SNS COLLEGE OF ENGINEERING
Kurumbapalayam (Po), Coimbatore – 641 107
An Autonomous Institution
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DEPARTMENT OF CSE

19IT103 – COMPUTATIONAL THINKING AND PYTHON PROGRAMMING

- **A readable, dynamic, pleasant, flexible, fast and powerful language**

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS

- **Python interpreter and interactive mode**, debugging; values and types: int, float, boolean, string , and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

Recap

- **Program** - A program is a sequence of instructions that specifies how to perform a computation.
- **Programming Language** - A programming language is a **computer language** that is used by **programmers (developers) to communicate with computers**.

Basic Programming Instructions

- **input:** Get data from the keyboard, a file, or some other device.
- **output:** Display data on the screen or send data to a file or other device.
- **math:** Perform basic mathematical operations like addition and multiplication.
- **conditional execution:** Check for certain conditions and execute the appropriate code.
- **repetition:** Perform some action repeatedly, usually with some variation.

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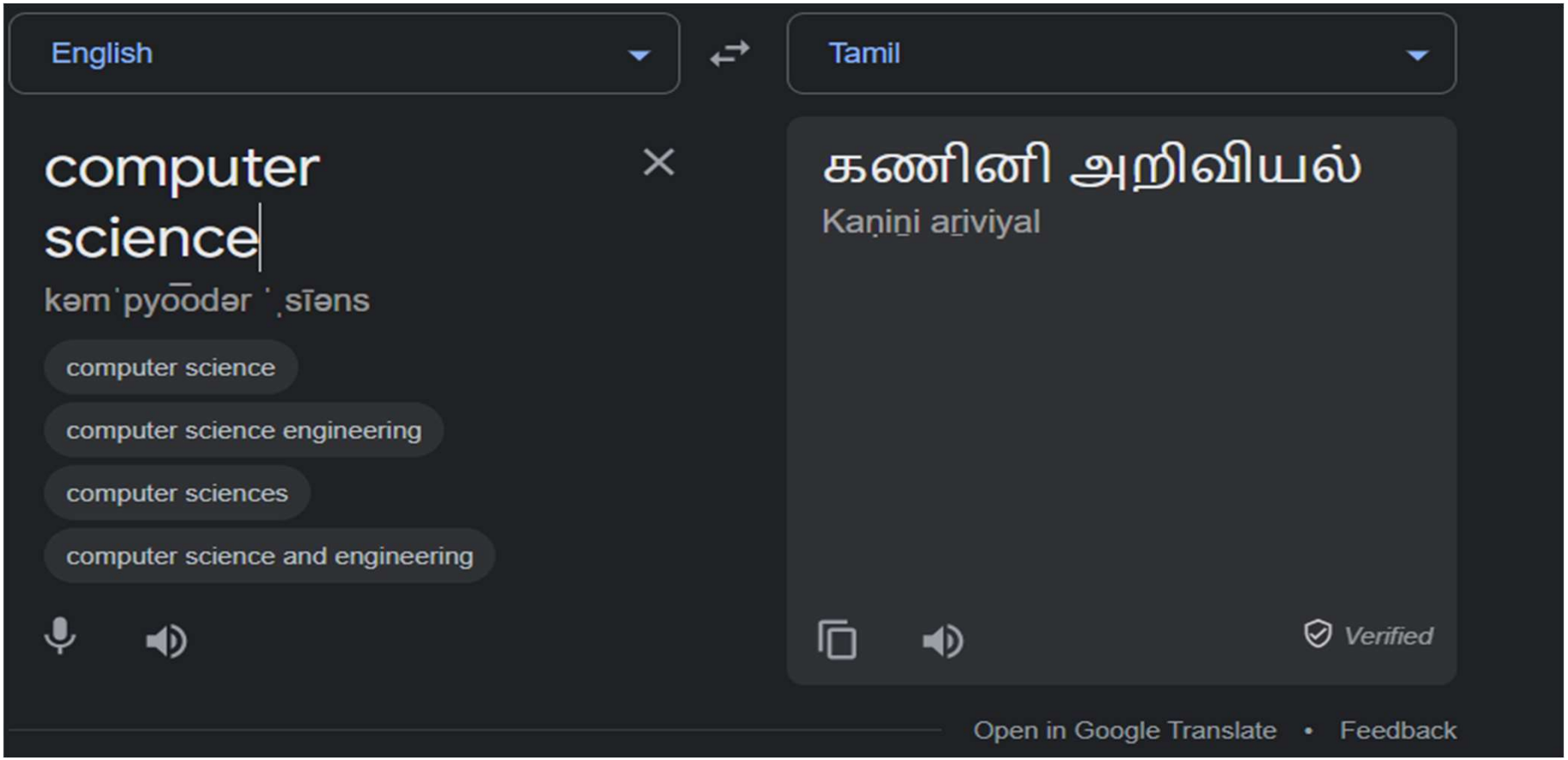
English
Tamil
computer science
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computer science
computer science engineering
computer sciences
computer science and engineering
கணினி அறிவியல்
Kaṇiṉi aṟiviyal
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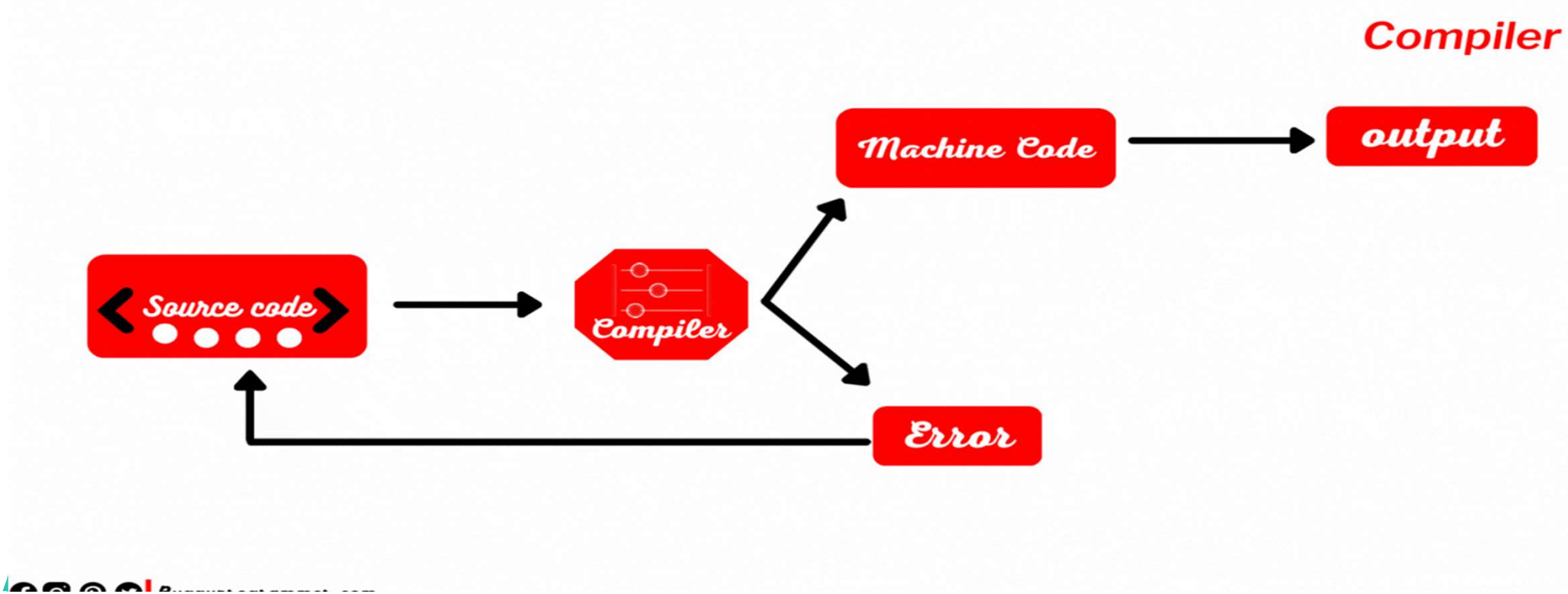
Compilers

