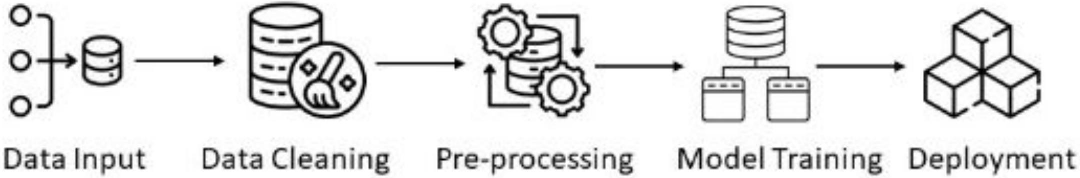
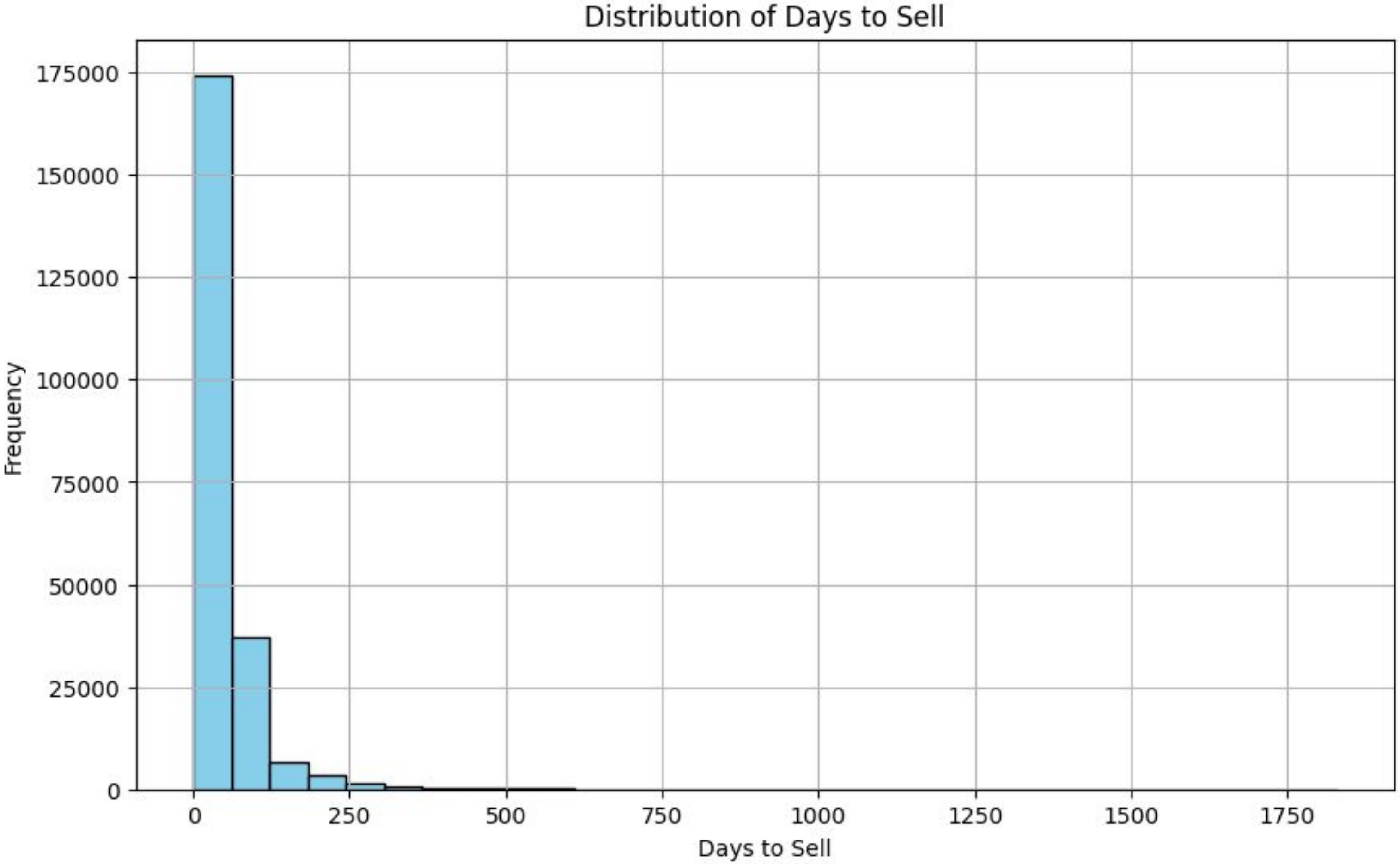
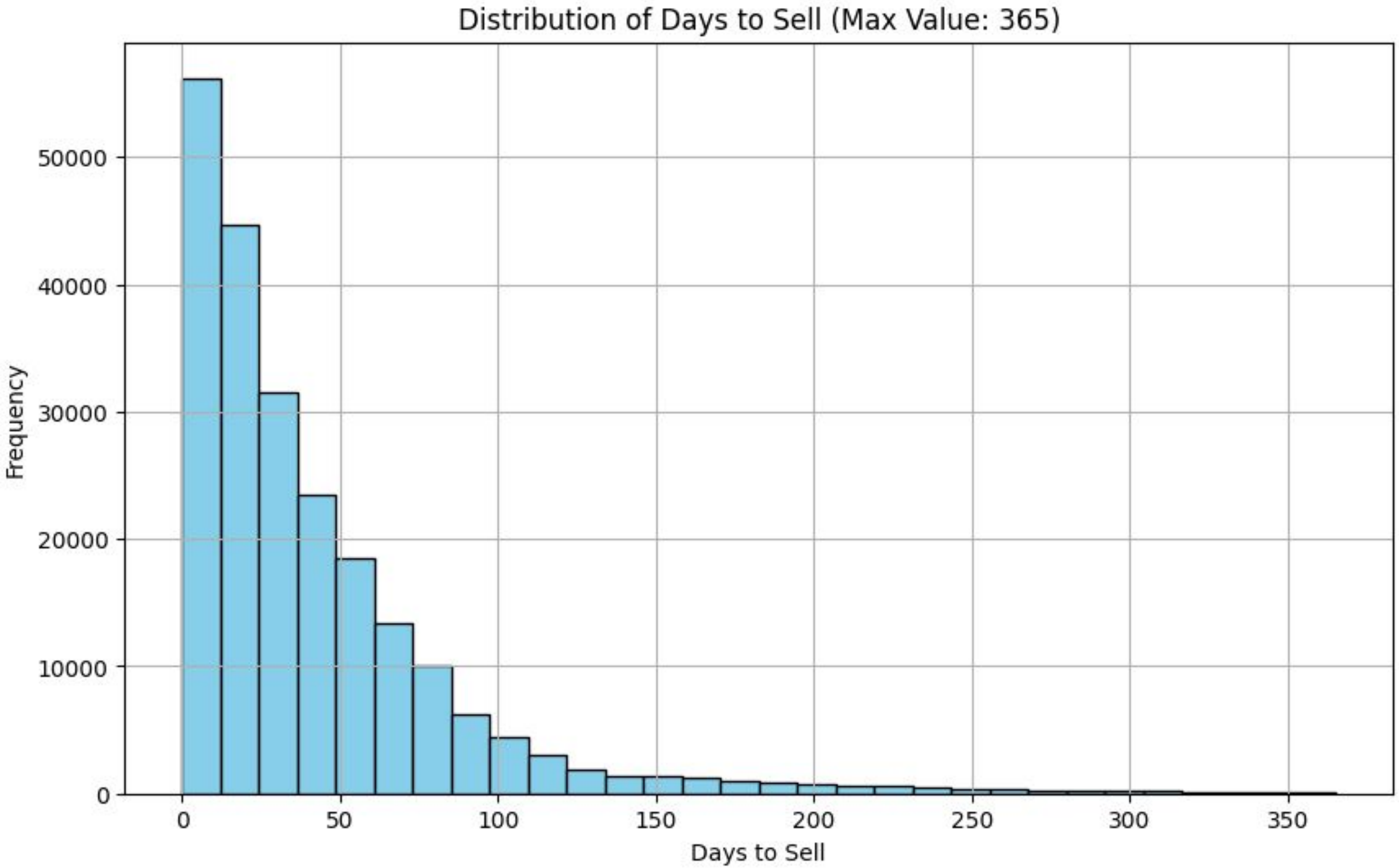
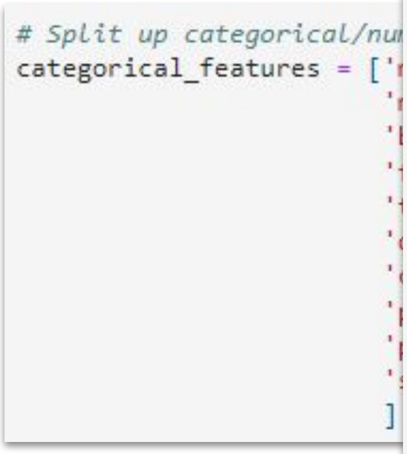
MathSoc AutoTrader Hackathon 2024

Ioan Gwenter, Lourenço Silva, Tom Cassar

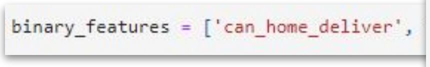

Data Input
Data Cleaning
Pre-processing
Model Training
Deployment


Distribution of Days to Sell
Frequency
175000
150000
125000
100000
75000
50000
25000
0
0
250
500
750
1000
1250
1500
1750
Days to Sell

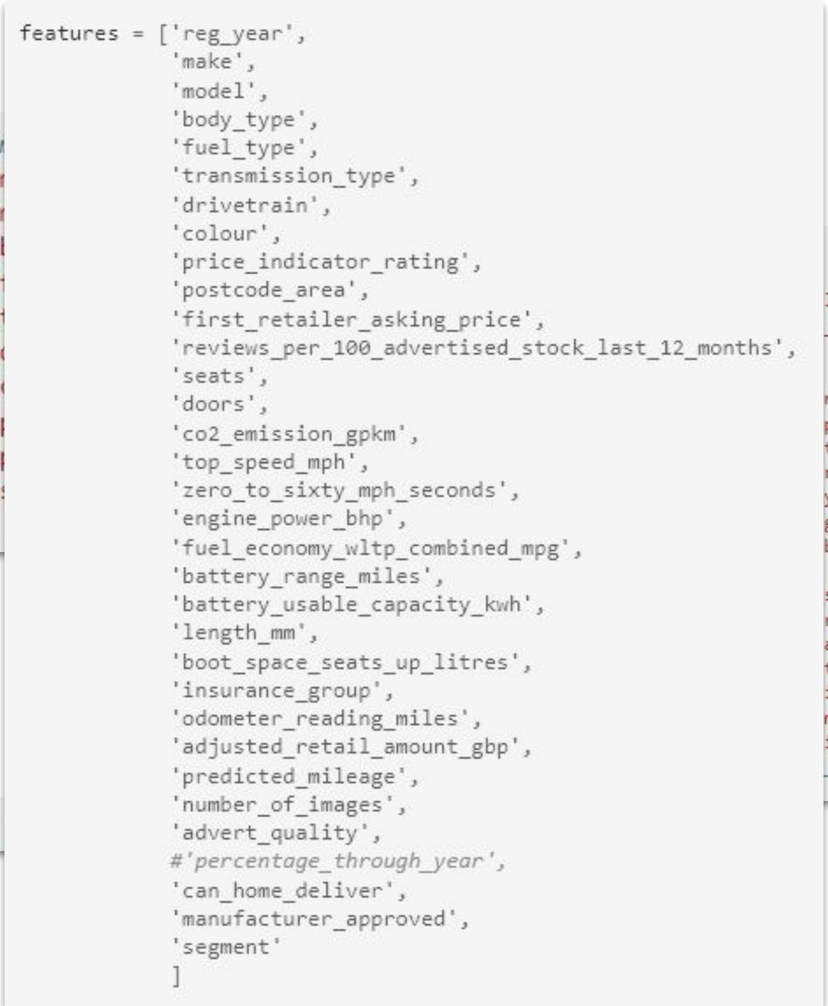

Distribution of Days to Sell (Max Value: 365)
Frequency
0
10000
20000
30000
40000
50000
0
50
100
150
200
250
300
350
Days to Sell



```
# Split up categorical/nu
categorical_features = ['m
                        'm
                        'b
                        'f
                        't
                        'd
                        'c
                        'p
                        'p
                        's
                        ]
```



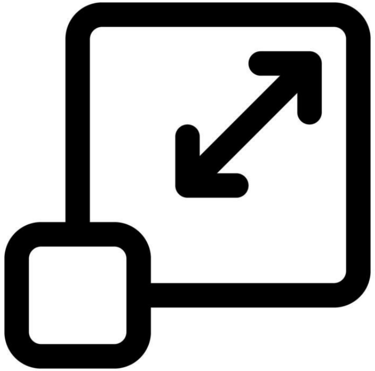
```
binary_features = ['can_home_deliver',
```

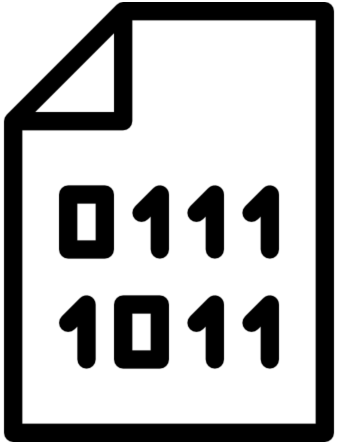


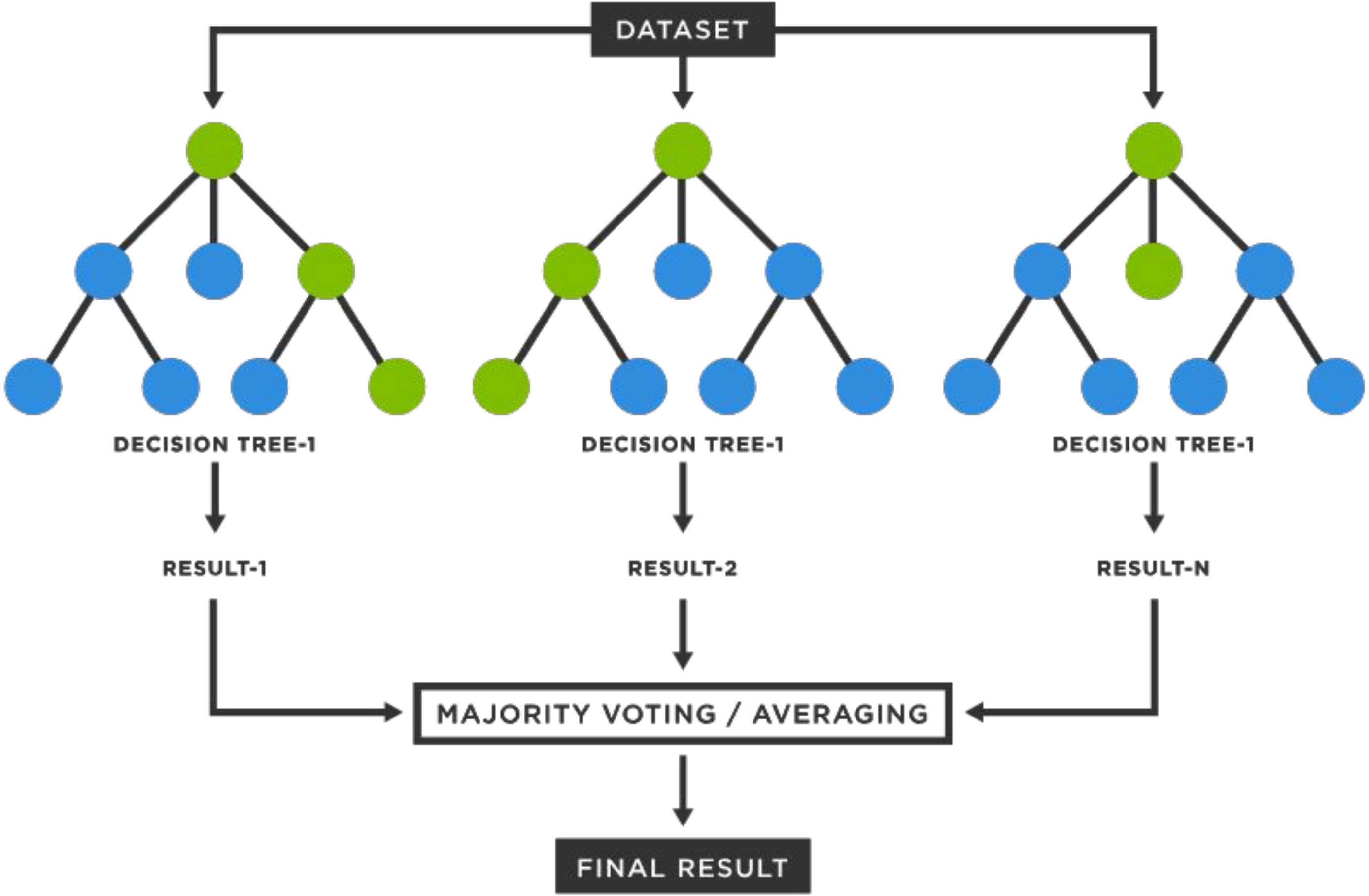
```
features = ['reg_year',
            'make',
            'model',
            'body_type',
            'fuel_type',
            'transmission_type',
            'drivetrain',
            'colour',
            'price_indicator_rating',
            'postcode_area',
            'first_retailer_asking_price',
            'reviews_per_100_advertised_stock_last_12_months',
            'seats',
            'doors',
            'co2_emission_gpkm',
            'top_speed_mph',
            'zero_to_sixty_mph_seconds',
            'engine_power_bhp',
            'fuel_economy_wltp_combined_mpg',
            'battery_range_miles',
            'battery_usable_capacity_kwh',
            'length_mm',
            'boot_space_seats_up_litres',
            'insurance_group',
            'odometer_reading_miles',
            'adjusted_retail_amount_gbp',
            'predicted_mileage',
            'number_of_images',
            'advert_quality',
           #'percentage_through_year',
            'can_home_deliver',
            'manufacturer_approved',
            'segment'
            ]
```

