

Web-Scraping Project: Used Cars on U.S. Market

www.carfax.com

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Outline

- ① Data (Source, Post-Scraping Processing)
- ② Observations:
 - ① Top fives
 - ② Comparison of a certain class of cars
 - ③ Correlations between quantities

- Select from 1000 most populous U.S. zip codes; 25 cars from each
- Key info. to be scraped **#done with scrapy**
Year, Make, Model, Price, Mileage, Body, Color, Engine

The screenshot shows a web browser displaying the Carfax website. The URL is https://www.carfax.com/Used-Cars-in-New-York-NY_c8636. The page features two main car listings:

2015 Toyota RAV4 LE
\$15,490 (\$254/mo est.)
GREAT VALUE \$3,630 below \$19,120 CARFAX Value

Mileage: 17,569 miles | Body Type: SUV
Color: Gray | Engine: 4 Cyl
Description: Used 2015 Toyota RAV4 LE with AWD, Keyless Entry, Cruise Control, CD (Single Disc), Rear-View Camera, Air Conditioning, MP3, Cloth Seats, Power Steering, Power Windows, AM/FM
Certified Luxury Motors Great Neck, NY (15 miles from New York, NY)

2015 Audi A6 2.0T
\$22,980 (\$376/mo est.)
GREAT VALUE \$5,400 below \$28,380 CARFAX Value

Mileage: 31,501 miles | Body Type: Sedan
Color: Black | Engine: 4 Cyl
Description: Used 2015 Audi A6 2.0T with AWD, Leather Seats, Fog Lights, Alloy Wheels, Navigation System, Keyless Entry, Cruise Control, Heated Seats, CO (Single Disc), AC Conditioning, MP3
Certified Luxury Motors Great Neck, NY (15 miles from New York, NY)

BTW, I chose this topic simply because I love cars



Post-Scraping Data Processing

- All the usual data cleaning; Add field: Manufacturer Country (e.g. Audi: Germany)
- For practical consideration, only retain

$$\{\text{Car}_j : 5,000 \text{ mi} < \text{Car}_j [\text{'Mileage'}] \leq 90,000 \text{ mi}\}$$

- Table ready:

```
In [86]: df = pd.merge(df, make_country_df, on='Make');
df = df[(df.Mileage>5000) & (df.Mileage<=90000)];
print(df.shape)

df.sample(10)
```

(17356, 9)

Out[86]:

	Year	Make	Model	Mileage	Price	Body	Color	Engine	Country
7581	2015	Chevrolet	Equinox	14296	18884	SUV	White	4 Cyl	USA
17506	2004	Mini	Cooper	79801	4999	Hatchback	Silver	4 Cyl	UK
13815	2015	Mercedes-Benz	M-Class	37984	33991	SUV	Gray	6 Cyl	Germany
14315	2014	Mercedes-Benz	E-Class	32697	23999	Coupe	Blue	6 Cyl	Germany
15753	2011	Cadillac	CTS	71462	15640	Coupe	Silver	6 Cyl	USA
17960	2015	Lexus	RX	18781	30996	SUV	Black	6 Cyl	Japan
5968	2015	Nissan	Altima	57027	8995	Sedan	Gray	4 Cyl	Japan
6497	2015	Nissan	Rogue	37849	16995	SUV	White	4 Cyl	Japan
13764	2015	Mercedes-Benz	GL-Class	22167	44484	SUV	Gray	6 Cyl	Germany
12311	2017	Toyota	Camry	9606	17995	Sedan	Red	4 Cyl	Japan

Some Top Fives

In terms of *volumes* on market: `#desc(n())`

- Top 5 Makes

Makes	Toyota, Ford, Nissan, Chevrolet, Mercedes-Benz
U.S. Makes	Ford, Chevrolet, Jeep, Dodge, GMC
Int'l Makes	Toyota, Nissan, Mercedes-Benz, BMW, Hyundai

