Lecture # 2.1
Introduction to Python

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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

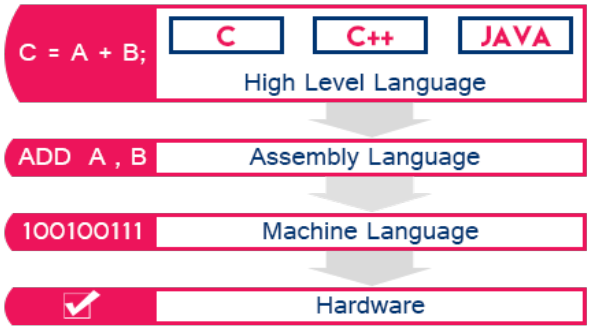
Following are some key features based on which python is being used so widely across the industry:

- 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

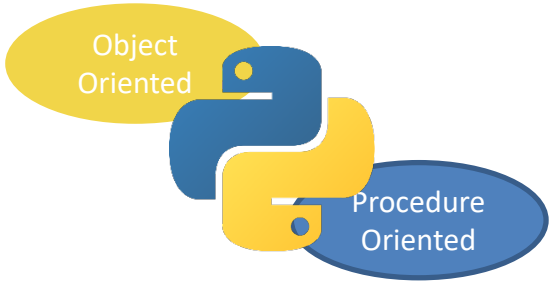
- It is free and open source, follows the FLOSS (free/libre open source software) philosophy, which means one can freely distribute its copies, reads its source code, and modify it to experience different flavors of python.

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.



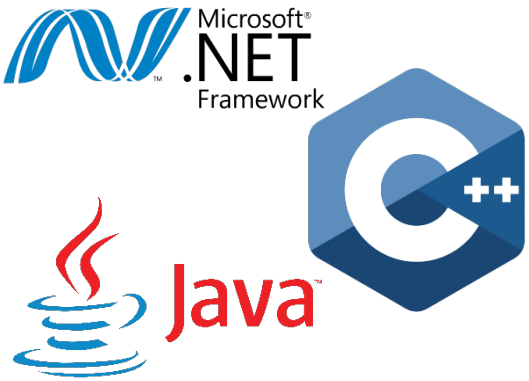
- Python supports multiple programming paradigm as it provides procedural programming as well as object-oriented programming support.



- 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 feature 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