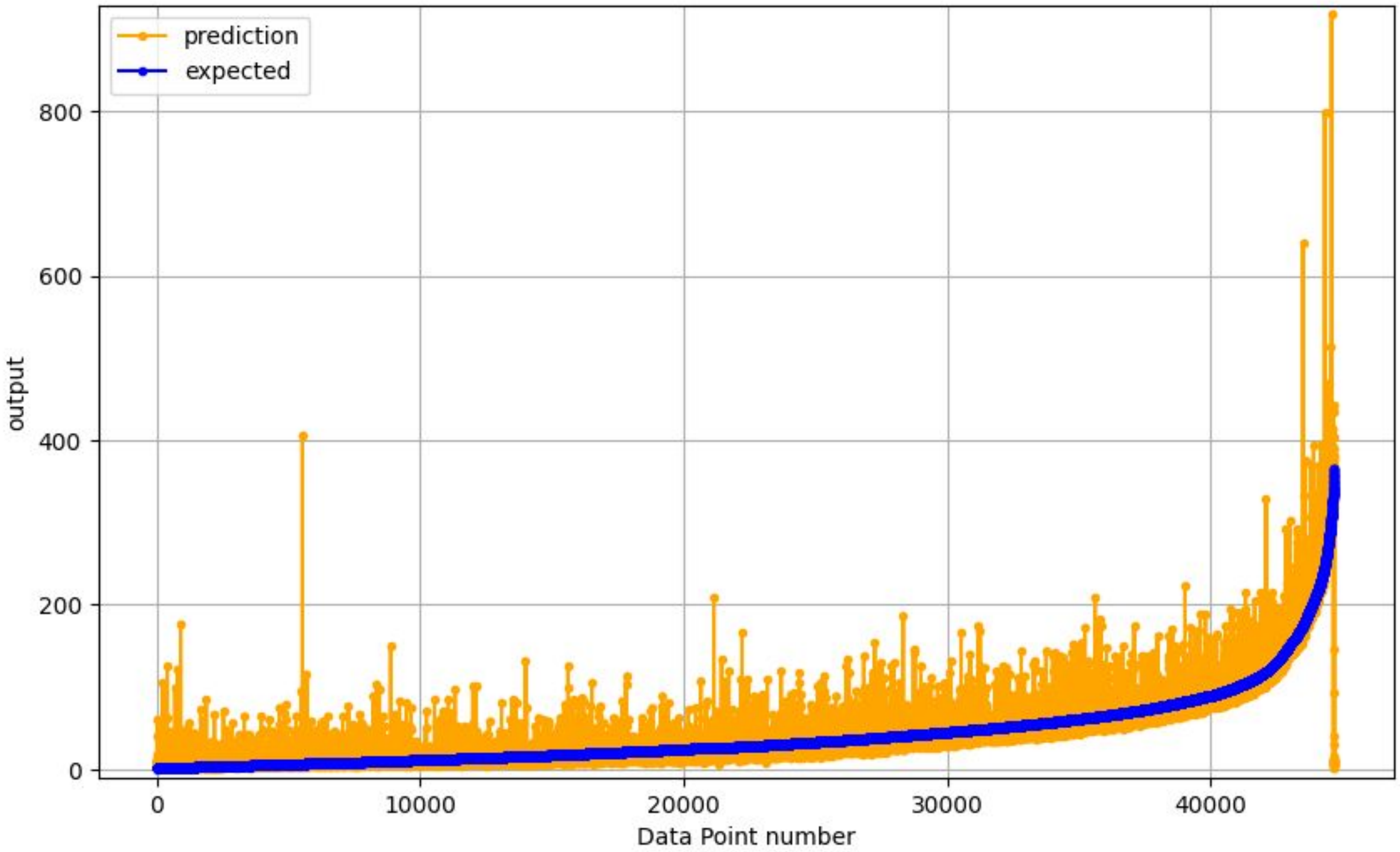
```
ler_asking_price',
_100_advertised_stock_last_12_months',


n_gpkm',
ph',
ty_mph_seconds',
r_bhp',
y_wltp_combined_mpg',
ge_miles',
ble_capacity_kwh',

seats_up_litres',
roup',
ading_miles',
tail_amount_gbp',
ileage',
mages',
ity',
_through_year'
```

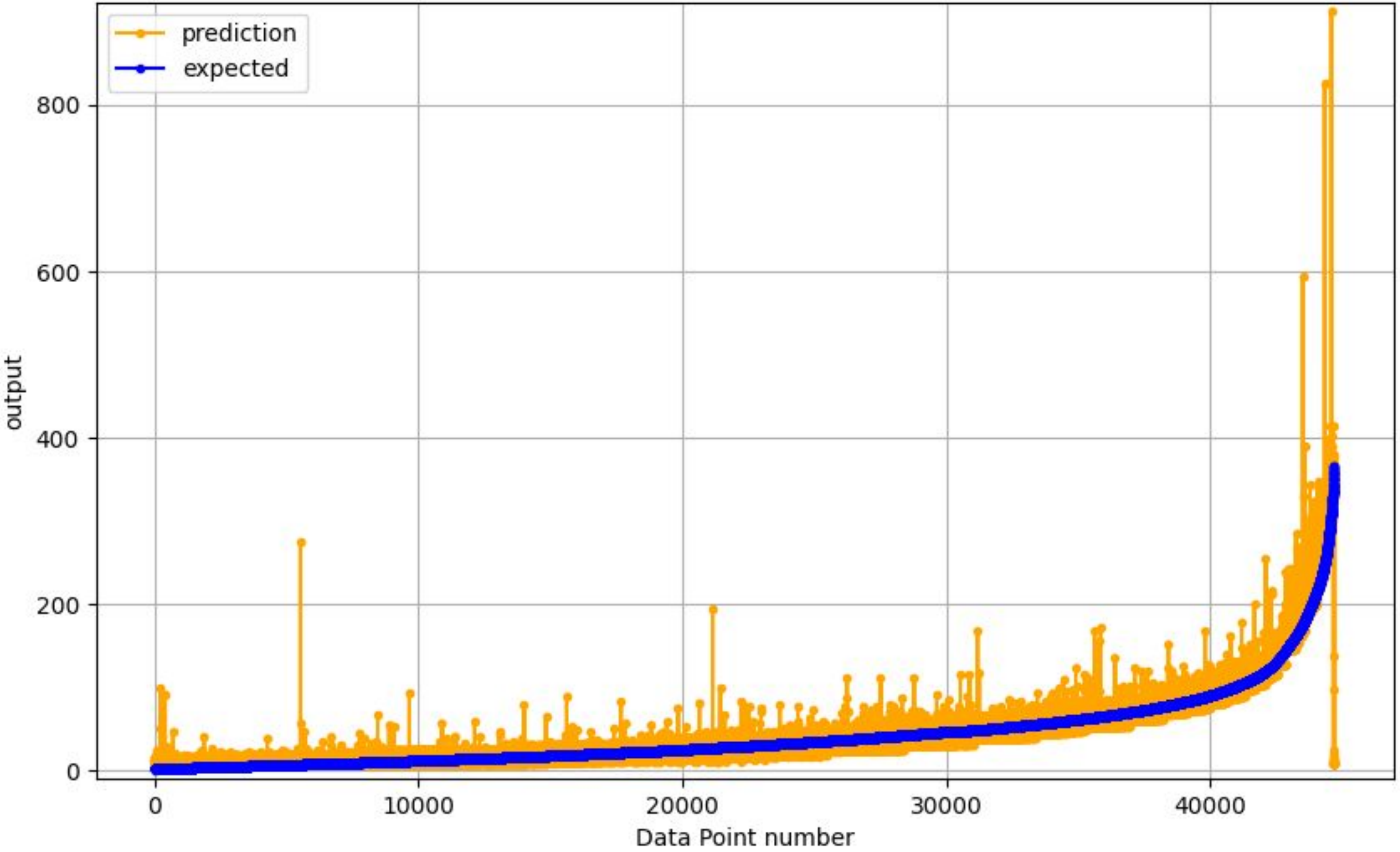
1



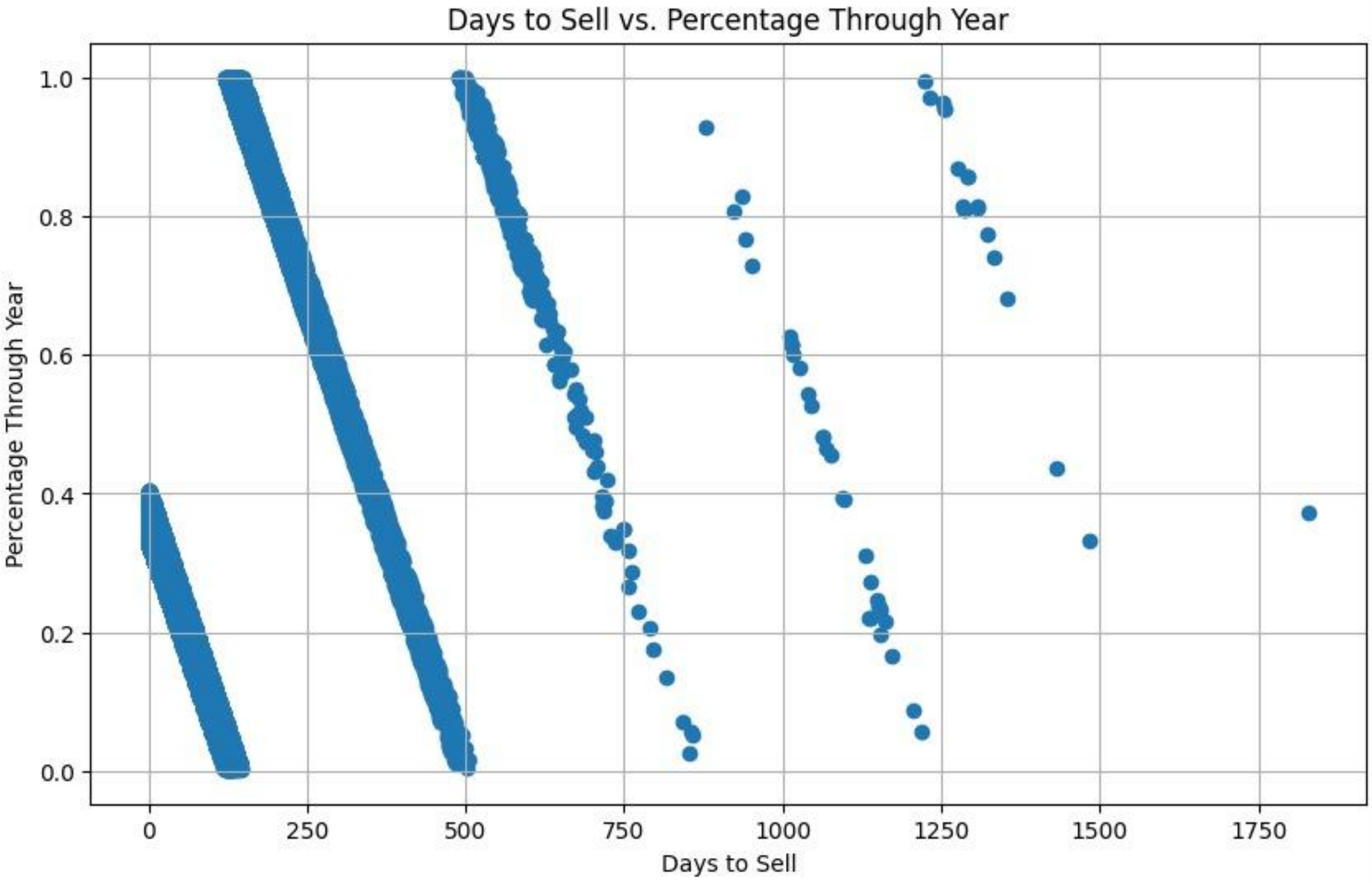

0111
1011

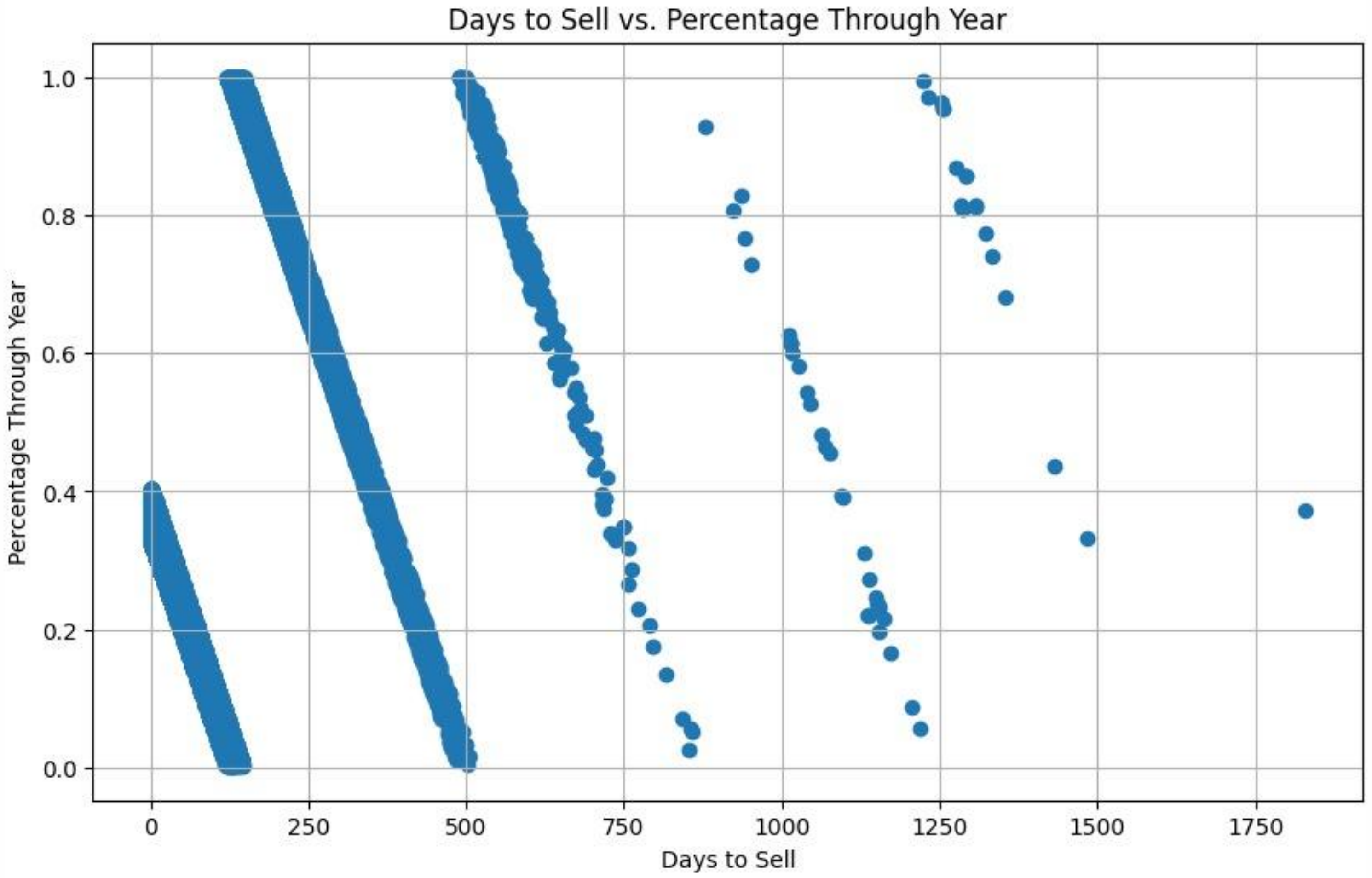

DATASET
DECISION TREE-1
DECISION TREE-1
DECISION TREE-1
RESULT-1
RESULT-2
RESULT-N
MAJORITY VOTING / AVERAGING
FINAL RESULT

