



CASE STUDY

Food Delivery Time

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01

Case Study

Food Delivery Time Prediction



A popular food delivery company wants to enhance its customer experience by providing accurate delivery time estimates. They receive a significant number of orders daily, and customers often complain about delayed deliveries.

The company aims to build a machine learning model that can predict the delivery time based on various factors to minimize delivery delays and improve overall customer satisfaction.



Source: Kaggle

(<https://www.kaggle.com/datasets/bhanupratapbiswas/food-delivery-time-prediction-case-study>)

Food Delivery Time Prediction



The company collects historical delivery data, including the following features:

- Courier ID: Unique ID of the courier
- Order ID: Unique ID of the order
- Courier age: Age of the courier
- Rating: Rating given by the customer out of 5
- Restaurant latitude: Latitude of the pick-up point
- Restaurant longitude: Longitude of the pick-up point
- Delivery location latitude: Latitude of the drop-off point
- Delivery location longitude: Longitude of the drop-off point
- Type of order: Four different types of food and beverage services ordered by the customer
- Type of vehicle: Four different means of transport used by the courier
- Time taken: Time (in minutes) taken by the delivery person to deliver the food package. This is calculated by taking the difference between the timestamps of the delivery person's pick-up confirmation and drop-off information





02

Define the problem



My missions

1. Conduct a data-driven analysis about food delivery time

- Handling missing values: Imputing or removing missing or incorrect data
- Defining distance between locations
- Identify delivery performance, delivery service quality, optimize delivery process

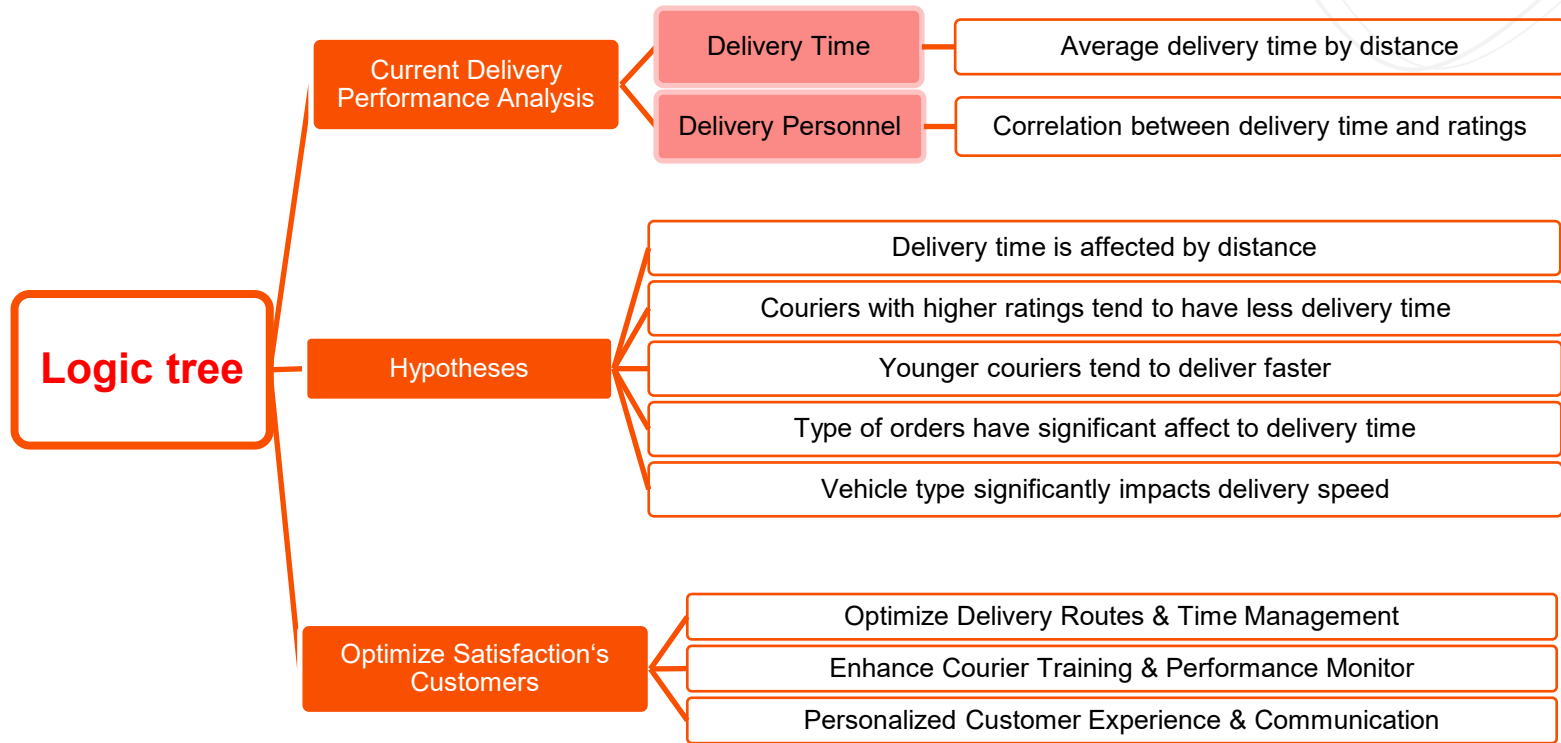
2. Answer the critical business question: **“What should we do to enhance satisfaction’s customers?”**



