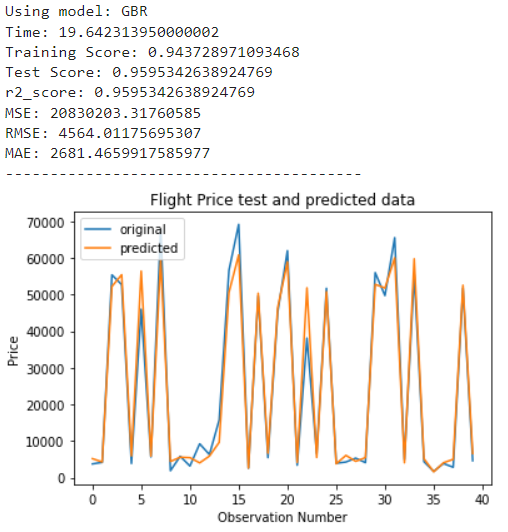
**Modeling phase**

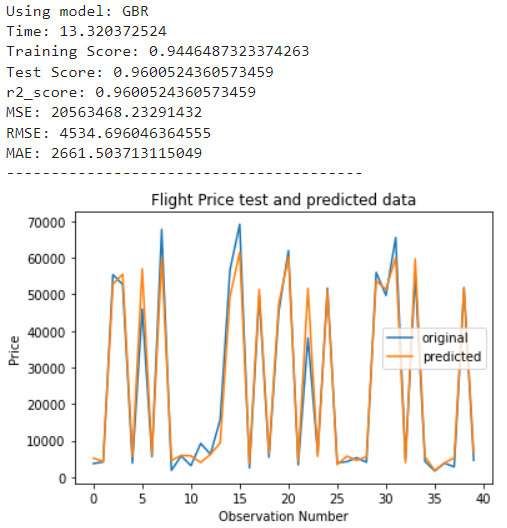
**Gradient Boosting Regressor Model:**

The main idea behind this algorithm is to build models sequentially and these subsequent models try to reduce the errors of the previous model, The objective here is to minimize the loss function by adding weak learners using gradient descent algorithm, Decision trees are used as the weak learner in gradient boosting, Specifically, regression trees are used that output real values for splits and whose output can be added together, allowing subsequent models outputs to be added and “correct” the residuals in the predictions, Trees are constructed in a greedy manner, choosing the best split points based minimize the loss function.

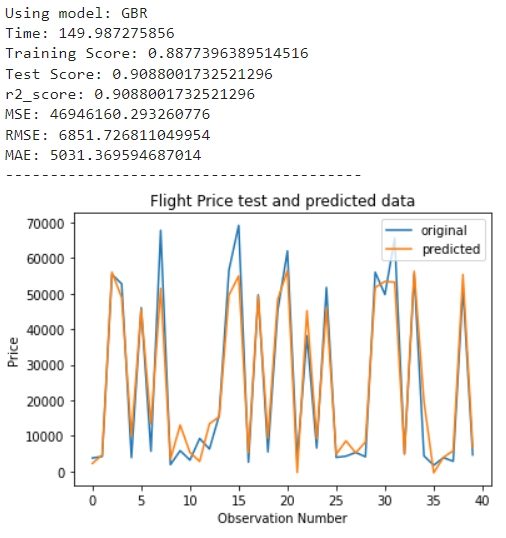
**The results of the model on the dataset which preprocessed with one hot encoding technique:**

****

**The results of the model on the dataset which preprocessed with target encoding technique:**

****

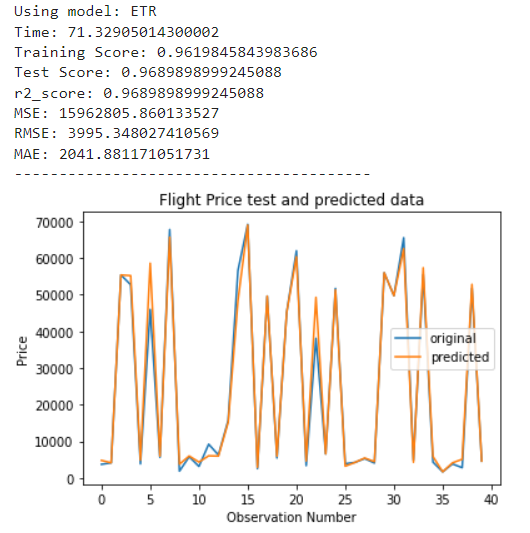
**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**