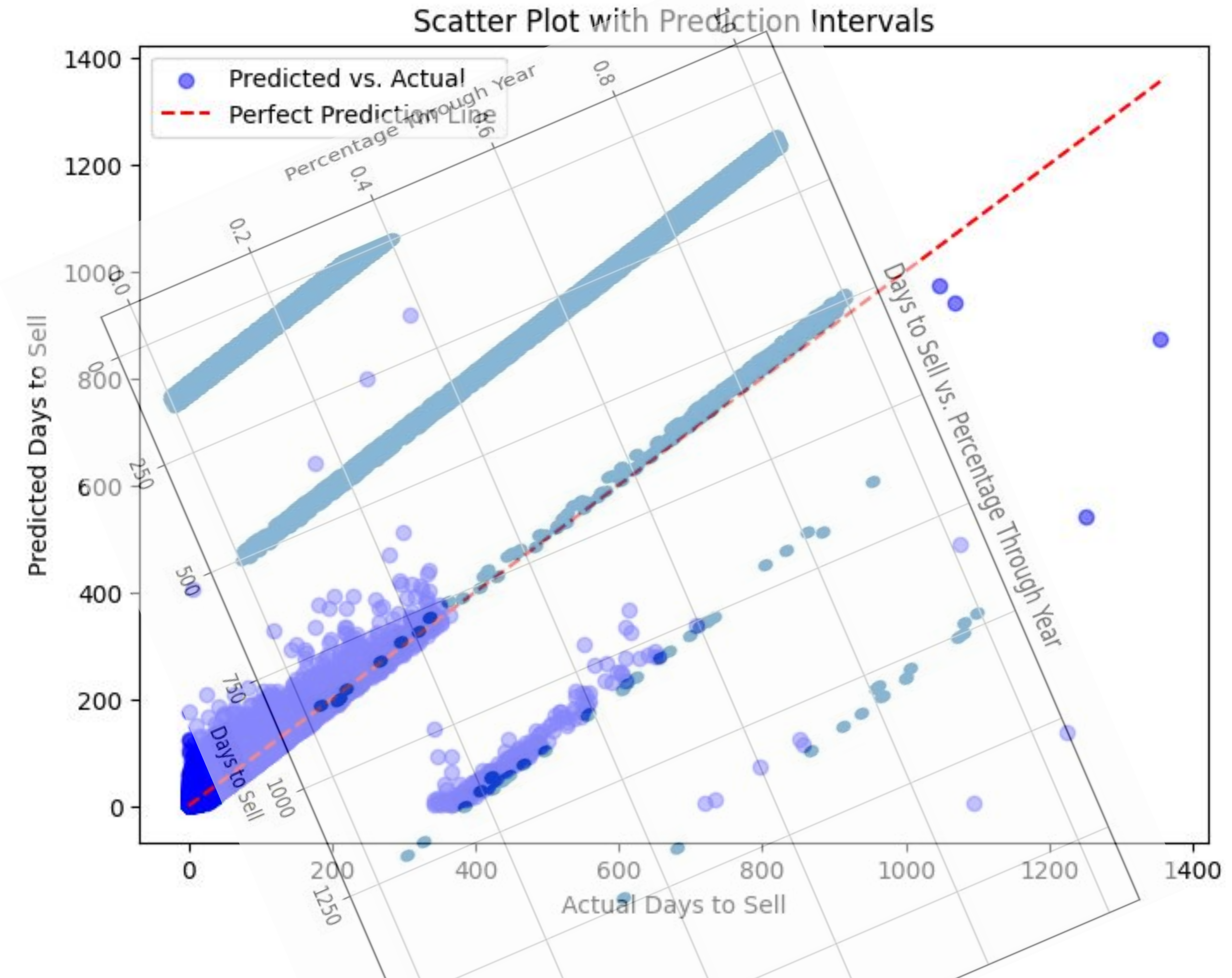

prediction
expected
800
600
400
200
0
output
0
10000
20000
30000
40000
Data Point number


prediction
expected
output
Data Point number
0
200
400
600
800
0
10000
20000
30000
40000

- MAE: 9.00 days
- RMSE: ~28.0 days
- R-Squared: 0.711


Days to Sell vs. Percentage Through Year
Percentage Through Year
0.0
0.2
0.4
0.6
0.8
1.0
0
250
500
750
1000
1250
1500
1750
Days to Sell

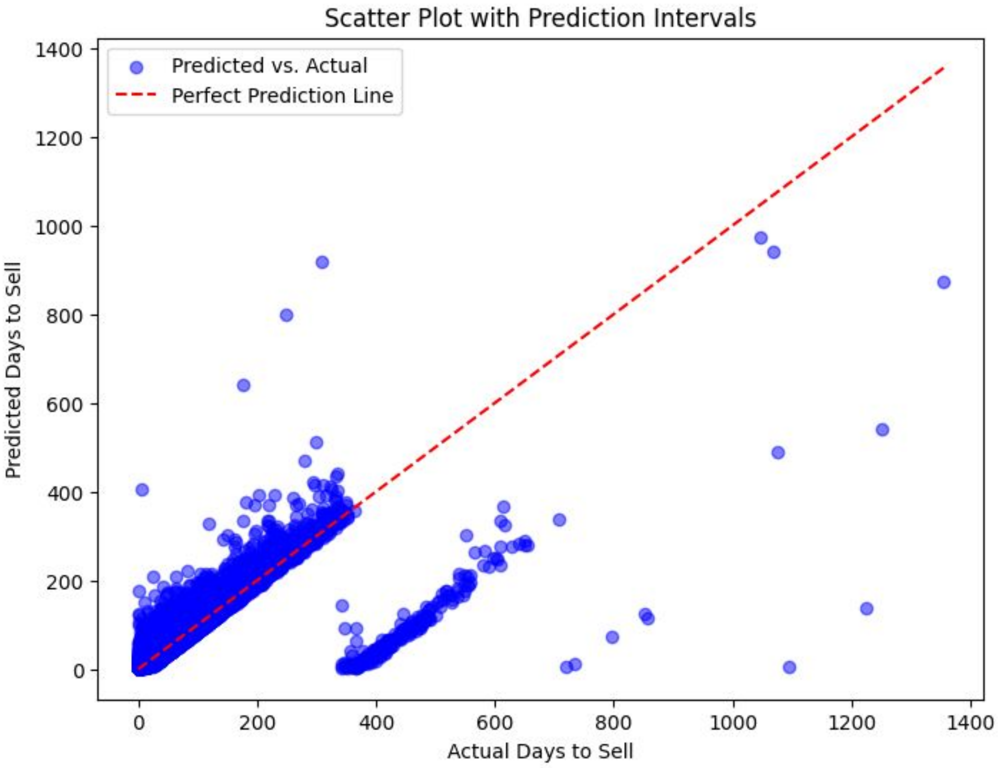

Days to Sell vs. Percentage Through Year
Percentage Through Year
0.0
0.2
0.4
0.6
0.8
1.0
0
250
500
750
1000
1250
1500
1750
Days to Sell

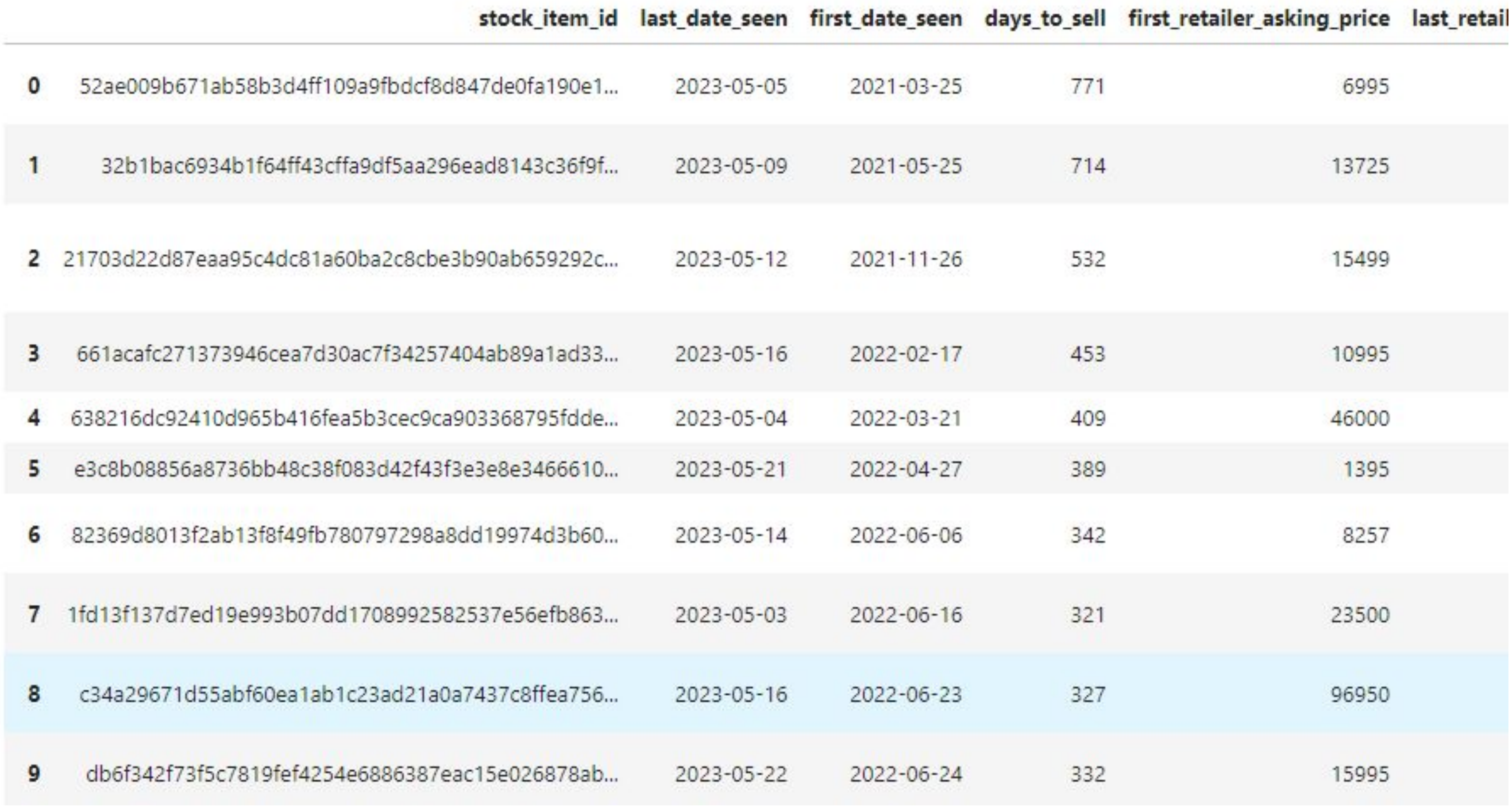


Scatter Plot with Prediction Intervals
Predicted vs. Actual
Perfect Prediction Line
Predicted Days to Sell
Actual Days to Sell
0
200
400
600
800
1000
1200
1400
Days to Sell vs. Percentage Through Year
Percentage Through Year
Days to Sell
0.0
0.2
0.4
0.6
0.8
1.0
0
250
500
750
1000
1250

Our model was <u>Biased</u>

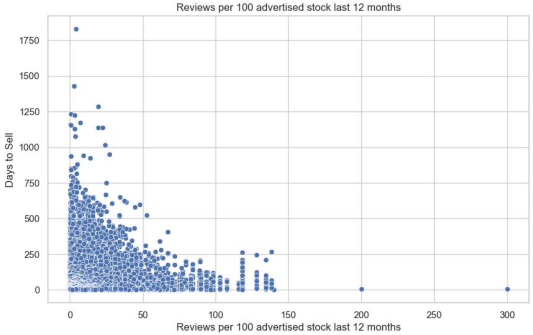
Data Leakage

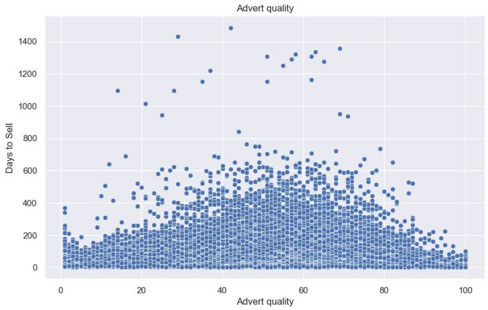


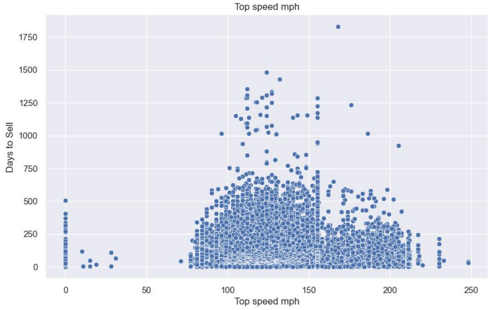


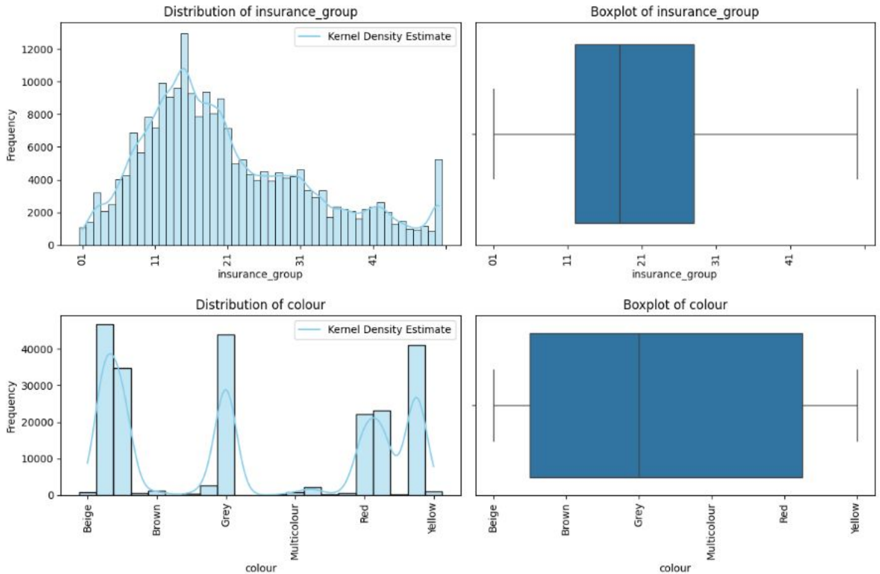
	stock_item_id	last_date_seen	first_date_seen	days_to_sell	first_retailer_asking_price	last_retail
0	52ae009b671ab58b3d4ff109a9fbdcf8d847de0fa190e1...	2023-05-05	2021-03-25	771	6995	
1	32b1bac6934b1f64ff43cffa9df5aa296ead8143c36f9f...	2023-05-09	2021-05-25	714	13725	
2	21703d22d87eaa95c4dc81a60ba2c8cbe3b90ab659292c...	2023-05-12	2021-11-26	532	15499	
3	661acafc271373946cea7d30ac7f34257404ab89a1ad33...	2023-05-16	2022-02-17	453	10995	
4	638216dc92410d965b416fea5b3cec9ca903368795fdde...	2023-05-04	2022-03-21	409	46000	
5	e3c8b08856a8736bb48c38f083d42f43f3e3e8e3466610...	2023-05-21	2022-04-27	389	1395	
6	82369d8013f2ab13f8f49fb780797298a8dd19974d3b60...	2023-05-14	2022-06-06	342	8257	
7	1fd13f137d7ed19e993b07dd1708992582537e56efb863...	2023-05-03	2022-06-16	321	23500	
8	c34a29671d55abf60ea1ab1c23ad21a0a7437c8ffea756...	2023-05-16	2022-06-23	327	96950	
9	db6f342f73f5c7819fef4254e6886387eac15e026878ab...	2023-05-22	2022-06-24	332	15995	

