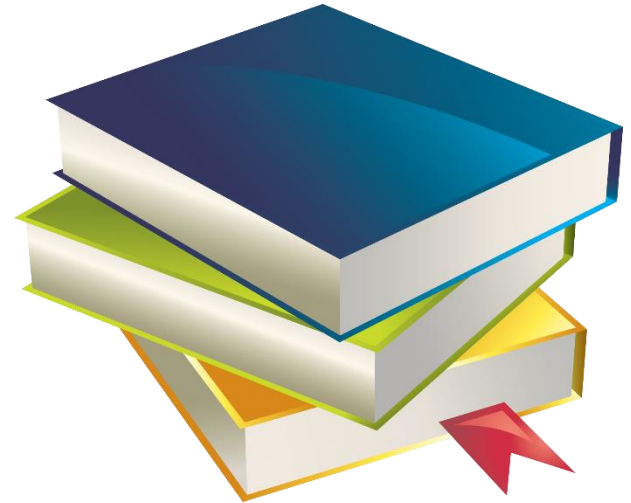
**DATA
SCIENCE**





Today's Agenda

- Introduction to Python
 - History of Python
 - Key Features of Python
 - Important Libraries & Frame Works
 - Applications
 - Organizations using Python
- Setting up Environment
 - Installation and Hello World in Python
 - Code Editors and Desktop IDEs
- **Demonstration**



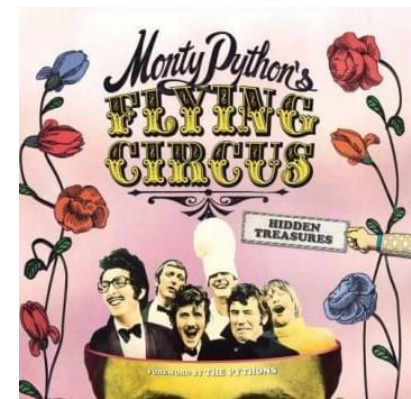


Introduction to Python



History of Python

- Python is an interpreted, general-purpose, high-level programming language developed by Guido van Rossum
- Guido named it, after the show “*Monty Python’s Flying Circus*”, being a huge fan of it.
- Version 1.0 was released in 1994, with features like exception handling, lambda, map, filter, and reduce.
- Version 2.0 was released in 2000 with features including, list comprehensions and garbage collection.
- Version 3.0 was released in 2008.
- Version 3.9.6 is latest stable version released in 2021





Key Features of Python

Following are some key features based on which python is being used so widely across the industry:

- Python is a simple language due to its resemblance with English language, which increases its readability, writability, and makes it easy to learn. It cuts down the code about 20 percent of its actual size.
200-300 loc in Java = 50-60 loc in Python
- It is free and open source, follows the FLOSS (free/libre open source software) philosophy, which means one can freely distribute its copies, reads its source code, and modify it to experience different flavors of python.

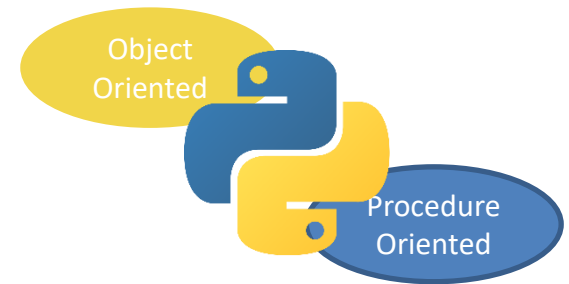
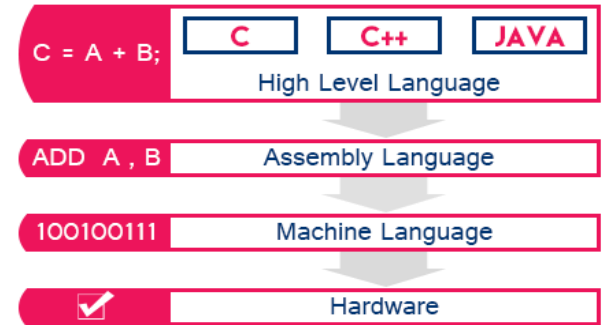


open source



Key Features of Python (cont...)

- Python is a high-level language, which makes programmers need not to bother about low-level details such as memory allocation etc., while practicing scripting in Python.
- Python supports multiple programming paradigm as it provides procedural programming as well as object-oriented programming support.
- It is a portable language as supported by many platforms like Linux, MS Windows, Mac, Free BSD, Solaris, BeOS and many more.





