EV Fleet Route Planning - Optimization (Write-up in progress)

Aksh Garg - Stanford CS '25

February 2023

1 Variables

1.1 Constants:

- N : Number of Vehicles
- T : Number of Time Steps to Run Optimization For
- C : Number of Charging Stations
- K : Number of Chargers Per Charging Station
- $MROC$: Max Rate of Charge

1.2 Optimization Variables:

- X, (Vehicle Trajectories)
- B (Battery Level of Cars)
- C (How much charge is being provided at a given time step),
- D (Helper var for encapsulating L1 Distance).

1.3 Variables Dimensions:

- $|X| : [N, T, 2]$
- $|B| : [N, T]$
- $|C| : [N, C, T]$
- $|C_{cond}| : [N, C, T]$
- $|C_{diff}| : [N, C, T, 2]$
- $|D| : [N, C, 2]$

2 Constraints

Subject to: (1)

$$0 \leq X_{i,j,k} \leq Size \quad \forall i \in \{1,2,\ldots,N\}, j \in \{1,2,\ldots,T\}, k \in \{1,2,\ldots,D\} \quad (2)$$

$$10 \leq B_{i,j} \leq 100 \quad \forall i \in \{1,2,\ldots,N\}, j \in \{1,2,\ldots,T\} \quad (3)$$

$$D_{i,j,k} \geq 0 \quad \forall i \in \{1,\ldots,N\}, j \in \{1,\ldots,T-1\}, k \in \{1,2,\ldots,D\} \quad (4)$$

$$0 \leq C_{i,c,t} \leq \text{MROC} \quad \forall c \in \{1,\ldots,C\}, i \in \{1,\ldots,N\}, t \in \{1,\ldots,T-1\} \quad (5)$$

$$0 \leq Ccond_{i,c,t} \leq 1 \quad \forall c \in \{1,\ldots,C\}, i \in \{1,\ldots,N\}, t \in \{1,\ldots,T-1\} \quad (6)$$

$$\sum_{k=1}^{D} x_{i,j,k} = 1 \quad \forall i \in \{1,2,\ldots,N\}, j \in \{1,2,\ldots,T\} \quad (7)$$

$$b_{i,j} = b_{i,j-1} + \sum_{k=1}^{D} d_{i,j-1,k} - \sum_{ci=1}^{C} c_{i,ci,j-1} \quad \forall i \in \{1,2,\ldots,N\}, j \in \{1,2,\ldots,T\} \quad (8)$$

$$b_{i,0} = b_{i,0}^{initial} \quad \forall i \in \{1,2,\ldots,N\} \quad (9)$$

(to be continued)