Research for Delivery Time Predictions

Considerations

Taking into account the environment, factors and available data of order delivery, I suggest using the help of machine learning models.

The best models for predicting distances and routes are “Graph Neural Networks”. However, we need only to predict time - numerical data.

Therefore, Deep Learning models, like “Recurrent Neural Networks” or “Long Short-Term Memory Networks” are strong contenders. These models are able to recognize patterns and make predictions from data. Deep Learning models can capture complex patterns in traffic data and user behaviour.

1. Predicting delivery times per sector

To validate the hypothesis of predicting delivery times per sector, I would calculate descriptive statistics of actual delivery times for each sector (Sector 1, Sector 2, and Sector 3). I would compare delivery times across sectors using box plots and histograms.

Basically, it was already visible during Delivery Time Analysis.

2. Alternative method/algorithm

Given the skew and outliers in the data, using the median delivery time per sector might be more robust than the mean.

A more advanced approach could involve a regression model that includes the sector as a predictor variable. Additional variables, if available, such as time of day, day of week, or order size, could be very helpful to improve accuracy.

3. Why could some deliveries take more time?

The abnormal sector theory turned out to be true. Some sectors are actually taking more time.

While the data doesn’t explicitly show reasons why some deliveries take more time, it can be reasoned by factors like the absence of elevators, traffic conditions, distance of the delivery location or even delivery personnel availability.

4. What additional data would be worth collecting for future analysis of this domain?

To improve delivery time predictions and analysis, it would be excellent to collect data, such as:

- Traffic data
- Weather conditions
- Distance of delivery
- Time of day and day of the week of the order
- Building accessibility information (e.g., presence of elevator, presence of parking)

5. What is the risk of over- or under- estimating the delivery times?

Risk of Under-estimating:

- Customer dissatisfaction due to late deliveries.
- Loss of trust and potential loss of future business.
- Increased customer service costs due to handling complaints.

Risk of Over-estimating:

- Customers may be discouraged from placing orders if delivery times seem too long.
- Inefficient use of delivery resources, as drivers may have idle time.