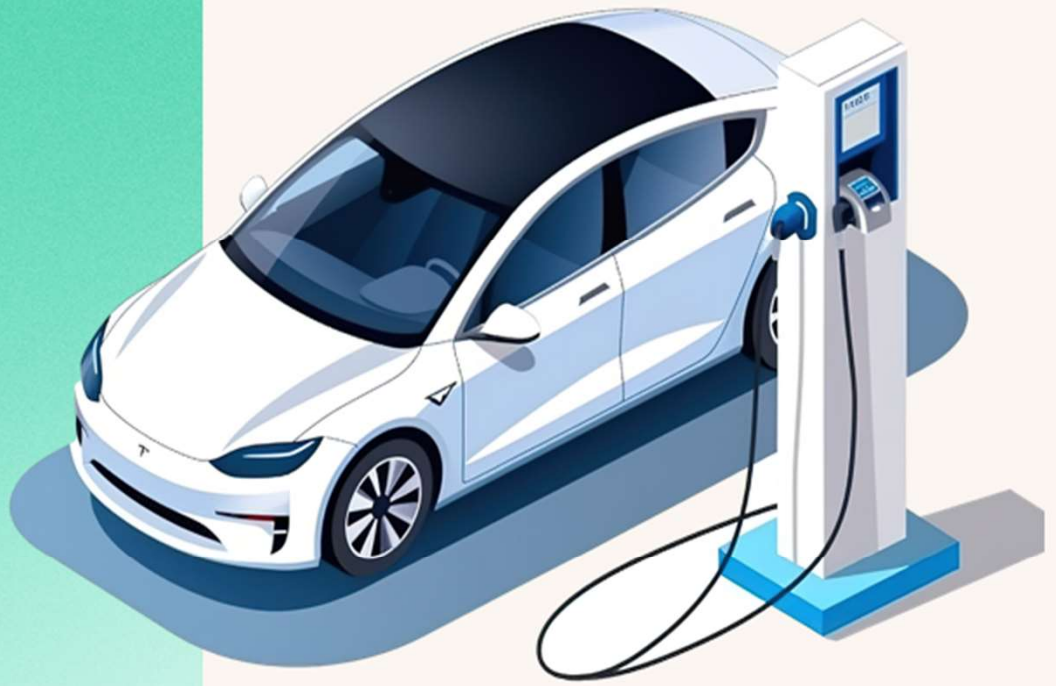
ELECTRIC VEHICLE SALES BY STATE IN INDIA



PRESENTED BY :

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DATA ANALYST INTERN

TOOLS USED : PYTHON, SQL, EXCEL, POWER BI

UNIFIED MENTOR PRIVATE LIMITED

DATE :

Executive Summary

- India's EV market has approx 4 million total sales, indicating strong nationwide adoption.
- EV sales have grown 77.2% Year-over-Year, confirming rapid acceleration in recent years.
- Uttar Pradesh leads EV adoption with ~732K sales, followed by Maharashtra and Karnataka.
- Two-wheelers dominate the EV market, contributing over 50% of total sales.
- Clear seasonal demand patterns, with higher sales in the last quarter of the year.

Business Impact

- Supports data-driven decisions for policy planning, EV infrastructure rollout, and market expansion strategies.

Problem Statement & Objectives

Problem Statement

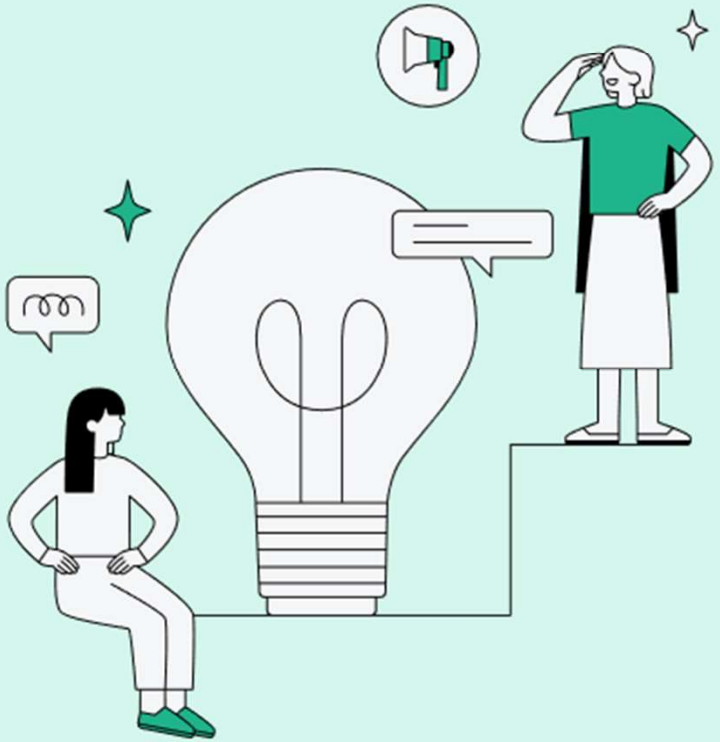
EV adoption in India varies significantly across states, vehicle categories, and time periods, making it difficult to prioritize investments and policies.

