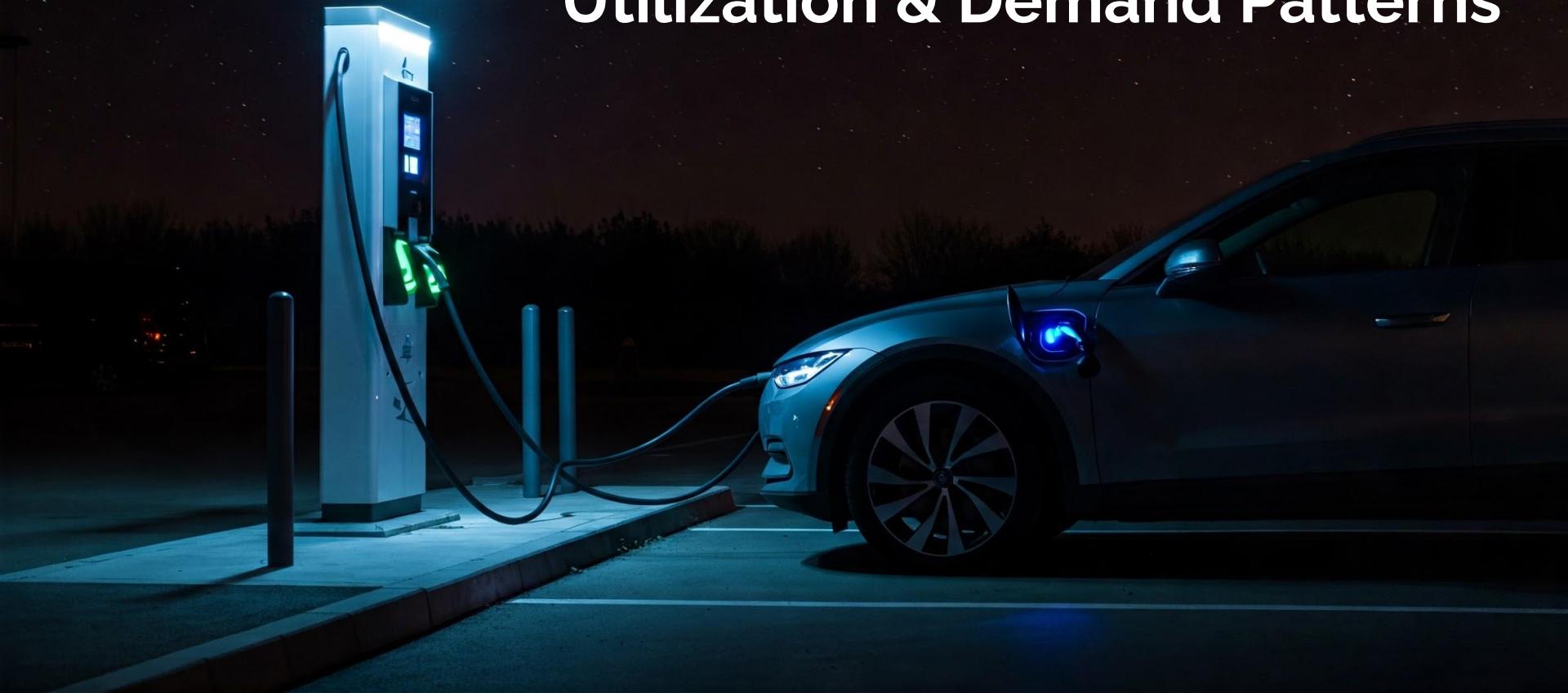


EV Charging Station Utilization & Demand Patterns



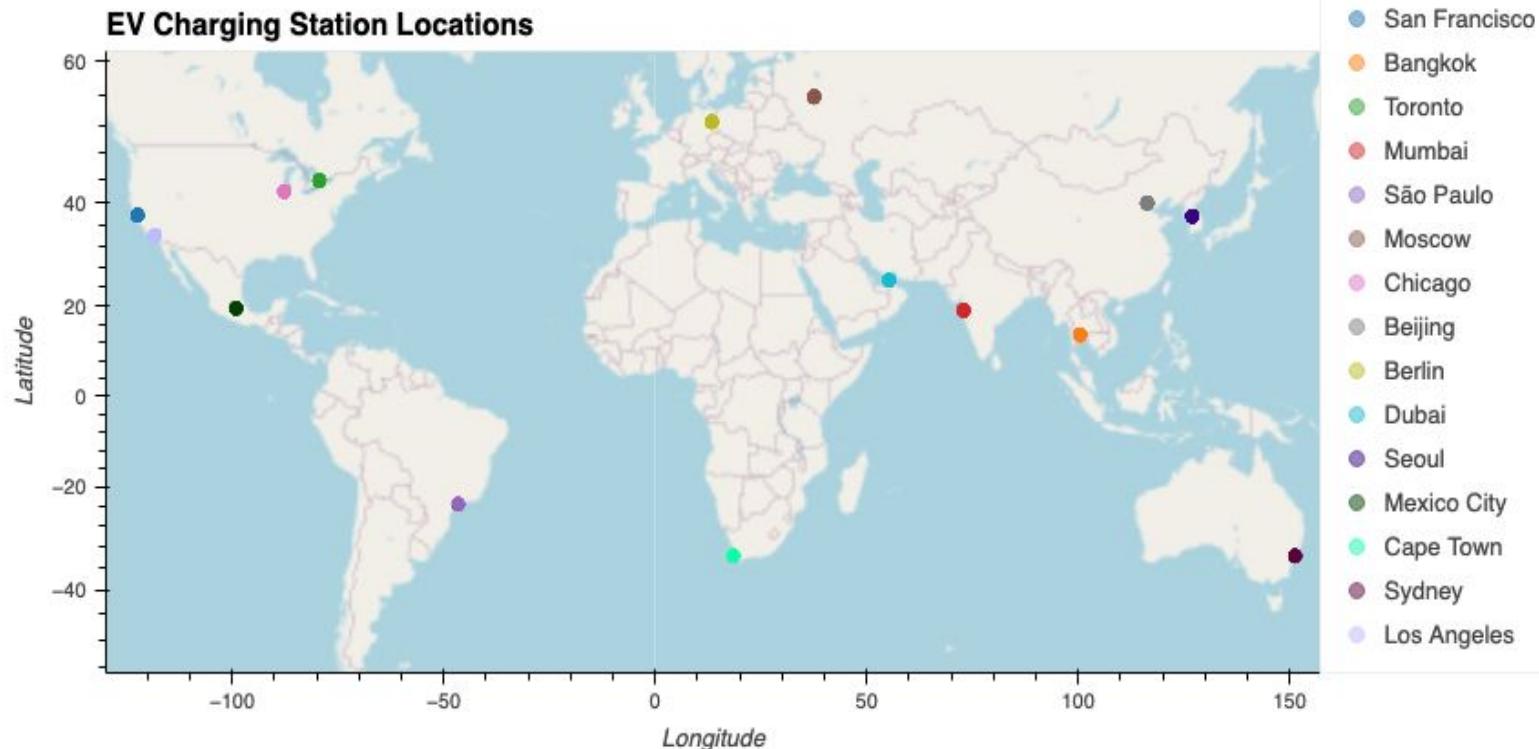


Project Description:

The goal of this project is to analyze EV charging station data, which contains detailed information about station locations, charging capacities, availability, usage statistics, and more. We will uncover utilization and demand patterns by exploring how factors like charging capacity, availability hours, and installation year influence station usage. This analysis will provide data-driven insights to optimize EV charging infrastructure, enhance user accessibility, and improve resource allocation.



Project Scope





Research Questions to Answer

1

What is the trend in EV installations over the years?

3

Do stations with 24/7 availability attract more users compared to those with limited hours?

2

How does charging capacity (kW) relate to station usage?

4

Which cities have the highest and lowest average daily usage?

5

What is the charging cost by city (distribution)?