- A **compiler** is a program that translates source code into object code to be understood by a specific central processing unit (CPU).



Compilers

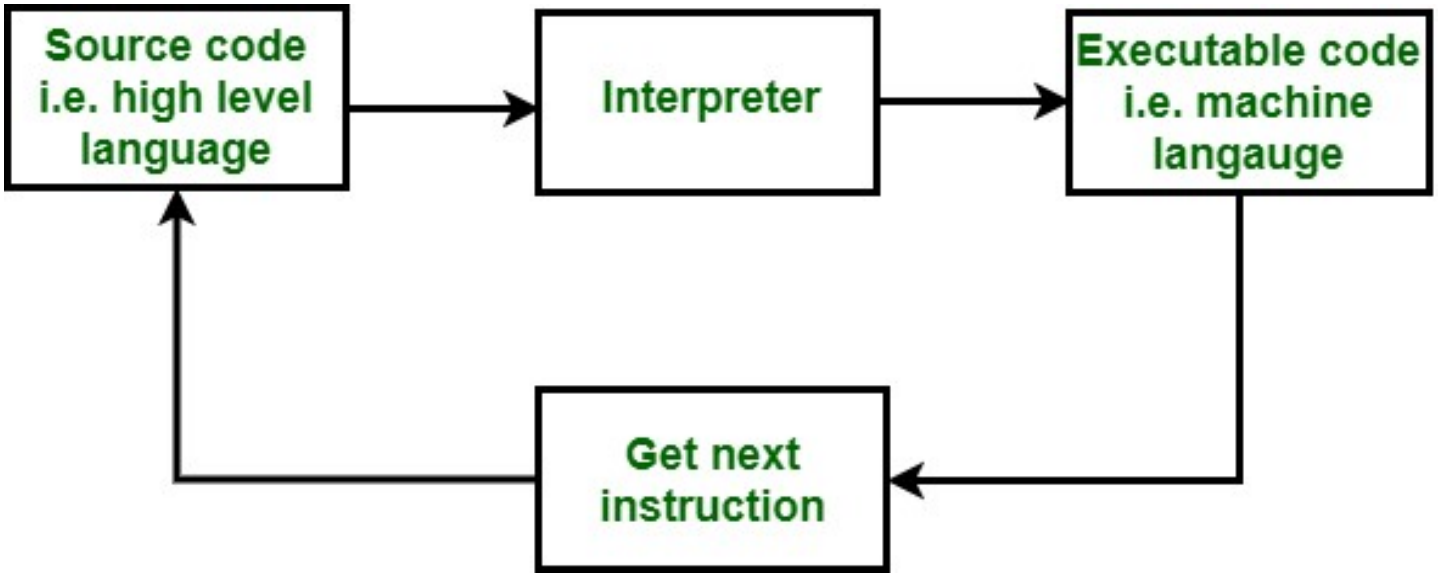
```
#include <stdio.h>

int main()
{
   printf(
        "Codeforwin");
   return 0;
}
```


```
10101011100011001000
11110001111000110000
10101000111000101000
10110111010011111111
10001010101110010100
11101011010101010100
10101100010001110110
10101000111010100110
01010101000011011100
10111101011010111010
00011111111111000100
```

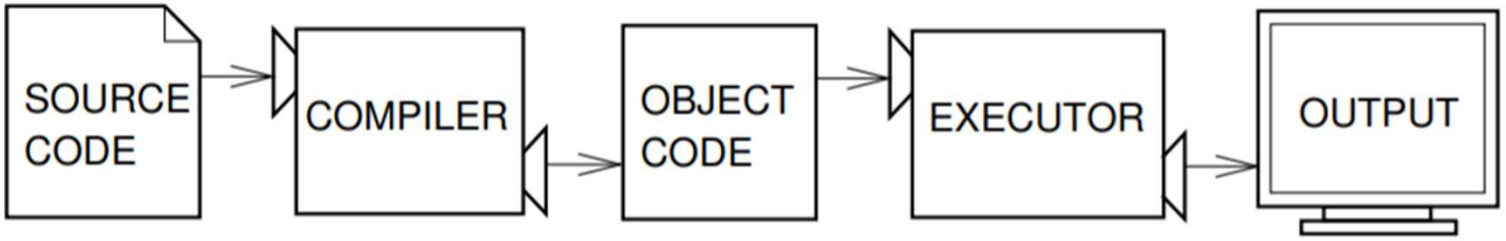
Interpreter

- An Interpreter directly executes instructions written in a programming or scripting language without previously converting them to an object code or machine code.



