Member-only story

# Day 2 of 30 days of Data Engineering

With examples and projects...

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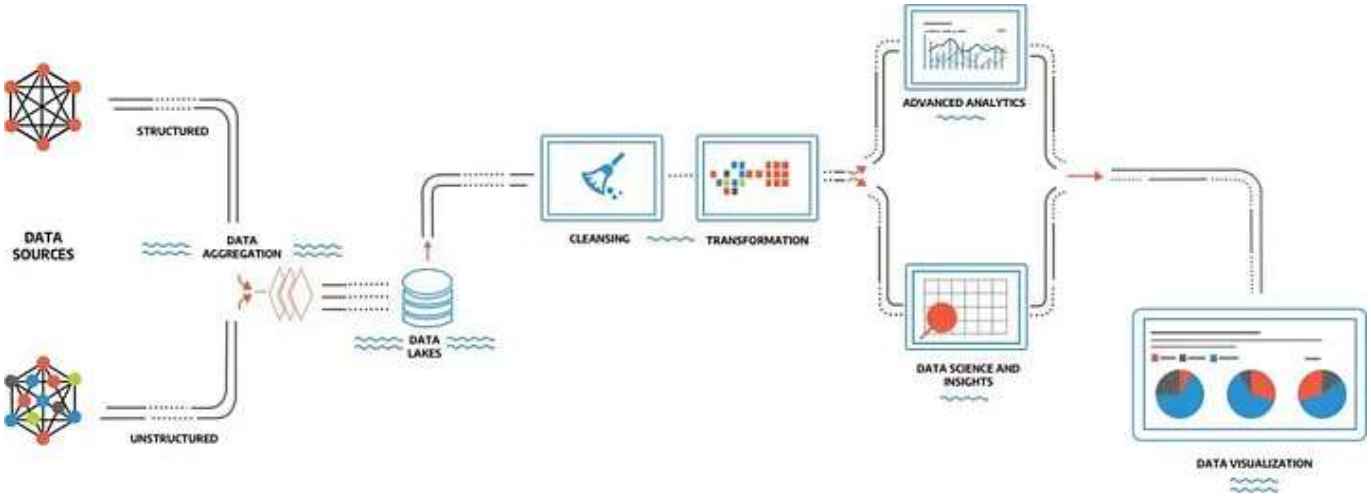


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Welcome back peeps to Day 2 of Data Engineering!

## What's covered in 30 days of Data Engineering with projects Series till now—

> *Day 1 : What's Data Engineering, Why Data Engineering, Data Engineers — ML Engineers — Data Scientists, Purpose and Scope*
>
> *Day 2 : Complete Python for Data Engineering — Part 1*
>
> *Day 3 : Complete Advanced Python for Data Engineering — Part 2*

*Day 4: Techniques to write efficient and Optimized Code*

*Day 5 : SQL*

*Day 6 : Advanced SQL*

*Day 7 : BigQuery and SQL vs NOSQL databases*

*Day 8 : Advanced Functions*

*Day 9 : Query Optimizations*

*Day 10 : MySQL and PostgreSQL*

*Day 11: Shell scripting and Linux “touch” command*

*Day 12 : Map Reduce, Data Warehouse, Data Lakes*

*Day 13: Pandas, Pandas, Data Cleaning and processing, Outlier Detection, Noisy Data, Missing Data, Pandas Functions, Aggregate Functions, Joins*

*Day 14 : Numpy*

*Day 15 : Advanced Pandas Techniques*

*Day 16 : Data Pre-processing, Handling missing values, Data Cleaning, Mean/mode/median Imputation, Hot Deck Imputation, Rescale Data, Binarize Data, Regression Imputation, Stochastic regression imputation, Feature Scaling*

*Day 17 : Data Augmentation, Read and Process Large Datasets*

*Day 18 : Data Visualization basics, Data Visualization Projects, Data Visualization using Plotly and Bokeh, Data Profiling, Summary Functions, Indexing, Grouping, Linear Regression, Multi Linear Regression, Polynomial Regression, Regression, Support Vector Regression, Decision Tree Regression, Random Forest Regression, Feature Engineering, GroupBy Features, Categorical and Numerical Features, Missing Value Analysis, Fill the missing Values, Unique Value Analysis, Univariate Analysis, Bivariate Analysis, Multivariate Analysis, Correlation Analysis, Spearman's ρ, Pearson's r, Kendall's τ, Cramér's V (φc), Phik (φk)*

*Day 19 : MySQL and PostgreSQL*

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This is Day 2 of 30 days of Data Engineering Series where we will be covering —

**Complete Python for Data Engineering — Part 1**

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**Our whole syllabi for 30 days of Data Engineering —**

I'l be covering only the most important topics in Data Engineering **with projects** ( written below) —

## 1. Data Engineering

> *What's Data Engineering*
>
> *Why Data Engineering*
>
> *Data Engineers — ML Engineers — Data Scientists*

> *Purpose and Scope*

## 2. Python for Data Engineering

> *Basic Python with Project*
>
> *Advanced Python with Project*
>
> *Techniques to write efficient and optimized code*

## 3. Scripting and Automation

> *Shell Scripting*
>
> *CRON*
>
> *ETL*

## 4. Relational Databases and SQL

> *RDBMS*

> *Data Modeling*
>
> *Basic SQL*
>
> *Advanced SQL*
>
> ***Big Query***

## 5. NoSQL Data bases and Map Reduce

> *Unstructured Data*
>
> *Advanced ETL*
>
> *Map-Reduce*
>
> *Data Warehouses*
>
> *Data API*

## 6.Data Analysis

> ***Pandas***
>
> *Numpy*
>
> *Web Scraping*
>
> *Data Visualization*

## 7. Data Processing Techniques

> *Batch Processing : Apache Spark*
>
> *Stream Processing — Spart Streaming*
>
> *Build Data Pipelines*
>
> *Target Databases*
>
> *Machine learning Algorithms*

## 8. Big Data

> *Big data basics*
>
> *HDFS in detail*
>
> *Hadoop Yarn*
>
> *Sqoop Hadoop*
>
> *Hadoop Yarn*
>
> *Hive*
>
> *Pig*
>
> *Hbase*

## 9. WorkFlows

> *Introduction to Airflow*

> *Airflow hands on project*

## 10. Infrastructure

> *Docker*
>
> *Kubernetes*
>
> *Business Intelligence*

## 11. Cloud Computing

> *AWS*
>
> *Google Cloud Platform*

## 12. Research Papers — Data Engineering

> *Some amazing research papers- data engineering that I have read over the years to help you boot up to the industry standards and what's next in this field.*

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## Let's get started with Day 2 —

*We will be covering below Python topics in detail with hands on coding exercise —*

> *1. Data types, strings, operators, and Chaining Comparison Operators with Logical Operators*
>
> *2. Python Lists and Dictionaries, Sets, Tuples*
>
> *3. Loops, Break and Continue Statements*
>
> *4. Object-Oriented Programming — Class and attributes*
>
> *5. Python strings in detail*
>
> *6. Python F-String*
>
> *7. Map, Classes, Functions and Arguments*

> *8. First Class functions, Private Variables, Global and Non Local Variables, __import__ function*
>
> *9. Magic Functions, Tuple Unpacking*
>
> *10. Static Variables and Methods in Python*
>
> *11. Lambda Functions, Magic methods*
>
> *12. Inheritance and Polymorphism, Errors and Exception Handling*
>
> *13. User-defined functions, Python garbage collection, debugger in Python*
>
> *14. Iterators, Generators, and Decorators, Memoization using Decorators*
>
> *15. Ordered and Defaultdict, Coroutine*
>
> *16. Regular expression, Magic methods, Closures*
>
> *17. ChainMap*
>
> *18. Python Itertools*

> *19. Advanced python constructs*
>
> *20. Comprehensions, Named Tuple, Type hinting in Python*
>
> *21. How to write efficient Code in Python*
>
> *22. Efficient Code and Optimization techniques for Python*

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## Highly Recommended Data Science and Machine Learning Courses that you MUST take ( with certificate) —

> *Complete Data Scientist*
>
> *Complete Data Analyst*
>
> *Complete Data Engineering*
>
> *Complete Machine Learning Engineer*

> *Complete Deep Learning*
>
> *Complete Natural Language Processing*
>
> *Complete Self Driving Car Engineer*

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Open up colab/jupyter notebook and start coding.

Let's dive in!

. . .

**Python is a high-level, most widely used multi-purpose, easy to read programming language.**

It is —

- Interpreted – Python is processed at runtime by the interpreter. i.e you do not need to compile your program before executing it

- Interactive – You can interact with the interpreter directly to write your programs
- Portable — It can run on wide range of hardware Platforms
- Object-Oriented – Python supports Object-Oriented style and Procedural Paradigms
- Used as a scripting language or can be compiled to byte-code for building large applications
- It has simple structure, and a clearly defined syntax
- Known as Beginner's Language – It's a great language for the beginner-level programmers
- Source code is comparatively easy-to-maintain
- Provides very high-level dynamic data types and supports dynamic type checking.
- Has a huge collection of standard library

Popular applications for Python:

- Web Development

- Data Science — including machine learning, data analysis, and data visualization
- Scripting
- Game Development
- CAD Applications
- Embedded Applications

