Class, Object & Method

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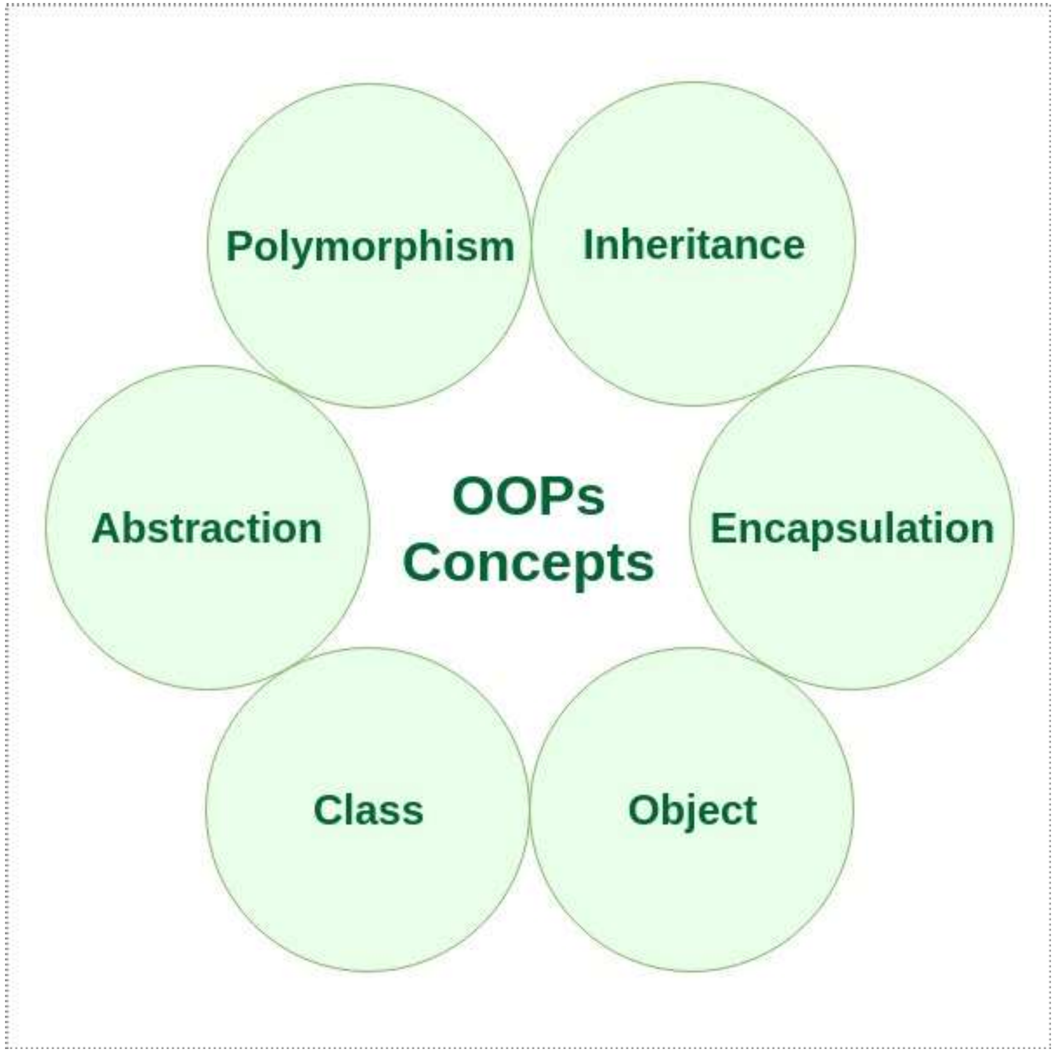
Object Oriented Programing (OOP)

Object-oriented programming (OOP) is a computer programming model that organizes software design around data, or objects, rather than functions and logic. An object can be defined as a data field that has unique attributes and behavior.



Classes

Classes are user-defined data types that act as the blueprint for individual objects, attributes and methods

An example of a class is the class Student. Students usually have a roll and gpa; these are attributes.

```
class student :
   roll= ""
   gpa = ""
```

Objects

An Object is an instance of a Class. A class is like a blueprint while an instance is a copy of the class with actual values.

```
kamal = student()
kamal.roll = 10
kamal.gpa = 3.75
print(f"Roll ={kamal.roll}, GPA={kamal.gpa}")
```

Introducing Method

A method is a function that “belongs to” an object.

```
class student:
    def set_value(self, a, b):
        self.roll = a
        self.gpa = b

    def display(self):
        print(f"Roll ={self.roll}, GPA={self.gpa}")

kamal = student()

kamal.set_value(10, 3.75)
kamal.display()
```

