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Python Cheat Sheet

April 7, 2020

Python 3.x Cheat Sheet

Introduction

Python has rapidly become the most desired language in the job market. The wide

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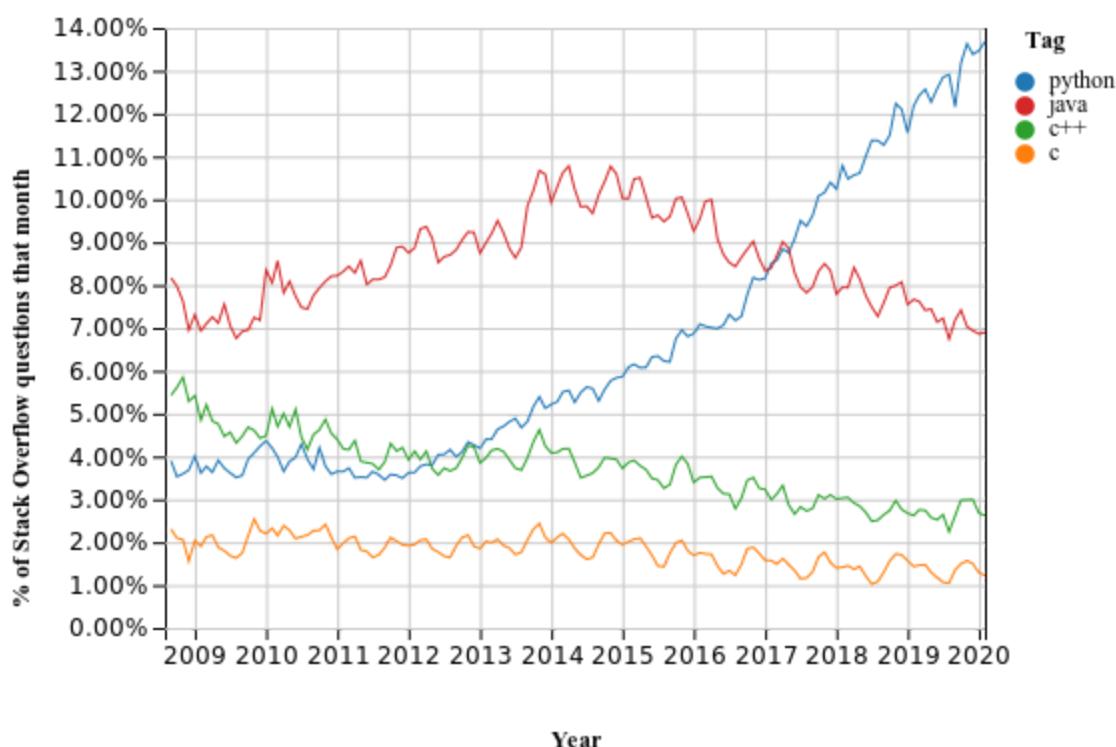
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Python's Community

The primary reason for Python's growth is its open-source development by a well-knit 30-year-old community. Trends given by StackOverflow.com are proof.



Even the corporate world loves Python. Google alone has created wildly popular machine

learning libraries like TensorFlow, Keras, etc., and has distributed them for free.

We are volunteers who make and take care of the Python programming language. We have decided that January 1, 2020, was the day that we sunset Python 2. That means that we will not improve it anymore after that day, even if someone finds a security problem in it. You should upgrade to Python 3 as soon as you can.

Types

The building block in Python is an object and objects have types. A type is a way of describing the data stored inside the object. For example, to store a number we have **integer, float and complex** types. The major categories of **types** in Python are **boolean, numerics, sequences, mappings, classes** and **exceptions**. We will cover all of them in details with examples but let us start with the basic types that are used most commonly.