**Complete Code —**

```python
# Data types, strings, operators, and Chaining Comparison Operators with Logical Operators
num1 = 10
num2 = 20
if num1 > num2 and num1 % 2 == 0:
    print("num1 is greater than num2 and is even")
else:
    print("Condition not satisfied")

# Python Lists and Dictionaries, Sets, Tuples
my_list = [1, 2, 3, 4, 5]
my_dict = {'name': 'John', 'age': 30}
my_set = {1, 2, 3, 4, 5}
my_tuple = (1, 2, 3, 4, 5)

# Loops, Break and Continue Statements
for num in my_list:
    if num == 3:
        break
    print(num)

# Object-Oriented Programming - Class and attributes
class Car:
    def __init__(self, make, model):
        self.make = make
        self.model = model

    def start_engine(self):
        print("Engine started.")

my_car = Car("Toyota", "Corolla")
print(my_car.make)
print(my_car.model)
my_car.start_engine()

# Python strings in detail
my_string = "Hello, World!"
print(len(my_string))
print(my_string.upper())
print(my_string.lower())
print(my_string.split(","))

# Python F-String
name = "John"
age = 30
print(f"My name is {name} and I am {age} years old.")

# Map, Classes, Functions and Arguments
def square(num):
```

```
    return num ** 2

numbers = [1, 2, 3, 4, 5]
squared_numbers = list(map(square, numbers))
print(squared_numbers)

# First Class functions, Private Variables, Global and Non Local Variables, __import__ function
def outer_func():
    x = 10
    def inner_func():
        nonlocal x
        x += 5
        print(x)
    inner_func()

outer_func()

# Magic Functions, Tuple Unpacking
my_tuple = (1, 2, 3)
a, b, c = my_tuple
print(a, b, c)

# Static Variables and Methods in Python
class MathUtils:
    PI = 3.14159

    @staticmethod
    def square(num):
        return num ** 2

print(MathUtils.PI)
print(MathUtils.square(5))

# Lambda Functions, Magic methods
add = lambda x, y: x + y
print(add(2, 3))

# Inheritance and Polymorphism, Errors and Exception Handling
class Animal:
    def sound(self):
        raise NotImplementedError("Subclasses must implement sound() method.")

class Cat(Animal):
    def sound(self):
        return "Meow"

my_cat = Cat()
print(my_cat.sound())

# User-defined functions, Python garbage collection, debugger in Python
def greet(name):
    print(f"Hello, {name}!")

greet("John")
```

```python
# Iterators, Generators, and Decorators, Memoization using Decorators
def fibonacci():
    a, b = 0, 1
    while True:
        yield a
        a, b = b, a + b

fib_gen = fibonacci()
for _ in range(10):
    print(next(fib_gen))

# Ordered and Defaultdict, Coroutine
from collections import OrderedDict, defaultdict

ordered_dict = OrderedDict()
ordered_dict['a'] = 1
ordered_dict['b'] = 2
print(ordered_dict)

default_dict = defaultdict(int)
default_dict['a'] = 1
default_dict['b'] = 2
print(default_dict['c'])  # Output: 0

# Regular expression, Magic methods, Closures
import re

pattern = r'\b[A-Za-z]+\b'
text = "Hello, World! This is a sample text."
matches = re.findall(pattern, text)
print(matches)

# ChainMap
from collections import ChainMap

dict1 = {'a': 1, 'b': 2}
dict2 = {'c': 3, 'd': 4}
chain_map = ChainMap(dict1, dict2)
print(chain_map['a'])  # Output: 1
print(chain_map['c'])  # Output: 3

# Python Itertools
import itertools

numbers = [1, 2, 3]
letters = ['a', 'b', 'c']
combined = itertools.product(numbers, letters)
for item in combined:
    print(item)

# Advanced python constructs
result = [x if x % 2 == 0 else None for x in numbers]
print(result)
```

```python
# Comprehensions, Named Tuple, Type hinting in Python
from typing import List, Tuple
from collections import namedtuple

Point = namedtuple('Point', ['x', 'y'])
p = Point(1, 2)
print(p.x)
print(p.y)

def multiply(numbers: List[int]) -> Tuple[int, int]:
    product = 1
    for num in numbers:
        product *= num
    return product, len(numbers)

print(multiply([1, 2, 3, 4, 5]))

# 13. User-defined functions, Python garbage collection, debugger in Python
def greet(name):
    print(f"Hello, {name}!")

greet("John")

# Python garbage collection - no specific code implementation required here
# Debugger in Python - can be done using the built-in pdb module or an IDE's debugging features

# 14. Iterators, Generators, and Decorators, Memoization using Decorators
def fibonacci():
    a, b = 0, 1
    while True:
        yield a
        a, b = b, a + b

fib_gen = fibonacci()
for _ in range(10):
    print(next(fib_gen))

# Decorators
def my_decorator(func):
    def wrapper():
        print("Before function call")
        func()
        print("After function call")
    return wrapper

@my_decorator
def my_function():
    print("Inside decorated function")

my_function()

# Memoization using Decorators
```

```
def memoize(func):
    memo = {}
    def wrapper(n):
        if n not in memo:
            memo[n] = func(n)
        return memo[n]
    return wrapper

@memoize
def fibonacci(n):
    if n <= 1:
        return n
    return fibonacci(n-1) + fibonacci(n-2)

print(fibonacci(10))

# 15. Ordered and Defaultdict, Coroutine
from collections import OrderedDict, defaultdict

ordered_dict = OrderedDict()
ordered_dict['a'] = 1
ordered_dict['b'] = 2
print(ordered_dict)

default_dict = defaultdict(int)
default_dict['a'] = 1
default_dict['b'] = 2
print(default_dict['c'])  # Output: 0

# Coroutine
def coroutine():
    while True:
        x = yield
        print(f"Received: {x}")

coro = coroutine()
next(coro)
coro.send(10)

# 16. Regular expression, Magic methods, Closures
import re

pattern = r'\b[A-Za-z]+\b'
text = "Hello, World! This is a sample text."
matches = re.findall(pattern, text)
print(matches)

# Closures
def outer_func(x):
    def inner_func(y):
        return x + y
    return inner_func

closure = outer_func(10)
```

```
print(closure(5))

# 17. ChainMap
from collections import ChainMap

dict1 = {'a': 1, 'b': 2}
dict2 = {'c': 3, 'd': 4}
chain_map = ChainMap(dict1, dict2)
print(chain_map['a'])  # Output: 1
print(chain_map['c'])  # Output: 3

# 18. Python Itertools
import itertools

numbers = [1, 2, 3]
letters = ['a', 'b', 'c']
combined = itertools.product(numbers, letters)
for item in combined:
    print(item)

# 19. Advanced python constructs
result = [x if x % 2 == 0 else None for x in numbers]
print(result)

# 20. Comprehensions, Named Tuple, Type hinting in Python
from typing import List, Tuple
from collections import namedtuple

Point = namedtuple('Point', ['x', 'y'])
p = Point(1, 2)
print(p.x)
print(p.y)

def multiply(numbers: List[int]) -> Tuple[int, int]:
    product = 1
    for num in numbers:
        product *= num
    return product, len(numbers)
```

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## Projects Videos —

*All the projects, data structures, SQL, algorithms, system design, Data Science and ML , Data Analytics, Data Engineering, , Implemented Data Science and ML projects, Implemented Data Engineering Projects, Implemented Deep Learning Projects, Implemented Machine Learning Ops Projects, Implemented Time Series Analysis and Forecasting Projects, Implemented Applied Machine Learning Projects, Implemented Tensorflow and Keras Projects, Implemented PyTorch Projects, Implemented Scikit Learn Projects, Implemented Big Data Projects, Implemented Cloud Machine Learning Projects, Implemented Neural Networks Projects, Implemented OpenCV Projects,Complete ML Research Papers Summarized, Implemented Data Analytics projects, Implemented Data Visualization Projects, Implemented Data Mining Projects, Implemented Natural Leaning Processing Projects, MLOps and Deep Learning, Applied Machine Learning with Projects Series, PyTorch with Projects Series, Tensorflow and Keras with Projects Series, Scikit Learn Series with Projects, Time Series Analysis and Forecasting with Projects Series, ML System Design Case Studies Series videos will be published on our youtube channel ( just launched).*

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**Ignito**

Excited to share that we have launched our Youtube channel — Ignito to cover all the projects and coding exercise for ...

www.youtube.com


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*30 days of Data Structures and Algorithms and System Design Simplified*

*60 Days of Deep Learning with Projects Series*

*30 days of Data Engineering with projects Series*

*Data Science and Machine Learning Research ( papers) Simplified* **

*100 days : Your Data Science and Machine Learning Degree Series with projects*

*23 Data Science Techniques You Should Know*

*Tech Interview Series — Curated List of coding questions*

*Complete System Design with most popular Questions Series*

*Complete Data Visualization and Pre-processing Series with projects*

*Kaggle Best Notebooks that will teach you the most*

*60 days of Data Science and ML Series with projects*

*Complete Developers Guide to Git*

*All the Data Science and Machine Learning Resources*

*210 Machine Learning Projects*

*30 days of Machine Learning Ops*

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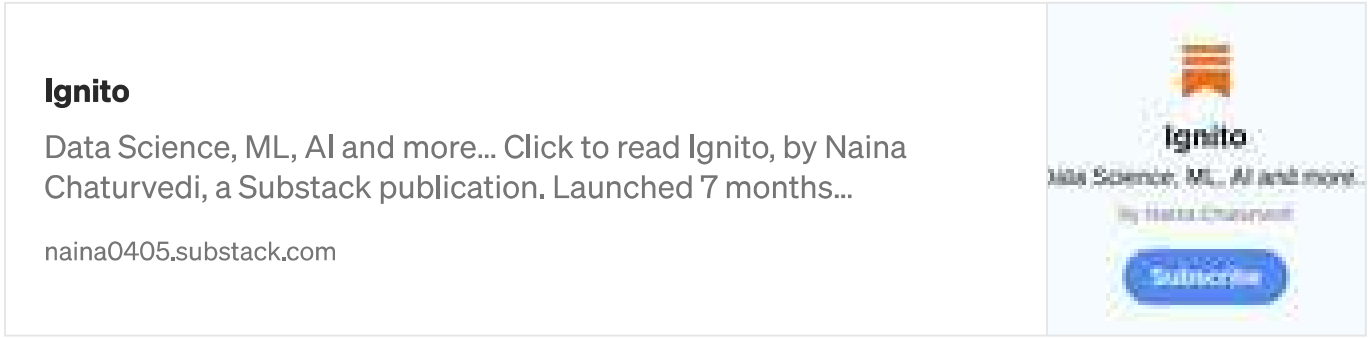


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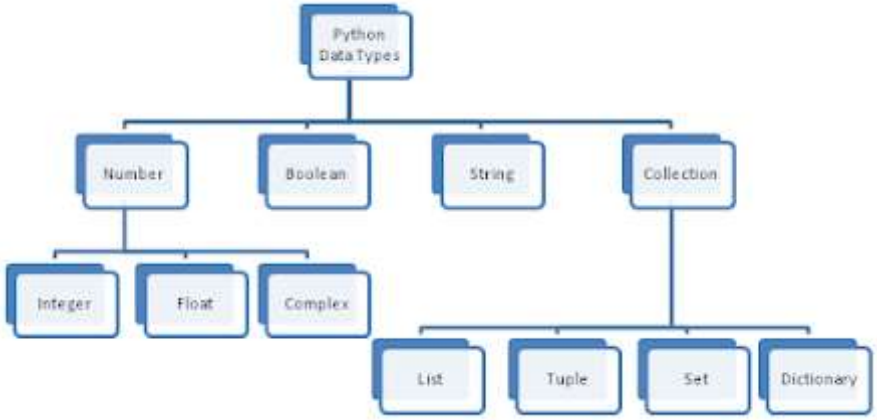
## Python Data Types

Data Types represent the kind of value variables can hold and what all operations can be performed on a particular data.




