



Search and Optimisation/Machine Learning 1, Course Assignment 2016

This assignment is about using search and optimisation methods to find approximate solutions to the n -queens problem.

Requirements:

- The size of the board and the number of queens n must be a hyper-parameter (selected by the user).
- Find approximate solutions to random instances of the problem using the following methods:
 - A *creeping random search* method. The local:global search ratio and other hyper-parameters you deem fit, should be inputs to your algorithm (i.e. the user can change them). Do not use a library – you are expected to implement the algorithm yourself.
 - *Simulated annealing*. Any hyper-parameters you deem fit should be inputs to the algorithm. Do not use a library – you are expected to implement the algorithm yourself.
 - *Genetic algorithms*. Again, any hyper-parameters you deem fit should be inputs to the algorithm. You are allowed to use a genetic algorithm library to implement this (however, the problem is simple enough that you shouldn't need to).
- Evaluate the performance of all three methods using at least four instance sizes (size of the board and number of queens) – choose your sizes wisely. You can use random instances. Structure your evaluation as follows:

1. Instance name: 8-queens (random)

CRS method: *<setup>*

SA method: *<setup>*

GA method: *<setup>*

Results: *<your evaluation, comparison>*

Expected results: *<observations>*

...

...

and so on...

- Write a report that:
 - Describes how you used each technique to tackle the problem (e.g. design, fitness function, chromosome, encoding, operators, etc...).
 - Contains an evaluation contrasting and comparing the results, strengths, weaknesses, and limitations of all three methods. I expect proper experimental procedure discussing your setup, expected outcomes, results, and a good discussion.

Other instructions:

- Use your better judgment when choosing the instances to deal with (do not choose trivial problems nor unreasonably complex ones – you are expected to understand what you’re dealing with).
- If you choose to implement this assignment in any language other than C, C++, BASIC, Pascal, Java, C#, Objective C, Matlab, or Python, let me know beforehand.
- DO NOT print the source code of your program in the report.
- On a CD accompanying your report, YOU MUST:
 - Include the source code.
 - Provide an executable version of your program (in general, I expect to “double click” on your executable and be able to run your program – assume I’m running a clean installation of Mac OS X, or Windows 8+).
 - Copies of any data sets used.
 - DO NOT create an installer.
 - Include a soft copy of your report.
 - WRITE YOUR NAME AND ID ON THE CD.
- Plagiarism will not be tolerated.
- Any other University, or Faculty assignment requirements apply.

The deadline for this assignment is Friday 27th May 2016 at 17:00

Please submit your report and CD to the ICS departmental secretary.