Cont. Data Structures-I

🎯 Session Objectives

- 📚 Understand the meaning of data structures and why we use them.
- 🗂️ Common data structures in Python
- 📋 Understand what lists are.
- ⚙️ Understand common methods and operations associated with lists.
- 🚀 Understand the meaning of list comprehension
- 🔒 Understand what tuples are.
- 🛠️ Understand common methods and operations associated with tuples.
- ⚖️ Understand the Comparison between Lists and Tuples

```
# Comparison List
_list1 = [1,2,3,4,5]
_list2 = [1,2,3]
result = (_list1 == _list2)
print(result) # False
```

```
False
```

```
_list1 = [1,2,3,4,5]
_list2 = [1,2,3,4,5]
result = (_list1 == _list2)
print(result) # True
```

```
True
```

```
_list1 = [1,2,3,4,5,6,7]
_list2 = [1,2,3,4,5]
result = (_list1 != _list2)
print(result) # True
```

```
True
```

```
_list1 = [1,2,3,4,5,6,7]
_list2 = [1,2,3,4,5]
result = (_list1 >= _list2)
print(result) # True
```

```
True
```

```
_list1 = [1,2,3,4,5,6,7]
_list2 = [1,2,3,4,5]
result = (_list1 <= _list2)
print(result) # False
```

```
False
```

```
_list1 = [1,2,3,4,5]
_list2 = ['1','2','3','4','5']
result = (_list1 != _list2)
print(result) # True
```

```
True
```

```
_list1 = [1,2,3,4,5]
_list2 = ['1','2','3','4','5']
result = (_list1 <= _list2)
print(result) # TypeError: '<=' not supported between instances of 'int' and 'str'
```

```
_list1 = ['a','b','c']
_list2 = ['1','2','3','4','5']
result = (_list1 >= _list2)
print(result) # True
```

```
True
```

Removing items from list: ¶

1. remove -> Remove the first occurrence of a element
2. pop -> Removes by index, returns value can be stored in a new variable
3. del -> delete by index or slicing
4. clear -> Empties the list

```
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Australia',
                'Spain', 'New Zealand', 'Finland']
country_list.remove('Spain')
print(country_list)
```

```
['India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Aus
tralia', 'New Zealand', 'Finland']
```

```
country_list.remove('Finland')
print(country_list)
```

```
['India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Aus
tralia', 'New Zealand']
```

```
country_list.remove('UAE') # country_list.remove('Finland')
print(country_list)
```

```
country_list.append('Spain')
print(country_list)
```

```
['India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Aus
tralia', 'New Zealand', 'Spain']
```

```python
# While applying pop(idx), we can store the popped element in new_variable, which we can use it if required
pop_country = country_list.pop(-1) # 'Spain'
print(pop_country) # 'Spain'
print(country_list)
```

```
Spain
['India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Aus
tralia', 'New Zealand']
```

```python
# del required a call of a list with specific index or slicing to delete an element or a list of elements
del country_list[3] # 'China'
print(country_list)
```

```
['India', 'America', 'Russia', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Australia',
'New Zealand']
```

