Assignment 3

(COMP 3608 - Intelligent Systems)
(For students who want to obtain 3 credits)

Date Available: Friday, April 05, 2019
Due Date: 11.50 PM, Friday, April 19, 2019
Total Mark: 100 marks (weighted 6% out of 100%)

Question 1 [40 marks]
Write a Python program to implement the following algorithms presented in the lecture notes of Topic 4: ANNs.
a. [10 marks] Perceptron Learning Algorithm (`perceptAND.py`)
b. [10 marks] Perceptron Learning Algorithm (`perceptOR.py`)
c. [20 marks] Backpropagation Learning Algorithm (`bpXOR.py`)
Your programs must allow a user to test the demonstrative examples of AND, OR, and XOR operations presented in the lecture notes of Topic 4: ANNs.
• A demonstrative example of the `perceptAND.py` program output is given below.

```
  x1  x2  Yd  Y   e   w1    w2
Epoch 1
  0   0   0   0   0   0.3  -0.1
  0   1   0   0   0   0.3  -0.1
  1   0   0   1  -1   0.2  -0.1
  1   1   1   0   1   0.3   0.0
...
Epoch 5
  0   0   0   0   0   0.1   0.1
  0   1   0   0   0   0.1   0.1
  1   0   0   0   0   0.1   0.1
  1   1   1   1   0   0.1   0.1
```

• A demonstrative example of the `bpXOR.py` program output is given below.

```
 x1  x2  Yd    Y        e       SSE
  0   0   0  0.0175  -0.0175
  0   1   1  0.9850   0.0150
  1   0   1  0.9849   0.0151
  1   1   0  0.0155  -0.0155  0.0010
```

Question 2 [60 marks]
Write a Python program to implement the basic genetic algorithm presented in the lecture notes of Topic 6: GAs. Your program must allow a user to test the demonstrative example 1 presented in Topic 6: GAs. That is, find the maximum value of the function $f(x) = 15x - x^2$, where the integer parameter $x \in [0, 15]$. A demonstrative example of the program output is given below.

```
Chromosome      String          Integer         fitness         fitness Ratio
1               1100            12              36              16.51
2               0100            4               44              20.18
3               0001            1               14              6.42
4               1110            14              14              6.42
5               0111            7               56              25.68
6               1001            9               54              24.77
Average fitness:                                36
```

```
-------------------------------------------------
...
-------------------------------------------------
Chromosome      String          Integer         fitness         fitness Ratio
1               0111            7               56              20.74
2               1101            13              26              9.62
3               0101            5               50              18.51
4               1101            13              26              9.62
5               0111            7               56              20.74
6               0111            7               56              20.74
Average fitness:                                45
-------------------------------------------------
...
Average fitness:                                56
```

Submission

1. At the top of your files, you should include the following information.

```
/*
Full Name:
Student ID:
Email:
Course Code:
*/
```

2. Submit your files zipped into the file named **`A3_StudentID.zip`** (e.g., **`A3_809000437.zip`**) to Mr. Inzamam via the email inzamam.rahaman@outlook.com.

3. Late submission penalty: 10% per day, up to five days

End of Assignment 3