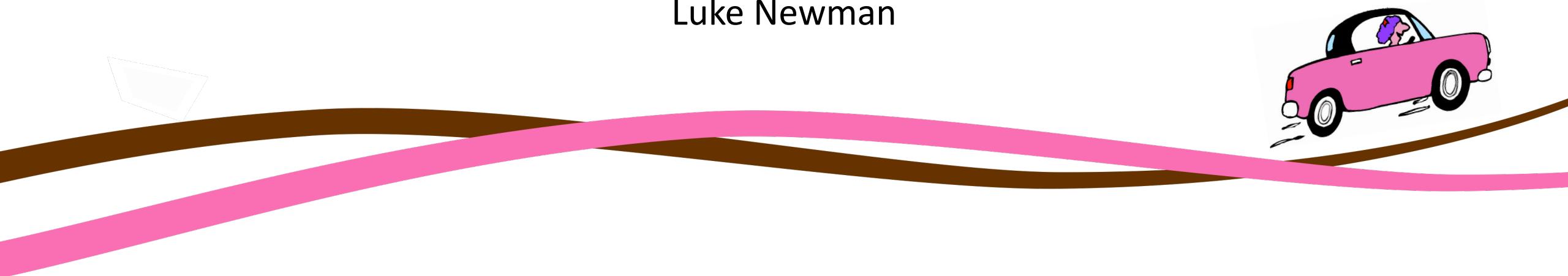


Should you Buy or Lease your Next Car

Luke Newman



Introduction



We examine the cost of leasing a car with predicted depreciation cost.

We use Acura TLX because it is rated as one of the best cars to lease.

Three lease agreements and their specs are shown below:

	V6 FWD with Technology Package	Inline-4-FWD with Technology Package	V6 SH-AWD with A-spec Red Package
Lease	\$776 per month 12,000 miles per year	\$951 per month 10,000 miles per year	\$752 per month 12,000 miles per year
MSRP	\$40,100	\$36,700	\$44,800
Year	2017	2018	2016
Mileage	36,000	20,000	48,000
Accidents	0	0	0
Drive	FWD	FWD	SH-AWD
Engine	3.5L V-6	2.4L Inline-4	3.5L V-6
Trim	3.5L FWD with Technology Package	2.4L FWD with Technology Package	3.5L SH-AWD with A-Spec Package Red Leather

Methodology



Data collected from online car marketplace Truecar.com.



Sponsored 2017 Acura TLX
V6 FWD with Technology Package

Fair Price
\$51 off avg. list price

\$24,990

- 15,556 miles
- 463 mi - Redding, CA
- Black exterior, Black interior
- No accidents, 1 Owner, Fleet use

Methodology



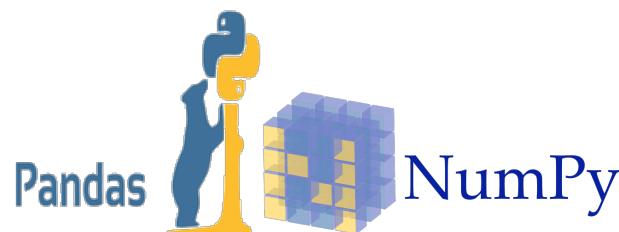
Data collected from online car marketplace Truecar.com.



Tools



BeautifulSoup



- Distance: 15,556 miles
- Location: 463 mi - Redding, CA
- Exterior/Interior: Black exterior, Black interior
- Accidents: No accidents, 1 Owner, Fleet use

Methodology



Data collected from online car marketplace Truecar.com.



