Introduction to Python

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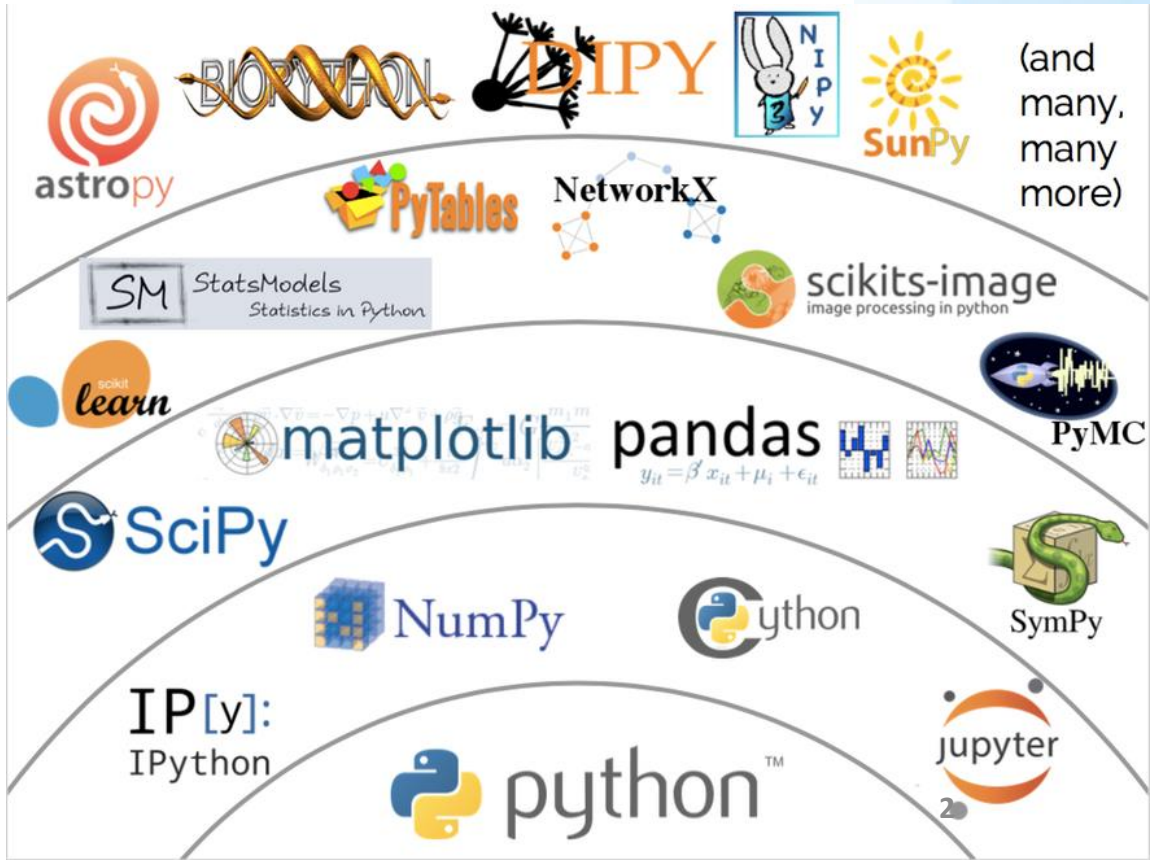
Agenda

- Introduction
- History and usage
- Comparison
- companies using python
- Variables, Datatypes
- Keywords
- Looping constructs



Python … *at first glance*

- Python is an interpreted, object-oriented, high-level programming language with dynamic semantics.
- Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.
- *Python is portable: it runs on many Unix variants, on the Mac, and on PCs under MS-DOS, Windows, Windows NT, and OS/2.*
- *not to mention* around 80 percent of the top computer science programs around the world teach Python as the introduction to the program.

The languages of the 4th millennium

Language	Frequency
Python	26 %
JavaScript	23 %
C#	20 %
Java	15 %
C++	13 %
Ruby	3 %
Perl	0.2%
LISP	< 0.1 %
BASIC	< 0.1 %
Cobol	< 0.1 %
Fortran	< 0.1 %

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History of Python

- A scientist once said

  "*I have used a combination of Perl, Fortran, NCL, Matlab, R and others for routine research, but found out this general- purpose language, Python, can handle almost all in an efficient way from requesting data from remote online sites to statistics, and graphics*."

- The programming language Python was conceived in the late 1980s, and its implementation was started in December 1989 by Guido van Rossum at CWI in at the National Research Institute for Mathematics and Computer Science in the Netherlands.
- 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**.