Key Features of Python (cont...)

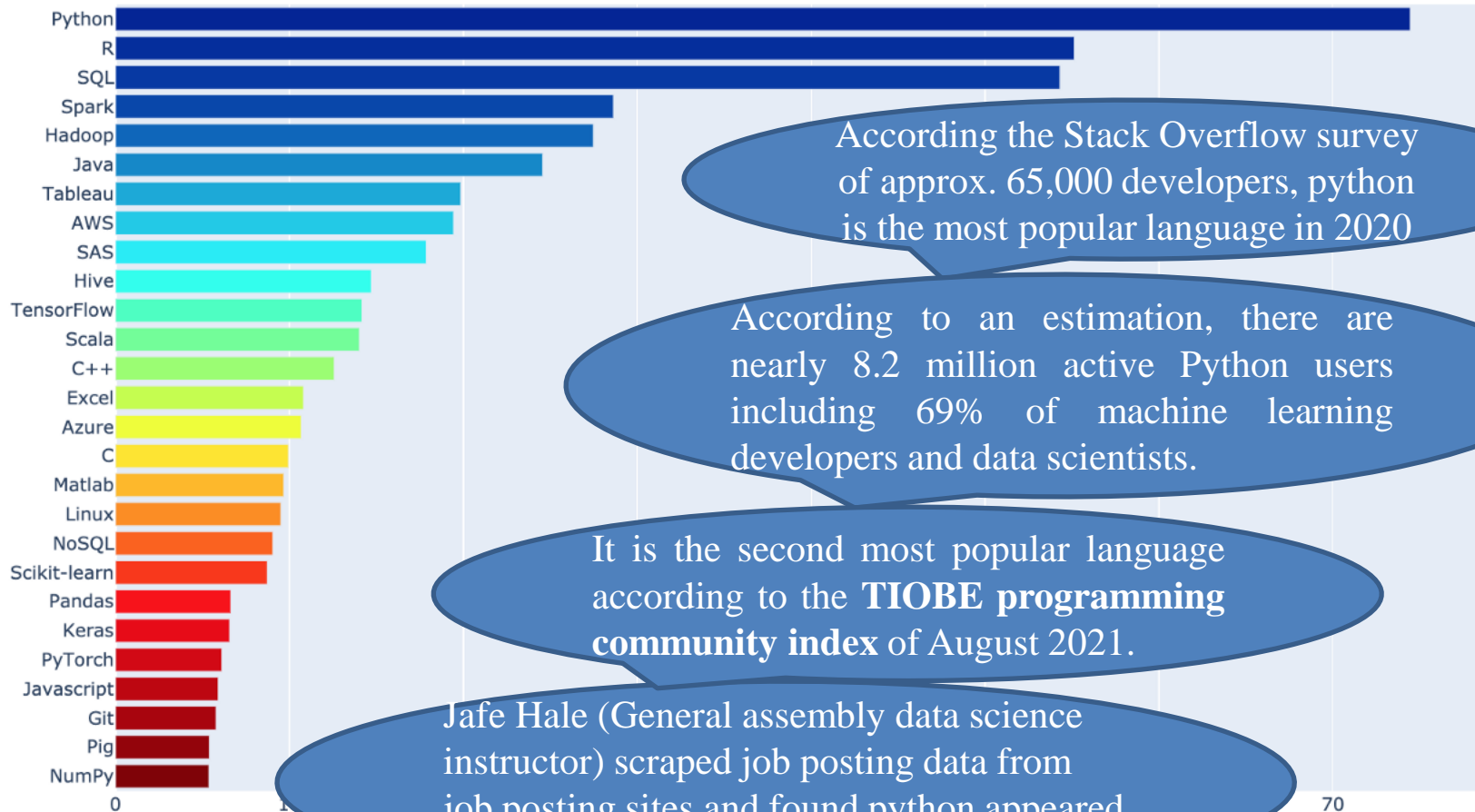
- One of the key features of Python is its extensibility. Python can completely integrate Java as well as .Net components. It can also invoke C/C++ libraries, which means one can perform cross-language operations as well.
- Python has extensive support for different libraries, that aims to provide assistance for performing complex tasks without starting from scratch.





Importance of Python

Technologies in Data Scientist Job Listings 2019



According to the Stack Overflow survey of approx. 65,000 developers, python is the most popular language in 2020

According to an estimation, there are nearly 8.2 million active Python users including 69% of machine learning developers and data scientists.

It is the second most popular language according to the **TIOBE programming community index** of August 2021.

