

Improving Personalized Shopping Experiences by Predictive Business Analysis of Customers' Buying Preferences

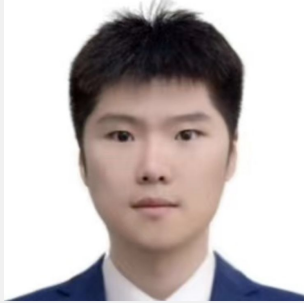
Carmax Showcase Presentation

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01/15/2023

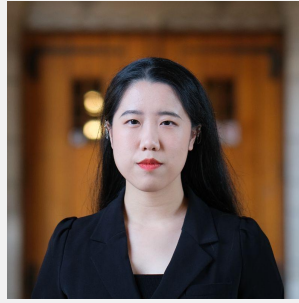


Our Team



M.Eng. ORIE - DA

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Our Goals

Imperative Strategy

Improve personalized shopping experiences for customers on Carmax stores and website to improve Carmax customer services

Recommendations

1. Implement market-specific advertisements in terms of brand and premium levels
2. Prioritize cars of the same make for customers who trade in mid-range cars with high customer loyalty
3. Show more upgrading options for medium-level car owners
4. For appraised cars with high brand loyalty, CarMax could prioritize cars with better performances of the same brand



Workflow **Outline**

01 DATA CLEANING

02 MARKET ANALYSIS

03 CUSTOMER LOYALTY

04 UPGRADE TENDENCY

05 DEEPER ANALYSIS

06 CONCLUSION



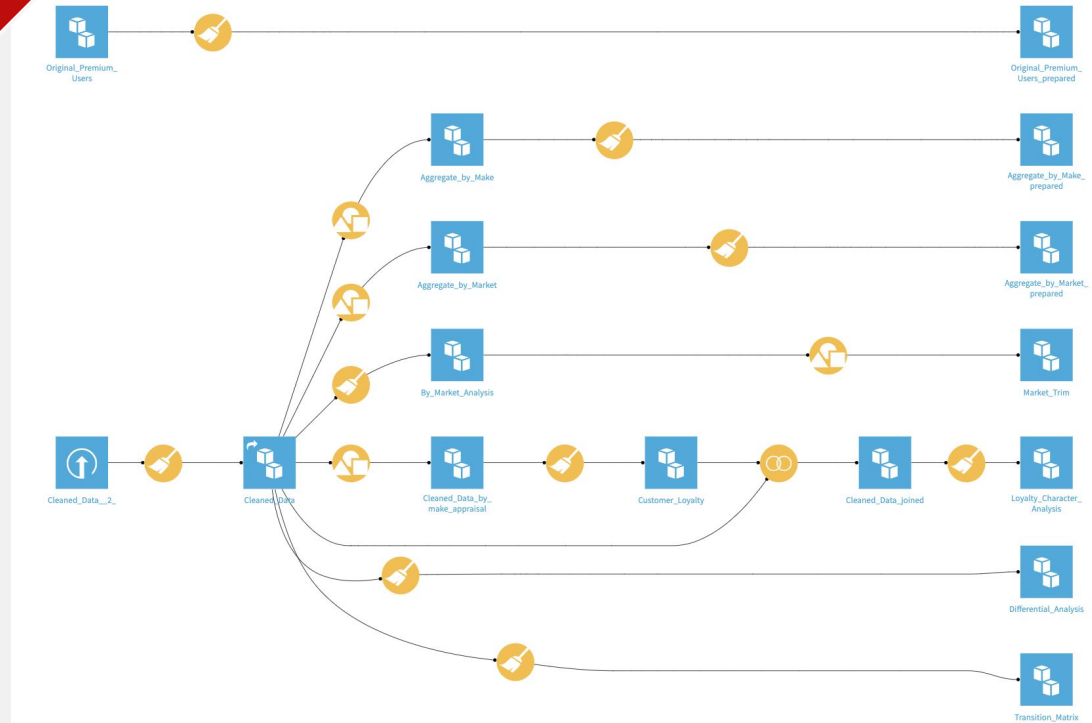
01 Data Cleaning



- Delete missing data points
- Digitize string variables to numeric variables
- Differences between purchased and appraised vehicles
 - **Price, model_year, mileage**
- Boolean variables
 - **Same_make, same_trim**
- Willingness to upgrade
 - **Trim_upgrade, trim_downgrade**

