Electric Vehicles

Are we ready for an electric future?

Merim Tojaga | INSH 5302 | Data Viz Project 3 | December 8th 2024

BACKGROUND

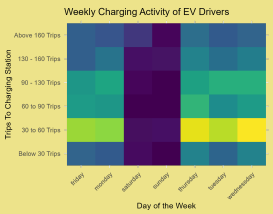
I love cars. I grew up watching shows like Top Gear and movies like 2 Fast 2 Furious. At first, I didn't like electric vehicles because they seemed soulless to me without an engine providing character, but I soon began to appreciate the complex engineering and what EVs represented: the future. However, I do not believe we are quite ready for the mass adoption of EVs. In California, the state government created a mandate that by 2035, all new vehicles sold must be EVs. In 2023, during a summer heatwave, the Governor of California asked residents not to charge their EVs for fear of overloading the power grid. The point of this data visualization was to assess the pros and cons of EVs and provide the reader with information to form their own opinion on the current state of electric vehicles within the United States.

DATA SET

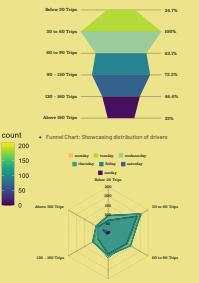
The Data Set is Called "EV Charging" from the Moderndive package in R. It is 3,395 charging sessions from 85 drivers across 25 different work locations. It has 24 columns ("variables").

PRELIMINARY ANALYSIS

Before looking at the direct features, such as cost and kilowatts used, we must first understand a little about the drivers themselves. The three charts below describe the distribution of how much these EVs were driven. They also track which days.

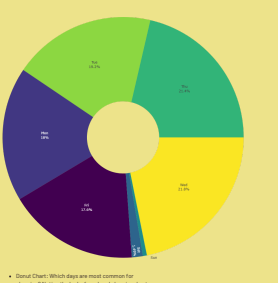


- Heat Map: Key take away is that most charging is in the middle of the week.



- Funnel Chart: Showcasing distribution of drivers

- Radar Chart (Interactive): Which days are favored by each group of drivers. Do more experienced drivers avoid the lines?



- Donut Chart: Which days are most common for charging? Notice the lack of weekend charging due to the data set being collected by people at work.

IMPORTANCE OF DATE

If we are to adopt EVs, we must acknowledge the shortfalls in our power grid. Outdated electric infrastructure will need major changes to support the power needs of all these new EVs. Knowing the times when people are most likely to charge their cars is critical to maintaining these grids as they are worked on and upgraded. Offering incentives, such as lower charging rates for people who charge their cars during "off-peak" days and hours, could help reduce potential stress on the power grid.

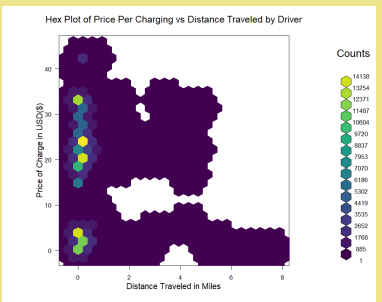
DATA COLLECTION

This data set was collected by employees at work, represented in five categories: Research and Development, Office, Manufacturing, and Other. It is important to understand the limitations of this data set because certain metrics, like drive time and price per charge, might be skewed by the fact that charging is occurring at a workplace where it might be free for employees. If EVs were the only cars on the road, I imagine charging prices might increase due to demand.

- Pyramid Plot: In the Data Set which group was charging the most? Who was using the most energy. We can clearly see that a lot of data entries were made by Research and Development, they probably get the most value out this collection

- Tree Map (Interactive): Categories of data collection, size of squares by kWh Total. Three Levels: collection site, kWh total, and sum of charge times in hours.

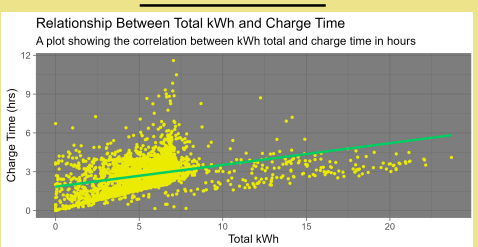
PRICE x DISTANCE



- Hex Plot: This plot has Distance Traveled in Miles on the x - axis (How far away the charging station was from the driver), and Price of Charge in USD $ on the Y - axis. The Color signifies how many observations occurred for that specific value, the closer the color is to yellow the more observations occurred.

As we can observe from the hex plot, the most common price per charge is around $25 USD. The price can vary from as much as $35 USD to $0. This depends entirely on where a person is charging, as I doubt a private charging facility will offer free electricity, and companies offering free charging to their employees are not getting that electricity out of thin air. It is important to note that some of these prices are close to what some people pay for gas. Is there an incentive for people to drive EVs over gas cars? (Besides the environmental cause.)

KILOWATTS x CHARGE TIME



- Scatter Plot: This plot has Kilowatts (kWh) on the x - axis, and Charge time in hours on the Y - axis. The trend line represents the average across the scatter plot.

The scatter plot above showcases the amount of kilowatts against the charge time in hours. This is one of the main problems that EVs need to address. We can see that any charge exceeding 10 kilowatts requires an hour and a half or more of charging. For your information, the average EV needs 34.6 kWh of charge to drive 100 miles. Understanding this, we can see that an EV might not be the best choice for someone commuting. It would require extra effort from the driver to ensure the car can make the commute every day. I will also note, in reference to this graph, that the data set could be outdated, and newer technologies could reduce charge time and increase the range the EV can drive.

CONCLUSION

There is no doubt in my mind that EVs are the future, and I, for one, am excited about a cleaner environment. However, there are several issues to address before we can get there. One of the most important is our infrastructure. We do not have nearly as many EV charging stations as we do gas stations, and I do not believe that our electric grid could handle that task in its current state. Furthermore, with charging prices often equaling those of gas and charging times taking hours, what reason does a person with a gas car have to switch to an EV? Besides helping the environment, it seems like it could cause more of a hassle for the average person than provide a solution. Of course, the decision is always up to the individual, but at the current rate, it seems that EVs are being forced on people when they are not yet ready to overtake gas cars.