Jeff Hale (General assembly data science instructor) scraped job posting data from job posting sites and found python appeared in nearly 75% of all job postings in 2019

Image source: [The Most In-Demand Tech Skills for Data Scientists](#) by Jeff Hale




Python Libraries

Scientific Computations

Linear algebra, Optimization


Image processing



Data Analysis
Data Cleaning

Data structure and manipulation tools


High level Abstraction



Building Neural Networks

Reduce errors up to 50-60%


Pipelining



Numerical Computation

Faster computation with vectorization


N-Dimensional array creation



Data Visualization

As usable as Matlab +Free, Open-source


Outlier Detection



Deep Neural Networks

Computer Vision


Natural Language Processing



Machine Learning

Regression, Clustering, Classification

Support supervised, unsupervised task





Python Frameworks

- Micro web framework
- Supports Extension feature
- Pinterest and LinkedIn use it



- Web Application framework
- Makes web development easier using MVC architecture
- Support for multiple data exchange formats



- Platform Independent web framework
- Allows hierarchical object traversal



- Used in semantic web, linked open data applications
- Supports RQL, SQL, LDAP, Subversion and Mercurial



- Follows MTV architecture
- Emphasis reusability of components
- Instagram, Mozilla, Bitbucket uses it

- Reduce tedious web development tasks (form creation from scratch)
- Focuses on Rapid development



Python is used in a Wide Variety of Applications

Make web-applications at a rapid rate, because of frameworks it uses (Django, flask, pyramid)



Web Development



Data Analysis

Libraires such as Numpy and Pandas help in data analysis and data extraction

Used in developing interactive games, Uses PySoy and PyGame libraries



Web Scraping

Pull large amount of data from websites to use in real-world processes



Libraires such as Pandas, Scikit-learn, Numpy helps in Machine learning and AI related tasks



Organizations using Python

YouTube video sharing service is largely written in Python



NASA uses Python for scientific programming tasks



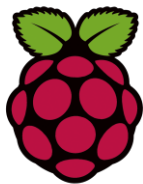
Google uses Python in web search system



Dropbox storage service code is in Python



Netflix also uses Python



Its single-board computer promotes Python as its educational language



BitTorrent peer-to-peer file sharing system is also a Python program



NSA uses Python for cryptography and intelligence analysis



Python Installation



Download and Install Python

- Download and install the latest stable version for your operating system (www.python.org)
- Step 2: To verify, use the following command on terminal

```
$ python --version
```

The screenshot shows the Python.org website. The navigation bar includes links for About, Downloads, Documentation, Community, Success Stories, News, and Events. The 'Downloads' menu is open, showing options for All releases, Source code, Windows, macOS, Other Platforms, License, and Alternative Implementations. The 'Windows' option is selected, leading to the 'Download for Windows' page. A red box highlights the 'Python 3.9.6' download button. A note below the button states: 'Note that Python 3.9+ cannot be used on Windows 7 or earlier. Not the OS you are looking for? Python can be used on many operating systems and environments. View the full list of downloads.'



Installing Python and a Hello World





Code Editors vs IDEs

- A source-code editor is a text editor program designed specifically for writing/editing source code of programming language(s). It provides features like code completion, hints, highlighting and custom folding of different sections of your code for better readability.
- An Integrated Development Environment is a self-contained package that allows a programmer to write, compile, debug and execute code at one place.
 - Desktop IDE: PyCharm, Spyder
 - Browser-based IDE: jupyter notebook
 - Cloud-based IDE: PythonAnywhere, Google Colab



pythonanywhere



Spyder

Python 3.8.8 (default, Apr 13 2021, 12:59:45)
Type "copyright", "credits" or "license" for more information.

IPython 7.22.0 -- An enhanced Interactive Python.

```
In [1]: runfile('/Users/arif/Documents/DS-522/Demo-Files/Section-2/Lec-2.1/fibo_series.py', wdir='/Users/arif/Documents/DS-522/Demo-Files/Section-2/Lec-2.1')
Fibonacci Series: 0 1 1 2 3 5 8

In [2]: |
```

LSP Python: ready conda: base (Python 3.8.8) Line 1, Col 1 ASCII LF RW Mem 67%



Things To Do

- Download and install Python on your system.
- Open Python prompt and run different commands in Interactive mode
- Download and install Spider and try implementing following algorithms in Python:
 - ✓ Linear and Binary search
 - ✓ Bubble, Selection, Insertion and Merge sort
 - ✓ Fibonacci series generator



Coming to office hours does NOT mean you are academically weak!