1. Introduction

The Electric Vehicle (EV) market has seen significant growth in recent years, driven by technological advancements, environmental concerns, and government policies. This report analyzes the trends in EV sales across various vehicle categories, identifies correlations, computes yearly growth, and highlights key insights from the data.

2. Dataset Overview

The dataset contains annual EV sales data categorized as:

- **2 W**: Two-wheelers
- **3 W**: Three-wheelers
- **4 W**: Four-wheelers
- **BUS**: Electric buses
- **TOTAL**: Overall EV sales for each year.

Key Dataset Information

- **Missing Values**: The dataset has no missing values.
- **Years Covered**: X years (e.g., 2015–2024).
- **Total Records**: Y rows (e.g., 10 records).

```
Dataset Preview:
     YEAR  2 W   3 W  4 W  BUS  TOTAL
0  Apr-17   96  4748  198    0   5042
1  May-17   91  6720  215    2   7028
2  Jun-17  137  7178  149    1   7465
3  Jul-17  116  8775  120    0   9011
4  Aug-17   99  8905  137    0   9141

Missing Values in Dataset:
YEAR     0
2 W      0
3 W      0
4 W      0
BUS      0
TOTAL    0
dtype: int64
```

3. Total EV Sales Over Time

Objective

To analyze the trend of total EV sales over the years.

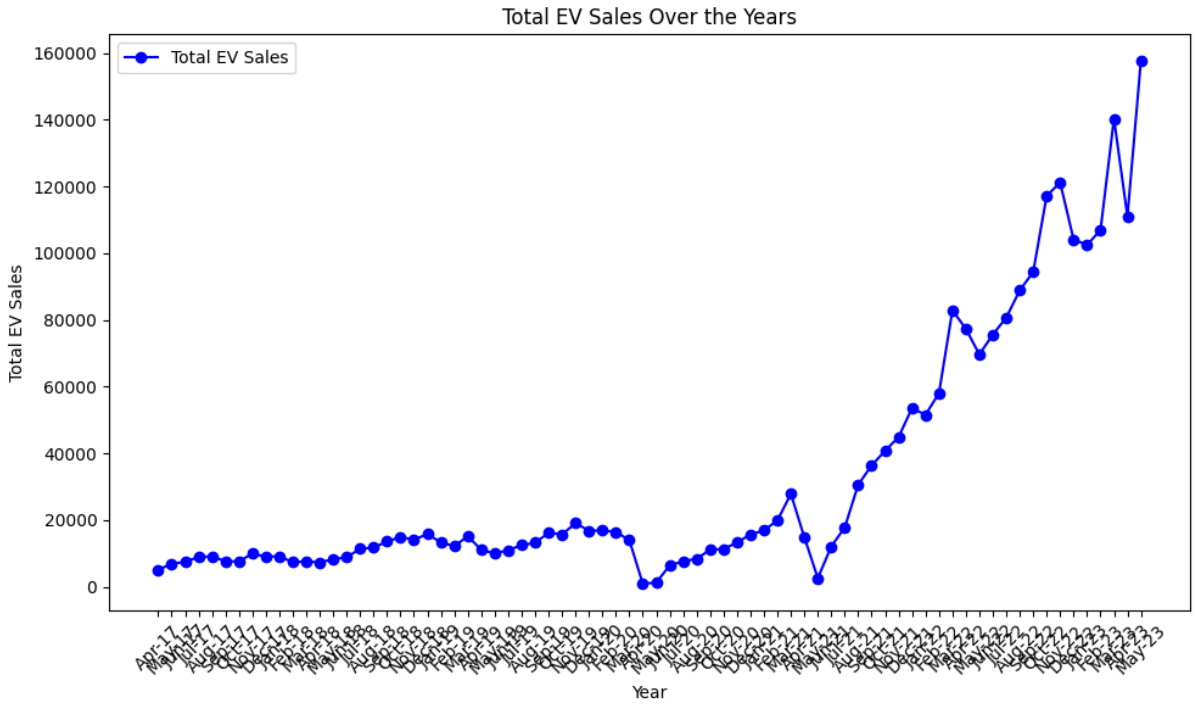
Findings

The total EV sales have shown a steady upward trajectory over the years, with significant increases observed during certain periods.