Pic credits : tpoint

## Implementation —

```
#Int data Type

var = 5
print(var)
print(type(var))
```

## Output —

```
5
<class 'int'>
```

## Implementation —

```
#Float data type

var2 = 0.1234
print(var2)
print(type(var2))
```

## Output —

```
0.1234
<class 'float'>
```

## Implementation —

```
#Complex numbers data type

x = 2j
print(x)
print(type(x))
```

## Output —

```
2j
<class 'complex'>
```

## Implementation —

```
#String Data Type

str_one = "Hello World"
print(str_one)
print(type(str_one))
```

## Output —

```
Hello World
<class 'str'>
```

## Implementation —

```
#list Data type
```

```
list1 = ["car","bike"]
print(list1)
print(type(list1))
```

## Output —

```
['car', 'bike']
<class 'list'>
```

## Implementation —

```
#Tuple Data Type

tup= ("car","bike","bus")
print(tup)
print(type(tup))
```

## Output —

```
('car', 'bike', 'bus')
<class 'tuple'>
```

## Implementation —

```
#Dictionary Data type

dict_one = {"Name": "Steve", "Location": "NewYork"}
print(dict_one)
print(type(dict_one))
```

## Output —

```
{'Name': 'Steve', 'Location': 'NewYork'}
<class 'dict'>
```

## Implementation —

```
#Set Data type

set_one = set({"Hello","world","Hello"})
print(set_one)
print(type(set_one))
```

## Output —

```
{'world', 'Hello'}
<class 'set'>
```

## Implementation —

```
#Frozen Set

f_one = frozenset({"Hello","World","Hello"})
print(f_one)
print(type(f_one))
```

## Output —

```
frozenset({'Hello', 'World'})
<class 'frozenset'>
```

## Implementation —

```
#Boolean Data Type
```

```
b = True
print(b)
print(type(b))
```

## Output —

```
True
<class 'bool'>
```

## Implementation —

```
#Byte Data Type

byte_one = b"World"
print(type(byte_one))
print(byte_one)
```

## Output —

```
<class 'bytes'>
b'World'
```

. . .

## Python Strings

Strings are arrays of bytes representing unicode characters.

- Strings in python are surrounded by either single quotation marks, or double quotation marks.

> *'today' is the same as "today".*
>
> *Example :*
>
> *var1 = 'Hello'*
>
> *var2 = "Complete Python Course"*

- You can assign a multiline string to a variable by using three quotes.

**Implementation —**

```
#String
str1 = "Welcome to complete Python Course"
str2 = 'Welcome to the complete Python Course'
str3 = """This is a
       multiline
       String"""
```

### Output —

```
Welcome to complete Python Course
Welcome to the complete Python Course
This is a
       multiline
       String
```

### Indexing and Slicing with Strings —

- In python, Indexing is used to access individual characters of a string
- Square brackets are used to access the character of the string using Index
- Index starts with 0

- -1 refers to the last character, -2 refers to the second last character and so on

> *Example:*
>
> *var[3]*
>
> *var[-2]*

- In python, Slicing is used to access a range of characters in the string
- Slicing operator colon (:) is used

> *Example:*
>
> *var[1:4]*
>
> *var[:4]*

**Implementation —**

```
# Indexing : String starts with 0th Index
```

```
s= "Captain America"
print(s[4])
```

## Output —

```
a
```

## Implementation —

```
#Slicing : slice(start, stop, step), it returns a sliced object
containing elements in the given range

s= "Captain America"
print(s[1:5:2])
```

## Output —

```
at
```

## Implementation —

```
#Reverse
print(s[::-1])
```

**Output —**

```
aciremA niatpaC
```

. . .

## String Methods

- istitle() : Checks for Titlecased String



- join() : Returns a Concatenated String
- ljust() : returns left-justified string of given width
- lower() : returns lowercased string
- lstrip() : Removes Leading Characters
- maketrans() : returns a translation table

- replace() : Replaces Substring Inside
- rfind() : Returns the Highest Index of Substring
- rjust() : returns right-justified string of given width
- rstrip() : Removes Trailing Characters
- split() : Splits String from Left
- splitlines() : Splits String at Line Boundaries
- startswith() : Checks if String Starts with the Specified String
- strip() : Removes Both Leading and Trailing Characters
- swapcase() : swap uppercase characters to lowercase; vice versa
- title() : Returns a Title Cased String
- translate() : returns mapped characterred string
- upper() : returns uppercased string
- zfill() : Returns a Copy of The String Padded With Zeros
- capitalize() : Converts first character to Capital Letter
- casefold() : converts to case folded strings
- center(): Pads string with specified character

- count() : returns occurrences of substring in string
- encode() : returns encoded string of given string
- endswith(): Checks if String Ends with the Specified Suffix
- expandtabs() : Replaces Tab character With Spaces
- find(): Returns the index of first occurrence of substring
- format(): formats string into nicer output
- format_map() : Formats the String Using Dictionary
- index(): Returns Index of Substring
- isalnum(): Checks Alphanumeric Character
- isalpha() : Checks if All Characters are Alphabets
- isdecimal() : Checks Decimal Characters
- isdigit() : Checks Digit Characters
- isidentifier() : Checks for Valid Identifier
- islower() : Checks if all Alphabets in a String are Lowercase
- isnumeric() : Checks Numeric Characters
- isprintable() : Checks Printable Character

- isspace() : Checks Whitespace Characters

### Implementation —

```
#capitalize() method : Returns a copy of the string with its first
#character capitalized and the rest lowercased

a = "complete python course"
print(a.capitalize())
```

### Output —

```
Complete python course
```

### Implementation —

```
#centre(width[, fillchar])   : Returns the string centered in a
#string of length width

a = "Python"
b = a.center(10, "*")
print(b)
```

### Output —

```
**Python**
```

### Implementation —

```
# casefold() method : Returns a casefolded copy of the string.
#Casefolded strings may be used for caseless matching

a = "PYTHON"
print(a.casefold())
```

### Output —

```
python
```

### Implementation —

```
# count(sub[, start[, end]]) : Returns the number of non-overlapping
#occurrences of substring (sub) in the range [start, end]
```

```
a = "Welcome to complete Python Course"

print(a.count("c"))
print(a.count("o"))
print(a.count("Python"))
```

## Output —

```
2
5
1
```

## Implementation —

```
# endswith(suffix[, start[, end]]) : Returns True if the string ends
#with the specified suffix, otherwise it returns False

a = "Watermelon"
print(a.endswith("s"))
print(a.endswith("melon"))
```

## Output —

```
False
True
```

## Implementation —

```
# find(sub[, start[, end]]) : Returns the lowest index in the string
# where substring sub is found within the slice s[start:end]

a = "Exercise"
print(a.find("r"))
print(a.find("e"))
```

## Output —

```
3
2
```

## Implementation —

```
# index(sub[, start[, end]]) : Similar to find function, except that
# it raises a ValueError when the substring is not found
```

```
a = "Continent"
print(a.index("i"))
print(a.index("C"))
print(a.index("nent"))
```

## Output —

```
4
0
5
```

## Implementation —

```
# isalnum() : Returns True if all characters in the string are
#alphanumeric, else returns False

c = "456"
d = "$*%!!**"
print(c.isalnum())
print(d.isalnum())
```

## Output —

```
True
False
```

## Implementation —

```
# isalpha() : Returns True if all characters in the string are
#alphabetic, else returns False

c = "456"
d = "Python"
print(c.isalpha())
print(d.isalpha())
```

## Output —

```
False
True
```

## Implementation —

```
# isdecimal() : Returns True if all characters in the string are
#decimal characters, else returns False
```

```
c = u"\u00B10"
x = "10"
print(c.isdecimal())
print(x.isdecimal())
```

## Output —

```
False
True
```

## Implementation —

```
# isdigit() : Returns True if all characters in the string are
#digits, else returns False

c = "4567"
d = "1.65"
print(c.isdigit())
print(d.isdigit())
```

## Output —

```
True
```

```
False
```

## Implementation —

```
# join(iterable) : Returns a string which is the concatenation of
#the strings in iterable.
# A TypeError will be raised if there are any non-string values in
#iterable

a = ","
print(a.join("CD"))
```

## Output —

```
C,D
```

## Implementation —

```
# partition(sep) : Splits the string at the first occurrence of sep,
#and returns a 3-tuple containing the part before the separator, the
#separator itself, and the part after the separator

a = "Complete.Python-course"
```

```
print(a.partition("-"))
print(a.partition("."))
```

## Output —

```
('Complete.Python', '-', 'course')
('Complete', '.', 'Python-course')
```

## Implementation —

```
# split(sep=None, maxsplit=-1) : Returns a list of the words in the
#string,using sep as the delimiter strip.If maxsplit is given,at
#most maxsplit splits are done.If maxsplit is not specified or -1,
#then there is no limit on the number of splits.

a = "Welcome,,Friends,"
print(a.split(","))
```

## Output —

```
['Welcome', '', 'Friends', '']
```

## Implementation —

```
# strip([chars]) : Returns a copy of the string with leading and
#trailing characters removed. The chars argument is a string
#specifying the set of characters to be removed

a = "***Python***"
print(a.strip("*"))
```

## Output —

```
Python
```

## Implementation —

```
# swapcase() : Returns a copy of the string with uppercase
#characters converted to lowercase and vice versa
a = "Hi Homies"
print(a.swapcase())
```

## Output —

```
hI hOMIES
```

## Implementation —

```
# zfill(width) : Returns a copy of the string left filled with ASCII
#0 digits to make a string of length width

a = "-124"
print(a.zfill(6))
```

## Output —

```
-00124
```

## Implementation —

```
# lstrip([chars]) : Return a copy of the string with leading
#characters removed.The chars argument is a string specifying the
#set of characters to be removed.

a = "*****Python-----"
print(a.lstrip("*"))
```

## Output —

```
Python-----
```

## Implementation —

```
# rindex(sub[, start[, end]]) : Just like rfind() but raises
#ValueError when the substring sub is not found

a = "Hi World"

print(a.rindex("d"))
print(a.rindex("W"))
```

## Output —

```
7
3
```

. . .

## Python F Strings

- Python F-String are used to embed python expressions inside string literals for formatting, using minimal syntax.
- It's an expression that's evaluated at the run time.
- They have the f prefix and use {} brackets to evaluate values.
- f-strings are faster than %-formatting and str.format()

Syntax —

f "string_variable"

- In order to format and output an expression in the formatted way, you should use curly braces {}

### Implementation —

```
def max_no(x,y):
    return x if x>y else y
f_no= 12
```

```
s_no =25
print(f'Max of {f_no} and {s_no} is {max(f_no,s_no)}')
```

## Output —

```
Max of 12 and 25 is 25
```

## Implementation —

```
from decimal import Decimal
width = 4
round_point = 2
value = Decimal('12.39065')
print(f'result:{value:{width}.{round_point}}')
```

## Output —

```
result:  12
```

. . .