Key Findings

EV Insights

- **Steady and Sustainable Growth:** Focus on long-term expansion with a balanced approach.
- **Moderate Number of Installations:** Avoid oversaturation while ensuring accessibility.
- **Limited Operating Hours:** Optimize resource allocation and reduce costs.
- **Use 50 or 150 kW Chargers:** Cost-effective solution without sacrificing functionality.
- **Plan for Growth Strategically:**
 - Expand in moderate-use cities to establish presence.
 - Add more chargers in high-demand cities to maximize impact.
- **Leverage Government Subsidies:** Invest in cities where subsidies lower installation and operational costs.

Additional Notes about the dataset

- Dataset was too broad and compromised (ex. Latitude and Longitude were incorrect)
- Data evenly distributed across all questions and analysis

Analysis





Trends in EV Charging Station Installations

Description:

- Tracks EV charging station installation counts per station operator over a 13-year period.

Key Findings:

- Overall steady growth with some slowdowns in installations increase over time, but a few years show slower growth or slight declines.
- Operator-specific patterns as some operators experience rapid growth at times, while others maintain consistent expansion.

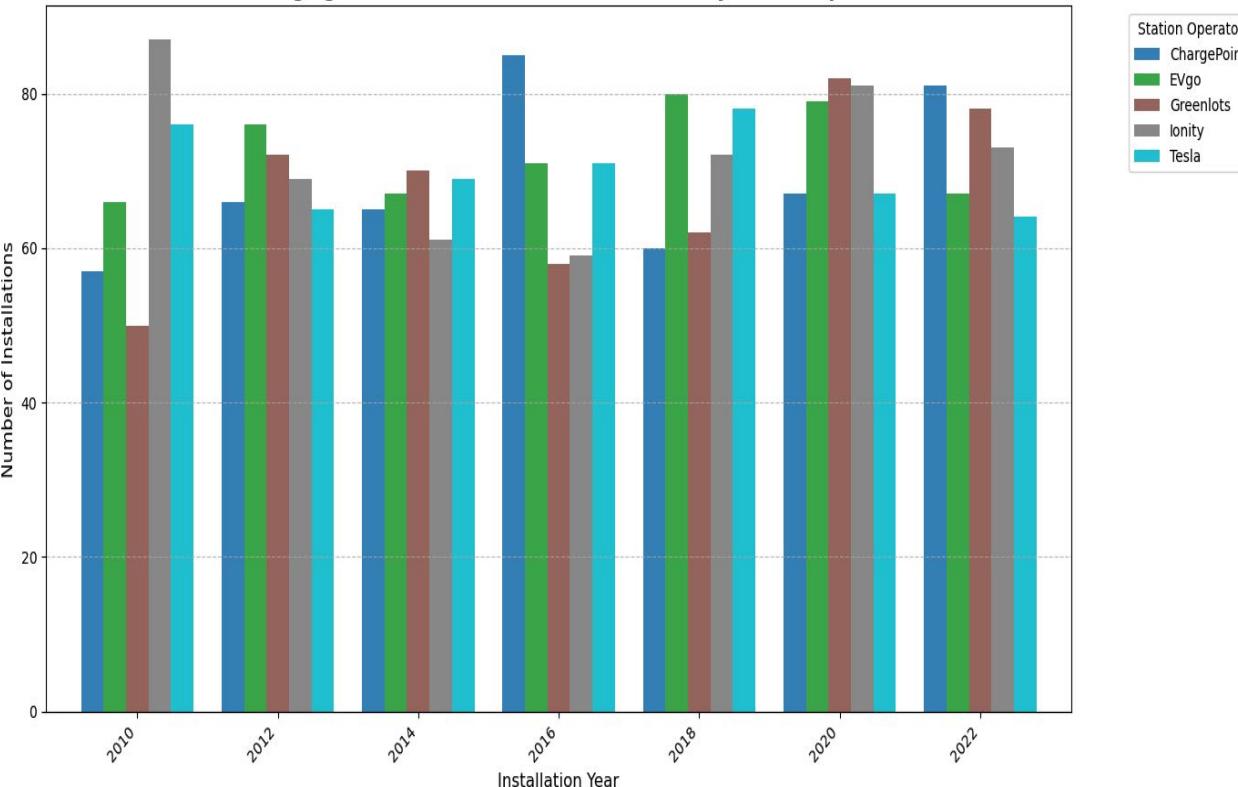
Potential Reasons:

- Market maturity and saturation can slow growth and indicate towards a decrease in installations for following years.
- Policy or funding changes: Growth patterns may reflect shifts in incentives or available resources.

