

ITOM Data-base Final Project

Cars.com Final Report

Introduction of the organization

Cars.com is a leader solution provider that enables customers to buy and sell cars through a digital marketplace. Cars.com application was founded in 2019 in Dallas, Texas by a group of SMU students who sense an opportunity to help students get a better online car-shopping experience. The application provides a variety of information about different cars and dealerships for customers to obtain. We believe that this application will enable students to overcome many challenges such as communication, transportation, and system and process familiarity. In addition, we are confident that our data-driven engine search will smooth the hectic process and enrich it with reliable and accurate information about cars and dealerships.

Scope of the Project

The website will provide users (students) to buy and sell cars in the DFW area. The users are provided with options to input their personal information, preferences and budget into the application, and the algorithm behind will return recommendations. Students are provided with insights of the nearest dealers and private sellers including their rating, location, and a history of their vehicles sales. The website provides students with the cars' information that best fit their needs as below :

- Customer: Student ID, budget, preference (make, model, year...etc.)
- Location: Longitude, Latitude, zip code, City, School
- Cars: VIN #, manufacture, model, year, features, Carfax report, mileage, type
- Price: fair price, sale price
- Recommendation: dealer rating, customer feedback

Goals of the Project

The intended users for this database are students including international students from different universities and different dealerships in the DFW area. The database will facilitate the process of buying a car for international students attending universities in the US. The application will increase efficiency in the car search by providing a special feature that enables verified students to get special promotions, and offer the eligibility of payment plan without the need of social security number. This application benefits the dealers as well , since it assists in generating more revenues by increasing their car sales.

CONCEPTUAL DESIGN & LOGICAL DESIGN

Tables Contained in E-R Diagram:

- **Student** – Information from students such as his ID and unique password to make use of the app.

Includes: Student_Id and Student_PW

- **Order** - Basic information that distinguishes each order.

Includes: Order_Id, Year, Month, Day, Vin, Sold_Price, Student_ID

- **Vehicle Info** - Descriptive information of the cars.

Includes: VIN, price, year, manufacturer, make, odometer, paint_color, image_url, Dealer_ID

- **Car Check** – Information to check background information from cars.

Includes: VIN, title_status, condition, report_link, Score

- **Dealer** -Personal information from dealers including location from nearest dealers.

Includes: Dealer_ID, Dealer_Name, Address, Phone, Latitude, Longitude

Reasons for E-R Diagram Design:

Cars.com is an app that provides competitive prices and accurate information about cars in the U.S. market for students. Our operational database/UI is focused exclusively to the following business units: Students and Car Dealers. We picked these entities due to their strong relationship on each other. The system can be managed by dealers/car sellers in order to record all aspects pertinent to the car information and their personal information.

Dataset

The data used in our project was found on Kaggle – Kaggle Data. Since the dataset was not exhaustive, we had to generate a database demo and merge it with the original dataset from Kaggle. However, Latitude, Longitude and Student ID was generated due to privacy measures.

ER-Diagram

We have three main tables including student, vehicle information and dealer information in the ER-Diagram (Exhibit 1).

1-The student table: consists of student id and the student password to log into the application. Student Id is the primary key of the student table and the foreign key for the Order table. When a student signs up for the system, the UI generates a unique password for them.

2-The Vehicle Info table: has the VIN as its primary key. Based on the primary key, we can get the details of the cars. Dealers can list their cars by inputting price, year, manufacturer, make, odometer, paint color and even attach an image of the car. Once the car is listed into the database, it will automatically upload as part of the inventory and then when a customer makes an order it will be removed from the list of cars available and moved to the orders table.

3-The dealer information table: uses Dealer_ID as its primary key and connects with the other two tables as a foreign key. The dealer information tables contain details pertaining to the seller of the car. Besides having personal information from the dealer in order to contact them, the table contains the physical location of the car (latitude and longitude).

In addition, we included a car check table that allows buyers to make a check of the title status, condition, report and score of the car. This table was created in order to promote the security of the buyer and prevent any potential illegal origin, stolen cars, unauthorized software, etc.

