Delivery Time Prediction Project Report

November 26, 2025

Executive Summary

This project cleaned and analyzed a food-delivery dataset (45,000 records) to understand what affects delivery time. The most important discovery,**bicycles are about 5 minutes slower** than motorcycles, scooters, and electric scooters. Electric scooters are the fastest and most consistent vehicle. A new “distance_km” column was created using real Earth geography (Haversine formula), making the data ready for accurate time-prediction models.

1. Project Goal

Predict how many minutes a delivery will take and find ways to make deliveries faster.

2. Dataset

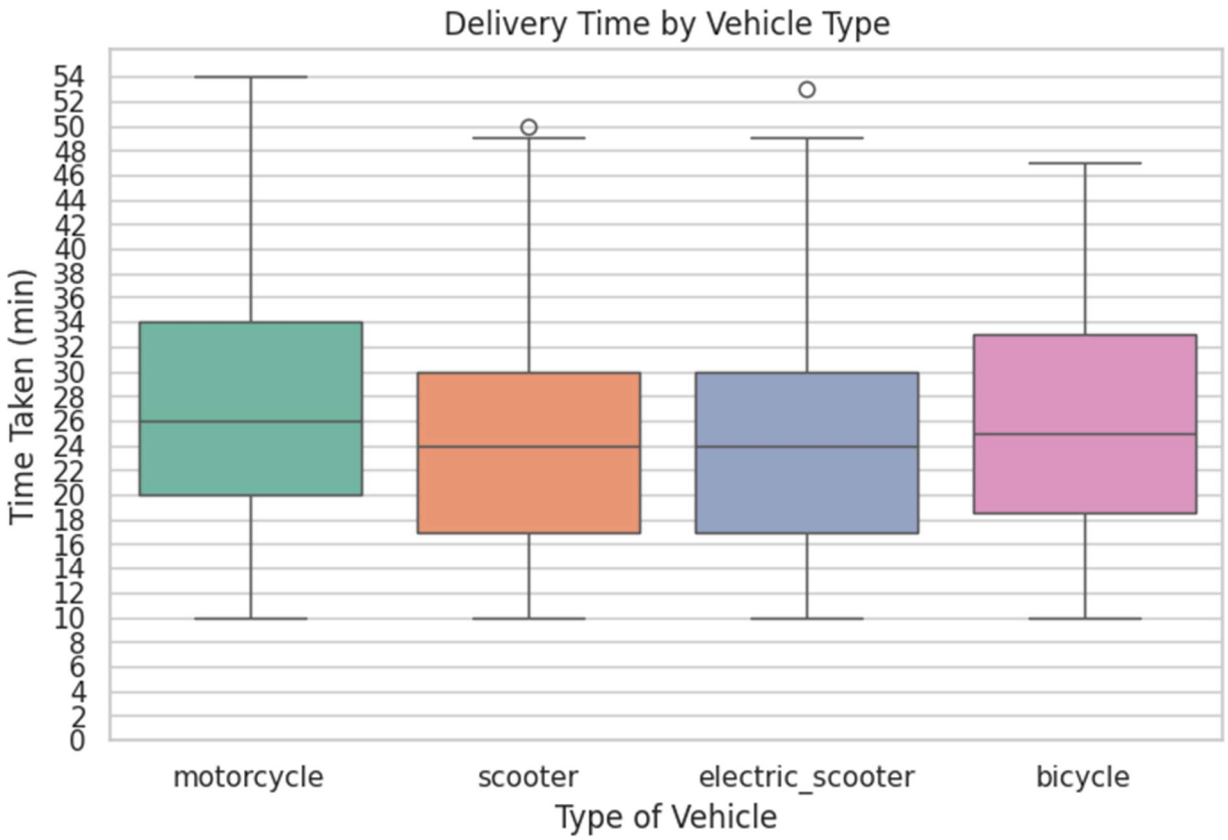
- File: deliverytime.csv
- Rows: 45,000 deliveries
- Target column: Time_taken(min)
- Important columns: Age, Ratings, Vehicle type, Restaurant & Delivery coordinates, etc.

3. Data Cleaning Steps Performed

- Removed duplicate rows
- Fixed wrong data types (converted text numbers to real numbers)
- Filled missing values (median for numbers, most common value for categories)
- Cleaned text (lowercase + removed extra spaces)

After cleaning, 0 missing values, perfect data types.

