LAPTOP PRICE PREDICTION FOR SMART TECH CO.

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Major Objectives

1) Accurate Pricing: Develop a model that can accurately predict laptop prices based on various features, helping our clients stay competitive in the market.

2) Market Positioning: Understand how different features contribute to pricing, enabling Smart Tech Co. to strategically position its laptops in the market.

3) Brand Influence: Assess the impact of brand reputation on pricing, providing insights into brand perception and market demand.

Data exploration

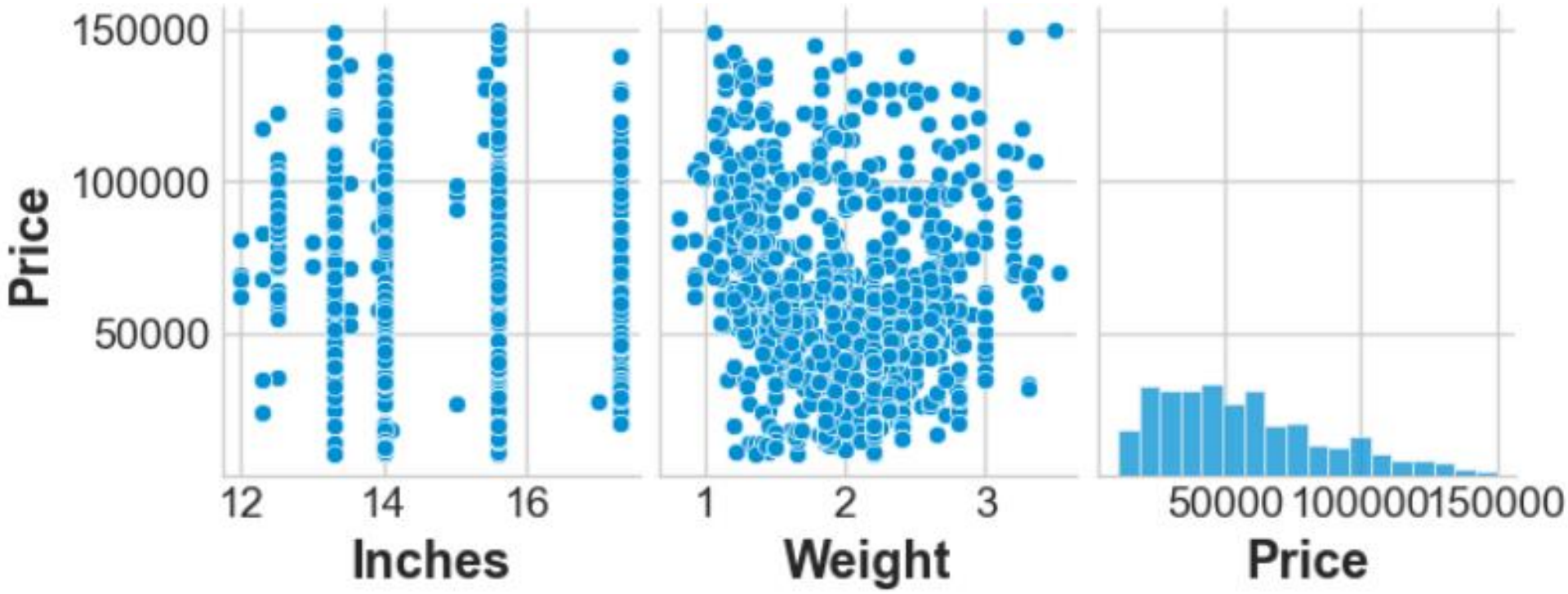
	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
0	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 2.3GHz	8GB	128GB SSD	Intel Iris Plus Graphics 640	macOS	1.37	71378.6832
1	Apple	Ultrabook	13.3	1440x900	Intel Core i5 1.8GHz	8GB	128GB Flash Storage	Intel HD Graphics 6000	macOS	1.34	47895.5232
2	HP	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8GB	256GB SSD	Intel HD Graphics 620	No OS	1.86	30636.0000
3	Apple	Ultrabook	15.4	IPS Panel Retina Display 2880x1800	Intel Core i7 2.7GHz	16GB	512GB SSD	AMD Radeon Pro 455	macOS	1.83	135195.3360
4	Apple	Ultrabook	13.3	IPS Panel Retina Display 2560x1600	Intel Core i5 3.1GHz	8GB	256GB SSD	Intel Iris Plus Graphics 650	macOS	1.37	96095.8080