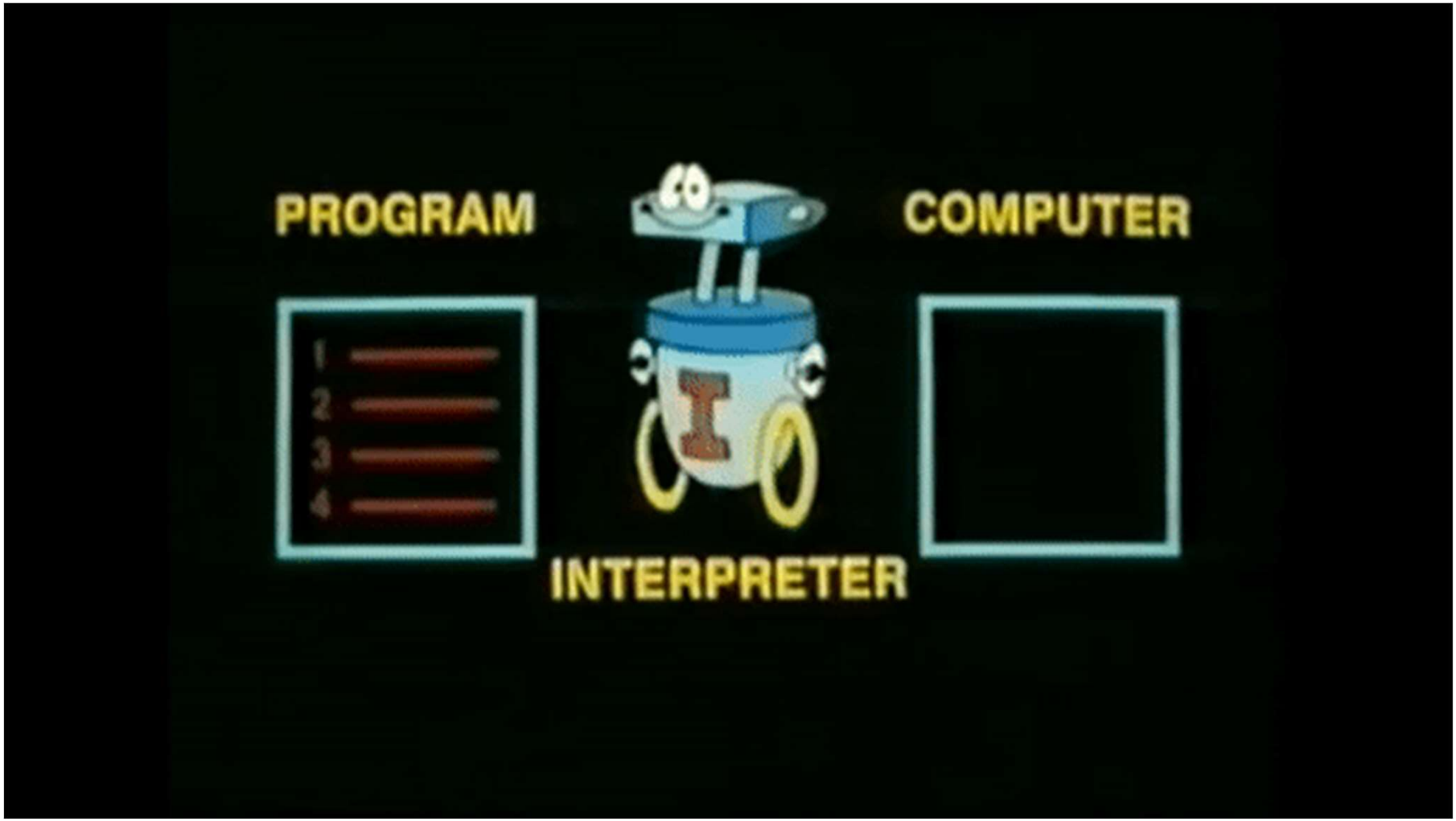
Compiler & Interpreter – Block Diagram

INTERPRETER



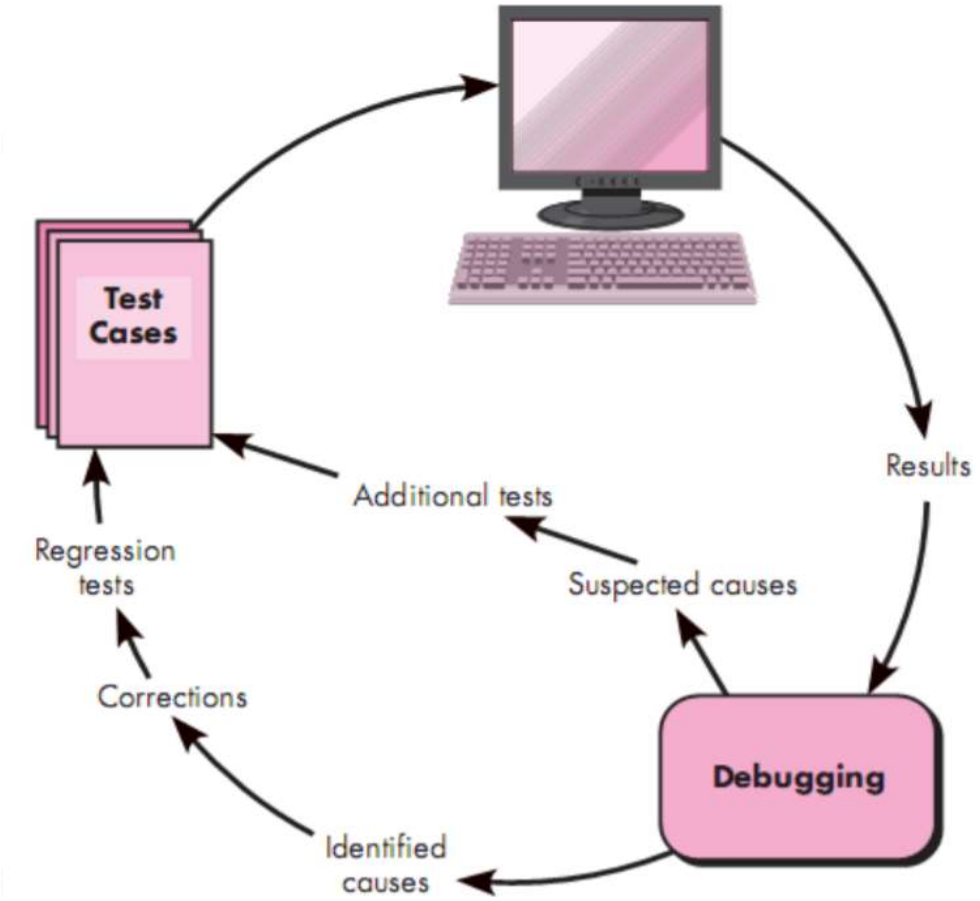
COMPILER

Compiler & Interpreter



Debugger

- A debugger is a computer program used by programmers to test and debug a target program.



Compiler vs Debugger

COMPILER	DEBUGGER
It is a computer program used to translate high-level language into set machine language.	It is a computer program used to test and debug target programs.
It generally allows computer to run understand program without need of programming software used to create it.	It generally allows you to uncover and diagnose errors in computer software.
It is very important to convert text that programmer writes into format that CPU understands.	It is very important to provide maximum useful information of data structures and allows easy interpretation.
It takes less time as compared to debugger.	It takes more time as fixing some errors may introduce others.
Compiled programs might have some errors or bugs.	Debugged program cannot have any errors.