03

Diagnose the problem

Diagnose the problem





04

Delivery Insight

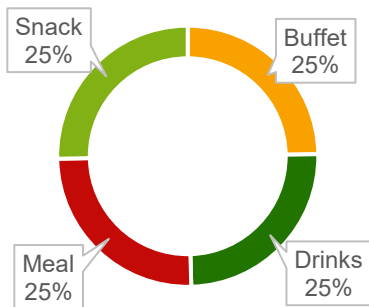
N = 45540

57%
couriers <= 30 years old

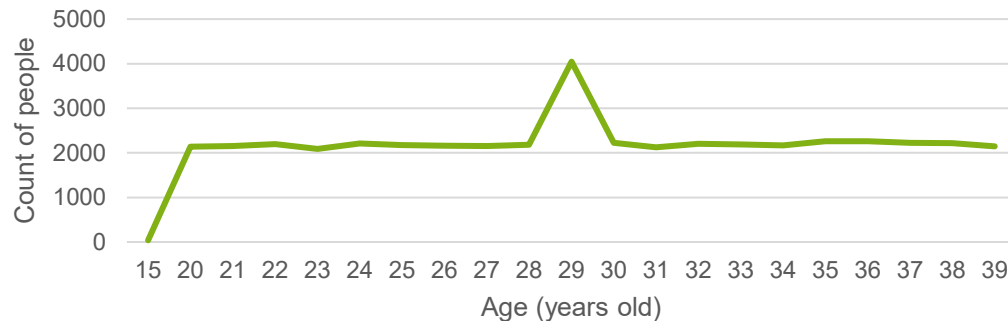
97%
Ratings from 4*

Food Delivery Analysis | Overview

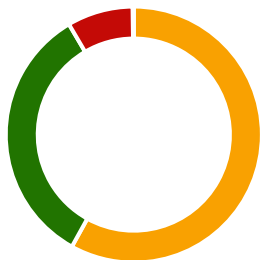