Data exploration

```
data.describe(include='all')
```

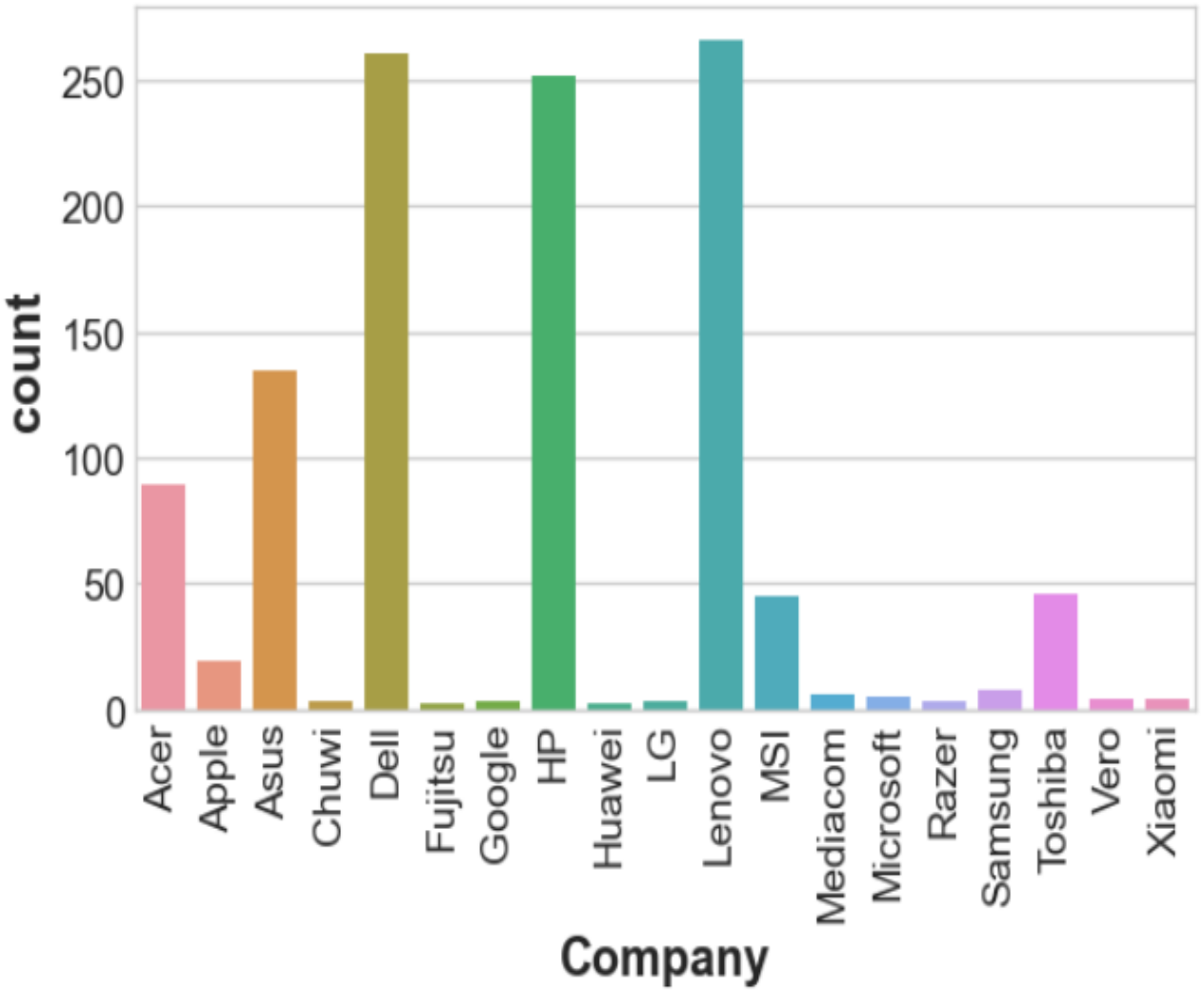
	Unnamed: 0	Company	TypeName	Inches	ScreenResolution	Cpu	Ram	Memory	Gpu	OpSys	Weight	Price
count	1273.000000	1273	1273	1273	1273	1273	1273	1273	1273	1273	1273	1273.000000
unique	NaN	19	6	25	40	118	10	40	110	9	189	NaN
top	NaN	Lenovo	Notebook	15.6	Full HD 1920x1080	Intel Core i5 7200U 2.5GHz	8GB	256GB SSD	Intel HD Graphics 620	Windows 10	2.2kg	NaN
freq	NaN	290	710	640	495	183	601	401	271	1047	111	NaN
mean	652.674784	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	59955.814073
std	376.493027	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	37332.251005
min	0.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	9270.720000
25%	327.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	31914.720000
50%	652.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	52161.120000
75%	980.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	79333.387200
max	1302.000000	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	324954.720000