Objectives

- Analyze EV sales trends over time.
- Identify top-performing states.
- Understand vehicle category and type dominance.
- Detect seasonal sales patterns.

Why it matters ?

- Policymakers need clarity on where adoption is strongest.
- Businesses must identify dominant EV segments.
- Infrastructure planning depends on regional demand trends.

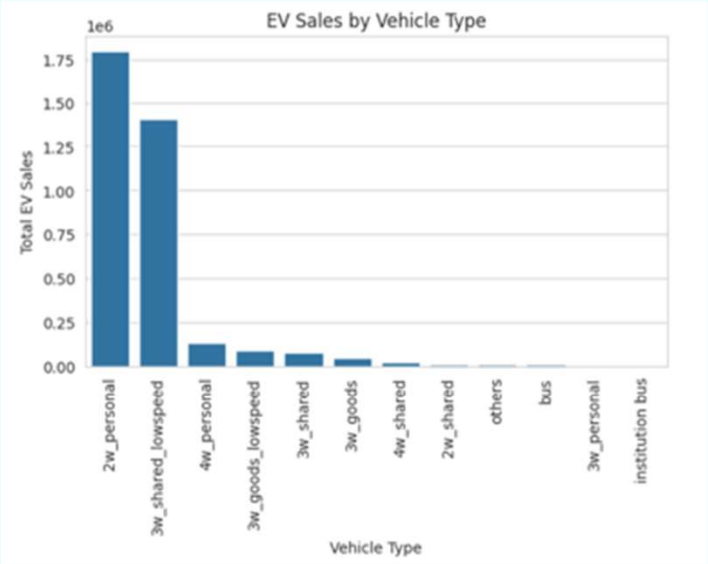


Data Preparation and Cleaning

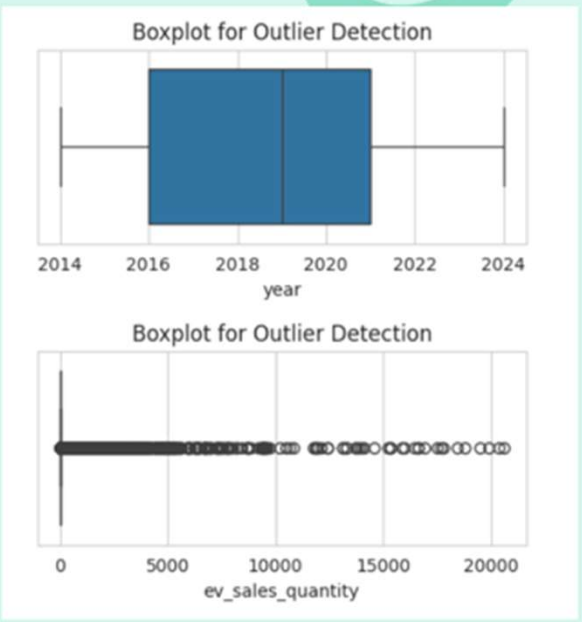
Data Loading & Cleaning

```
# Load the dataset:
df = pd.read_csv('/content/Electric Vehicle Sales by State in India.csv')
# Looking for any Missing Values:
df.isnull().sum()
# Check number of duplicate data
print('Total no. of duplicate values =', df.duplicated().sum())
# Convert all column names to lowercase
df2.columns = df2.columns.str.lower()
# Convert datatype of 'date_added' column to 'datetime' datatype
df2['date'] = pd.to_datetime(df2['date'])
# Show datatype to confirm changes
print(df2['date'].dtypes)
# Extract month column from 'date' column
df2['month_added'] = df2['date'].dt.month
# Convert datatype of 'year', 'ev_sales_quantity' & 'month_added'
column to 'int' datatype
df2['year'] = df2['year'].astype(int)
df2['ev_sales_quantity'] = df2['ev_sales_quantity'].astype(int)
df2['month_added'] = df2['month_added'].astype(int)
# Remove leading/trailing spaces in string columns
df2['state'] = df2['state'].str.strip()
df2['vehicle_type'] = df2['vehicle_type'].str.strip()
df2['vehicle_category'] = df2['vehicle_category'].str.strip()
df2['vehicle_class'] = df2['vehicle_class'].str.strip()
```