In-Depth Data Exploration

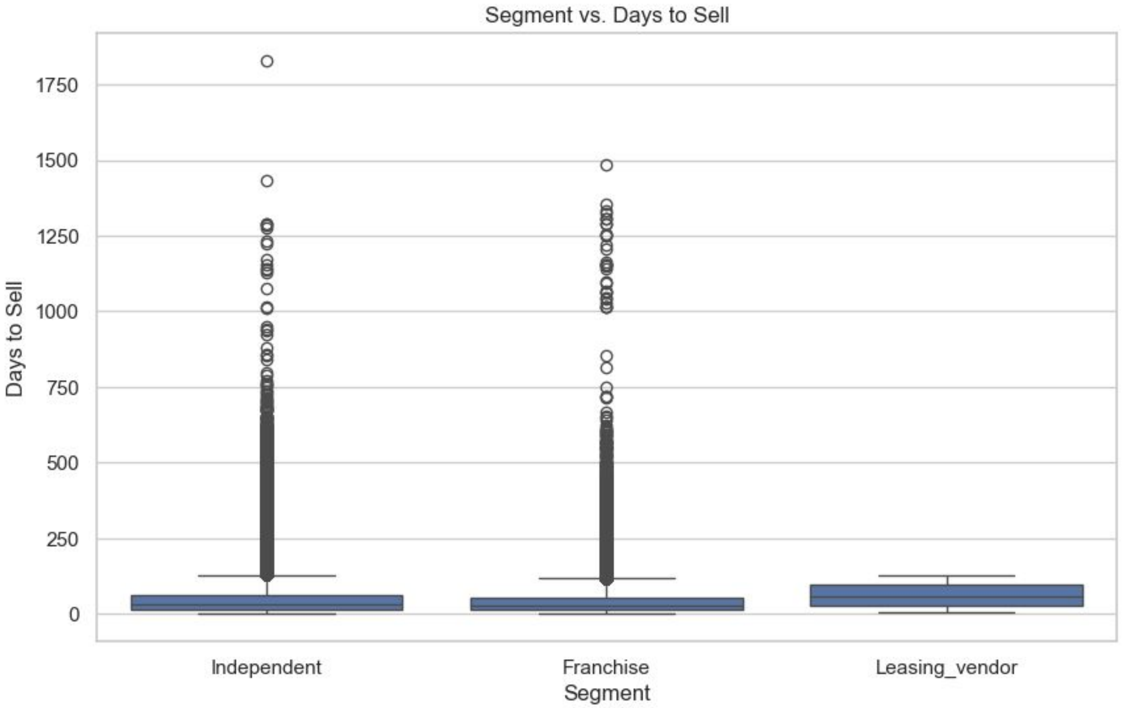

Reviews per 100 advertised stock last 12 months
Days to Sell
0
250
500
750
1000
1250
1500
1750
0
50
100
150
200
250
300
Reviews per 100 advertised stock last 12 months


Advert quality
Days to Sell
0
200
400
600
800
1000
1200
1400
0
20
40
60
80
100
Advert quality


Top speed mph
Days to Sell
0
250
500
750
1000
1250
1500
1750
0
50
100
150
200
250
Top speed mph


Distribution of insurance_group
Kernel Density Estimate
Frequency
0
2000
4000
6000
8000
10000
12000
01
11
21
31
41
insurance_group
Boxplot of insurance_group
01
11
21
31
41
insurance_group
Distribution of colour
Kernel Density Estimate
Frequency
0
10000
20000
30000
40000
Beige
Brown
Grey
Multicolour
Red
Yellow
colour
Boxplot of colour
Beige
Brown
Grey
Multicolour
Red
Yellow
colour

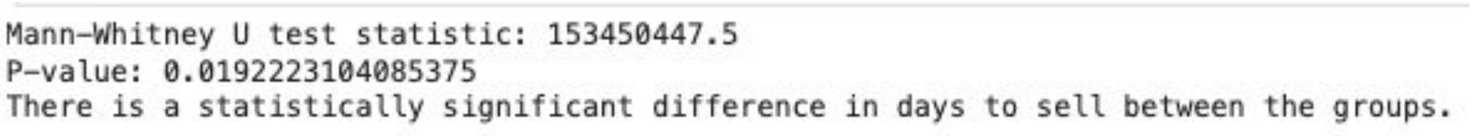
The Problem with Plots



Is the `segment` feature worth including, or just **noise**?

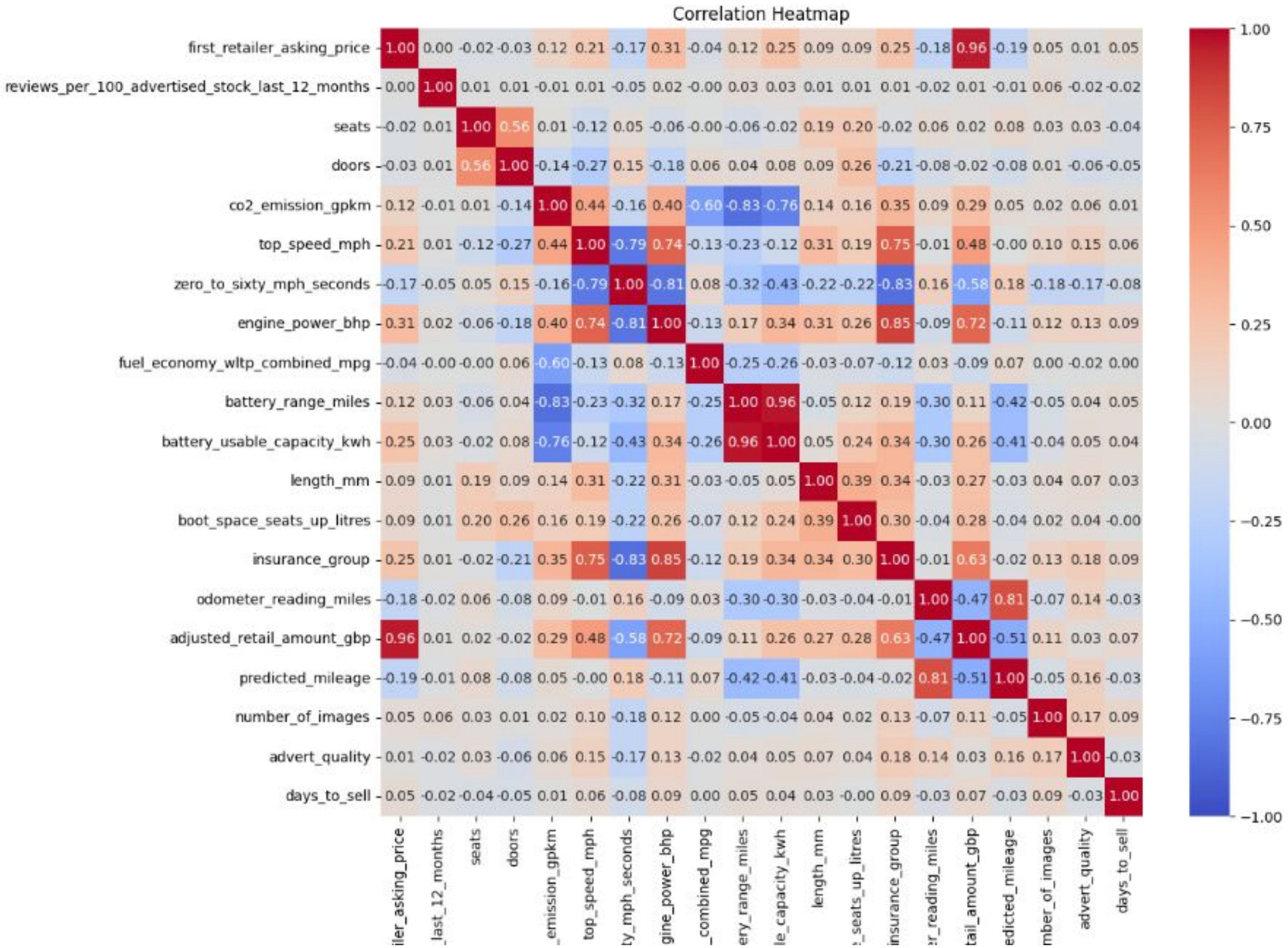
Statistical Tests

Mann-Whitney U Test (α=0.05)

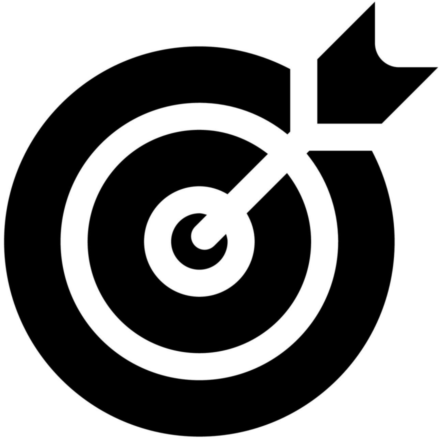


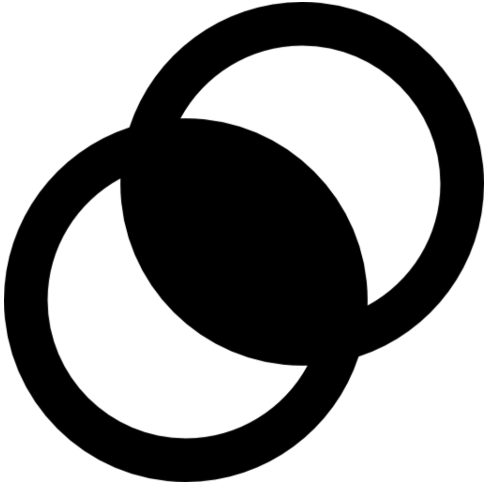
```
Mann-Whitney U test statistic: 153450447.5
P-value: 0.0192223104085375
There is a statistically significant difference in days to sell between the groups.
```

So, **include** the `segment` feature

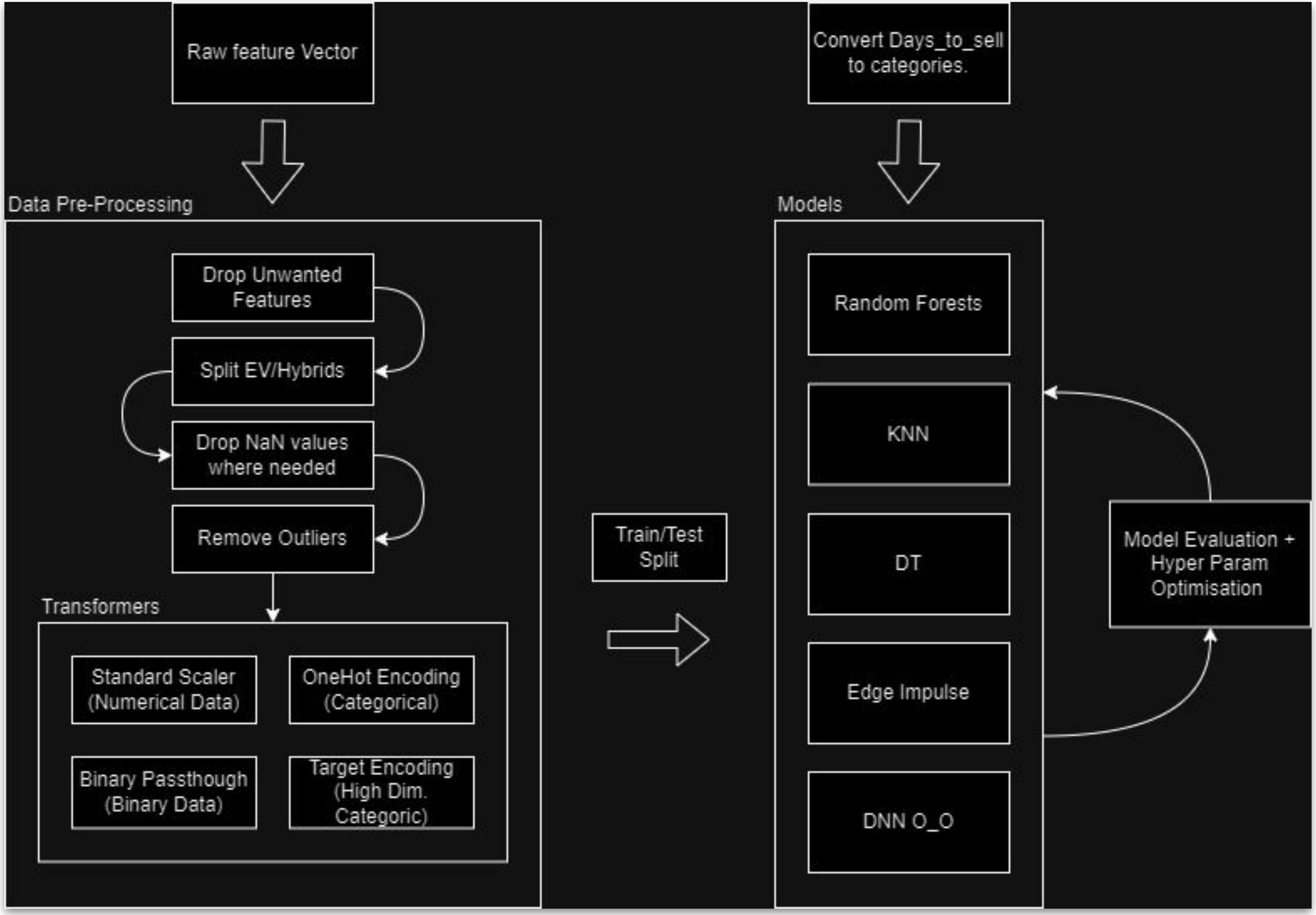

Correlation Heatmap
first_retailer_asking_price 1.00 0.00 -0.02 -0.03 0.12 0.21 -0.17 0.31 -0.04 0.12 0.25 0.09 0.09 0.25 -0.18 0.96 -0.19 0.05 0.01 0.05
reviews_per_100_advertised_stock_last_12_months 0.00 1.00 0.01 0.01 -0.01 0.01 -0.05 0.02 -0.00 0.03 0.03 0.01 0.01 0.01 -0.02 0.01 -0.01 0.06 -0.02 -0.02
seats -0.02 0.01 1.00 0.56 0.01 -0.12 0.05 -0.06 -0.00 -0.06 -0.02 0.19 0.20 -0.02 0.06 0.02 0.08 0.03 0.03 -0.04
doors -0.03 0.01 0.56 1.00 -0.14 -0.27 0.15 -0.18 0.06 0.04 0.08 0.09 0.26 -0.21 -0.08 -0.02 -0.08 0.01 -0.06 -0.05
co2_emission_gpkm 0.12 -0.01 0.01 -0.14 1.00 0.44 -0.16 0.40 -0.60 -0.83 -0.76 0.14 0.16 0.35 0.09 0.29 0.05 0.02 0.06 0.01
top_speed_mph 0.21 0.01 -0.12 -0.27 0.44 1.00 -0.79 0.74 -0.13 -0.23 -0.12 0.31 0.19 0.75 -0.01 0.48 -0.00 0.10 0.15 0.06
zero_to_sixty_mph_seconds -0.17 -0.05 0.05 0.15 -0.16 -0.79 1.00 -0.81 0.08 -0.32 -0.43 -0.22 -0.22 -0.83 0.16 -0.58 0.18 -0.18 -0.17 -0.08
engine_power_bhp 0.31 0.02 -0.06 -0.18 0.40 0.74 -0.81 1.00 -0.13 0.17 0.34 0.31 0.26 0.85 -0.09 0.72 -0.11 0.12 0.13 0.09
fuel_economy_wltp_combined_mpg -0.04 -0.00 -0.00 0.06 -0.60 -0.13 0.08 -0.13 1.00 -0.25 -0.26 -0.03 -0.07 -0.12 0.03 -0.09 0.07 0.00 -0.02 0.00
battery_range_miles 0.12 0.03 -0.06 0.04 -0.83 -0.23 -0.32 0.17 -0.25 1.00 0.96 -0.05 0.12 0.19 -0.30 0.11 -0.42 -0.05 0.04 0.05
battery_usable_capacity_kwh 0.25 0.03 -0.02 0.08 -0.76 -0.12 -0.43 0.34 -0.26 0.96 1.00 0.05 0.24 0.34 -0.30 0.26 -0.41 -0.04 0.05 0.04
length_mm 0.09 0.01 0.19 0.09 0.14 0.31 -0.22 0.31 -0.03 -0.05 0.05 1.00 0.39 0.34 -0.03 0.27 -0.03 0.04 0.07 0.03
boot_space_seats_up_litres 0.09 0.01 0.20 0.26 0.16 0.19 -0.22 0.26 -0.07 0.12 0.24 0.39 1.00 0.30 -0.04 0.28 -0.04 0.02 0.04 -0.00
insurance_group 0.25 0.01 -0.02 -0.21 0.35 0.75 -0.83 0.85 -0.12 0.19 0.34 0.34 0.30 1.00 -0.01 0.63 -0.02 0.13 0.18 0.09
odometer_reading_miles -0.18 -0.02 0.06 -0.08 0.09 -0.01 0.16 -0.09 0.03 -0.30 -0.30 -0.03 -0.04 -0.01 1.00 -0.47 0.81 -0.07 0.14 -0.03
adjusted_retail_amount_gbp 0.96 0.01 0.02 -0.02 0.29 0.48 -0.58 0.72 -0.09 0.11 0.26 0.27 0.28 0.63 -0.47 1.00 -0.51 0.11 0.03 0.07
predicted_mileage -0.19 -0.01 0.08 -0.08 0.05 -0.00 0.18 -0.11 0.07 -0.42 -0.41 -0.03 -0.04 -0.02 0.81 -0.51 1.00 -0.05 0.16 -0.03
number_of_images 0.05 0.06 0.03 0.01 0.02 0.10 -0.18 0.12 0.00 -0.05 -0.04 0.04 0.02 0.13 -0.07 0.11 -0.05 1.00 0.17 0.09
advert_quality 0.01 -0.02 0.03 -0.06 0.06 0.15 -0.17 0.13 -0.02 0.04 0.05 0.07 0.04 0.18 0.14 0.03 0.16 0.17 1.00 -0.03
days_to_sell 0.05 -0.02 -0.04 -0.05 0.01 0.06 -0.08 0.09 0.00 0.05 0.04 0.03 -0.00 0.09 -0.03 0.07 -0.03 0.09 -0.03 1.00
iler_asking_price
last_12_months
seats
doors
emission_gpkm
top_speed_mph
ty_mph_seconds
gine_power_bhp
combined_mpg
ery_range_miles
le_capacity_kwh
length_mm
seats_up_litres
insurance_group
r_reading_miles
tail_amount_gbp
edicted_mileage
mber_of_images
advert_quality
days_to_sell
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00