Basic Types

Integers

```
a = 10 # Integer  
b = -9 # Integer can be negative  
c = 0b011 # Integer can be Binary  
d = 0o123 # Integer can be Octal  
e = 0x9AF # Integer can be Hexadecimal  
print("Positive Integer = ",a, " | ",type(a))  
print("Negative Integer = ",b, " | ",type(b))  
print("Binary Integer = ",c, " | ",type(c))  
print("Octal Integer = ",d, " | ",type(d))  
print("Hexadecimal Integer = ",e, " | ",type(e))
```

In Python 3 the length of an integer is limited by memory and nothing else. The `type()` function is used to get the type of the variable. Let's see what this code prints on the terminal. The `print` function converts the binary, octal and hexadecimal forms to decimal

before printing

- The maximum value a float in Python can have is 1.8×10^{308} . Anything bigger and Python labels it as **inf** i.e. infinity.
- Complex numbers are specified as <real part> + <imaginary part>**j**.
- Strings are sequences of characters. Strings are enclosed within a pair of single or double-quotes.

```
in1 = (1+2j) | <class 'complex'>
fl1 = 0.78 | <class 'float'>
fl2 = 0.026 | <class 'float'>
fl3 = inf | <class 'float'>
bl1 = True | <class 'bool'>
bl2 = False | <class 'bool'>
st1 = Hello World! | <class 'str'>
bt1 = b'holá' | <class 'bytes'>
```

String

Just like an integer, a string can be as long as one wants. To check how long the string is, we can use **len()** function. We will cover functions later, but as of now consider it a block of code that performs a single task.

```
str1 = "I am a string"
```

```
str2 = 'I too am a string'
```

```
str3 = ""
```

```
str4 = str1 + ' ' + str2
```

I am a string	type(str1) = <class 'str'>	len(str1) = 13
I too am a string	type(str2) = <class 'str'>	len(str2) = 17
I am a string I too am a string	type(str3) = <class 'str'>	len(str3) = 0
	type(str4) = <class 'str'>	len(str4) = 31

- We can have a 0-length string as well. (**str3**)

double quotes (") to enclose strings.

```
str8 = ""Yet another way of escaping single ('') and double (")"
```

```
str9 = """Yet another way of escaping single ('') and double (")"""
```

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```
Yet another way of escaping single ('') and double (")
```

```
Yet another way of escaping single ('') and double (")
```

Printing a Raw string reveals the escape characters used.

#Raw String

```
str10 = R"Let's escape both single quote(') and double quote(\"")"
```

```
Let's escape both single quote(') and double quote(\"")
```

As mentioned earlier, strings are sequences of characters. So, we can actually treat them like an array and access individual substrings using their positions. The first character of any non-empty string starts from index 0. To access any character at position L+1 in the string, we index it by writing str[L].

#Indexing String