Normalization

We used the rules learned in class to normalize our design to the 3rd normal form

Relationships / CRUD OPERATIONS		
ENTITY	CRUD	Relationships
Student	CRU	A student can have one to many orders
Vehicle Info	CU	vehicle can have one car check
Car Check	CRU	Car check can have one vehicle
Dealer Info	CRUD	Dealer can have many cars
Order	R	An order can have one to many cars

Shiny/UI

We designed a Shiny application that interacts with MySQL database and performs CRUD operations. We read data from MySQL database and used R to analyze car data. The functions of the Shiny application are listed below.

Two accounts

In our dashboard, we designed two types of user accounts. One is for administrator, the other is for customers. The administrator has access to all the car data in database and can edit, delete

any information. The customer account is for end users where they can search and enter new car's information.

Two search functions

two search functions where we allow our users to do some basic search operations. The “Buy a car” enables customers to enter any specs of the car they want. The “Sell a car” enables customer to enter any information of the car they want to sell.

Insert, Update, and Delete functions

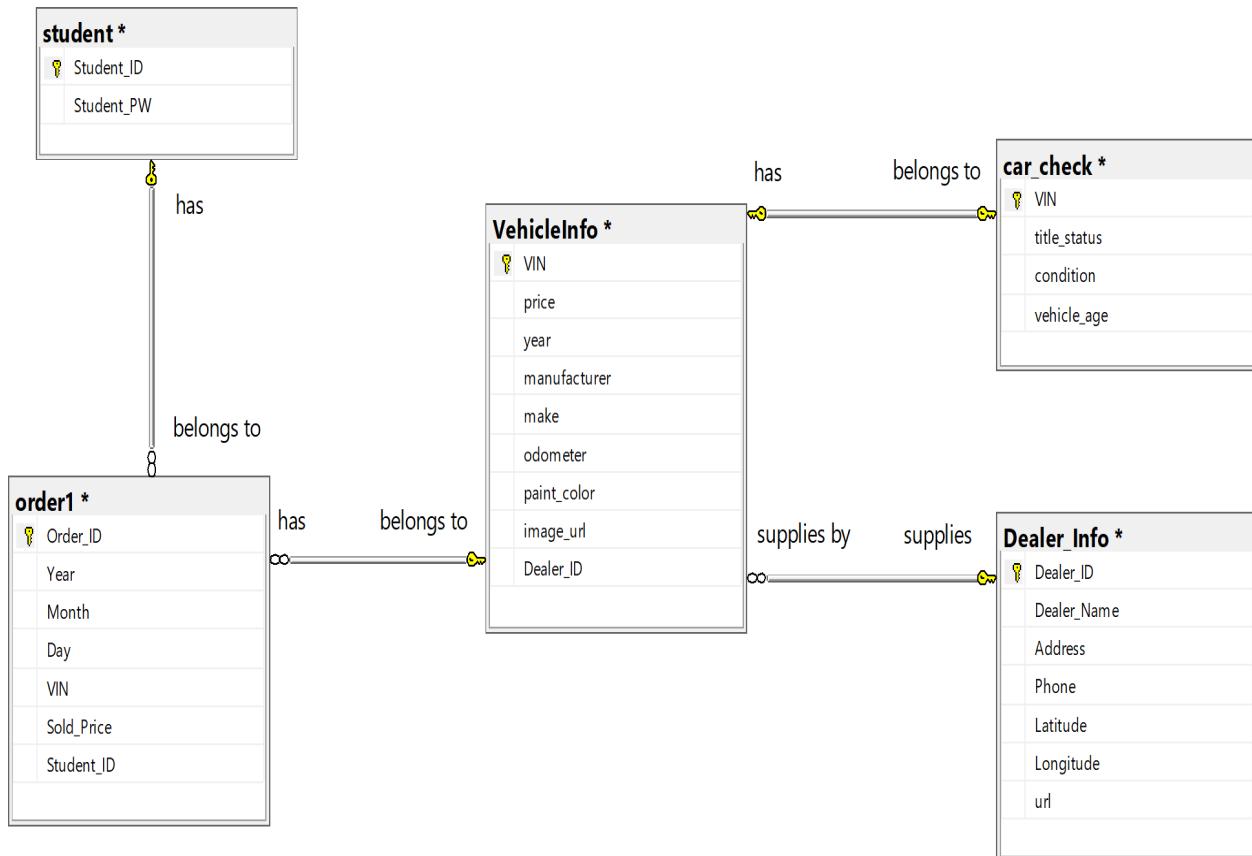
The insert function enables internal users to add a car with detailed information: name of the car, year, price, manufacture, and image URL. Besides, we also created update function, where users can edit the information they entered before. Finally, delete function could be used to delete any car by administrator. Once the car is sold, the information related to this car will be automatically deleted from vehicle database and pasted to order database. However, due to security control, external users are not allowed to delete any cars.