- Top 5 Models

Models	Toyota Corolla, Toyota Camry, Nissan Altima, Toyota RAV4, Nissan Rogue
U.S. Models	Chevrolet Silverado, Jeep Wrangler, Ford Explorer, Chevrolet Cruze, Ford F-150
Int'l Models	Toyota Corolla, Toyota Camry, Nissan Altima, Toyota RAV4, Nissan Rogue

Some Other Top Fives

- In terms of *volumes* on market: `#desc(n())`

Top 5 Colors	Black, White, Gray, Silver, Red
Top 5 Audi	Q5, A4, A6, A3, A5

- In terms of *price* on market: `#desc(median(Price))`

Top 5 U.S. Models	Dodge SRT, Cadillac Escalade, Lincoln Continental, Ford F-250, GMC Yukon
Top 5 Int'l Models	Audi R8, Porsche 911, BMW i8, Toyota Land Cruiser, Mercedes-Benz GLS

Comparison of Three Models of the Same Class {Audi A4, BMW 3, Mercedes-Benz C-Class}

(1/3)

Note: Audi A4 = \mathcal{O} (BMW 3) = \mathcal{O} (Benz C-Class)



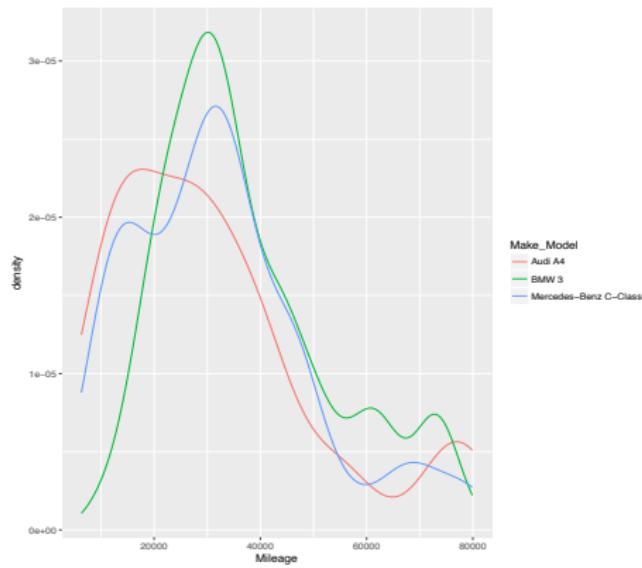
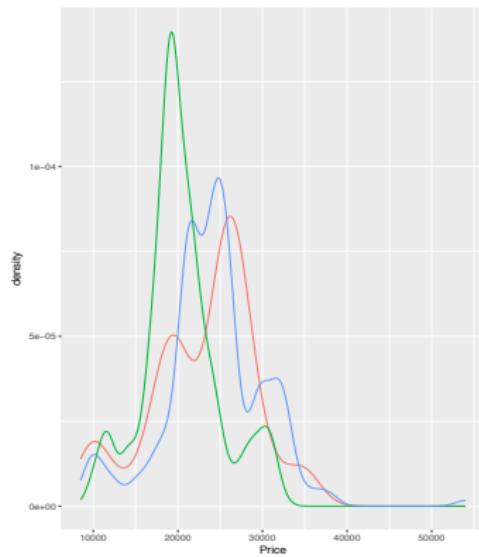
Comparison of Three Models of the Same Class {Audi A4, BMW 3, Mercedes-Benz C-Class}

(2/3)

Note: Audi A4 = \mathcal{O} (BMW 3) = \mathcal{O} (Benz C-Class)

Left: Price distributions; Right: Mileage distributions

(not very informative)