Recommendations:

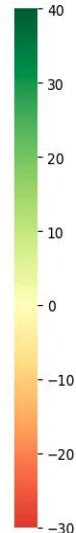
- Focus on steady, sustainable growth by avoiding oversaturation by prioritizing long-term expansion.
- Target regions with slower growth and investigate causes and adjust strategies for underserved areas.

EV Charging Station Installations Over the Years by Station Operator





Year Over Year EV Installation Growth %



Description:

- Year-over-Year (YoY) Growth Rate of EV charging station installations by operator over 13 - years.

Key Findings:

- Growth patterns vary some years show strong growth, while others reflect sharp declines.
- ChargePoint and Greenlots show steady growth, while Ionity and Tesla have higher volatility.

Potential Reasons:

- Market strategy shifts as operators may focus on selective growth years or regional markets.
- Policy and funding changes can cause fluctuations and may result from government incentives or infrastructure grants.

Recommendations:

- Prioritize steady-growth rather than operators installing a large number of operators, one year to have negative growth the next year
- Investigate volatility by analyzing extreme growth or decline to guide future expansion plans.

Impact of 24/7 Availability on Usage

Key Observations

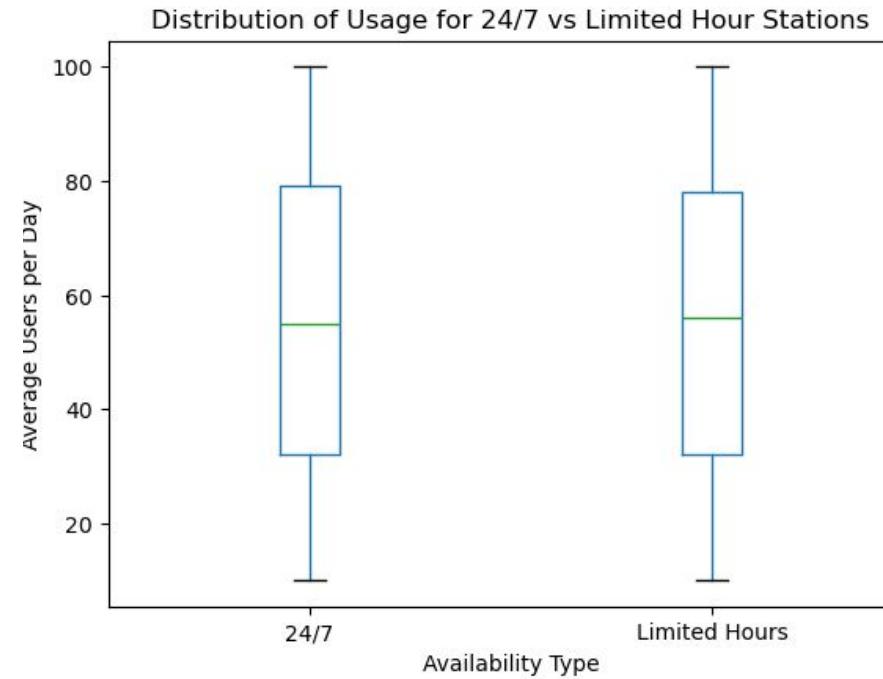
- 24/7 availability does not appear to have a significant impact on the number of daily users.
- Access of 24/7 availability may not be a primary factor driving station usage.

Potential Reasons

- Variables such as location, charger type, or cost might have a stronger influence.

Recommendations

- Opening 24/7 stations may not be in an owner's best interest as there won't be significantly more usage than a limited hour station.