Type of Orders



Age of Couriers

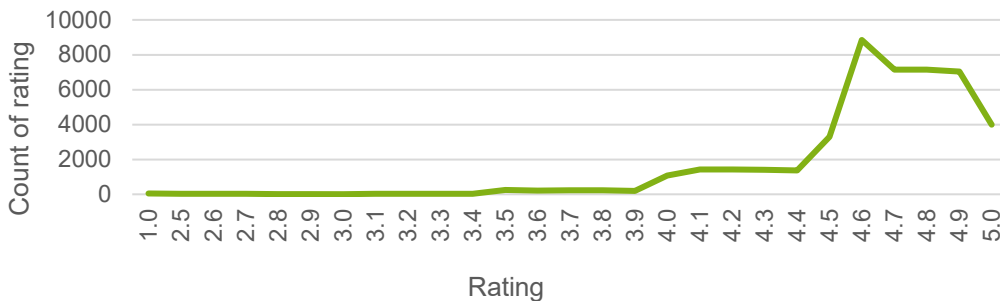


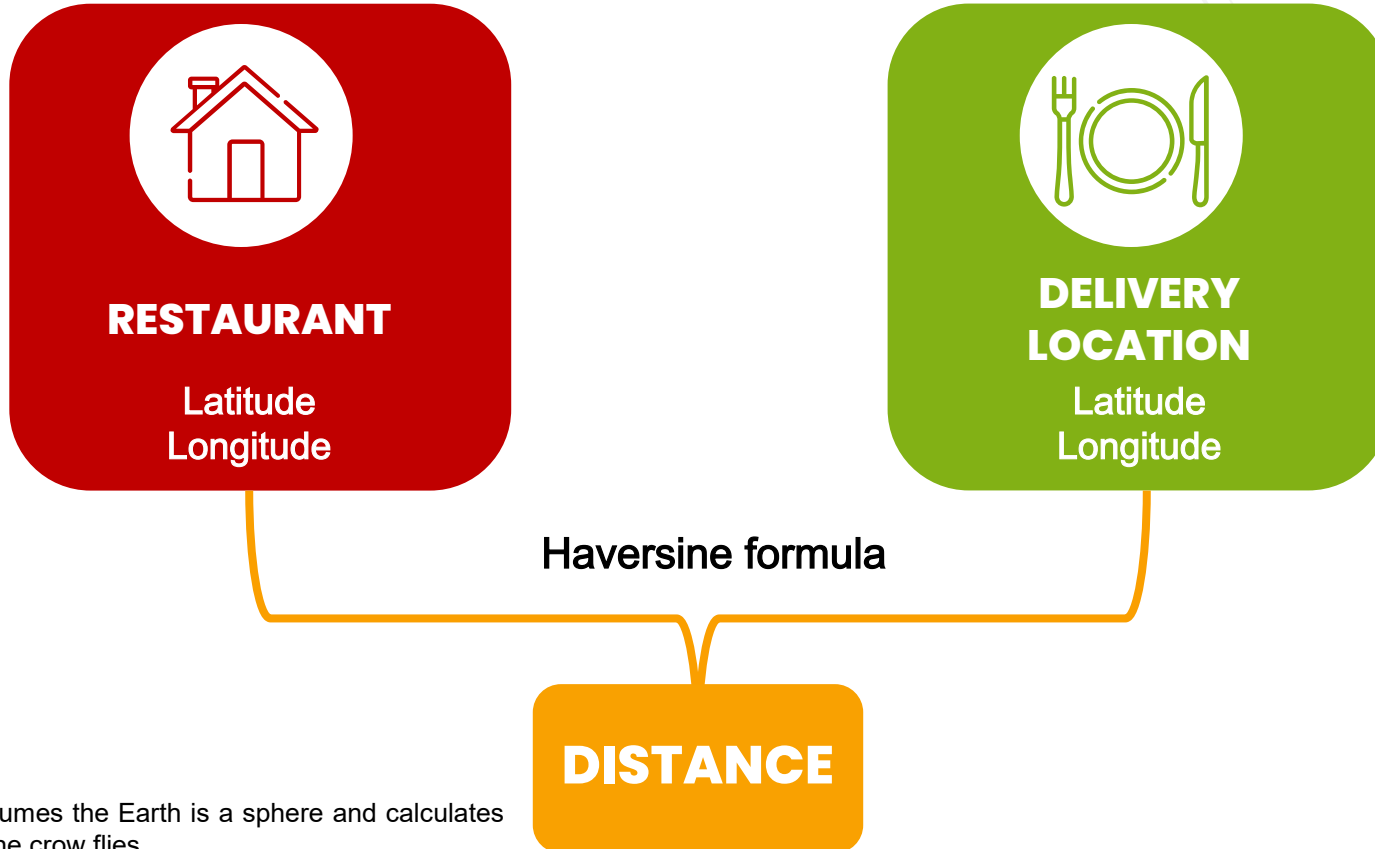
Type of Vehicles



motorcycle scooter electric_scooter bicycle

Ratings





This formula assumes the Earth is a sphere and calculates the distance as the crow flies.