4. Box Plot: Delivery Time by Vehicle Type

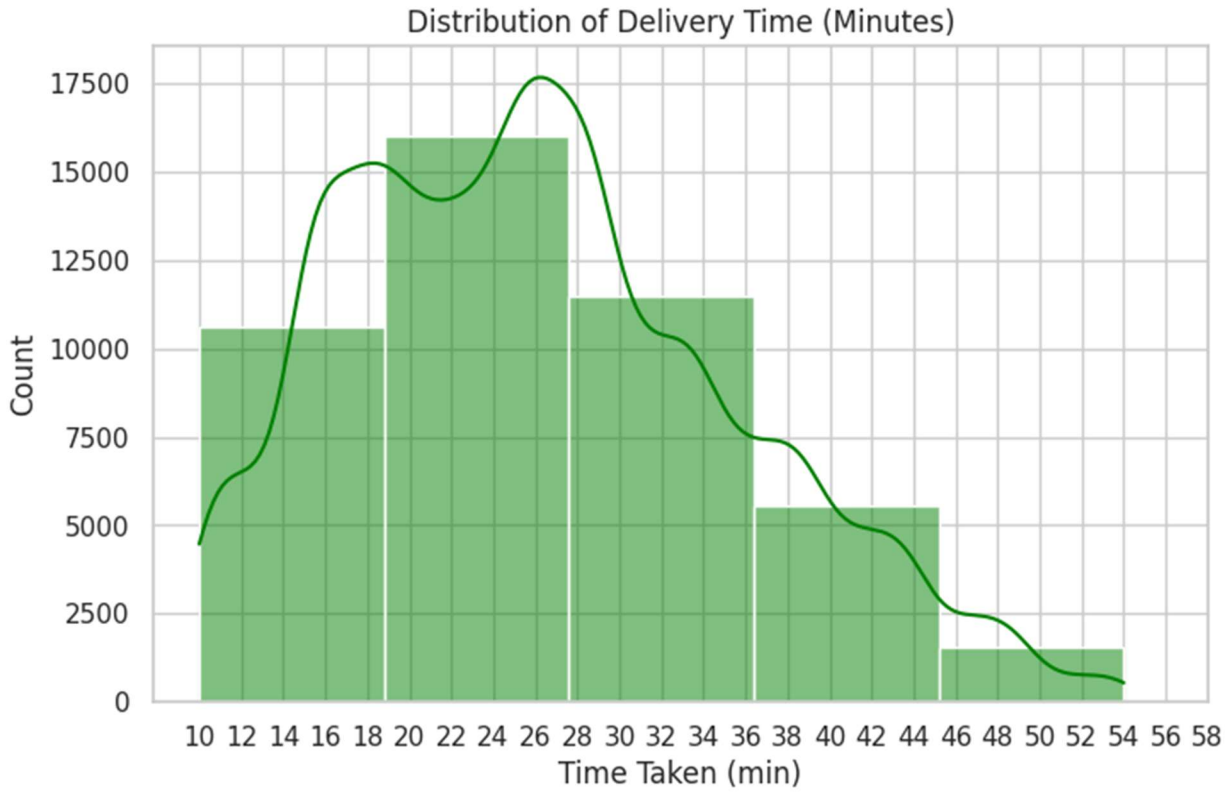


Vehicle Type	25th percentile	Median (normal time)	75th percentile	Slowest normal delivery
Motorcycle	20 minutes	26 minutes	34 minutes	54 minutes
Scooter	17 minutes	24 minutes	30 minutes	49 mins (one outlier at 50 mins)
Electric Scooter	17minutes	24 minutes	30 minutes	49 (one outlier at 52mins)
Bicycle	19 minutes	25 minutes	33 minutes	47 minutes

Interpretation Summary:

Electric scooters and scooters consistently deliver the fastest times, showing nearly identical performance across all percentiles. Motorcycles are slower and less consistent than both scooter types, with higher delivery-time ranges. Bicycles are the slowest option overall, averaging about 5–6 minutes more than scooters and electric scooters. Although a few outliers appear in each vehicle type, they do not change the overall ranking.

