Recommendations for buying Used Vehicle Based on regression analysis

Web Scraping and Linear Regression Analysis

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Introduction

Vehicles are important tools that allow great flexibility in our daily life. While our life is facilitated by vehicles, you may want to ask when you are buying a car:

- How do I choose it?
- What year, make, and model?
- With limited budget and buying a used car, what features of should I focus on?

Data Collection

	make	year	mileage	fuel_type	drive_type	transmission	engine_size	engine_type	cty_mpg	hwy_mpg	price
0	INFINITI	2017	46423	gas	awd	automatic	3.50	regular	19	26	27690
1	Chevrolet	2017	40653	gas	awd	automatic	3.60	regular	17	24	28589
2	Jeep	2020	11994	gas	awd	automatic	2.40	regular	22	30	24900
5	Mercedes-Benz	2013	76867	gas	awd	automatic	3.50	regular	20	28	14995
6	Nissan	2019	29537	gas	fwd	automatic	2.50	regular	27	37	17995
7	Ford	2014	98388	gas	awd	automatic	1.60	turbo	22	30	11995
8	Ford	2015	69024	gas	awd	automatic	3.50	regular	17	23	19995
9	Subaru	2012	98464	gas	awd	automatic	2.00	regular	27	36	8995

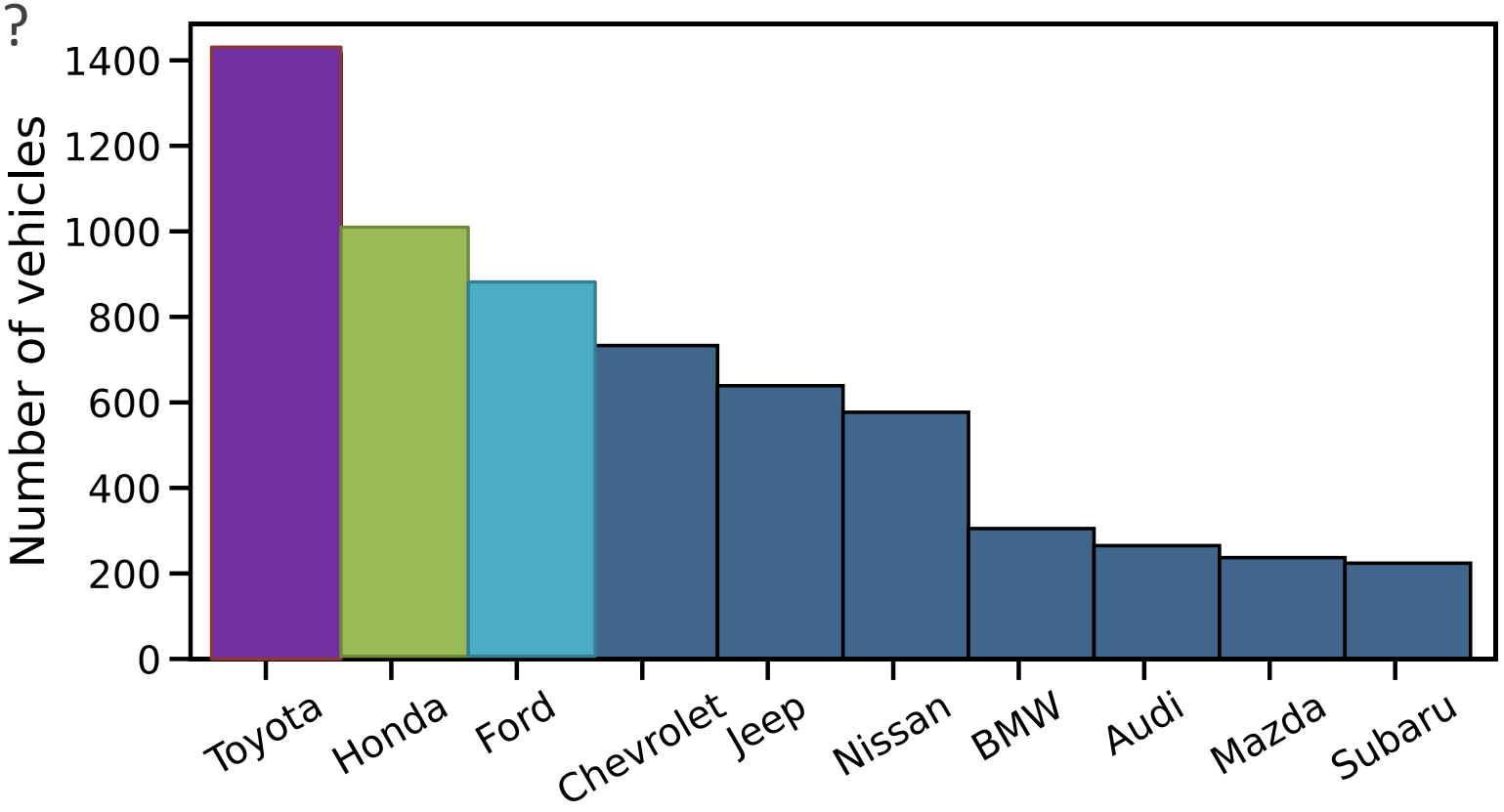
Clean Data
6557 cars
in total

Within 25 mi
from Boston, MA

TrueCar®

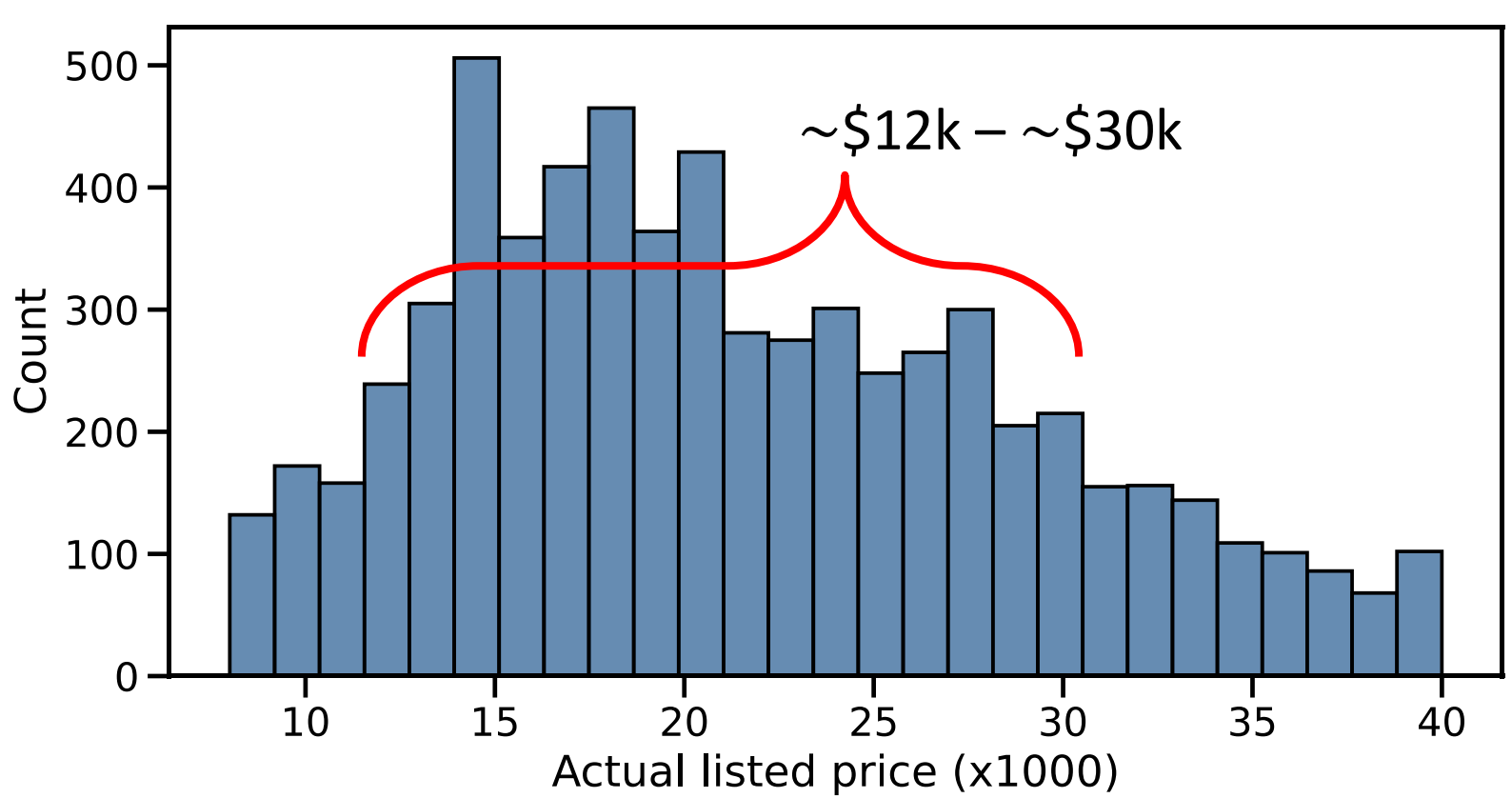
Exploratory analysis

What makes?