Analytics

- **Market share** - Users can visualize the different demand for a variety of car models
- **Car recommendation** - Users can obtain recommendations on car models based on customers inputting features.
- **Inventory management**- Users have the opportunity to manage prices and inventory by visualizing customers demand
- **Sellers map** - Users can view dealerships' locations on a map

Appendix:

Exhibit 1

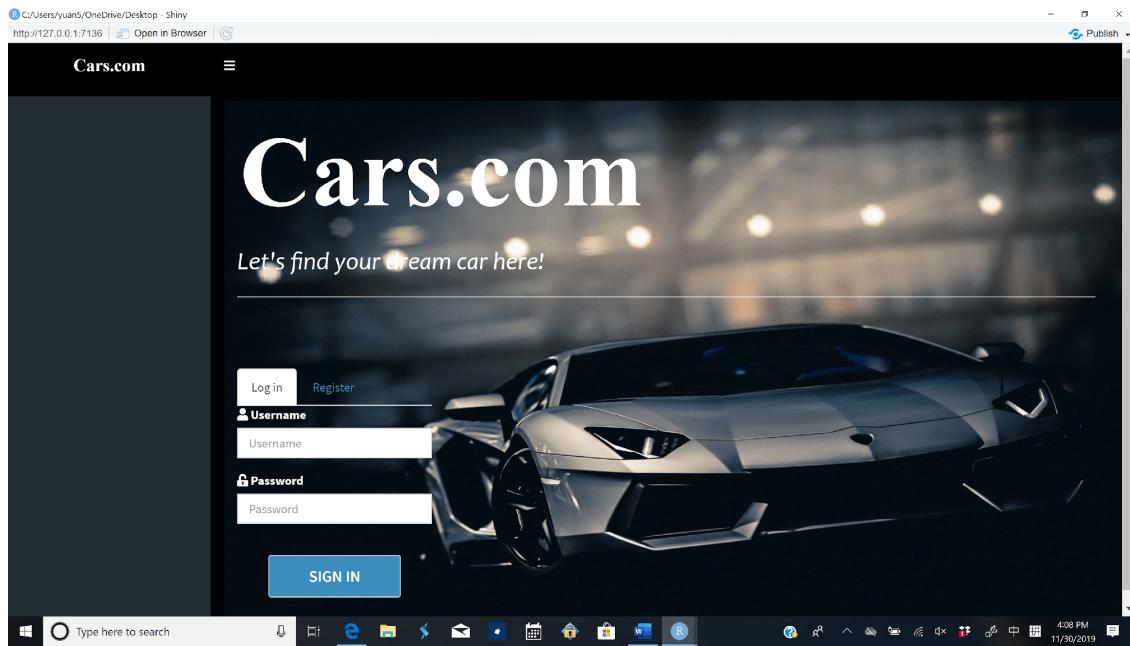


- Relationships:
 - A vehicle belongs to minimum 0 and maximum 1 order. An order has minimum 1 and maximum 1 vehicle.
 - A student has minimum 0 and maximum many orders. An order belongs to minimum 1 and maximum 1 student.
 - A vehicle has minimum 1 and maximum 1 car check. A car check belongs to minimum 1 and maximum 1 vehicle.
 - A vehicle supplies by minimum 1 and maximum 1 dealer. A dealer supplies minimum 0 and maximum many vehicle.

