Buy Car vs. Uber

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Abstract. With ridesharing services such as Uber becoming so ingrained in modern transportation, consumers are now wondering whether they need a car at all anymore. Deciding whether to own a car or to solely utilize Uber can be a big financial savings if correct. This application intends to help a user explore the car market and then decide based off their personalized inputs, whether it is suggested to buy the car of your choice or to just Uber.

Keywords: Car Buying · Uber · Data Visualization.

1 Introduction

For many years, the decision for an American was not about whether to buy a car, but rather, about what car to buy. However, this is no longer the case for a present day potential buyer. The transportation industry has been revolutionized by ridesharing services such as Uber and the number of consumers that use these applications continue to grow. [1] If you Uber, you only pay the upfront cost which is highly enticing for an individual who does not commute long distances. Until today, there was no easy streamlined way to explore the car market and compare your car of choice to ubering. This application creates an intuitive five-step process for consumers to analyze the car market and retrieve a financial suggestion of whether to buy or Uber.

The application is a five-step process. The first step has interactive visualizations for the user to explore the current car market. The second step provides information regarding electric cars and the locations of car charging stations to see if it is a feasible option for you. The third step prompts the user to select a car whose overall costs to the buyer will be compared to uber. The fourth step prompts the user to enter his/her daily commute and show them the costs for a variety of Uber options. The fifth, and final step, informs the user of its suggestion with a breakdown explaining why. An in-depth description of each will be provided in the System section.

2 Data

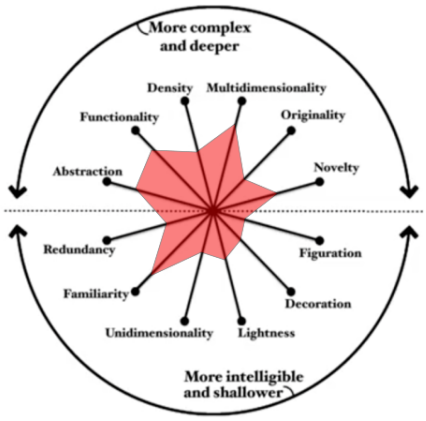
A variety of sources were used to retrieve all the data needed for the application. CarSalesBase was used to retrieve all the sales information for cars from 1973 to 2017. [2] CarSalesBase also provided the hierarchy to the data from type of car

(i.e. SUV) to size (i.e. midsized). To integrate fuel economy data to each car, we took a dataset on the 2017 miles per gallon ratings from government data. [3]. This data also provides the electric vehicle ranges. The average price of gas in the United States was given by the U.S. Energy Information Administration [4]. For price, we took the base model's manfuacterer's suggested retail price (MSRP). The service and insurance costs were retrieved from AAA (The Automobile Club) [5]. To explore the feasilbility of an electric car, we needed the location data of all public electric car charging stations which is also provided by the government [6]. Lastly, the Uber prices for an individuals commute is retrieved by making an API call to Uber. [7]

3 Approach

3.1 Design Considerations

Our ultimate design goal was to have the website be intuitive to use for a new user. This is why we decided to lay out the webpage in 5 simple tabs that are on the left side of the screen. This creates the flow for the application.



The wheel above describes the design attributes we went with on the unit level. Our main goal was for the user to easily understand the information and navigate to next steps. Therefore, we made the interface of each chart very similar to one another. For instance all the charts you click on a bar, line, or slice to drill down or to select the item. This makes the application more familiar to use. From a content perspective, the data displayed is quite novel; there is very little repetition in what is shown across the charts. The most overlap is how you can view 2017 sales of cars in both the line chart and bar chart.

Most of our data is presented abstractly in the charts and the figure of the car is only seen once. The visualizations also serve a very functional purpose of extracting information. Therefore, little decoration is used. Lastly, the data is highly multidimensional, especially in Step 1. Each of those charts has multiple layers of data and the bar chart even allows for different filters to be used.

3.2 Technical Considerations

In creating the application there were a number of technical decisions made. For a framework, we had multiple options but decided on using Angular due to our familiartiy with it. Another technical consideration regarded what functionality the charts could have. We really wanted to have the drill down functionality but it was unknown if this would be able to be developed as we never before dealt with visualizing hierarchical data.