Sponsored 2017 Acura TLX
V6 FWD with Technology Package

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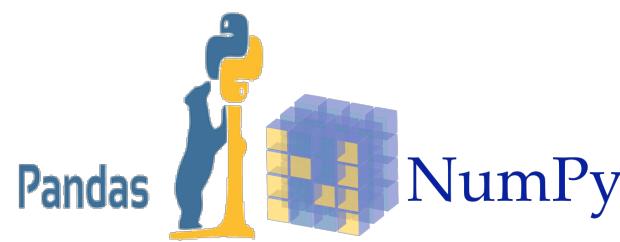
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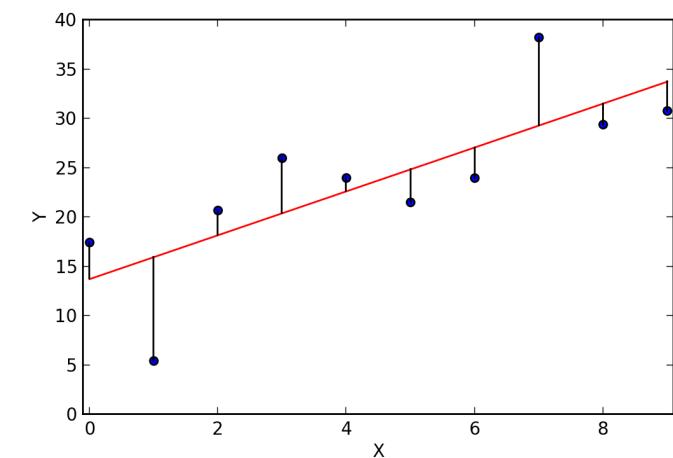