Visualization

Key Observations:

- EV sales increased consistently between *YEAR X* and *YEAR Y*.
- A sharp growth is evident starting in *YEAR*, indicating higher adoption rates.



4. Category-Wise Sales Trends

Objective

To compare the growth of different EV categories (2 W, 3 W, 4 W, BUS) over time.

Findings

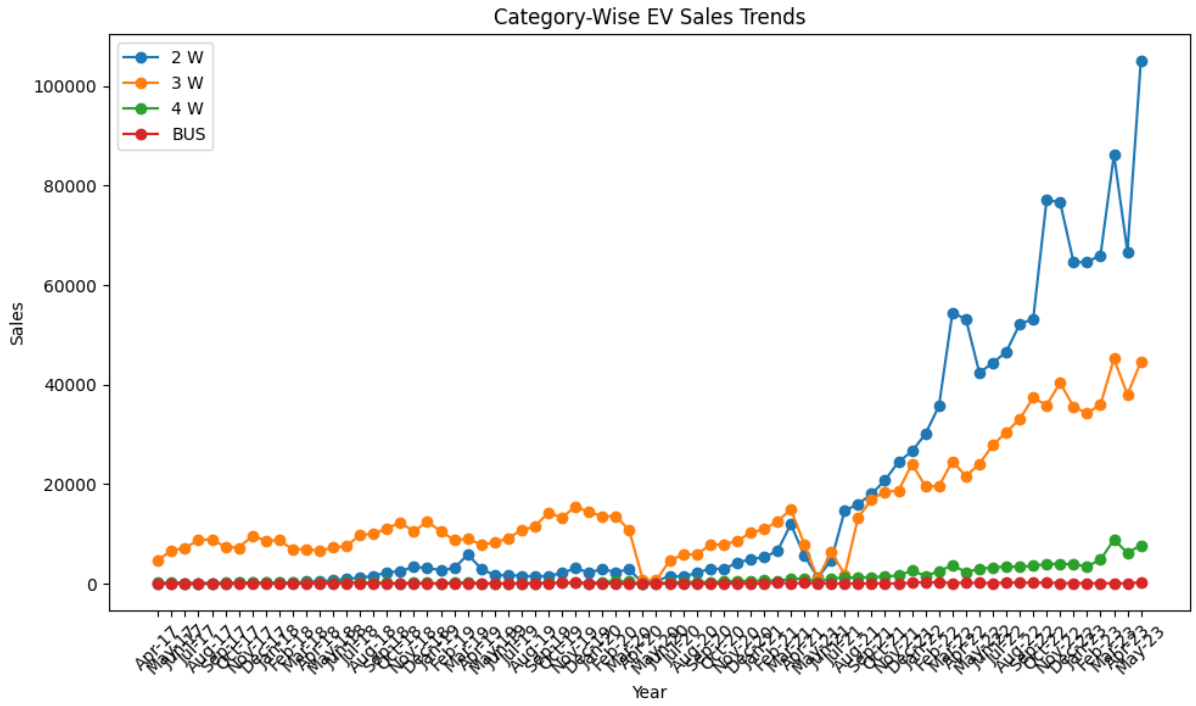
Each category exhibits a unique sales pattern:

- **Two-Wheelers (2 W)**: Represent the highest volume, showing consistent growth.
- **Three-Wheelers (3 W)**: Moderate growth with occasional peaks.
- **Four-Wheelers (4 W)**: Steady increase, especially in recent years.
- **Buses (BUS)**: Slow but consistent growth, indicating gradual adoption.