“The Curse of High Dimensionality”

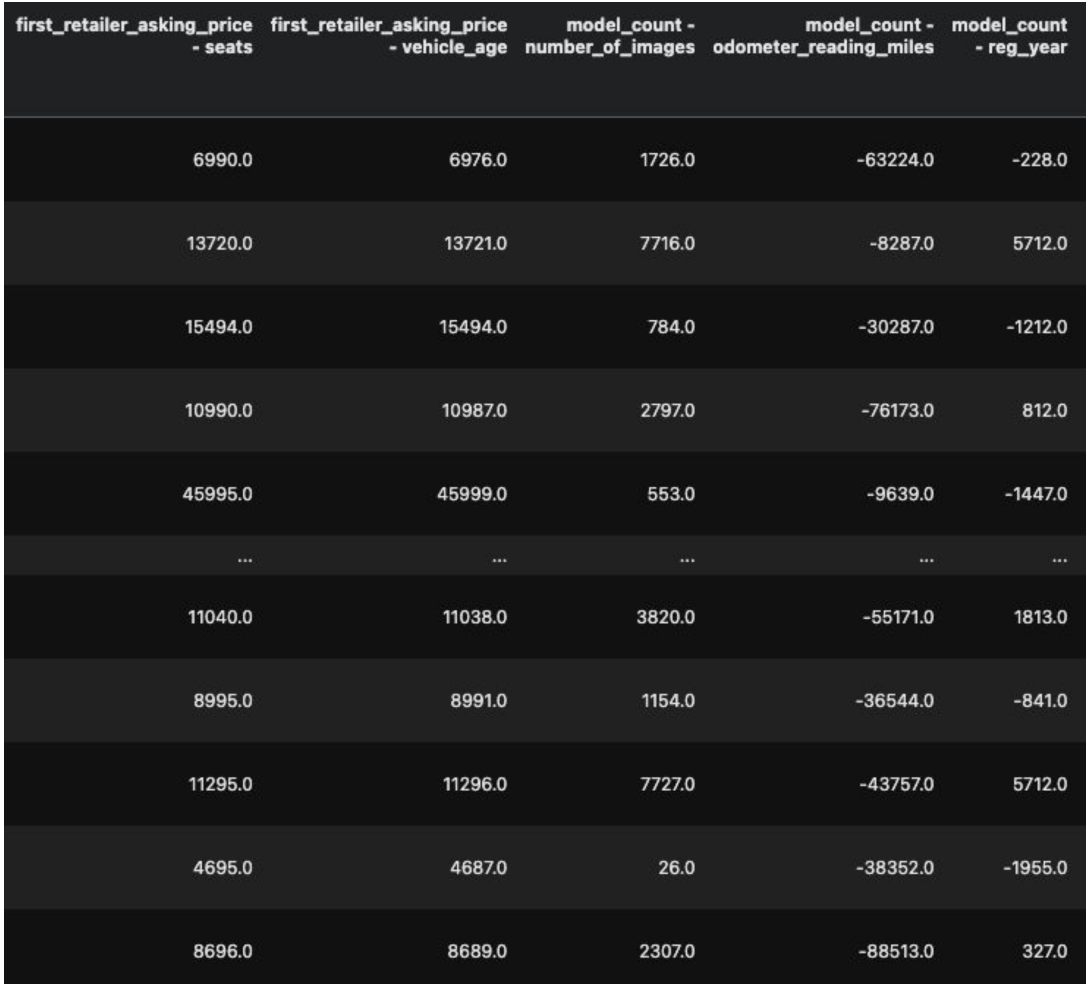




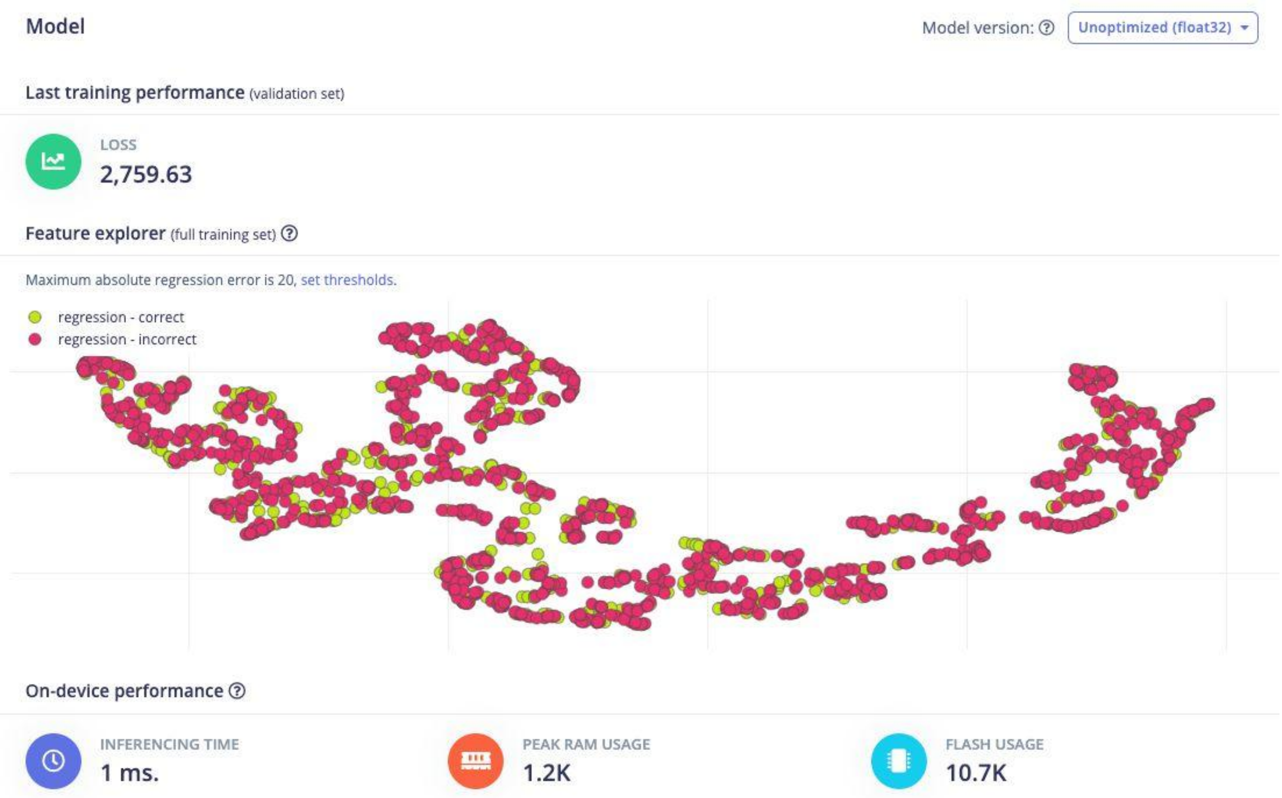
KEEP
MOVING
FORWA
KEEP MOVING FORWARD


Raw feature Vector
Convert Days_to_sell to categories.
Data Pre-Processing
Drop Unwanted Features
Split EV/Hybrids
Drop NaN values where needed
Remove Outliers
Transformers
Standard Scaler (Numerical Data)
OneHot Encoding (Categorical)
Binary Passthough (Binary Data)
Target Encoding (High Dim. Categoric)
Train/Test Split
Models
Random Forests
KNN
DT
Edge Impulse
DNN O_O
Model Evaluation + Hyper Param Optimisation

Featuretools



first_retailer_asking_price - seats	first_retailer_asking_price - vehicle_age	model_count - number_of_images	model_count - odometer_reading_miles	model_count - reg_year
6990.0	6976.0	1726.0	-63224.0	-228.0
13720.0	13721.0	7716.0	-8287.0	5712.0
15494.0	15494.0	784.0	-30287.0	-1212.0
10990.0	10987.0	2797.0	-76173.0	812.0
45995.0	45999.0	553.0	-9639.0	-1447.0
...	...	...	...	...
11040.0	11038.0	3820.0	-55171.0	1813.0
8995.0	8991.0	1154.0	-36544.0	-841.0
11295.0	11296.0	7727.0	-43757.0	5712.0
4695.0	4687.0	26.0	-38352.0	-1955.0
8696.0	8689.0	2307.0	-88513.0	327.0



Model

Model version: ⓘ Unoptimized (float32) ▾

Last training performance (validation set)

LOSS
2,759.63

Feature explorer (full training set) ⓘ

Maximum absolute regression error is 20, set thresholds.

On-device performance ⓘ

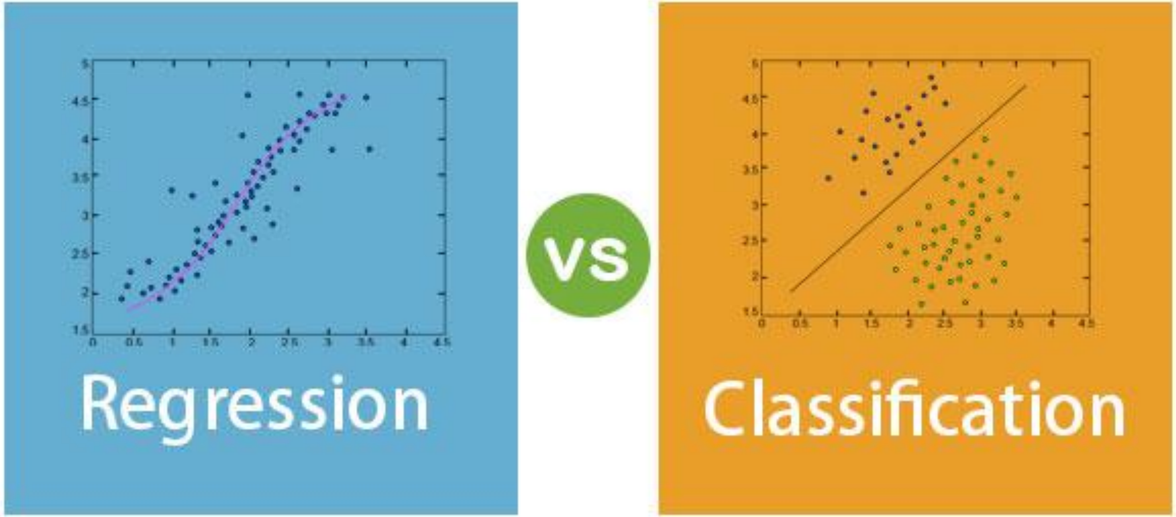
INFERENCING TIME
1 ms.

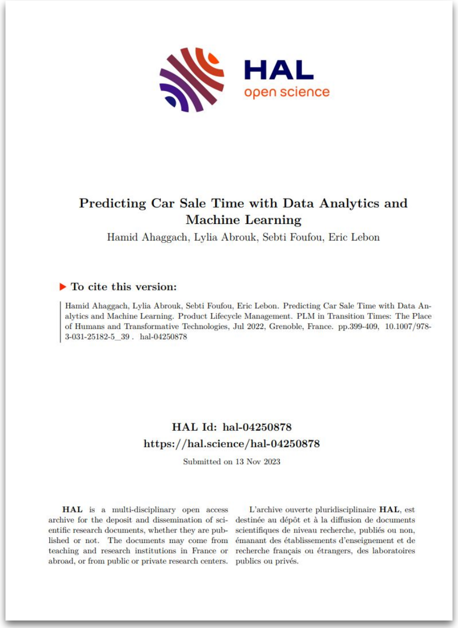
PEAK RAM USAGE
1.2K

FLASH USAGE
10.7K

EDGE IMPULSE

DATA COLLECTED
45h 54m 52s





HAL open science

Predicting Car Sale Time with Data Analytics and Machine Learning

Hamid Ahaggach, Lylia Abrouk, Sebti Foufou, Eric Lebon

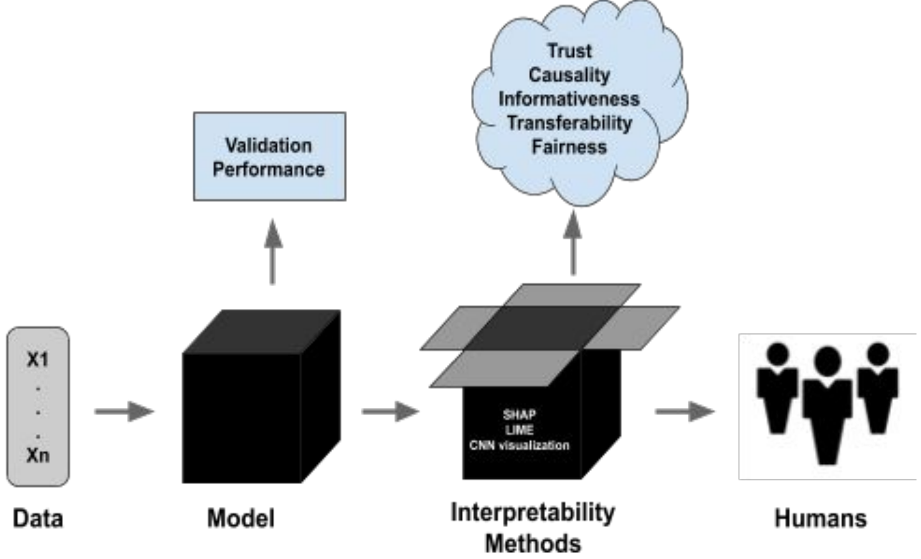
▶ **To cite this version:**

> Hamid Ahaggach, Lylia Abrouk, Sebti Foufou, Eric Lebon. Predicting Car Sale Time with Data Analytics and Machine Learning. Product Lifecycle Management. PLM in Transition Times: The Place of Humans and Transformative Technologies, Jul 2022, Grenoble, France. pp.399-409, 10.1007/978-3-031-25182-5_39 . hal-04250878