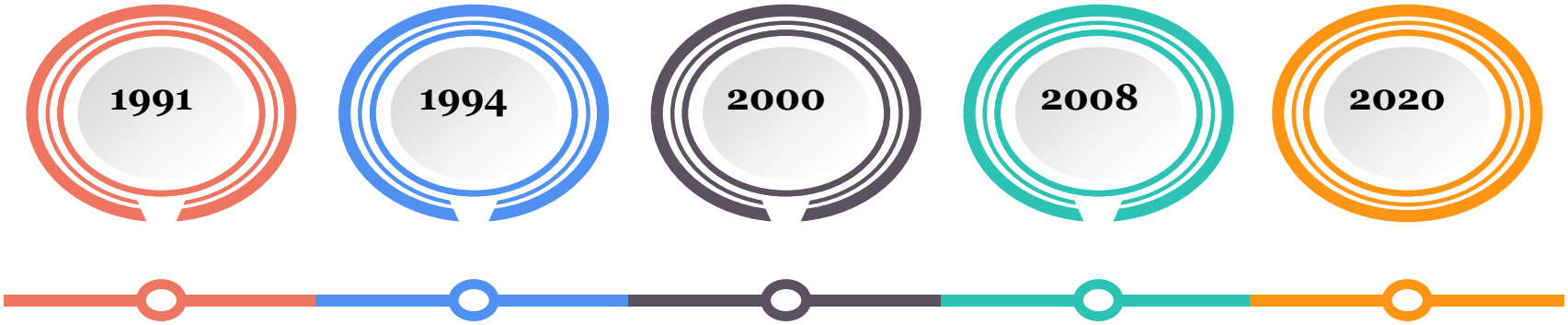
Compiler vs Debugger

COMPILER	DEBUGGER
It has capability to detect syntax Errors and compile time errors.	It provides more capabilities to detect errors in programs as compared to compiler.
It generates IL (Intermediate Language) code.	It checks IL code line by line.
It is more difficult task to design and develop a compiler.	It is less difficult to design and develop a debugger as compared to compiler.
It performs various tasks such as pre-processing, parsing, semantic analysis, lexical analysis, etc.	It performs various tasks such as check and change data contents, detect and remove existing potential errors, etc.

Compiler vs Interpreter

COMPILER	INTERPRETER
Compiler scans the whole program in one go.	Translates program one statement at a time.
As it scans the code in one go, the errors (if any) are shown at the end together.	Considering it scans code one line at a time, errors are shown line by line.
Main advantage of compilers is, it's execution time.	Due to interpreters being slow in executing the object code, it is preferred less.
It converts the source code into object code.	It does not convert source code into object code instead it scans it line by line.
It does not require source code for later execution.	It requires source code for later execution.
C, C++, C# etc.	Python, Ruby, Perl, SNOBOL, MATLAB, etc.

History of Python



Van Rossum Publishes version 0.9.0 to alt.sources

Python 1.0, including functional programming (lambda's, map, filter, reduce

Python 2 introduces list comprehensions and garbage collection

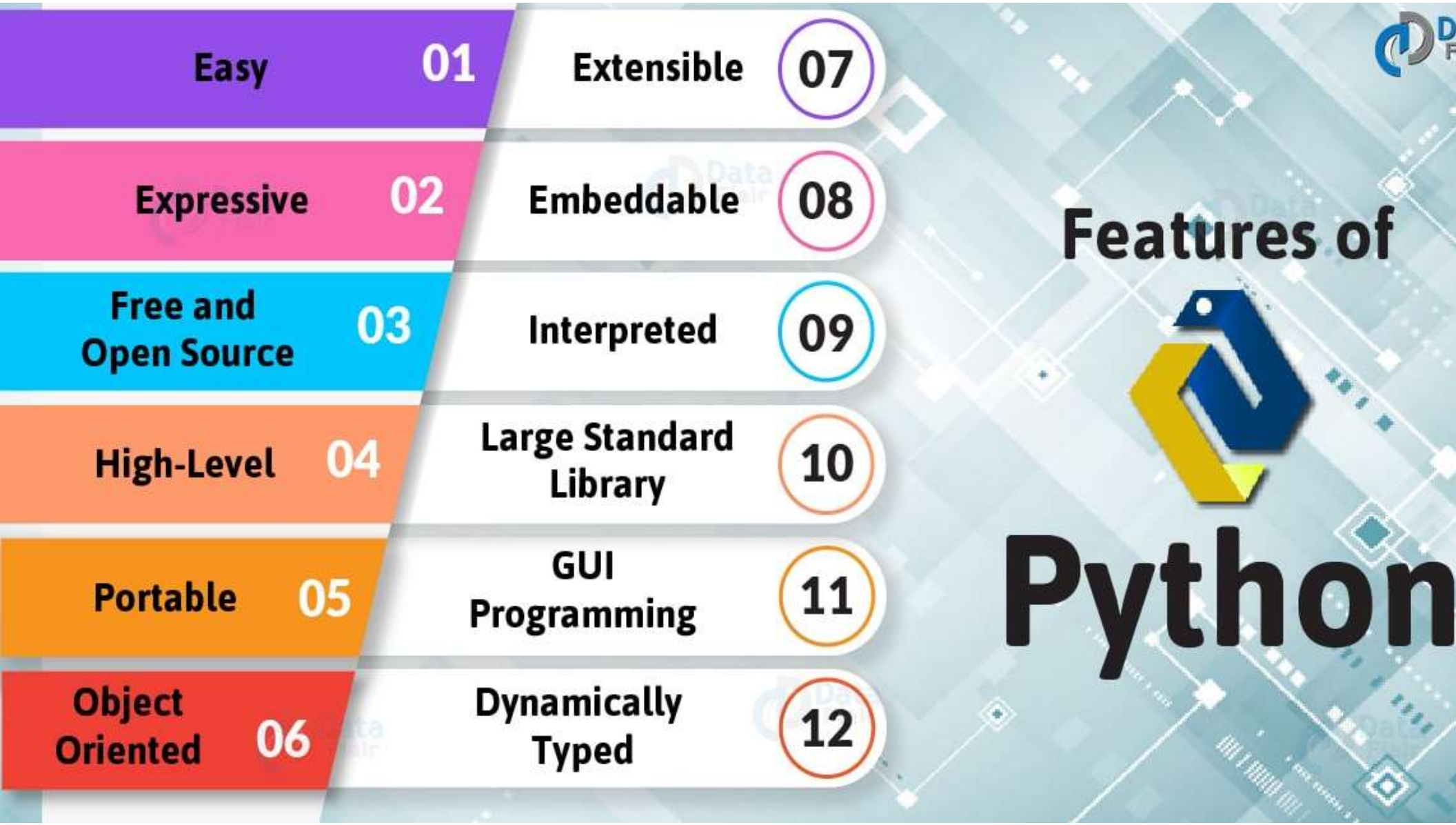
Python 3 fixes fundamental design flaws and is not backwards compatible.