Distance (km)

1.47

9.74

20.97

Min

Average

Max

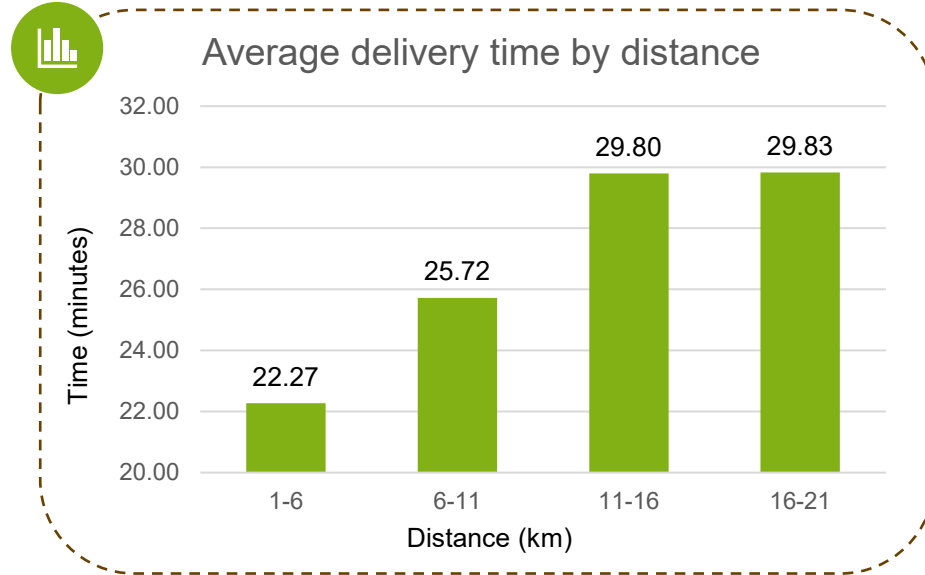
Time (minutes)

10

26

54

Delivery time increases with distance



The increase in delivery time is **not linear**—the time difference between 11-16 km and 16-21 km is **minimal**.