HAL Id: hal-04250878

https://hal.science/hal-04250878

Submitted on 13 Nov 2023


Trust
Causality
Informativeness
Transferability
Fairness
Validation Performance
X1
.
.
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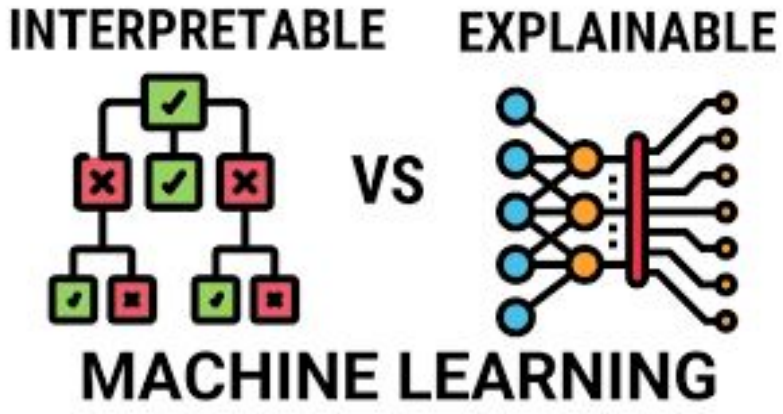
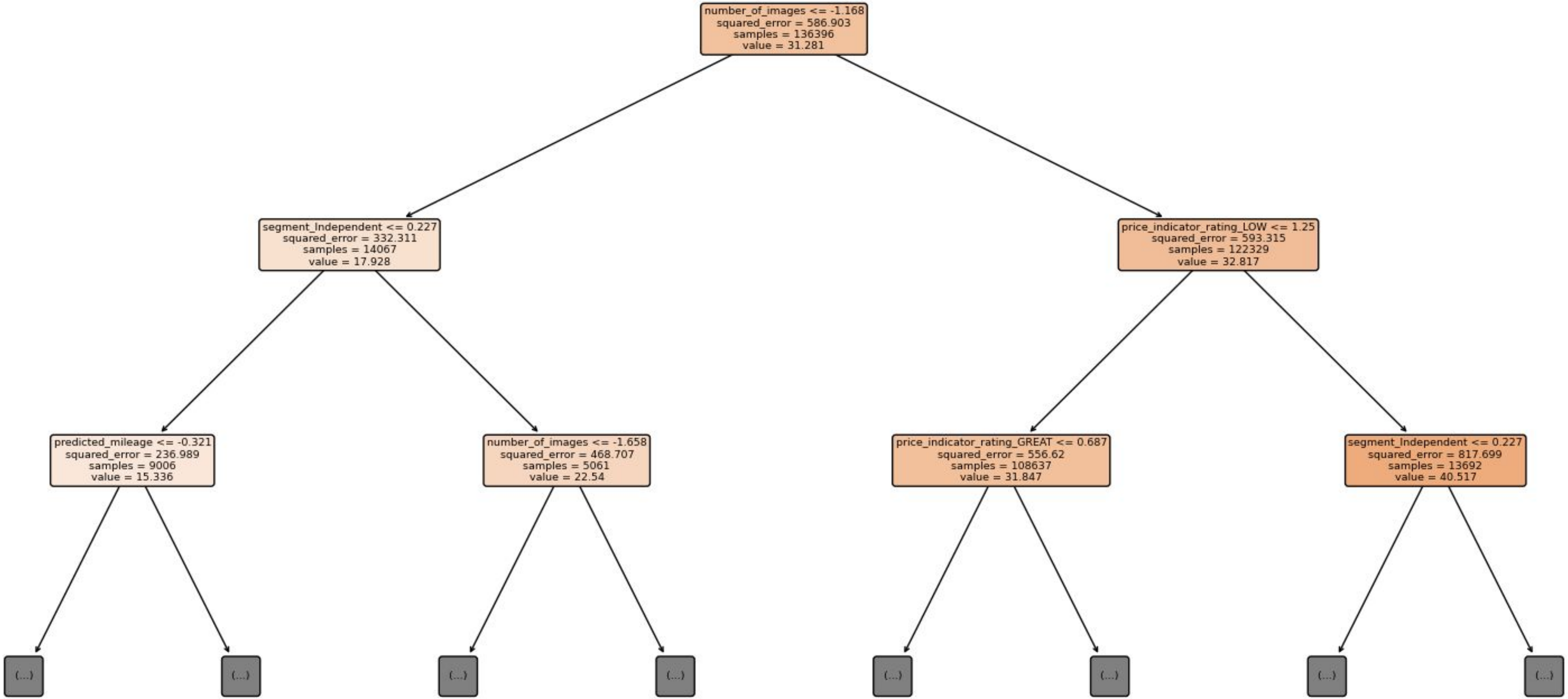
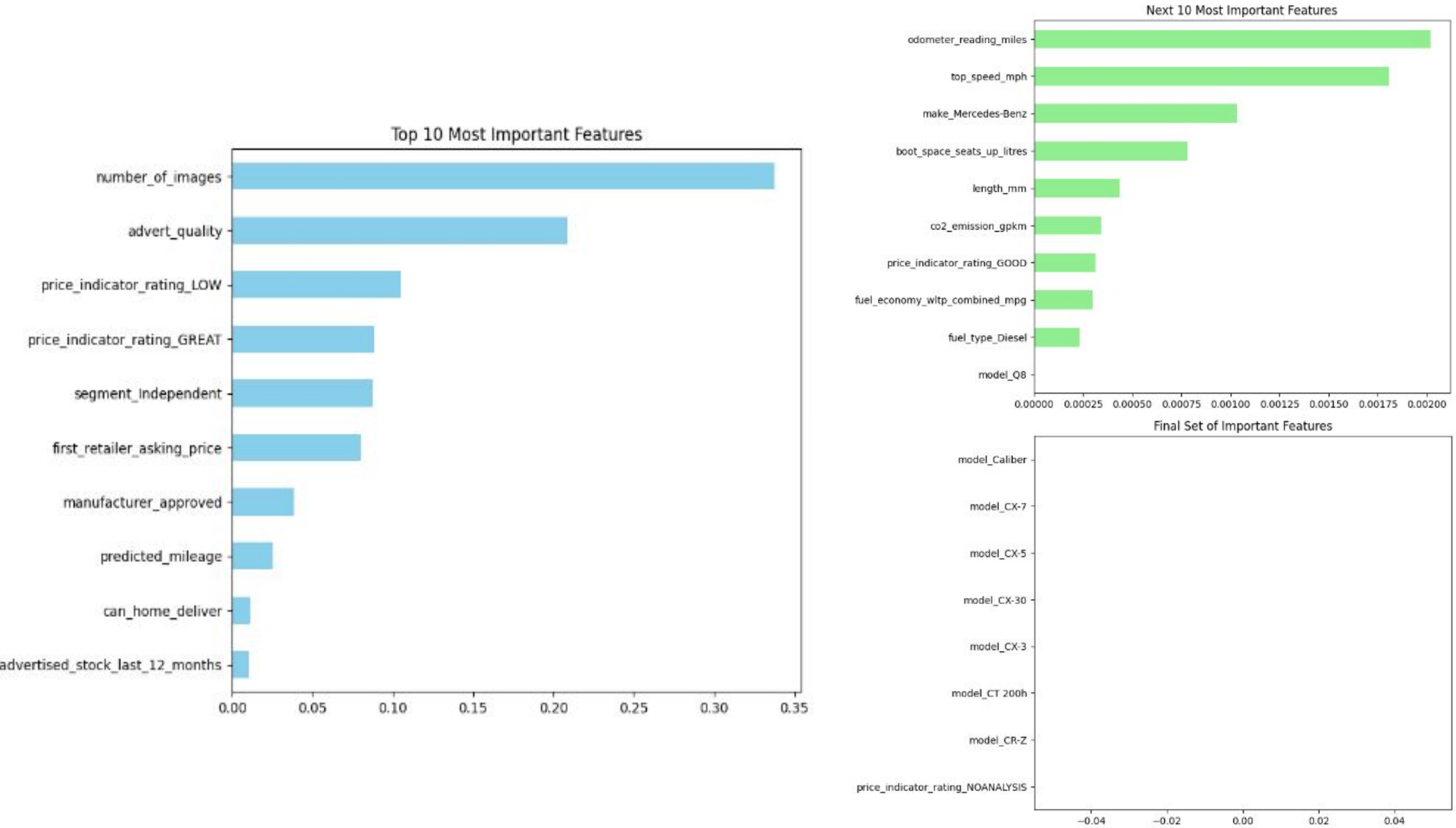
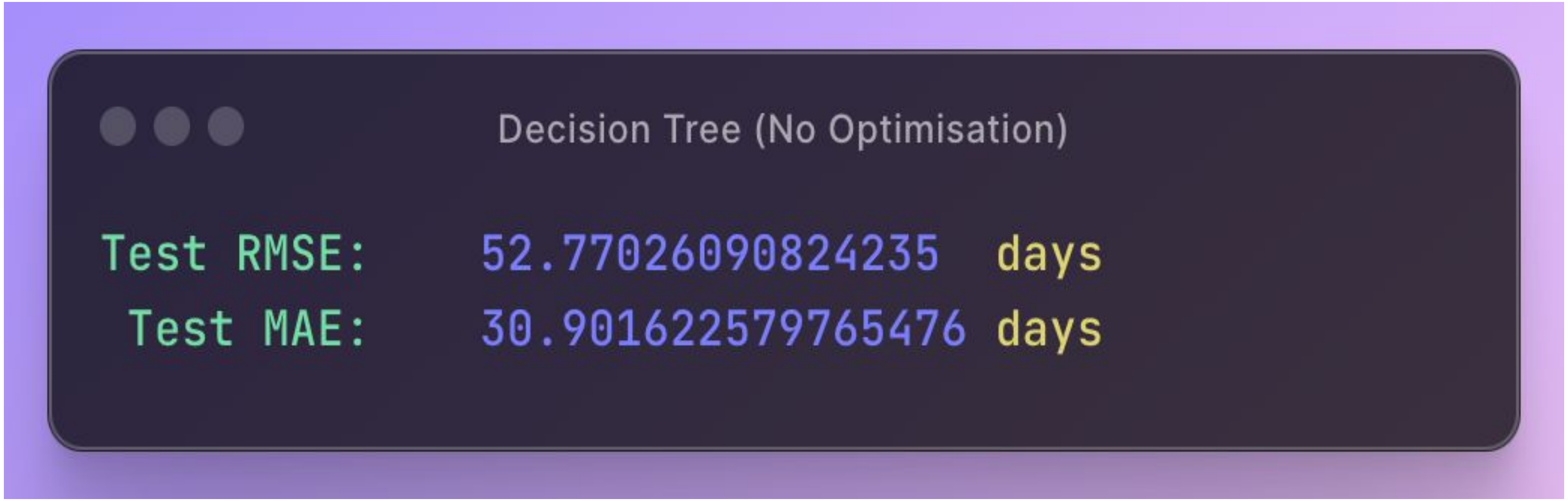
Xn
Data
Model
SHAP
LIME
CNN visualization
Interpretability Methods
Humans

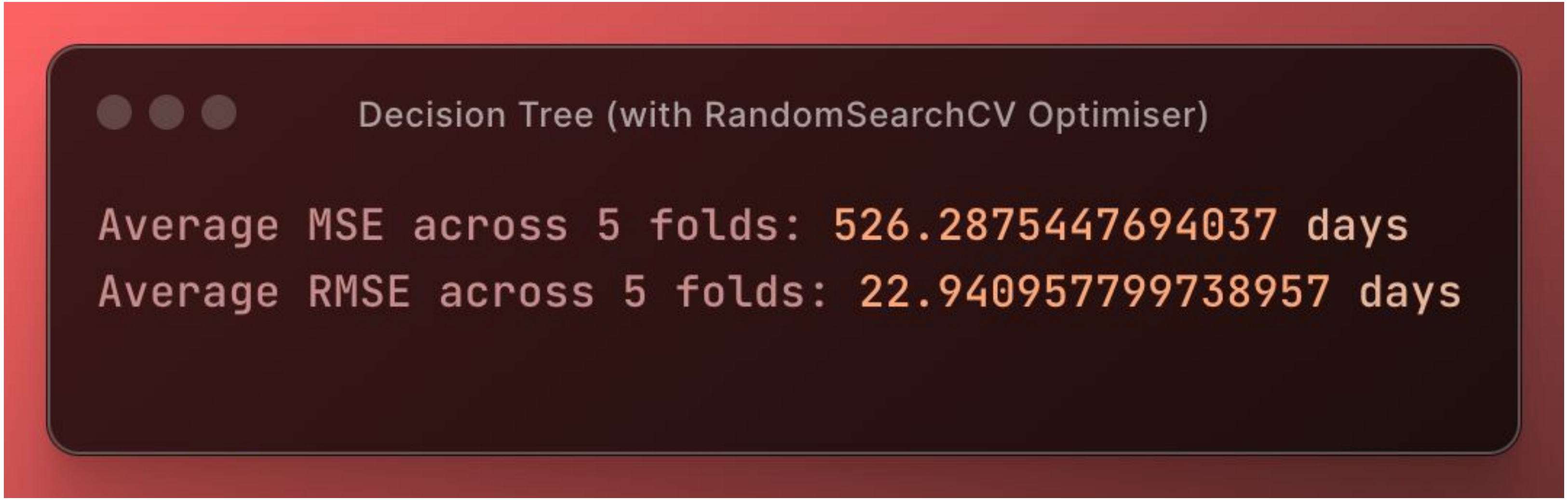

INTERPRETABLE
VS
EXPLAINABLE
MACHINE LEARNING


number_of_images <= -1.168
squared_error = 586.903
samples = 136396
value = 31.281
segment_Independent <= 0.227
squared_error = 332.311
samples = 14067
value = 17.928
price_indicator_rating_LOW <= 1.25
squared_error = 593.315
samples = 122329
value = 32.817
predicted_mileage <= -0.321
squared_error = 236.989
samples = 9006
value = 15.336
number_of_images <= -1.658
squared_error = 468.707
samples = 5061
value = 22.54
price_indicator_rating_GREAT <= 0.687
squared_error = 556.62
samples = 108637
value = 31.847
segment_Independent <= 0.227
squared_error = 817.699
samples = 13692
value = 40.517
(...)
(...)
(...)
(...)
(...)
(...)
(...)
(...)


Top 10 Most Important Features
number_of_images
advert_quality
price_indicator_rating_LOW
price_indicator_rating_GREAT
segment_Independent
first_retailer_asking_price
manufacturer_approved
predicted_mileage
can_home_deliver
advertised_stock_last_12_months
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
Next 10 Most Important Features
odometer_reading_miles
top_speed_mph
make_Mercedes-Benz
boot_space_seats_up_litres
length_mm
co2_emission_gpkm
price_indicator_rating_GOOD
fuel_economy_wltp_combined_mpg
fuel_type_Diesel
model_Q8
0.00000
0.00025
0.00050
0.00075
0.00100
0.00125
0.00150
0.00175
0.00200
Final Set of Important Features
model_Caliber
model_CX-7
model_CX-5
model_CX-30
model_CX-3
model_CT 200h
model_CR-Z
price_indicator_rating_NOANALYSIS
−0.04
−0.02
0.00
0.02
0.04

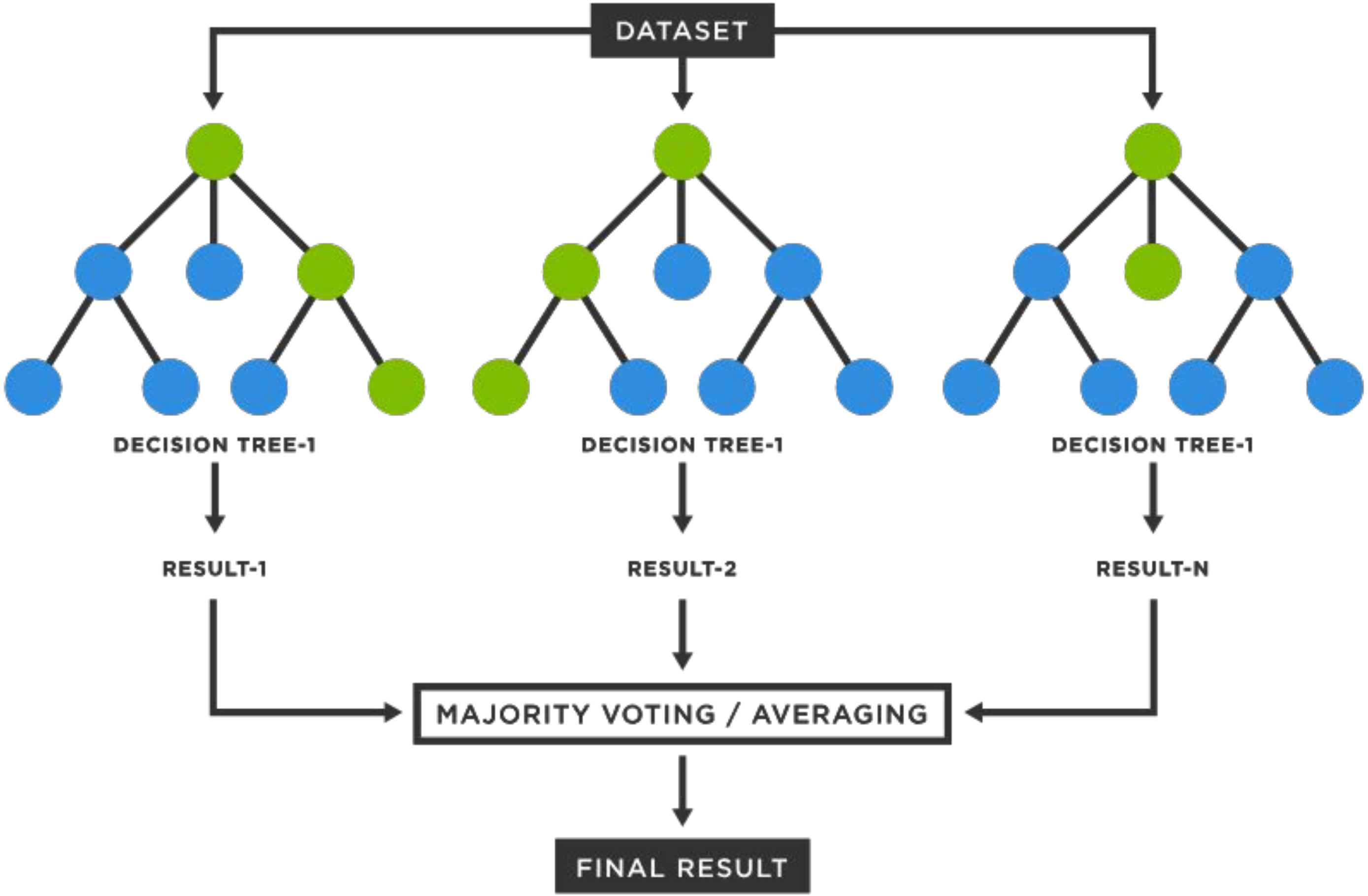


```
Test RMSE:    52.77026090824235  days
 Test MAE:    30.901622579765476 days
```



Decision Tree (with RandomSearchCV Optimiser)

```
Average MSE across 5 folds: 526.2875447694037 days
Average RMSE across 5 folds: 22.940957799738957 days
```



