

Team Mini Project: Alternative Fueling Locations

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Data Science Senior Capstone

United States

For the first section of our project that visualizes the US, we decided to use Tableau. This was a program that was familiar and easy to use as opposed to PowerBI which we haven't really used much in the past. The process used to generate the visuals for this project were fairly straight forward. The first thing done was to upload the dataset into Tableau. And when looking at the AFL for the entire US, there were 584 unknown locations within the data. With tens of thousands of total datapoints, roughly 500 missing values was not the biggest problem. For the group of visualizations the missing datapoints were just not included in the maps and a side note was added. From there we were able to start on the group of AFL visualizations for the US

Starting with the very first point, "A map of the continental United States that displays a dot for each AFL, colored coded by the Fuel Type Code". We started by dragging the values state and city into the worksheet. And from there we chose the map option. This gave us a datapoint at every city that was included in the dataset. We needed to include state and city as some state values included the specific city, while some of the city values did not include which state it was in, meaning the program did not have enough information to place the datapoint. But as mentioned, this was fixed by adding both city and state. To color code all the fuel types, we just dragged the variable "Fuel Type Code" into the color section on Tableau. The same process was repeated for Hawaii and Alaska.

Next, we had to make a map for each fuel type. This was done the same was as before, but this time a sliding bar was added for the Fuel Type Code. Instead of having seven maps for each the continental US, Hawaii, and Alaska, this sliding bar allows us to condense space in the final dashboard.

Overall, we did not run into too many problems for this section of the project. If we did, the fixes were very simple and straight forward.

Regions

For the regions Tableau was used because it is easy to create visualizations with and has been used previously in other classes whereas PowerBI has not. These visualizations were first created by making a new dimension which had 5 different available groups that encompassed the states for each region. This was done by right clicking on the State dimension and then creating 5 groups by putting each of the states into their respect regional groups. This new dimension was put into the filters for each visualization and then from there was able to select which region. There was also 130 missing values from the dimensions that were removed as 130 values out of 56,800 is but a small portion.

The map that displays a dot for each AFL location and in color coded by fuel type was created by adding the desired region to filters through the state grouping. Then, adding city and state to detail along with fuel type code to color. The map for each fuel type location was made doing the same thing as the first map except fuel type code was added to the filters along the state grouping. From there a slider was added to the sheet to allow each fuel type to be seen on one sheet. This makes it to where 7 sheets are not required, only the one. The part-to-a-whole graphs that were generated were a stacked bar chart because it shows the proportion of AFLs by fuel type within each region; a tree map as it makes seeing how the fuel types frequency in comparison to the other easy to understand; the heatmap table was done to show which state has the highest percent of each fuel type. That one goes hand in hand with a bar chart for each fuel type that shows the same thing as the heatmap but instead of color intensity it gives a size comparison perspective. The bubble chart was made to show something like the tree map but with another layer to it. This layer being that each state had its own bubble for the fuel types, which gives a good perspective of the fuel types distribution between the states. A multiple bar chart that showed a 100% total of each state makes it clear to find the common fuel type for each state. Lastly, a stacked area chart displays the count of each fuel type for each state in away that also actively compares them to another state providing an interesting visual representation.

Electric Vehicles

The Electric Vehicles (EV_AFL) dashboard file focuses on electric vehicle charging stations in the US. Tableau was used as the visualization tool to create interactive dashboards, geographic maps, and easily filter the data for viewing. The dataset was filtered to include only stations with the fuel type code "ELEC", allowing EV charging stations to be viewed separately from other alternative fuels. This workbook includes eight maps showing charging locations across the continental US, Alaska, Hawaii, and each of the five US regions (West, Midwest, Southwest,

Southeast, Northeast). Calculated fields were used to establish each region/area that would be used to create the maps. EV charging stations are displayed as points and color-coded by EV Network to show how the different charging network providers are distributed geographically.

During the development of these visualizations, some challenges were encountered related to data preparation and mapping accuracy. A small number of data records had missing or invalid geographic coordinates, and were excluded from the dashboard to improve map clarity.

In addition to the maps, part-to-whole graphs were created to summarize the number of charging locations for each EV Network. Bar charts were used for these visualizations to show clear categorical comparisons of charging station counts across networks. Separate network charts were made for the continental US, Alaska, Hawaii, and each of the five regions, allowing differences in EV Network counts to be compared across the geographic areas.

Eight dashboards were made, one for each area of the US, each containing the map of the area and its respective bar graph of the EV charging stations and their networks. All dashboards were put into one storyboard to organize all of the visualizations in a clearer manner.

Specific State Data

The State Specific Data (TOP10_AFL) dashboard file shows alternative fueling locations for the ten most populous US states (CA, TX, FL, NY, PA, IL, OH, GA, NC, MI), based on US Census Bureau population estimates. Tableau was the most effective tool for this section because it allows for interactive state-level filtering, and multiple visualizations can be synchronized to change based on user selection. This workbook contains a dashboard with an interactive map and a corresponding part-to-whole graph. The map shows the fuel station locations color-coded by Fuel Type Code. The part-to-whole graphs are bar charts showing fuel-type counts within the selected states. A state dropdown filter was put in so users can switch between states' data, avoiding the need for ten separate dashboards to visualize each of the states individually. The dropdown filter is effective for both the map and the bar chart simultaneously.

References

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