Metric

BeautifulSoup



RMSE

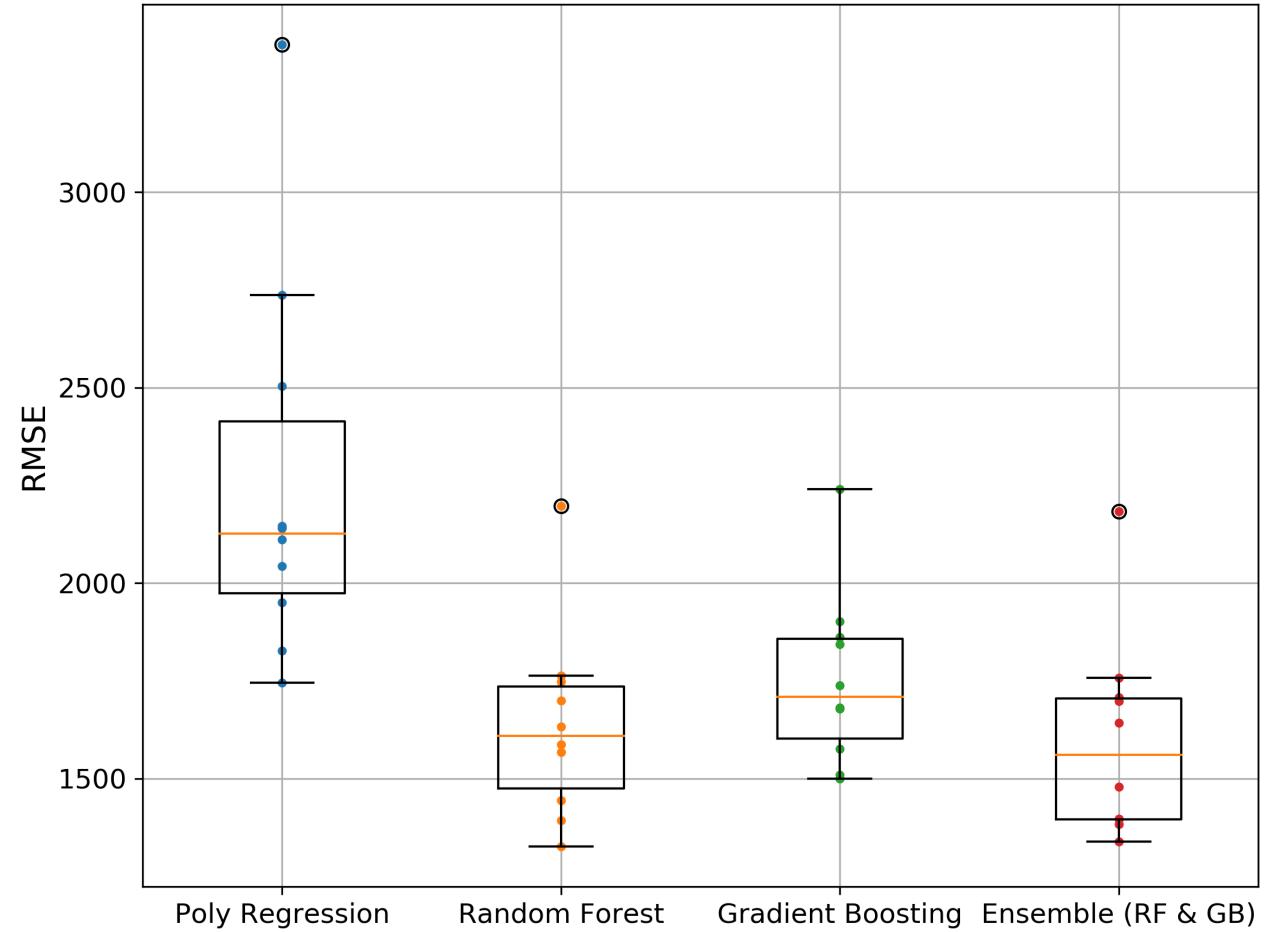


Results



The scores of the best models scored on 10 fold cross-validation are shown here (lower score is better).

The best model was obtained through an ensemble of optimized Random Forest and Gradient Boosting tree models.