## Operators in Python

- In python, operators are used to perform operations on variables and values

> *Arithmetic operators : +, — , *, /, //, %, ***
>
> *Logical operators : and, or, not*
>
> *Identity operators : is, is not*
>
> *Membership operators : in , not in*
>
> *Bitwise operators : &, |, ^,~, << , >>*
>
> *Assignment operators : =, +=, -=, *=,/= , %=, //=, **=, &=, |=, ^=, >>=, <<=*
>
> *Comparison operators : ==, !=, > , <, >=, <=*

- Ternary operators are operators that evaluate things based on a condition being true or false

Syntax : [true] if [expression] else [false]

- Operator overloading can be implemented in Python

> *Example —*
>
> *a & b*
>
> *a >> 2*
>
> *a is not b*
>
> *'b' in list1*

**Implementation —**

```
#Arithmatic Operators

x=10
y=4

#Addition
print("Addition:",x+y)

#Subtraction
print("Subtraction:",x-y)
```

```
#Multiply
print("Multiply: ",x*y)

#Division
print("Division:",x/y)

#Modulus
print("Modulus:",x%y)

#Floor Division
print("Floor Division:",x//y)

#Exponent
print("Exponent:",x**y)
```

## Output —

```
Addition: 14
Subtraction: 6
Multiply:  40
Division: 2.5
Modulus: 2
Floor Division: 2
Exponent: 10000
```

## Implementation —

```
#Comparison Operator  : Result is either True or False
```

```
x=5
y=3

#Greater than
print("Greater than:",x>y)

#Less than
print("Greater than:",x<y)

#Greater than equal to
print("Greater than equal to:",x>=y)

#less than equal to
print("Less than:",x<=y)

#Not equal to
print("Not equal to:",x!=y)

#Equal to
print("Equal to:",x==y)
```

## Output —

```
Greater than: True
Greater than: False
Greater than equal to: True
Less than: False
Not equal to: True
Equal to: False
```

## Implementation —

```
#Logical Operators : and, or, not [Result is either True or False]

x= True
y= False

#And
print("And result:",(x and y))

#Or
print("Or result:",(x or y))

#Not
print("Not result:",(not y))
```

## Output —

```
And result: False
Or result: True
Not result: True
```

## Implementation —

```
# Bitwise operators

x = 1001
y = 1010

#And
print("And result:",(x & y))
```

```
#Or
print("Or result:",(x | y))

#Not
print("Not result:",(~y))

#Xor
print("XOR result:",(x^y))

#Bitwise right shift
print("Bitwise right shift result:",(x>>2))

#Bitwise left shift
print("Bitwise left shift result:",(x<<2))
```

## Output —

```
And result: 992
Or result: 1019
Not result: -1011
XOR result: 27
Bitwise right shift result: 250
Bitwise left shift result: 4004
```

## Implementation —

```
# Assignment operators : used in Python to assign values to variables

x=5
x+=5
```

```
x-=2
x*=2
x**=2
```

## Implementation —

```
# Identity Operator : is and is not are the identity operators in
Python

x=5
y=5
z='a'
print("Is operator result:", (x is y))
print("Not is operator result:", (y is not z))
```

## Output —

```
Is operator result: True
Not is operator result: True
```

## Implementation —

```
#Membership operator : in operator
```

```
x = 'Python Course'
print('y' in x)
print('a' in x)
```

**Output —**

```
True
False
```

. . .

## Chaining Comparison Operators with Logical Operators

- In python, in order to check more than two conditions, we implement chaining where two or more operators are chained together as shown in the example below

> *if x < y < z :*
>
> *{.....}*

- In accordance with associativity and precedence in Python, all comparison operations have the same priority. Resultant values of Comparisons yield boolean values such as either True or False
- When chaining the comparison operators, the sequence can be arbitrary.

> *Example —*
>
> *x > y <= c is equivalent to x > y and y <= c*

**Implementation —**

```
#Chaining Comparison operators with Logical operators

a, b, c, d, e, f, g = 10, 15, 2, 1, 45, 25, 19
e1 = a <= b < c > d < e is not f is g
e2 = a is d < f is c

print(e1)
print(e2)
```

**Output —**

```
False
False
```

. . .

## Python Lists

- One of the most versatile data type in Python, Lists are used to store multiple items ( homogeneous or non-homogeneous) in a single variable.
- Place the items inside the square brackets[]
- Items can be of any data type
- Lists are defined as objects with the data type ‘list’
- Items are ordered, changeable, and allow duplicate values
- list() constructor can be used when creating a new list
- To access values in lists, use the square brackets for slicing along with the index to obtain item value available at a particular index
- Items inside list are indexed, the first item has index [0], the second item has index [1] etc

> *Example —*
>
> *var=[1, 2 , ‘car’, ‘sunday’ , 3.14]*
>
> *empty_list = []*
>
> *items = list((“apple”, “banana”, “grapes”))*

## Implementation —

```
#Create a List

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
print(list_one)
```

## Output —

```
['sunday', 'monday', 'tuesday', 'wednesday', 'thursday']
```

## Implementation —

```
#List Length

print(len(list_one))
```

## Output —

```
5
```

## Implementation —

```
# List with different data types

list_two = ['abc',67,True,3.14,"female"]
print(list_two)
```

## Output —

```
['abc', 67, True, 3.14, 'female']
```

## Implementation —

```
#type() with List
print(type(list_two))
```

## Output —

```
<class 'list'>
```

## Implementation —

```
#list() constructor to make a List

list_cons = list(("hello","World","Beautiful","Day"))
print(list_cons)
```

## Output —

```
['hello', 'World', 'Beautiful', 'Day']
```

## Implementation —

```
# nested list

list_nest= ["hello",[8,4,6],['World']]
print(list_nest)
```

## Output —

```
['hello', [8, 4, 6], ['World']]
```

## Implementation —

```
#slice lists in Python : Use the slicing operator :(colon)

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
print(list_one[1:4])
```

## Output —

```
['monday', 'tuesday', 'wednesday']
```

## Implementation —

```
#Add/Change List Elements : use the assignment operator = to change
#an item

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one[3] = 'friday'
print(list_one)
```

## Output —

```
['sunday', 'monday', 'tuesday', 'friday', 'thursday']
```

## Implementation —

```
# Appending and Extending lists in Python : Use the append() or
#extend() method

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one.append('friday')
print(list_one)

#extend

list_one.extend(['saturday'])
print(list_one)
```

## Output —

```
['sunday', 'monday', 'tuesday', 'wednesday', 'thursday', 'friday']
['sunday', 'monday', 'tuesday', 'wednesday', 'thursday', 'friday',
'saturday']
```

## Implementation —

```
# Concatenating and repeat lists : use + operator to concate two
#lists and use * operator to repeat lists

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
print(list_one + [0,1,2,3,4])

#repeat operation
print(['a','b']*2)
```

## Output —

```
['sunday', 'monday', 'tuesday', 'wednesday', 'thursday', 0, 1, 2, 3,
4]
['a', 'b', 'a', 'b']
```

## Implementation —

```
# Delete/Remove List Elements : delete one or more items or entire
list using the keyword del

del list_one[2]
print(list_one)

#remove method : remove the given item or pop() method to remove an
item at the given index location

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one.remove("tuesday")
print(list_one)

#pop method

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one.pop(2)
print("Pop result:", list_one)
```

## Output —

```
['sunday', 'monday', 'thursday']
['sunday', 'monday', 'wednesday', 'thursday']
Pop result: ['sunday', 'monday', 'wednesday', 'thursday']
```

## Implementation —

```
# index() method : Returns the index of the first matched item
```

```
list_one = ["sunday","monday","tuesday","wednesday","thursday"]
print(list_one.index("tuesday"))
```

## Output —

```
2
```

## Implementation —

```
# sort() method: Sort items in a list in ascending order

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one.sort()
print(list_one)
```

## Output —

```
['monday', 'sunday', 'thursday', 'tuesday', 'wednesday']
```

## Implementation —

```
# reverse() : Reverse the order of items in the list

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one.reverse()
print(list_one)
```

## Output —

```
['thursday', 'wednesday', 'tuesday', 'monday', 'sunday']
```

## Implementation —

```
# copy(): Returns a shallow copy of the list

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_two = list_one.copy()
print(list_two)
```

## Output —

```
['sunday', 'monday', 'tuesday', 'wednesday', 'thursday']
```

## Implementation —

```
#Membership : check if an item exists in a list or not, using the
keyword in

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
print('tuesday' in list_one)
```

## Output —

```
True
```

## Implementation —

```
# insert() method : insert item at a desired location

list_one = ["sunday","monday","tuesday","wednesday","thursday"]
list_one.insert(2,'friday')
print(list_one)
```

## Output —

```
['sunday', 'monday', 'friday', 'tuesday', 'wednesday', 'thursday']
```

. . .

## All the Complete System Design Series Parts —

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## Github —

**Complete-System-Design/README.md at main · Coder-World04/Complete-System-Design**

This repository contains everything you need to become proficient in System Design Topics you should know in System...

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## List Comprehensions

- In python, list comprehensions are used to create a new list based on the values of an existing list in the most elegant and shortest way.
- List comprehension consists of an expression followed by for statement inside square [] brackets.

> *Example :*
>
> *new_list = [x for x in list1 if “a” in x]*

### Implementation —

```
sqr = [2**x for x in range(20)]
print(sqr)
```

### Output —

```
[1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192,
16384, 32768, 65536, 131072, 262144, 524288]
```

. . .