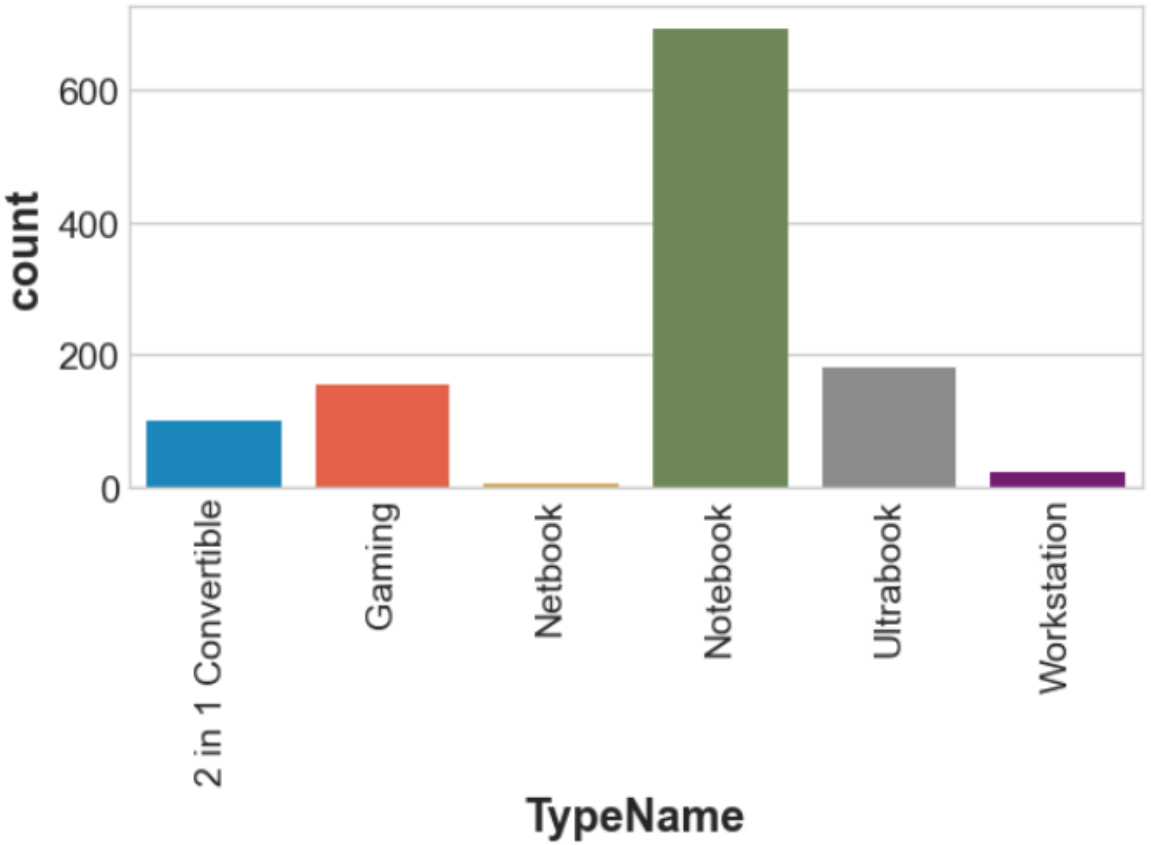
Data exploration



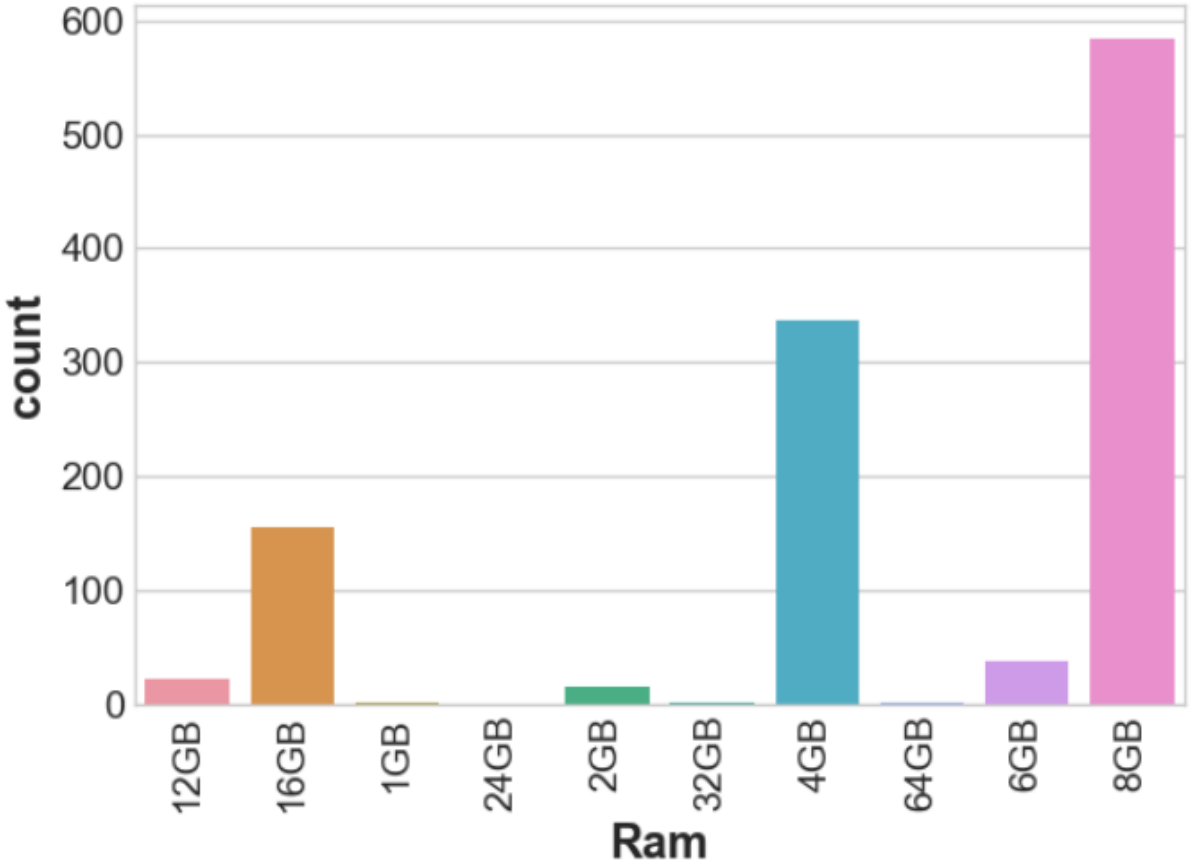
- The screen inches, weight does not significantly affect prices
- Laptops of all sizes and weights had various prices ranges

