MMDM

April 2024

1 mathematical model

Firstly let's define parameters using in our model:

- N - number of clients, including flower market
- d_{ij} - distance between i and j customers
- D_i - flower demand for i customer
- L_k - max capacity for courier k
- c_k - delivery cost per kilometer for courier k
- x_{ijk} - binary mask (1 if courier attend customer j after i, 0 otherwise)

Now let's define our target function and restrictions:
min $\sum_{K}^{k=1} \sum_{N}^{i=1} \sum_{N}^{j=1} \mathrm{c}_k * d_{ij} * x_{ijk}$

- Every customer must be attended by only one courier only once
  $\sum_{N}^{j=1} \mathrm{x}_{ijk} = 1, \forall k \in 1, 2, .., K, \forall i \in 1, 2, .., N, i \neq j$

- Max load of every courier must not be larger than max capacity $\sum_{N}^{j=1} \sum_{N}^{i=1} \mathrm{D}_j * x_{ijk} \leq \mathrm{L}_k, \forall k \in 1, 2, .., K$
- Every courier must leave flower market and then come back
  $\sum_{N}^{j=1} \mathrm{x}_{0jk} = 1, \forall k \in 1, 2, .., K$
  $\sum_{N}^{i=1} \mathrm{x}_{i0k} = 1, \forall k \in 1, 2, .., K$
  $\sum_{N}^{j=1} \mathrm{x}_{ijk} \leq 1, \forall k \in 1, 2, .., K$
  $\sum_{N}^{i=1} \mathrm{x}_{ijk} \leq 1, \forall k \in 1, 2, .., K$