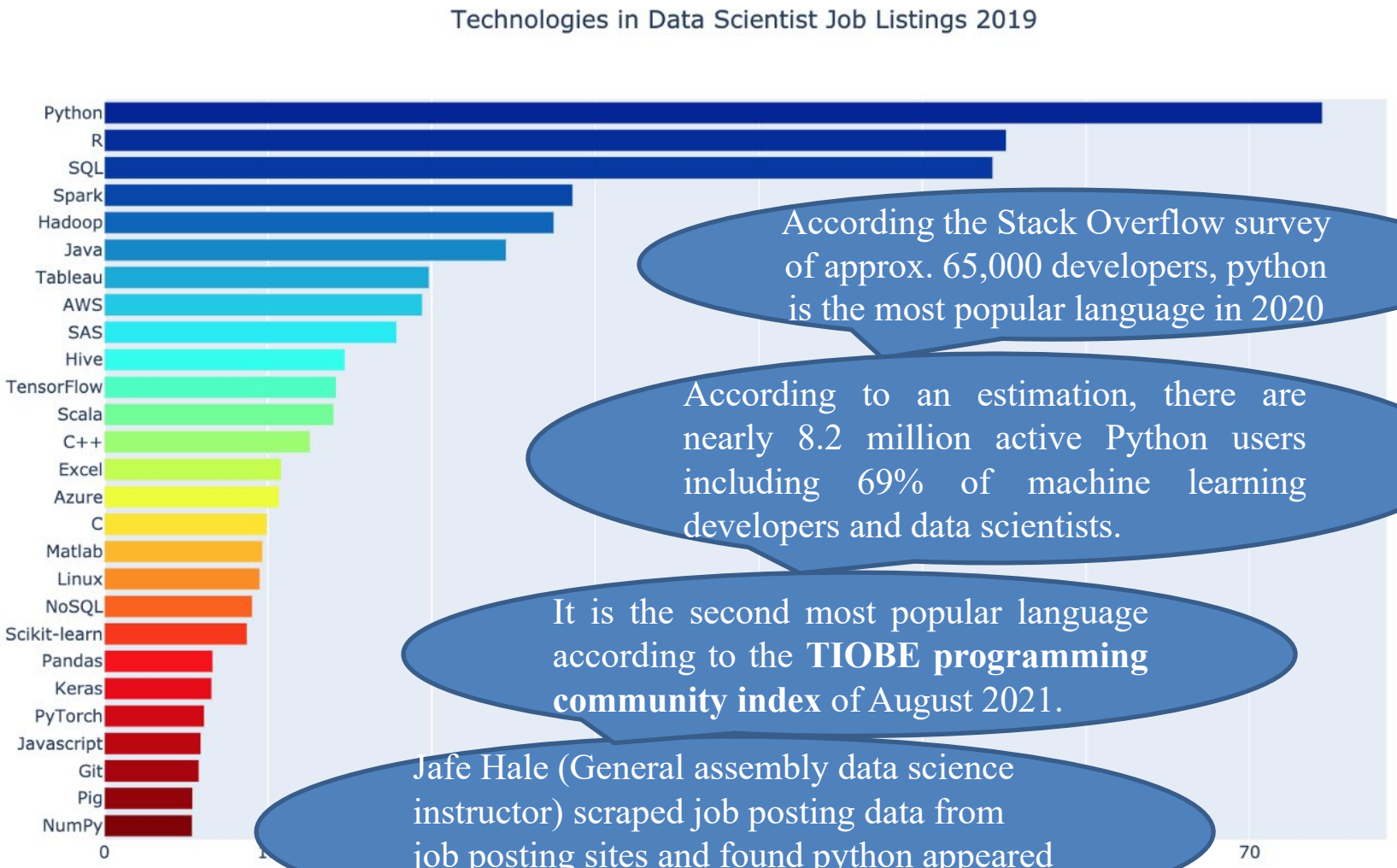


Image source: [The Most In-Demand Tech Skills for Data Scientists](#) by Jeff Hale

