OPTIMIZING TAXI OPERATIONS THROUGH DATA-DRIVEN INSIGHTS

JCDS 2904 - CHRISTIAN

OVERVIEW

Problem Statement

The company lacks insights into when and where taxi operations are most profitable. There is also limited understanding of what factors most influence total earnings and tips. This hampers the ability to make informed operational, pricing, and staffing decisions

Goal

To uncover patterns in time, location, and trip characteristics that significantly impact total earnings and tips. This analysis aims to deliver actionable recommendations that can improve operational efficiency, optimize resource allocation, and enhance revenue.

TAXI SERVICE OPERATORS

responsible for managing fleets and maximizing revenue

CITY TRANSPORTATION MANAGERS

interested in traffic, congestion, and service efficiency

PRICING AND STRATEGY TEAMS

focused on optimizing fare structures and customer satisfaction

DATASET

68211 Rows
20 Columns
4334 Missing Values
174 Invalid Values
43 Outliers

💵 Fare Breakdown

- fare_amount
- extra
- mta_tax
- tip_amount
- tolls_amount
- ehail_fee
- improvement_surcharge
- congestion_surcharge

📍 Location Data

- PULocationID
- DOLocationID
- RatecodeID

👥 Passanger & Distance

- passenger_count
- trip_distance

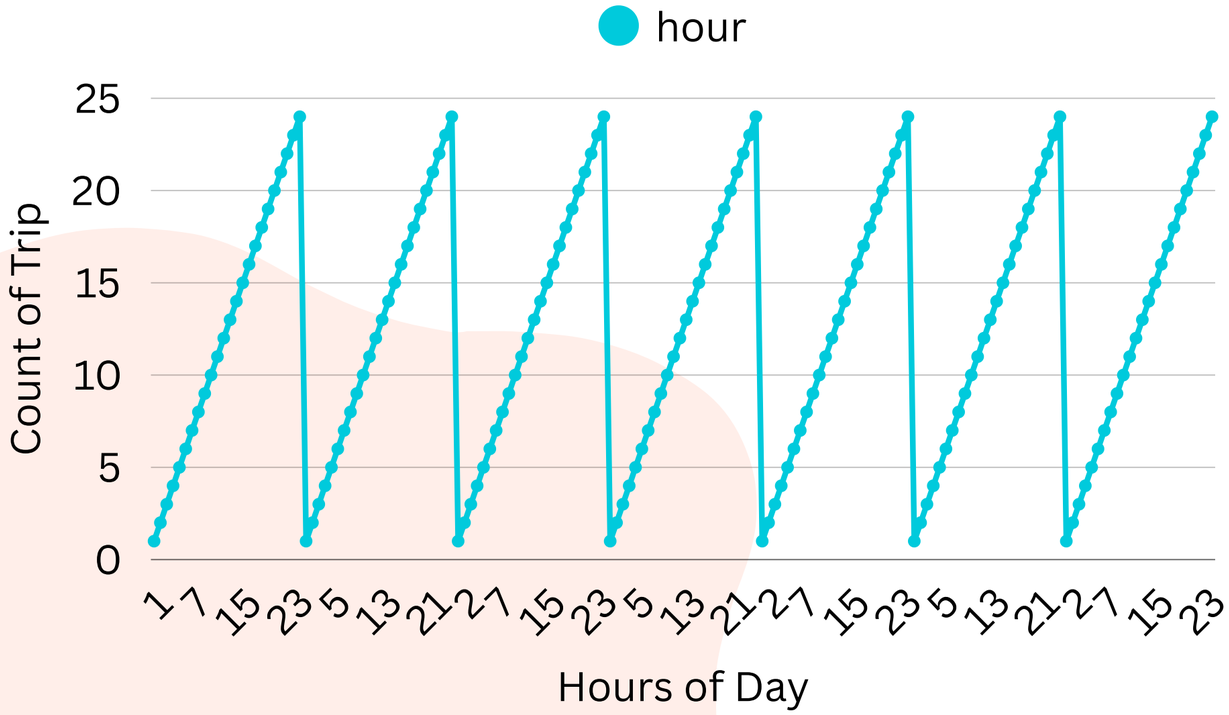
💳 Payment Info

- payment_type

🕒 Trip Info

- VendorID
- lpep_pickup_datetime
- lpep_dropoff_datetime
- store_and_fwd_flag
- trip_type

TRIP & VOLUME TRENDS



- Shows consistent demand peaks on weekdays, especially from 6 PM to 8 PM.
- Visualizes daily rhythm of urban mobility.
- Why it matters: Helps optimize fleet availability during critical hours.