Data Pipeline

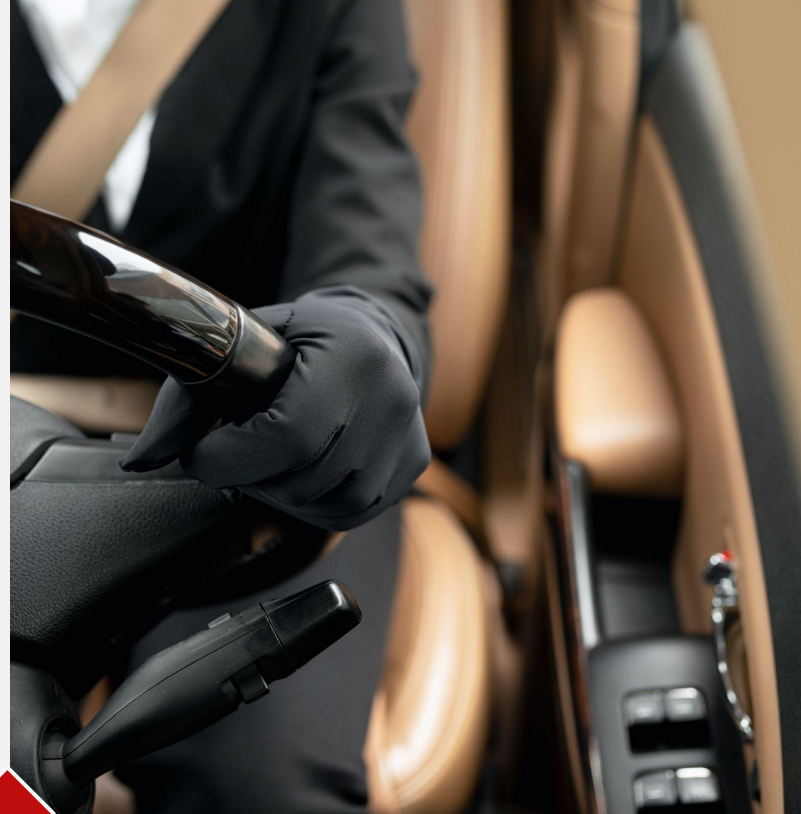
- Dataiku
- Multi-branch data pipeline



02

Market Analysis

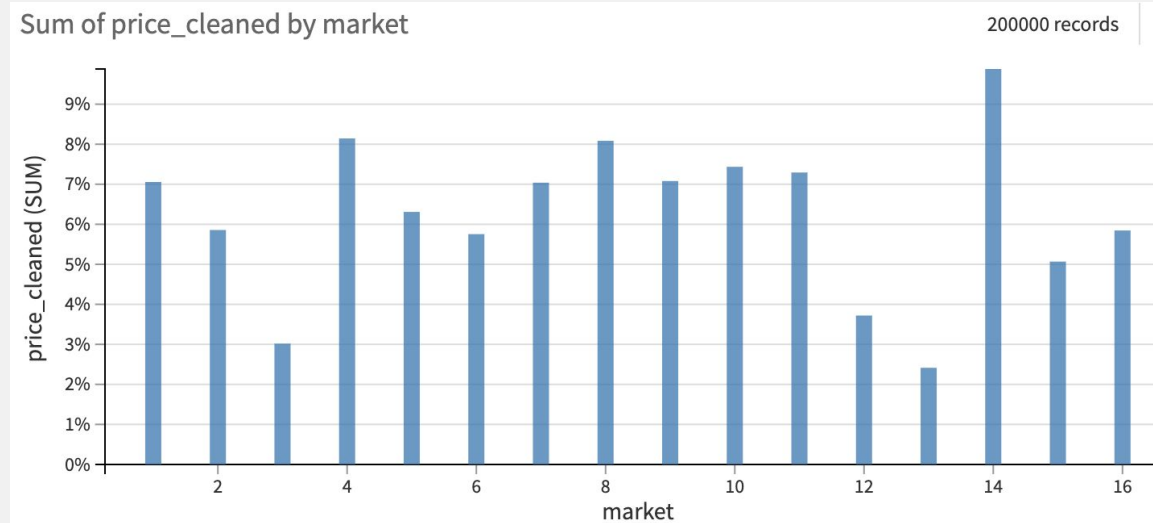
General Information Introduction with
One-dimensional Analysis in Macro view





Market Share

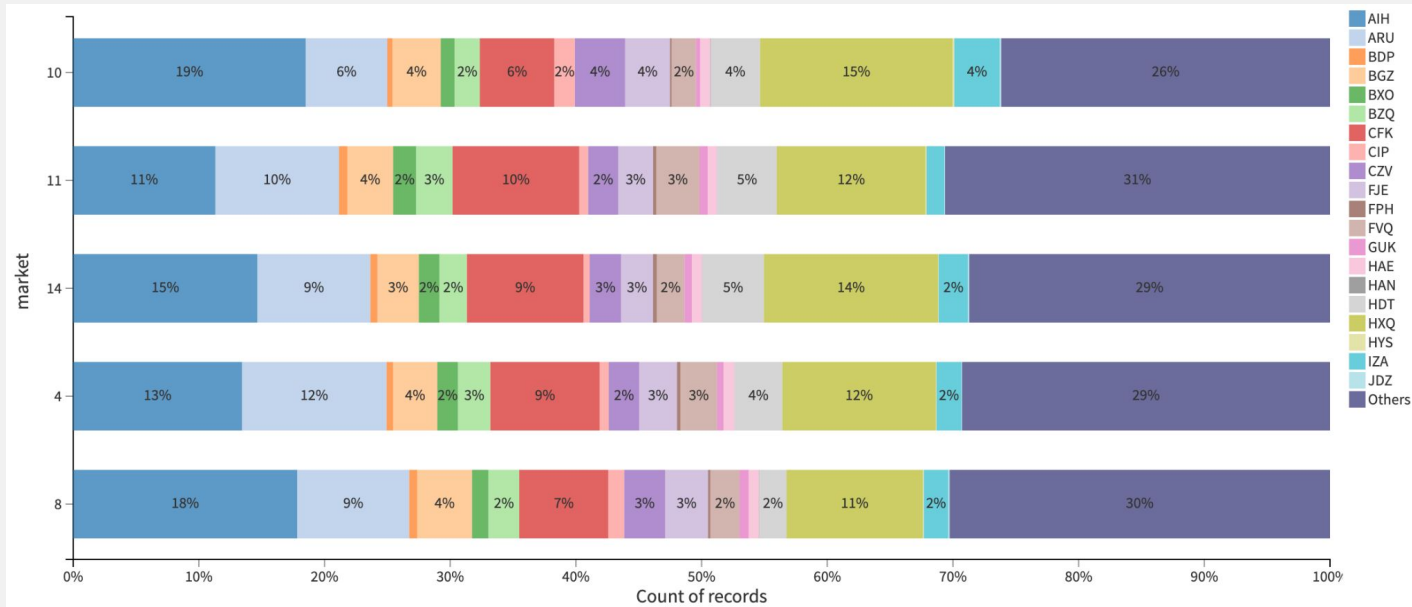
- Market 14 9.88%
- Market 4 8.14%
- Market 8 8.09%
- Market 10 7.44%
- Market 11 7.29%