Python Libraries

Scientific Computations

Linear algebra, Optimization

Image processing

SciPy

Data Analysis Data Cleaning

Data structure and manipulation tools

High level Abstraction

pandas

Building Neural Networks

Reduce errors up to 50-60%

Pipelining

TensorFlow

Numerical Computation

Faster computation with vectorization

N-Dimensional array creation

NumPy

Data Visualization

As usable as Matlab +Free, Open-source

Outlier Detection

matplotlib

Deep Neural Networks

Computer Vision

Natural Language Processing

PyTorch

Machine Learning

Regression, Clustering, Classification

Support supervised, unsupervised task

scikit learn

Python Frameworks

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

Flask

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

TurboGears

- Platform Independent web framework
- Allows hierarchical object traversal

pyramid

CubicWeb

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

WEB2PY

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

django

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

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

Used in developing interactive games, Uses PySoy and PyGame libraries

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

Web Scraping

Data Analysis

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

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

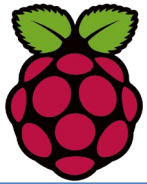
Google

Dropbox

Dropbox storage service code is in Python

NETFLIX

Netflix also uses Python



Its single-board computer promotes Python as its educational language

BitTorrent

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

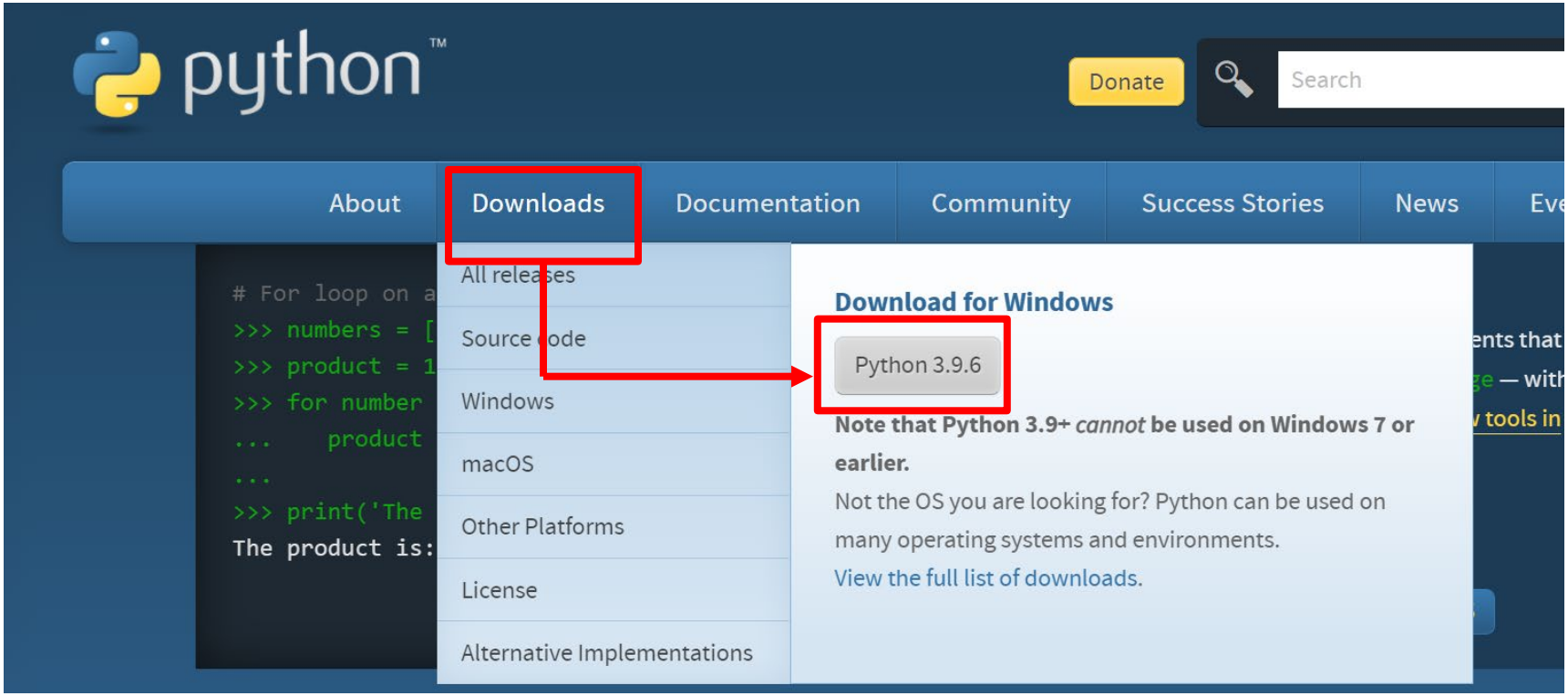
NSA uses Python for cryptography and intelligence analysis

