Vehicle Routing Problem (VRP)

A seller needs to send trucks with goods to customers.

- Demand of each customer must be satisfied by one truck.

- Truck capacity must not be exceeded for any truck.

- Total distance should be minimized.

Parameters:

n = number of points (1 - depot, $2, \dots, n$ - customers)

d_{ij} = distance from node i to node j

D_i = demand of customer i

C = capacity of each truck

Variables:

x_{ij} = 1 if a truck goes from node i to node j , 0 otherwise

f_{ij} = number of units in a truck going from node i to node j

$$\min \sum_{i=1}^{n} \sum_{j=1}^{n} d_{ij} x_{ij} \qquad (1)$$

$$\sum_{j=1}^{n} x_{ij} = 1 \quad \forall i = 2, \dots, n \qquad (2)$$

$$\sum_{j=1}^{n} x_{ji} = 1 \quad \forall i = 2, \dots, n \qquad (3)$$

$$\sum_{j=1}^{n} f_{ji} - \sum_{j=1}^{n} f_{ij} = D_i \quad \forall i = 2, \dots, n \qquad (4)$$

$$0 \leq f_{ij} \leq C \cdot x_{ij} \quad \forall i, j = 1, \dots, n \qquad (5)$$

$$x_{ij} \in \{0,1\} \quad \forall i, j = 1, \dots, n \qquad (6)$$