Exploratory analysis

Plan your budget



Features and Labels

Features:

Continuous variables:

- ❖Year
- ❖Mileage
- ❖Engine size (# liters)
- ❖City MPG

Categorical variables:

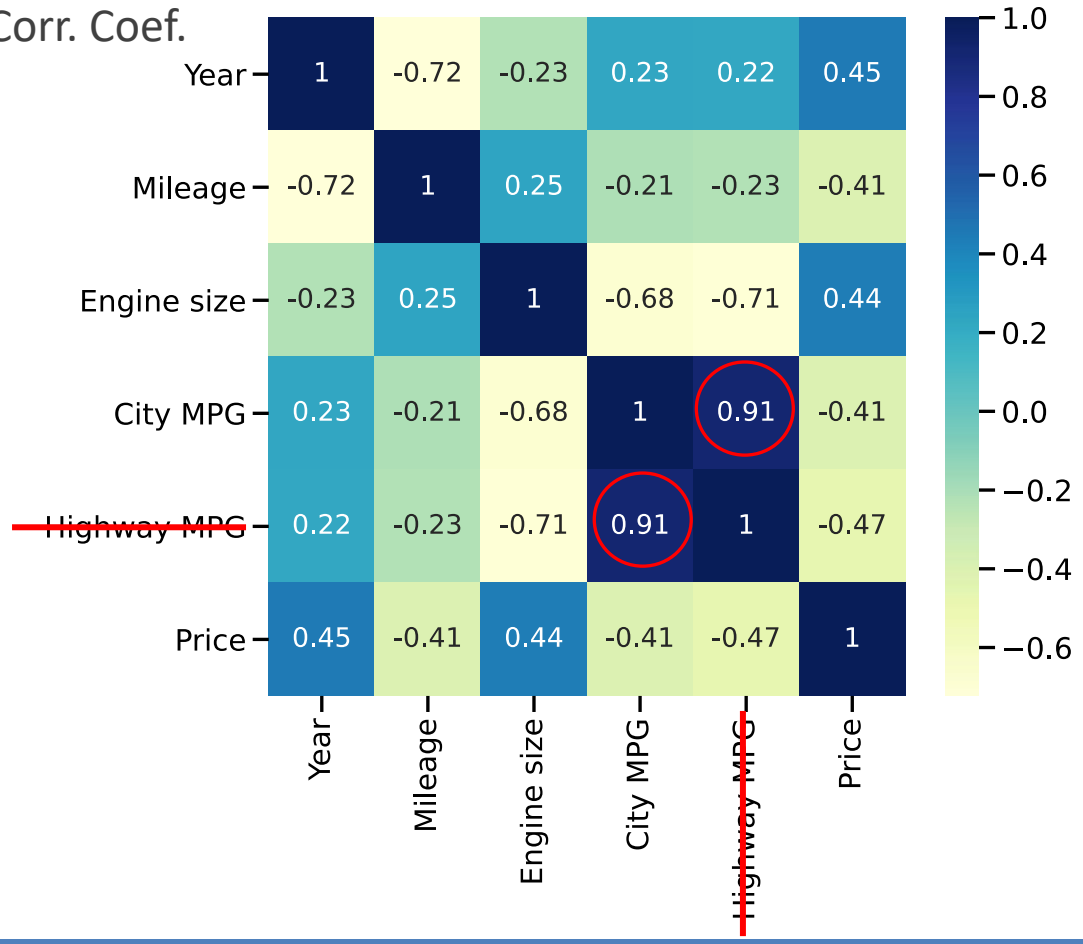
- ❖Fuel type (gas, diesel, hybrid)
- ❖Drive type (AWD, FWD, RWD)
- ❖Transmission (Manual and Auto.)
- ❖Engine type (Regular and Turbo.)

Label:

Listed price

Feature Engineering

Corr. Coef.