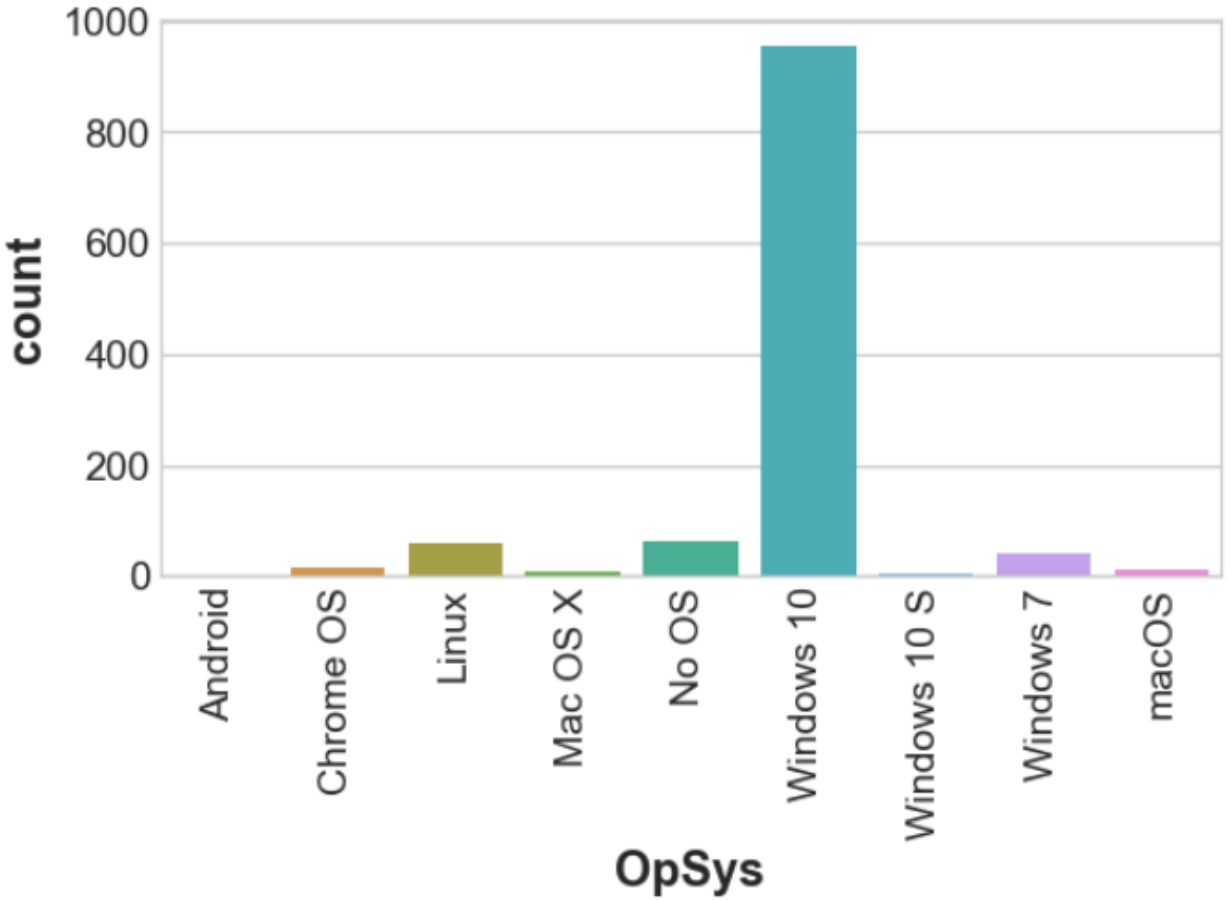
Data exploration





Data exploration





Data preprocessing

1) 30 rows had missing values in all columns. Also, 3 cells had placeholder (?) values. These rows were removed.
2) Outliers were removed using IQR method.
3) The data was split into training and validation data using train_test_split
4) One-hot encoding was used for columns with low cardinality while Ordinal encoding was used for columns with high cardinality.
5) MinMaxScaler was used for scaling the numerical columns.