```
print("str7[0] =", str7[0])
```

```
print("str7[1] =", str7[1])
```

```
print("str7[0:10] =", str7[0:10])
```

```
print("str7[10:5] =", str7[10:5])
```

```
print("str7[10:25] =", str7[10:25])
```

```
str7[0]      =  L
str7[1]      =  e
str7[0:10]   =  Let's esca
str7[10:5]   =
str7[10:25]  =  pe both single
```

Note that even a space is counted as a character in a string

<code>fl1</code>	<code>= 10.8</code>	<code>type(fl1)</code>	<code>= <class 'float'></code>
<code>int(str1)</code>	<code>= 15</code>	<code>type(int(str1))</code>	<code>= <class 'int'></code>
<code>float(str1)</code>	<code>= 15.0</code>	<code>type(float(str1))</code>	<code>= <class 'float'></code>
<code>str(int1)</code>	<code>= 10</code>	<code>type(str(int1))</code>	<code>= <class 'str'></code>
<code>str(fl1)</code>	<code>= 10.8</code>	<code>type(str(fl1))</code>	<code>= <class 'str'></code>
<hr/>			
<code>int(10.8)</code>	<code>= 10</code>		
<code>int(-10.8)</code>	<code>= -10</code>		
<code>round(10.8)</code>	<code>= 11</code>		
<code>round(-10.8)</code>	<code>= -11</code>		
<code>bin(10)</code>	<code>= 0b1010</code>		
<code>oct(10)</code>	<code>= 0o12</code>		
<code>hex(10)</code>	<code>= 0xa</code>		
<code>bool(10)</code>	<code>= True</code>		
<code>bool('abc')</code>	<code>= True</code>		
<code>bool(None)</code>	<code>= False</code>		
<code>bool('')</code>	<code>= False</code>		

- A decimal point is added when an integer is converted to a float.
- Float to integer conversion also rounds down the number.
- One can also change the representation of a number from decimal to binary etc.
- Bool() converts any non-empty string to **True** and an empty string to false.

Operators

Operators are symbols that perform an operation on one or more variables. The most common numerical operation, for example, is the addition of two or more numbers.

Numerical Operations

#Operators

num1 = 10

num2 = 4

num3 = 5e2

num1 += 1

num1 *= 3

num1 /= 2

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<code>num4</code> FOR FREE		= 12					
<code>num5</code>		= 9					
<code>bin(num4)</code>		= 0b1100					
<code>bin(num5)</code>		= 0b1001					
<code>bool1 or bool2</code>		= True					
<code>bool1 and bool2</code>		= False					
<code>bool1 bool2</code>		= True					
<code>bool1 & bool2</code>		= False					
<code>bin(num4)</code>		= 0b1100					
<code>bin(num4)</code>		= 0b1001					
<code>num4 num5</code>		= 0b1101					
<code>num4 & num5</code>		= 0b1000					
<code>num4 << 2</code>		= 0b110000 # Number left shifted by 2 bits					
<code>num4 >> 2</code>		= 0b11 # Number right shifted by 2 bits					

Data Structures

Some of Python's built-in types also serve as data structures. Let us begin by looking at **list and tuples** which, just like string and byte, are **sequence types**. That is they are arranged in a sequence and can be accessed in that sequence.

List

A list can be created in one of the following ways.

- Using a pair of square brackets to denote the empty list: []
- Using square brackets, separating items with commas: [a], [a, b, c]
- Using a list comprehension: [x for x in iterable]
- Using the type constructor: list() or list(iterable)

List Indexing and slicing

```
l2.append(12) # Add an element at the end
sum(l2)      # Sum all the elements
max(l2)      # Find the maximum element
min(l2)      # Find the minimum element
l2.extend(l3) # Add elements of another list to this list
l2.insert(1,13) # Insert element at a specific index
l2.remove('a') # Remove a specific element
l2.count('ab') # Count occurrences of element
l2.reverse()  # Reverse List
l2.pop(4)     # Remove element from this position
```

l2	= [4, 1, 3, 9, 7]
l3	= ['a', 'ab', 'abc', 'ab', 'ab']
Sorted l2	= [1, 3, 4, 7, 9]
after appending l2	= [1, 3, 4, 7, 9, 12]
Sum all elements of l2	= 36
Max element of l2	= 12
Min element of l2	= 1
after extending l2 with l3	= [1, 3, 4, 7, 9, 12, 'a', 'ab', 'abc', 'ab', 'ab']
after inserting element at 1 index l2	= [1, 13, 3, 4, 7, 9, 12, 'a', 'ab', 'abc', 'ab', 'ab']
after removing element 'a'	= [1, 13, 3, 4, 7, 9, 12, 'ab', 'abc', 'ab', 'ab']
Count occurrences of element 'ab'	= 3
Reversing the list	= ['ab', 'ab', 'abc', 'ab', 12, 9, 7, 4, 3, 13, 1]
Removing the element at index 4	= ['ab', 'ab', 'abc', 'ab', 9, 7, 4, 3, 13, 1]

Tuple

Tuple is very similar to a list. So much so, that some people resort to [calling it a cousin of the list data structure](#). Tuple is immutable, which means that its elements cannot be changed.

#Tuples

