# Web-Scraping Project: Used Cars on U.S. Market
# www.carfax.com

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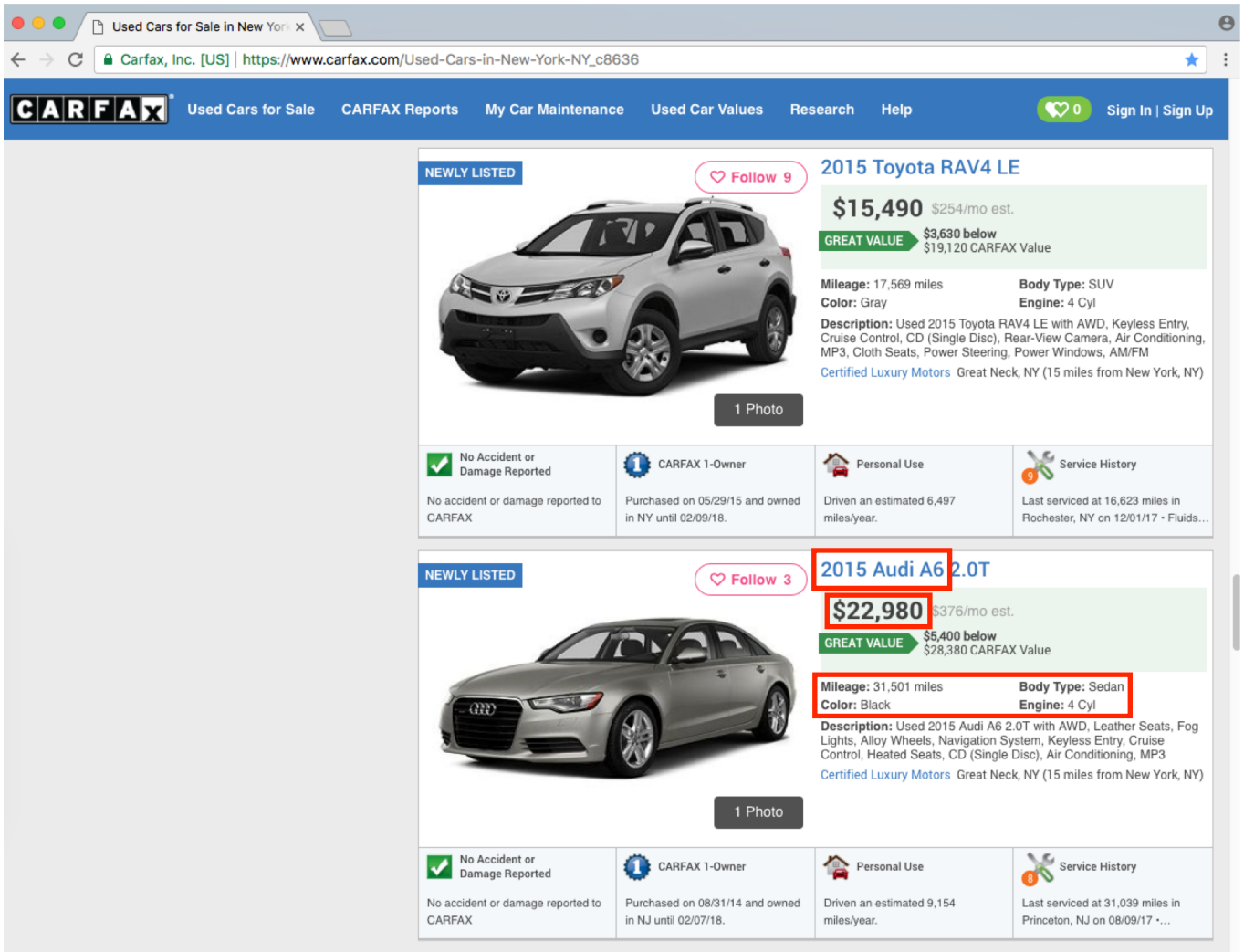
# Outline