Default Constructors

Constructors are generally used for instantiating an object

```
class student:
    def __init__(self):
        self.section="A"

    def display(self):
        print(f"section = {self.section}")

kamal = student()
kamal.display()
```

Parameterized Constructors

Constructors are generally used for instantiating an object

```
class student:
    def __init__(self, roll, gpa):
        self.roll=roll
        self.gpa=gpa

    def display(self):
        print(f"Roll ={self.roll}, GPA={self.gpa}")

kamal = student(10, 3.75)
kamal.display()
```

Pass Statement

Create a placeholder for future code:

```
class Person:
    pass
```

```
def myfunction():
  pass
```

Intro to Inheritance

Inheritance allows us to define a class that inherits all the methods and properties from another class.

Parent class is the class being inherited from, also called base class.
Child class is the class that inherits from another class, also called derived class.

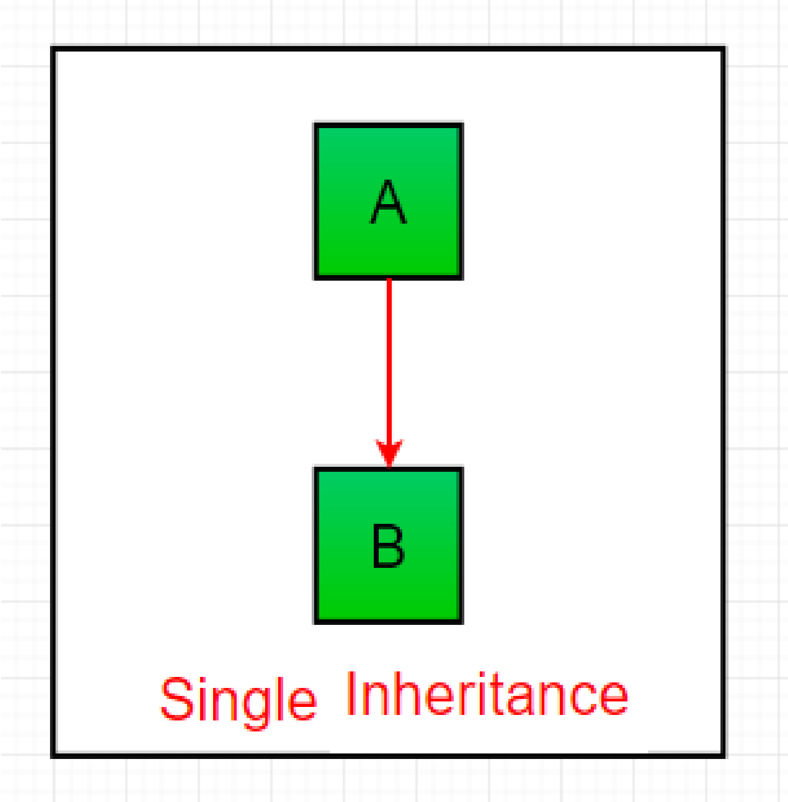
Parent class

```
class Person:
  def __init__(self, fname, lname):
    self.firstname = fname
    self.lastname = lname

  def printname(self):
    print(self.firstname, self.lastname)
```

Child class

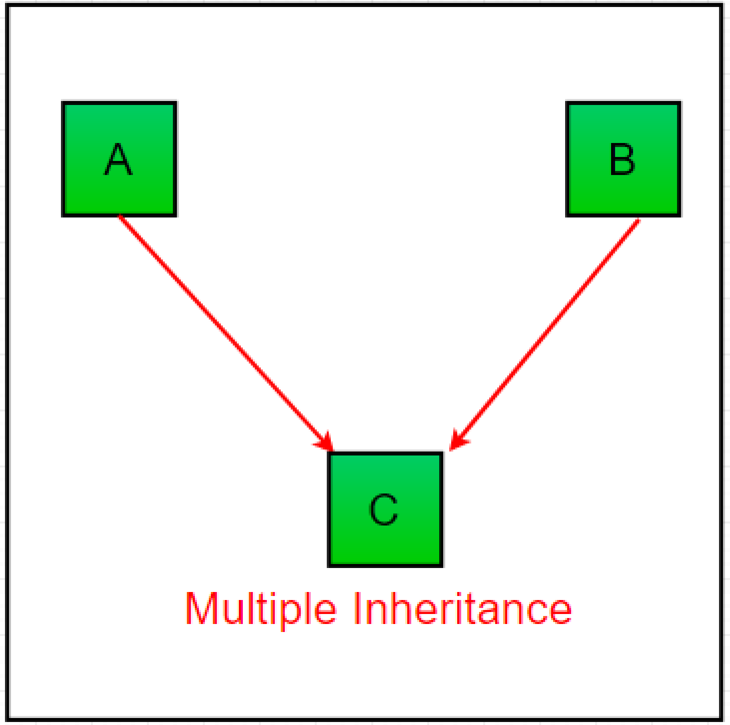
```
class Student(Person):
  pass
#--------------------------------
y = Student("Abul", "Hossain")
y.printname()
```