- Data Dictionary

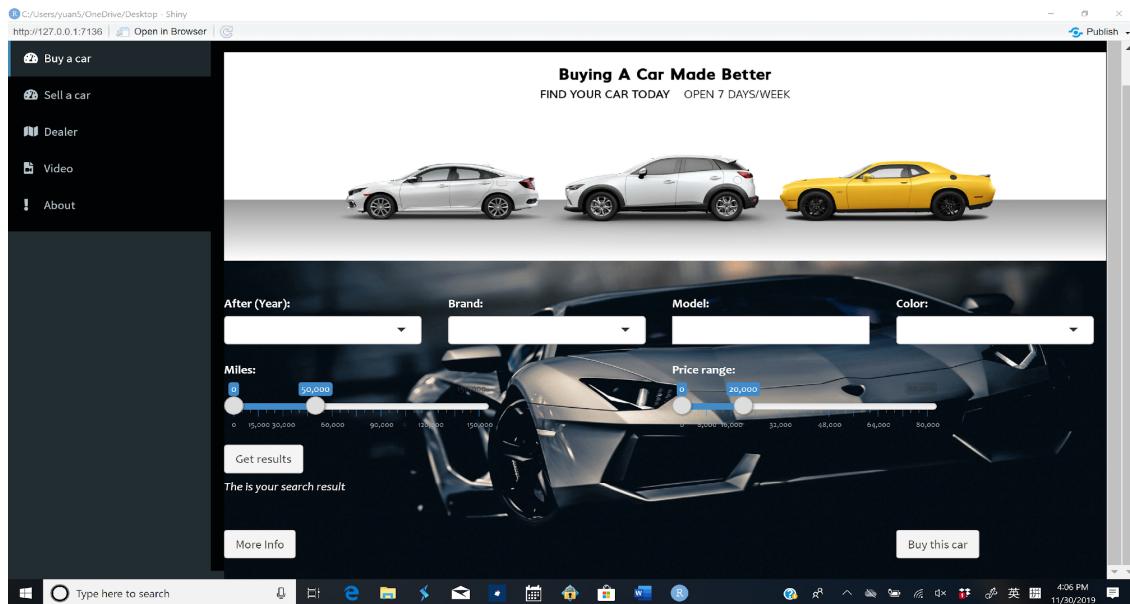
Student	
Student_ID	Unique identification for each student
Student_PW	Password made by student
Order	
Order_ID	Unique identification for each order
Year	Year of the order
Month	Month of the order
Day	Day of the order
VIN	Vehicle identification number of the car in the order
Sold_Price	Out-the-door price for the car
Student_ID	Unique identification for student who bought the car
VehicleInfo	
VIN	Vehicle identification number of the car
Price	Dealer price of the vehicle
Year	Year of the car
Manufacturer	Manufacturer of the car
Make	Model of the car
Odometer	Mileages of the car
Paint_color	Color of the car
Image_url	Image of the car
Dealer_ID	Unique identification for dealer who own that car
Car_check	
VIN	Vehicle identification number of the car
Title_status	Status of the title of the car (Clean, salvage, rebuilt...etc.)
Condition	Condition of the car (Excellent, good, fair...etc.)
Vehicle_age	Years since the car has been made.
Dealer_Info	
Dealer_ID	Unique identification for dealer
Dealer_Name	Name of the dealer
Address	Address of the dealer
Phone	Phone number of the dealer
Latitude	Latitude of the dealer location
Longitude	Longitude of the dealer location
url	Image url of the dealer

Exhibit 2:



This exhibit shows that the users need to register in order to use the service provided, students and dealers need to have users to improve reliability and credibility

Exhibit3 :



This exhibit shows the buy page for students where they can input features to get filtered car results

Exhibit 4:

The screenshot shows a web application interface for selling a car. At the top, there's a banner with the text "SELL YOUR CAR THE EASY WAY" and "Get your free online car valuation now". Below the banner are several input fields: "VIN:", "Price:", "Year:", "Manufacturer:", "Model:", "Miles:", "color:", and "Image URL:". A "Submit" button is located at the bottom left of the form area. On the far left, a sidebar menu includes options like "Buy a car", "Sell a car" (which is currently selected), "Dealer", "Video", and "About". The status bar at the bottom shows system icons and the date/time: 11/30/2019 4:07 PM.

