

Métodos de Apoio à Decisão

Assignment 3: Routing

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In this assignment there will be some questions based on the following exercises. In the assignment's class there will be a set of questions in Codex, with the computers set up as in previous classes. The AMPL book and the classes' slides will be available for consulting.

Note 1: You will be able to use *glpsol* and/or the commercial software *AMPL* (<https://ampl.com>); a version with a license for this course is available in <https://www.dcc.fc.up.pt/~jpp/AMPL>. A well-known solver for dealing with integer optimization problems is *gurobi*.

Note 2: You will be given scratch paper. Please do not use any other materials or electronic devices during the class.

Note 3: Even though students are encouraged to work in collaboration with a colleague in the solution of this assignment, each student will have to submit his answers separately.

The Traveling Salesman Problem with Time Windows (*TSPTW*)

You've started a company, located in town 1, for assisting people with difficulties using their computers. You have a set of customers to visit, each of them with a lower and upper bound on the time to be visited (t_{\min} e t_{\max}). The time that it takes to go from one town located in (x_1, y_1) to another town located in (x_2, y_2) can be computed as $|x_1 - x_2| + |y_1 - y_2|$.

Consider the following instance:

	Town	x	y	t_{\min}	t_{\max}
1	Lisbon	31	170	100	200
2	Porto	84	413	600	900
3	Amadora	22	173	900	1000
4	Braga	103	453	500	800
5	Setubal	56	151	100	400
6	Coimbra	103	319	300	500
7	Queluz	19	174	700	1000
8	Cacem	15	175	700	900
9	Vila Nova de Gaia	83	410	500	900
10	Algueirao	10	178	700	900
11	Loures	28	181	800	1000
12	Felgueiras	125	435	300	500
13	Evora	155	155	0	200
14	Rio de Mouro	12	175	700	900
15	Odivelas	26	177	700	1000
16	Aveiro	80	362	500	700
17	Amora	33	161	0	100
18	Corroios	30	162	0	200

Solve the following variants of the problem:

1. Problem 1: minimize the cost (in terms of journey duration) to serve all customers (ignoring service time windows);
2. Problem 2: minimize the lead/lag with which each customer is served, summed for all customers (e.g., if Porto is served at time 599, the *lead* is 1 unit; if it is served at time 905, the *lag* is 5 units);
3. Problem 3: minimize the total time used, satisfying customers with the minimum total delay determined in the previous question.

A text file with the data can be found at <http://www.dcc.fc.up.pt/~jpp/mad/assignment-03.txt>.