Top Brand Sales

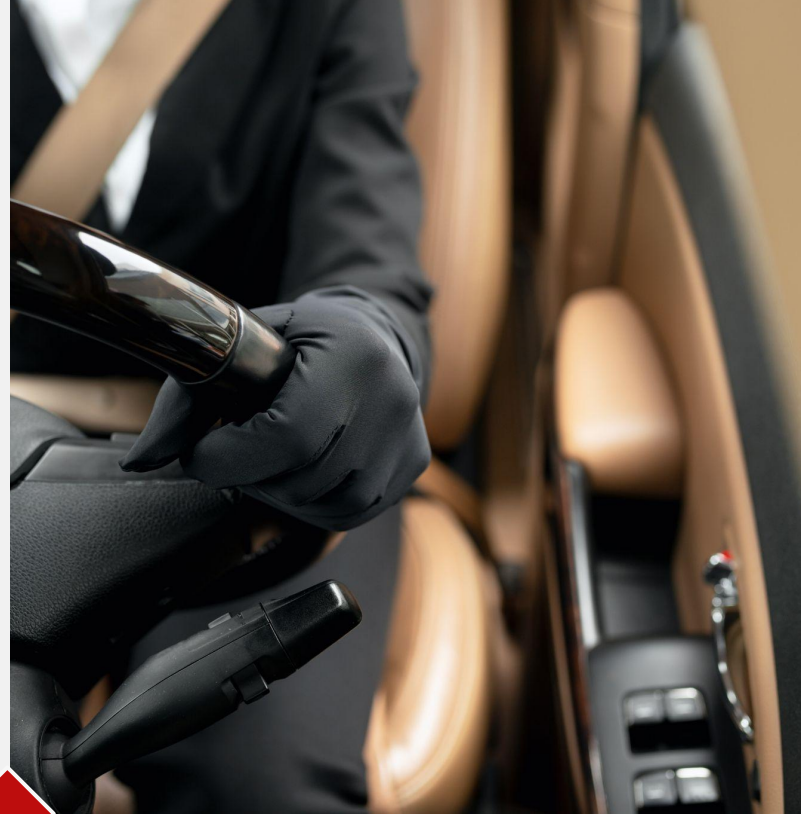
- Market 14: AIH (15%), HXQ (14%)
- Market 4: AIH (13%), HXQ (12%)
- Market 8: AIH (18%), HXQ (11%)
- Market 10: AIH (19%), HXQ (15%)
- Market 11: AIH (11%), HXQ (12%)
- Market 11: AIH (11%), HXQ (12%)



03

Loyalty Analysis

Mid-range car drivers are more likely to be loyal to a specific brand





User Loyalty by Brands

30.38%



AIH

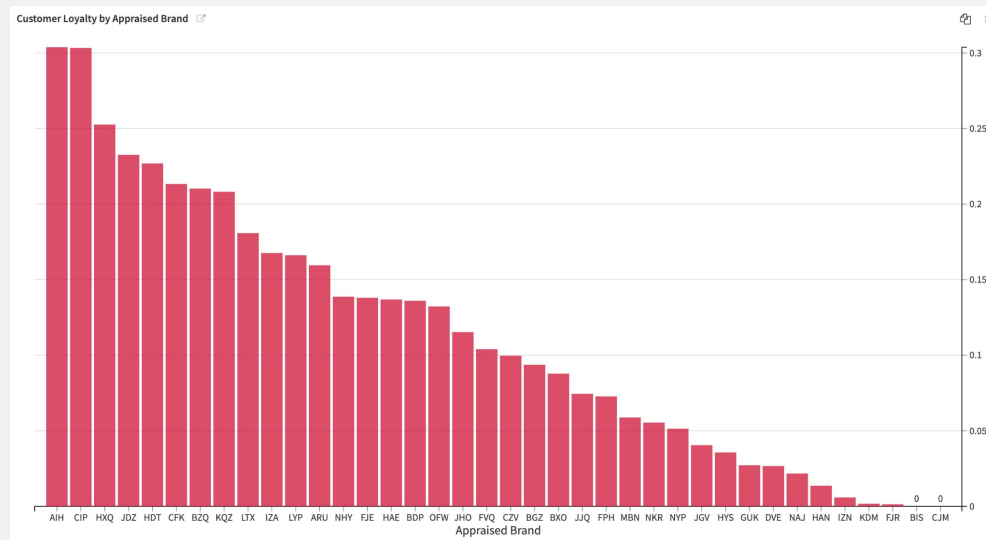
Buyers choose to buy another
AIH car (n = 21,000)