Total Usage v. Charging Capacity

Key Findings:

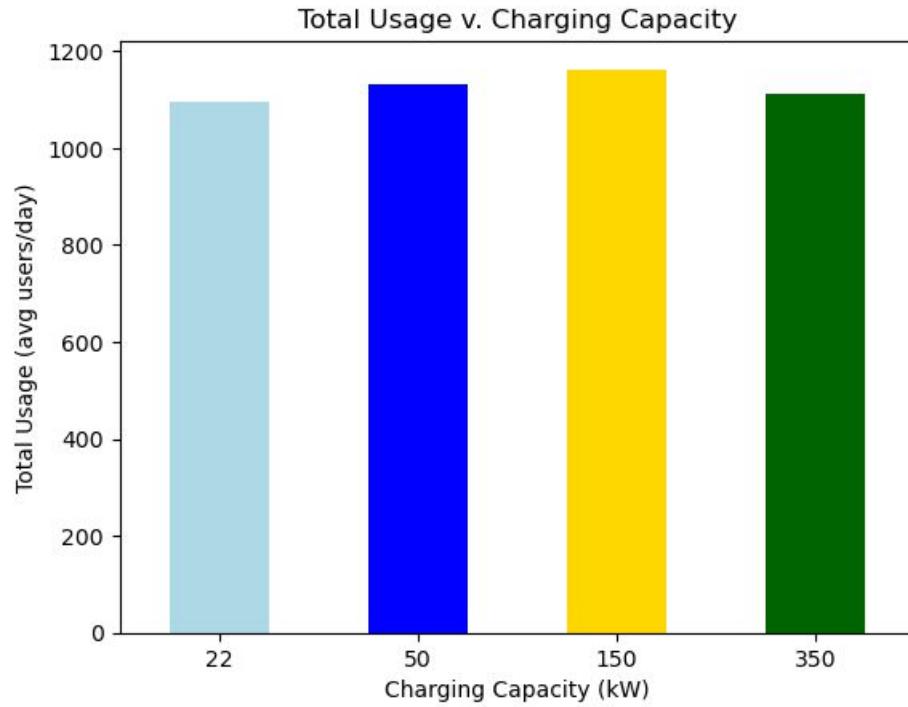
- The stations with 50 kW and 150 kW charging capacity see the most users per day

Potential Reasons:

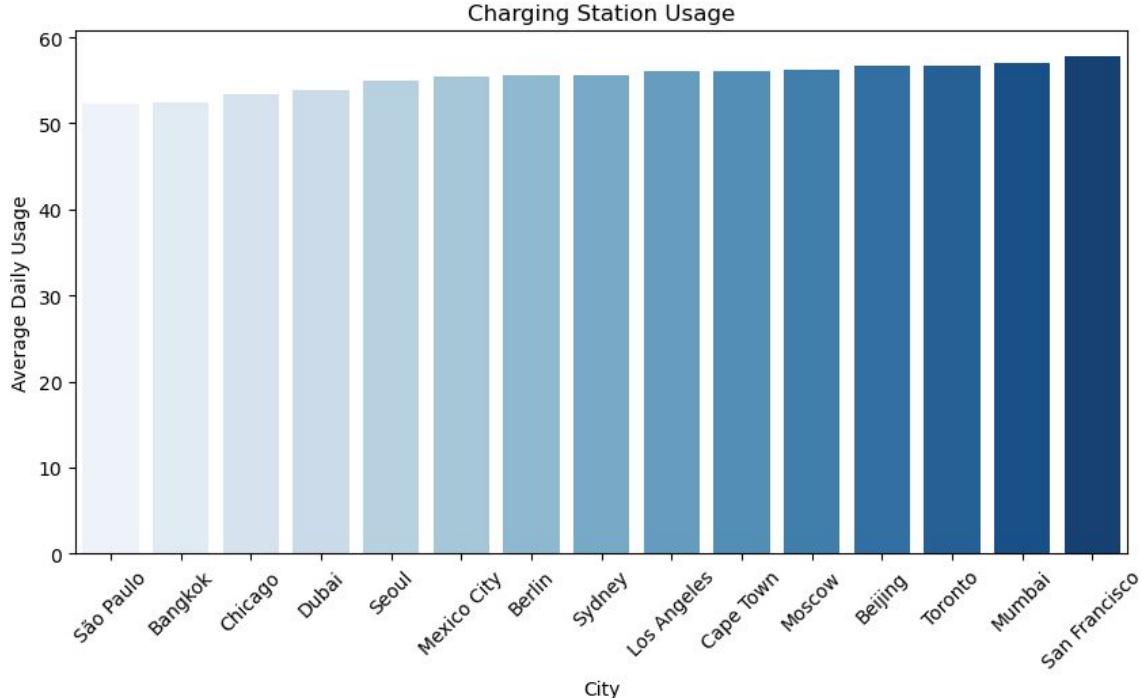
- Certain vehicles may not be able to utilize the full capacity of a 350 kW charger
- More 50 kW and 150 kW chargers in high-traffic areas