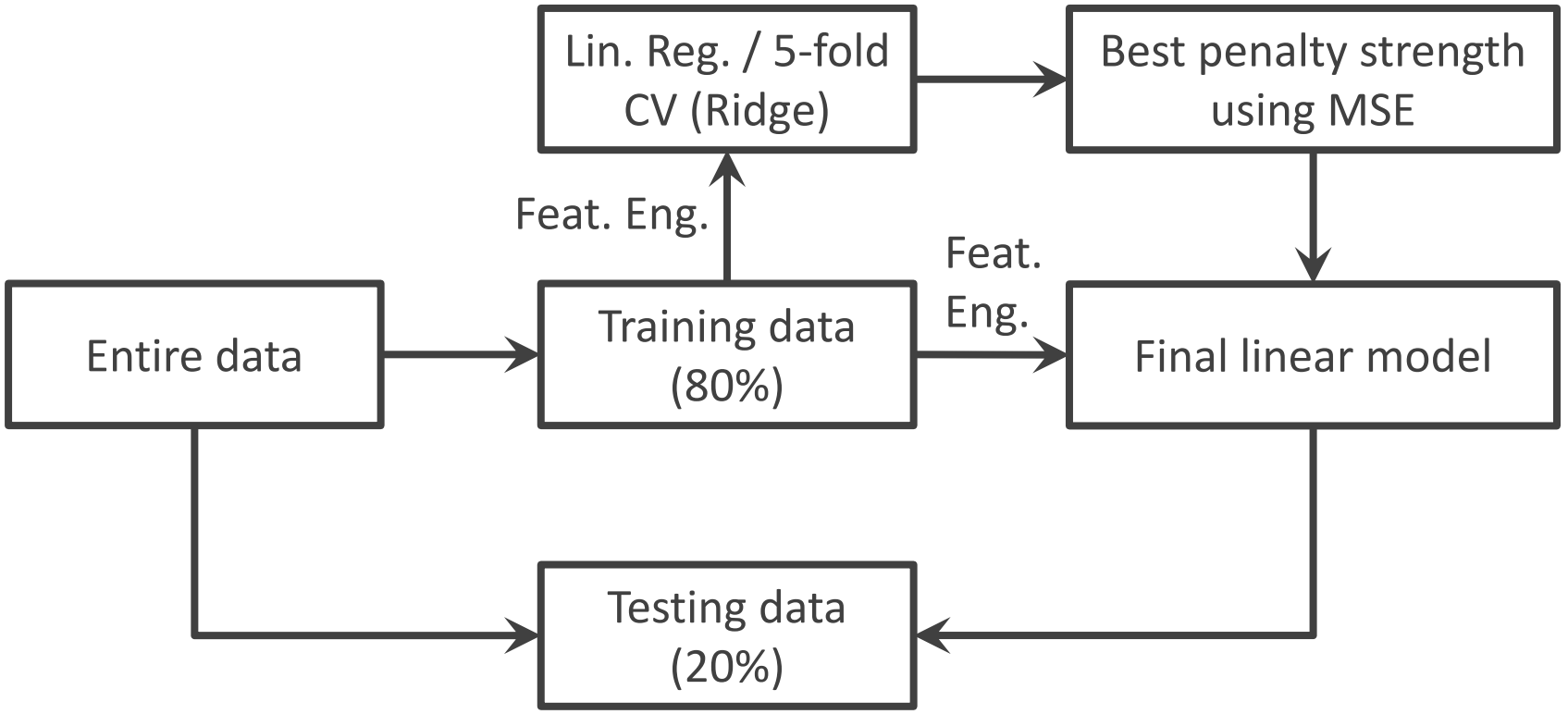
Redundant feature:

- ❖ Highway MPG

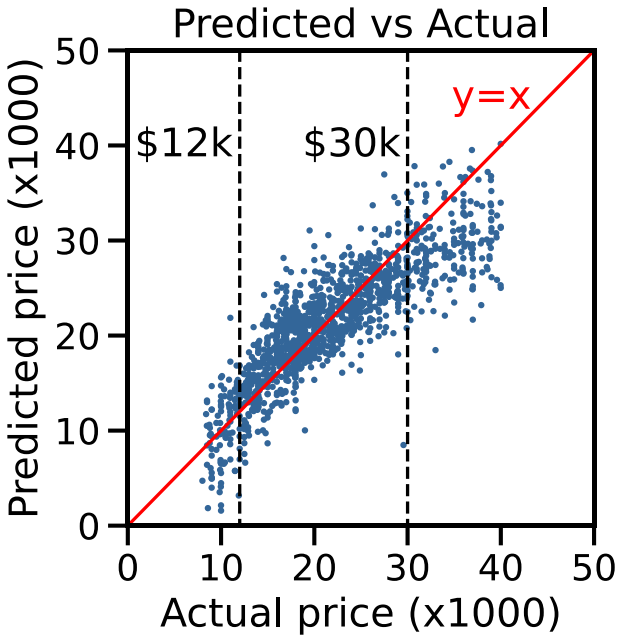
Interaction features:

- ❖ Drive type × City MPG
  - RWD → same gas, more power (typically on luxury vehicles)
- ❖ Transmission × City MPG
  - M.T. on low trim and high MPG → low price
- ❖ Fuel type × City MPG
  - Hybrid and high MPG → high price