0%



BIS

Buyers choose to buy another
BIS car (n = 722)

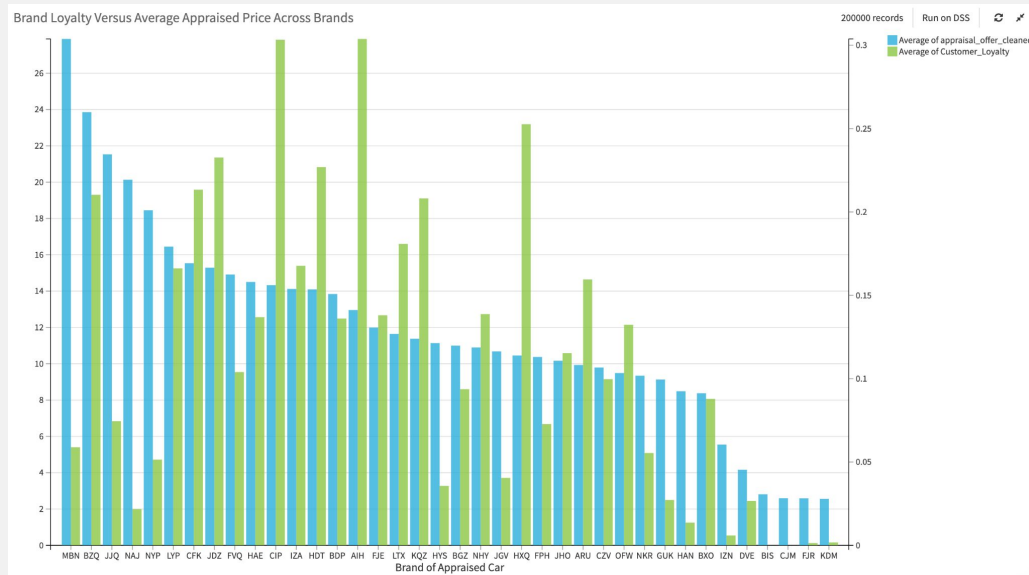


Customer Loyalty varies across different brands; CarMax could incorporate those information into suggestions



User Loyalty by Brands

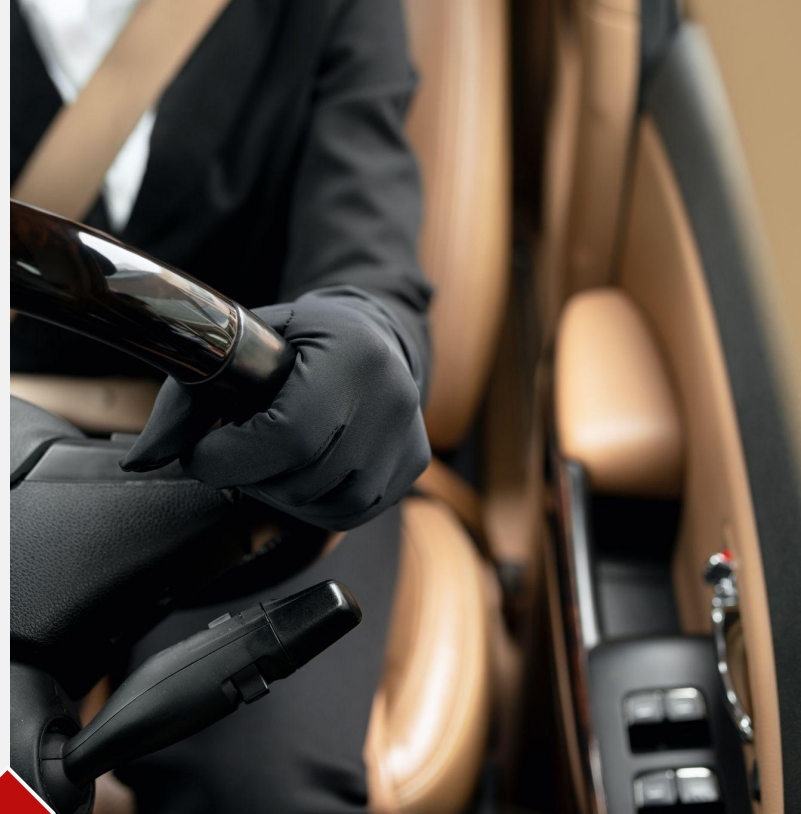
- The cars sell in the Medium Price Range generally gains more user loyalty
- This purchasing behaviour can also be observed in reality... (i.e. Toyota Corolla)
- Besides using the information about the trade-in brands, CarMax could gain customer loyalty insights from user portrait