Recommendation:

- Install 50 kW and 150 kW chargers in and around major cities
- These stations will meet the needs of EV drivers and keep infrastructure costs lower



City Charging Station Usage



Key Findings:

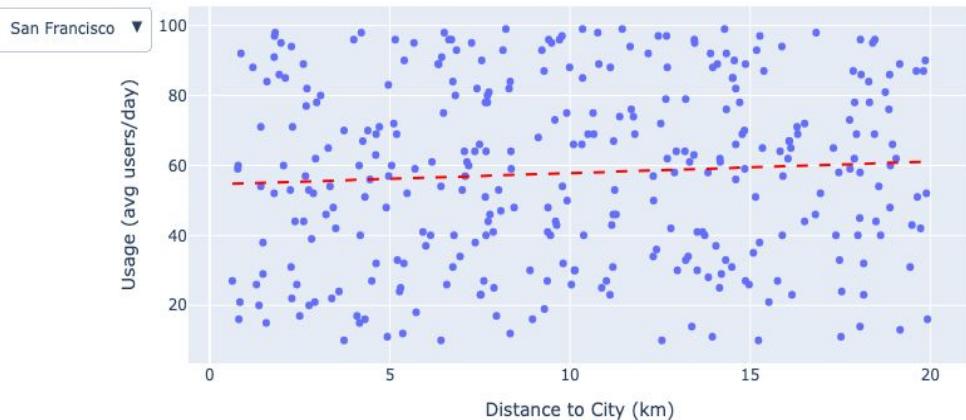
- The average daily usage of each charging station across all of these cities is between 50 and 60 users per day
- Cities like San Francisco and Toronto have high usage
- São Paulo has the lowest usage

Recommendation:

- Add more stations in high-demand areas
- Raise awareness in low-usage cities
- Plan for growth in moderate-usage cities

High Usage Areas: San Francisco

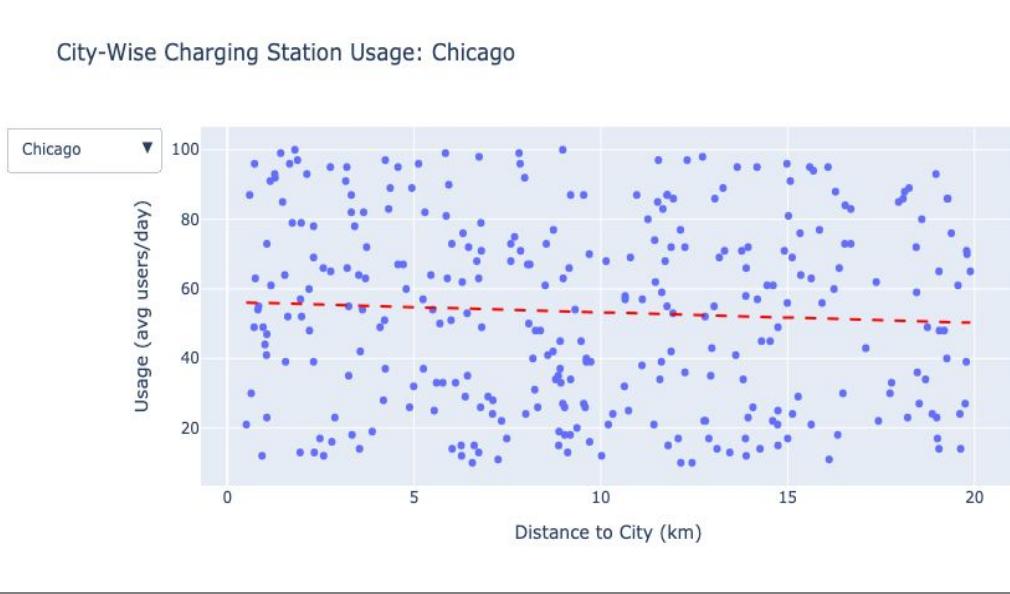
City-Wise Charging Station Usage: San Francisco