DATASET

DECISION TREE-1

DECISION TREE-1

DECISION TREE-1

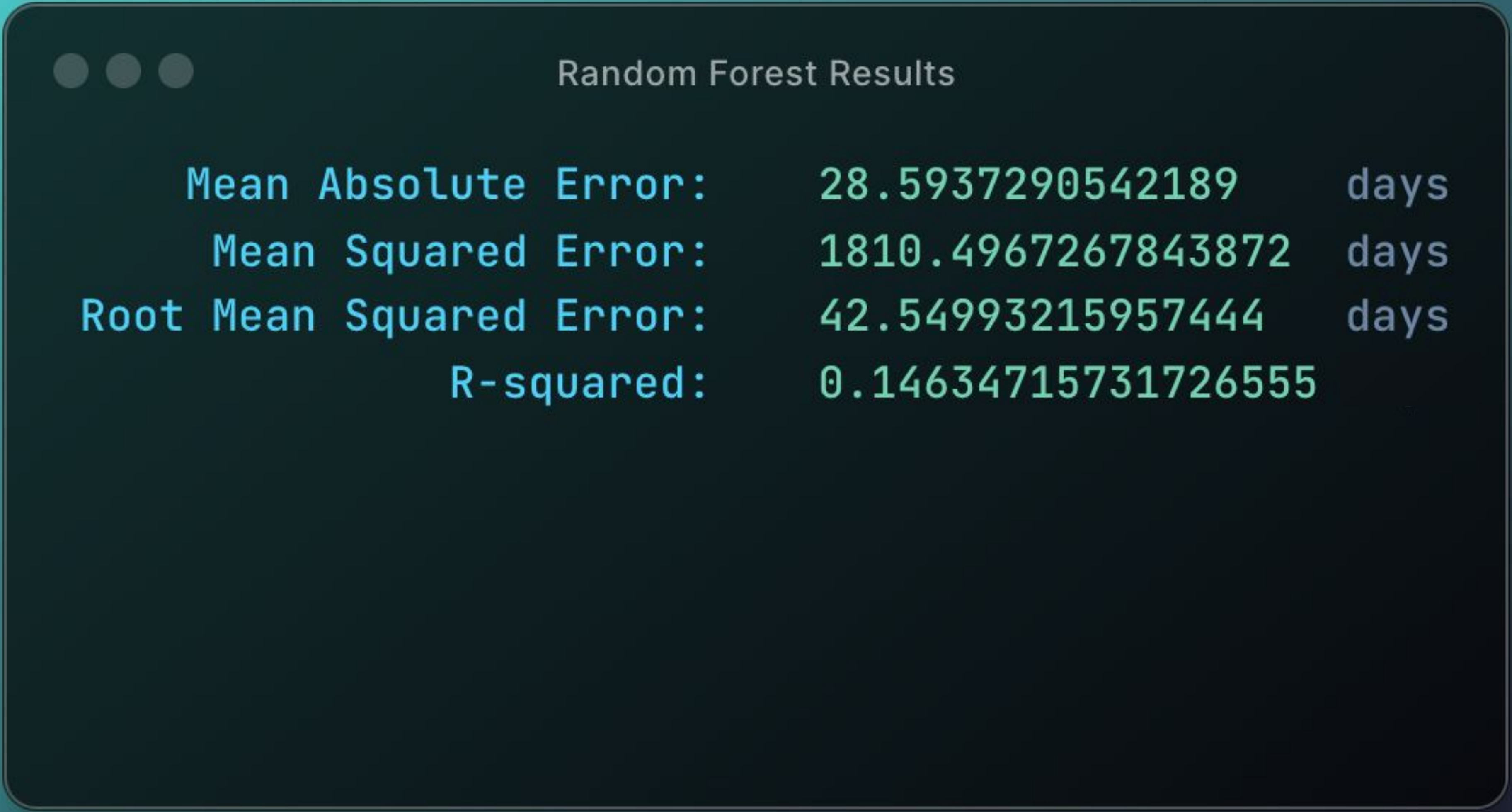
RESULT-1

RESULT-2

RESULT-N

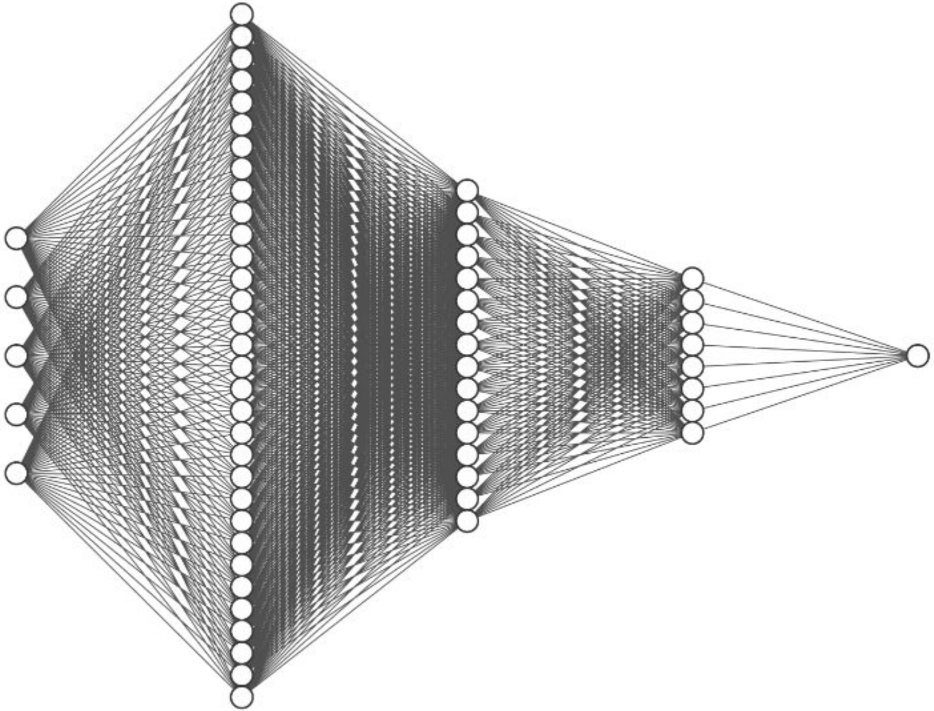
MAJORITY VOTING / AVERAGING

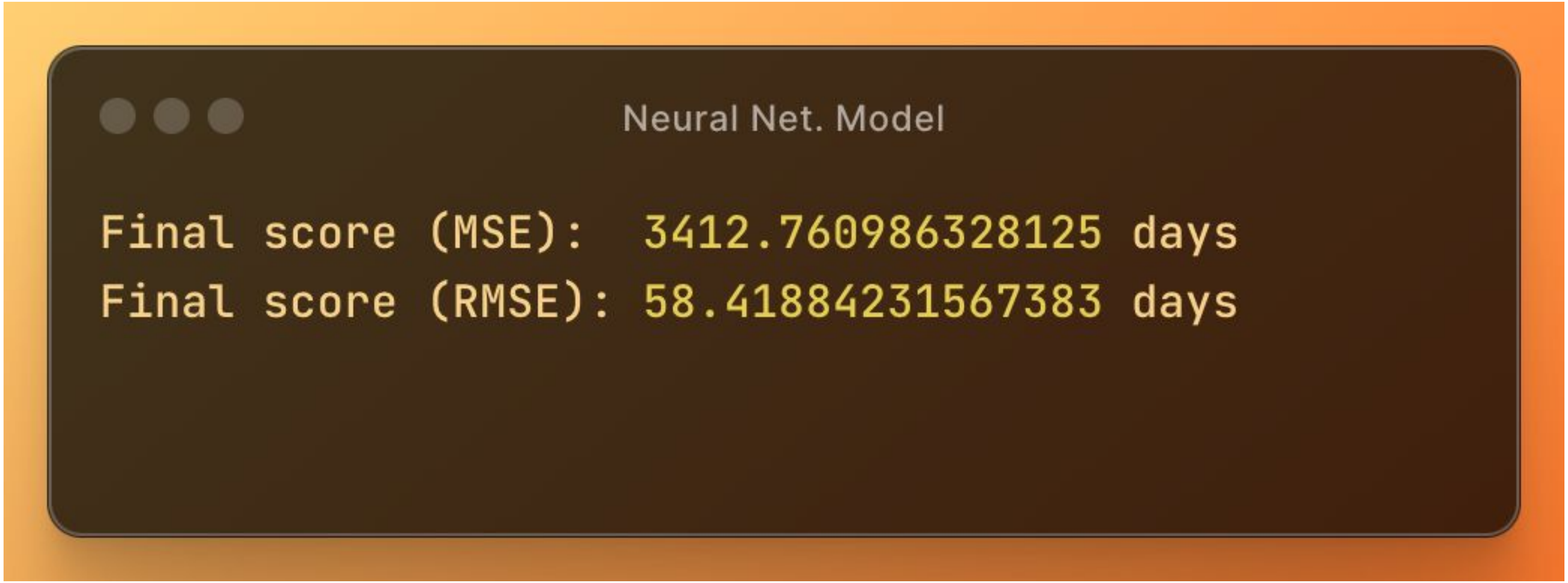
FINAL RESULT



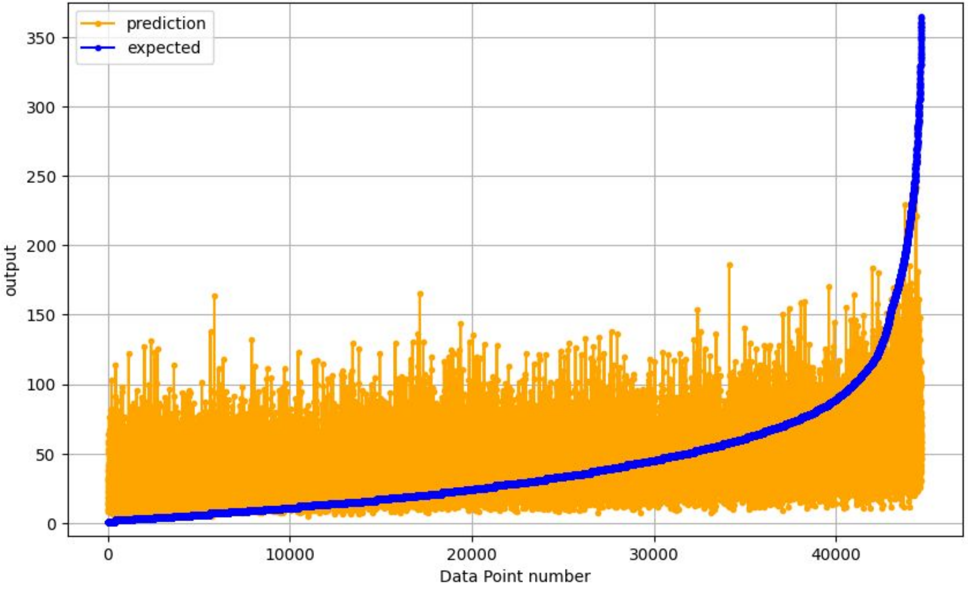
```
      Mean Absolute Error:    28.5937290542189    days
       Mean Squared Error:    1810.4967267843872  days
  Root Mean Squared Error:    42.54993215957444   days
                R-squared:    0.14634715731726555
```

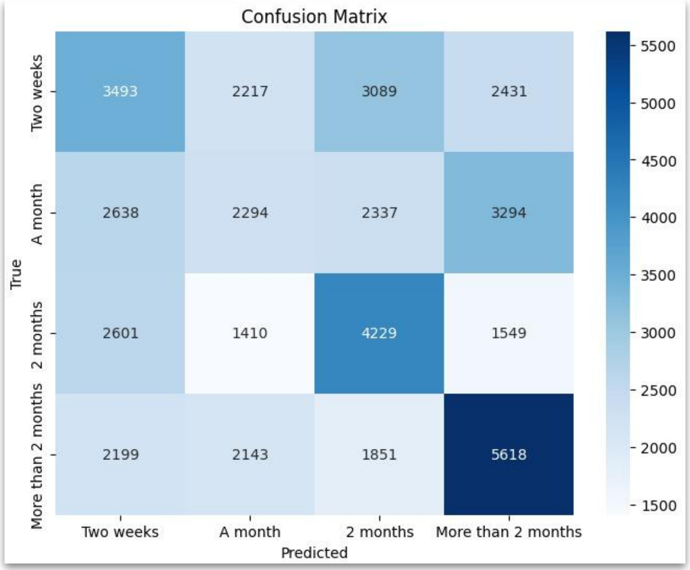
NN Approach





```
Final score (MSE):  3412.760986328125 days
Final score (RMSE): 58.41884231567383 days
```




Confusion Matrix

True \ Predicted	Two weeks	A month	2 months	More than 2 months
Two weeks	3493	2217	3089	2431
A month	2638	2294	2337	3294
2 months	2601	1410	4229	1549
More than 2 months	2199	2143	1851	5618

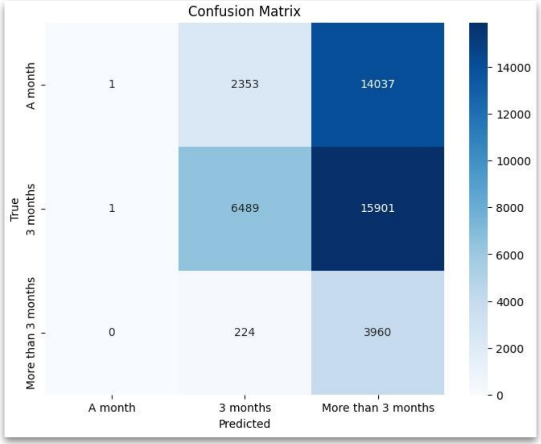
So *what* limited our solution?

“ Simply knowing what a jupyter notebook is

DOES NOT

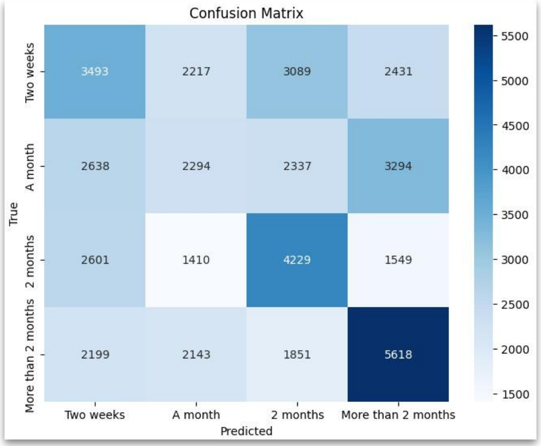
make you an ML engineer! ”

~ Tom Cassar, 2024



Confusion Matrix

True \ Predicted	A month	3 months	More than 3 months
A month	1	2353	14037
3 months	1	6489	15901
More than 3 months	0	224	3960



