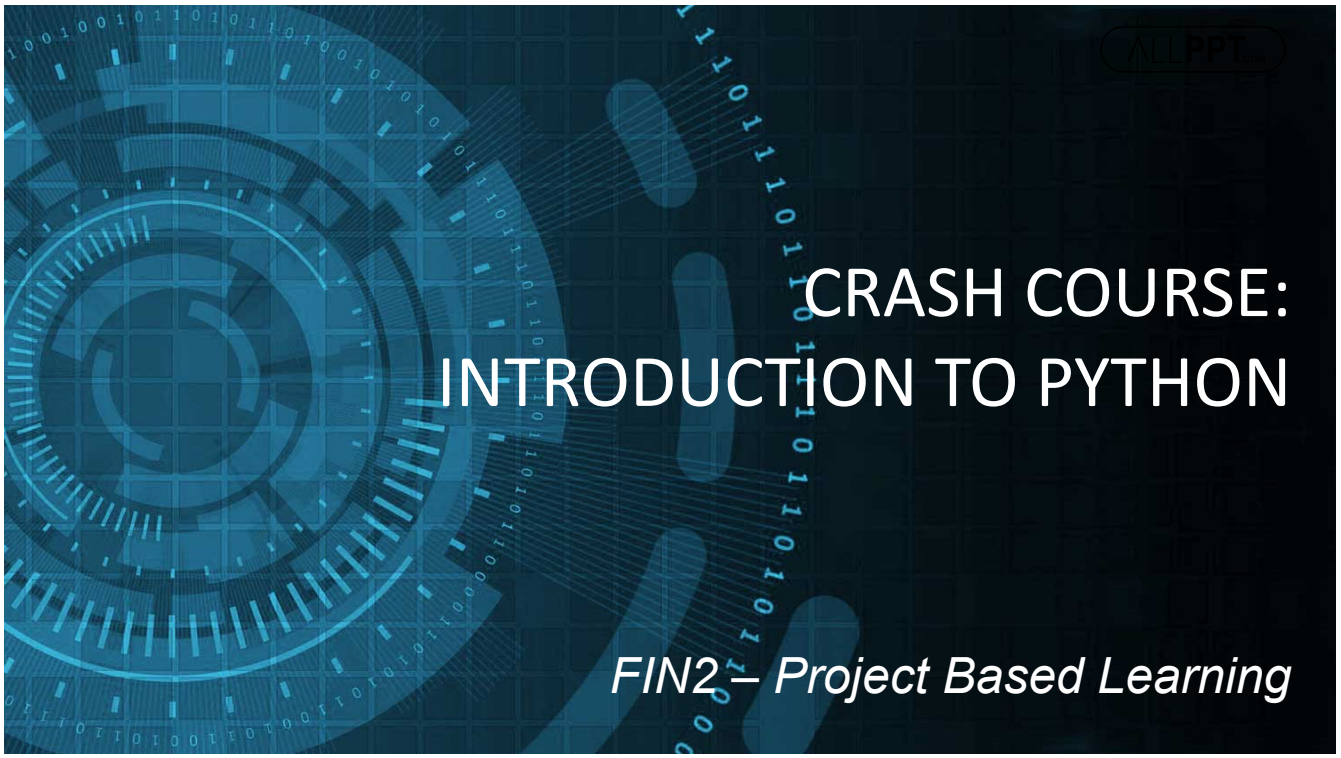


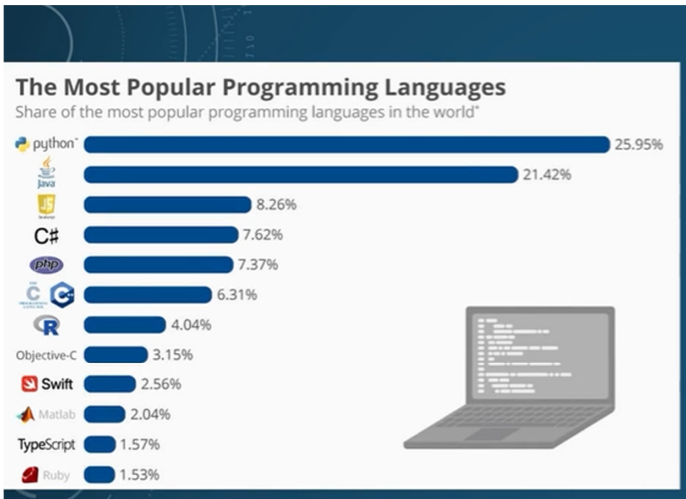
Python
The Jupiter Notebooks

https://www.anaconda.com/download

Python

- Python is a high-level, interpreted programming language that is known for its clear syntax and readability. It supports multiple programming paradigms, including procedural, object-oriented, and functional programming.
- Python is widely used in many areas such as web development, data analysis, artificial intelligence, machine learning, automation, and more.

