CSCI 4588/5588, Spring 2023
Machine Learning II
Partial Study Guide for Test#1

Chapter 01

1. Write down the pseudocode for the Genetic Algorithm.

Ans: Genetic Algorithm (GA) is a population-based optimization algorithm. The formation was inspired by natural evolution. A pseudocode for GA is given below:

1. Form the initial population (usually random)

2. Compute the fitness to evaluate each chromosome (member of the population)

3. Select pairs to mate from best-ranked individuals and replenish population
   a. - Apply crossover operator
   b. - Apply mutation operator
4. Check for termination criteria, else go to step #2

Figure: Pseudocode for Genetic Algorithm

2. Write down the pseudocode of the iterative Hill-Climbing Algorithm.

Ans:

```
procedure iterated hillclimber
begin
    t ← 0
    repeat
        local ← FALSE
        select a current string vc at random
        evaluate vc
        repeat
            select 30 new strings in the neighborhood of vc
                by flipping single bits of vc
            select the string vn from the set of new strings
                with the largest value of objective function f
            if f(vc) < f(vn)
                then vc ← vn
                else local ← TRUE
        until local
        t ← t + 1
    until t = MAX
end
```

3. Write down the pseudocode of the Simulated Annealing Algorithm.
Ans:

```
procedure simulated annealing
begin
    t ← 0
    initialize temperature T
    select a current string vc at random
    evaluate vc
    repeat
        repeat
            select a new string vn
                in the neighborhood of vc
                by flipping a single bit of vc
            if f(vc) < f(vn)
                then vc ← vn
                else if random[0, 1) < exp{(f(vn) − f(vc))/T}
                    then vc ← vn
        until (termination-condition)
        T ← g(T, t)
        t ← t + 1
    until (stop-criterion)
end
```

4. Name ten non-deterministic algorithms (Excluding Genetic Algorithms, Hill-Climbing, and Simulated Annealing).
Ans:

Particle Swarm Optimization (PSO),
Artificial Colony Optimization (ACO),
Artificial Bee Colony (ABC),
Glowworm Swarm Optimization (GSO),
Cuckoo Search Algorithm (CSA),
Firefly Algorithm (FA),
Bat Algorithm (BA),
Monkey Algorithm (MA),
Krill Herd Algorithm (KHA),
Wind Driven Optimization (WDO),
Social Spider Algorithm (SSA),
Artificial Immune Systems,
Conformational Space Annealing, …

Chapter 02

At least 10 questions are coming here.