Course Title (Course Code): Statistics for Data Science (CSE303)
Lab 02 Exercises
Course Instructor: Md Al-Imran
Lab Title: Intermediate Python Programming

Lab Objective

Familiarize students with the extended fundamental concepts of functions, list comprehension, and object-oriented programming.

Lab Outcome

After completing this lab successfully, students will be able to:

1. Understand the fundamental concepts of Python.
2. Write Python programs to solve generic problems with modest complexity.

Psychomotor Learning Levels

This lab involves activities that encompass the following learning levels in psychomotor domain.

Level	Category	Meaning	Keywords
P1	Imitation	Copy action of another; observe and replicate.	Relate, Repeat, Choose, Copy, Follow, Show, Identify, Isolate.
P2	Manipulation	Reproduce activity from instruction or memory	Copy, response, trace, Show, Start, Perform, Execute, Recreate.

Lab Activities

1. **Function and Lambda Function Revisit**

```
# reading input values from user
username = input('What is your name? ')
age = int(input('What is your age? '))
greeting = input('write your greetings: ')
def my_function_with_args(username, age, greeting):
        print("Hello, %s , Your age is %d, From My Function!, I wish you %s"%(username, age, greeting))

my_function_with_args(username, age, greeting)

Lambda:
double = lambda x: x * 2
print(double(5))
```

2. **Revisiting OOP Python**

   Inheritance

   Overriding methods

   Magic functions

   Nested Class

   Callbacks

3. **List Comprehension revisit**

```
sentence = "the quick brown fox jumps over the lazy dog"
words = sentence.split()
word_lengths = []
for word in words:
    if word != "the": word_lengths.append(len(word))

print(words)

print(word_lengths)
```

Using List Comprehension: word_lengths = [len(word) for word in words if word != "the"]

4. map(), filter(), reduce()

The map() function applies a given function to each item of an iterable (list, tuple etc.) and returns a list of the results.

The syntax of map() is: `map(function, iterable, ...)`

A code snippet transforming each element of a list into its double and put them into another list

```
def double(x):

    return x*2

list1 = [1, 2, 3, 4, 5, 6]

results = []

for i in list1:

    results.append(double(i))
```

The following shows the use of map() in the above case:

```
def double(x):

  return x*2

list1 = [1, 2, 3, 4, 5, 6]

results = [x for x in map(double, list1)] #lambda functions can also be used

print(results)
```

The filter() method constructs an iterator from elements of an iterable for which a function returns true. The syntax of filter() method is: `filter(function, iterable)`

```
def filterVowels(letter):

    vowels = ['a', 'e', 'i', 'o', 'u']

    if(letter in vowels):

        return True
```

```
        else:
            return False
    filteredVowels = filter(filterVowels, letters)
    print('The filtered vowels are:')
    for vowel in filteredVowels:
        print(vowel)
```

The reduce(fun,seq) function is used to apply a particular function passed in its argument to all of the list elements mentioned in the sequence passed along. This function is defined in "functools" module.

The syntax of reduce() method is: reduce(function, iterable)

```
def add(a, b):
    return a+b
# importing functools for reduce()
import functools
# initializing list
list1 = [1, 3, 5, 6, 2] # using reduce to compute sum of list
print ("The sum of the list elements is : ", end="")
print (functools.reduce(add,list1))
```

5. String Methods

- Python String capitalize(): Converts first character to Capital Letter
- Python String casefold(): converts to case folded strings
- Python String center(): Pads string with specified character
- Python String count(): returns occurrences of substring in string
- Python String encode(): returns encoded string of given string
- Python String endswith(): Checks if String Ends with the Specified Suffix
- Python String expandtabs(): Replaces Tab character With Spaces
- Python String find(): Returns the index of first occurrence of substring
- Python String format(): formats string into nicer output
- Python String format_map(): Formats the String Using Dictionary
- Python String index(): Returns Index of Substring
- Python String isalnum(): Checks Alphanumeric Character
- Python String isalpha(): Checks if All Characters are Alphabets
- Python String isdecimal(): Checks Decimal Characters
- Python String isdigit(): Checks Digit Characters
- Python String isidentifier(): Checks for Valid Identifier

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- Python String islower(): Checks if all Alphabets in a String are Lowercase
- Python String isnumeric(): Checks Numeric Characters
- Python String isprintable(): Checks Printable Character
- Python String isspace(): Checks Whitespace Characters
- Python String istitle(): Checks for Titlecased String
- Python String isupper(): returns if all characters are uppercase characters
- Python String join(): Returns a Concatenated String
- Python String ljust(): returns left-justified string of given width
- Python String lower(): returns lowercased string
- Python String lstrip(): Removes Leading Characters
- Python String maketrans(): returns a translation table
- Python String partition(): Returns a Tuple
- Python String replace(): Replaces Substring Inside
- Python String rfind(): Returns the Highest Index of Substring
- Python String rindex(): Returns Highest Index of Substring
- Python String rjust(): returns right-justified string of given width
- Python String rpartition(): Returns a Tuple
- Python String rsplit(): Splits String From Right
- Python String rstrip(): Removes Trailing Characters
- Python String split(): Splits String from Left
- Python String splitlines(): Splits String at Line Boundaries
- Python String startswith(): Checks if String Starts with the Specified String
- Python String strip(): Removes Both Leading and Trailing Characters
- Python String swapcase(): swap uppercase characters to lowercase; vice versa
- Python String title(): Returns a Title Cased String
- Python String translate(): returns mapped charactered string
- Python String upper(): returns uppercased string
- Python String zfill(): Returns a Copy of The String Padded With Zeros

Useful Links:

- Book: Practical Statistics for Data Science by O'Reilly Publications
- https://www.learnpython.org/
- https://realpython.com/