```
tp1 = ("hello") # Single length tuple
tp2 = (1,2,3,[5,6]) # Tuple containing mutable types
```

tp2	= (1, 2, 3, [5, 6])
tp2[0]	= 1
tp2[3]	= [5, 6]

sense to have a few data objects that stay constant and can't be modified by anybody, e.g. configuration parameters etc.

Set

Set is unordered. That means it doesn't preserve the order in which elements are added to the set. Therefore, it doesn't support sequence methods like indexing or slicing. A set is used to remove duplicates, and computing mathematical operations such as intersection, union and difference.

#Sets

```
set1 = {'a', 'b', 'c', 'a'}
```

```
set2 = {'a', 'd', 'e', 'f'}
```

```
set3 = {'a', 'd'}
```

```
set1 = {'b', 'c', 'a'} | type(set1) = <class 'set'> | len(set1) = 3
set1.union(set2) = {'e', 'a', 'd', 'f', 'c', 'b'}
set1.intersection(set2) = {'a'}
set1.issubset(set2) = False
set3.issubset(set2) = True
```

- Note that each element is unique in the set.
- The order of elements in a set is different every time it is printed.
- list1 = ['a', 'b', 'a', 'a'] set1 = **set**(list1) #How to convert list to a set
- Note how a set is created from a list.
- Also, this serves as a method to find out the unique elements in a list.

```
list1 = ['a', 'b', 'a', 'a'] | list1 length = 4
set1 = {'b', 'a'} | set1 length = 2
```

Dictionary

What is known as a hash in other languages is called a dictionary in Python. A dictionary is

which is essentially a dictionary.

Control Flow

In Python, the flow of a program can be controlled by various statements. These statements alter the flow based on certain Boolean conditions.

If/Else

If/else is the most common control flow statement. Elif is short for ‘else if’.

```
#Conditionals – If/Else  
count = 26  
if(count < 10):  
    print("Too Less")  
elif(count >= 10 and count < 30 ):  
    print("Just right")  
else:  
    print("Too much")
```

```
Just right
```

For Loop

For loops are used to repeat a certain block of code a predetermined number of times. Unlike C or Java, the for loop in Python loops over sequences like list, string or even a structure like dictionary as well. Let’s take a look at some examples.

```
#For Loop  
list1 = [1,2,3,4,5,6,7,8,9,10] count = 0  
print("list1 = ",list1)  
for list_item in list1:  
    print("list1[",count,"] = ",list_item)
```

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In case we want to break the loop upon some special condition, we use the **break statement**. In the code block below, we will loop over a list of fruits. We know that an elephant has snuck into our fruit basket and we want to remove it. So as soon as we find elephant, we halt our loop and stop printing any more fruits.

```
fruits = ["apple", "banana", "cherry", "dragonfruit", "elephant", "fig"] print("Available Fruits = ", fruits)
```

```
for fruit in fruits:
```

```
    if(fruit == "elephant"):
```

```
        print("I cannot eat", fruit)
```

```
        break
```

```
    else:
```

```
        print("I can eat", fruit)
```

```
Available Fruits =  ['apple', 'banana', 'cherry', 'dragonfruit', 'elephant', 'fig']
I can eat apple
I can eat banana
I can eat cherry
I can eat dragonfruit
I cannot eat elephant
```

A **Continue** statement is used to skip everything after itself and move on to the next iteration of the loop, whereas **Pass** is just a filler statement.

```
Current Letter : r
Current Letter : t
This is pass block
Current Letter : h
Current Letter : d
Current Letter : a
Current Letter : y
```

```
# Continue Statement
Current Letter : B
Current Letter : i
Current Letter : r
Current Letter : t
Current Letter : d
Current Letter : a
Current Letter : y
```

While Loop

The difference between **for** and **while** is that while keeps on going until its condition turns false.