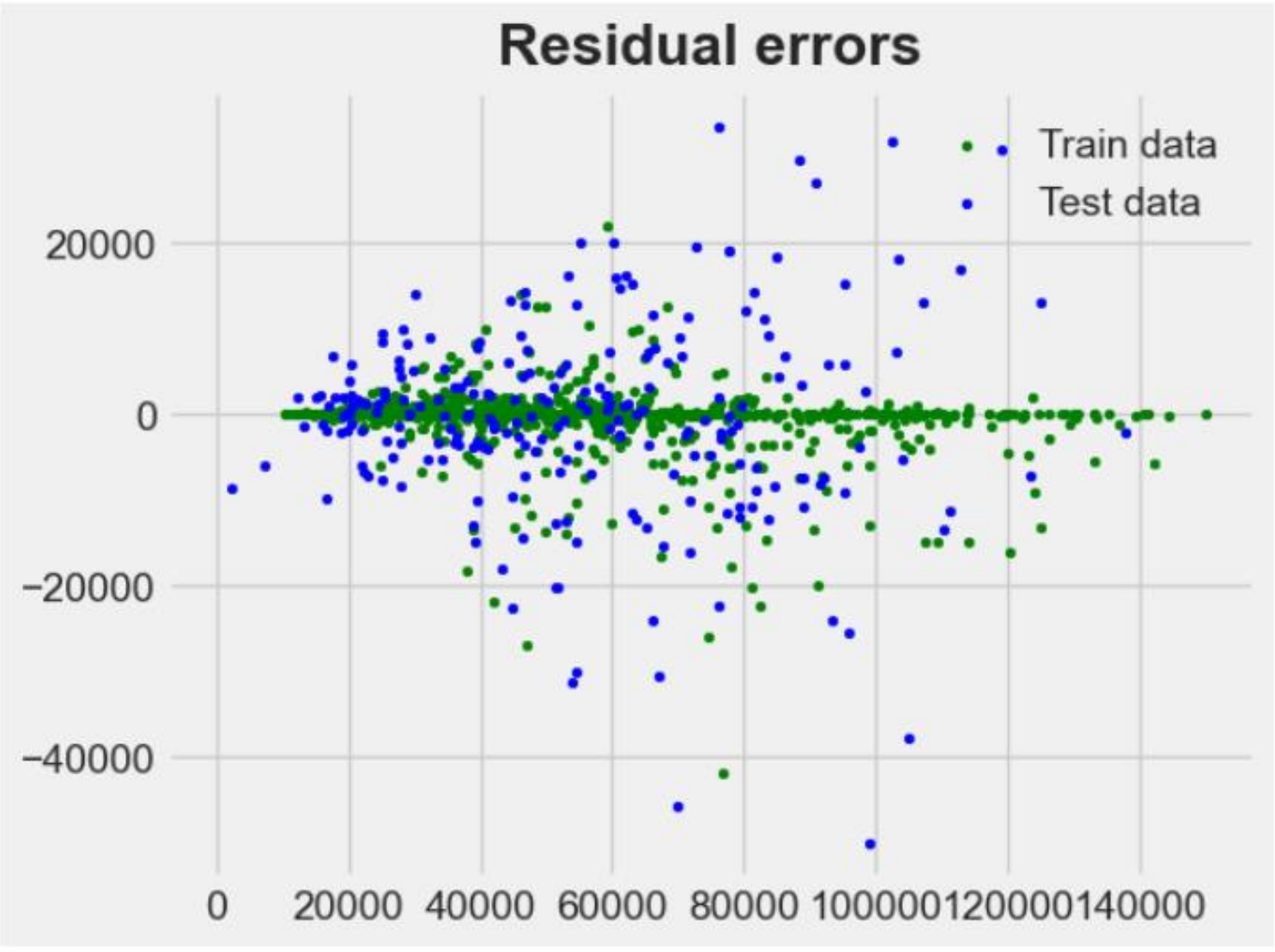
Model Development

- Random Forest Regressor, Linear Regression and Gradient Boosting Regressor were used to train on the data. Pipelines were used for simplicity.
- Since Gradient Boosting Regressor had the least MAE, it was chosen. The parameters were tuned by trial and error.
- The Mean Absolute Percentage Error was found as ~15.6%. The MAE was ~7998.

Model	MAE
Linear Regressor	10578
Random Forest Regressor	9320
Gradient Boosting Regressor	7998