Single Inheritance



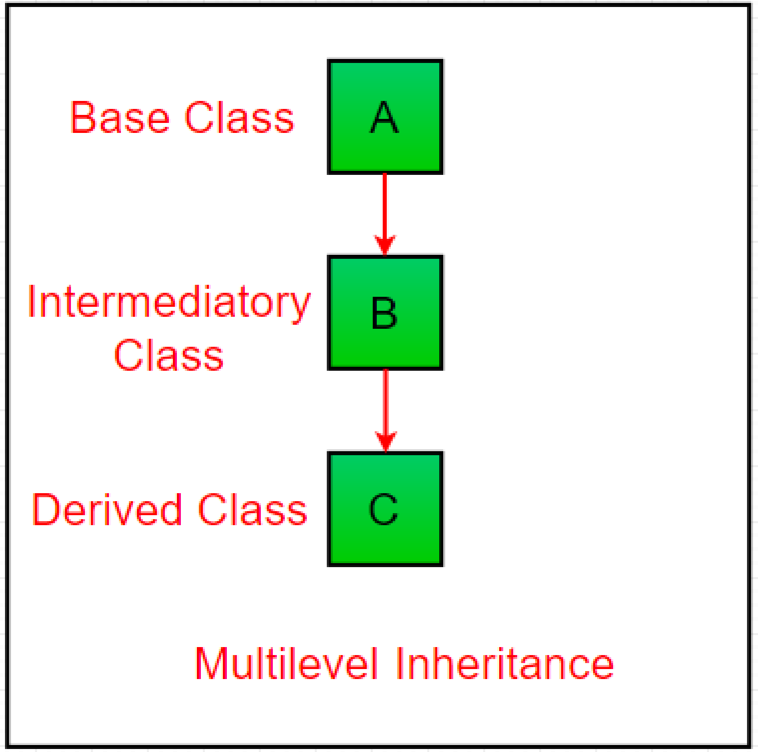

```
class A:
    def display1(self):
        print("This is class A")

class B(A):
    def display2(self):
        print("This is class B")

objB = B()
objB.display1()
objB.display2()
```

Multiple Inheritance



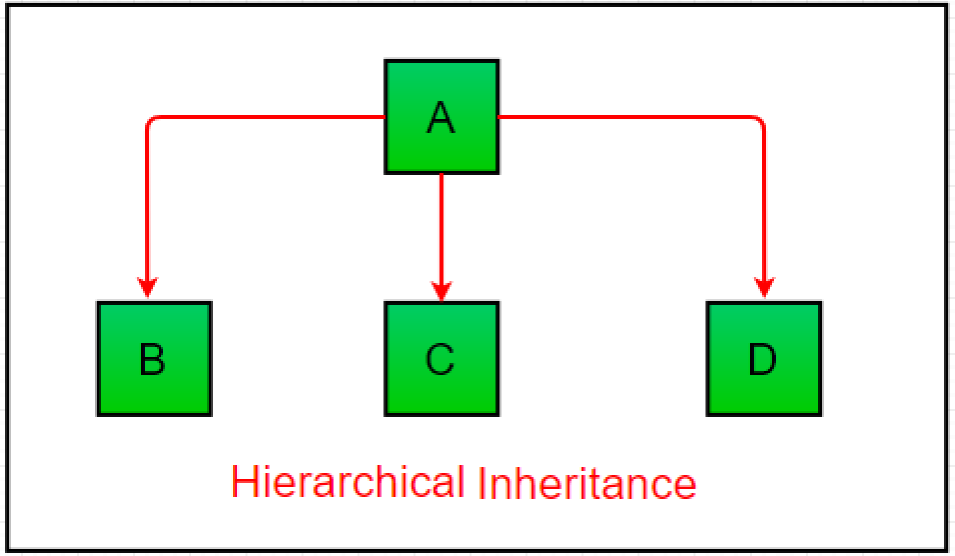

```
class A:
    def display1(self):
        print("This is class A")

class B:
    def display2(self):
        print("This is class B")

class C(A, B):
    def display3(self):
        print("This is class C")

objC = C()
objC.display1()
objC.display2()
objC.display3()
```

Multilevel Inheritance




```
class A:
    def display1(self):
        print("This is class A")

class B(A):
    def display2(self):
        print("This is class B")

class C(B):
    def display3(self):
        print("This is class C")

objC = C()

objC.display1()
objC.display2()
objC.display3()
```

