DR. BR AMBEDKAR NATIONALINSTITUTE OF TECHNOLOGY

, JALANDHAR (144011), PUNJAB

Machine Learning (CSPC-204)

Mini-Project

Submitted by:

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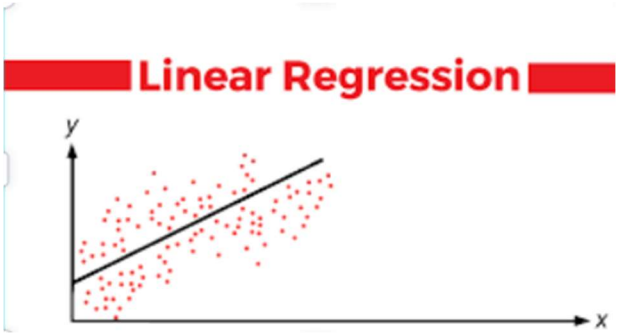
Introduction

Predict the price of an old car using some set of features given in dataset. We Trained our model on two algorithms Linear Regression and XGBoost.

Algorithm Description

Linear Regression:-

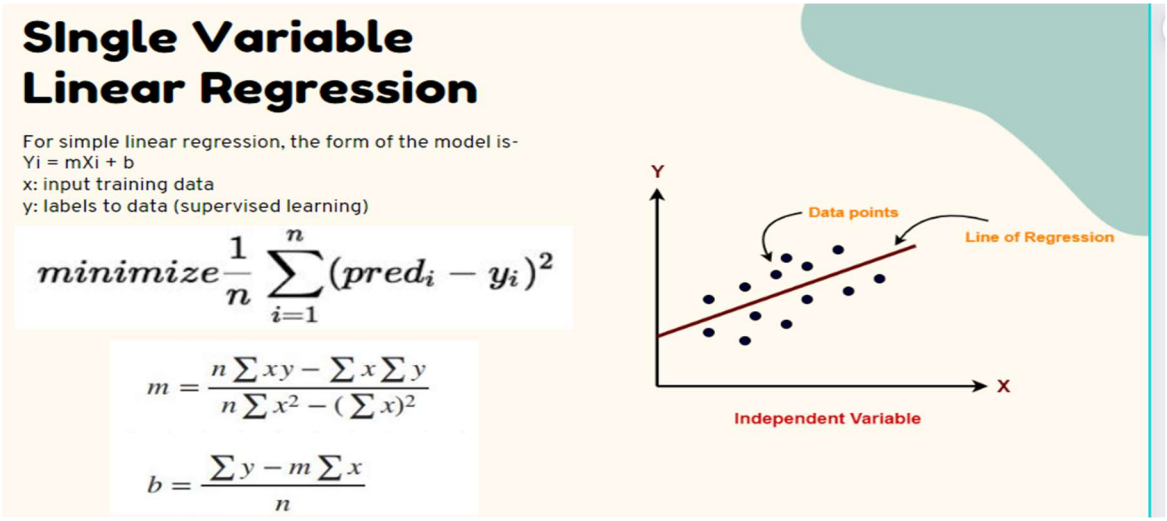


Regression is used to study the relationship between two variables.

Linear Regression is used to study the relationship between two variables.

It assumes that there exists a linear relationship between a dependent variable and independent variable.

It tries to find out the best linear relationship that describes the data you have.

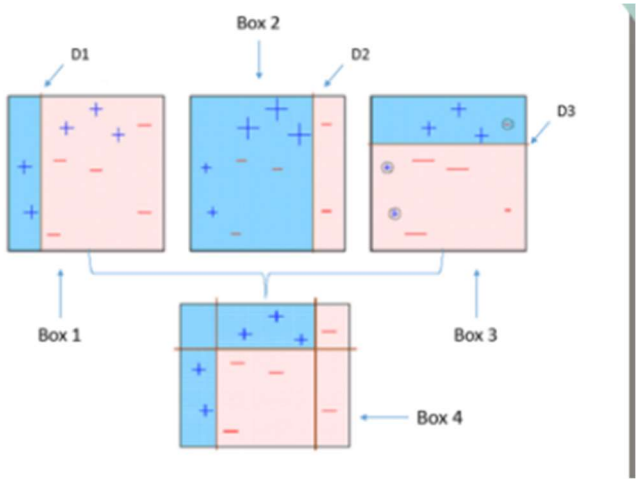


XGBoost:-

Stands for:

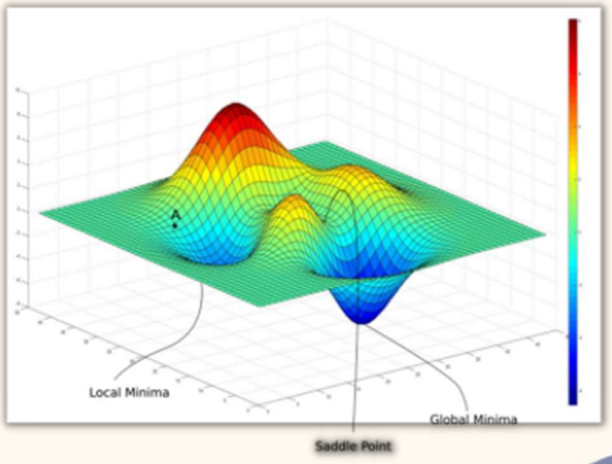
- eXtreme Gradient Boosting.
- XGBoost is a powerful iterative learning algorithm based on gradient boosting.