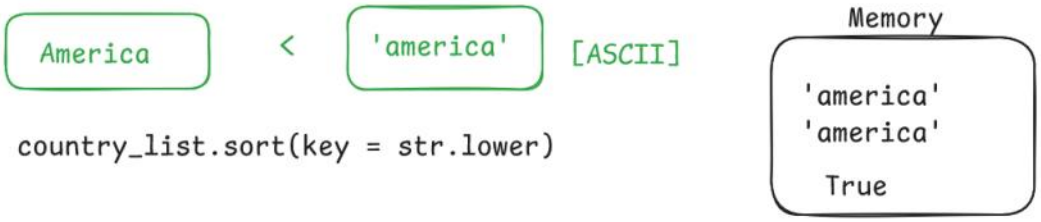
```python
del country_list[3:6] # ['Canada','Japan','Vietnam']
print(country_list)
```

```
['India', 'America', 'Russia', 'Sri-Lanka', 'France', 'Singapore', 'Australia', 'New Zealand']
```

```python
# .clear() -> It will empty the original Lists
country_list.clear()
print(country_list)
```

```
[]
```

```python
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'France', 'Singapore', 'Australia',
                'Spain', 'New Zealand', 'Finland']
del country_list -> Removes the complete list
print(country_list) # NameError: name 'country_list' is not defined
```




```python
# Sorting [Ascending] & Reverse() [::-1]
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland']
country_list.sort()
```

```python
print(country_list)
```

```
['America', 'Canada', 'China', 'Finland', 'India', 'Japan', 'New Zealand', 'Russia', 'Spain', 'Sri-Lanka', 'Vi
etnam', 'australia', 'france', 'singapore']
```

```python
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland']
country_list.sort()
print(country_list[::-1])
```

```
['singapore', 'france', 'australia', 'Vietnam', 'Sri-Lanka', 'Spain', 'Russia', 'New Zealand', 'Japan', 'Indi
a', 'Finland', 'China', 'Canada', 'America']
```

```
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland']
country_list.sort(reverse = True)
print(country_list)
```

```
['singapore', 'france', 'australia', 'Vietnam', 'Sri-Lanka', 'Spain', 'Russia', 'New Zealand', 'Japan', 'Indi
a', 'Finland', 'China', 'Canada', 'America']
```

```
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland']
country_list.sort(key = str.lower)
print(country_list)
```

```
['America', 'australia', 'Canada', 'China', 'Finland', 'france', 'India', 'Japan', 'New Zealand', 'Russia', 's
ingapore', 'Spain', 'Sri-Lanka', 'Vietnam']
```

```
# If 'America' and 'america' then which one will come first?using str.lower
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'america']
country_list.sort(key = str.lower)
print(country_list)
```

```
['America', 'america', 'australia', 'Canada', 'China', 'Finland', 'france', 'India', 'Japan', 'New Zealand',
'Russia', 'singapore', 'Spain', 'Sri-Lanka', 'Vietnam']
```

```
# If 'America' and 'america' then which one will come first?using str.lower
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'america']
country_list.sort(key = str.upper)
print(country_list)
```

```
['America', 'america', 'australia', 'Canada', 'China', 'Finland', 'france', 'India', 'Japan', 'New Zealand',
'Russia', 'singapore', 'Spain', 'Sri-Lanka', 'Vietnam']
```

```
# .reverse() -> the original List
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland']
country_list.reverse()
print(country_list)
```

```
['Finland', 'New Zealand', 'Spain', 'australia', 'singapore', 'france', 'Sri-Lanka', 'Vietnam', 'Japan', 'Cana
da', 'China', 'Russia', 'America', 'India']
```

```
# 'Joining' strings from a list
word_list = ['Python', 'is', 'an' , 'awesome', 'programming', 'language']
final_statement = ' '.join(word_list)
print(final_statement)
```

```
Python is an awesome programming language
```

```
char_list = ['P','y','t','h','o','n',' ','P','r','o','g','r','a','m','m','i','n','g!']
result = ''.join(char_list)
print(result)
```

```
Python Programming!
```

```
# Count() -> Calculating the occurrence of element in a list
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
count_india = country_list.count('India')
print(count_india)
```

```
2
```

```
num_list = [1,2,1,2,1,2,1,2,1,2,1,2,21,2,121,121,1,2,2,2,12,22,22]
print(num_list.count(2))
print(num_list.count(1))
```

```
10
7
```

```
# Deep Copy [Same Memory] Vs Shallow Copy[Independent Memory]
# .copy [Shallow Copy]
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
new_country_list = country_list.copy()
print(id(country_list))
print(id(new_country_list))
```

```
2063808540032
2063808535040
```

```
del new_country_list[-3:]
print("Country List : " , country_list)
print("New Country List : " , new_country_list)
```

```
Country List :  ['India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'france',
'singapore', 'australia', 'Spain', 'New Zealand', 'Finland', 'India', 'Japan', 'America']
New Country List :  ['India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'franc
e', 'singapore', 'australia', 'Spain', 'New Zealand', 'Finland']
```

```python
# deep copy
weekday_list = ['Mon','Tue','Wed','Thurs','Fri']
weekend_list = ['Sat','Sun']
week_list = weekday_list + weekend_list
new_week_list = week_list # deep copy
print(id(week_list))
print(id(new_week_list))
```

```
2063808535808
2063808535808
```

```python
# Before
print(week_list)
print(new_week_list)
```

```
['Mon', 'Tue', 'Wed', 'Thurs', 'Fri', 'Sat', 'Sun']
['Mon', 'Tue', 'Wed', 'Thurs', 'Fri', 'Sat', 'Sun']
```

```python
# After
del new_week_list[-3:] # removing 'Fri','Sat','Sun'
print(week_list)
print(new_week_list)
```

```
['Mon', 'Tue', 'Wed', 'Thurs']
['Mon', 'Tue', 'Wed', 'Thurs']
```

```python
# Using slicing [:] (Shallow Copy)
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
new_country_list = country_list[:]
print(id(country_list))
print(id(new_country_list))
```

```
2063808426816
2063808425984
```

```python
# Using list() constructor (Shallow Copy)
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
new_country_list = list(country_list)
print(id(country_list))
print(id(new_country_list))
```

```
2063808542400
2063808438912
```

```python
# Index() -> Its a method to find the position of a first occurrence of a specified value in a list.
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
print(country_list.index('India'))
print(country_list.index('Japan'))
print(country_list.index('America'))
print(country_list.index('India',1)) # Provide the 2nd occurrence
print(country_list.index('Japan',7))
print(country_list.index('America',3))
# print(country_list.index('North Korea')) # ValueError: 'North Korea' is not in list
```

```
0
5
1
14
15
16
```

```python
# List Comprehensions
squared = [i**2 for i in range(1,6)] # for i in range(1,6) -> [1,2,3,4,5]
print(squared)
```

```
[1, 4, 9, 16, 25]
```

