

G52AIM Lab 2 – Iterated Local Search Report Exercise Sheet

1 REPORT [50 MARKS]

These questions are designed to test your knowledge and intuition. We are only looking for short 1 or 2-line answers. You may optionally include any of the following to complement your answers:

1. Drawings (i.e. pen and paper illustrations) of the search landscape.
2. Figures generated using the G52AIM framework; for example, boxplots or progress plots.
3. Statistical tests, ensuring you state the test used, the outcome of the test, and what it means!

The report template can be found on Moodle under the section Lab 02 and named usernamehere-lab02-report.docx.

2 QUESTIONS

Question 1

Iterated Local Search (ILS) combines perturbative and local search heuristics by applying them in succession before evaluating its move acceptance criterion. The version of ILS implemented during the lab uses a random bit flip heuristic as the perturbative heuristic and Davis's Bit Hill Climbing (accepting only improving moves) as its local search heuristic. What advantage(s), with specific reference to ILS's ability to explore and overcome search landscape features, does this version of ILS have over a basic local search procedure using DBHC?

Questions where you are asked what you would expect do not require you to run any experiments. They are understanding based questions which require only a valid reason to justify your answer.

Question 2

ILS, as implemented in the lab, embeds two parameter settings, intensity of mutation (IOM) and depth of search (DOS). These are integer values which correlate to the number of times each perturbative and local search heuristic is applied before moving on to the next step in the algorithm.

Q2A:

What would you expect would happen, with specific reference to ILS's ability to explore and overcome search landscape features, if its configuration had **IOM is set too low** and **DOS too high** and why?

Q2B:

What would you expect would happen, with specific reference to ILS's ability to explore and overcome search landscape features, if its configuration had **IOM is set too high** and **DOS too low** and why?

Question 3

Given a short computational budget of 1 second, would you expect DBHC or ILS with $IOM = 1$ and $DOS = 1$ to have the better average performance? You should explain your reasoning which lead to your conclusion.

Question 4

Given a longer computational budget of 30 seconds, would you expect DBHC or ILS with $IOM = 1$ and $DOS = 1$ to have the better average performance? You should explain your reasoning which lead to your conclusion.

Questions where you are asked "does..." requires you to run experiments to properly answer the question. You should think carefully about your experimental design, use of statistics, and your conclusion(s).

Question 5

Given a computational budget of 15 seconds, does DBHC (OI) or ILS with parameter settings of $IOM = 2$ and $DOS = 2$ perform the best for solving MAX-SAT instance 2? As with last weeks exercise, you should back up your answer with some form of statistically valid reasoning. **Note that** it might be easier to edit Lab01TestFrameConfig to run the respective configuration when testing DBHC.

3 MARKING CRITERIA

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|------------------------------------------------------|-------------|
| 1. Valid answer. | [10 marks]. |
| 2. | |
| a. Valid answer with explanation. | [10 marks]. |
| b. Valid answer with explanation. | [10 marks]. |
| 3. Valid answer with explanation. | [5 marks]. |
| 4. Valid answer with explanation. | [5 marks]. |
| 5. Correct answer with statistically valid evidence. | [10 marks]. |

4 SUBMISSION

Deadline: Tuesday 20/02/2018 – 15:00

You should submit a single PDF file called **[username]-lab02-report.pdf** to Moodle under **CW2b**.