## Python Dictionaries

- In python, dictionary is an unordered collection of data values in which data values are stored in key:value pairs
- Created by placing sequence of elements within curly {} braces, separated by ‘ , ‘
- Values can be of any datatype and can be duplicated, whereas keys are immutable and can’t be repeated
- Can be created by the built-in function dict()
- Dictionaries are defined as objects with the data type ‘dict
- dict() constructor can be used when creating a new dict
- To access values in dict, use the keys
- Key Value format makes dictionary one of the most optimized and efficient data type in Python

> *Example —*

> *var={ ‘first_day’: ‘sunday’ , ‘second_day’: ‘monday’, ‘third_day’: ‘tuesday’}*
>
> *empty_dict = {}*
>
> *class dict(**kwarg)*

## Implementation —

```
#Create a Dictionary

#empty dictionary
dict_emp = {}

#dict with items
dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(dict_one)
```

## Output —

```
{0: 'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
```

## Implementation —

```
#Accessing Elements from Dictionary : Using keys or get() method

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(dict_one[1])

#get() method
print(dict_one.get(2))
```

## Output —

```
monday
tuesday
```

## Implementation —

```
# Length of Dictionary
dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(len(dict_one))
```

## Output —

```
5
```

## Implementation —

```
#Changing and Adding Dictionary elements: add new items or change the
value of existing items using an = operator

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}

#change element
dict_one[2] = 'friday'
print("After changing the element", dict_one)

#Add element
dict_one[5] = 'saturday'
print("After adding the element :", dict_one)
```

## Output —

```
After changing the element {0: 'sunday', 1: 'monday', 2: 'friday', 3:
'wednesday', 4: 'thursday'}
After adding the element : {0: 'sunday', 1: 'monday', 2: 'friday', 3:
'wednesday', 4: 'thursday', 5: 'saturday'}
```

## Implementation —

```
#Removing elements from Dictionary : Use the pop() or popitem()
#method

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(dict_one.pop(2))

#popitem : remove an arbitrary item and return (key,value)

print(dict_one.popitem())
```

## Output —

```
tuesday
(4, 'thursday')
```

## Implementation —

```
# remove all items : using clear method

dict_one.clear()
print(dict_one)
```

## Output —

```
{}
```

## Implementation —

```
#fromkeys(seq[, t]): Returns a new dictionary with keys from seq and
value equal to t

subjects = {}.fromkeys(['Computer Science','Space
Science','Math','English'])
print(subjects)
```

## Output —

```
{'Computer Science': None, 'Space Science': None, 'Math': None,
'English': None}
```

## Implementation —

```
#items() method : displays a list of dictionary's (key, value) tuple
pairs

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
```

```
print(dict_one.items())
```

## Output —

```
dict_items([(0, 'sunday'), (1, 'monday'), (2, 'tuesday'), (3,
'wednesday'), (4, 'thursday')])
```

## Implementation —

```
#keys() method : displays a list of all the keys in the dictionary

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(dict_one.keys())
```

## Output —

```
dict_keys([0, 1, 2, 3, 4])
```

## Implementation —

```
#values() method : displays a list of all the values in the
dictionary
dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(dict_one.values())
```

## Output —

```
dict_values(['sunday', 'monday', 'tuesday', 'wednesday', 'thursday'])
```

## Implementation —

```
#setdefault() method : returns the value of a key. If not there, it
inserts key with a value to the dictionary
dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
element = dict_one.setdefault(3)
print(element)

#If key not present
element = dict_one.setdefault(6)
print("If key is not present:", dict_one.items())
```

## Output —

```
wednesday
If key is not present: dict_items([(0, 'sunday'), (1, 'monday'), (2,
'tuesday'), (3, 'wednesday'), (4, 'thursday'), (6, None)])
```

## Implementation —

```
#Nested Dictionaries
people = {"subject": {0:"Maths",1:"English",3:"Science"},
          "marks": {0:42,1:36,2: 78},
          "Age": {0:12,1:34,2:19}
         }
#print(people["marks"][0])
print(people["Age"][0])
```

## Output —

```
42
```

## Implementation —

```
#sorted(): Return a new sorted list of keys in the dictionary
dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
```

```
'thursday'}
print(sorted(dict_one))
```

## Output —

```
[0, 1, 2, 3, 4]
```

## Implementation —

```
#Iterate through dictionay

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
for i in dict_one.items():
    print(i)
```

## Output —

```
(0, 'sunday')
(1, 'monday')
(2, 'tuesday')
(3, 'wednesday')
(4, 'thursday')
```

## Implementation —

```
# Dictionary Comprehension

cubes = {x: x*x*x for x in range(10)}
print(cubes)
```

## Output —

```
{0: 0, 1: 1, 2: 8, 3: 27, 4: 64, 5: 125, 6: 216, 7: 343, 8: 512, 9:
729}
```

## Implementation —

```
# update() method : updates the dictionary with the elements from
# another dictionary object or from any other key/value pairs

dict1 ={0:"zero",4:"four",5:"five"}
dict2={2:"two"}
# updates the value of key 2
dict1.update(dict2)
print(dict1)
```

## Output —

```
{0: 'zero', 4: 'four', 5: 'five', 2: 'two'}
```

### Implementation —

```
# Membership Test : check if a key is in a dictionary or not using
#the keyword in

dict_one = {0:'sunday', 1: 'monday', 2: 'tuesday', 3: 'wednesday', 4:
'thursday'}
print(0 in dict_one.keys())
```

### Output —

```
True
```

. . .

## Python Tuples

- In python, a tuple is a collection of objects which is ordered and immutable
- Created by placing sequence of elements within round () braces, separated by ‘ , ‘
- Values can be of any datatype
- Concatenation of tuples can be done by the use of ‘+’ operator
- Tuples are just like lists except that the tuples are immutable i.e cannot be changed

> *Example —*
>
> *var= (4, ‘Hello’, 5, ‘World’)*
>
> *empty_tuple = ()*

**Implementation —**

```
# Tuple with items

tup= (10,"Hello",3.14,"a")
print(tup)
```

```
print(type(tup))
```

## Output —

```
(10, 'Hello', 3.14, 'a')
<class 'tuple'>
```

## Implementation —

```
# Negative Indexing : index of -1 refers to the last item, -2 to the
#second last item and so on

tup = (10,"Hello",3.14,"a")
print(tup[-2])

#Reverse the tuple
print(tup[::-1])
```

## Output —

```
3.14
('a', 3.14, 'Hello', 10)
```

## Implementation —

```
#concatenation and repeat in Tuples

#concatenation using + operator
tup = (10,"Hello",3.14,"a")
print(tup + (50,60))

#repeat using * operator
print(tup * 2)
```

## Output —

```
(10, 'Hello', 3.14, 'a', 50, 60)
(10, 'Hello', 3.14, 'a', 10, 'Hello', 3.14, 'a')
```

## Implementation —

```
#membership : check if an item exists in a tuple or not, using the
keyword in

tup = (10,"Hello",3.14,"a")
print(10 in tup)
print("World" in tup)
```

## Output —

```
True
False
```

## Implementation —

```
#Iterate through Tuple : use for loop to iterate through each item
#in a tuple

tup = (10,"Hello",3.14,"a")
for i in tup:
    print(i)
```

## Output —

```
10
Hello
3.14
a
```

## Implementation —

```
#Nested Tuple

nest_tup = ((10,"Hello",3.14,"a"), (70,(8,"Mike")))
print(nest_tup)

a,b = nest_tup
print(a)
print(b)
```

## Output —

```
((10, 'Hello', 3.14, 'a'), (70, (8, 'Mike')))
(10, 'Hello', 3.14, 'a')
(70, (8, 'Mike'))
```

## Implementation —

```
#Enumerate : use enumerate function

tup = (10,"Hello",3.14,"a")
for i in enumerate(tup):
    print(i)
```

## Output —

```
(0, 10)
(1, 'Hello')
(2, 3.14)
(3, 'a')
```

. . .

## Python Sets

- In python, a set is a collection of objects which is both unindexed and unordered
- Sets make sure that there are no duplicate elements in the items sequence
- Created by using the built-in set() function with an iterable object by placing the items inside curly {} braces, separated by ‘,’
- Items can be added to the set by using built-in add() function
- Items can be accessed by looping through the set using loops or using ‘in’ keyword
- Items can be removed from the set by using built-in remove()

> *Example —*
>
> *var= set([“Hello”, “People”, “Hello”])*

## Implementation —

```
#Create Set
set_one = {10, 20, 30, 40}
print(set_one)

#Create set from list using set()
set_two = set([10, 20, 30, 40, 30, 20])
print(set_two)
```

## Output —

```
{40, 10, 20, 30}
{40, 10, 20, 30}
```

## Implementation —

```
# Removing elements : Use the methods discard(), pop() and remove()
#set_one is {100, 70, 40, 10, 80, 20, 60, 30}
#discard() method
set_one.discard(100)
print("After discard:",set_one)

#remove() method
set_one.remove(40)
print("After removing element :", set_one)

#pop() method
set_one.pop()
print("After removing element :", set_one)
```

## Output —

```
After discard: {70, 40, 10, 80, 20, 60, 30}
After removing element : {70, 10, 80, 20, 60, 30}
After removing element : {10, 80, 20, 60, 30}
```

## Implementation —

```
#Set operations
X = {10, 20, 30, 40, 50}
Y = {40, 50, 60, 70, 80}
Z = {20, 30, 100, 50, 10}
```

```
#Union : Union of X, Y, Z is a set of all elements from all three
#sets using | operator or union() method
print("Set Union:", X|Y|Z)

#Intersection :Intersection of X, Y, Z is a set of all elements from
#all three sets using & operator or intersection()
print("Set Intersection:", X&Y&Z)

#Difference : Difference of X, Y is a set of all elements from both
#sets using - operator or difference()
print("Set Difference:", X-Y)

# Symmetric Difference : Symmetric Difference of X, Y, Z is a set of
#all elements from all three sets using ^ operator or
#symmetric_difference()
print("Set Symmetric Difference:", X^Y^Z)
```

## Output —

```
Set Union: {100, 70, 40, 10, 80, 50, 20, 60, 30}
Set Intersection: {50}
Set Difference: {10, 20, 30}
Set Symmetric Difference: {80, 50, 100, 70, 60}
```

## Implementation —

```
#enumerate : Returns an enumerate object which contains the index
#and value for all the items of the set as a pair
```

```
set_one = {10, 20, 30, 40, 50, 30}
for i in enumerate(set_one):
    print(i)
```

## Output —

```
(0, 40)
(1, 10)
(2, 50)
(3, 20)
(4, 30)
```

## Implementation —

```
#Frozenset : set which has the characteristics of a set, but its
elements cannot be changed once assigned

X = frozenset([10, 20, 30, 40, 50])
Y = frozenset([40, 50, 60, 70, 80])

print(X.union(Y))
```

## Output —

```
frozenset({70, 40, 10, 80, 50, 20, 60, 30})
```

. . .

## Loops in Python

**If, Elif and Else Statements —**

- In python, If, Elif and Else statements are used to facilitate decision making i.e when we want to execute a code only if a certain condition is satisfied.
- In the example below, the program evaluates the test expression and will execute statement(s) only if the test expression is True. If the test expression1 is False, then it checks elif test expression 2 and if that's also False, then at last it goes to else and executed else statement.

> *if test_expression1:*
>
> *statement(s)*
>
> *elif test_expression2:*

```
statements(s)

else :

statement
```

- Python interprets non-zero values as True. None and 0 are interpreted as False.
- The if block can have only one else block but there can be multiple elif blocks.