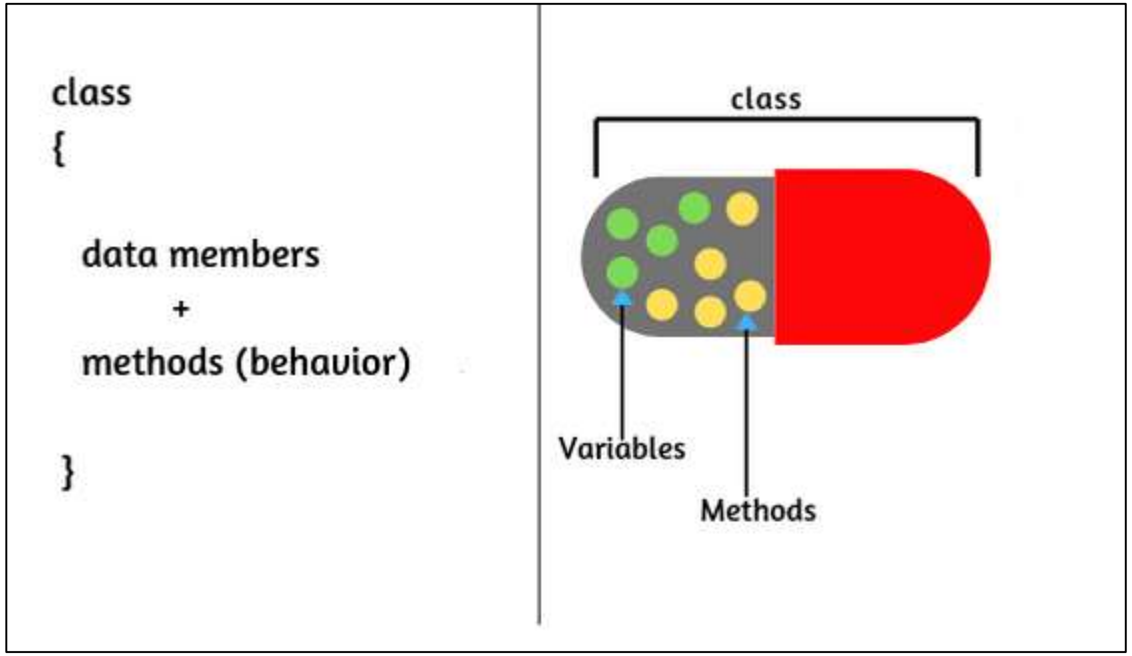
Hierarchical Inheritance




```python
class Parent:  # Base class
    def func1(self):
        print("This function is in parent class.")

class Child1(Parent): # Derived class1
    def func2(self):
        print("This function is in child 1.")

class Child2(Parent): # Derivied class2
    def func3(self):
        print("This function is in child 2.")

# Driver's code
object1 = Child1()
object2 = Child2()
object1.func1()
object1.func2()
object2.func1()
object2.func3()
```

Encapsulation

Encapsulation in Python describes the concept of bundling data and methods within a single unit. So, for example, when you create a class, it means you are implementing encapsulation.



Polymorphism

Polymorphism is taken from the Greek words Poly (many) and morphism (forms). It means that the same function name can be used for different types.

```
#Built in Polymorphic function
print(len("Aksadur Rahman"))
print(len([10, 20, 30]))

#User define polymorphic function
def add(x, y, z=0):
    return x+y+z

print(add(30, 20))
print(add(10, 30, 20))
```