- Robust and highly versatile, with custom objective loss function compatibility.



Why use Xgboost?

- All of the advantages of gradient boosting, plus more.
- Utilizes CPU Parallel Processing by default.
- Two main reasons for use:
  1. Low Runtime
  2. High Model Performance



How does XGBoost work?

- Tree-Based Boosting algorithm.
- 4 Critical Parameters for Tuning:
  1. η: ETA or "Learning Rate"
  2. max_depth: Controls the "height" of the tree via splits.
  3. γ: Minimum required loss for the model to justify a split.
  4. λ: L2 (Ridge) regularization on variable weights.

Data Cleaning

One Hot Encoding for Categorical Variable

What is Categorical Data?

Categorical data are variables that contain label values rather than numeric values. The number of possible values is often limited to a fixed set.
Many machine learning algorithms including linear regression cannot operate on label data directly. They require all input variables and output variables to be numeric.

Using this encoding and allowing the model to assume a natural ordering between categories may result in poor performance or unexpected results (predictions halfway between categories).

For example:

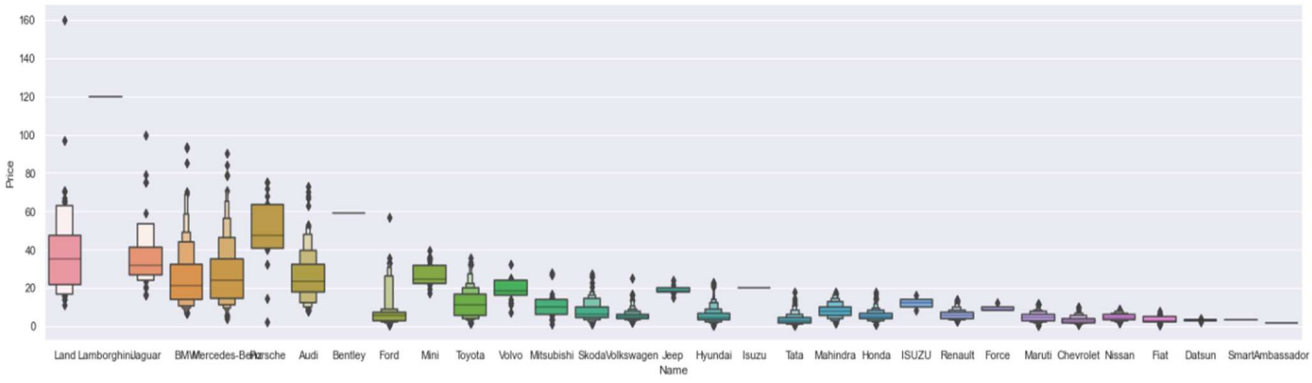
```
red,    green,  blue
1,      0,      0
0,      1,      0
0,      0,      1
```

The binary variables are often called "dummy variables" in other fields, such as statistics.