**While loops —**

- In python, while loop is used to traverse/iterate over a block of code as long as the test condition is true
- In the example below, test_expression is checked first. The body of the loop is entered only if the test_expression evaluates to True. The loop continues till the test condition becomes False.

```
while test_expression:
```

> *Do this*
>
> *Example :*
>
> *while i <= 10:*
>
> *sum = sum — i*
>
> *i = i+1*

**For Loops and Range function —**

- In python, for loop is used to traverse/iterate over a sequence (list, tuple, string etc)
- In the example below, i is the variable that takes the value of the item inside the sequence on each iteration. Loop continues until we reach the last item in the sequence

> *for i in sequence:*

Do this

- Range ( range()) is used to generate sequence of numbers where the syntax of range is

> *range(start, stop, step_size)*
>
> *Example :*
>
> *for i in range(len(list1)):*
>
> *print(“The element is “, list1[i])*

**Implementation —**

```
price = 200

if price > 120:
    print("Price is greater than 120")
elif price == 120:
    print("Price is 120")
elif price < 120:
    print("Price is less than 120")
else:
    print("Exit")
```

## Output —

```
Price is greater than 120
```

## Implementation —

```
# If, Elif and Else one liner
x = 200

var = {x < 190: "Condition one satisfied",
       x != 200: "Condition two satisfied"}.get(True, "Condition
third satisfied")

print(var)
```

## Output —

```
Condition third satisfied
```

## Implementation —

```
#while with else statement
i = 1
while i < 6:
  print(i)
  i += 1
else:
  print("i is no longer less than 6")
```

## Output —

```
1
2
3
4
5
i is no longer less than 6
```

## Implementation —

```
# for loop with range function

days =['sunday','monday','tuesday']
for i in range(len(days)):
    print("Today is", days[i])
```

**Output —**

```
Today is sunday
Today is monday
Today is tuesday
```

. . .

## Break and Continue Statement

- In python, we can use break statement when we want to terminate the current loop without checking test condition
- Once terminated using the break statement, the control of the program goes to the statement immediately after the body of the loop

> *Example :*
>
> *for value in list1:*
>
> *if value == “t”:*

> *break*
>
> *print(value)*

- In python, we can use continue statement when we want to skip the rest of the code for the current loop iteration

> *Example :*
>
> *for value in list1:*
>
> *if value == “t”:*
>
> *continue*
>
> *print(value)*

**Implementation —**

```
#break statement
count = 0
while True:
```

```
    print(count)
    count += 1
    if count >= 10:
        break

print('exit')
```

## Output —

```
0
1
2
3
4
5
6
7
8
9
exit
```

## Implementation —

```
#Continue statement
for x in range(15):
    if x % 2 == 0:
```

```
        continue
    print(x)
```

**Output —**

```
1
3
5
7
9
11
13
```

. . .

## Input Output in Python

- In python, there are two inbuilt functions to read the input from the user

> *raw_input ( ) function : reads one line from user input and returns it as a string*

> *input ( ) function : Similar to raw_input, except it evaluates the user expression*

- For multiple user inputs, we can use —

> *split() method*

List comprehension

- In python, output is using the print() function
- String literals in print() statement are used to format the output

\n : Add blank new line

“” : To print an empty line.

- end keyword is used to print specific content at the end of the execution of the print() function

> *Example —*

> *num= input(“Enter the number: “)*
>
> *str = raw_input(“Enter your input: “)*
>
> *print(“Python” , end = ‘**’)*

### Implementation —

```
# input
num = int(input('Enter a number: '))
```

### Output —

```
Enter a number: 50
```

### Implementation —

```
num = 5
print('The value of num is', num)
```

```
print("The value is %d" %num)
```

**Output —**

```
The value of num is 5
The value is 5
```

. . .

## Python Object Oriented Programming

- Python is a multi-paradigm programming language and supports Object Oriented programming. In Python everything is a object. An object has two characteristics : Attributes and Behavior
- Principles of object-oriented programming system are —

> *Class*
>
> *Object*
>
> *Method*

> *Inheritance*
>
> *Polymorphism*
>
> *Encapsulation*

- Class and constructor — It's a blueprint for the object. In python we use the class keyword to define class. Class constructor is used to assign the values to the data members of the class when an object of the class is created.
- Object — It's an instantiation of a class.
- Method — It's a function that is associated with an object
- Inheritance — Specifies that the child object acquires all the properties and behaviors of the parent object.
- Polymorphism — Refers to functions having the same names but carrying different functionalities.
- Encapsulation — To prevents data from direct modification, we can restrict access to methods and variables in python

. . .

## Attributes and Class in Python

- In Python, a class is blueprint of the object
- To define a class, we use the keyword “class” following the class name and semicolon —

> *class class_name:*
>
> *Body of the class*

- Object — It’s an instantiation of a class. The object instance contains real data or value

> *To create an instance :*
>
> *obj1 = class_name()*

- Class constructor — to assign the values to the data members of the class when an object of the class is created, we use constructor. The __init__() method is called constructor method

> *class class_name:*
>
> *def __init__(self, parameters):*
>
> *self.param1 = parameters*

- Instance attributes refer to the attributes inside the constructor method. Class attributes refer to the attributes outside the constructor method
- Method — It's a function that is associated with an object, used to describe the behavior of the objects

> *def method_name(self)*

**Implementation —**

```
#Class implementation
class cat:

def __init__(self, cat_name, cat_breed):
        self.name = cat_name
        self.age = cat_breed
```

## Implementation —

```
#Class attribute and Instance Attribute

class emp:
    x = 10      #class attribute
    def __init__(self):
        self.name = 'Steve'
        self.salary = 10000

    def display(self):
        print(self.name)
        print(self.salary)

obj_emp = emp()
print("Dictionary conversion:", vars(obj_emp))
```

## Output —

```
Dictionary conversion: {'name': 'Steve', 'salary': 10000}
```

. . .

# Functions in Python

In python, functions are a convenient way to divide your code into useful blocks, allowing us to order our code, make it more readable, reuse it, define interfaces and save a lot of time

- A function can be called multiple times to provide modularity and reusability to the python program
- We can easily track a large python program easily when it is divided into multiple functions
- There are mainly two types of functions —

User-define functions — Defined by the user to perform the specific task

Built-in functions — Functions which are pre-defined

- You can define the function using the def keyword
- Arguments is the information that's passed into the function
- The return statement is used to return the value. A function can have only one return
- Once created, we can call the function using the function name followed by the parentheses

> Example :
>
> def my_function(parameters):
>
> print(“My first Function”)
>
> return expression
>
> #calling the function
>
> my_function()

. . .

## Private Variables in Python

In python, a variable is a named location used to store or hold the value/data in the memory.

- When we create a variable inside a function, it is local by default

- We create Private Variables by using underscore _ before a named prefix
- This is quite helpful for letting subclasses override methods without breaking intraclass method calls

There are three ways private variables can be implemented :

> _Single Leading Underscores
>
> __Double Leading Underscores
>
> __Double leading and Double trailing underscores__

- __name__ is a special built-in variable which points to the name of the current module

> Example :
>
> _program
>
> __var

> __len__

## Implementation —

```
# Private Variable
#Single underscore (_)
class test:
    def __init__(self,num):
        self._num= num#_privatemethod private method
    def _numfunc(self):
        print("Hello")obj=test(156)
#_ attributes can be accessed as normal variables
obj._numfunc()
```

## Implementation —

```
# Private Variable
#Double Underscore (__)class test:
    def __init__(self,num):
        self.__num= num
    def Print(self):
        print("__num = {}".format(self.__num))obj=test(156)
```

## Implementation —

```
# Private Variable
#Trailing underscore(n_)class Test:
    def __init__(self,c):
        #To avoid clash with python keyword
        self.num_= num
```

. . .

## Global and Non Local Variables in Python

When we create a variable inside a function, it is local by default. When we define a variable outside of a function, it is global by default

- Nonlocal variables are used in nested functions whose local scope is not defined
- Global variables are those variables which are defined and declared outside a function and we can use them inside the function or we can use *global* keyword to make a variable global inside a function

> Example :
>
> **global** variable_name

## Implementation —

```
#Local Variabledef test():
    l = "local_variable"
    return lvar=test()
print(var)
```

## Output —

```
local_variable
```

## Implementation —

```
#Global Variablevar = 10def test():
    var = 20
    print("local variable x:", var)val=test()
print("global variable x:", var)
```

## Output —

```
local variable x: 20
global variable x: 10
```

### Implementation —

```
#Non Local Variabledef test():
    var = "local_variable"def test_one():
        nonlocal var
        var = "non_local_variable"
        print("Non Local value:", var)
    test_one()
    print("Outer value:", var)
test()
```

. . .

## First Class functions in Python

In python, a function in Python is First Class Function, if it supports all of the properties of a First Class object such as —

> It is an instance of an Object type

> Pass First Class Function as argument of some other functions
>
> Return Functions from other function
>
> Store Functions in lists, sets or some other data structures
>
> Functions can be stored as variable

- In Python, a function can be assigned as variable which is used without function parentheses
- Functions are objects you can pass them as arguments to other functions
- First-class functions allow you to pass around behavior and abstract
- Closure functions — Functions are be nested and they can carry forward parent function's state with them

> Example :
>
> def func1(func):

> var = func(‘Hello World’)
>
> print(var)

### Implementation —

```
#Implementation 2
def outer(a):   # Outer functiondef inner(b):   # Inner function
        return b+10
    return inner(a)a = 10
var = outer(a)
print(var)
```

### Output —

```
20
```

. . .

## __import__() function

In python, the inbuilt __import__() function helps to import modules in runtime

**Syntax —**

*__import__(name, globals, locals, fromlist, level)*

- name : Name of the module to import.
- globals : Dictionary of global names used to determine how to interpret the name in a package context.
- locals : Dictionary of local names names used to determine how to interpret the name in a package context.
- fromlist : The fromlist gives the names of objects or submodules that should be imported from the module given by name.
- level : level specifies whether to use absolute or relative imports.
- To import a module by name, use importlib.import_module()

> Example :
>
> _var = __import__('spam.ham', globals(), locals(), [], -1)

### Implementation —

```
#implementation
#fabs() method is defined in the math module which returns the
#absolute value of a number
math_score = __import__('math', globals(), locals(), [], 0)
print(math_score.fabs(-17.4))
```

### Output —

```
17.4
```

. . .

## Tuple Unpacking with Python Functions

In python, tuples are immutable data types. Python offers a very powerful tuple assignment tool that maps right hand side arguments into left hand side arguments i.e mapping is known as unpacking of a tuple of values into a normal variable.

- During the unpacking of tuple, the total number of variables on the left-hand side should be equivalent to the total number of values in given tuple
- It uses a special syntax to pass optional arguments (*args) for tuple unpacking

> Example :
>
> days = (“sunday”, “monday”, “tuesday”,”wednesday”,”thursday”)
>
> (day1, day2, *day) = days

**Implementation —**

```
def result(a, b):
    return a + b
# function with normal variables
print (result(100, 200))

# A tuple is created
c = (100, 300)

# Tuple is passed
```

```
# function unpacked them

print (result(*c))
```

**Output —**

```
300
400
```

. . .

## Static Variables and Methods in Python

In Python, Static variables are the variables that belong to the class and not to objects.