```
#While Loop
count = 0
while count < 5:
    print(count)
    count += 1
```

```
0
1
2
3
```

```
def generate_number_list(upper_limit):
```

```
    index = 0
    output_list = [] #Empty List
    while(index < upper_limit):
        output_list.append(index)
        index+=1
    return output_list
```

```
print(generate_number_list(5))
print(generate_number_list(10))
```

- Upper_limit is a parameter of the function
- To output the generated list we use a keyword **return**
- Using the same function with a different parameter(argument) we could generate two different lists

```
[0, 1, 2, 3, 4]
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9]
```

Named Arguments Vs Positional Arguments

If we have multiple parameters, we may use positional arguments or named arguments.

- Positional arguments are mentioned in the order they are defined in the function.
- Named orders are defined like this: argument_name = argument value, and they can follow any order.

#Named Argument vs Positional Argument

```
def generate_number_list(start_index, upper_limit):
    index = start_index
    output_list = [] #Empty List
    while(index < upper_limit):
        output_list.append(index)
```

```
    index = index + increment  
    return output_list  
print("Default Value for Increment = ",generate_number_list(0,11))  
print("Non-Default Value for Increment = ",generate_number_list(0,11,2))
```

```
Default Value for Increment      = [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]  
Non-Default Value for Increment = [0, 2, 4, 6, 8, 10]
```

Lambda Functions

Python allows us to create functions without a name. These functions do not contain the **def** keyword that we saw above. However, they contain the keyword **lambda**, and so they are called lambda functions. They have the following structure: **lambda arguments : expression.**

```
#Lambda Function  
x = lambda a : a/2
```

```
x(100)      = 50.0  
x(x(100)) = 25.0
```

Range

Rather than being a function, **range** is actually an immutable sequence type like a tuple. It generates a range of numbers.

```
#Range Function  
list1 = [] for x in range(5):  
    list1.append(x)  
print("list1 = ", list1)  
list2 = [] for x in range(2,5):  
    list2.append(x)
```

Classes

Python is an object-oriented programming language and classes are the foundation of an object-oriented design. Objects are instances of a class. Any action that is performed on these objects is done through class methods. Let's take a look at how to create and use a class.

Creating Class and Methods

```
#Import Random Library
import random
#Class Definition
class Ball:
    """ A simple ball class to demonstrate OOP"""
    #Constructor Function
    def __init__(self, brand, age, color):
        self.brand = brand
        self.age = age
        self.color = color
    #Game for which ball is required and its speed in miles/hour
    self.game = "Football"
    self.speed = 0
    #Method to kick the ball
    def kick(self):
        self.speed = random.randint(5,50)
        print("Ball ",self.brand," has been kicked. Its new speed is ", self.speed, " miles/hour")
    def stop(self):
        if(self.speed == 0):
            print("The ",self.brand," ball is already stopped")
        else:
            self.speed = 0
```

```
print("Ball2 brand | age |color = (,ball2.brand, " | ", ball2.age, " | ", ball2.color,")")
```

Contact Company

Ball1.stop()

```
print('Ball2 speed = ',ball2.speed)
```

```
ball2.kick()
```

```
print("Ball2 speed = ",ball2.speed)
```

```
ball2.stop()
```

```
print("Ball2 speed = ",ball2.speed)
```

```
Ball1 brand | age |color = ( Lego | 10 | Black )  
Ball2 brand | age |color = ( Nike | 1 | Yellow )
```