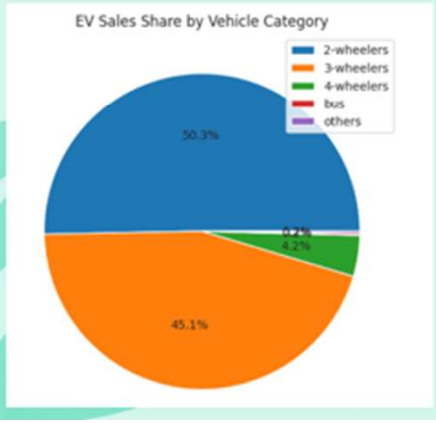
Vehicle Type Analysis



Outlier Detection



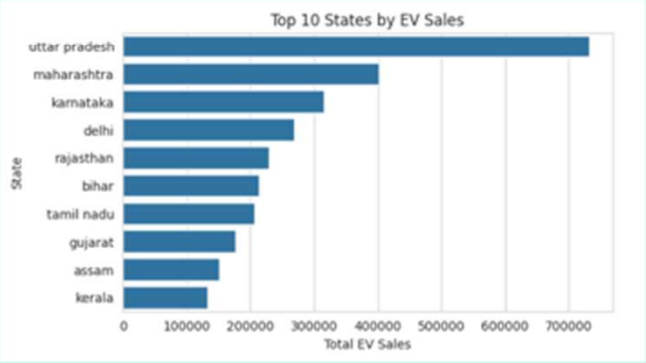
Vehicle Category Analysis



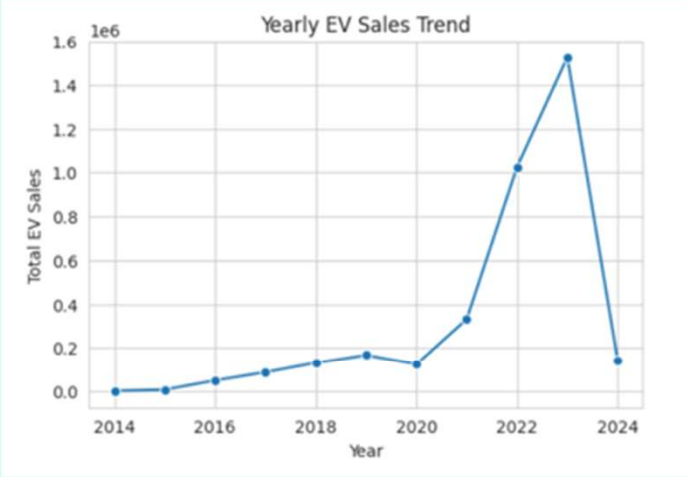
- 2-wheeler personal dominate EV sales in India, followed by 3-wheeler shared low speed, while four-wheelers lag significantly and buses and other categories remain at early adoption stages.
- The year column shows no outliers, while EV sales quantity has many extreme values, reflecting rare but exceptionally high sales events.
- Two-wheelers lead EV sales at 50.3%, followed by three-wheelers at 45.1%, while others contribute under 5%.

Exploratory Data Analysis (EDA)

