Evolutionary computation (CS5048)

In-class activity 03

In this activity, you will implement a simple learning classifier system that replicates the behavior of an XOR gate by using a population of multiplexers. The value of this activity is 6% of the final grade of the course.

The problem

The XOR gate taks two variables as input and produces the corresponding output, which is 1 when the inputs are different, and 0 otherwise. Since the problem will be represented by using an environment of multiplexers, the environment to train the LCS will be:

ID	Instance
E_1	110110
E_2	111010
E_3	110010
E_4	011110
E_5	000011
E_6	101011

The task is to implement a LCS that learns the patters in the environment and produces a set of classifiers that, when working together, behave as the XOR gate.

Implementing a LCS

Implement a simple LCS that solves the problem described above. The following is a simple description of the LCS algorithm.

```
procedure LCS(n, [E])
    [E] ← SHUFFLE([E])
    [P] ← φ
    do
        instance ← NEXT([E])
        [M] ← MATCH(instance, [P])
        if LENGTH([M]) == 0 then
            [M] ← COVERING(instance)
            [P] ← [P] ∪ [M]
        end if
        [C], [I] ← SPLIT([M])
        UPDATE([C], [I])
```

```
        parents ← SELECT([C], 2)
        offspring ← COMBINE(parents)
        offspring ← MUTATE(offspring)
        [P] ← [P] ⋃ offspring
        while LENGTH([P]) > n do
            [P] ← DELETE([P])
        end while
    while stopping condition is met
    return [P]
end procedure
```

Deliverables

Prepare a ZIP file that contains your source codes of the LCS requested and submit it to Canvas. **Please, do not submit other formats but ZIP**. There is no need to submit any additional document but the source codes.

I promise to apply my knowledge, strive for its development, and not use unauthorized or illegal means to complete this activity, following the Tecnológico de Monterrey Student Code of Honor.