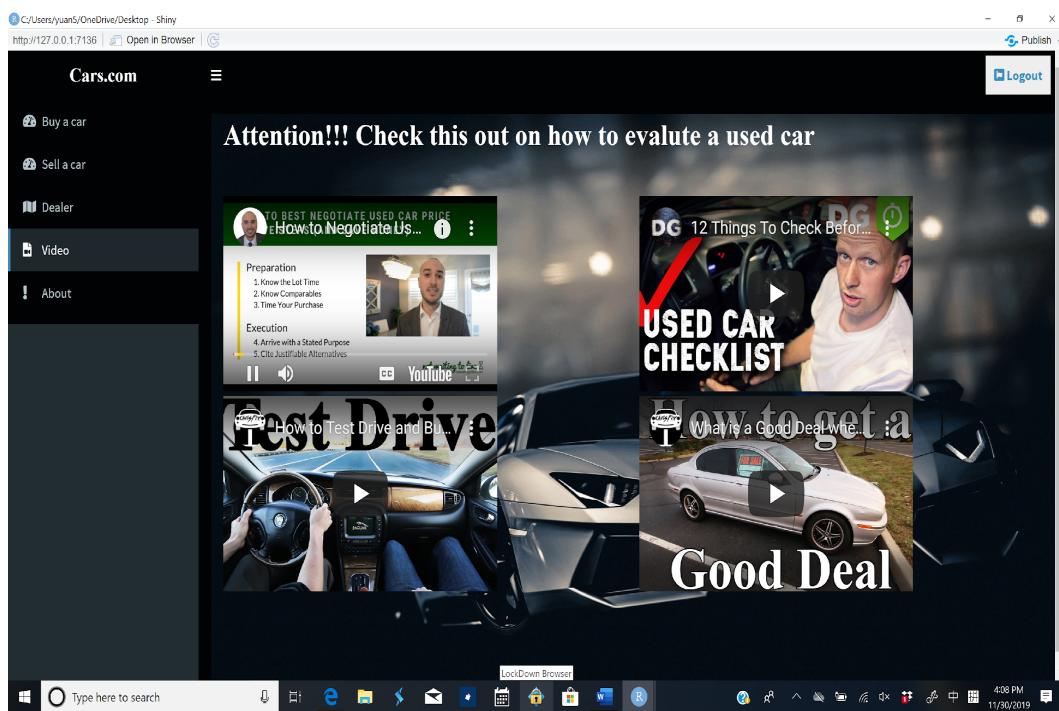
This exhibit shows the page for selling a car (both users dealers and students), users here need to input cars information correctly in order to match with customers features.

Exhibit 5:

The screenshot shows a dealer search results page for the Dallas area. On the left, a sidebar menu lists "Buy a car", "Sell a car", "Dealer" (selected), "Video", and "About". The main content area features a map of the Dallas area with various dealer locations marked by blue teardrop icons. A callout text says "Click on teardrop to check names and more information". To the right of the map is a section titled "Dealer Info" which displays details for Goodson Acura. The info includes: Dealer_Name (Goodson Acura), Address ("4801 Lemmon Ave, Dallas, TX 75219"), and Phone ((214) 692-2872). Below this is a photo of several Acura vehicles parked outside a dealership building. The status bar at the bottom shows system icons and the date/time: 11/30/2019 4:07 PM.

