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Prof. Yang

DS4200

Final Project

Final Project – Visualization Explanations

Link to Website: https://jasonchen1001.github.io/DS4200_final_project_Group31/

Our topic discusses the distribution of Electric Vehicle (EV) charging infrastructures, and the purpose of our study is to examine how the type of each charger affects user experience and usage to allow policy makers and companies to encourage further adoption of EVs.

- 1) Charging Station Distribution Map (Geographic Map)
 - Marks: points, circles
 - Channels: position (longitude and latitude)
 - Encoding: circle size, point color (different charger types), circle labels showing count on different levels
 - Interactions: zoom in/out, tooltips

The main purpose of this graph is to give a general overview on the current global distribution of the charging stations, allowing the user to locate where the most popular and least popular locations are. This geographic map shows all the geographical distribution of EV charging stations around the world on 4 levels: continent, country, state, city levels. The clustered counts at each level as a feature and circle size allows the audience to easily understand the information. Finally, we also incorporated tool tips and color encoding for each specific location for further detail if the user is interested in examining a specific area, they are more familiar with.

- 2) Installation Trends Overtime (Line graph)
 - Marks: lines, points
 - Channels: position on axis
 - Encoding: color showing different charger types
 - Interactions: legend toggle/filter to show or hide, tooltip

We were interested in learning on the greater scale whether the number of charging stations have increased as the electric vehicle industry is maturing. We decided to use a line chart to show the installation trends of electric vehicle charger types by time, from 2010 to 2024. For clarity and ease of interpretation, we encoded each type of charger with a different color, and added a filter feature whereby users can hide or show a line by toggling the field on the legend.

- 3) Cost vs. Charger Type Distribution (Heatmap)
 - Marks: rectangles
 - Channels: position on axis
 - Encoding: Color intensity, text labels on rectangle
 - Interactions: tooltip

The purpose of the heatmap is to understand the distribution of costs across different charger types, and how each cost affects usage. We used a heatmap because the color gradient scale works well with showing the relationship between an increase in cost and charger type, allowing for buckets, and allowing us to add text labels on the rectangle since the numbers are so similar. We also added a tool tip with more information such as usage to see how costs can affect usage.

4) Feature Comparison Across Charger Types

- Marks: boxplot
- Channels: height, width, color
- Features:
 - - User rating
 - - Daily usage
 - - Charging capacity
 - - Maintenance score
- Interactions:
 - - Feature selector dropdown
 - - Tooltip showing detailed statistics
 - - Statistics section at bottom

Finally, to gather insight on how different features vary across charger types and cost ranges, we created a boxplot visualization that allows comparison of multiple features. The user can select different features to compare, and the data is grouped by both charger type and cost range. The boxplot shows the distribution of values including median, quartiles, and outliers. We included a comprehensive statistics section at the bottom showing mean, median, quartiles and sample size for each group to provide detailed quantitative insights.

5) Charger Type Usage Analysis

- Marks: bars
- Channels: height
- Encoding: color for charger type
- Features: statistic section at bottom
- Interactions: filter for charger type and usage range, tooltip

Finally, to gather insight on how charger type can directly impact the usage frequency per day, we used a bar plot showing the average daily usage by charger type. The user is also able to filter by the usage range of medium or high usage to show the usage patterns across two different groups. Since the number of average daily usage is very similar across the three types, we added an additional feature of usage statistics at the bottom of the graph for clarity. We included the average uses, median, and count of chargers for both medium and high usage.

6) Cost vs Rating Analysis

- Marks: points
- Channels: position on axis
- Encoding: color for charger type
- Interactions: drop down filter for charger type and availability, tooltip

To understand how cost can impact the user experience via rating as a proxy, we decided to use a scatter plot. We used color encodings on each charger type and added a trend line for interpretation. Since there is so much information, we added a trendline to summarize the relationship between the user rating and cost. We added more detail to this visualization by added two filters, which are charger type and availability to better understand how cost and user experience varies also by the type of charger.