

# CSCI 4560/6560 Evolutionary Computation

## Assignment Number 2: Due 9/23/2021

### 1. [50 points]

The N-queens problem generalizes the 8-queens problem to the goal of placing N queens on an N by N chess-board such that no queens attack each other. Use a genetic or evolutionary algorithm to solve the N-queens problem. You may download and use an existing EA or implement your own. You should try to solve the problem for the highest possible value of N that your program can handle in 1000000 fitness evaluations. **Turn in a printout of your code and some sample solutions (for low values of N).** If you use an existing package, you should only turn in a printout of the parts you modify/introduce such as the fitness function.

### 2. [50 points]

The Traveling-salesperson problem is stated as follows. Given a set of N cities, find a tour that minimizes the total distance traveled while visiting all the cities and returning to the point of origin. In this assignment you should use the locations of the cities in the file:

`cobweb.cs.uga.edu/~khaled/ECcourse/TSPDATA.txt`

and use Euclidean distance. The file has the X and Y coordinates 127 cities.

Use an evolutionary algorithm to solve the traveling salesperson problem. You may download and use an existing EA or implement your own. You should try to find the shortest tour among the cities. The shortest known tour has length 118282. **Turn in a printout of your code and your solutions.** If you use an existing package, you should only turn in a printout of the parts you modify/introduce, such as the fitness function.

### Note:

- A large collection of GA and EC packages can be downloaded from the web. The following are some recommendations, courtesy of our TA Mohammad.
  - Python : pyevolve, DEAP, GeneAI, Pystep, Pyvolution,
  - Java : jgap, jenetics
  - C++: GAlib
  - C: GAUL
- Regarding the N-queens problem, as you will use different machines in different environments, getting a solution for a higher value of N will not be a critical factor in evaluation. However, using intelligent operators and/or strategies will earn more credit. As this is the first programming assignment, a program that works correctly and solves the problem for some reasonable value of N will earn at least 80% of the grade regardless of optimality.

- You can use the same program (with some modifications) to solve both the N-queens and the Traveling-salesperson problems. The only part that **needs** to be different is the fitness function. On the other hand, if you choose to write two different programs you are welcomed to do so as long as you finish on time.
- **You should also include a brief description of your problem formulation (representation, parenthood selection, mutation, crossover, survival selection) for each part.**