```
Ball1 speed = 0
```

```
The Lego ball is already stopped
```

```
Ball2 speed = 0
```

```
Ball Nike has been kicked. Its new speed is 14 miles/hour
```

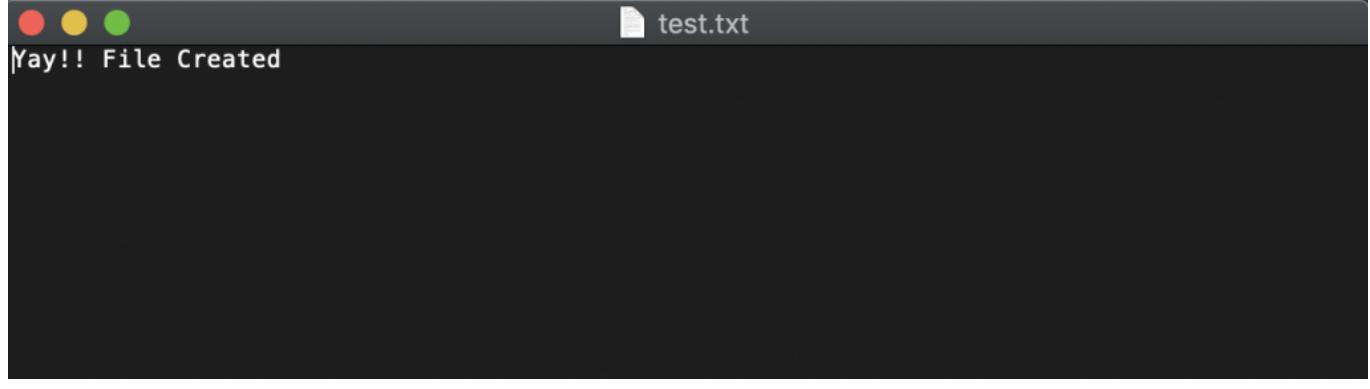
```
Ball2 speed = 14
```

```
Nike Ball successfully stopped
```

```
Ball2 speed = 0
```

Notice that the same method is used to create both the balls. Just the arguments are different.

- We can access the attribute of an object by writing `object.attribute` (e.g. `Ball2.color` gives us its color).
- We can call a method by writing `object.method()` e.g. `Ball2.kick()`
- The kick method modifies the speed attribute of the ball. We checked that by printing the speed separately after kicking `Ball2`.



, you can import a library, , you need to install it using `pip`. `PIP` is a package installer that comes bundled with Python.

PIP

To install any package, we just type

pip install package_name.

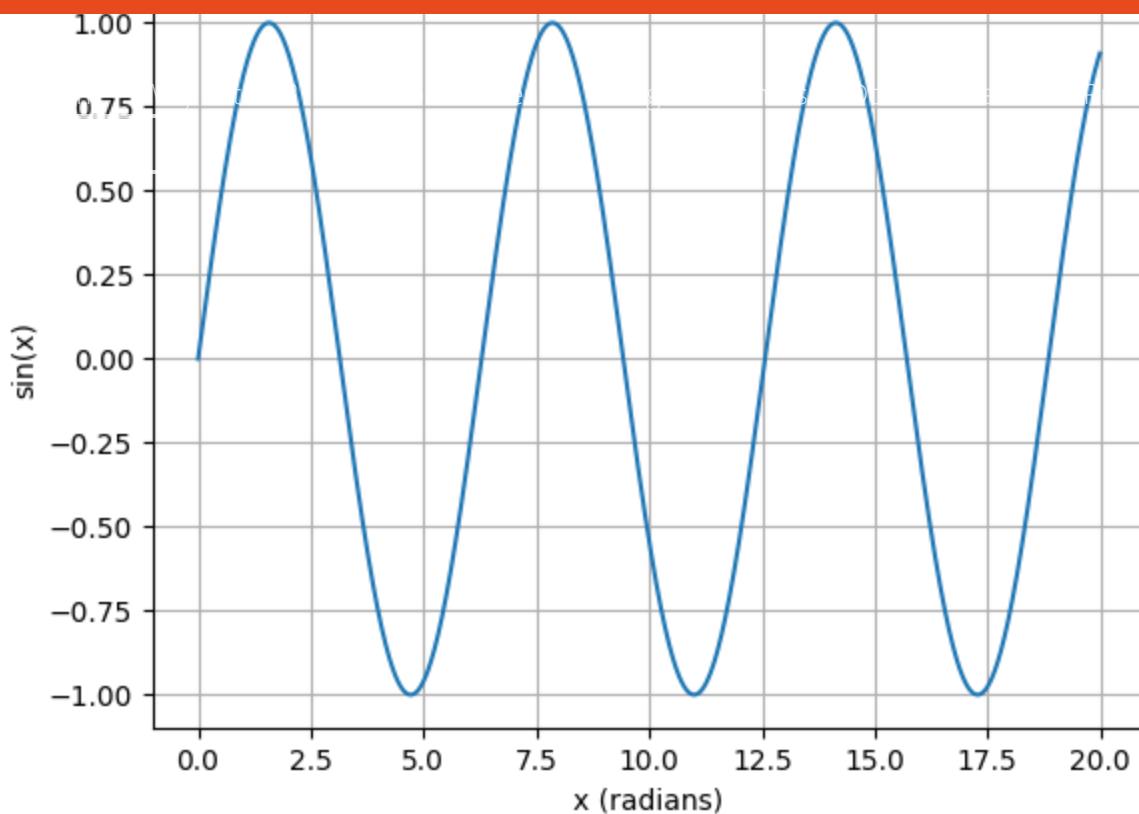
So, let's say we wanted to install a package called **PyGame**. It is a library to make games using Python. The following would happen once we run pip for this package.