- Static variables are shared amongst objects of the class
- Python allows providing same variable name for a class/static variable and an instance variable

Static Method -

- In Python, Static methods are the methods which are bound to the class rather than an object of the class
- Static Methods are called using the class name and not the objects of the class
- Static methods are bound to the class
- There are two ways of defining a static method:

*@staticmethod*

*staticmethod()*

> Example :
>
> class class_name:
>
> @staticmethod
>
> def function_name(parameters):

> print(var)

## Implementation —

```
class test:
    static_variable = 25 # Access through
classprint(test.static_variable) # prints 5# Access through an
instance
ins = test()
print(ins.static_variable) # still 5# Change within an instance
ins.static_variable = 14
print(ins.static_variable)
print(test.static_variable)
```

## Output —

```
25
25
14
25
```

## Implementation —

```
# Static Method : Use @staticmethod
class sample_shape:

    @staticmethod
    def msgg(msg):
        print(msg)
        print("Triangles")

sample_shape.msgg("Welcome to sample shape class")
```

**Output —**

```
Welcome to sample shape class
Triangles
```

. . .

## Lambda Functions in Python

In python, Lambda is used to create small anonymous functions using “lambda” keyword and can be used wherever function objects are needed.It can any number of arguments but only one expression

> *Syntax :*

> *lambda argument(s): expression*

- It can be used inside another function
- In python normal functions are defined using the def keyword, anonymous functions are defined using the lambda keyword
- Whenever we require a nameless function for a short period of time, we use lambda functions

> *Example :*
>
> *var = lambda x: x * 5*

**Implementation —**

```
#A lambda function that adds 10 to the number passed in as an
#argument, and print the result
x = lambda a, b, c : a * b + c
print(x(5, 6, 8))
```

**Output —**

```
38
```

. . .

## Map and Filter Functions in Python

In python, Map allows you to process and transform the items of the iterables or collections without using a for loop.

- In Python, the map() function applies the given function to each item of a given iterable construct (i.e lists, tuples etc) and returns a map object

> *Syntax —*
>
> *map(function, iterable)*

- In python, filter() function returns an iterator when the items are filtered through a function to test if the item is true or not

> *Syntax —*
>
> *filter(function, iterable)*

where function is the to be run for each item in the iterable

iterable is the iterable to be filtered

> *Example :*
>
> *result = map(lambda x: x+x, numbers)*
>
> *var = filter(function_name, sequence)*

**Implementation —**

```
#map
numbers = [1,2,3,4,5]
strings = ['s', 't', 'x', 'y', 'z']

mapped_list = list(map(lambda x, y: (x, y), strings, numbers))
```

```
print(mapped_list)
```

## Output —

```
[('s', 1), ('t', 2), ('x', 3), ('y', 4), ('z', 5)]
```

## Implementation —

```
#map implementation
days = ['Sunday', 'Monday', 'Tuesday', 'Wednesday']

mod_days = list(map(str.swapcase, days))

print(mod_days)
```

## Output —

```
['sUNDAY', 'mONDAY', 'tUESDAY', 'wEDNESDAY']
```

## Implementation —

```
#Filter function

marks = [95, 40, 68, 95, 67, 61, 88, 23, 38, 92]

def stud(score):
    return score < 33

fail_list = list(filter(stud, marks))
print(fail_list)
```

## Output —

```
[23]
```

. . .

## Complete Code —

```
# Data types, strings, operators, and Chaining Comparison Operators with Logical
num1 = 10
```

```
num2 = 20
if num1 > num2 and num1 % 2 == 0:
    print("num1 is greater than num2 and is even")
else:
    print("Condition not satisfied")

# Python Lists and Dictionaries, Sets, Tuples
my_list = [1, 2, 3, 4, 5]
my_dict = {'name': 'John', 'age': 30}
my_set = {1, 2, 3, 4, 5}
my_tuple = (1, 2, 3, 4, 5)

# Loops, Break and Continue Statements
for num in my_list:
    if num == 3:
        break
    print(num)

# Object-Oriented Programming - Class and attributes
class Car:
    def __init__(self, make, model):
        self.make = make
        self.model = model

    def start_engine(self):
        print("Engine started.")

my_car = Car("Toyota", "Corolla")
print(my_car.make)
print(my_car.model)
my_car.start_engine()

# Python strings in detail
my_string = "Hello, World!"
print(len(my_string))
print(my_string.upper())
```

```
print(my_string.lower())
print(my_string.split(","))

# Python F-String
name = "John"
age = 30
print(f"My name is {name} and I am {age} years old.")

# Map, Classes, Functions and Arguments
def square(num):
    return num ** 2

numbers = [1, 2, 3, 4, 5]
squared_numbers = list(map(square, numbers))
print(squared_numbers)

# First Class functions, Private Variables, Global and Non Local Variables, __im
def outer_func():
    x = 10
    def inner_func():
        nonlocal x
        x += 5
        print(x)
    inner_func()

outer_func()

# Magic Functions, Tuple Unpacking
my_tuple = (1, 2, 3)
a, b, c = my_tuple
print(a, b, c)

# Static Variables and Methods in Python
class MathUtils:
    PI = 3.14159
```

```
    @staticmethod
    def square(num):
        return num ** 2

print(MathUtils.PI)
print(MathUtils.square(5))

# Lambda Functions, Magic methods
add = lambda x, y: x + y
print(add(2, 3))

# Inheritance and Polymorphism, Errors and Exception Handling
class Animal:
    def sound(self):
        raise NotImplementedError("Subclasses must implement sound() method.")

class Cat(Animal):
    def sound(self):
        return "Meow"

my_cat = Cat()
print(my_cat.sound())

# User-defined functions, Python garbage collection, debugger in Python
def greet(name):
    print(f"Hello, {name}!")

greet("John")

# Iterators, Generators, and Decorators, Memoization using Decorators
def fibonacci():
    a, b = 0, 1
    while True:
        yield a
        a, b = b, a + b
```

```
fib_gen = fibonacci()
for _ in range(10):
    print(next(fib_gen))

# Ordered and Defaultdict, Coroutine
from collections import OrderedDict, defaultdict

ordered_dict = OrderedDict()
ordered_dict['a'] = 1
ordered_dict['b'] = 2
print(ordered_dict)

default_dict = defaultdict(int)
default_dict['a'] = 1
default_dict['b'] = 2
print(default_dict['c'])  # Output: 0

# Regular expression, Magic methods, Closures
import re

pattern = r'\b[A-Za-z]+\b'
text = "Hello, World! This is a sample text."
matches = re.findall(pattern, text)
print(matches)

# ChainMap
from collections import ChainMap

dict1 = {'a': 1, 'b': 2}
dict2 = {'c': 3, 'd': 4}
chain_map = ChainMap(dict1, dict2)
print(chain_map['a'])  # Output: 1
print(chain_map['c'])  # Output: 3

# Python Itertools
import itertools
```

```
numbers = [1, 2, 3]
letters = ['a', 'b', 'c']
combined = itertools.product(numbers, letters)
for item in combined:
    print(item)

# Advanced python constructs
result = [x if x % 2 == 0 else None for x in numbers]
print(result)

# Comprehensions, Named Tuple, Type hinting in Python
from typing import List, Tuple
from collections import namedtuple

Point = namedtuple('Point', ['x', 'y'])
p = Point(1, 2)
print(p.x)
print(p.y)

def multiply(numbers: List[int]) -> Tuple[int, int]:
    product = 1
    for num in numbers:
        product *= num
    return product, len(numbers)

print(multiply([1, 2, 3, 4, 5]))

# 13. User-defined functions, Python garbage collection, debugger in Python
def greet(name):
    print(f"Hello, {name}!")

greet("John")

# Python garbage collection - no specific code implementation required here
# Debugger in Python - can be done using the built-in pdb module or an IDE's deb
```

```
# 14. Iterators, Generators, and Decorators, Memoization using Decorators
def fibonacci():
    a, b = 0, 1
    while True:
        yield a
        a, b = b, a + b

fib_gen = fibonacci()
for _ in range(10):
    print(next(fib_gen))

# Decorators
def my_decorator(func):
    def wrapper():
        print("Before function call")
        func()
        print("After function call")
    return wrapper

@my_decorator
def my_function():
    print("Inside decorated function")

my_function()

# Memoization using Decorators
def memoize(func):
    memo = {}
    def wrapper(n):
        if n not in memo:
            memo[n] = func(n)
        return memo[n]
    return wrapper

@memoize
```

```
def fibonacci(n):
    if n <= 1:
        return n
    return fibonacci(n-1) + fibonacci(n-2)

print(fibonacci(10))

# 15. Ordered and Defaultdict, Coroutine
from collections import OrderedDict, defaultdict

ordered_dict = OrderedDict()
ordered_dict['a'] = 1
ordered_dict['b'] = 2
print(ordered_dict)

default_dict = defaultdict(int)
default_dict['a'] = 1
default_dict['b'] = 2
print(default_dict['c'])  # Output: 0

# Coroutine
def coroutine():
    while True:
        x = yield
        print(f"Received: {x}")

coro = coroutine()
next(coro)
coro.send(10)

# 16. Regular expression, Magic methods, Closures
import re

pattern = r'\b[A-Za-z]+\b'
text = "Hello, World! This is a sample text."
matches = re.findall(pattern, text)
```

```
print(matches)

# Closures
def outer_func(x):
    def inner_func(y):
        return x + y
    return inner_func

closure = outer_func(10)
print(closure(5))

# 17. ChainMap
from collections import ChainMap

dict1 = {'a': 1, 'b': 2}
dict2 = {'c': 3, 'd': 4}
chain_map = ChainMap(dict1, dict2)
print(chain_map['a'])  # Output: 1
print(chain_map['c'])  # Output: 3

# 18. Python Itertools
import itertools

numbers = [1, 2, 3]
letters = ['a', 'b', 'c']
combined = itertools.product(numbers, letters)
for item in combined:
    print(item)

# 19. Advanced python constructs
result = [x if x % 2 == 0 else None for x in numbers]
print(result)

# 20. Comprehensions, Named Tuple, Type hinting in Python
from typing import List, Tuple
from collections import namedtuple
```

```
Point = namedtuple('Point', ['x', 'y'])
p = Point(1, 2)
print(p.x)
print(p.y)

def multiply(numbers: List[int]) -> Tuple[int, int]:
    product = 1
    for num in numbers:
        product *= num
    return product, len(numbers)
```

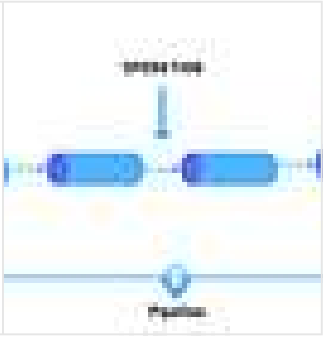
That's it for now!