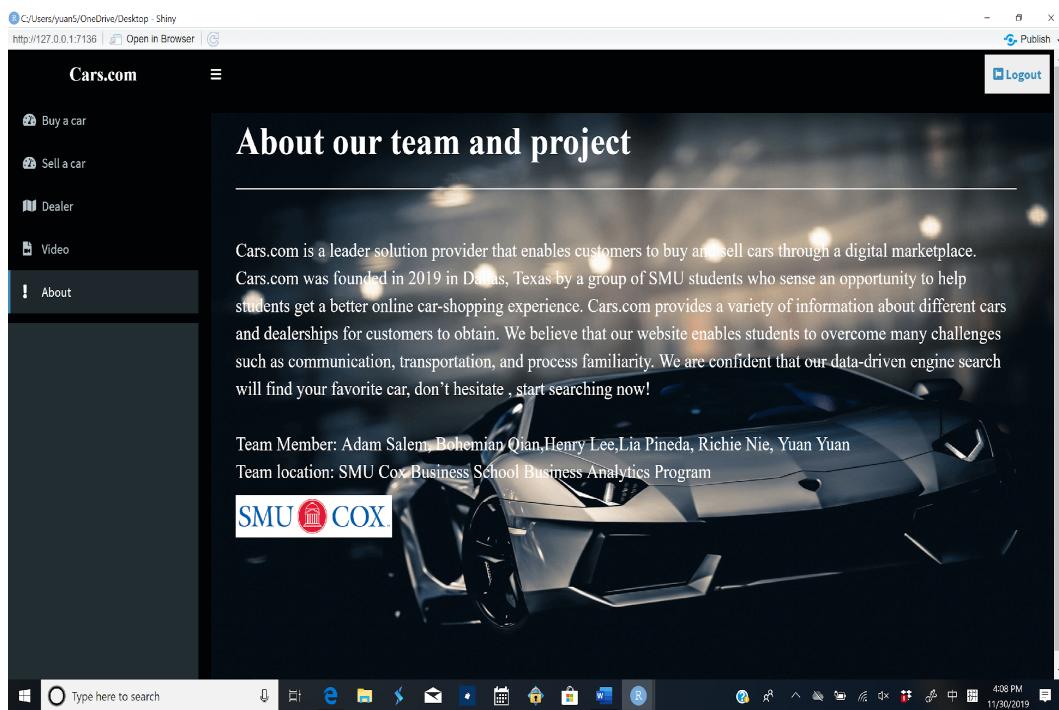
The Exhibit shows the dealers information page which provide users with dealer maps and information of cars that they have in their wishing list.

Exhibit 6:



This Exhibit show a video tab page, those videos will assist customers in buying skills such as negotiation , communication and driving tests.

Exhibit 7:



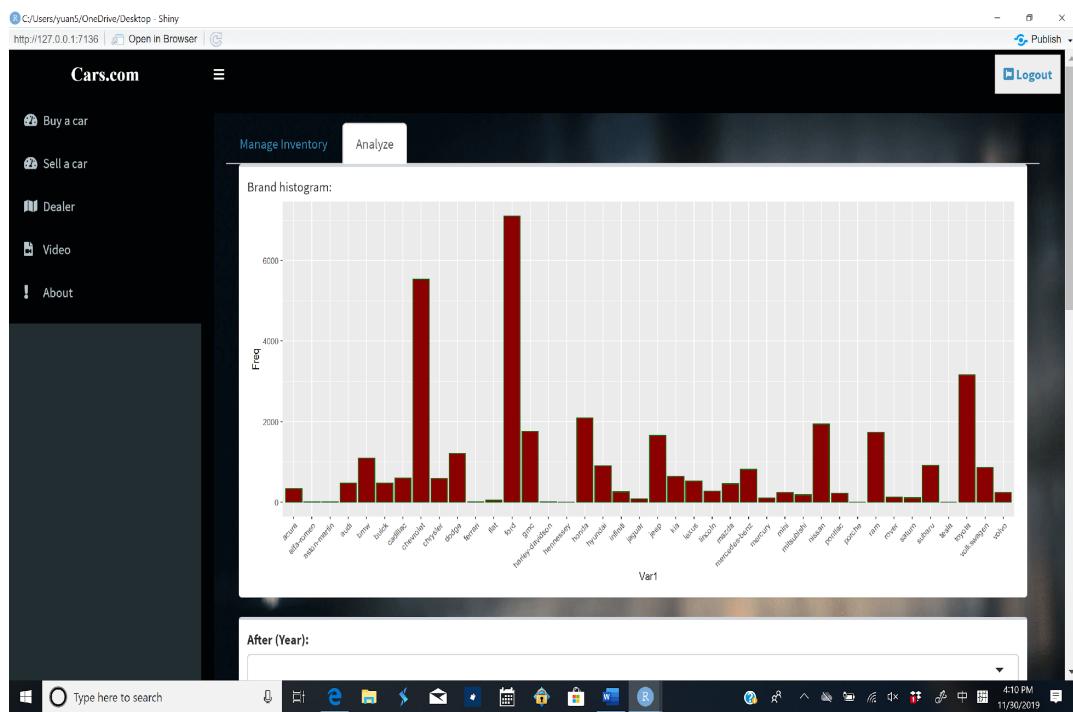
The about page tab will tell a story about the website founders and application goals.