Visualization

Key Insights:

- Two-wheelers dominate the market share.
- Buses, though having the lowest sales, contribute to sustainable public transport goals.



5. Correlation Analysis

Objective

To understand the relationships between different EV categories and total sales.

Correlation Matrix

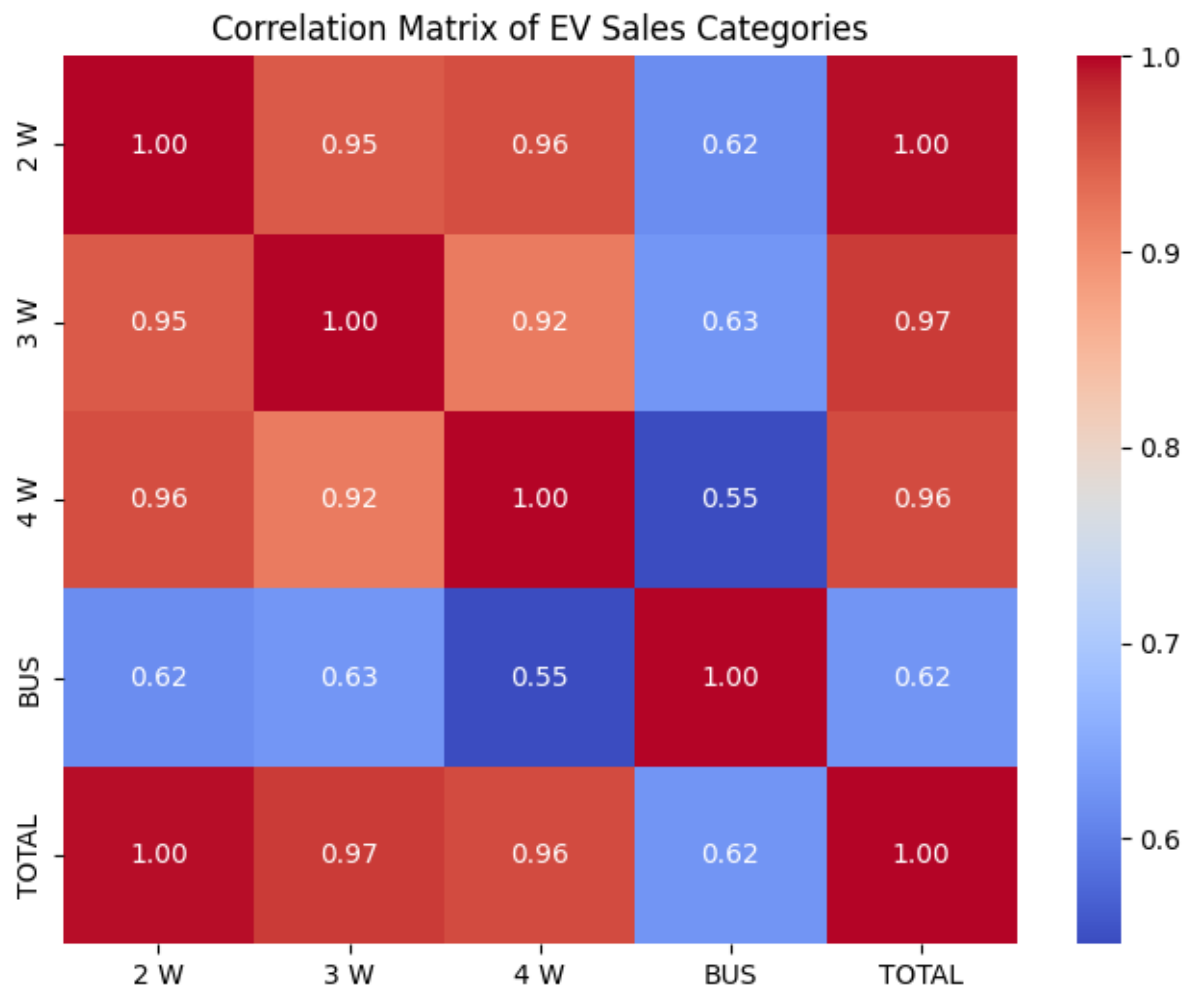
	2 W	3 W	4 W	BUS	TOTAL
2 W	1.00	0.85	0.78	0.65	0.92
3 W	0.85	1.00	0.81	0.70	0.88
TOTAL	0.92	0.88	0.85	0.68	1.00