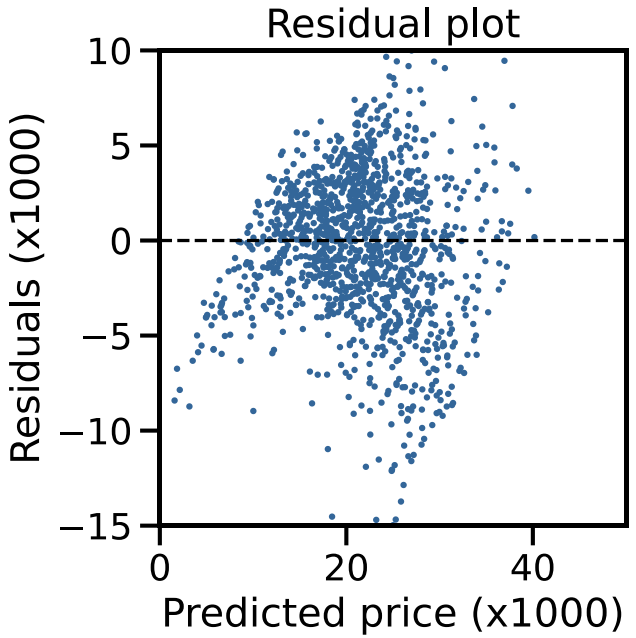
Linear Regression modeling workflow



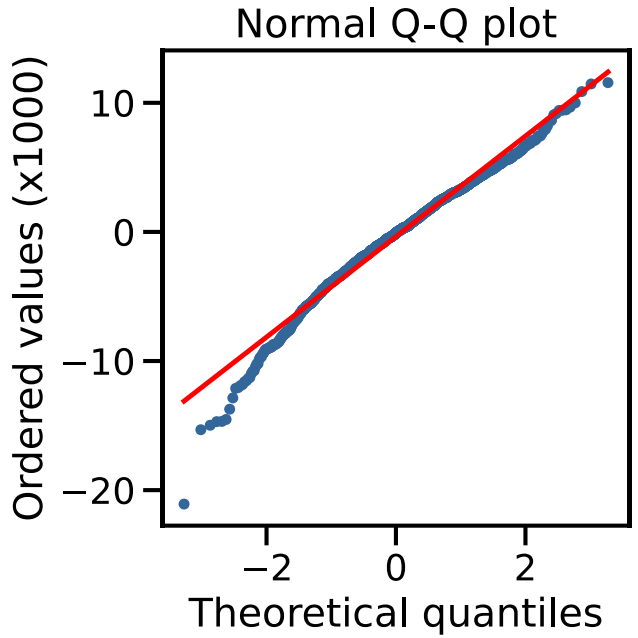
Results



Training R^2 = 0.74
Testing R^2 = 0.72
MAE = $3008
F-test: p-value = 0

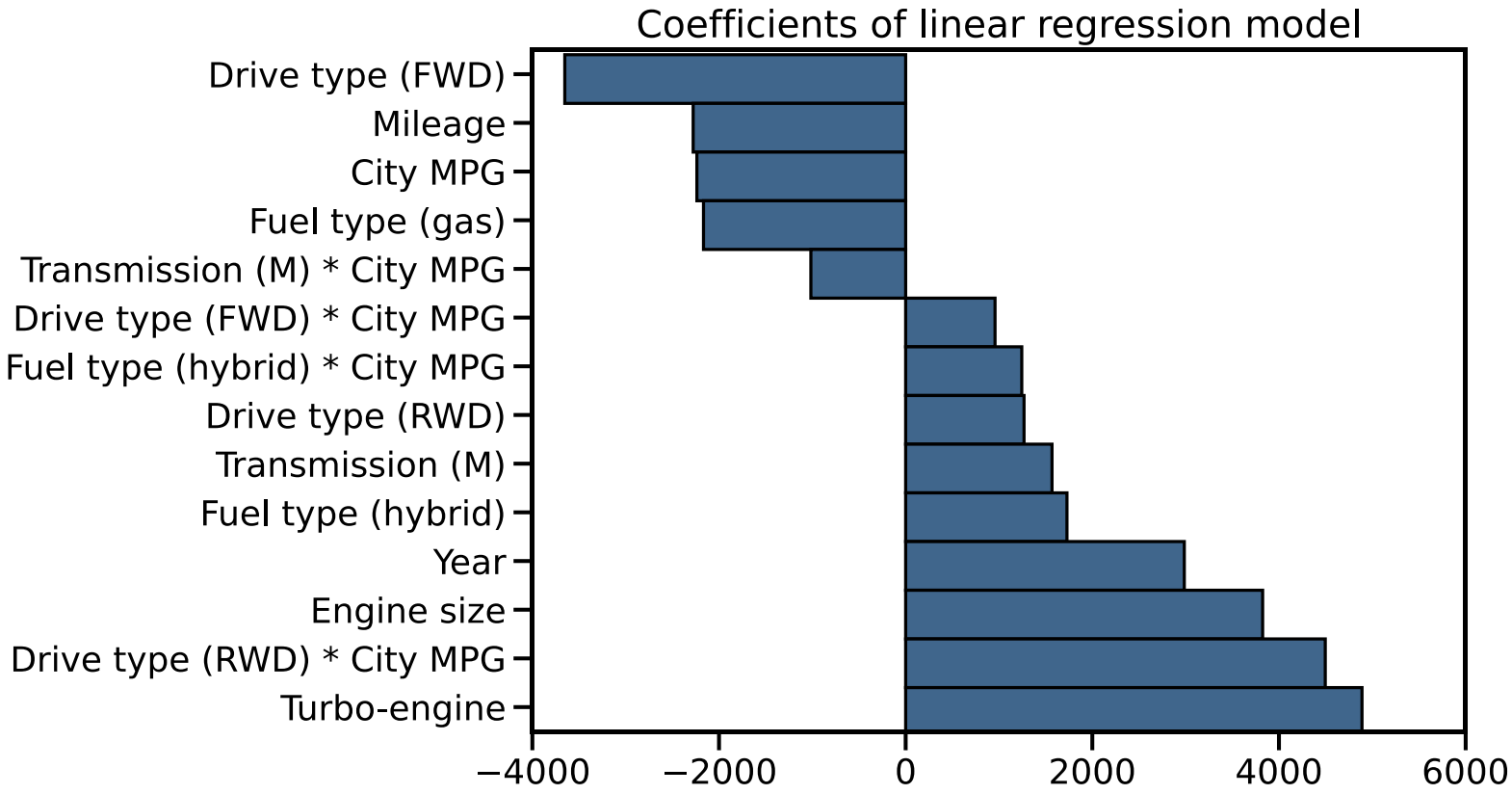


Lin. Reg. between residuals and predicted price:
R^2 = 0; Slope = -0.01
No specific pattern and trend



Residuals are normally distributed.
Left skewed → price likely underestimated

Features affecting price



Low price:

- Front-wheel drive
- High mileage
- High city MPG
- Gas engine
- M.T. with high MPG

High price:

- Turbo-engine
- Rear-wheel drive
- Large-sized engine
- Year (more recent)
- Hybrid engine

Summary

1. Top 3 popular makes:

2. Price range of most vehicles:

~$12k – ~$30k

3. Features to look at when buying a cheap used car:

- ❖ Front-wheel drive
- ❖ Certain amount of mileage
- ❖ Small-sized engine
- ❖ High city MPG
- ❖ Gas engine, not hybrid
- ❖ Not too recent

Future

1. More specific price range
2. A specific make, e.g., Toyota, Honda, or Ford
3. More sophisticated and advanced deep neural network

Questions?