Exhibit 8:

A screenshot of a web browser window titled "Cars.com". The main content area is titled "Manage Inventory" and contains fields for "Brand:", "Model:", and "VIN:". Below these fields are buttons for "Get results", "Edit", and "Delete". To the right of the input fields is a large, blurred image of a silver sports car. The left sidebar of the website includes links for "Buy a car", "Sell a car", "Dealer", "Video", and "About". The top right corner has a "Logout" button. The browser's address bar shows the URL "http://127.0.0.1:7136" and the title "C:/Users/yuan5/OneDrive/Desktop - Shiny". The taskbar at the bottom of the screen shows various pinned icons and the date/time "11/30/2019 4:10 PM".

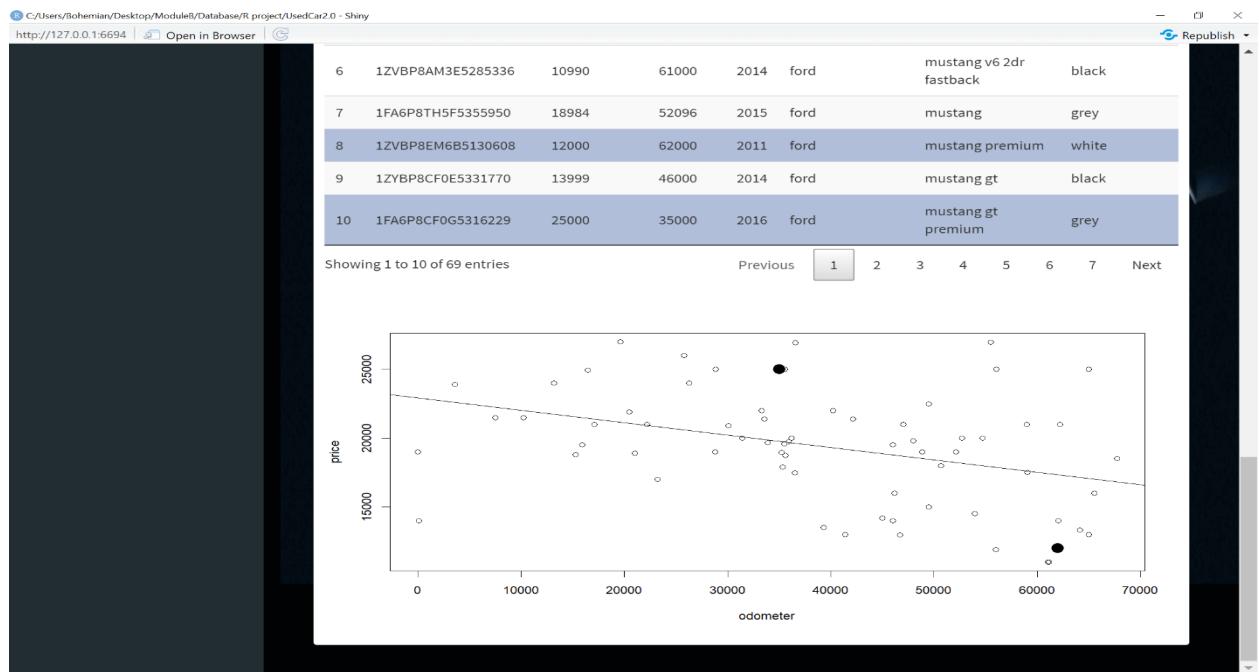
This is a special page will help users to manage their inventory specifically for dealers by searching the different demand for different car models.

Exhibit 9:



This Analyze page shows a distribution to inform customers about the overall demand for car models in the market.

Exhibit 10:



In the Exhibit 9, the line is a simple linear regression between price and mileage. The black dot above the average line suggests a high price and the dot below the line suggests a good deal for customers.