MSc in Business Analytics 2022-23

Large Scale Optimization

Competitive Assignment

Teams Declaration: https://docs.google.com/spreadsheets/d/1HZtclCBQB-4bb0T-u2jreWhg3QyJZdTkP7DfA2mNfBA/edit?usp=sharing

(2-4 team members)

Deadline: 15 Jan 2023

The scenario you must deal with is described below:

A. After a natural disaster, relief supplies must be transported to a set of 200 geographically dispersed locations.
B. Each of these locations covers different regions, so it has a predetermined product demand.
C. To transport goods a set of 26 homogeneous vehicles is used, each with a maximum carrying capacity equal to 3 tn.
D. Each vehicle starts its route from a central point $d$ = {0} where the products are located. It then visits some of the 200 service locations.
E. All routes are considered to start simultaneously at t=0.
F. Every service location is served once by exactly one visit of a single vehicle
G. Vehicles are considered to have a constant speed of 40 km/hr.
H. At every service location, an unloading time of 15 minutes is considered. This time is necessary for the unloading operations.

The problem calls for the minimization of the service time completion of the customer to be served last. In other words, all service locations will obviously have a time when they have received their products ($t_i, i = 1 \dots 200$). The problem calls for the minimization of the largest $t_i$ value.

The problem nodes must be generated by the following code which must be integrated to your program:

```
import random
random.seed(1)
nodes = []
depot = Node(0, 50, 50, 0, 0)
cust_num = 200
for i in range(cust_num):
    x = random.randint(0, 100)
    y = random.randint(0, 100)
    dem = 100 * (1 + random.randint(1, 4)) # demand in kg
    unloading_time = 15 # unloading time in minutes
    n = Node(i + 1, x, y, dem, unloading_time)
    nodes.append(n)
```

Grading

- The production of an initial feasible solution is graded with 6 points.
- The production of a feasible improved solution (by means of an improvement algorithm) is graded with 8 points.
- The best solution will be graded with 10.
  The worst solution will be graded with 8 (if it is an improved version of the initial feasible one).
- The rest of the solutions will be linearly graded according to their objective score.

Comments

- You should submit your code (zipped folder).
- This folder must include a .txt file with the solution with the following format (example for a problem with 3 vehicles and 10 customers):

  Objective:
  1.12567 hr
  Routes:
  3
  Routes Summary:
  0,6,4,5,1
  0,9,7,8
  0,2,3,10

- Your code should obtain the final solution reported within approx. 4 minutes of run time on a modern processor.
- If your code uses a random generator, one of the following seed should be used (1, 2, 3, 4, 5)