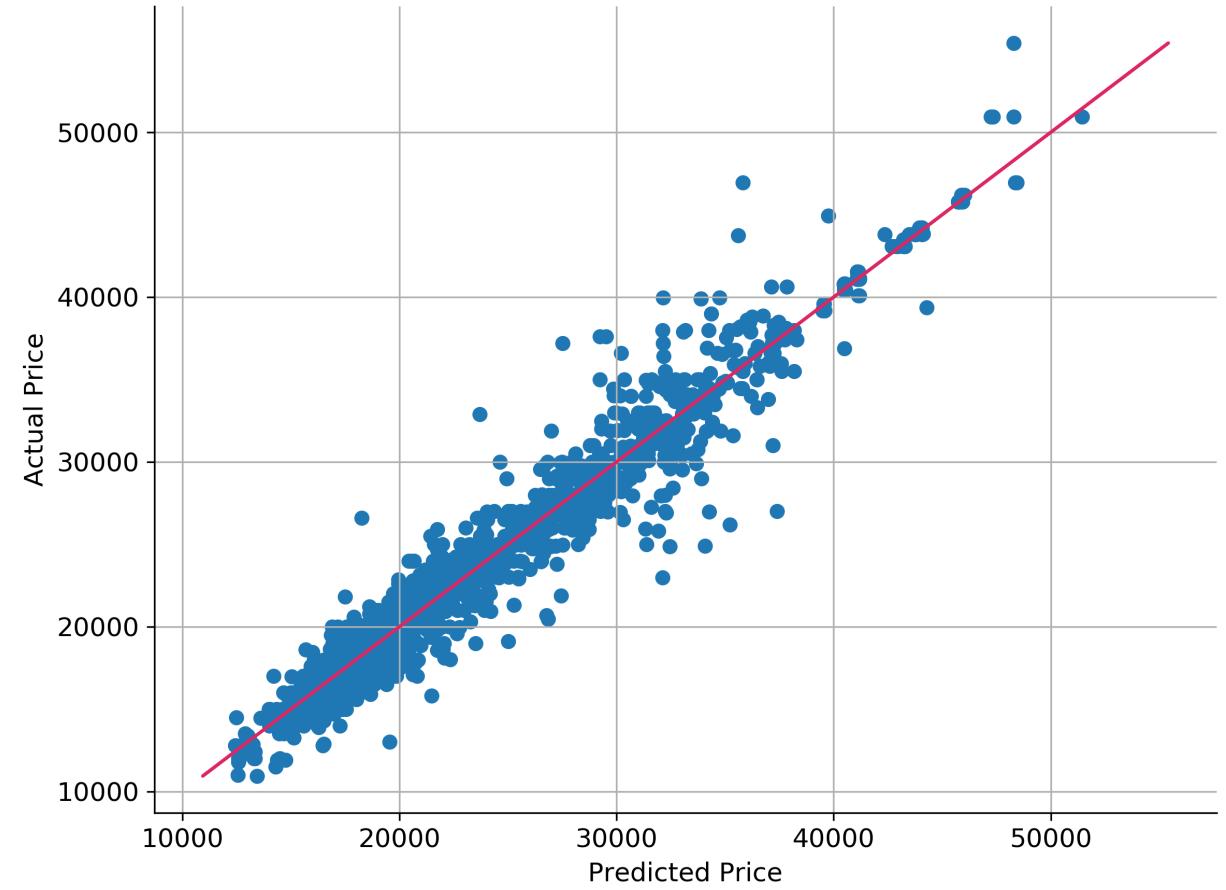


Results

Plotting actual price vs predicted price shows us how well our model predicts across the range of values of our target.