Python



WHY IS IT SO POPULAR?

1. It has a simple syntax that mimics natural language, so it's easy to read and understand
2. Easily reusable code which adds to it's simplicity
3. General-Purpose programming language - Python can be used for many different tasks, from web development to machine learning
4. It's open source, which means it's free to use and distribute, even for commercial purposes.
5. Python has a large and active community that contributes to Python's pool of modules and libraries

Python

- Variables in Python
- Data Types in Python

Integer (int): 1, 2, 5,…	List (list): [1, 2, ‘abc’]
Float (float): 1.2. 3.41…	Tuple (tuple): (5, 6, 7)
Boolean (bool): true, false	Sets (set): {‘cookies, ‘chocolate’}
String (str): ‘a’, “cat”…	Dictionaries (dict): {keys:value} {“dog”:1, “cat”:2}

LAB Section

The codes used in this section are provided by IBM.

Exercises

- What is the value of x where x = 3 + 2 * 2?
- What is the value of y where y = (3 + 2) * 2?
- Consider the following tuple:

```
genres_tuple = ("pop", "rock", "soul", "hard rock", "soft rock", \
                "R&B", "progressive rock", "disco")
genres_tuple
```

  - Find the length of the tuple
  - Access the element, with respect to index 3
  - Use slicing to obtain indexes 3, 4 and 5
  - Find the first index of "disco"

Exercises

Shopping list

- Create an empty list
- Now store the number of items to the shopping_list: Watch, Laptop, Shoes, Pen, Clothes
- Seems like I missed one item "Football" to add in the shopping list.
- Let's check the first item that we need to buy.
- Let's check the last item that we need to buy.
- Instead of "Pen" I want to buy "Notebook" let's change the item stored in the list.
- Let's delete items that are unimportant, such as; I don't want to buy Clothes, let's delete it.
- We are ready with our shopping list. Print in

Exercises

- Convert the list ['rap','house','electronic music', 'rap'] to a set
- Consider the list A = [1, 2, 2, 1] and set B = set([1, 2, 2, 1]), does sum(A) == sum(B)?
- Create a new set album_set3 that is the union of album_set1 and album_set2

```
album_set1 = set(["Thriller", 'AC/DC', 'Back in Black'])
album_set2 = set([ "AC/DC", "Back in Black", "The Dark Side of the Moon"])
```

- Find out if album_set1 is a subset of album_set3

Operators

- Comparison, Logical, and Membership Operators in Python

Comparison Operators

Operator	Name
==	Equal
!=	Not equal
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to

Operators

- Comparison, Logical, and Membership Operators in Python

Logical Operators

Operator	Description
and	Returns True if both statements are true
or	Returns True if one of the statements is true
not	Reverse the result, returns False if the result is true

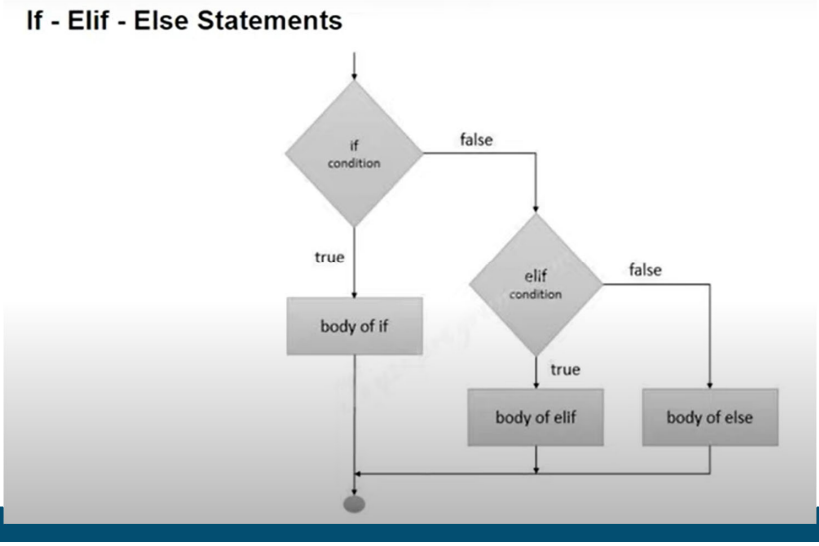
Operators

- Comparison, Logical, and Membership Operators in Python

Membership Operators

Operator	Description
in	Returns True if a sequence with the specified value is present in the object
not in	Returns True if a sequence with the specified value is not present in the object