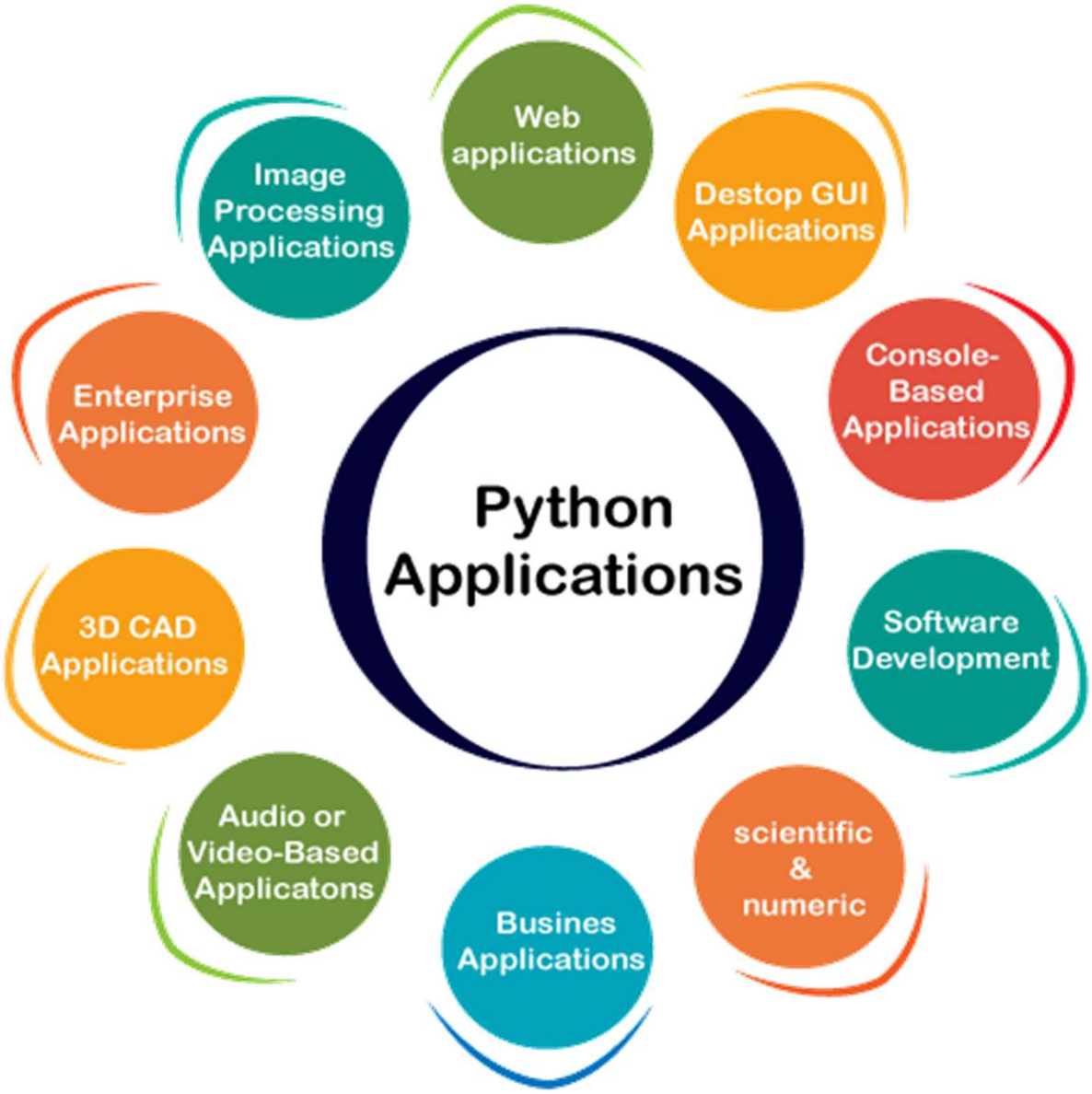
Python 2 is end of life, last version 2.7.18 released

python

Why is it called Python?

When he began implementing Python, Guido van Rossum was also reading the published scripts from "Monty Python's Flying Circus", a BBC comedy series from the 1970s. Van Rossum thought he needed a name that was short, unique, and slightly mysterious, so he decided to call the language Python.


Easy 01
Expressive 02
Free and Open Source 03
High-Level 04
Portable 05
Object Oriented 06
Extensible 07
Embeddable 08
Interpreted 09
Large Standard Library 10
GUI Programming 11
Dynamically Typed 12
Features of
Python


Python Applications
Web applications
Destop GUI Applications
Console-Based Applications
Software Development
scientific & numeric
Busines Applications
Audio or Video-Based Applicatons
3D CAD Applications
Enterprise Applications
Image Processing Applications

Python Interpreter

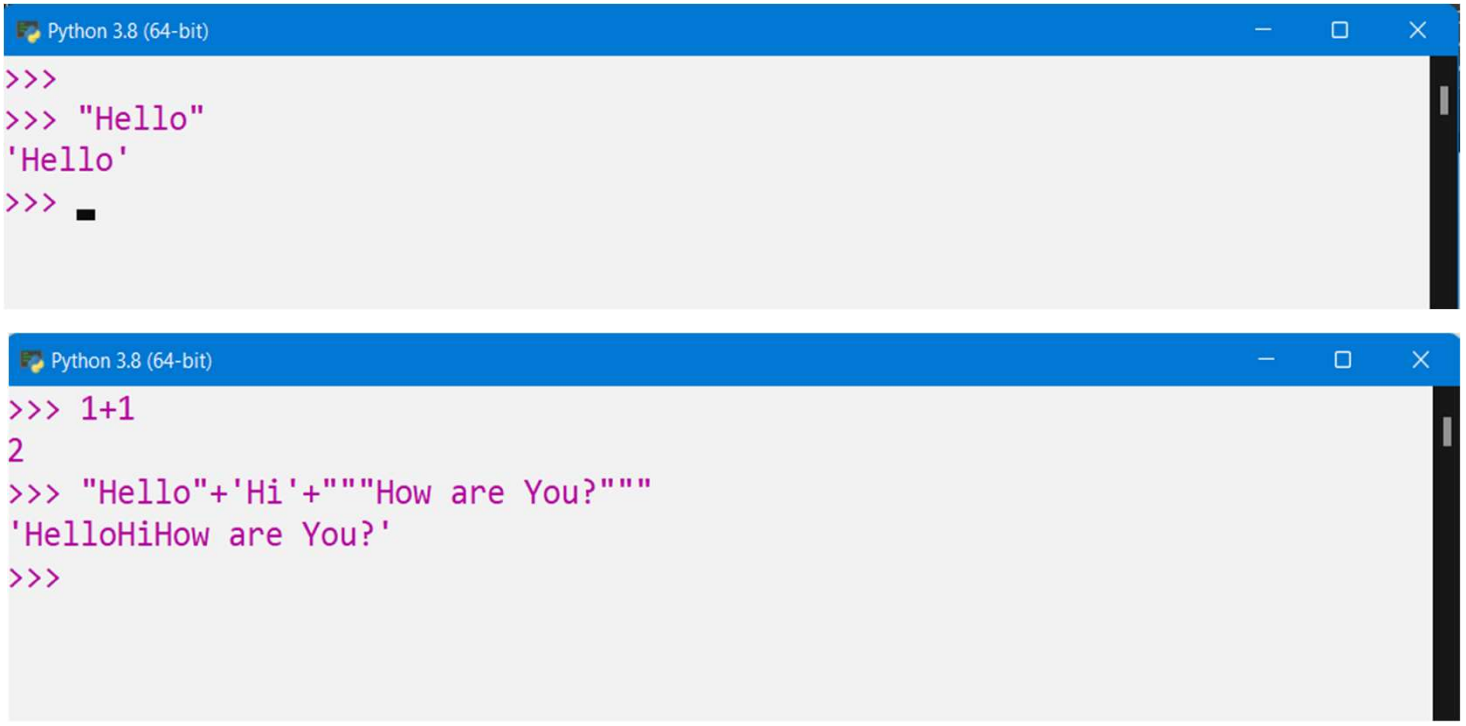
- Python is considered an interpreted language because Python programs are executed by an interpreter.
- There are two ways to use the interpreter:
  i) interactive mode
  ii) script mode.