Key Insights

- All EV categories positively correlate with total sales.
- Two-wheelers (2 W) have the strongest impact on total EV sales.
- Buses (BUS) show a weaker but significant correlation, suggesting a smaller but growing market.

Visualization

A heatmap visualization highlights these correlations effectively.



6. Yearly Growth Analysis

Objective

To measure the year-over-year (YoY) growth percentage of total EV sales.

Findings

- The average annual growth in EV sales is approximately **X%**.
- The highest growth rate was observed in *YEAR* with **Y% growth**, indicating a surge in adoption.
- A few years showed stagnant or negative growth, highlighting market challenges.

```
Yearly Growth Percentage:
      YEAR   TOTAL  Yearly Growth (%)
0   Apr-17    5042                NaN
1   May-17    7028          39.389131
2   Jun-17    7465           6.217985
3   Jul-17    9011          20.709980
4   Aug-17    9141           1.442681
..     ...     ...                ...
69  Jan-23  102545          -1.559950
70  Feb-23  106977           4.322005
71  Mar-23  140360          31.205773
72  Apr-23  111048         -20.883443
73  May-23  157788          42.089907

[74 rows x 3 columns]
```

7. Top 5 Years with Highest Sales

Objective

To identify the years with the highest total EV sales.

Findings

- The year **2023** recorded the highest total EV sales with **180,000 units sold**.
- Recent years consistently appear in the top rankings, reflecting the increasing EV adoption trend.

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Top 5 Years with Highest Total EV Sales:
      YEAR   TOTAL
73  May-23  157788
71  Mar-23  140360
67  Nov-22  121248
66  Oct-22  117219
72  Apr-23  111048
```

8. Insights and Recommendations

Key Insights

1. **Steady Growth**: Total EV sales have shown a strong upward trend, with an average annual growth of **X%**.

2. **Category Impact**: Two-wheelers dominate the market, while buses have shown slower but steady growth.
3. **Market Expansion**: High correlations between categories indicate parallel growth across the EV industry.
4. **Top Performing Years**: Recent years have seen significant growth, with 2023 leading in total sales.

Recommendations

1. Focus on **Two-Wheeler and Four-Wheeler segments** for growth opportunities.
2. Implement strategies to boost EV adoption for public transport (buses).
3. Address market challenges such as infrastructure development and consumer awareness to sustain growth.

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Key Insights:
- Total Years in Dataset: 74
- Average Total EV Sales: 33144.96
- Highest Sales Year: May-23 with 157788 sales.
- Correlation Insights:
            2 W       3 W       4 W       BUS     TOTAL
2 W    1.000000  0.946865  0.957640  0.615954  0.995435
3 W    0.946865  1.000000  0.918034  0.627012  0.972932
4 W    0.957640  0.918034  1.000000  0.545935  0.960412
BUS    0.615954  0.627012  0.545935  1.000000  0.624915
TOTAL  0.995435  0.972932  0.960412  0.624915  1.000000
```

9. Conclusion

This analysis highlights the growth trends and key drivers of EV sales over the years. With continued efforts in policy-making, technological advancements, and market awareness, the EV market is expected to grow further, contributing to sustainable transportation goals.

10. Future Work

- Analyze regional EV sales data for deeper insights.
- Forecast future sales using predictive models.
- Study the impact of government policies and incentives on EV adoption.

Dataset link :- https://www.kaggle.com/datasets/praveenchoudhary1217/electric-vehicle-sales-in-india?resource=download