If Else Statements



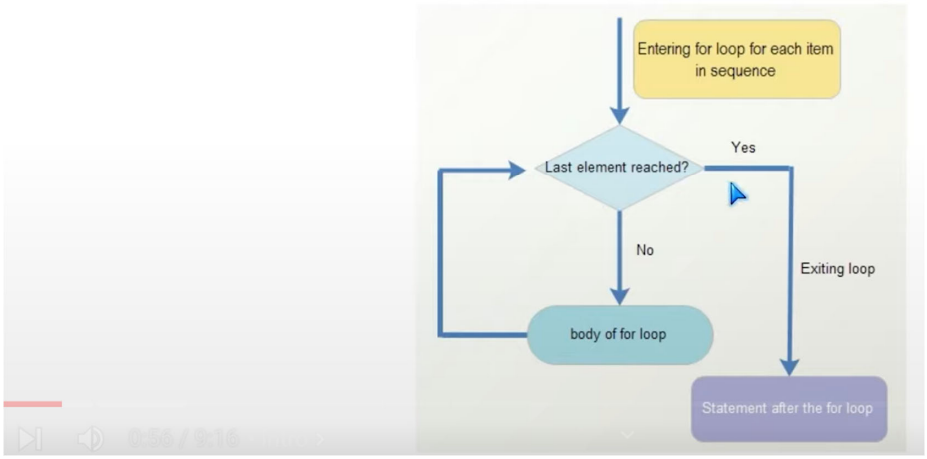
Exercises

- There are 2 sisters, Annie and Jane, born in 1996 and 1999 respectively. They want to know who was born in a leap year. Write an if-else statement to determine who was born in a leap year.
- In a school canteen, children under the age of 9 are only given milk porridge for breakfast. Children from 10 to 14 are given a sandwich, and children from 15 to 17 are given a burger. The canteen master asks the age of the student and gives them breakfast accordingly. Sam's age is 10. Use if-else statement to determine what the canteen master will offer to him

Loops

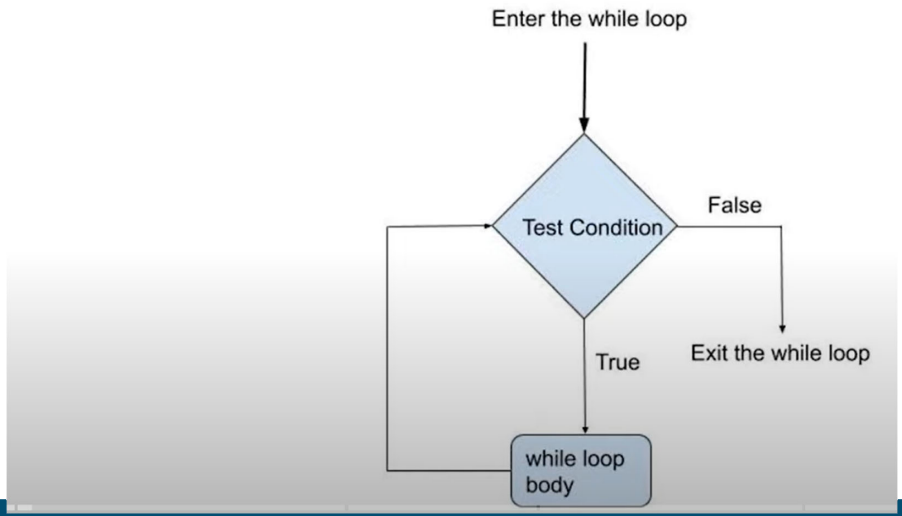
For Loops

```
In [1]: integers = [1,2,3,4,5]
```



Loops

While Loops



Write a for loop the prints out all the element between -5 and 5 using the range function