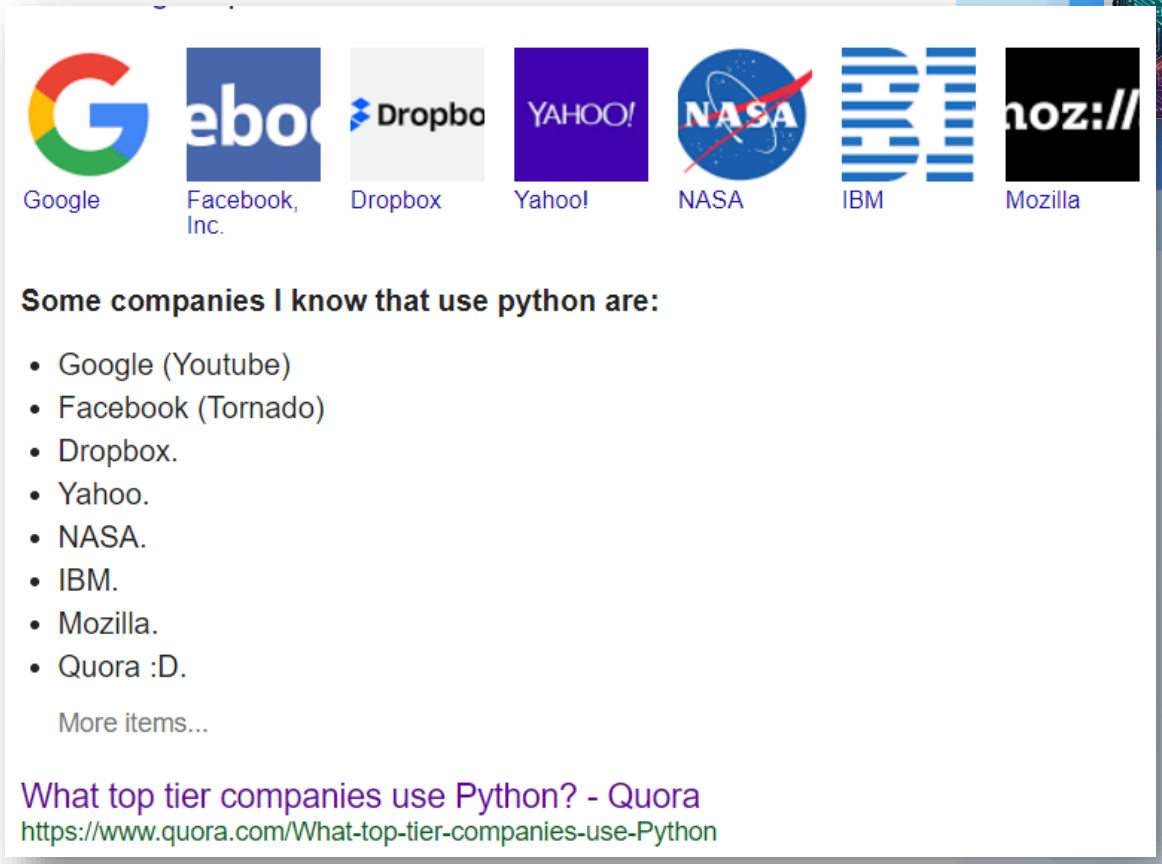
About Python

- Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.
- Python source code is now available under the GNU General Public License (GPL).
- Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language.
- Python is a scripting language like PHP, Perl, Ruby and so much more.
- It can be used for web programming (**django**, Zope, Google App Engine, and much more).
- Can be used for desktop applications (Blender 3D, or even for games pygame).
- Python can also be translated into binary code like java.
- Python can be used for both artificial intelligence and statistical analysis.
- Python is now maintained by a core development team at the institute, although Guido van Rossum still holds a vital role in directing its progress.

More about Python

- **Python** is developed under an OSI-approved open source **license**, making it freely usable and distributable, even for **commercial use**. **Python's license** is administered by the **Python** Software Foundation.
- **Python** is not an exception - its most popular implementation is called CPython and is **written in C**
- The biggest difference between Java and Python is that **Java** is statically typed and **Python** is dynamically typed. *This makes **Python** very easy to write and not too bad to read, but difficult to analyze.*
- IronPython is the **Python** running on .NET
- Jython is the **Python** running on the Java Virtual Machine

Programming *with* Python



Python Identifiers

- A Python identifier is a name used to identify a variable, function, class, module or other object.
- An identifier starts with a letter A to Z or a to z or an underscore (_) followed by zero or more letters, underscores and digits (0 to 9).
- Python does not allow punctuation characters such as @, $, and % within identifiers.
- Python is a case sensitive programming language.

naming conventions for Python identifiers :

- Class names start with an uppercase letter. All other identifiers start with a lowercase letter.
- Starting an identifier with a single leading underscore indicates that the identifier is private.
- Starting an identifier with two leading underscores indicates a strongly private identifier.
- If the identifier also ends with two trailing underscores, the identifier is a language-defined special name.