Data Analysis using NumPy

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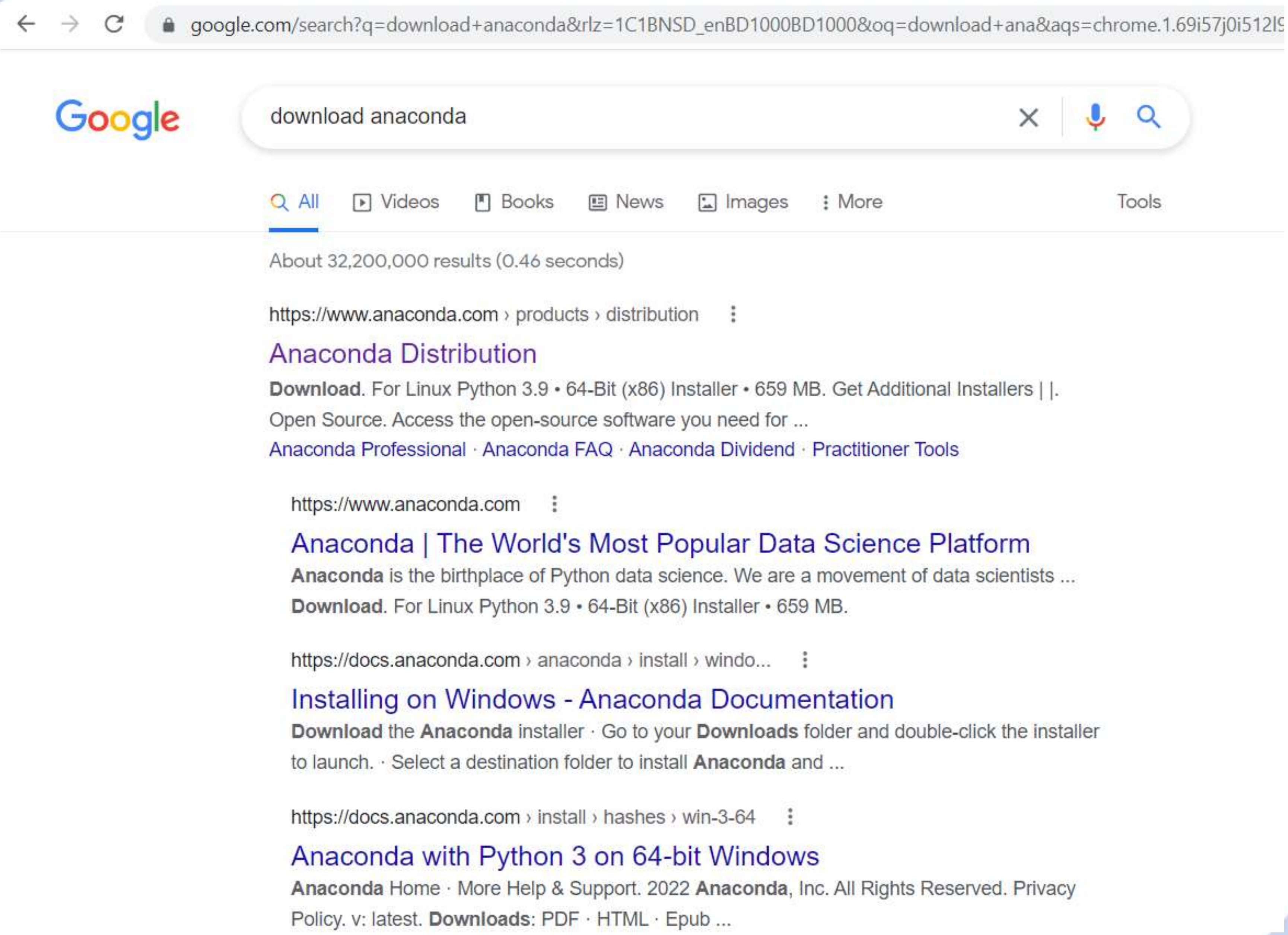
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