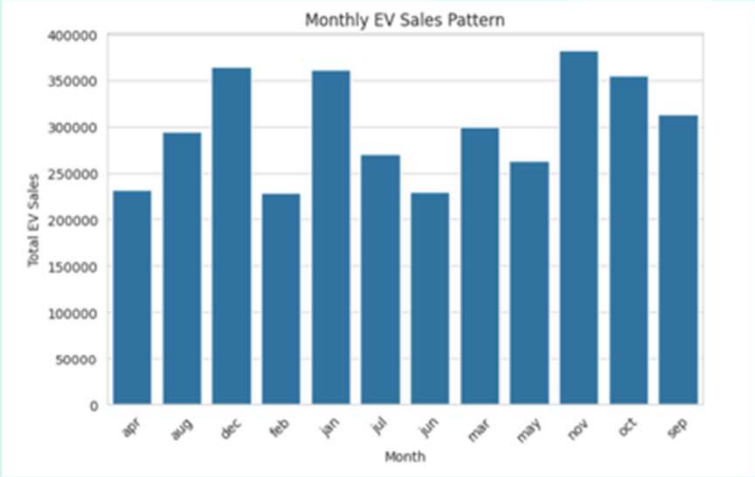
State-wise EV Sales



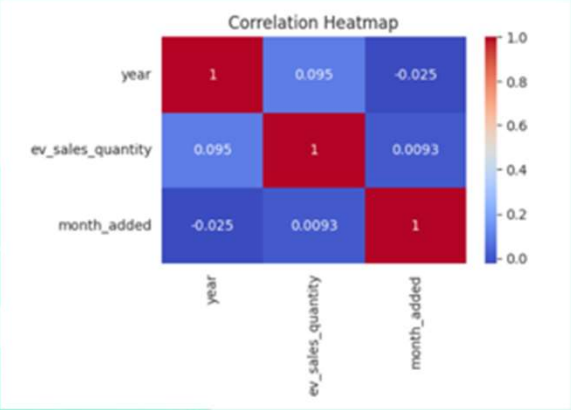
Yearly EV Sales Analysis



Monthly EV Sales Pattern



Correlation Analysis



- Uttar Pradesh leads EV sales, followed by Maharashtra and Karnataka, while adoption drops sharply across other Indian states.
- EV sales grew gradually until 2019, dipped in 2020, surged rapidly post-2020, with lower 2024 sales due to partial data.
- EV sales peak during year-end months, dip mid-year, and remain consistently higher in the latter half annually.
- Year shows a weak positive correlation with EV sales, while month has negligible linear impact despite observable seasonal patterns.

SQL Analysis For Insights

1) Top 10 states by EV sales

```sql
select
    state,
    sum(ev_sales_quantity) as total_sales
from ev_sales_data
group by state
order by total_sales desc
limit 10;
```

state	total_sales
uttar pradesh	732074
maharashtra	401535
karnataka	315498
delhi	268538
rajasthan	228573
bihar	213465
tamil nadu	206902
gujarat	176713
assam	151917
kerala	133246

2) Year-wise EV sales trend

```sql
select
    year,
    sum(ev_sales_quantity) as total_sales
from ev_sales_data
group by year
order by year;
```

year	total_sales
2014	2392
2015	7805
2016	49855
2017	87420
2018	130254
2019	166819
2020	124684
2021	331498
2022	1024723
2023	1525179
2024	143182

3) Monthly EV sales pattern

```sql
select
    month_name,
    sum(ev_sales_quantity) as total_sales
from ev_sales_data
group by month_name
order by total_sales desc;
```

month_name	total_sales
nov	382217
dec	364558
jan	360703
oct	355083
sep	313433
mar	299888
aug	294022
jul	270473
may	262747
apr	232194
jun	229754
feb	228739

4) Most EV sales Vehicle category

```sql
select
    vehicle_category,
    sum(ev_sales_quantity) as total_sales
from ev_sales_data
group by vehicle_category
order by total_sales desc;
```

vehicle_category	total_sales
2-wheelers	1808105
3-wheelers	1620310
4-wheelers	149775
others	8612
bus	7009

5) Top vehicle type in EV sales

```sql
select
    vehicle_type,
    sum(ev_sales_quantity) as total_sales
from ev_sales_data
group by vehicle_type
order by total_sales desc;
```