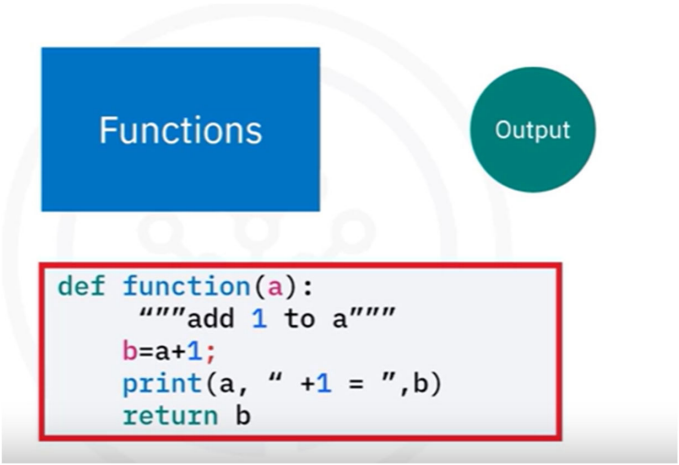
Exercises

- Write a **for** loop the prints out all the element between -5 and 5 using the range function
- Print the elements of the following list:

  Genres=['rock', 'R&B', 'Soundtrack', 'R&B', 'soul', 'pop’]
- Write a while loop to display the values of the Rating of an album playlist stored in the list PlayListRatings. If the score is less than 6, exit the loop. The list PlayListRatings is given by:

  PlayListRatings = [10, 9.5, 10, 8, 7.5, 5, 10, 10]
- Your little brother has just learned multiplication tables in school. Today he has learned tables of 6 and 7. Help him memorise both the tables by printing them using for loop.

Functions



Objects and Class

- Python has many different kinds of data types
- In Python, each is an object
  - You can find the type of an object by using the command `type()`

```
>>type([1,34,3])
<class 'list'>
```

Instance of type List

List

```
>>type('The cat is yellow')
<class 'str'>
```

Instance of type str

str

```
>>type(1)
<class 'int'>
```

Instance of type int

int

```
>>type( {"dog": 1, "Cat": 2})
<class 'dict'>
```

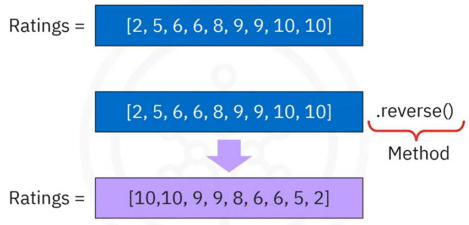
Instance of type dict

dict

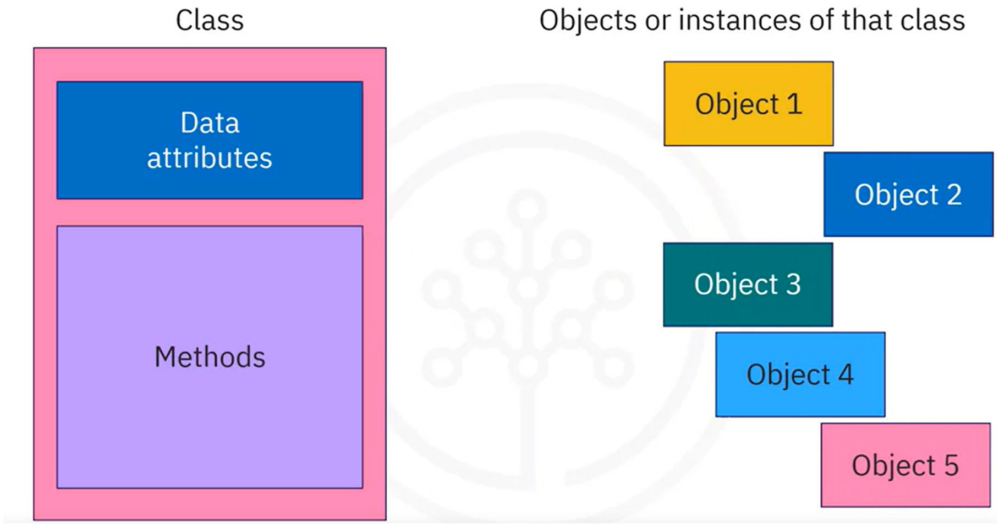
Objects and Class

- A class or type's methods are functions that every instance of that class or type provides.
- It's how you interact with the object.
- We have been using methods all this time, for example, on lists.
- Sorting is an example of a method that interacts with the data in the object.

