Knut-Knut

By

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in

AI Architecture

Data Analysis

Parsed and Plotted Data

The parsed datasets were visualized for each path configuration. Figure 5 shows the results.

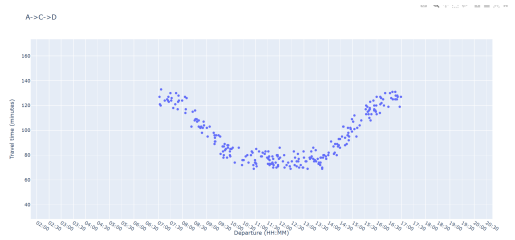

Figure 1: Results for path A → C → D

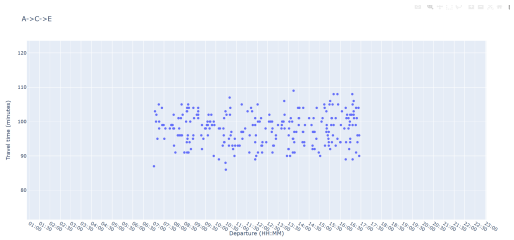

Figure 2: Results for path A → C → E

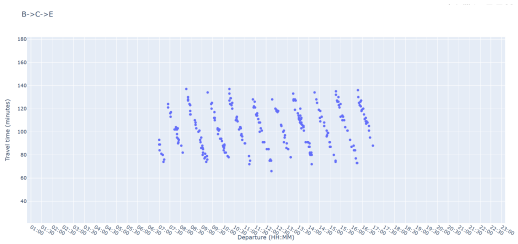

Figure 3: Results for path B → C → E

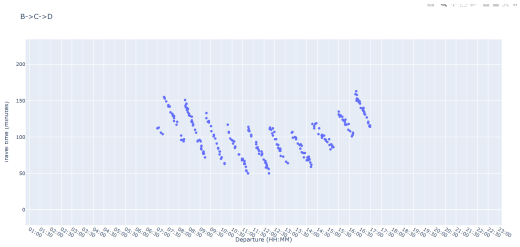

Figure 4: Results for path B → C → D

Figure 5: Parsed and plotted data for all considered paths.

Models Used for Each Path

Based on the visualized traffic patterns, different model types were selected for each path:

- **A → C → D**: Quadratic model

$$\hat{y}(t) = at^2 + bt + c$$

- **A → C → E**: Baseline model

$$\hat{y}(t) = \bar{y}, \quad \bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$$

- **B → C → E**: Single sinusoid model

$$\hat{y}(t) = A \cdot \sin(\omega t + \phi) + C$$

- **B → C → D**: Double sinusoid model

$$\hat{y}(t) = C + A_1 \cdot \sin(\omega t + \phi_1) + A_2 \cdot \sin(2\omega t + \phi_2)$$

Training Results

After training, the models were saved to `trained_model.pkl`. The resulting training losses for each path were:

- A $\rightarrow$ C $\rightarrow$ D: loss = 302.995
- A $\rightarrow$ C $\rightarrow$ E: loss = 20.892
- B $\rightarrow$ C $\rightarrow$ D: loss = 549.636
- B $\rightarrow$ C $\rightarrow$ E: loss = 288.356

At departure time 08:30, the predicted travel times were:

$$\begin{aligned} \text{A} \rightarrow \text{C} \rightarrow \text{D} &: 90.5 \text{ min} \\ \text{A} \rightarrow \text{C} \rightarrow \text{E} &: 97.8 \text{ min} \\ \text{B} \rightarrow \text{C} \rightarrow \text{D} &: 128.0 \text{ min} \\ \text{B} \rightarrow \text{C} \rightarrow \text{E} &: 103.0 \text{ min} \end{aligned}$$

The best path at 08:30 was therefore $\mathbf{A} \rightarrow \mathbf{C} \rightarrow \mathbf{D}$.

Predicted Best Paths Throughout the Day

Table 1 shows the best predicted path and estimated travel time every 30 minutes between 07:00 and 17:00.

Time	Best Path	Estimated Time (min)
07:00	A $\rightarrow$ C $\rightarrow$ D	93.2
07:30	A $\rightarrow$ C $\rightarrow$ D	92.1
08:00	A $\rightarrow$ C $\rightarrow$ D	91.2
08:30	A $\rightarrow$ C $\rightarrow$ D	90.5
09:00	A $\rightarrow$ C $\rightarrow$ D	89.9
09:30	A $\rightarrow$ C $\rightarrow$ D	89.5
10:00	A $\rightarrow$ C $\rightarrow$ D	89.2
10:30	A $\rightarrow$ C $\rightarrow$ D	89.2
11:00	B $\rightarrow$ C $\rightarrow$ D	77.2
11:30	B $\rightarrow$ C $\rightarrow$ D	64.2
12:00	B $\rightarrow$ C $\rightarrow$ D	55.9
12:30	B $\rightarrow$ C $\rightarrow$ D	53.6
13:00	B $\rightarrow$ C $\rightarrow$ D	57.0
13:30	B $\rightarrow$ C $\rightarrow$ D	65.0
14:00	B $\rightarrow$ C $\rightarrow$ D	76.2
14:30	B $\rightarrow$ C $\rightarrow$ D	88.9
15:00	A $\rightarrow$ C $\rightarrow$ D	95.5
15:30	A $\rightarrow$ C $\rightarrow$ D	97.0
16:00	A $\rightarrow$ C $\rightarrow$ E	97.8
16:30	A $\rightarrow$ C $\rightarrow$ E	97.8

Table 1: Best predicted paths and estimated travel times.