****

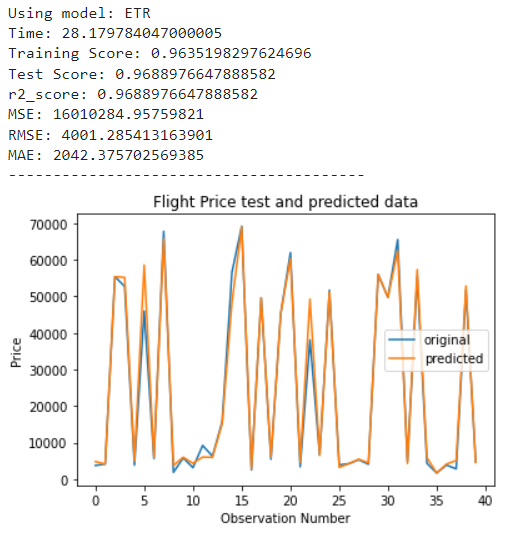
**Extra Trees Regressor Model:**

Extra Trees is an ensemble machine learning algorithm that combines the predictions from many decisions trees, The Extra Trees algorithm works by creating a large number of decision trees from the training dataset. Predictions are made by averaging the prediction of the decision trees

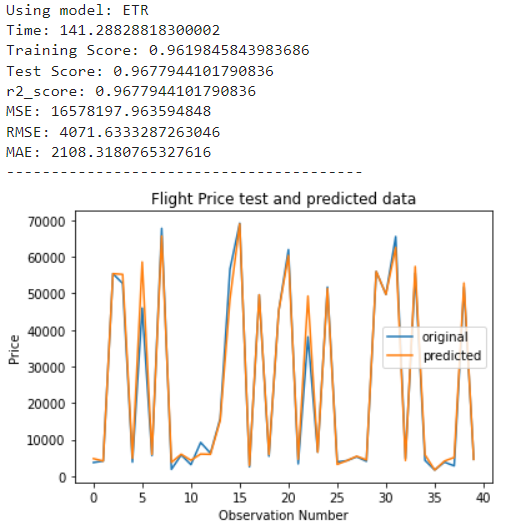
**The results of the model on the dataset which preprocessed with one hot encoding technique:**

****

**The results of the model on the dataset which preprocessed with target encoding technique:**



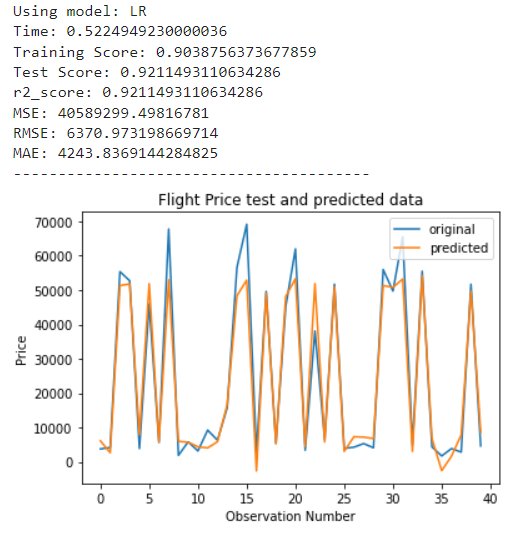
**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**



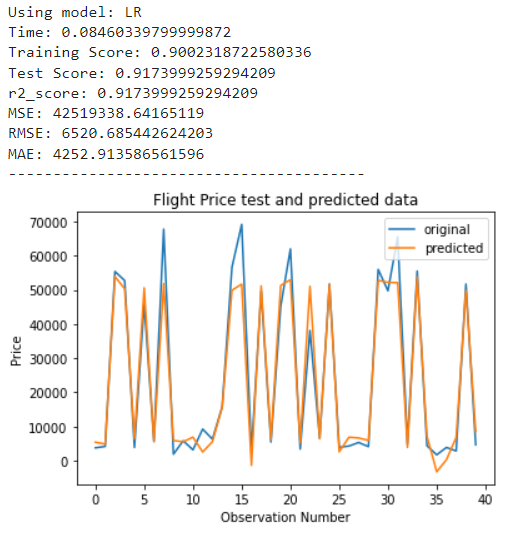
**Multiple Linear Regression Model:**

Multiple regression is a technique that can be used to analyze the relationship between a single dependent variable and several independent variables. The objective of multiple regression analysis is to use the independent variables whose values are known to predict the value of the single dependent value. Each predictor value is weighed, the weights denoting their relative contribution to the overall prediction.