- The data points are widely scattered, indicating variability in charging station usage at different distances.
- The regression line has a slight positive slope, meaning that, on average, charging station usage slightly increases with distance from the city center.
- Factors other than distance, such as location (residential vs. commercial), accessibility, or station capacity, influence usage.

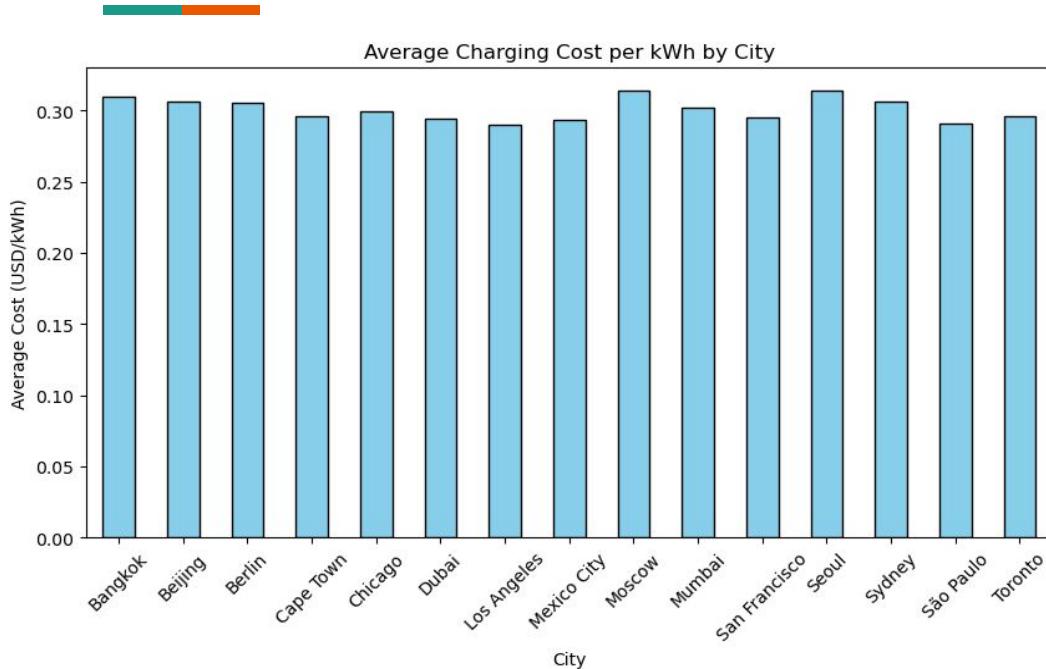
Low Usage Areas: Chicago

City-Wise Charging Station Usage: Chicago



- The data appears widely scattered, showing significant variability in charging station usage.
- The slope of the regression line is slightly negative, suggesting a weak decreasing trend in usage as the distance from the city increases.
- While there is some decrease in usage with increasing distance, the spread of the points show that charging stations at similar distance can have widely different usage.

Average charging cost by City



Charging Cost by City Analysis:

- The cost of charging per kWh varies across different cities due to multiple factors, including electricity generation sources, government subsidies, infrastructure, and demand-supply dynamics.

Most expensive city Seoul (0.314 USD/kWh)

Least expensive city Los Angeles (0.289 USD/kWh)

- The likelihood of government subsidies, lower electricity rates, or other factors like competition is makes the cost per kWh to vary significantly.

Recommendation:

Companies can invest in cities that subsidize electric vehicle as a way of minimizing costs.



Thank you.