List Comprehension

Table of contents

01
Introduction

02
Comparison

03
Examples

04
Summary

01

Introductioan

Introductioan

- List comprehension is a **concise** and **efficient** way to create lists in Python.

- It provides an elegant alternative to traditional **for loops** for generating lists from iterables (like lists, tuples, strings, sets, and range()).

Why Use List Comprehension?

- **Conciseness** → Reduces code length compared to loops.
- **Efficiency** → Faster execution as Python optimizes list comprehensions.
- **Readability** → More expressive and easier to understand.
- **Flexibility** → Supports filtering, transformations, and multiple iterations.
- **Reduced Errors** → Less room for mistakes compared to loops.

Syntax Basic

Python

```python
new_list = [expression for item in iterable]
```

Explanation:

- **expression** → The operation or transformation applied to each element.
- **item** → The variable representing each element in the iterable.
- **iterable** → The source of elements (list, tuple, string, range(), etc.).

Syntax with if

Python

```python
new_list = [expression for item in iterable if condition]
```

Explanation:

- **expression** → The operation or transformation applied to each element.
- **item** → The variable representing each element in the iterable.
- **iterable** → The source of elements (list, tuple, string, range(), etc.).
- **if condition (optional)** → Filters elements based on a condition.

Syntax with if-else

Python

```
new_list = [true_exp if condition else false_exp for item in iterable]
```

Explanation:

- **true_exp** → The operation or transformation applied if condition is true.
- **false_exp** → The operation or transformation applied if condition is false.
- **item** → The variable representing each element in the iterable.
- **iterable** → The source of elements (list, tuple, string, range(), etc.).
- **if condition (optional)** → Filters elements based on a condition.

Syntax with Nested list

Python

```
new_list = [element for sublist in nested_list for element in
sublist]
```

Explanation:

- **element** → The variable representing each element in the iterable.
- **sublist** → Part of a nested list
- **nested_list** → List within another list.
- **if condition (optional)** → Filters elements based on a condition.

02

Comparison

For Loop Vs List Comprehension

Python

Using For Loop	**Using List Comprehension**

```python
fruits = ["apple", "banana", "cherry", "kiwi", "mango"]
```

Using For Loop

```python
newlist = []
for x in fruits:
    if "a" in x:
        newlist.append(x)
print(newlist)
```

Using List Comprehension

```python
newlist = [x for x in fruits if "a" in x]
print(newlist)
```

Output

```
['apple', 'banana', 'mango']
```

03

Examples

Example 1:

Objective:

Create a list of numbers from 0 to 9

Python

```python
numbers = [x for x in range(10)]
print(numbers)
```

Output

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

Example 2:

Objective:

Filtering elements (Only include numbers less than 5)

Python

```python
small_numbers = [x for x in range(10) if x < 5]
print(small_numbers)
```

Output

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

Example 3:

Objective:

Convert lowercase letters to uppercase

Python

```python
text = "hello python"
uppercase_letters = [char.upper() for char in text if char.isalpha()]
print(uppercase_letters)
```

Output

```
['H', 'E', 'L', 'L', 'O', 'P', 'Y', 'T', 'H', 'O', 'N']
```

Example 4:

Objective:

Extract even numbers from 1 to 20

Python

```
even_numbers = [num for num in range(1, 21) if num % 2 == 0]
print(even_numbers)
```

Output

```
[2, 4, 6, 8, 10, 12, 14, 16, 18, 20]
```

Example 5:

Objective:

Exclude a specific item ("apple")

Python

```
fruits = ["apple", "banana", "cherry", "kiwi", "mango"]
filtered_fruits = [x for x in fruits if x != "apple"]
print(filtered_fruits)
```

Output

```
['banana', 'cherry', 'kiwi', 'mango']
```

Example 6:

Objective:

Replace "banana" with "orange"

Python

```
fruits = ["apple", "banana", "cherry", "kiwi", "mango"]
new_fruits = [x if x != "banana" else "orange" for x in fruits]
print(new_fruits)
```