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

# Data Source: www.carfax.com

- 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



# 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)

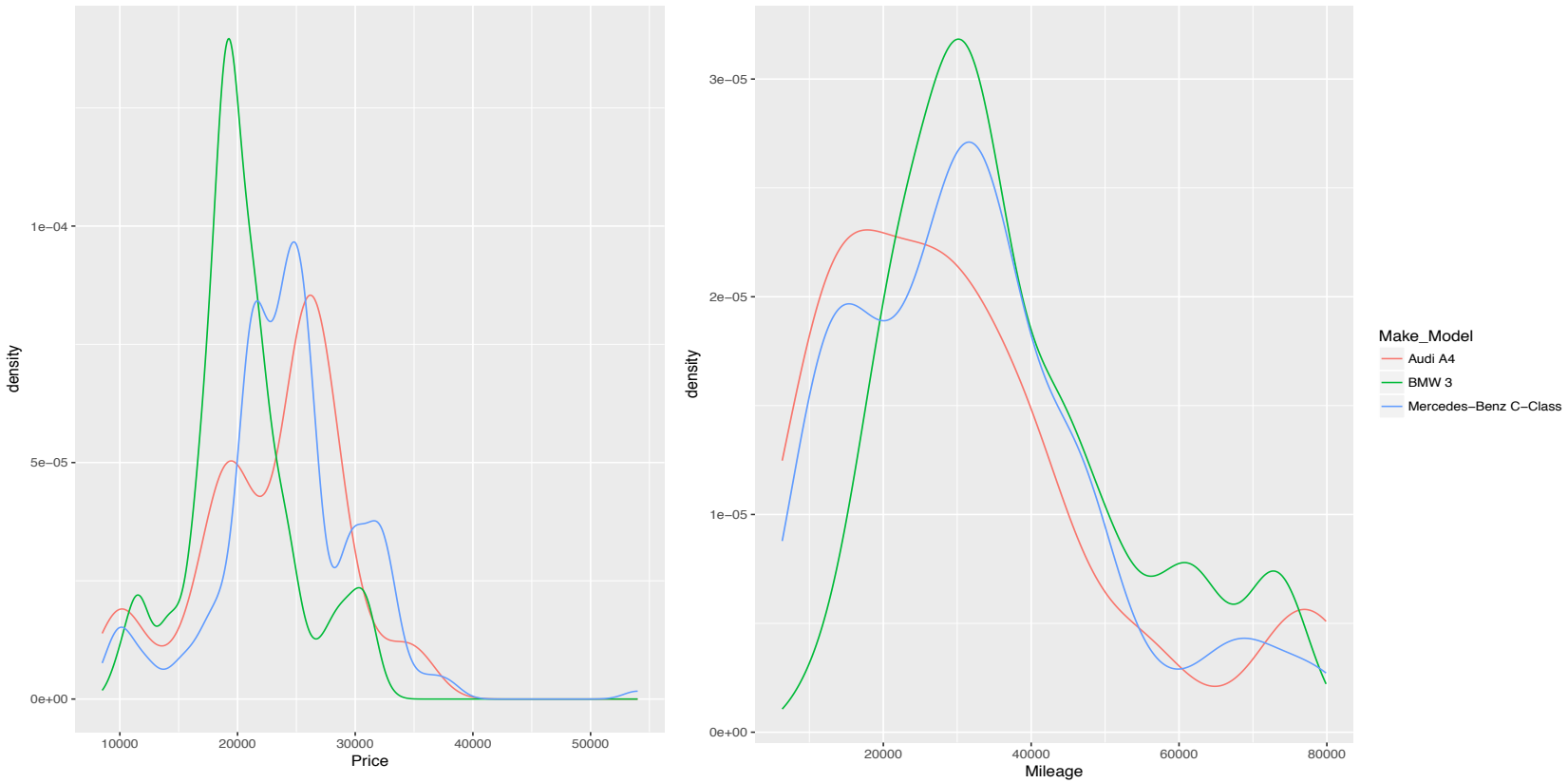
Note: Audi A4 $= \mathcal{O}$ (BMW 3) $= \mathcal{O}$ (Benz C-Class)