3.3 Development

There were multiple steps in the development of this application. The three major steps were data preprocessing, unit development, and integration.

As our data came from a variety of sources, integrated them all into logical JSON objects involved us creating several Python scripts. For example, a script was needed to map the miles per gallon government data to our sales data and one was needed to create a nested parent-child hierarchy

In order to work in a parallel manner, most of the visualizations were developed independently of one another. This made sense as we could break up the effort and because most of the visualizations do not need integration with other units. For those that did need integration, the necessary functions were developed and tested first independently.

Once all the units were developed and tested, they were integrated into our final production application where all the data flowed properly.

3.4 Evaluation

To evaluate the system, necessary technical testing was needed as well as a simple sanity check. For the technical testing, both unit testing and systems integrated testing (SIT) was used. In unit testing, each visualization was tested independently before integration. In SIT, the full end-to-end process was tested to ensure the data was being properly stored and utilized at each step. After technical testing was finished, a sanity check was used to ensure the application's user interface and experience was up to our standards. To complete this, we asked a few of our classmates to use the application without us giving any assistance and receive feedback from them.

4 System

4.1 Step 1: Car Market

This section has three interactive drill-down charts to explore the car market in different ways. The donut chart shows the market shares for each car company in the overall car market in 2017. This chart has drill down functionality from company market share to car makeup of company sales. By hovering, information of the slice is displayed. The line chart allows you to analyze the trends in car

sales from 1973 until 2017 with drilldown functionality by clicking the lines and also has tooltips. The final chart in this step, the horizontal bar chart, allows a user to compare the sales, miles per gallon, and price of the automobile market in 2017. This chart is also hierarchical where it goes from segment of car, to size, and then to the individual car. For the miles per gallon and price, the values shown at the top two layers of the hierarchy are averaged for the cars in the respective category. In contrast, the number of sales is aggregated. The user can order the chart in alphabetical, ascending, or descending order.

4.2 Step 2: Electric Cars

This step allows the user to explore the feasibility of using an electric car because one major concern for them is if it can drive to the places the driver desires if going longer distances. The first chart in this tab, the lollipop chart, shows the different ranges for electric cars. The user can click on a bar to select the electric car of choice. The second visualization on this page shows the locations of all public electric car charging stations in the United States. When you hover over a station's point, it will expand its radius to the length of the range of the electric car you chose in the lollipop chart previously. The expanded dot also becomes slightly transparent so you can see what stations you can hop between. Additionally, the charging station's information is additionally displayed if the user needs it.

4.3 Step 3: Car Selection

This third step is when the user selects a car through inputting a variety of information. First, it will ask the user to input how many years they expect to own the car for. After this, the page has a variety of check boxes which ask the user what kind of segment and size car they desire. The last box then has a dropdown menu which the user can select the car of choice. The choices in the dropdown are dynamically filtered by the checkboxes selected. Once a car is selected, the bottom part of the page will display all the information regarding the car to the user as well as a picture of it. It will then prompt the user to confirm their selection.

4.4 Step 4: Uber Commute

Now that a car is selected, the only information that is needed now is the uber pricing to compare it to. In order to get this information, the user is asked to input the start and end locations of the individual's commute. A google map API is used to process the locations and also to display a map if the user needs it. Once the locations are inputted, the Uber API is called which returns the prices for the available kinds of Ubers in the area. This average price for each kind is displayed to the user in a vertical bar chart. The user will click on a bar to select the Uber desired. Once a bar is selected, the system prompts the user to confirm their selection which will be stored.

4.5 Step 5: Buy vs. Uber

Step 5 displays the total cost breakdown and suggestion to buy or uber with the savings expected. It also displays a visualization below to change the amount of miles you drive in a week. The default is your commute ten times. You can scroll the green dot to change this if you drive more or less in a week and it will dynamically change the suggestion. A reference line is given so the user can base their movement off of.

5 Related Work & Conclusions

The inspiration for this work came from the New York Times article on whether to Rent or Buy a house. [8] A similar calculation was attempted by the website rideordrive.org. Where our application differs is that it allows you to explore the market and select a car rather than rideordrive which asks the user to input all the car's information. [9]

Once the user goes through each step, they should have a good idea about whether buying a car or just ubering is the better financial decision for them. We hope that this intuitive web page will help individuals save money.

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