```
$ pip install pygame
Collecting pygame
  Downloading pygame-1.9.6-cp37-cp37m-macosx_10_11_intel.whl (4.9 MB)
    |████████████████████████████████| 4.9 MB 1.9 MB/s
Installing collected packages: pygame
Successfully installed pygame-1.9.6
```

Matplotlib

Matplotlib is a package to create data visualizations.

```
#matplotlib (Plotting a sine wave)
import matplotlib
import matplotlib.pyplot as plt
import math
# Data for plotting
x_axis = range(0,2000)
x_axis = [x/100 for x in x_axis] y_axis= [math.sin(x) for x in x_axis]
fig, ax = plt.subplots()
ax.plot(x_axis, y_axis)
ax.set(xlabel='x (radians)', ylabel='sin(x)',
       title='How Sine Wave Looks Like')
ax.grid()
fig.savefig("test.png")
plt.show()
```



Pandas

Pandas is a key Python library for data scientists. It has a data structure called DataFrame, which is like a table of data. With Pandas we can read csv/xls files and store the data in DataFrames. In this example, we will import housing data from a csv, store it in a dataframe, and analyze that data.

Head() function shows you the first 5 rows of your data. Each row is the data of a particular household in California.

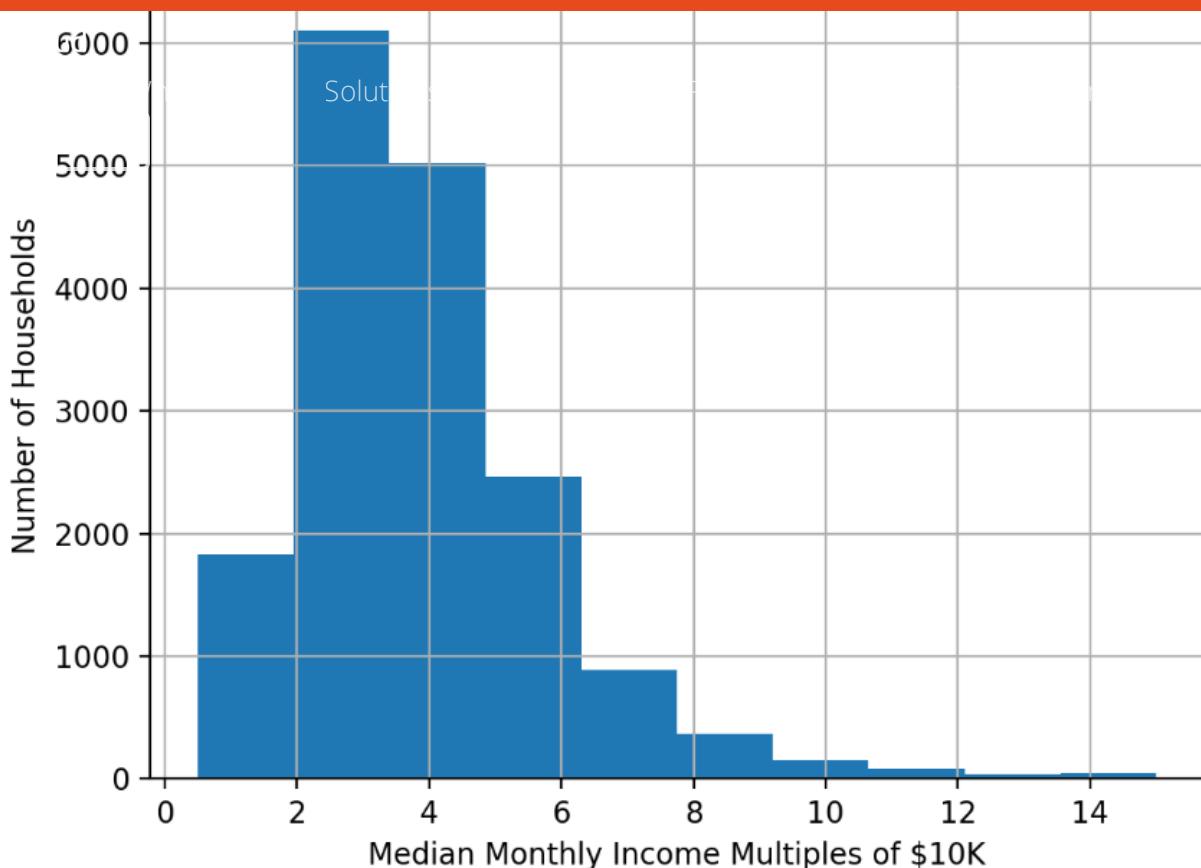
```
import numpy as np
```