No significant correlation between delivery distance and delivery time



Correlation between distance and delivery time

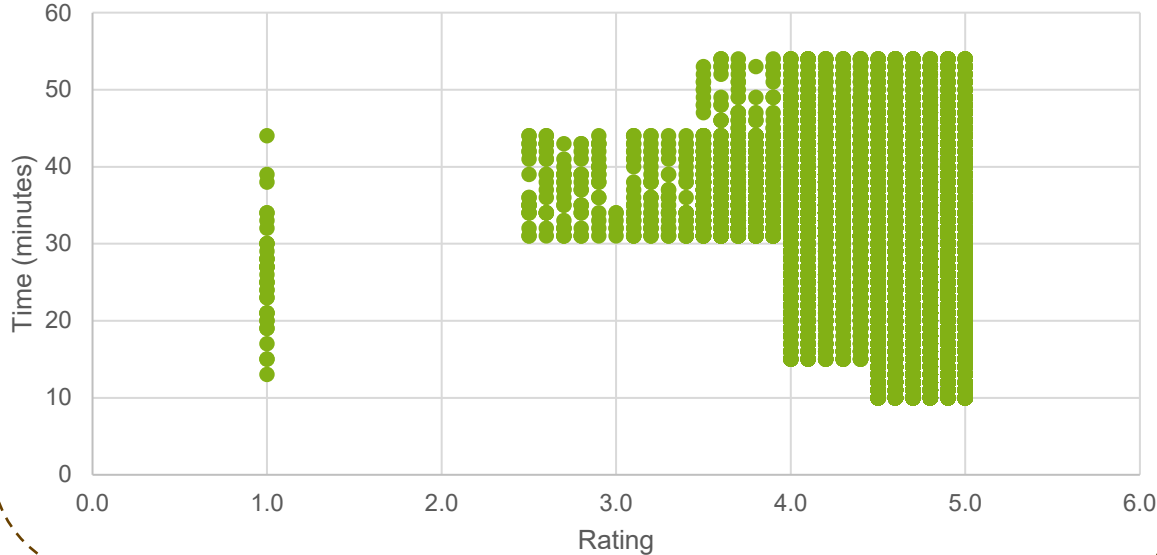


The **R-squared value (r^2)** of **0.1** suggests that only **10% of the variation** in delivery time can be explained by distance, indicating that other factors play a much greater role in determining delivery duration.

Less delivery time **takes** higher ratings



Correlation between ratings and delivery time



- Fast deliveries (**≤ 10 minutes**) receive the highest satisfaction.
- Customer satisfaction **starts declining after 15 minutes**.
- Deliveries **taking 30+ minutes** see a **significant drop** in ratings.
- Most **1-star ratings** come from deliveries within 30 minutes.

Couriers under 30 years old tend to deliver orders approximately 5 minutes faster than older couriers

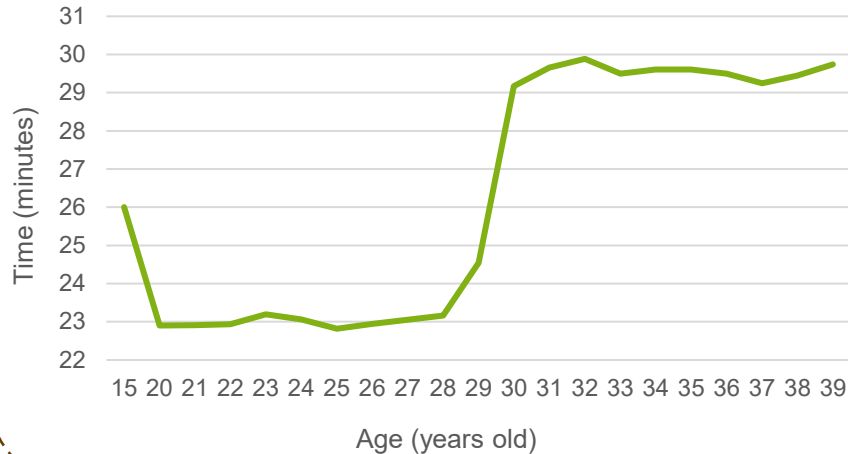
No statistically significant difference in delivery times across different order types



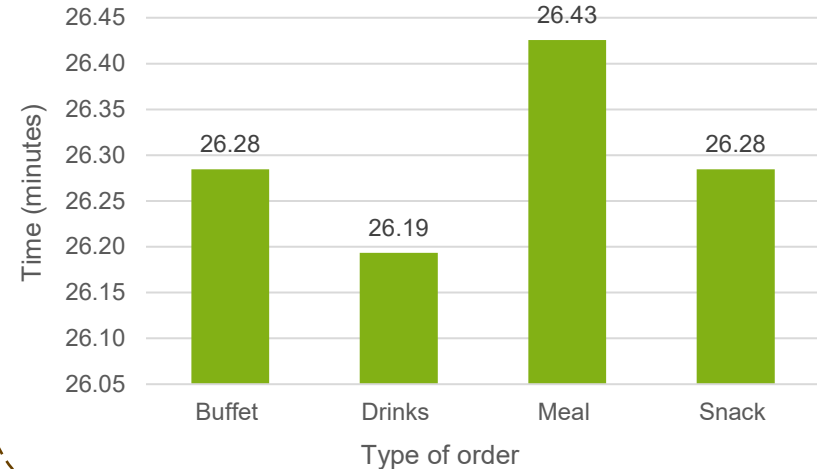
Using ANOVA test shows $p\text{-value} > 0.05$