Python Interactive Mode

- In interactive mode, you type Python programs, and the interpreter displays the result.
- The interpreter prints a welcome message stating its version number and a copyright notice before printing the first prompt:

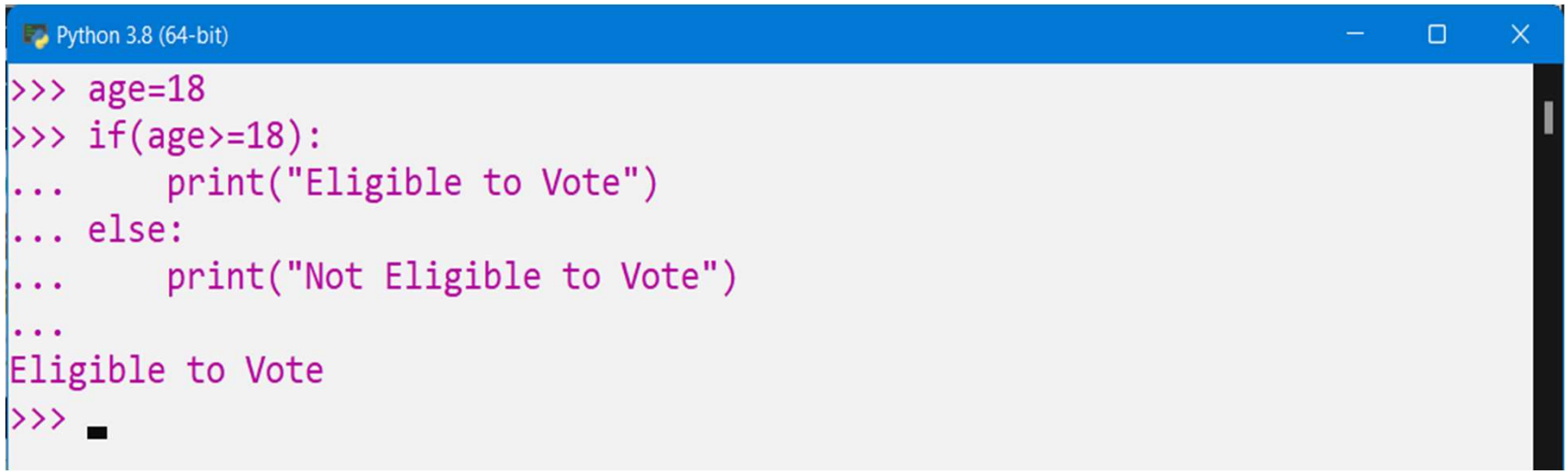
Python Interactive Mode

- In this mode it prompts for the next command with the primary prompt, usually three greater-than signs (>>>) (also known as **Chevron**)



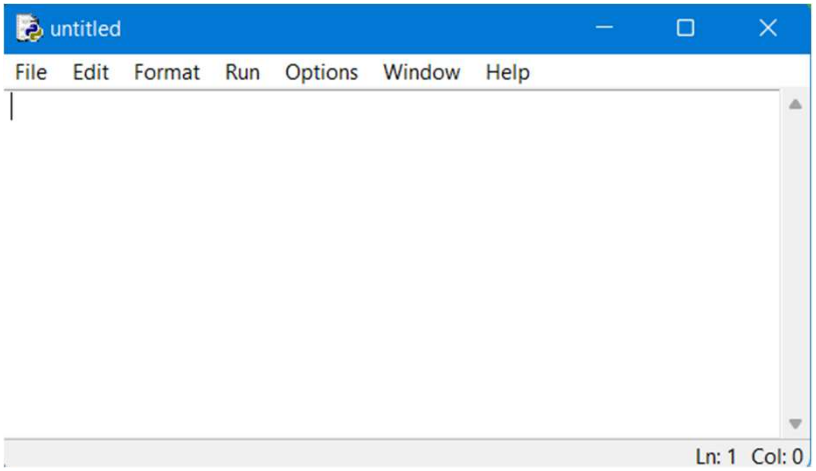
Python Interactive Mode

- For continuation lines it prompts with the secondary prompt, by default three dots (...)