Output

```
['apple', 'orange', 'cherry', 'kiwi', 'mango']
```

Example 7:

Objective:

Generate all possible pairs from two lists

Python

```python
list1 = [1, 2, 3]
list2 = ['A', 'B', 'C']
pairs = [(x, y) for x in list1 for y in list2]
print(pairs)
```

Output

```
[(1, 'A'), (1, 'B'), (1, 'C'), (2, 'A'), (2, 'B'), (2, 'C'), (3,
'A'), (3, 'B'), (3, 'C')]
```

Example 8:

Objective:

Convert all fruit names to uppercase

Python

```python
fruits = ["apple", "banana", "cherry", "kiwi", "mango"]
upper_fruits = [x.upper() for x in fruits]
print(upper_fruits)
```

Output

```
['APPLE', 'BANANA', 'CHERRY', 'KIWI', 'MANGO']
```

Example 9:

Objective:

Set all values to "hello"

Python

```
fruits = ["apple", "banana", "cherry"]
newlist = ["hello" for x in fruits]
print(newlist)
```

Output

```
['hello', 'hello', 'hello']
```

Example 10:

Objective:

Flatten a nested list (convert a 2D list into a 1D list)

Python

```python
nested_list = [[1, 2, 3], [4, 5, 6], [7, 8, 9]]
new_list = [element for sublist in nested_list for element in sublist]
print(new_list)
```

Output

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

04

Summary

Summary

- **List Comprehension** is a concise way to create lists from iterables.
- It allows **filtering elements** using conditions.
- We can **modify elements** using if-else inside expressions.
- Supports **nested loops** for combinations.
- Generally **faster and more readable** than traditional loops.

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List Loop

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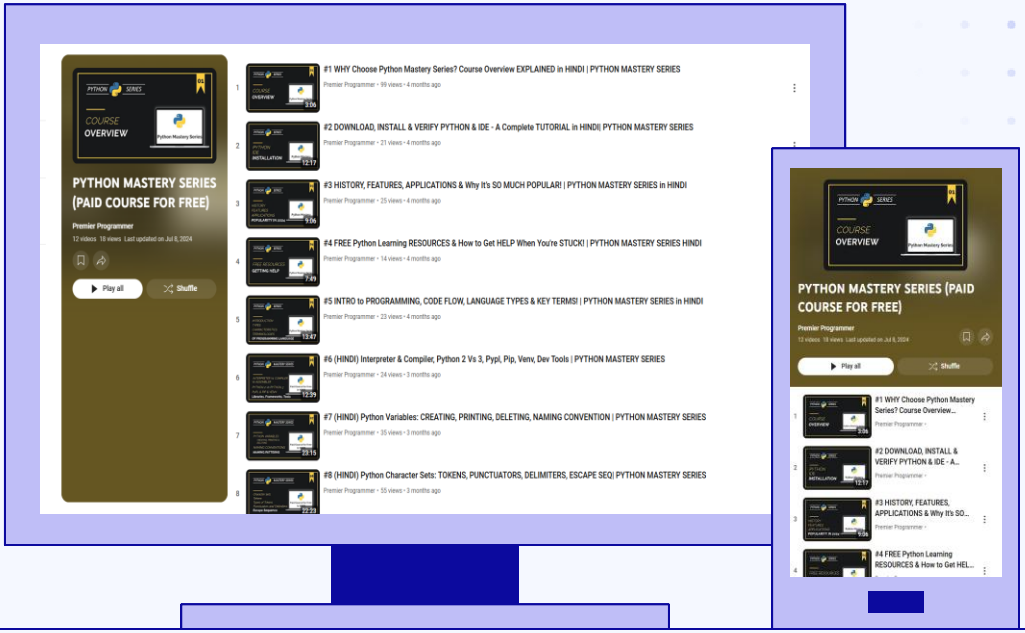

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