04

Upgrade Tendency

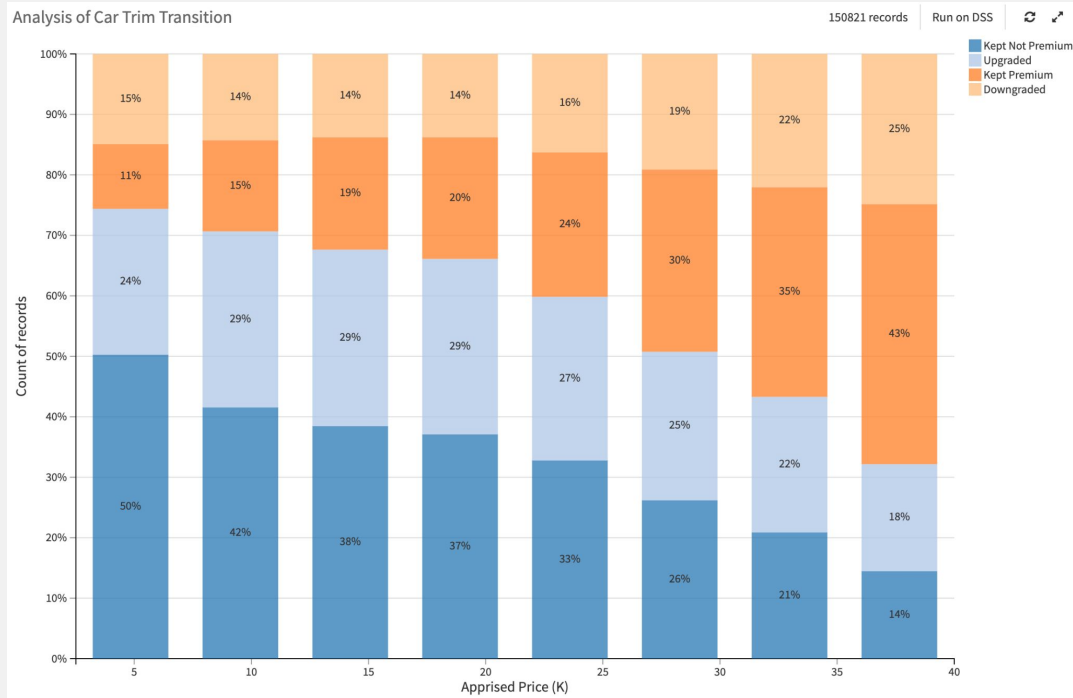
How willing are the
customers to upgrade their
cars?





Trim Type Transition Analysis

- Customers are classified into four categories by car trim (Missing Values Removed)
- Apparently, a higher fraction of cars are classified as 'Premium' when the price goes up
- Do the high-end users more likely to preserve their premium choices?





Trim Type Transition Analysis

42%

Owners of cars with premium trim bought another car with premium trim, if their original car worths \$5k

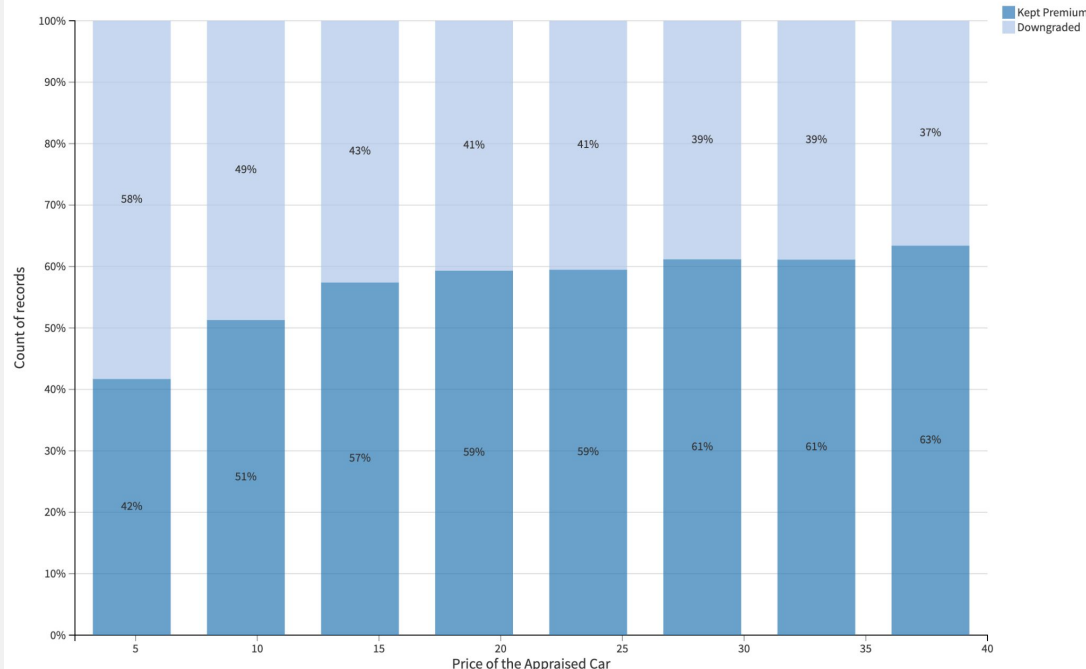
63%

Owners of cars with premium trim bought another car with premium trim, if their original car worths over \$35k

