INF3490/INF4490 Exercises - Week 3

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$\mathbb{P}$ marks the programming exercises, we strongly recommend using the python programming language for these. Exercises may be added/changed after publishing.

1 Evolution strategy(ES)

1.a

A common variant of evolution strategies used for (local) search is the $(1+4)$ ES. How would this differ from the $(1+1)$ ES in how the search space is explored? How does this, and $(1+\lambda)$ in general, compared to hill climbing and greedy search?

1.b

What effect does an adaptive search strategy have on optimization performance?

1.c

How would it affect the search if the strategy parameters were mutated after the solution parameters instead of before?

2 ES Implementation

$\mathbb{P}$ 2.a

Ignoring mutation, and starting with the population $\{1, 2, 3, 4\}$, implement and run 3 generations of a $(4+8)$ ES maximizing $g(x) = x$, and observe what the end population looks like (use intermediary recombination).

2.b

If a $(4, 8)$ ES had been used in Problem 2.a, what would the probability of the optimal solution ($x = 4$) surviving the first generation have been?

$\mathbb{P}$ 2.c

Repeat Problem 2.a with an EP with $q = 2$. How do the two algorithms compare?

3 Knapsack problem

In a 0-1 **knapsack problem**, how could you implement a repair mutation to transform infeasible solutions into feasible ones (i.e. make the sum of costs of the selected items go below the budget)?

Corrections and suggestions

Corrections of grammar, language, notation or suggestions for improving these exercises are appreciated. E-mail me at: **olehelg@uio.no** or use **GitHub** to submit an issue or create a pull request.