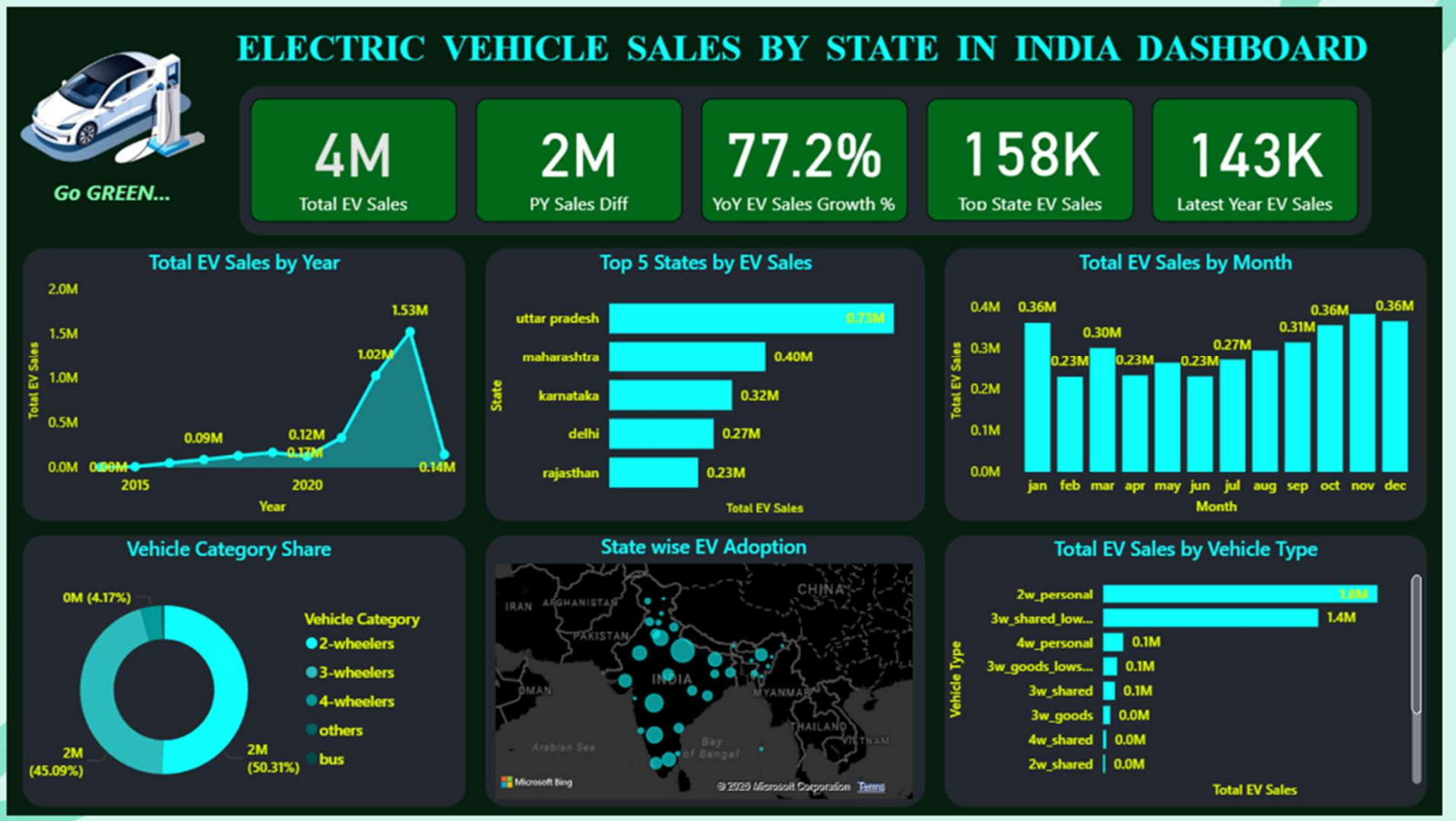
vehicle_type	total_sales
2w_personal	1796340
3w_shared_lowspeed	1408127
4w_personal	130676
3w_goods_lowspeed	90656
3w_shared	76132
3w_goods	44974
4w_shared	19099
2w_shared	11765
others	8612
bus	7009
3w_personal	421
institution bus	0

6) % share of vehicle category

```sql
select
    vehicle_category,
    sum(ev_sales_quantity) as category_sales,
    round(
        sum(ev_sales_quantity) * 100.0 /
        (select sum(ev_sales_quantity)
        from ev_sales_data), 2
    ) as percentage_share
from ev_sales_data
group by vehicle_category;
```

vehicle_category	category_sales	percentage_share
others	8612	0.24
bus	7009	0.20
2-wheelers	1808105	50.31
4-wheelers	149775	4.17
3-wheelers	1620310	45.09

Power BI Dashboard Insights



Recommendations

Recommendation 1 :

Prioritize EV infrastructure in top states.

- ***Insight:*** Few states dominate total sales.
- ***Outcome:*** Faster adoption and utilization.

Recommendation 2 :

Focus on two-wheeler EV ecosystem.

- ***Insight:*** Largest market share.
- ***Outcome:*** : Maximum impact per investment.

Recommendation 3 :

Encourage commercial EV fleets.

- ***Insight:*** Strong B2B participation.
- ***Outcome:*** Faster urban electrification.

Conclusion

- India’s EV market is in a high-growth phase.
- Adoption is uneven but accelerating.
- Data-driven insights can significantly improve policy and business decisions.
- The dashboard delivers clear, executive-ready insights.

Thank you very much!

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Date :