We are looking for red flags (missing high for one range and low for another).

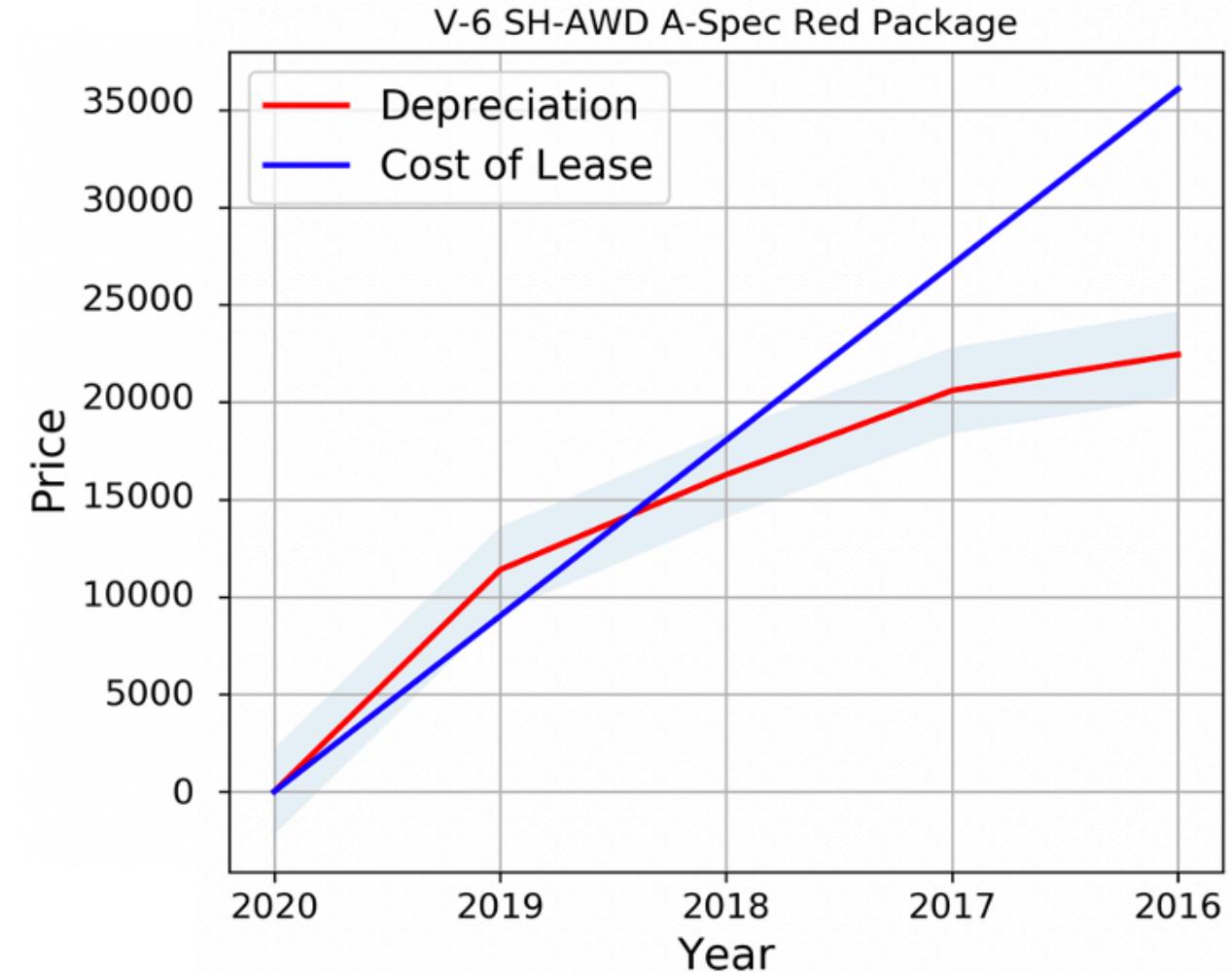
The final test set RMSE was 2207.82.