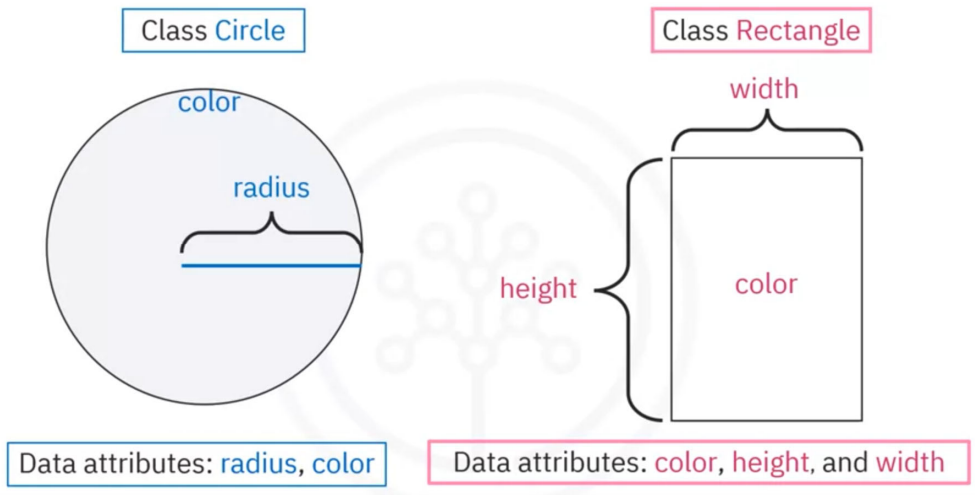
```
Ratings = [10,9,6,5,10,8,9,6,2]

Ratings.sort()
```



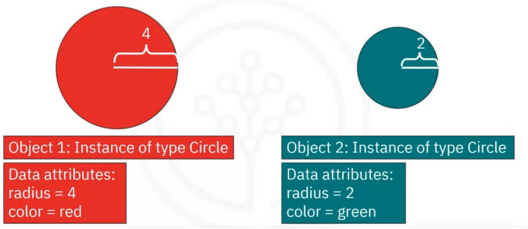
Objects and Class

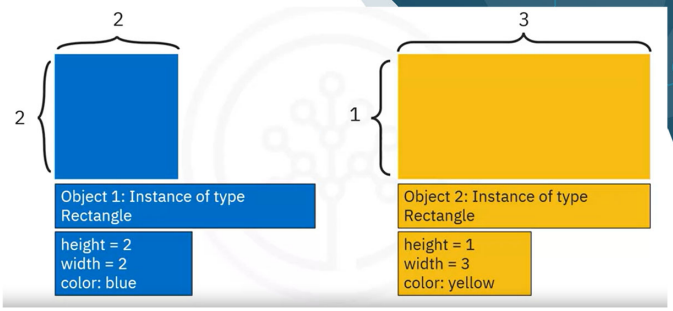


Objects and Class



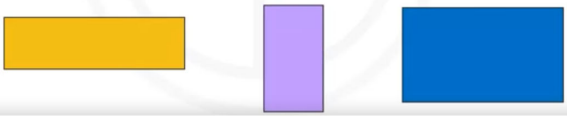
Objects and Class





- We now have different objects of class circle or type circle

- We also have different objects of class rectangle or type rectangle



Objects and Class

```
class Circle(object):
```

Define your class

```
def __init__(self, radius , color):
    self.radius = radius
    self.color = color
```

Data attributes used to initialize each instance of the class

```
C1=Circle(10,'red' )
```

```
class Circle(object ):
  def __init__(self, 10 , 'red'):
      self.radius = 10
      self.color = 'red'
```

self.radius = 10
self.color = 'red'

Data Quality

- As ML algorithms today rely on data for learning, the quality and volume of data are of utmost importance.
- Garbage in equals garbage out.
- Don't throw data at an AI team and assume it will be valuable.

Data Quality

- Data is messy
- Data problems
  - Incorrect labels
  - Missing values-
  - Multiple types of data house

house (square feet)	# of bedrooms	price (1000$)
523	1	100
645	1	0.001
708	unknown	200
1034	3	unknown
unknown	4	350
2545	unknown	440

Some data Python libraries

- **Numpy**: **Num**erical **Py**thon, is a fundamental library for numerical and scientific computing in Python.
- It provides support for large, multi-dimensional arrays and matrices, along with a collection of high-level mathematical functions to operate on these arrays.
- NumPy serves as the foundation for many data science and machine learning libraries, making it an essential tool for data analysis and scientific research in Python.

