# **CIS 530: Data Exploration and Analysis**

**TERM PROJECT SUMMARY**

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## Statistical/Hypothetical Question

The primary question that was investigated in this study was essentially this: Does the temperature of the surrounding environment have a major impact on the charging length and efficiency (charging rate) of electric cars (EVs)? The purpose of this inquiry is to determine whether or not differences in temperature affect the amount of time and energy needed to fully charge an electric vehicle, which may have consequences for the use of electric vehicles in different climates.

## Outcome of Exploratory Data Analysis (EDA)

## The EDA uncovered several discoveries regarding the connection between temperature and charge measures. In general, higher temperatures were associated with slightly shorter charging periods. Charging durations exhibited small differences across temperature ranges, with higher temperatures generally being shorter. The fact that the temperature is higher shows that the charging efficiency should be improved. Nevertheless, there was a significant amount of overlap between the charging durations at high and low temperatures, which suggests that temperature alone might not be the deciding factor in determining the length of time required for charging purposes. In addition, the dataset contained outliers: charging rate, energy consumed, and temperature. These outliers indicated extreme values that could influence the overall conclusions even though they were not occurring very frequently.

## Missed Aspects in the Analysis

During the course of the investigation, the potential interactions that could occur between temperature and other variables, such as the capacity of the battery or the type of charger, were not thoroughly investigated. When additional aspects that contribute to charging are considered, a more nuanced understanding of how temperature influences charging may have been obtained by examining these interactions of the system. Even though descriptive statistics were computed, more sophisticated statistical tests or machine learning models may have been utilized to forecast the time required for charging based on temperature and other variables.

## Potentially Helpful Variables

The analysis would have been enhanced by further data on humidity or precipitation, as meteorological conditions in conjunction with temperature may influence charging infrastructure or energy transfer efficiency. Moreover, data regarding charging station type (e.g., outdoor versus indoor) may have facilitated environmental exposure regulation, enhancing the analysis.

## Incorrect Assumptions

It was assumed that all charging sessions were independent, overlooking possible patterns in charging behavior influenced by prior sessions. Users may exhibit varying charging patterns that could influence the data but were not considered, thereby distorting the analysis of temperature's impact on charging duration.

## Challenges and Areas of Uncertainity

A considerable problem involved managing outliers and determining their interpretation or resolution in the analysis. Although outliers were detected, there was ambiguity on whether to eliminate them or examine them as distinct cases, as they may signify legitimate although atypical charging activities. A further problem involved comprehending the extensive impact of temperature amid several influencing elements, as isolating its effect was complicated without sophisticated statistical modeling. Moreover, comprehending the relationship between temperature and other factors, such as battery capacity, proved difficult without advanced statistical expertise or more refined methodologies.

## References

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