

Practical Work

In the logistic network of a company, we have a set N of n nodes. For each pair of nodes (i, j) in this network, we have a quantity of product $q_{i,j}$ to be sent from i to j . In addition, let T be the transportation cost matrix, such that $T[i,j]$ represents the unit cost of transportation from node i to node j . In order to organize this network and reduce the transportation cost, we want to install a set of h hubs and assign the rest of nodes to these hubs. The goal is to send the products via these hubs which have reduced transportation costs represented by a matrix TR . For each pair of hubs h_1, h_2 , the unit transportation cost $TR[h_1, h_2]$ is defined by $TR[h_1, h_2] = \alpha \times T[h_1, h_2]$, where $0 < \alpha < 1$. Thus, the products will be sent as follows: suppose that i and j are two nodes assigned respectively to hubs h_1 and h_2 . The quantity $q_{i,j}$ will be sent from i to h_1 , then from h_1 to h_2 , and finally from h_2 to j . Consequently, the transportation cost will be calculated as follows:

$$\text{Cost}_{i,j} = T[i, h_1] \times q_{i,j} + TR[h_1, h_2] \times q_{i,j} + T[h_2, j] \times q_{i,j}$$

To install the hubs, we must choose a subset of h nodes (where we will install them) from the set N , and then assign each node to one and only one hub, with the aim to minimize the total transportation cost.

Work to do:

- 1) Develop a function that read the data of the company from a text file.
- 2) Develop an efficient algorithm to select good hubs for the company.