Courier ages and average time taken



Average of time taken by type of orders



Statistically significant difference in delivery times across different vehicle types

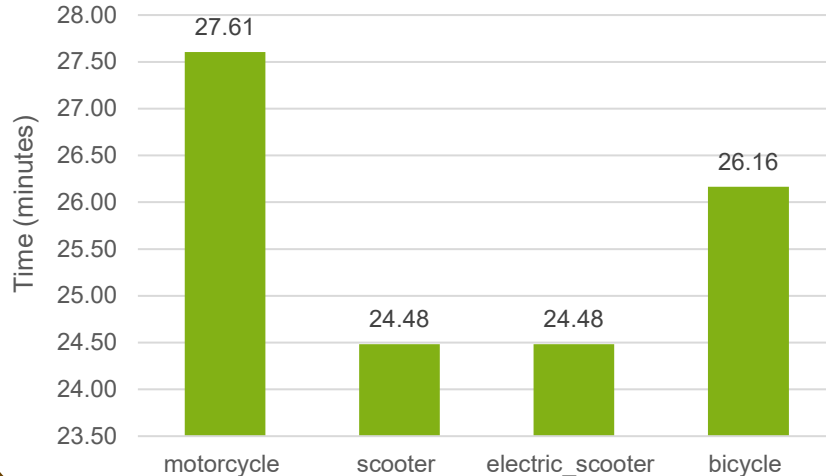


Using ANOVA test shows p-value < 0.05 . **At least one vehicle type** has a significantly different delivery time compared to the others.

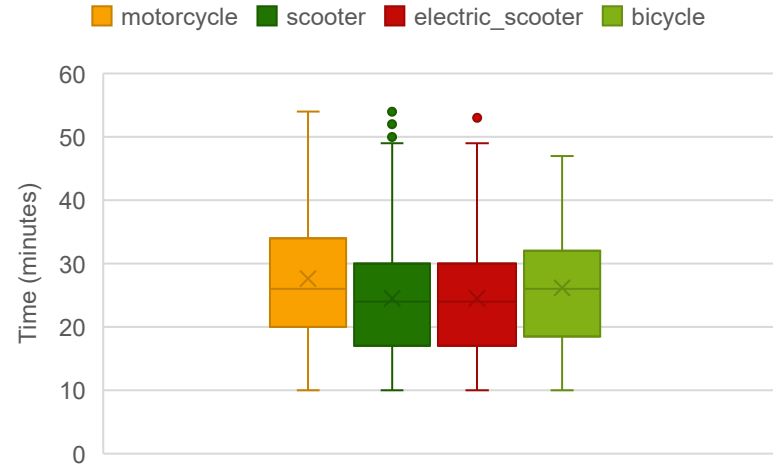
Scooter has **many outliers** → Some orders are experiencing **serious delays**.



Average of time taken by type of vehicles



BoxPlot of type of vehicles





Delivery Insight

- 1. Distance isn't the only factor that affects delivery time**
(traffic conditions, courier experience, route efficiency...)
- 2. Fast-delivery orders receive higher ratings**
(speed is a major driver of positive customer experience)
- 3. Younger couriers are faster than older groups**
(could be due to higher physical endurance, familiarity with routes, or a greater tendency to take risks)
- 4. Different types of orders don't affect delivery time**
- 5. Scooters (both normal & electric) deliver faster than other vehicle types**
(likely due to maneuverability in traffic and ease of parking)



Conclusions

1. Optimize delivery assignments by prioritizing scooters for short-to-medium distances.
2. Encourage fast deliveries by offering incentives for high-rated, quick couriers.
3. Analyze external factors affecting delivery time (e.g., weather, order volume, peak hours)
4. Investigate why certain couriers (especially older ones) are slower—training or better route planning might help.
5. Analyze customer reviews to identify recurring complaints in 1-star ratings.
6. Investigate couriers with frequent low ratings to provide training or feedback.



Thank you!

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