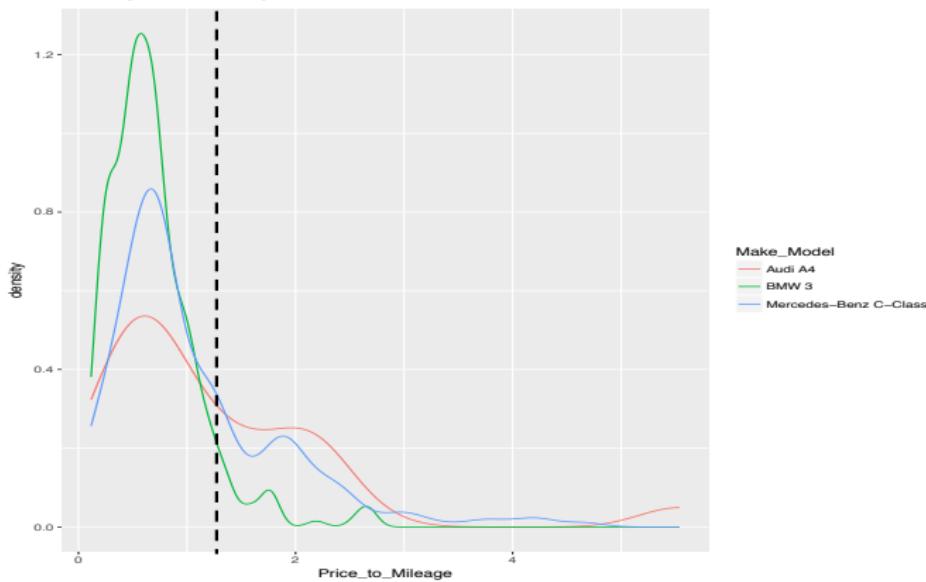


Comparison of Three Models of the Same Class {Audi A4, BMW 3, Mercedes-Benz C-Class}

(3/3)

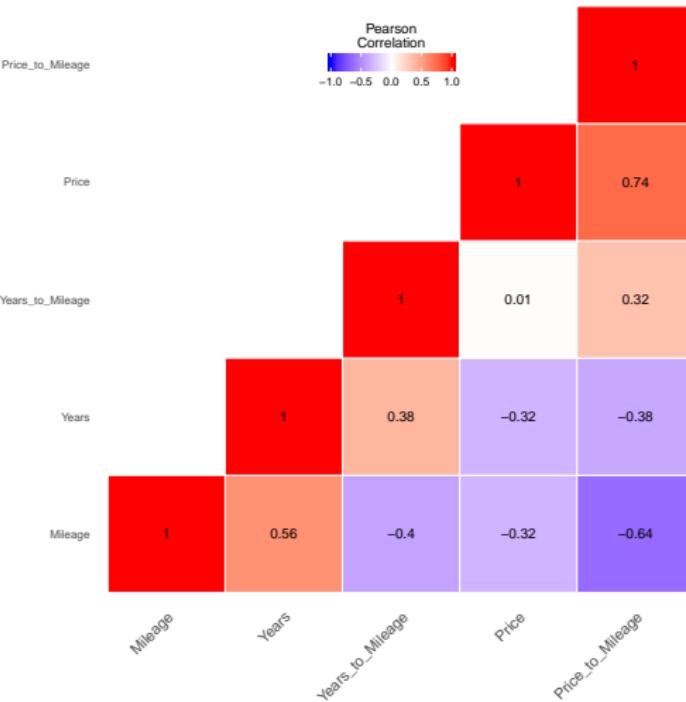
Price
Mileage Think about:
 $\frac{\$30k}{60k \text{ mi}}$ vs. $\frac{\$30k}{30k \text{ mi}}$
 $\frac{\$15k}{30k \text{ mi}}$ vs. $\frac{\$30k}{30k \text{ mi}}$

Postulate: Two categories of potential consumers for this class of cars



Heat Map of Pearson Correlations

Note: Quantity $\frac{\text{Years}}{\text{Mileage}}$ \sim Gentleness of Usage, e.g. consider: $\frac{5 \text{ years}}{5000 \text{ miles}}$ vs. $\frac{5 \text{ years}}{50000 \text{ miles}}$



- Possible Future Work:
 - ① More refined study wrt. locations, e.g., Mid-West market, NYC area market, etc
 - ② Incorporate other data, e.g., area demographic statistics, etc
 - ③ Discover more interesting patterns and try to explain them
 - ④ ... (Go talk to car dealers)
- Questions?
- Thank you!