Conclusions

The red line represents the predicted depreciation while the shaded area surrounding represents the 95% confidence intervals.

The cost to lease is \$12,000 more expensive.



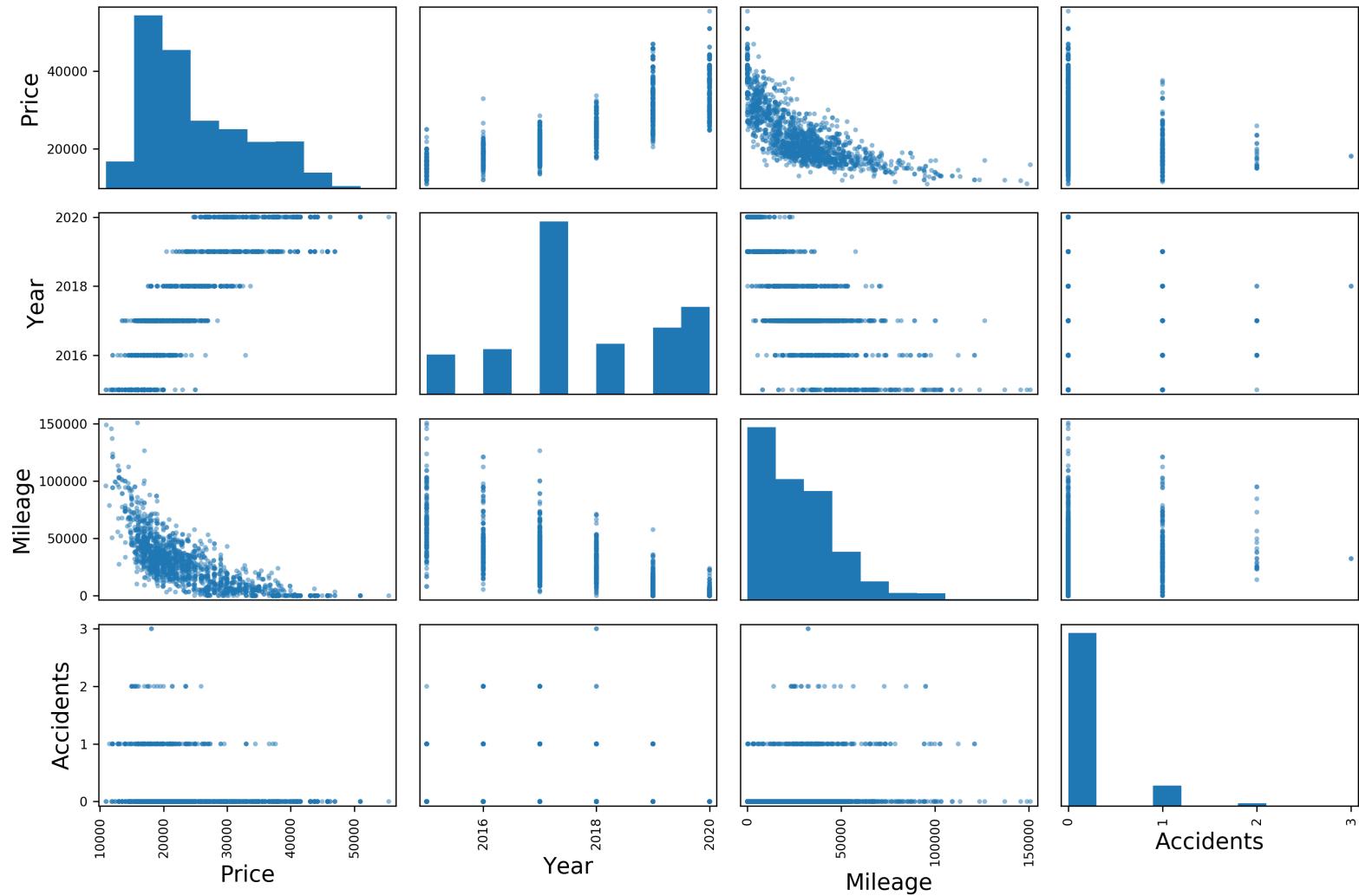
Future Work



We can model different cars who also have high rated leases and see by how much can you finance a new car that it will still be worth buying and reselling.

Take this problem further and try to model multiple car makes and models that can still accurately predict the value of a car.

Appendix

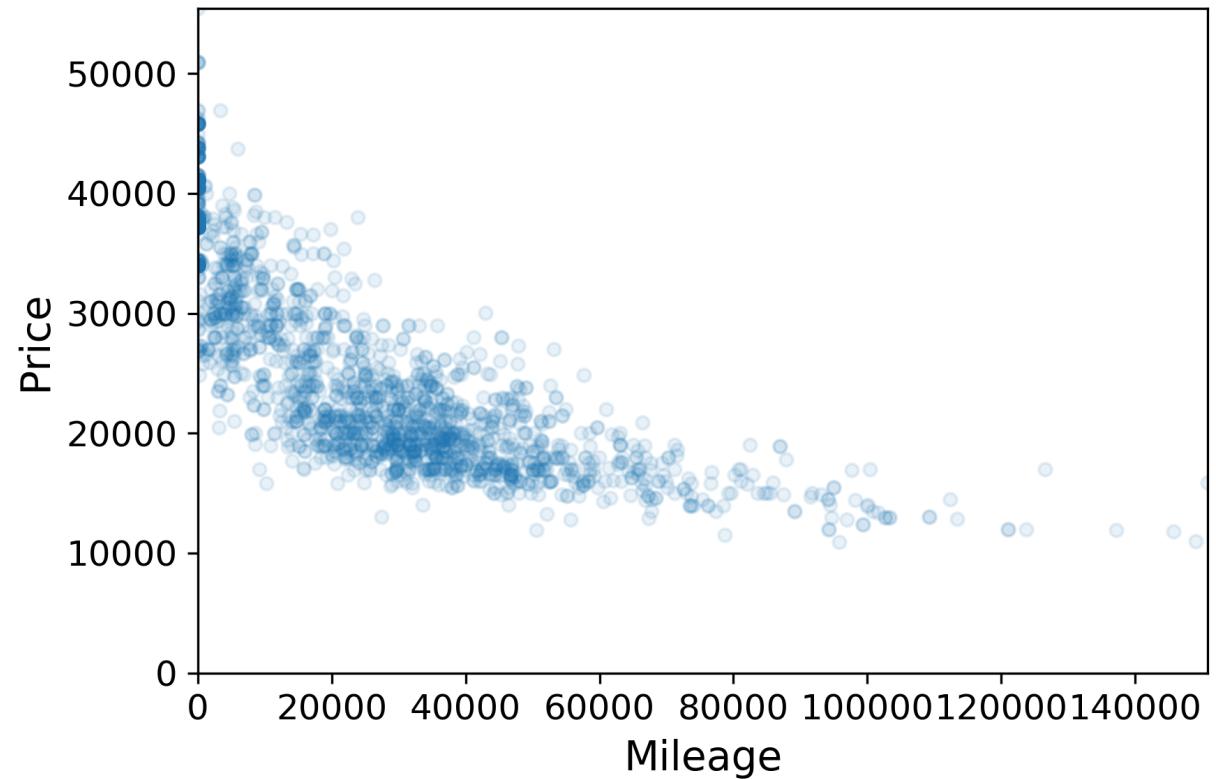


Appendix



The correlation between mileage and price was strong up until about 70,000 miles.

Reconfirms belief that cars depreciate less each year they get older.