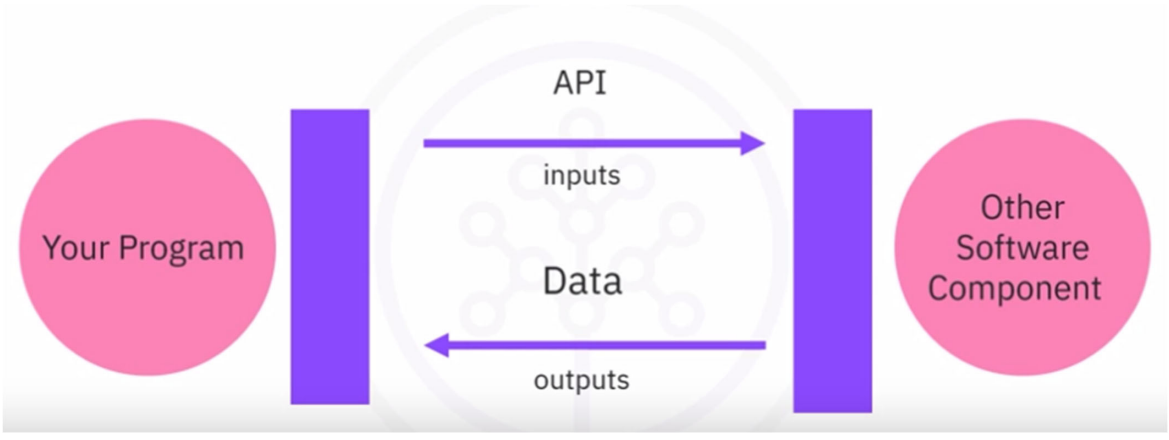
Some data Python libraries

- **Pandas**: Python Data Analysis Library - Pandas is a popular open-source data manipulation and analysis library for the Python programming language.
- It provides a powerful and flexible set of tools for working with structured data, making it a fundamental tool for data scientists, analysts, and engineers.
- Pandas is designed to handle data in various formats, such as tabular data, time series data, and more, making it an essential part of the data processing workflow in many industries.

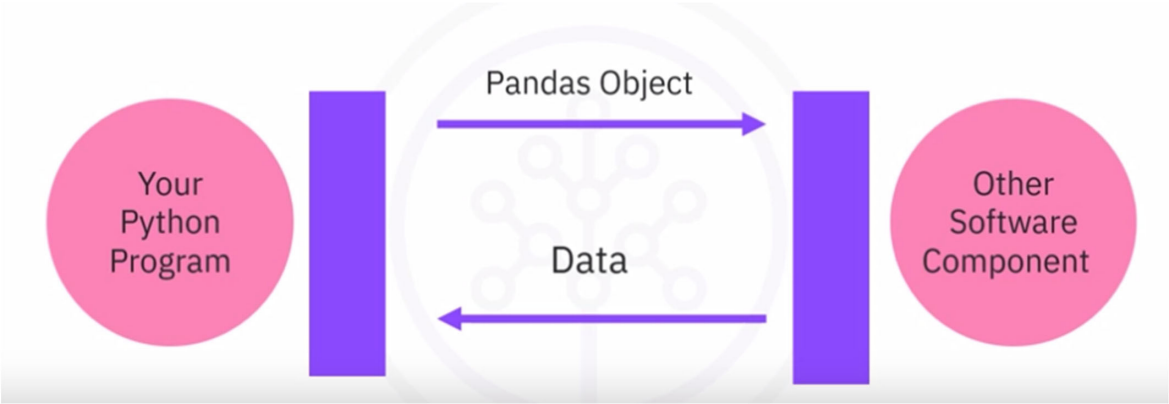
APIs and Data Collection

- Application Program Interfaces (APIs for short).
- An API lets two pieces of software talk to each other. For example, you have your program, you have some data, you have other software components. You use the API to communicate with other software via inputs and outputs. Just like a function, you don't have to know how the API works, just its inputs and outputs.
- Pandas is actually a set of software components, much of which are not even written in Python. You have some data. You have a set of software components. We use the pandas API to process the data by communicating with the other software components.

APIs and Data Collection



APIs and Data Collection



APIs and Data Collection

```
import pandas as pd
dict_= {'a':[11, 21, 31], 'b':[12, 22, 32]}
df = pd.DataFrame(dict_)
df.head()
```

	a	b
0	11	12
1	21	22
2	31	32

df

Rest API

REST APIs

REpresentational State Transfer APIs

- REST APIs are used to interact with web services, that is applications that you call through the internet
- They have a set of rules regarding:
  1. Communication
  2. Input or Request
  3. Output or Response