The Fraction of Premium Users buy another Premium Car, Compared to the car Price

49966 / 150821 records

Run on DSS





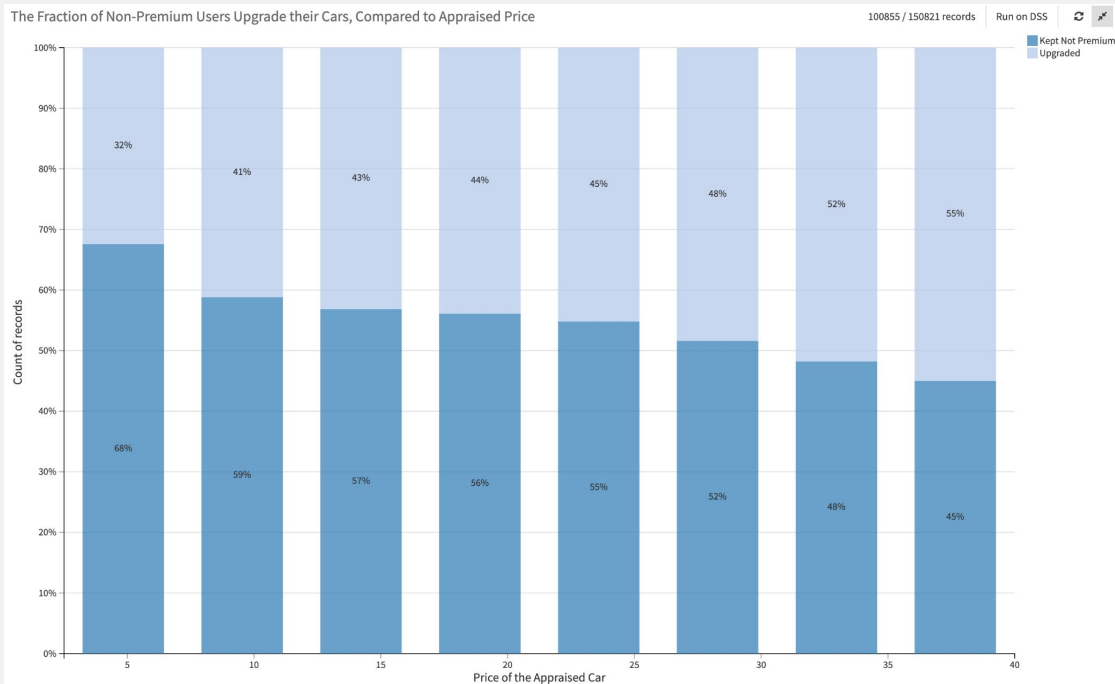
Trim Type Transition Analysis

32%

Owners of cars with non-premium trim upgrades their cars if their original car is worths \$5K

55%

Owners of cars with non-premium trim upgrades their cars if their original car worths over \$35K





Willingness to Upgrade Analysis

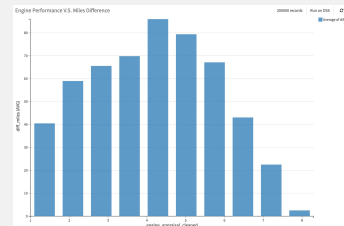
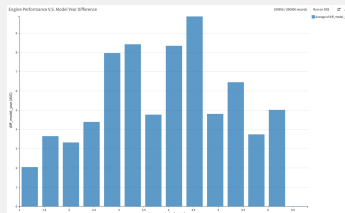
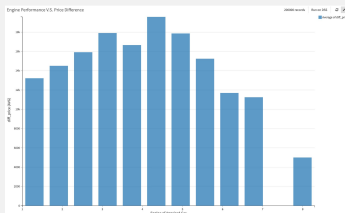
- Willingness to upgrade measurements
 - *diff_price*
 - *diff_model_year*
 - *diff_mileage*
- Car Performance measurements
 - *engine_appraisal*
 - *cylinders_appraisal*
- Our attempt is to use the performance of the original car to predict willingness to upgrade cars



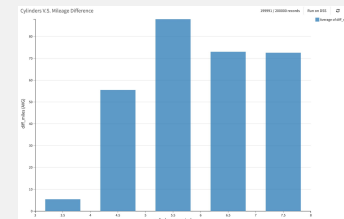
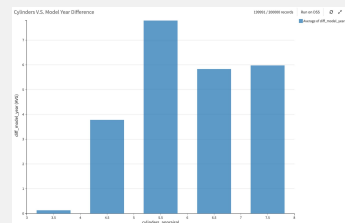
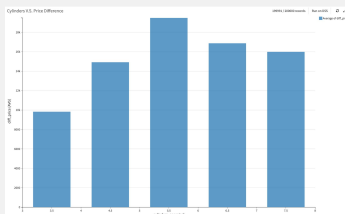