*Day 3 :*

**Day 3 of 30 days of Data Engineering Series**

With examples and projects ...

medium.com



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## Complete System Design Series Parts —

> 1. System design basics
>
> 2. Horizontal and vertical scaling
>
> 3. Load balancing and Message queues
>
> 4. High level design and low level design, Consistent Hashing, Monolithic and Microservices architecture
>
> 5. Caching, Indexing, Proxies
>
> 6. Networking, How Browsers work, Content Network Delivery ( CDN)
>
> 7. Database Sharding, CAP Theorem, Database schema Design
>
> 8. Concurrency, API, Components + OOP + Abstraction
>
> 9. Estimation and Planning, Performance

10. Map Reduce, Patterns and Microservices

11. SQL vs NoSQL and Cloud

12. Most Popular System Design Questions

## Github —

**Complete-System-Design/README.md at main · Coder-World04/Complete-System-Design**

This repository contains everything you need to become proficient in System Design Topics you should know in System...

github.com

**Most Popular System Design Questions — Mega Compilation**

Just for your reference...

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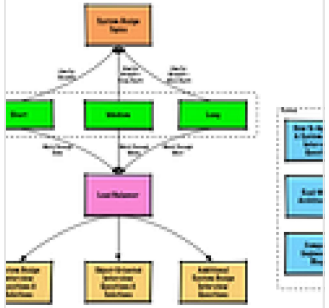

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## For Python Projects —

**Complete Python And Projects — Mega Compilation**

Everything that you need to know in Python with Projects...

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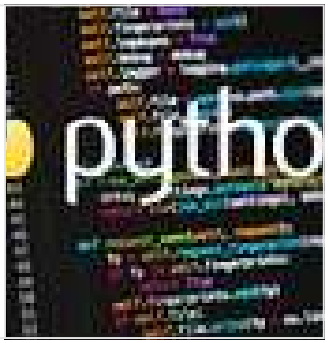


**Analyzing Video using Python, OpenCV and NumPy**

With Code Implementation...

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## For other projects, tune to —

### Build Machine Learning Pipelines( With Code)

**Build Machine Learning Pipelines( With Code) — Part 1**

Complete implementation...

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## Recurrent Neural Network with Keras

**Recurrent Neural Network with Keras**

Project Implementation and cheatsheet...

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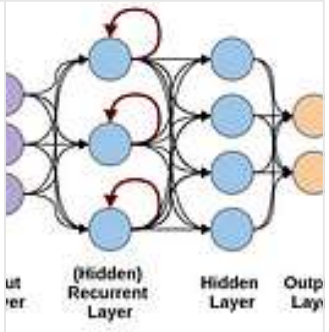


## Clustering Geolocation Data in Python using DBSCAN and K-Means

**Clustering Geolocation Data in Python using DBSCAN and K-Means**

Project Implementation...

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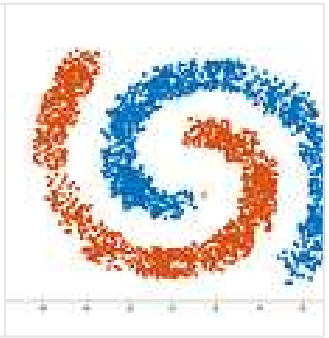

## Facial Expression Recognition using Keras

**Facial Expression Recognition using Keras**

Project Implementation...

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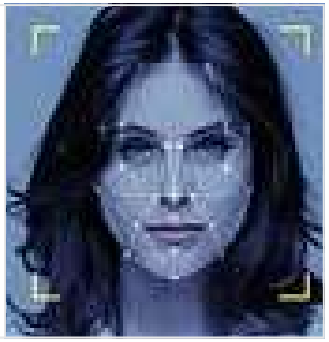

## Hyperparameter Tuning with Keras Tuner

**Hyperparameter Tuning with Keras Tuner**

Project Implementation....

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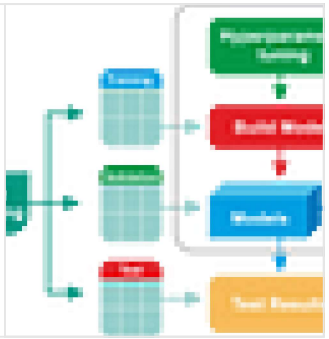

## Custom Layers in Keras

**Custom Layers in Keras**

Code implementation ...

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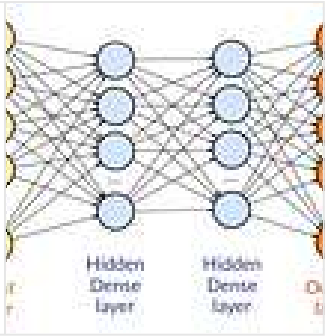

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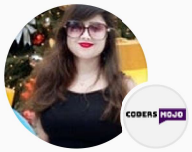

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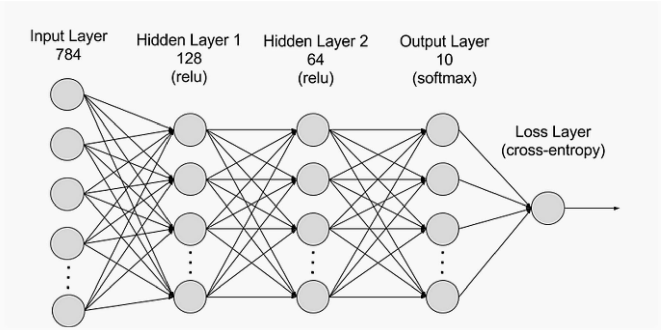


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Vertical series ( One post that will house all the projects as we build/implement them)

5 min read · Dec 30, 2022

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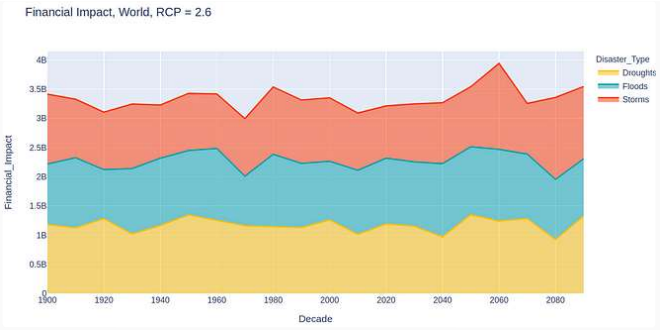


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8 min read · Nov 21, 2022

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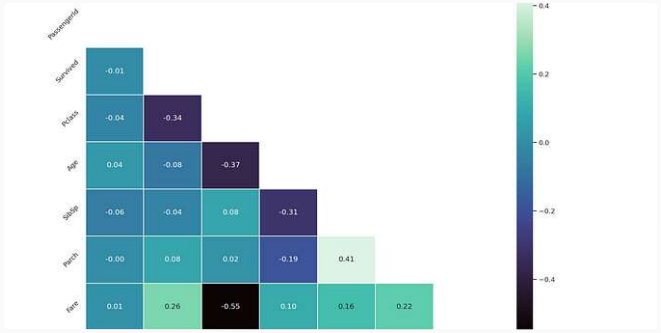

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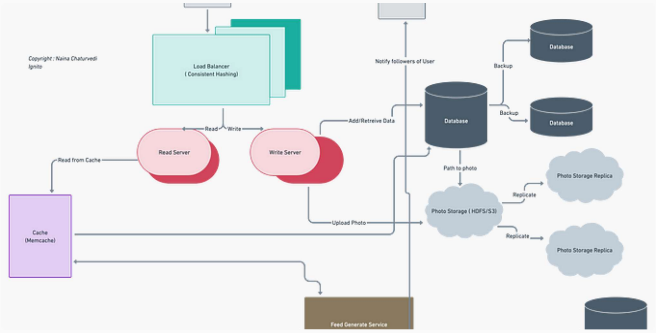

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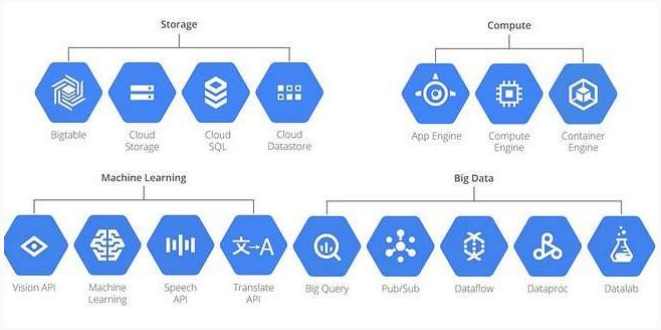


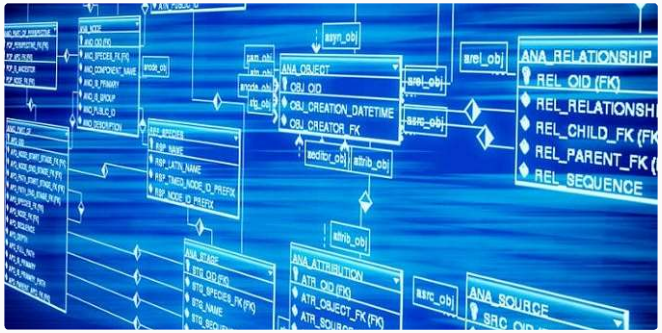

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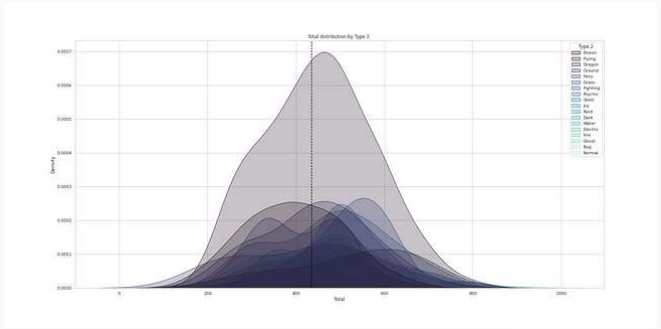

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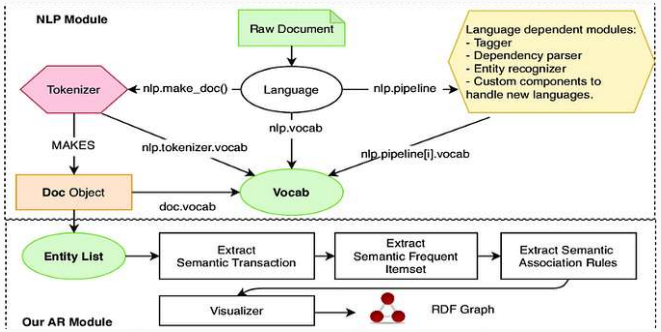


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