14h Artificial Intelligence CUP, Faculty of Informatics, USI, Lugano, 2019

The traveling salesman problem (TSP) probably is the most prominent problem in combinatorial optimization. Its simple definition along with its notorious difficulty has stimulated (and still stimulates) many efforts to find an efficient algorithm. Due to the NP-completeness of the TSP, only approximate solutions can be expected.
A salesman has to visit N cities with given distances dij between cities i and j, returning finally to his city of origin. Each city is to be visited only once, and the route is to be made as short as possible. A popular special case is the Euclidean TSP, where the cities are given by their positions (xi,yi) in the plane and the distance matrix is computed by the Euclidean distance:

$$d_{ij} = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2}.$$

The work of the student is to propose, implement and test a heuristic algorithm for the solution of the Euclidean Traveling Salesman Problem.

Students are provided with a set of 10 instances (AI_cup_2019_problems.zip file attached. Notice that the Euclidean coordinates (xi,yi) are real numbers but the computed dij distances must be integer. In the zip file for some problems the best known solution is also reported). For each instance students have to compute the shortest possible tour. Students are allowed to run their algorithm on each instance how many times they like with the constraint that each run on a single CPU can not be longer than 3 minutes.
Results must be replicable (in case we need to check the validity of your solutions) so please keep all the parameters of your best runs (remember also to store random seeds).

For each instance the following error is computed:
((student_tour_length – best_known_result)/best_known_result
The average of the 10 errors is the final result of your work. In case more students reach the same average, we consider date and time of the email with the results submission are considered.
The student who obtains the best average result will be rewarded with the 6st Artificial Intelligence CUP and he will have the right to present in class his work to the other students.

At the end of the semester (by December 16th 12.00p.m) each student has to send by email the result of his work and a short document with the description of the adopted approach.
To facilitate the submission an Exel file (AI_cup_2019_studentname.xls) is attached, where all the ten instances are listed. Please change the studentname extension with your real name and send this file and the description by email.

Good work

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