Willingness to Upgrade Analysis

Engine Performance



Cylinders



Difference in Price

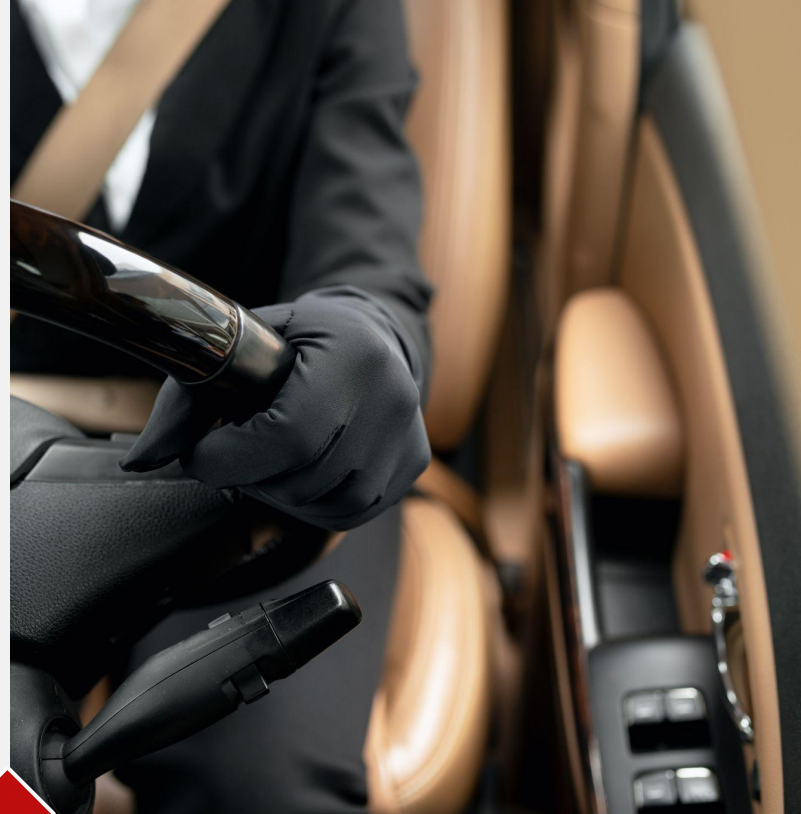
Difference in Mileage

Difference in Model Year

05

Deeper Analysis

Analyze Trim and Engine
Traits Under Specific Makes



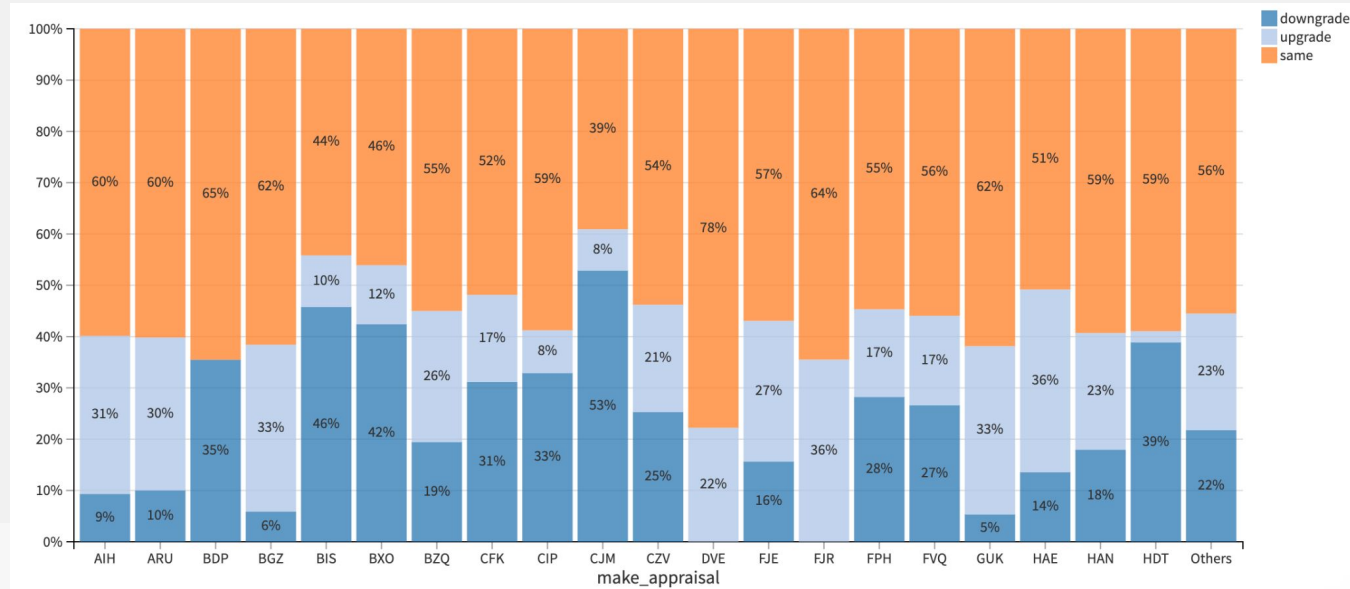
Trim Upgrade & Downgrade

Upgrade > Downgrade based on
non-cheap cars (price > \$25k)

- ◆ AIH (same make 33%)
- ◆ ARU (same make 18%)
- ◆ HAE (same make 16%)
- ◆ BZQ (same make 22%)
- ◆ FJE (same make 13%)
- ◆ BGZ (same make 9%)

Downgrade > Upgrade based on
cheap cars (price < \$25k)

- ◆ BIS (same make 0%)
- ◆ CJM (same make 0%)