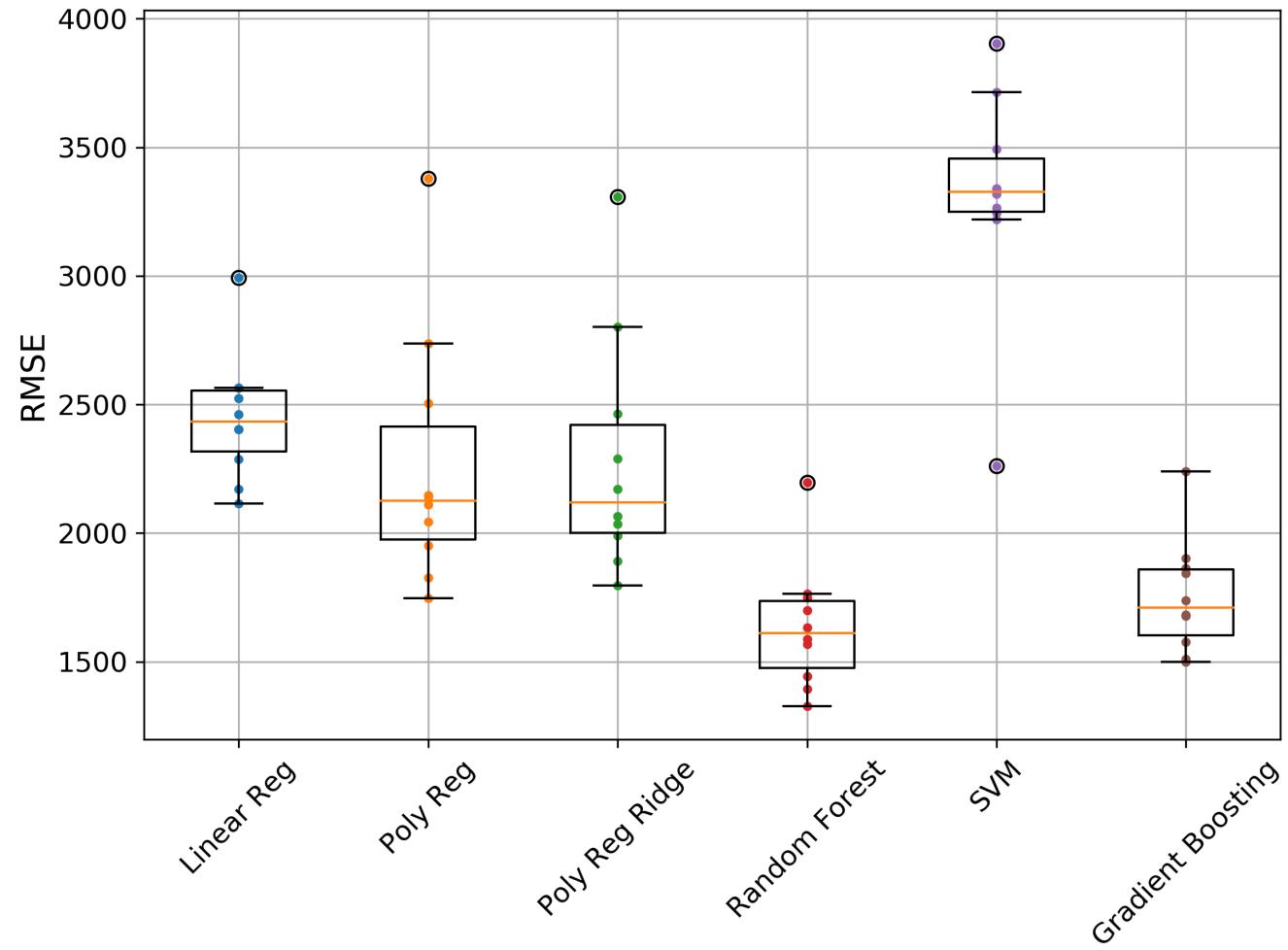


Appendix



We tried 6 different base models to see which algorithms generally performed the best.

Each model was trained with base hyperparameters.



Appendix



With our final model we predict the depreciation of three cars with different specs and compare with their respective leasing cost.