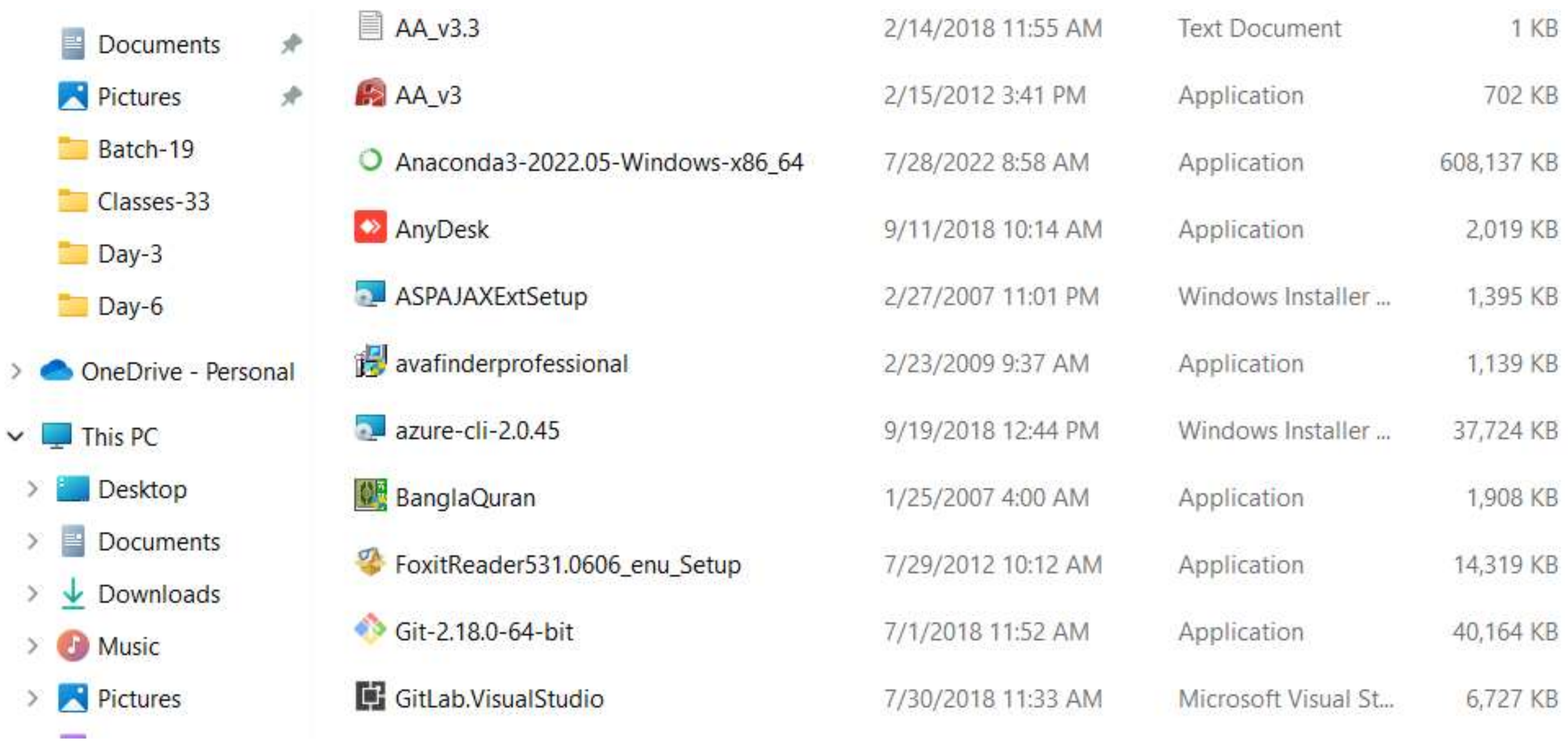
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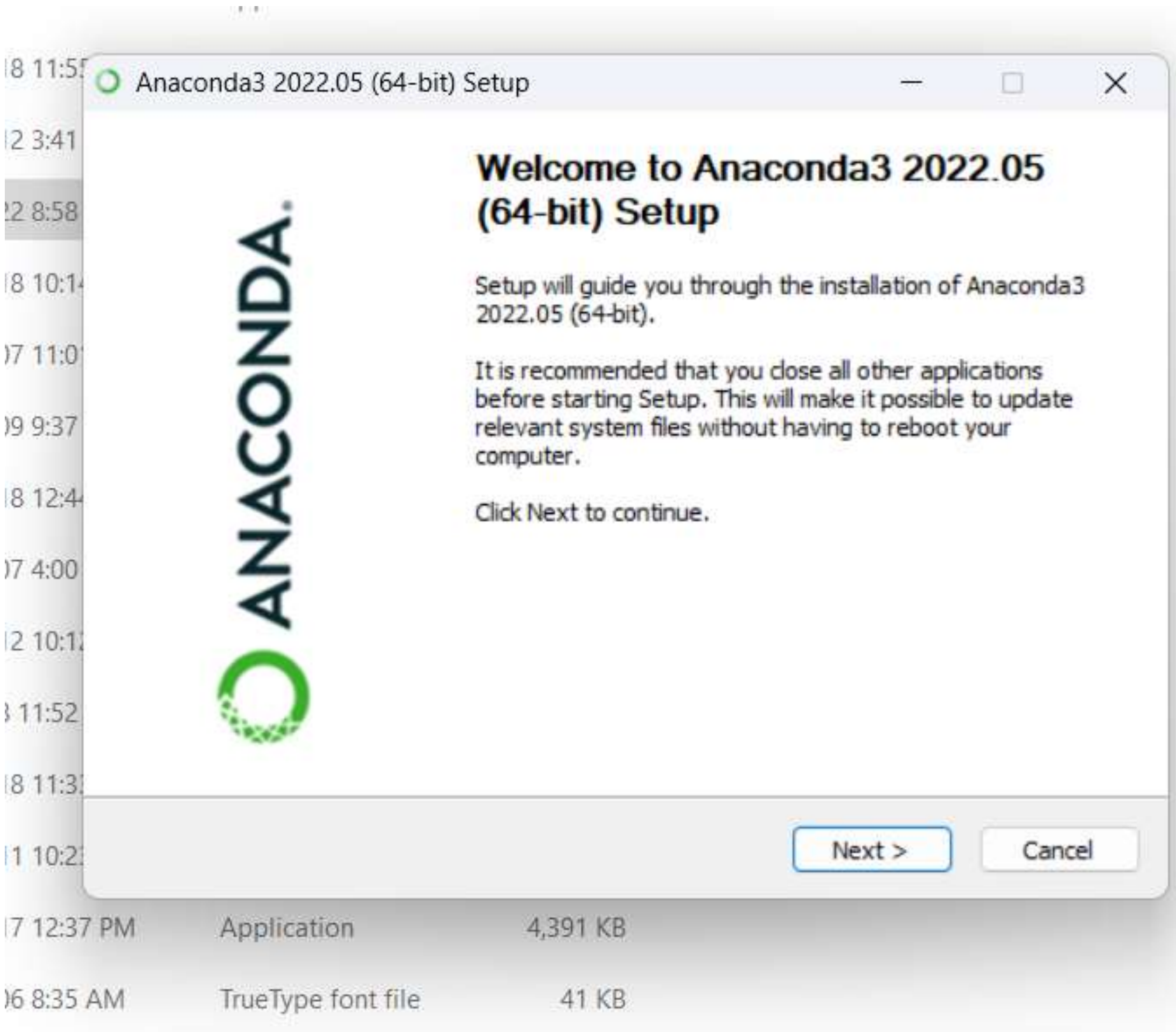