```
import pandas as pd
```

```
house_data = pd.read_csv("https://download.mlcc.google.com/mledu-datasets/california_housing_train.csv", sep=',')
```

```
print(house_data.head())
```

	longitude	latitude	housing_median_age	total_rooms	total_bedrooms	population	households	median_income	median_house_value
0	-114.31	34.19	15.0	5612.0	1283.0	1015.0	472.0	1.4936	66900.0
1	-114.47	34.40	19.0	7650.0	1901.0	1129.0	463.0	1.8200	80100.0



Beautiful Soup – The Package to Scrape Web

Beautiful soup package helps you scrape html from any webpage and break it down into its various components. For example, let's say we want to fetch the names of all the faculty members of English Department at Cambridge University. We could write the code below.

```
#Beautiful Soup
import requests
from bs4 import BeautifulSoup
import re
URL = "https://www.english.cam.ac.uk/people/"
r = requests.get(URL)
soup = BeautifulSoup(r.content)
```

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Python's immensely rich database of packages makes it a very powerful language. I encourage you to explore

other packages as well.

Jupyter

Finally, in the world of AI and Data Science, Jupyter is increasingly being the go-to tool for presenting your work at conferences or meetings. You can present your Python code in a

The screenshot shows a Jupyter Notebook interface with a tab labeled "ipywidgets.ipynb". The main content area displays the following Python code:

```
[ ]: from ipywidgets import IntSlider
[ ]: slider = IntSlider()
[ ]: slider
[ ]: slider.value
[ ]: slider.value = 20
[ ]: slider
```

Conclusion

Python language is the Thor's hammer in today's world. It is easy to learn, quick to master and amazing to experiment with. It is a must-have skill to be adept at Python. Just pick up any good tutorial and start converting your coffee to code.

Guest post: Rishi Sidhu

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You may also be interested in: [10 Tips to Save You Time and Frustration When Programming](#)

What is Python?

Python is a high-level, general-purpose, readable programming language that allows users

through an interpreter. Functions in Python have no restrictions on type of argument or return value. Python is a dynamically-typed language and is well known as the easier language to maintain, as it is simpler to use and it is object-oriented.

C++ is more challenging to code in, and it doesn't support garbage collection or rapid prototyping. It has more restrictions on functionality, is a statically-typed language, and is much less clean and manageable than Python.

Is Python free?

Python is free, open-source, and available for anyone to download and install at [python.org](https://www.python.org). Its huge and growing ecosystem has a wide array of open-source libraries and packages that are available for all users.

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