Engine Upgrade & Downgrade

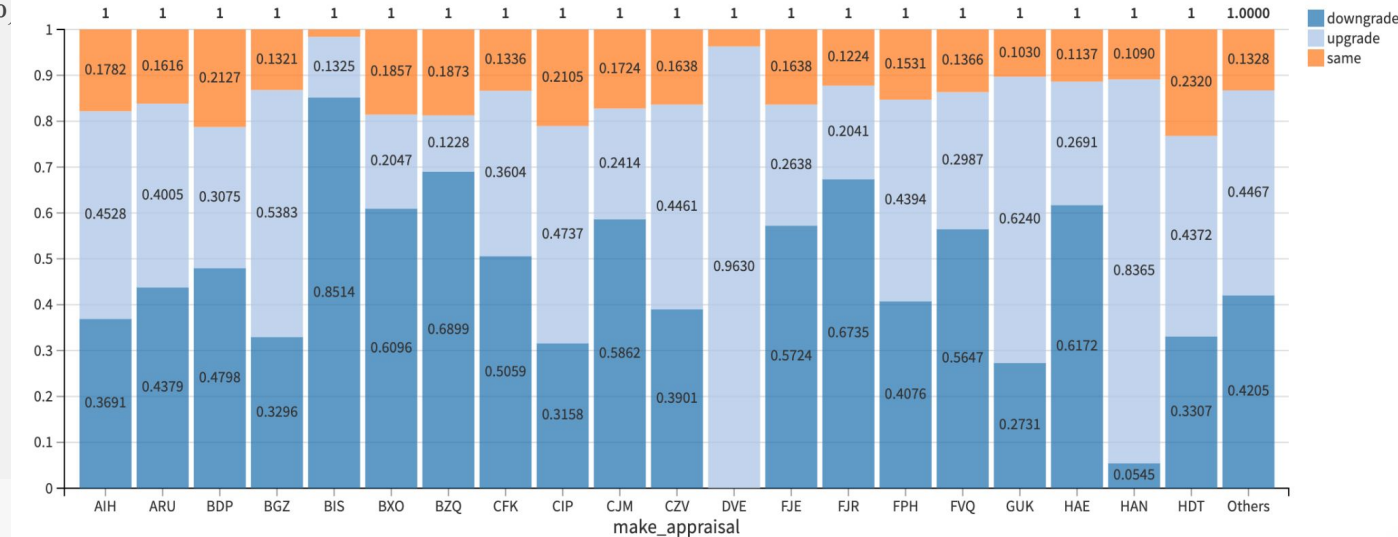
Upgrade > Downgrade based on
non-cheap cars (price > \$25k)

- ♦ AIH (same make 32.6%)
- ♦ BGZ (same make 9.3%)
- ♦ CIP (same make 19.3%)
- ♦ HDT (same make 21.5%)

Downgrade > Upgrade based on
cheap cars (price < \$25k)

- ♦ BIS (same make 0%)
- ♦ CJM (same make 0%)
- ♦ FJR (same make 0.4%)

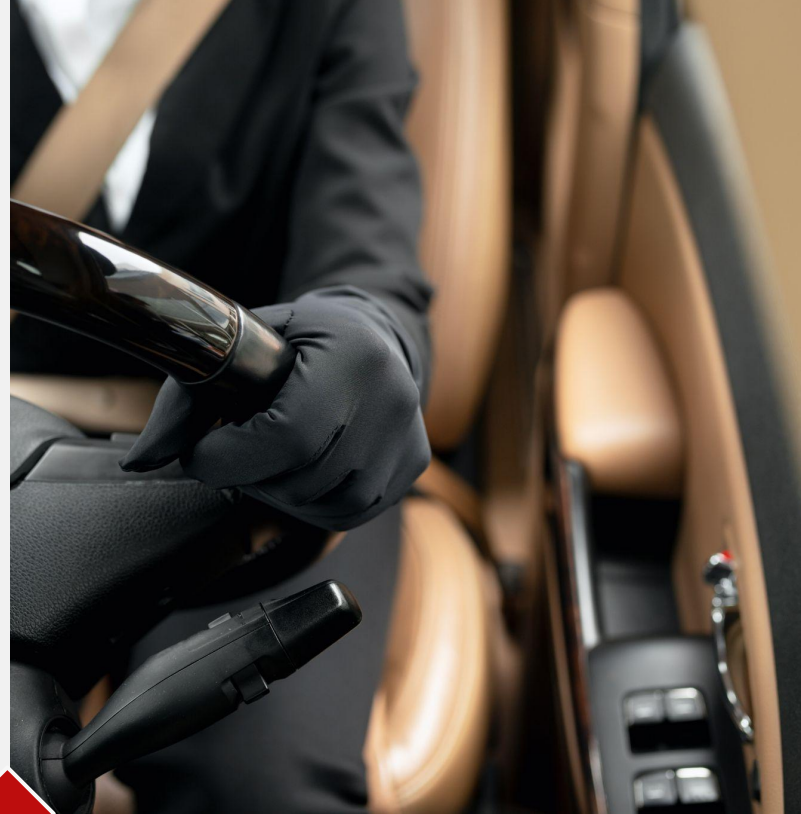
Conclusion: Even if customers can buy brands such as BIS and CJM with premium decoration and high engines at lower prices, they will not do so possibly due to the makes' drawbacks in functionalities.



06

Conclusions

Summarize key observations and recommendations to Carmax



Recommendations

on Improving **Personalized Shopping Experiences**

- ♦ Considering specific market and store areas, CarMax could implement market-specific advertisements in terms of popular brand and premium levels.
- ♦ Carmax could rank brands loyalty and recommend the same brand cars to customers who appraised high loyalty brand cars.
- ♦ Based on appraised cars' price and brand loyalty, Carmax could provide more upgrading options such as premium trim and greater engines to medium-level car owners with the same brand.
- ♦ For customers who are unlikely to buy the same brand, CarMax could suggest other cars of the same price or premium level that address their concerns with the old car.



THANKS!

Do not hesitate to contact and ask questions

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