# 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)



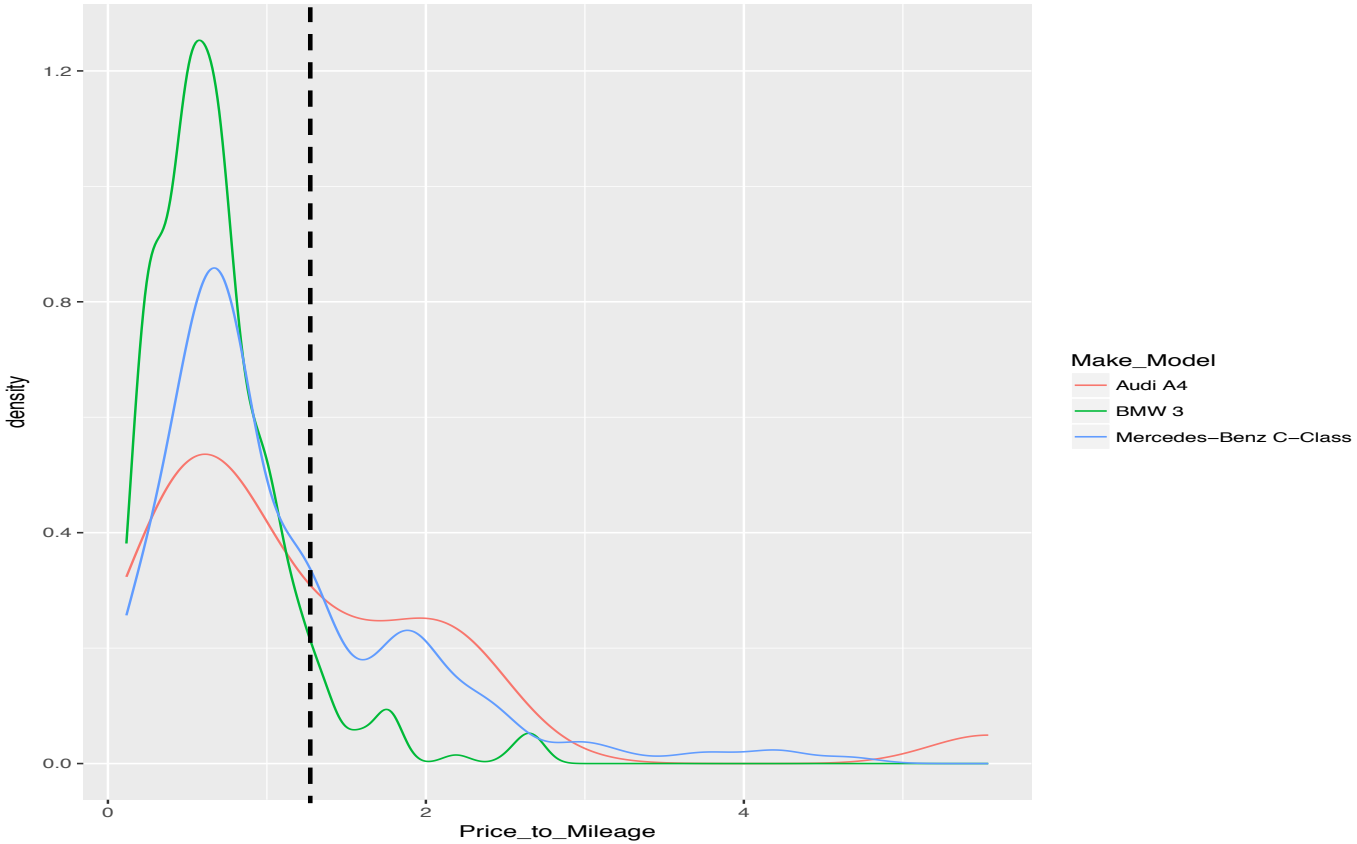
# Comparison of Three Models of the Same Class {Audi A4, BMW 3, Mercedes-Benz C-Class} (3/3)