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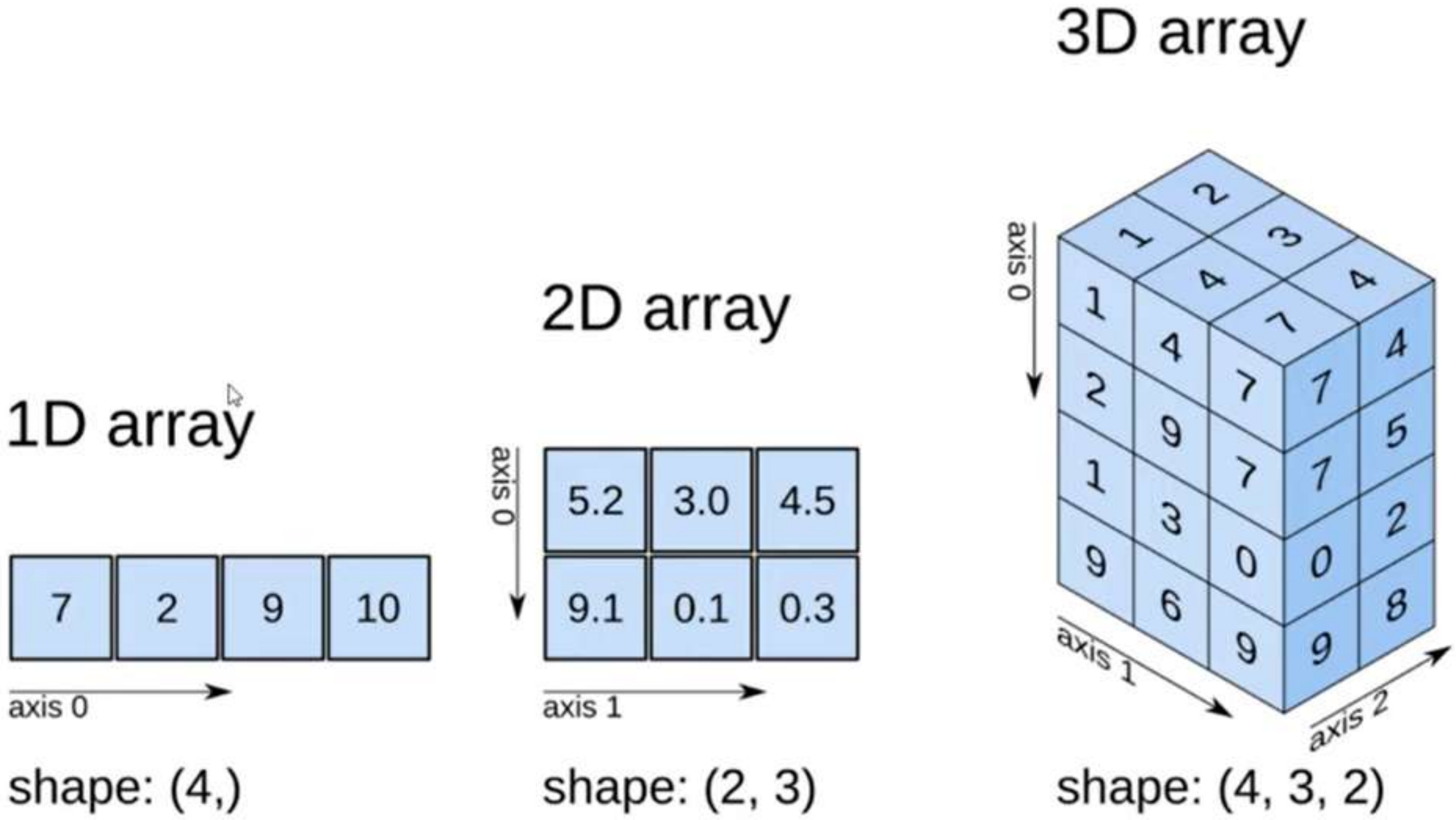
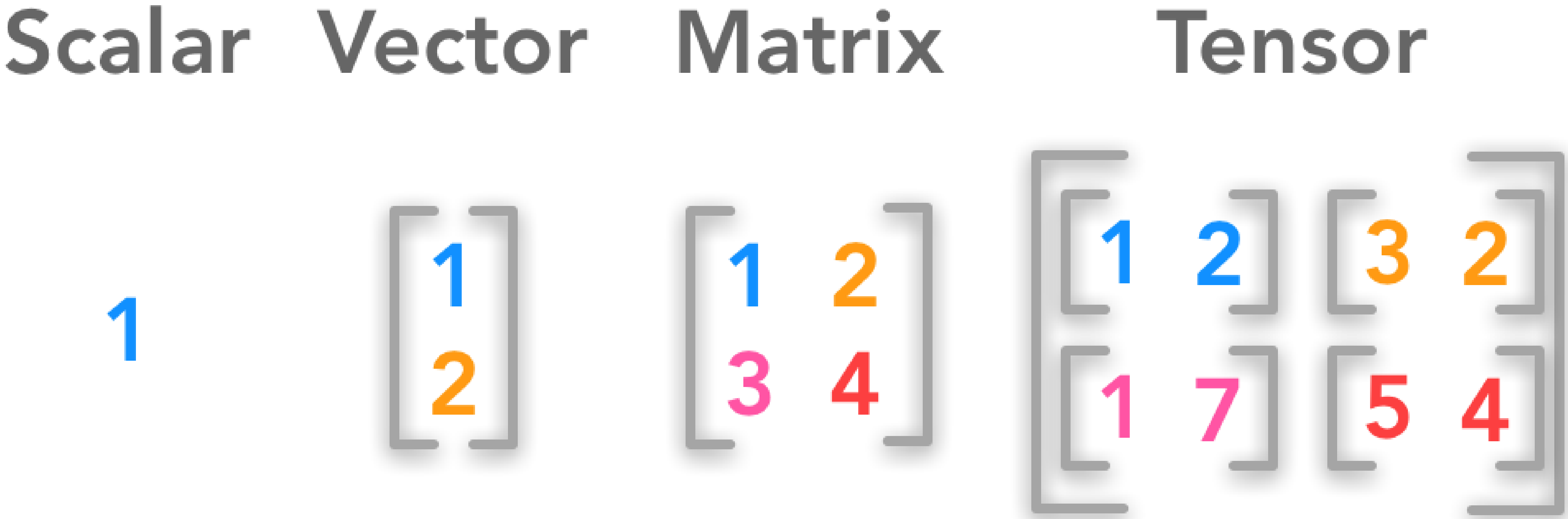
Numpy Array