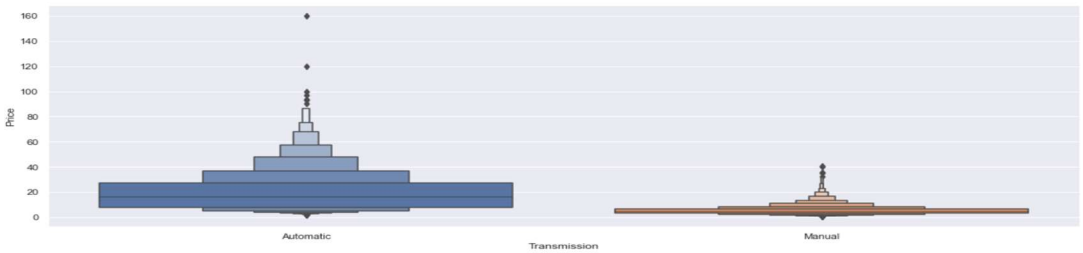
DataSet Description:-

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6019 entries, 0 to 6018
Data columns (total 14 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Unnamed: 0         6019 non-null   int64
 1   Name               6019 non-null   object
 2   Location           6019 non-null   object
 3   Year               6019 non-null   int64
 4   Kilometers_Driven  6019 non-null   int64
 5   Fuel_Type          6019 non-null   object
 6   Transmission       6019 non-null   object
 7   Owner_Type         6019 non-null   object
 8   Mileage            6017 non-null   object
 9   Engine             5983 non-null   object
 10  Power              5983 non-null   object
 11  Seats              5977 non-null   float64
 12  New_Price          824 non-null    object
 13  Price              6019 non-null   float64
dtypes: float64(2), int64(3), object(9)
memory usage: 658.5+ KB
```

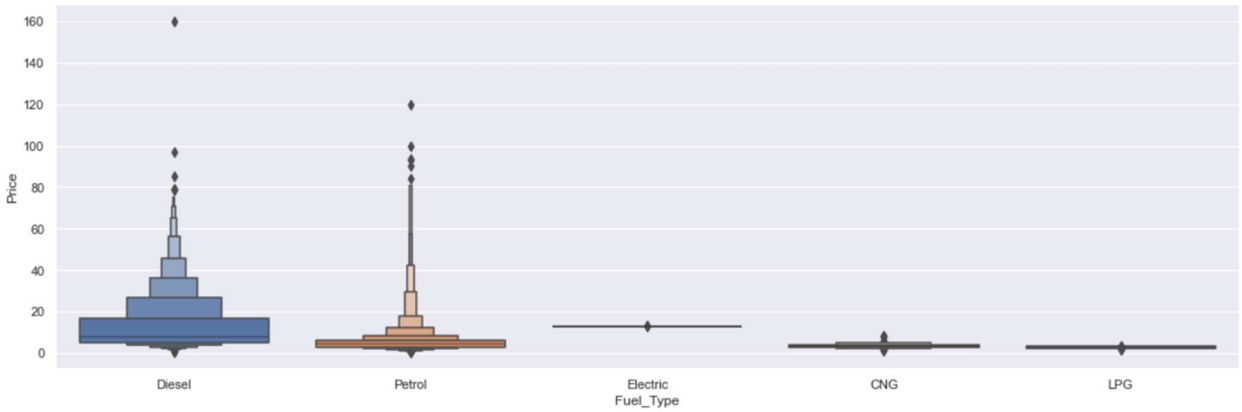
Price Vs Company Scatter Chart:-



Price Vs Transmission Scatter Chart:-



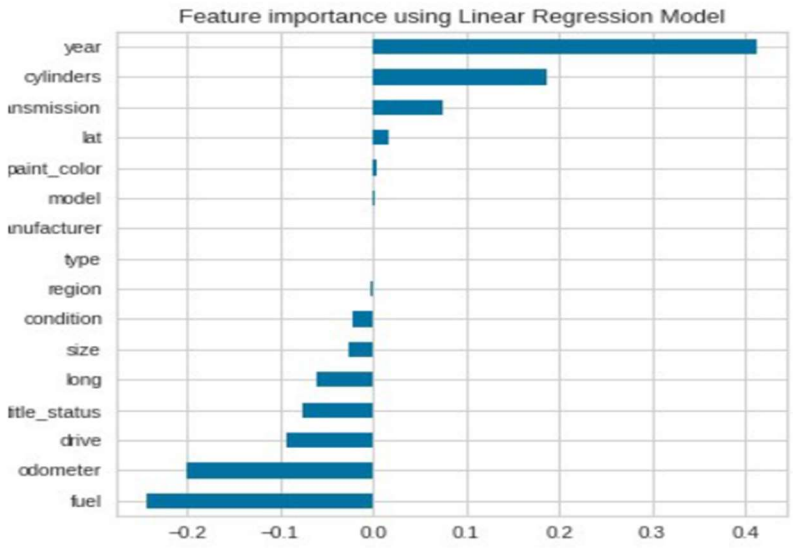
Price Vs Fuel Type Scatter Chart:-



Model Result:-

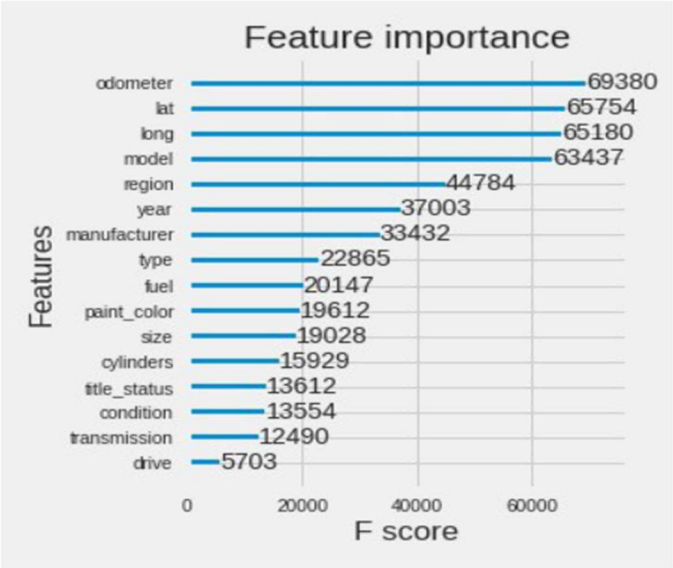
Linear Regression:-

Accuracy: - 77.35%



XGBoost :-

Accuracy:- 99.55%



Our Team

- ❖ Nayan Abhishek (20103098) – Data Visualization
- ❖ Narottam Singh (20103097) – Data Preprocessing
- ❖ Prasant (20103108) – Model Deployment