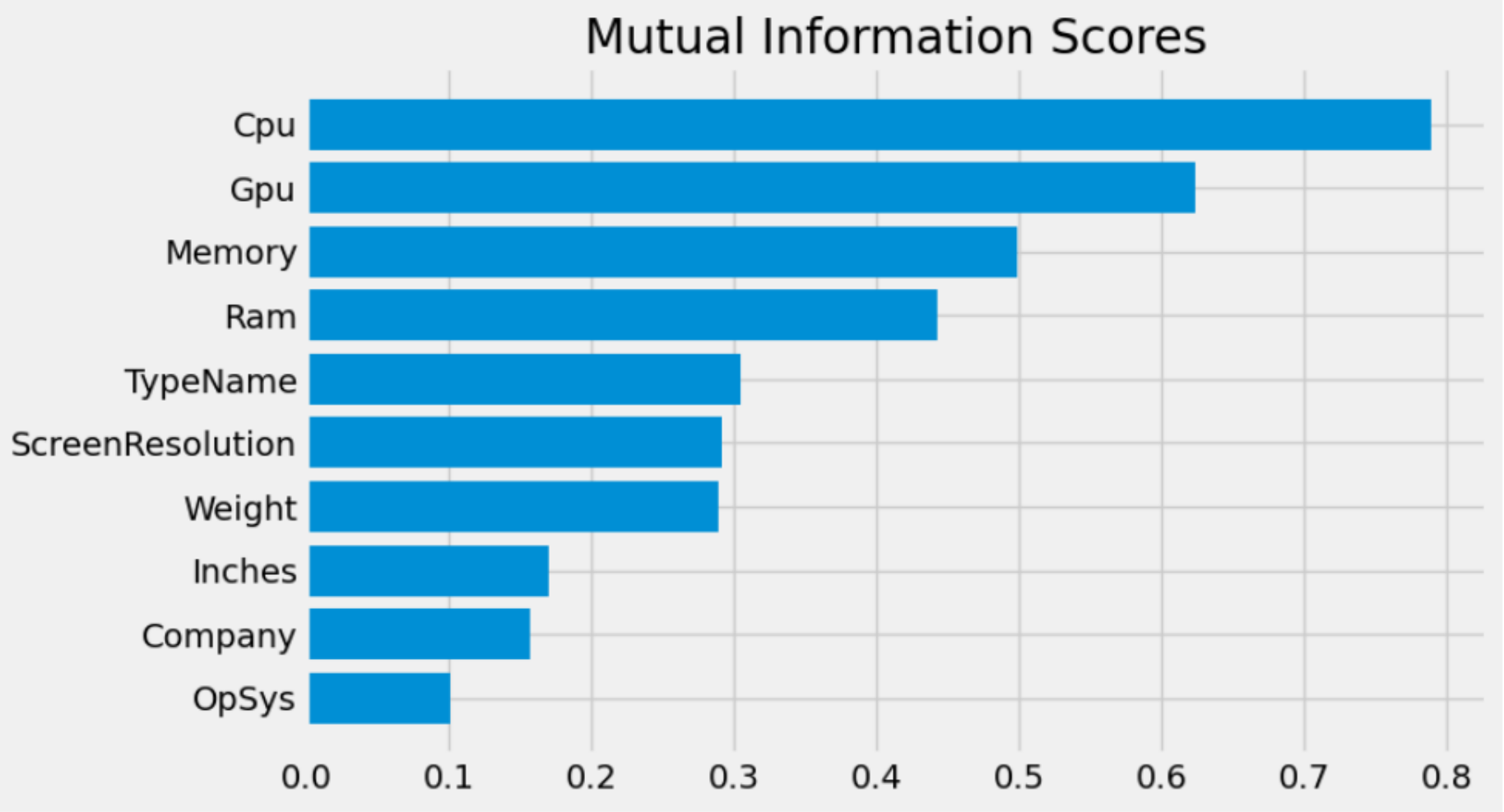
```
model3 = GradientBoostingRegressor(loss='absolute_error',
                                   learning_rate=0.1,
                                   n_estimators=1000,
                                   max_depth = 10,
                                   random_state = 1,
                                   max_features = 3)
```