1D array
7
2
9
10
axis 0
shape: (4,)
2D array
axis 0
5.2
3.0
4.5
9.1
0.1
0.3
axis 1
shape: (2, 3)
3D array
axis 0
1
2
3
4
7
4
1
4
7
7
4
2
9
7
7
5
1
3
7
2
9
0
0
6
9
8
9
axis 1
axis 2
shape: (4, 3, 2)

Numpy Array



List vs Numpy Array

Similarities between list and Numpy array:

Storing Data

Can be Indexed

Mutable

Slicing Operation

List vs Numpy Array

Difference between list and Numpy array:

List : Different Datatypes [1, 2.1, "a", 1]

Array: Similar Datatypes [1,2,3,4]

Numpy Array: Install Numpy

List : Built_in

List vs Numpy Array

A list cannot directly handle a mathematical operations, while array can

```
In [26]: list = [0,1,2]

In [27]: list*2
Out[27]: [0, 1, 2, 0, 1, 2]

In [28]: arr = np.array([0,1,2])

In [29]: arr*2
Out[29]: array([0, 2, 4])
```

List vs Numpy Array

An array consumes less memory than a list

```
In [41]: # importing system module
         import sys

In [43]: list
Out[43]: [0, 1, 2]

In [35]: sys.getsizeof(list)
Out[35]: 80

In [44]: arr
Out[44]: array([0, 1, 2])

In [40]: arr.itemsize
Out[40]: 4
```

Using an array is faster than a list

A list is easier to modify