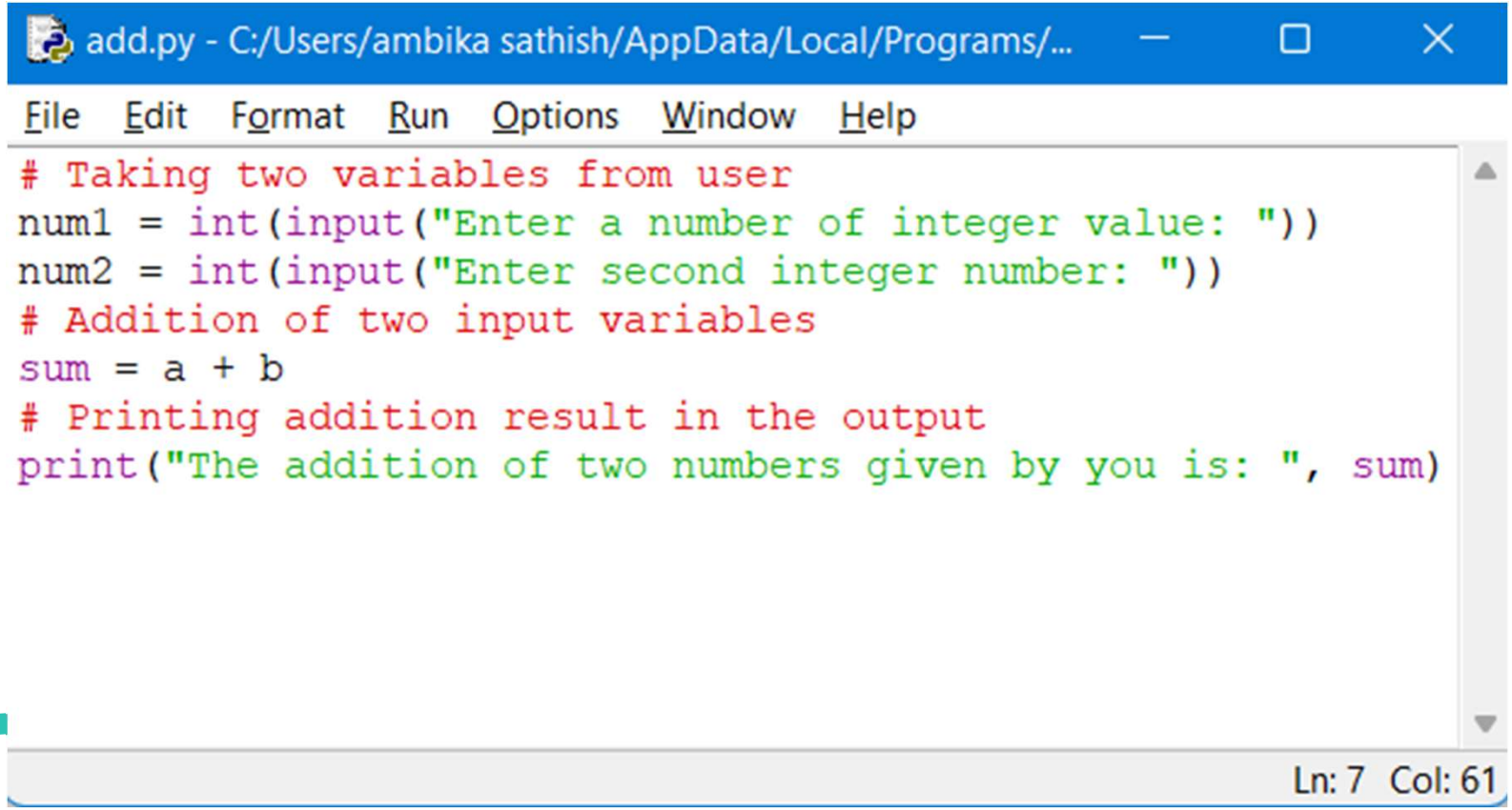


Python Script Mode

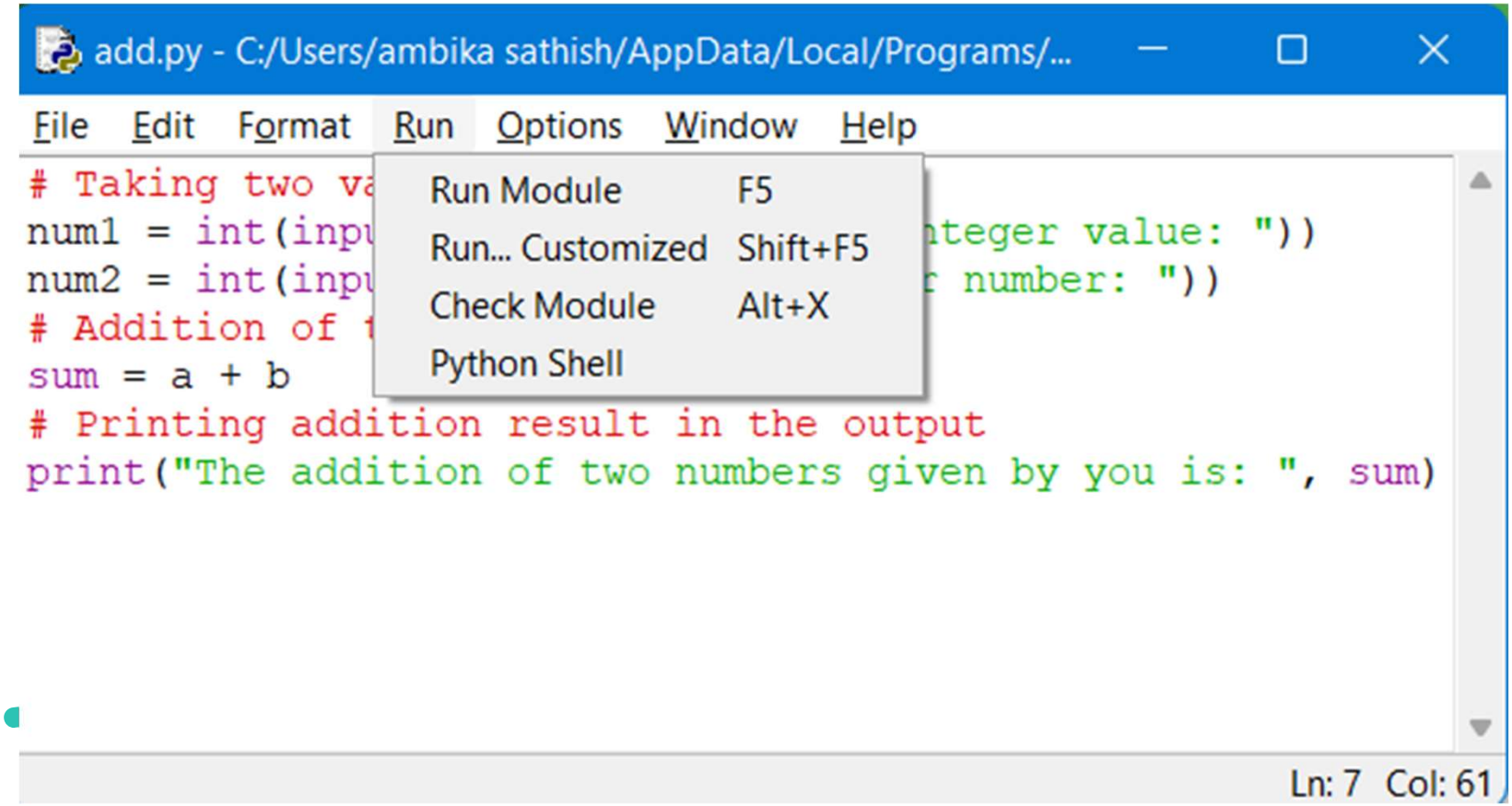
- First write a Python program inside a file (like a script) in the script mode, and then we execute the file after saving it in our system.
- We can execute the script of code either using the command prompt or using Python IDE installed in our system.



