Artificial Intelligence

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Homework 1 Iterated Local Search for Travelling Salesman Problem

Grade

The project grade, corresponding to 30% of your final grade, is given by a weighted average of your performance in the homeworks (**10%**, 25%, 30% and 35%).

Deadline

This homework must be submitted **Tuesday 18 October 2022** at **23:59** (time in Lugano).
The solution will be presented during the TA session following the assignment due.

Instructions

Implement the *Iterated Local Search (ILS)* in the three variants of the acceptance criterion that is described in the paper "Iterated Local Search: Framework and Applications":
1. Better
2. Random Walk (RW)
3. Large Step Markov Chain (LSMC)

The 2-opt local search is provided as a black-box, and the notebooks "Introduction to the TSP" and "ILS for the TSP" can be used to run your experiments.

Implement the *Double-Bridge perturbation* and the *Iterated Local Search*, evaluating your implementation for the following instances:
1. d198 (small size problem)
2. pr439 (medium size problem)
3. u1060 (medium-large size problem)

Test your implementation from at least three different starting seeds and show for each problem and variant of the ILS (with statistics, we refer to average and standard deviation values):
1. the statistics of the local search calls made during the search
2. the statistics of the percentage gap from the optimal value
3. the best result obtained during the search

The implementation has a limit of 3 minutes to run on each instance.

Submission

Deliver your code as a **Python Jupyter notebook file** and include a short *report* which briefly discussed your results and concisely provides evidence that you have accomplished each of the tasks listed above. It can be a pdf file, or it can be included in the Jupyter notebook file.