Lab 3 - Functional Programming (Section 1)

Course: Principles of Programming Languages (Code: IT092IU)

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1 Higher - order Functions

Lamda - allows us to create anonymous function

Syntax: *lambda arguments: expression*

Map - applies a function to all items in an input list; returns a map object

Syntax: *map(function, arguments)*

Filter - constructs an iterator from elements of an arguments for which a function returns "True".

Syntax: *filter(function, arguments)*

Reduce - is a function with 2 input parameters, function f and *list*. Instead of going through each element, reduce combines every 2 elements of the array with the input function f.

Syntax: *reduce(f, list)*

Required: *from functools import reduce*

2 Exercises

Exercise 1 Given an array A = [1, 2, 3, 4, 5, 6, 7, 8]. Write code in two ways, **traditional way** and **higher-order functions** to:

(a) Generate the square of each element in A.

(b) Generate the power of 3 of each element in A.

(c) Return the resultant square in the range of [20, 40].

(d) Generate the elements in A which are even number.

Exercise 2 Assuming two pixels at coordinates (x_1, y_1), (x_2, y_2). The distance (dst) of two pixels is defined as:

$$dst = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Using lamda function to calculate the distance of two pixels at coordinates (4,5), (3, 2).

Exercise 3 Given a dictionary of animals as:

```
animals = [
    {'type': 'Dog', 'name': 'Lucy'},
    {'type': 'Cat', 'name': 'Buddy'},
    {'type': 'Rabbit', 'name': 'Jack'},
    {'type': 'Cat', 'name': 'Duke'},
    {'type': 'Rabbit', 'name': 'Sadie'},
    {'type': 'Dog', 'name': 'Bella'},
]
```

Using higher-order functions to generate the names of all dogs from the given list of $animals$.

Exercise 4 Given an array B = [’a’, ’b’, ’c’, ’d’, ’e’]. Using higher-order functions to:

(a) Generate sum of elements in B from left to right.

(b) Generate sum of elements in B from right to left.

(c) Concatenate ’Y’ to the sum of elements in B from left to right

(d) Concatenate ’Y’ to the sum of elements in B from right to left

Exercise 5 Organize all above function, writing a main function that guides users passing variables to run any defined function.