✅ Why it matters: Helps determine fleet deployment and driver scheduling

TRIP HEATMAP BY DAY AND HOUR

Heatmap

Chart: Count of Trips by Day (Heatmap)

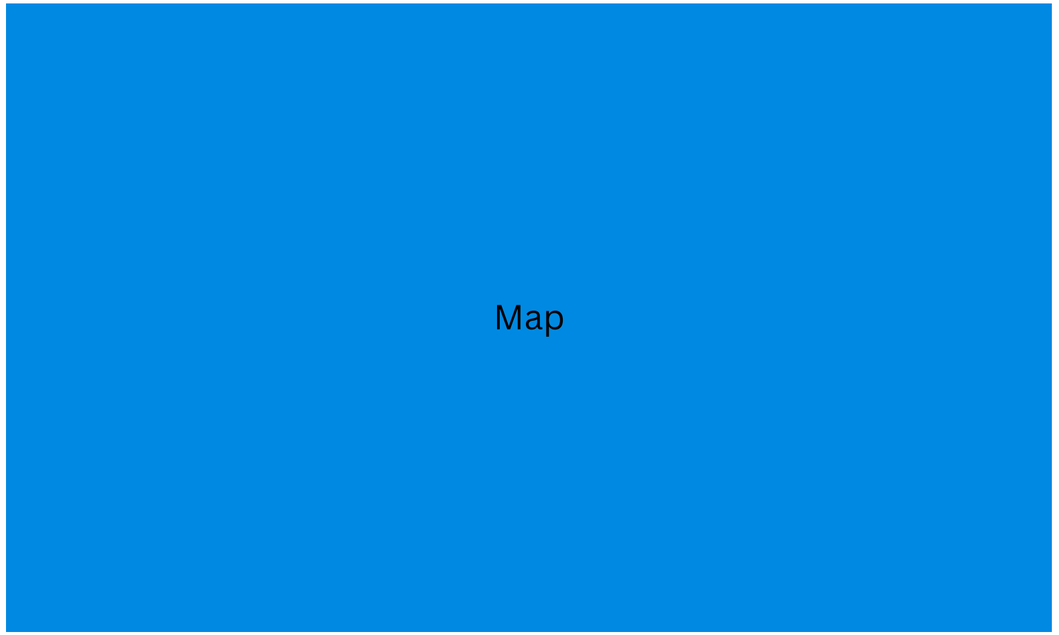
- Insight: Weekdays (Tue–Fri) show strong late afternoon/evening demand
- Suggestion: Annotate peak zones on the heatmap

✅ Why it matters: Supports time-based dynamic pricing or driver bonuses

GEOGRAPHIC PICKUP & DROPOFF HOTSPOTS

- Charts: Pickup and Dropoff Map (Bubble or Heatmap)
- Insight: Manhattan dominates both pickups and dropoffs
- Suggestion: Combine pickup & dropoff into a split-map or side-by-side layout
- ✅ Why it matters: Optimize fleet stationing

PICK UP HOTSPOTS



DROPOFF HOTSPOTS

FARE & TIP BY PAYMENT METHOD

Chart: Horizontal Bar (Avg Fare + Tip)

- Insight: Credit card users give highest tips
- Suggestion: Rename “Unknown” to “Unlabeled” or remove if too small

✅ Why it matters: Consider incentivizing card use to boost tips

Chart: Scatterplot – Distance vs Fare

- Insight: Strong linear trend; some long trips with low fare (potential anomalies)
- Suggestion: Add line of best fit or remove extreme outliers

