Lecture 4 - Simulated Annealing, Tabu search

Simulated Annealing

- Behaves like greedy local search and always accepts improving moves
- If a neighbour solution j is worse than the current solution i, j will be accepted (or not) depending on the “temperature” parameter c and the amount of deterioration f(i) - f(j).
- Early on, when the “temperature” is high, accepting a non-improving move is more likely than later on
- Guaranteed to give you as good results as local search, on average “probably” better.
- Runs longer on average than local search.
- The temperature decreases with time.
- Starting temperature is important, if its too low it will behave like greedy, if too high like random. When landscape is smooth we don’t need a high starting temperature, if its rough we will need a high starting temperature.
- A stopping condition can be the number of iterations without improvement.

Tabu Search

- Very similar to steepest, with additional adaptive memory
    - If there is no improvement in the neighbourhood (steepest would halt), accepts the neighbour that deteriorates the least.
    - Keep a list of already evaluated solutions to not visit them again.
    - One variation is storing moves instead of solutions
- A stopping condition can be the number of iterations without improvement.

On-line vs Off-line optimization

- The off-line approach to optimization is only concerned with the final result of the optimization algorithm, or rather its fitness value
- The on-line approach works in real time, continuously, and therefore we are not only interested in getting better solutions, but also how quick can an algorithm find those solutions.
- To evaluate the on-line optimization algorithm, you would use the average of all solutions, whereas for the off-line algorithm you would only need the best solution.