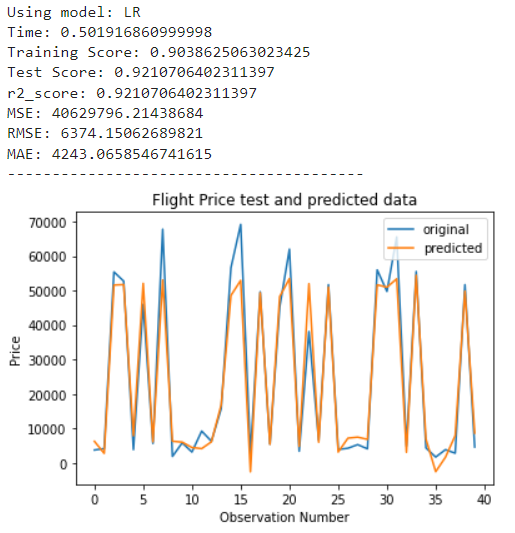
**The results of the model on the dataset which preprocessed with one hot encoding technique:**

****

**The results of the model on the dataset which preprocessed with target encoding technique:**

****

**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**



**Extreme Gradient Boosting Regressor Model:**

Gradient boosting refers to a class of ensemble machine learning algorithms that can be used for classification or regression predictive modeling problems. Ensembles are constructed from decision tree models. Trees are added one at a time to the ensemble and fit to correct the prediction errors made by prior models. This is a type of ensemble machine learning model referred to as boosting. Models are fit using any arbitrary differentiable loss function and gradient descent optimization algorithm. This gives the technique its name, “gradient boosting,” as the loss gradient is minimized as the model is fit, much like a neural network. Extreme Gradient Boosting is an efficient open-source implementation of the gradient boosting algorithm. It is designed to be both computationally efficient and highly effective.

**The results of the model on the dataset which preprocessed with one hot encoding technique:**

Chart, histogram

Description automatically generated

**The results of the model on the dataset which preprocessed with target encoding technique:**

Chart, histogram

Description automatically generated

**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**Chart, histogram

Description automatically generated

**Poisson Regressor Model:**

Poisson regression is a form of the generalized linear model and it is used to model count data and contingency tables.

**The results of the model on the dataset which preprocessed with one hot encoding technique:**

Chart

Description automatically generated with medium confidence

**The results of the model on the dataset which preprocessed with target encoding technique:**

Chart, histogram

Description automatically generated

**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**

Chart

Description automatically generated

**Histogram-Based Gradient Boosting Model:**

Gradient boosting is an ensemble of decision trees algorithms. A major problem of gradient boosting is that it is slow to train the model. This is particularly a problem when using the model on large datasets with tens of thousands of examples (rows).

Training the trees that are added to the ensemble can be dramatically accelerated by discretizing (binning) the continuous input variables to a few hundred unique values. Gradient boosting ensembles that implement this technique and tailor the training algorithm around input variables under this transform are referred to as histogram-based gradient boosting ensembles.

**The results of the model on the dataset which preprocessed with one hot encoding technique:**

Chart, histogram

Description automatically generated

**The results of the model on the dataset which preprocessed with target encoding technique:**

Chart, histogram

Description automatically generated

**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**Chart

Description automatically generated

**Light Gradient Boosted Machine Model:**

LightGBM extends the gradient boosting algorithm by adding a type of automatic feature selection as well as focusing on boosting examples with larger gradients. This can result in a dramatic speedup of training and improved predictive performance.

**The results of the model on the dataset which preprocessed with one hot encoding technique:**

Chart, histogram

Description automatically generated

**The results of the model on the dataset which preprocessed with target encoding technique:**

**Chart, histogram

Description automatically generated**

**The results of the model on the dataset which preprocessed with one Frequency domain encoding technique:**

Chart, histogram

Description automatically generated