✅ Why it matters: Monitor for underpricing or

Horizontal Bar

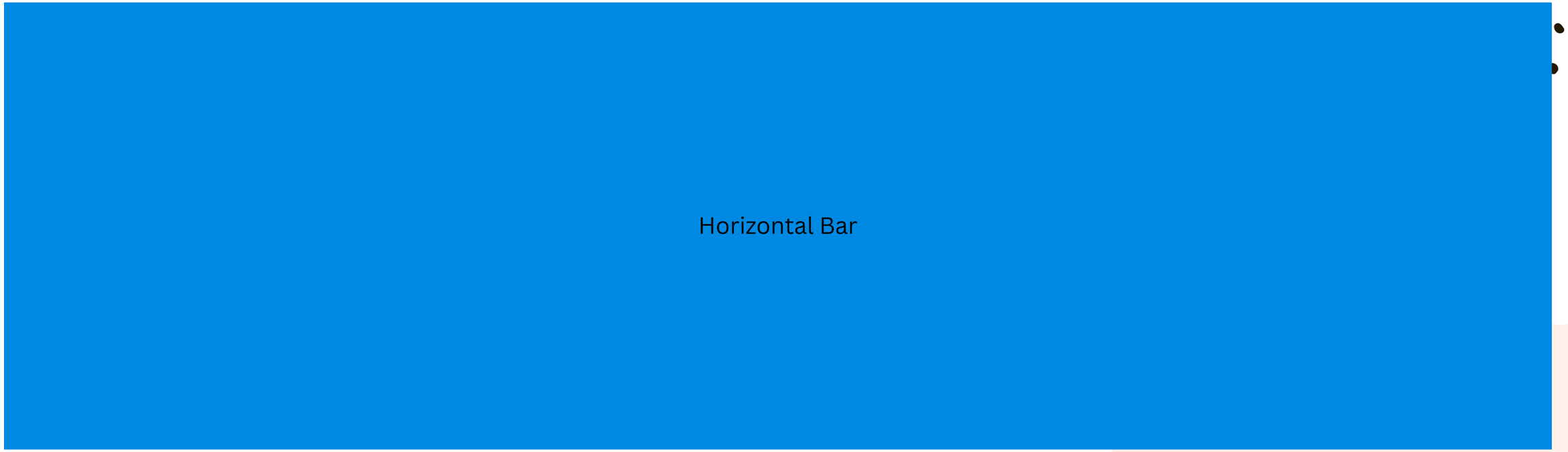
Scatterplot

TRIP LENGTH COMPOSITION

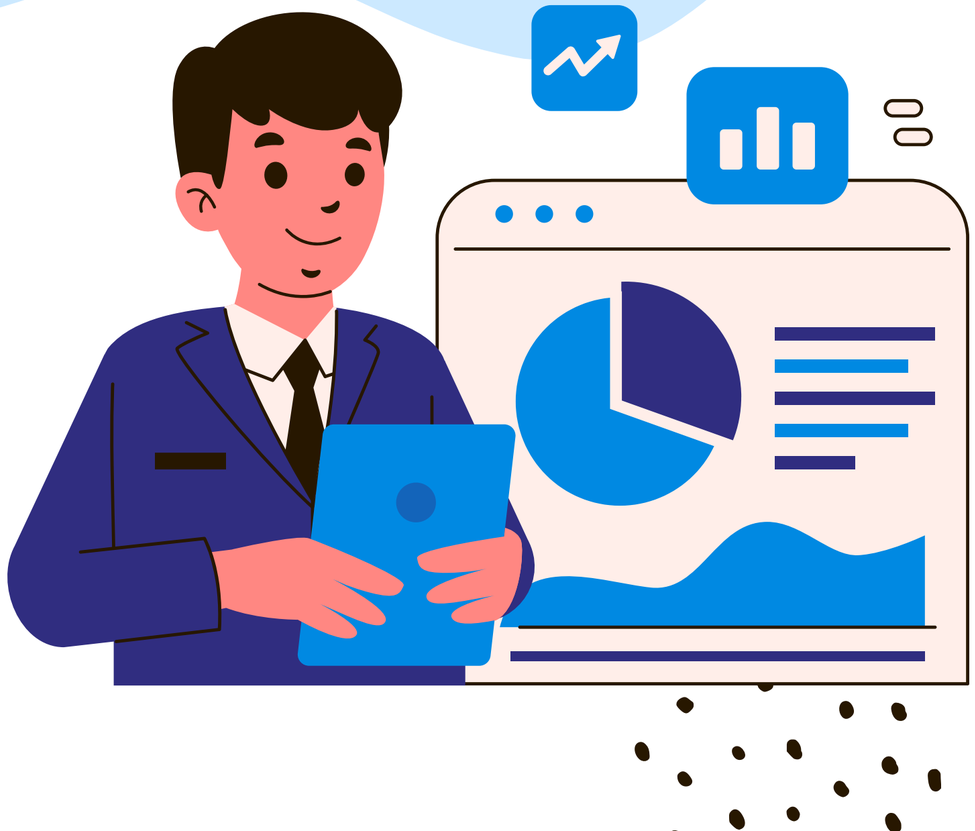
Chart: Bar Chart – Short vs Long Trip

- Insight: ~75% of trips are short (≤3 miles)
- Suggestion: Overlay % on bars for clarity

✅ Why it matters: Influences fuel usage, driver fatigue, and pricing strategy



CONCLUSION



- DEPLOY MORE DRIVERS DURING PEAK TIMES. (EVENINGS, WEEKDAYS)
- FOCUS FLEET AROUND MANHATTAN & QUEENS.
- PROMOTE CARD USAGE TO RAISE TIPS.
- MONITOR LONG-LOW-FARE TRIPS FOR PRICING ERRORS OR INEFFICIENCIES.

RECOMMENDATIONS

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- FOCUS FLEET AROUND MANHATTAN & QUEENS.
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- MONITOR LONG-LOW-FARE TRIPS FOR PRICING ERRORS OR INEFFICIENCIES.

THANK YOU