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
```

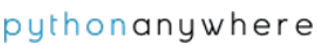


Installing Python and a Hello World

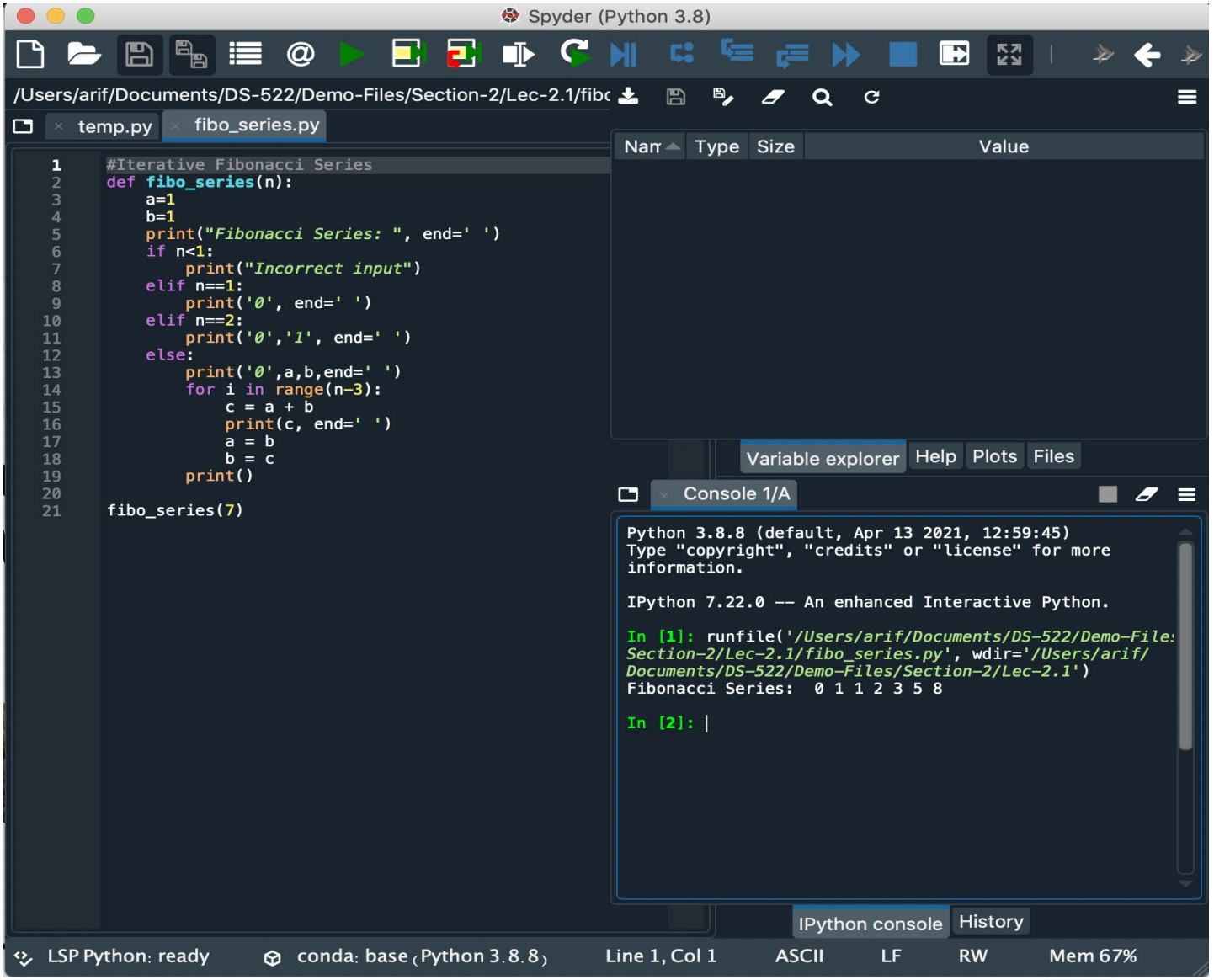
Code Editors vs IDEs

- 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



Spyder


Spyder (Python 3.8)
/Users/arif/Documents/DS-522/Demo-Files/Section-2/Lec-2.1/fibo
temp.py
fibo_series.py
#Iterative Fibonacci Series
def fibo_series(n):
a=1
b=1
print("Fibonacci Series: ", end=' ')
if n<1:
print("Incorrect input")
elif n==1:
print('0', end=' ')
elif n==2:
print('0','1', end=' ')
else:
print('0',a,b,end=' ')
for i in range(n-3):
c = a + b
print(c, end=' ')
a = b
b = c
print()
fibo_series(7)
Nam
Type
Size
Value
Variable explorer
Help
Plots
Files
Console 1/A
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]:
IPython console
History
LSP Python: ready
conda: base (Python 3.8.8)
Line 1, Col 1
ASCII
LF
RW
Mem 67%

A Hello World in Python

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!