What exactly is a Tuple?

- Ordered Collection (items maintains its positions)
- It can store different data types togethers
- But the only Big Difference here is : Immutability (Once Created, their elements can't be changed , added to, or removed.)

```python
_tuple = ()
print(type(_tuple))
```

```
<class 'tuple'>
```

```python
_tuple = (1,2,'3','4',False,True,29.99,'k')
print(_tuple)
```

```
(1, 2, '3', '4', False, True, 29.99, 'k')
```

```python
_tuple = 1,2,3,4,5
print(_tuple)
print(type(_tuple))
```

```
(1, 2, 3, 4, 5)
<class 'tuple'>
```

```python
# tuple() constructor
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
country_tuple = tuple(country_list)
print(country_tuple)
print(type(country_tuple))
```

```
('India', 'America', 'Russia', 'China', 'Canada', 'Japan', 'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'aus
tralia', 'Spain', 'New Zealand', 'Finland', 'India', 'Japan', 'America')
<class 'tuple'>
```

```python
char_tuple = tuple('Python')
print(char_tuple)
```

```
('P', 'y', 't', 'h', 'o', 'n')
```

```python
_tuple = tuple(('Python',))
print(_tuple)
```

```
('Python',)
```

```python
nested_list = [
        [1,2,3,4,5],
        [2,4,6,8,10],
        [1,3,5,7,9]
]
nested_tuple = tuple(nested_list)
print(nested_tuple) # ([1, 2, 3, 4, 5], [2, 4, 6, 8, 10], [1, 3, 5, 7, 9])
# List as an element in a tuple is mutable
nested_tuple[0].append(6)
print(nested_tuple) # ([1, 2, 3, 4, 5, 6], [2, 4, 6, 8, 10], [1, 3, 5, 7, 9])
```

```
([1, 2, 3, 4, 5], [2, 4, 6, 8, 10], [1, 3, 5, 7, 9])
([1, 2, 3, 4, 5, 6], [2, 4, 6, 8, 10], [1, 3, 5, 7, 9])
```

```python
nested_tuple = (('Mon','Tue','Wed'),('Thurs','Fri','Sat','Sun'))
print(nested_tuple)
print(type(nested_tuple))
# nested_tuple[0].append('Mon') # AttributeError: 'tuple' object has no attribute 'append'
```

```
(('Mon', 'Tue', 'Wed'), ('Thurs', 'Fri', 'Sat', 'Sun'))
<class 'tuple'>
```

```python
# Indexing & Slicing
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
country_tuple = tuple(country_list)
print(country_tuple[-1]) # 'America'
print(country_tuple[-5]) # 'New Zealand'
print(country_tuple[4:7]) # ('Canada','Japan','Vietnam')
print(country_tuple[4:7:2]) # ('Canada','Vietnam')
print(country_tuple[::-2]) # reverse the tuple with alterative elements
```

```
America
New Zealand
('Canada', 'Japan', 'Vietnam')
('Canada', 'Vietnam')
('America', 'India', 'New Zealand', 'australia', 'france', 'Vietnam', 'Canada', 'Russia', 'India')
```

```python
# Finding the tuple Length
country_list = ['India', 'America', 'Russia', 'China', 'Canada', 'Japan',
                'Vietnam', 'Sri-Lanka', 'france', 'singapore', 'australia',
                'Spain', 'New Zealand', 'Finland' , 'India', 'Japan', 'America']
country_tuple = tuple(country_list)
print(len(country_tuple)) # 17
```

```
17
```

```python
num_list = [11,22,33,44,55,66,77,88,99,110,False,True] # False -> 0 , True = 1
num_tuple = tuple(num_list)
print(len(num_tuple)) # 12
print(min(num_tuple)) # 0 [False]
print(max(num_tuple)) # 110
print(sum(num_tuple)) # sum of all elements + 1 [True] [605 + 1] = 606
```

```
12
False
110
606
```