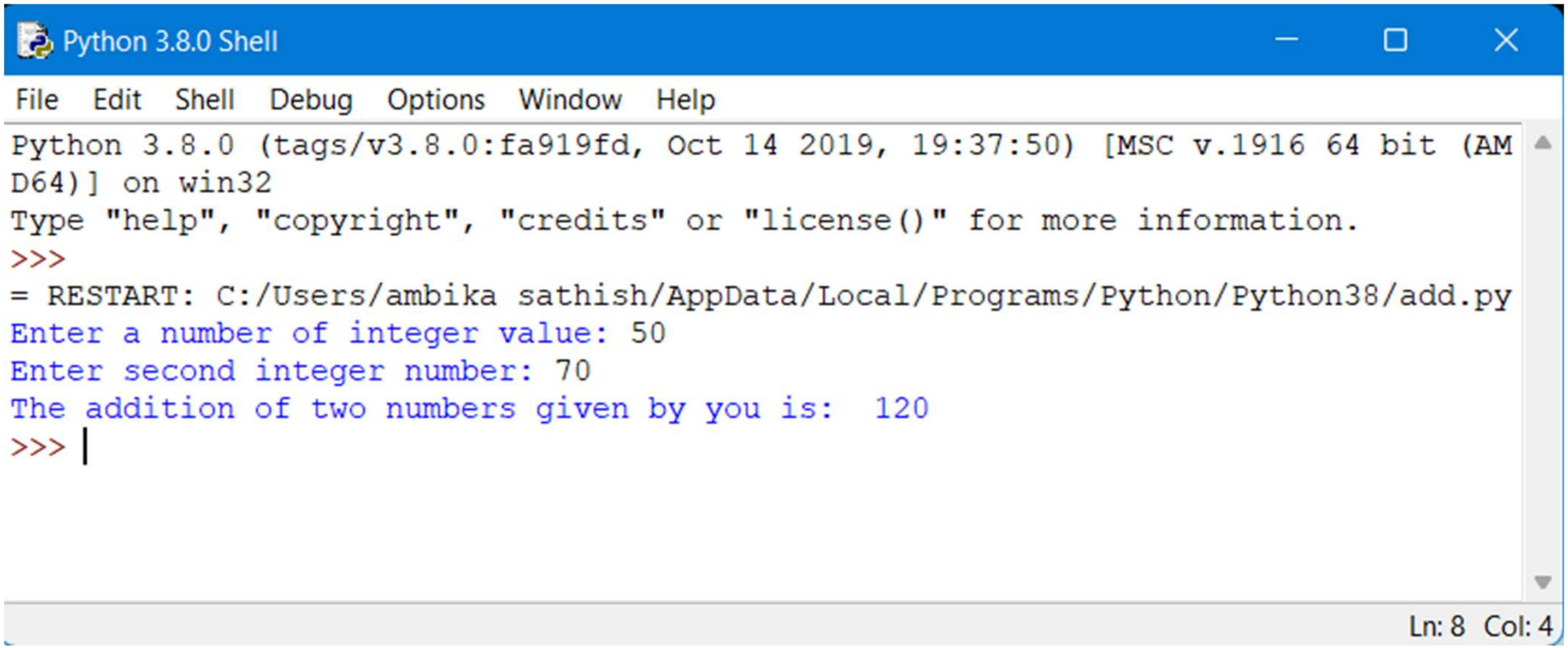
Python Script Mode



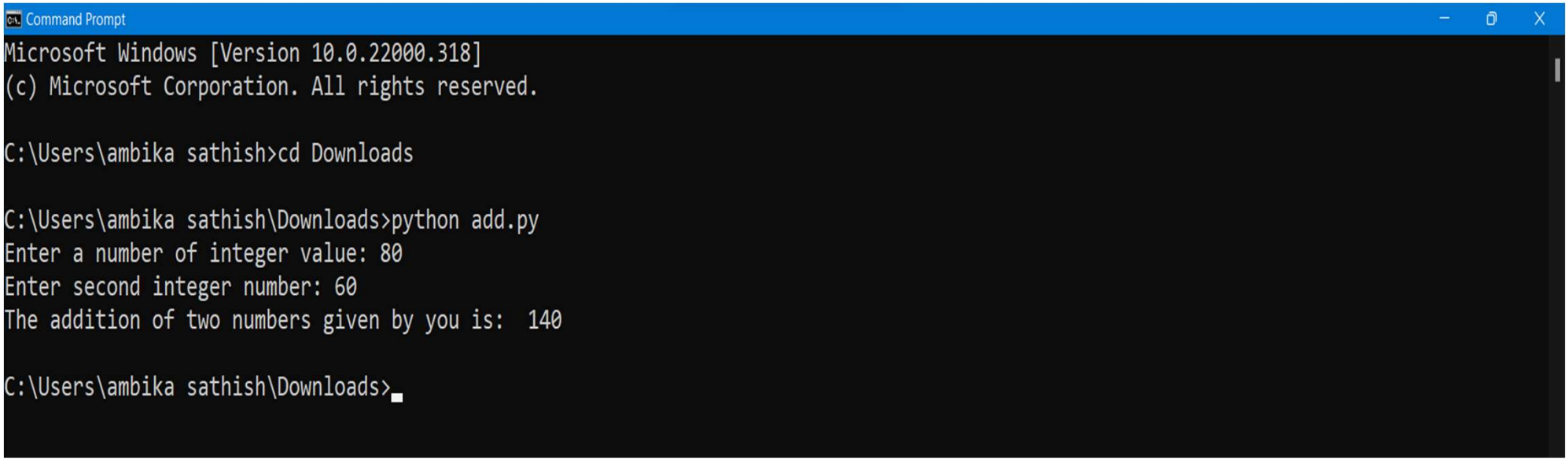
Python Script Mode



Python Script Mode



Python Script Mode



Python Script Mode vs Interactive Mode

INTERACTIVE MODE	SCRIPT MODE
It is a way executing a python program in which statements are written in command prompt result is obtained on the same.	In the script mode, the python file is written in a file. Python interpreter reads the file and then executes it and provides the desired result.
The interactive mode is more suitable for writing very short programs	Script mode is more suitable for writing long programs.
Editing of a code is tedious task.	Editing of code can easily be done.
We get output for every single line of code.	The entire program is first interpreted and then executed.
Code cannot be saved and used for the future.	Code can be saved and used for the future.
It is most preferred by beginners.	It is most preferred by experts.