$$\frac{\text{Price}}{\text{Mileage}}$$

Think about: $\frac{\$30k}{60k\ mi}$ vs. $\frac{\$30k}{30k\ mi}$

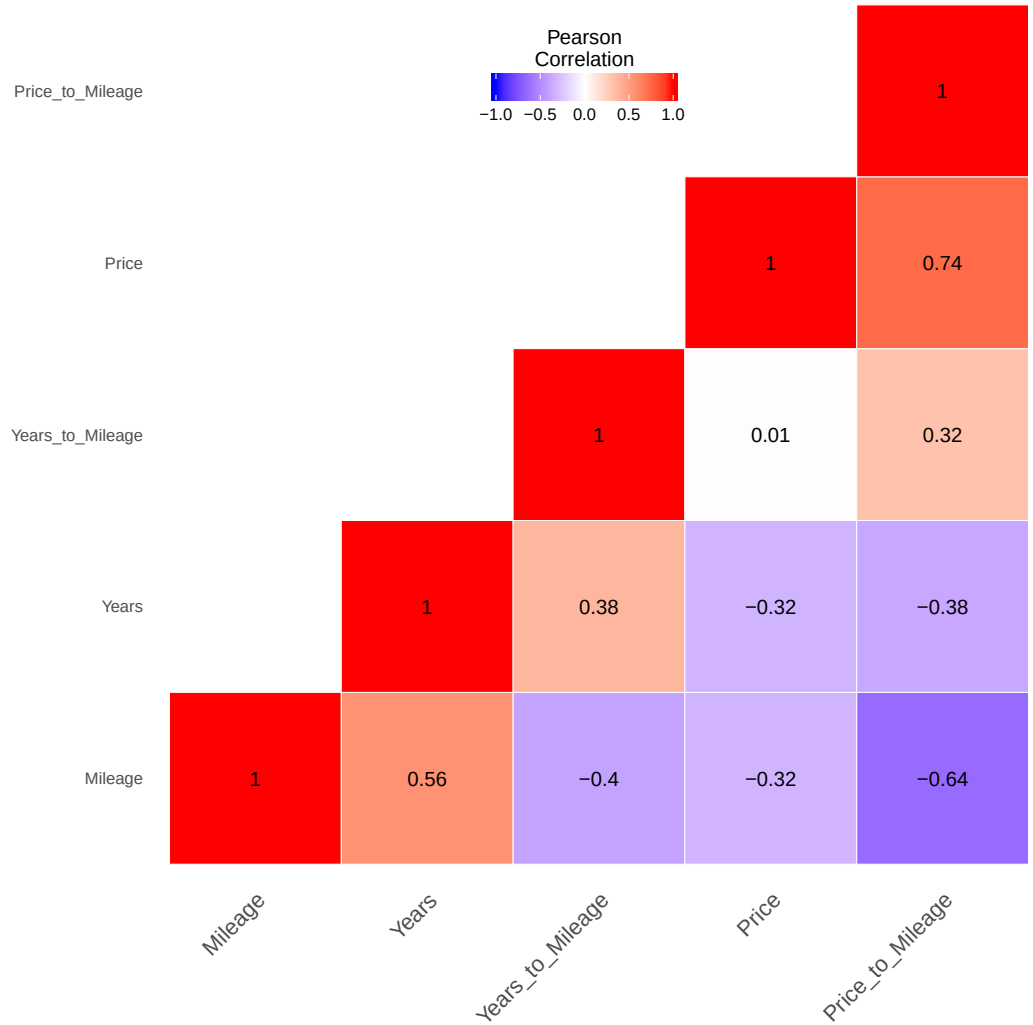
$\frac{\$15k}{30k\ mi}$ vs. $\frac{\$30k}{30k\ mi}$

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: $\frac{\text{5 years}}{\text{5000 miles}}$. vs. $\frac{\text{5 years}}{\text{50000 miles}}$



# Thank You

- 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. . . .
- Questions?
- Thank you!