CIT CORK INSTITUTE OF TECHNOLOGY

INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Metaheuristic Optimization

Lab: Genetic Algorithms for the N-Queens problem

N-Queens Problem

The N-Queens Problem) involves placing N queens on an NxN chess board such that no two queens attack each other. Recall that two queens attack each other if they are either in

- The same column
- The same row
- The same diagonal

To convert this satisfaction problem to an optimisation problem we will consider a candidate solution to be an assignment of a board position to each of N variables. The fitness of a solution (which we wish to minimise) is the number of attacking pairs of queens.

Lab Work.

Write a program that takes an input integer, N, from the user and solves it using a genetic algorithm. You must choose an encoding/representation for your candidate solutions, a crossover and mutation operator, and decide on the values for the standard parameters (maximum number of iterations, mutation rate, population size).

Your GA should use truncation selection, and allow elitism as a parameter.

You should create two versions, one where the encoding allows repetition and one where it does not.

Note that we know the optimal value for this case so our stopping condition has two components, the optimal value of 0 or the maximum number of iterations.

Consider how we would change this to a maximization problem and how we would compute the optimal value.