Confusion Matrix

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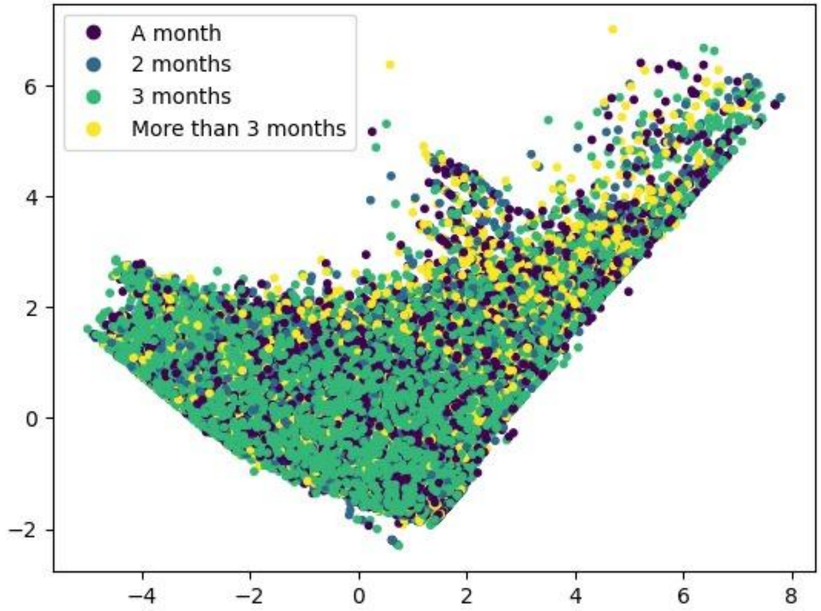
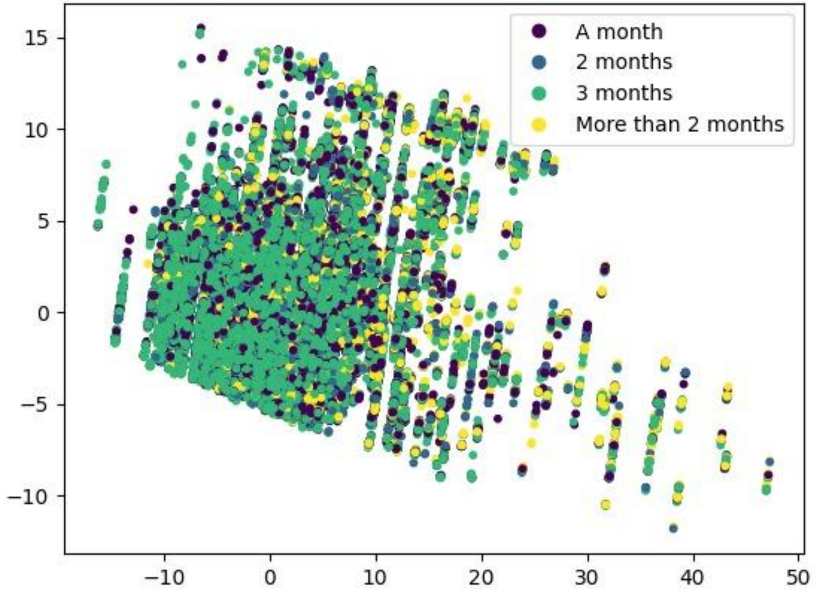
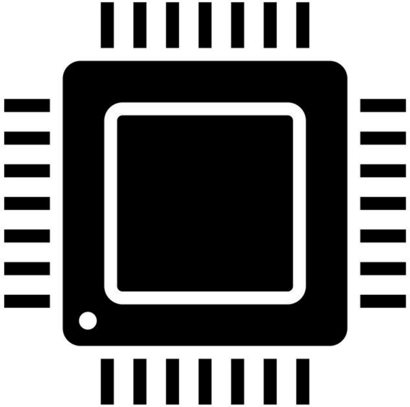
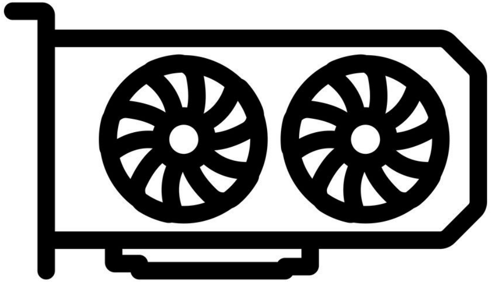
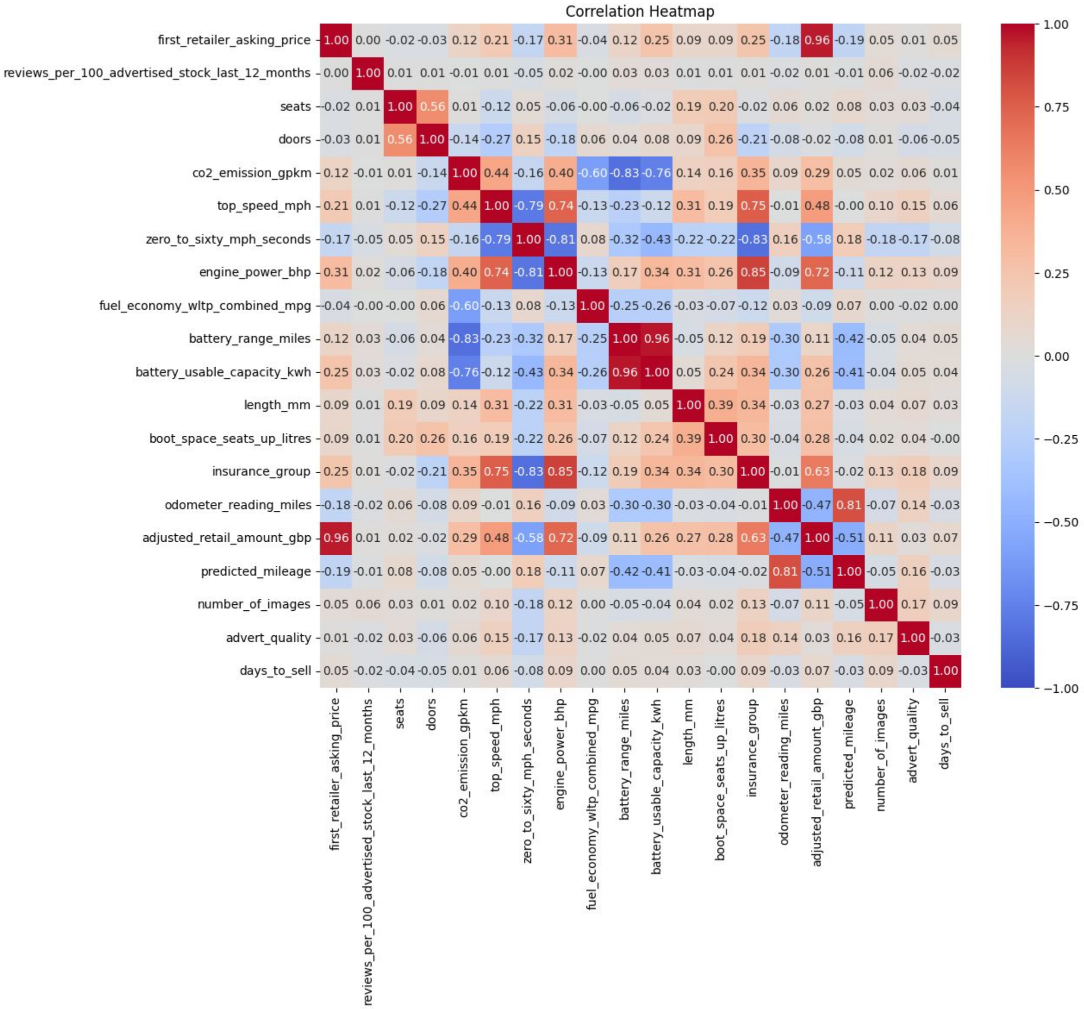

A month
2 months
3 months
More than 3 months
6
4
2
0
−2
−4
−2
0
2
4
6
8

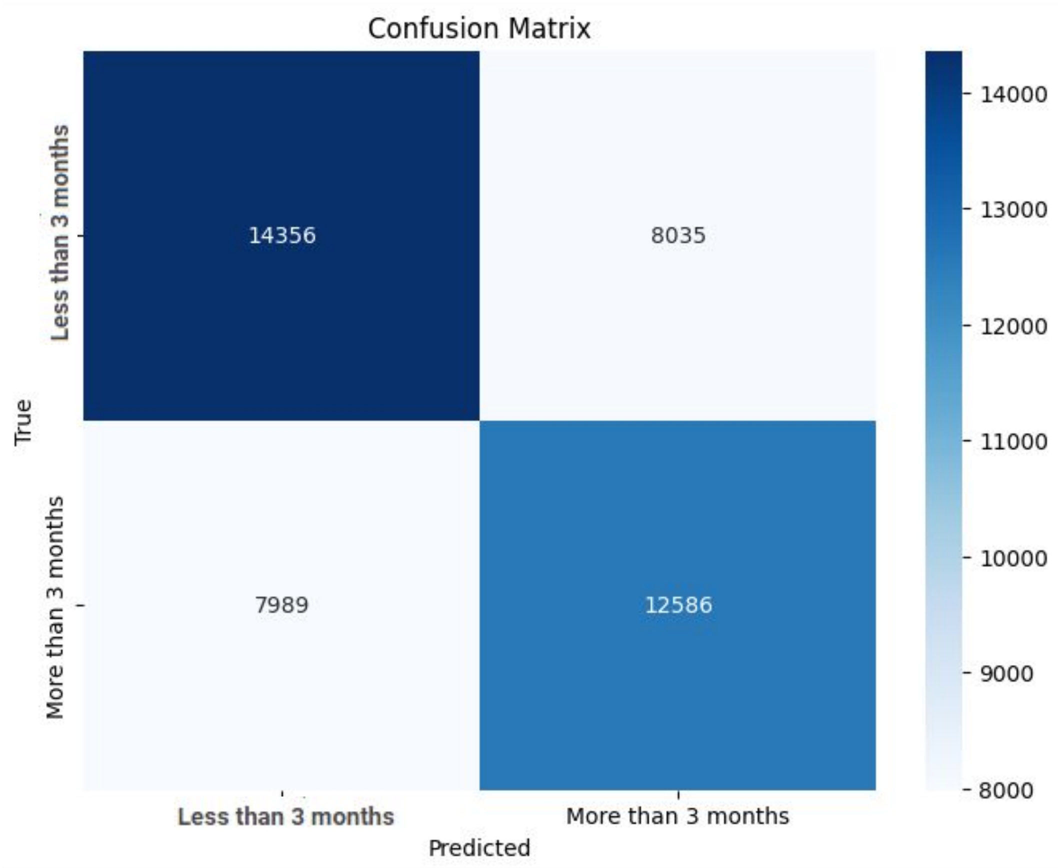

A month
2 months
3 months
More than 2 months
15
10
5
0
−5
−10
−10
0
10
20
30
40
50







	first_retailer_asking_price	reviews_per_100_advertised_stock_last_12_months	seats	doors	co2_emission_gpkm	top_speed_mph	zero_to_sixty_mph_seconds	engine_power_bhp	fuel_economy_wltp_combined_mpg	battery_range_miles	battery_usable_capacity_kwh	length_mm	boot_space_seats_up_litres	insurance_group	odometer_reading_miles	adjusted_retail_amount_gbp	predicted_mileage	number_of_images	advert_quality	days_to_sell
first_retailer_asking_price	1.00	0.00	-0.02	-0.03	0.12	0.21	-0.17	0.31	-0.04	0.12	0.25	0.09	0.09	0.25	-0.18	0.96	-0.19	0.05	0.01	0.05
reviews_per_100_advertised_stock_last_12_months	0.00	1.00	0.01	0.01	-0.01	0.01	-0.05	0.02	-0.00	0.03	0.03	0.01	0.01	0.01	-0.02	0.01	-0.01	0.06	-0.02	-0.02
seats	-0.02	0.01	1.00	0.56	0.01	-0.12	0.05	-0.06	-0.00	-0.06	-0.02	0.19	0.20	-0.02	0.06	0.02	0.08	0.03	0.03	-0.04
doors	-0.03	0.01	0.56	1.00	-0.14	-0.27	0.15	-0.18	0.06	0.04	0.08	0.09	0.26	-0.21	-0.08	-0.02	-0.08	0.01	-0.06	-0.05
co2_emission_gpkm	0.12	-0.01	0.01	-0.14	1.00	0.44	-0.16	0.40	-0.60	-0.83	-0.76	0.14	0.16	0.35	0.09	0.29	0.05	0.02	0.06	0.01
top_speed_mph	0.21	0.01	-0.12	-0.27	0.44	1.00	-0.79	0.74	-0.13	-0.23	-0.12	0.31	0.19	0.75	-0.01	0.48	-0.00	0.10	0.15	0.06
zero_to_sixty_mph_seconds	-0.17	-0.05	0.05	0.15	-0.16	-0.79	1.00	-0.81	0.08	-0.32	-0.43	-0.22	-0.22	-0.83	0.16	-0.58	0.18	-0.18	-0.17	-0.08
engine_power_bhp	0.31	0.02	-0.06	-0.18	0.40	0.74	-0.81	1.00	-0.13	0.17	0.34	0.31	0.26	0.85	-0.09	0.72	-0.11	0.12	0.13	0.09
fuel_economy_wltp_combined_mpg	-0.04	-0.00	-0.00	0.06	-0.60	-0.13	0.08	-0.13	1.00	-0.25	-0.26	-0.03	-0.07	-0.12	0.03	-0.09	0.07	0.00	-0.02	0.00
battery_range_miles	0.12	0.03	-0.06	0.04	-0.83	-0.23	-0.32	0.17	-0.25	1.00	0.96	-0.05	0.12	0.19	-0.30	0.11	-0.42	-0.05	0.04	0.05
battery_usable_capacity_kwh	0.25	0.03	-0.02	0.08	-0.76	-0.12	-0.43	0.34	-0.26	0.96	1.00	0.05	0.24	0.34	-0.30	0.26	-0.41	-0.04	0.05	0.04
length_mm	0.09	0.01	0.19	0.09	0.14	0.31	-0.22	0.31	-0.03	-0.05	0.05	1.00	0.39	0.34	-0.03	0.27	-0.03	0.04	0.07	0.03
boot_space_seats_up_litres	0.09	0.01	0.20	0.26	0.16	0.19	-0.22	0.26	-0.07	0.12	0.24	0.39	1.00	0.30	-0.04	0.28	-0.04	0.02	0.04	-0.00
insurance_group	0.25	0.01	-0.02	-0.21	0.35	0.75	-0.83	0.85	-0.12	0.19	0.34	0.34	0.30	1.00	-0.01	0.63	-0.02	0.13	0.18	0.09
odometer_reading_miles	-0.18	-0.02	0.06	-0.08	0.09	-0.01	0.16	-0.09	0.03	-0.30	-0.30	-0.03	-0.04	-0.01	1.00	-0.47	0.81	-0.07	0.14	-0.03
adjusted_retail_amount_gbp	0.96	0.01	0.02	-0.02	0.29	0.48	-0.58	0.72	-0.09	0.11	0.26	0.27	0.28	0.63	-0.47	1.00	-0.51	0.11	0.03	0.07
predicted_mileage	-0.19	-0.01	0.08	-0.08	0.05	-0.00	0.18	-0.11	0.07	-0.42	-0.41	-0.03	-0.04	-0.02	0.81	-0.51	1.00	-0.05	0.16	-0.03
number_of_images	0.05	0.06	0.03	0.01	0.02	0.10	-0.18	0.12	0.00	-0.05	-0.04	0.04	0.02	0.13	-0.07	0.11	-0.05	1.00	0.17	0.09
advert_quality	0.01	-0.02	0.03	-0.06	0.06	0.15	-0.17	0.13	-0.02	0.04	0.05	0.07	0.04	0.18	0.14	0.03	0.16	0.17	1.00	-0.03
days_to_sell	0.05	-0.02	-0.04	-0.05	0.01	0.06	-0.08	0.09	0.00	0.05	0.04	0.03	-0.00	0.09	-0.03	0.07	-0.03	0.09	-0.03	1.00



Confusion Matrix

True \ Predicted	Less than 3 months	More than 3 months
Less than 3 months	14356	8035
More than 3 months	7989	12586

Random Forest:

n_estimators: 1200

min_samples_leaf: 2

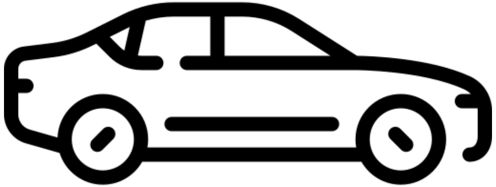
Min_samples_split: 2

max_depth: 100

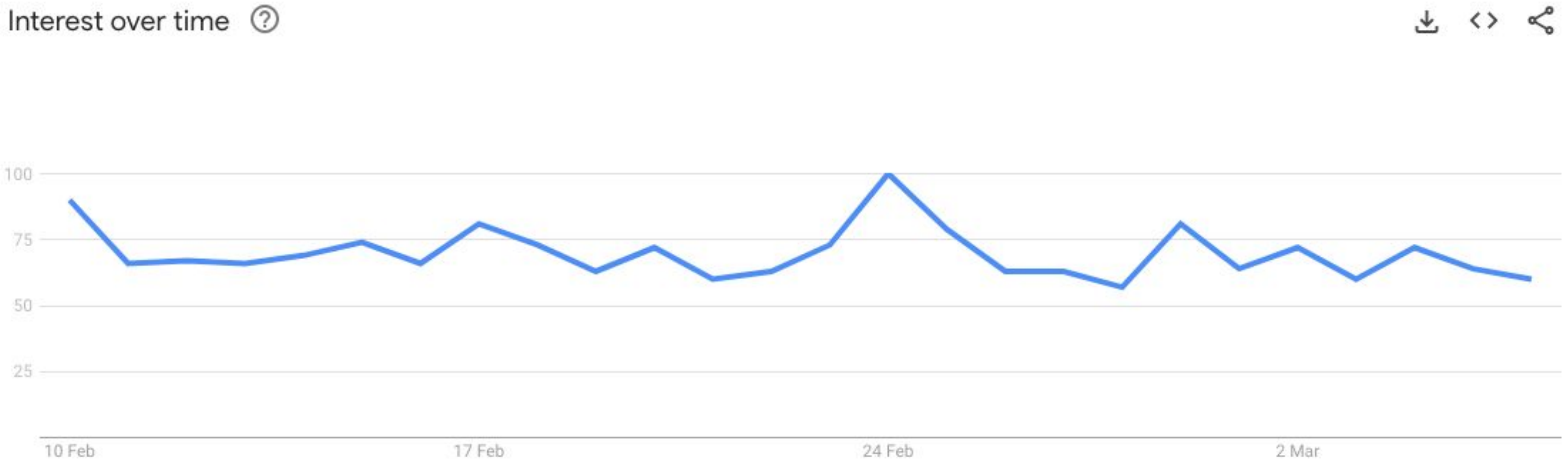
bootstrap: true

Class Weights:
< 3 months: 0.1
> 3 months 0.1029

VS



Improvements
&
Takeaways



Interest over time

MathSoc AutoTrader Hackathon 2024

Ioan Gwenter, Lourenço Silva, Tom Cassar