Residual error



Interpretability and Insights

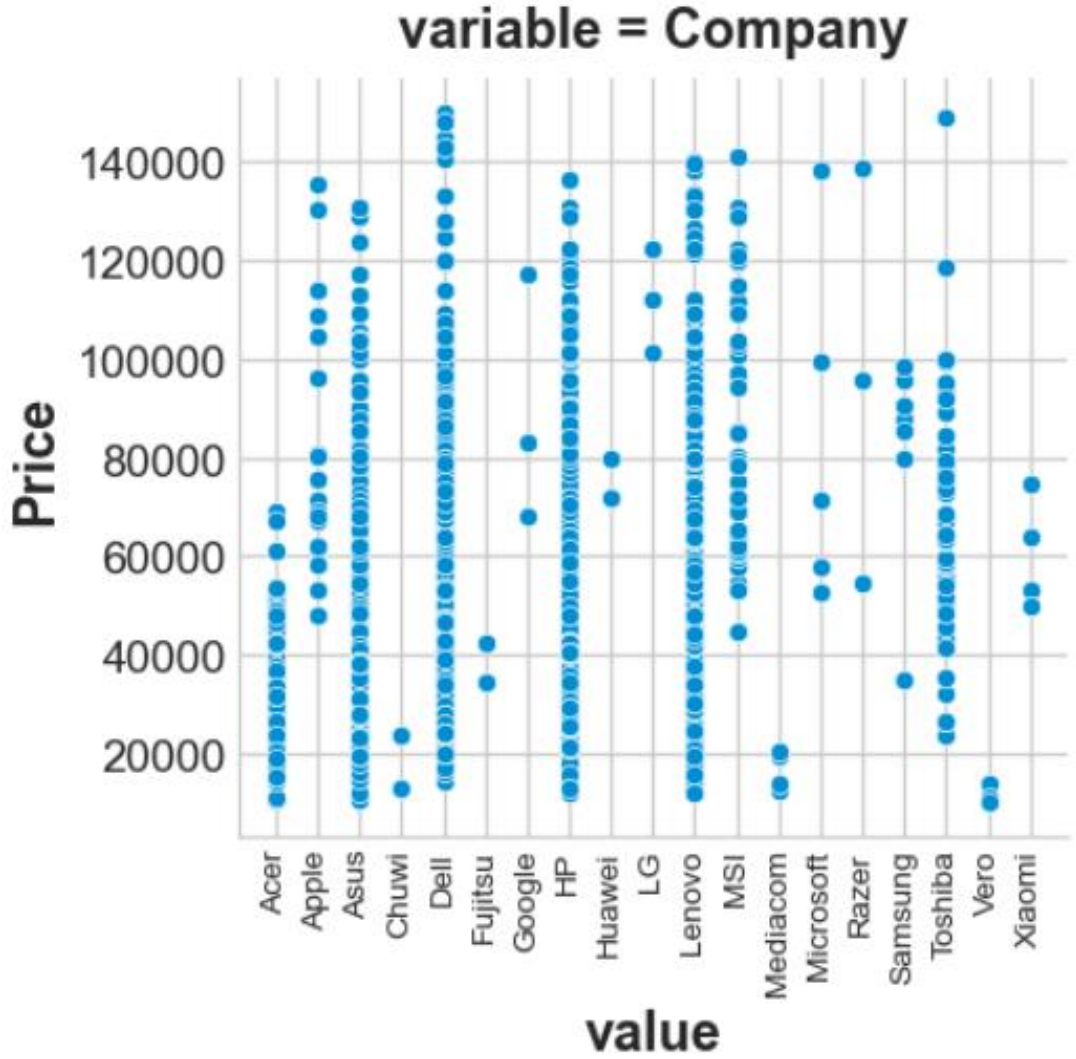
Mutual Information scores was used to find features playing pivotal roles.



- CPU, GPU, Memory & RAM had the most significant impact on laptop prices
- The company, operating system, screen inches had least influence on the price

Interpretability and Insights

- Asus, Dell, HP, Lenovo are the most popular brands
- Laptops of popular brands had a wide range of prices indicating that brand name does not significantly affect prices



Recommendations and Insights

CPU, GPU, Memory & RAM had the most significant impact on laptop prices

The company, operating system, screen inches had least influence on the price

The most in-demand features were:

- Brand-Lenovo, HP, Dell
- Type- Notebook
- RAM- 8 GB
- OS-Windows10

The prediction for lesser known brands had a MAPE of 21%. Since less data is available for lesser known brands, accuracy is comparatively lesser.

The brand of the laptop does not significantly influence its price

Occurrence of categorical columns with high cardinality and less number of numerical columns are the challenges faced in prediction

The model predicts the prices of laptops in the validation set with good accuracy (MAPE ~15.6%)

THANK YOU