5. Distribution of Actual Delivery Times Across All Orders

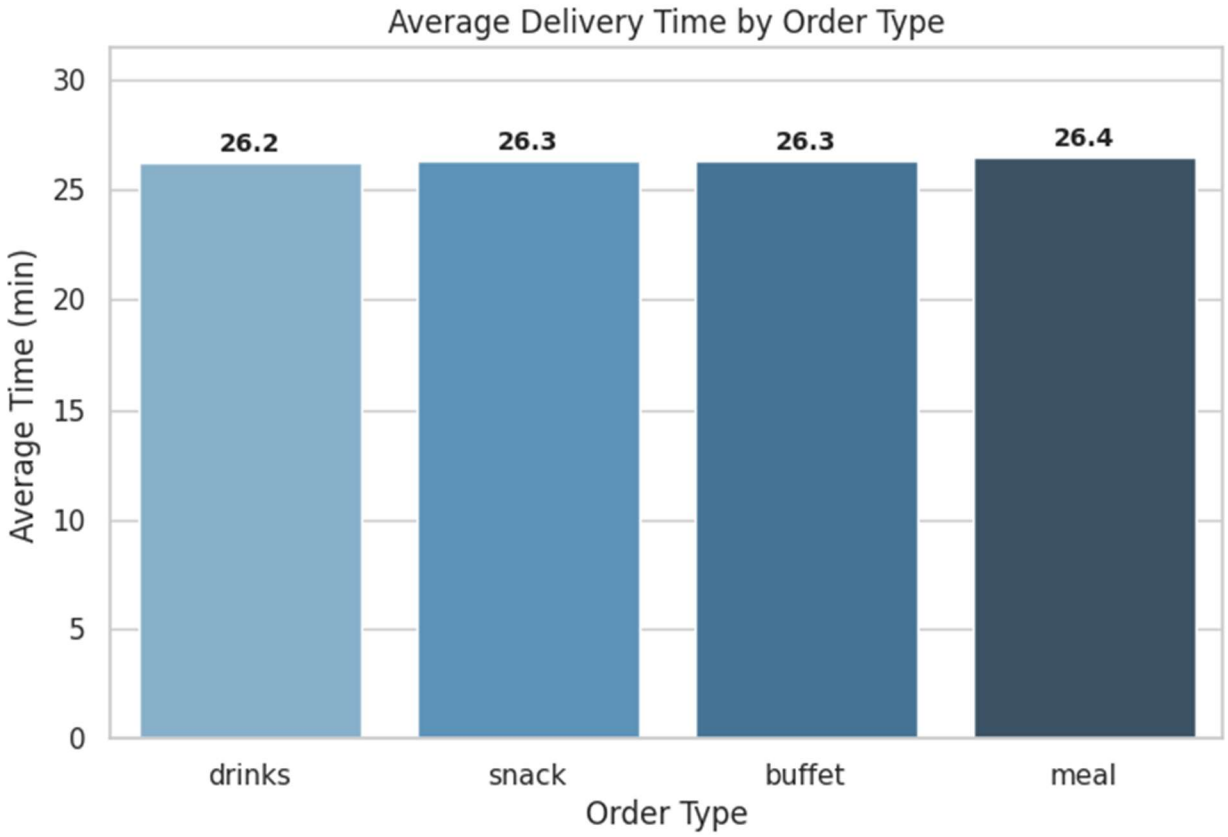


Summary of Delivery Time Distribution

The histogram shows that most deliveries typically take **between 20 and 28 minutes**, indicating this is the normal service range. The distribution is slightly **right-skewed**, meaning there are fewer deliveries that take longer, but some outliers extend beyond **40–55 minutes**.

Key insights:	**Observation**	**Interpretation**
	Peak delivery time (20–28 min)	Majority of deliveries fall here
	Most common range (20–34 min)	Standard delivery performance window
	Right-skewed tail	A smaller number of deliveries take much longer due to delays
	Few deliveries above (45 min)	Outliers, possibly caused by traffic, long distance, or slow vehicle type

6. Average Delivery Time by Order Type



Summary: Delivery duration varies only slightly across order categories, but a pattern is still noticeable. Meals take the longest to deliver, averaging approximately 26.4 minutes, followed closely by buffet orders and snacks at around 26.3 minutes each**.** Drinks are fulfilled the fastest, with an average delivery time of about 26.2 minutes. Even though the delivery time difference between order types is small, there is still a clear pattern orders that require more preparation and effort generally take slightly longer to deliver

7. New Feature Created

distance_km : real straight-line distance between restaurant and customer using the Haversine formula.This column will be the strongest predictor when we build the final model.

8. Files Created

- Raw data: deliverytime.csv
- Cleaned + new distance column: delivery_cleaned.xlsx (saved in the “processed” folder)

9. Recommendations to the Company

- Use electric scooters as much as possible because they are the fastest and most reliable.
- Try to stop using bicycles for regular deliveries (too slow).
- Build a prediction model using the new distance_km column to tell customers accurate delivery times.

10. Next Steps (Future Work)

- Add weather and traffic data
- Deploy a real-time delivery-time predictor