Building Blocks

- Values and Variables
  - numeric values
  - variables
  - assignment
  - identifiers
  - reserved words
  - comments

Standard Data Types

- Python has various standard data types that are used to define the operations possible on them and the storage method for each of them.
- Python has five standard data types
  - Numbers
  - String
  - List
  - Tuple
  - Dictionary

Python Numbers

- Number data types store numeric values.
- Number objects are created when you assign a value to them. For example –
  - *var1 = 1*
  - *var2 = 10*
- You can also delete the reference to a number object by using the del statement. The syntax of the del statement is –
- *del var1[,var2[,var3[....,varN]]]]*
- You can delete a single object or multiple objects by using the del statement. For example –
  - *del var*
  - *del var_a, var_b*

Checking the type of datatype

```
In [1]: type('hello')
Out[1]: str

In [2]: type (10)
Out[2]: int

In [3]: type(20.5)
Out[3]: float

In [4]: a=10
        a
Out[4]: 10

In [5]: del a

In [6]: a
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-6-60b725f10c9c> in <module>()
----> 1 a

NameError: name 'a' is not defined
```

Assigning Values to Variables

- Python variables do not need explicit declaration to reserve memory space.
- The declaration happens automatically when you assign a value to a variable.
- The equal sign (=) is used to assign values to variables.
- For example –

```
counter = 100          # An integer assignment
miles   = 1000.0       # A floating point
name    = “Nielit"       # A string
print(counter)
Print(miles)
Print(name)
```

- Here, 100, 1000.0 and “Nielit" are the values assigned to *counter*, *miles*, and *name* variables, respectively.

Multiline/single line

```
In [7]: a=10;b=20;c=30;
        print(a,b,c)

        10 20 30

In [8]: a\
        =\
        50
        print (a)

        50
```

Reserved words

and	exec	not
assert	finally	or
break	for	pass
class	from	print
continue	global	raise
def	if	return
del	import	try
elif	in	while
else	is	with
except	lambda	yield

Data type

Python supports four different numerical types –

- int (signed integers)
- long (long integers, they can also be represented in octal and hexadecimal)
- float (floating point real values)
- complex (complex numbers)

Basic operator

- Arithmetic Operators
- Comparison (Relational) Operators
- Assignment Operators

  (+= , -= , *= , //= , %=)
- Logical Operators

  (and, or, not)
- Bitwise Operators

Arithmetic Operator
+ Addition
- Subtraction
* Multiplication
/ Division
% Modulus
** Exponent
// Floor division
9//2 -> 4

Comparison Operator
==
!=
<>
>
<
>=
<=

Bitwise Operator
& Binary AND
| Binary OR
^ Binary XOR
~ Binary Ones Complement
<< Binary Left Shift
>> Binary Right Shift

Decision making

```
x = int( input('enter marks'))
if (x>50) : print('pass')
else : print('fail')
```

Or

```
x = int( input('enter marks'))
if (x>50) :
    print('pass')
else :
    print('fail')
```

```
if expression1:
        statement(s)
        if expression2:
                statement(s)
        elif expression3:
                statement(s)
        elif expression4:
                statement(s)
        else:
                statement(s)
  else:
        statement(s)
```

Exercise

1. Write command to check whether input number is even or odd.
2. Write a command/program to accept marks from user and print the division.
3. Write command/s to return sum of digits of given number.

loops

```
while expression :
        statements()
```

```
while expression :
        statements()
else :
        statements()
```

```
i=0
while (i<5) :
    print (i, 'Jai Ho')
    i=i+1
```

```
0 Jai Ho
1 Jai Ho
2 Jai Ho
3 Jai Ho
4 Jai Ho
```

```
i=0
while (i<5) :
    print (i, 'Jai Ho')
    i=i+1
else :
    print (i, ' Its over now')
```

```
0 Jai Ho
1 Jai Ho
2 Jai Ho
3 Jai Ho
4 Jai Ho
5  Its over now
```

for loop

for iterating Variable in sequence

    statement/s

```
In [3]: states=['J&K', 'HimachalPradesh','Punjab','Delhi']
        for st in states:
            print (st)
```

```
J&K
HimachalPradesh
Punjab
Delhi
```

```
In [4]: for st in range(len(states)):
            print (states[st])
```

```
J&K
HimachalPradesh
Punjab
Delhi
```

```
In [5]: for alpha in 'India':
            print(alpha)
```

```
I
n
d
i
a
```

for iterating Variable in sequence

    statement/s

else:

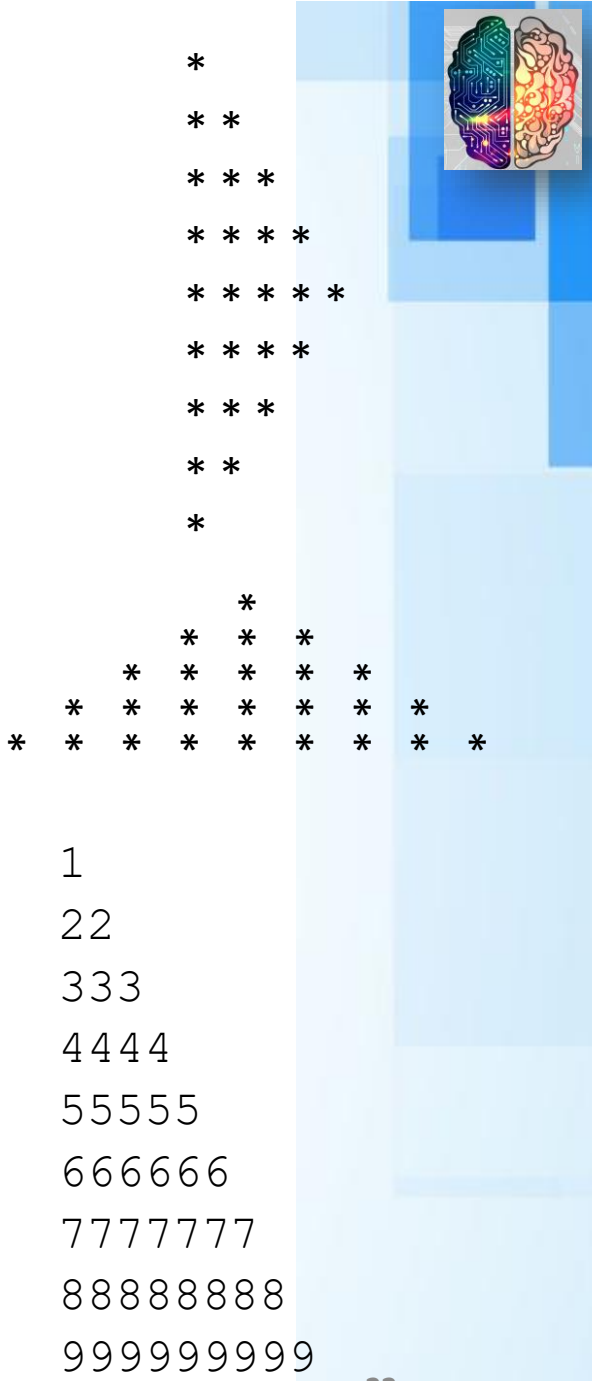
    statement/s

```
In [7]: for st in range(len(states)):
            print (states[st])
        else :
            print('------Its over ------ ')
```

```
J&K
HimachalPradesh
Punjab
Delhi
------Its over ------
```

Exercise

1. Write program to check whether given number is prime or not
2. Write a program to find those numbers which are divisible by 7 and multiple of 5, between 1500 and 2700 (both included).
3. Write a Python program to get the Fibonacci series between 0 to 50.
4. Write a program to construct the pattern, using a nested for loop.



Loop Control Statements

Break : Terminates loop statement

```
for alpha in 'Greatness':
    if alpha == 'n':
        break
    print ('letter ', alpha)
```

```
letter  G
letter  r
letter  e
letter  a
letter  t
```

continue : returns the control to the beginning of the while/for loop

```
for alpha in 'Greatness':
    if alpha == 'n':
        continue
    print ('letter ', alpha)
```

```
letter  G
letter  r
letter  e
letter  a
letter  t
letter  e
letter  s
letter  s
```

pass : is used when a statement is required syntactically but you do not want any command or code to execute

```
for alpha in 'Greatness':
    if alpha == 'n':
        pass
        print ('Pass block')
    print ('letter ', alpha)
```

```
letter  G
letter  r
letter  e
letter  a
letter  t
Pass block
letter  n
letter  e
letter  s
letter  s
```

Jupyter Notebook Link

- https://colab.research.google.com/drive/1jUAhD0VvIz23RA8Hr25pDzK__srpTcsm?usp=sharing

Github Link

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