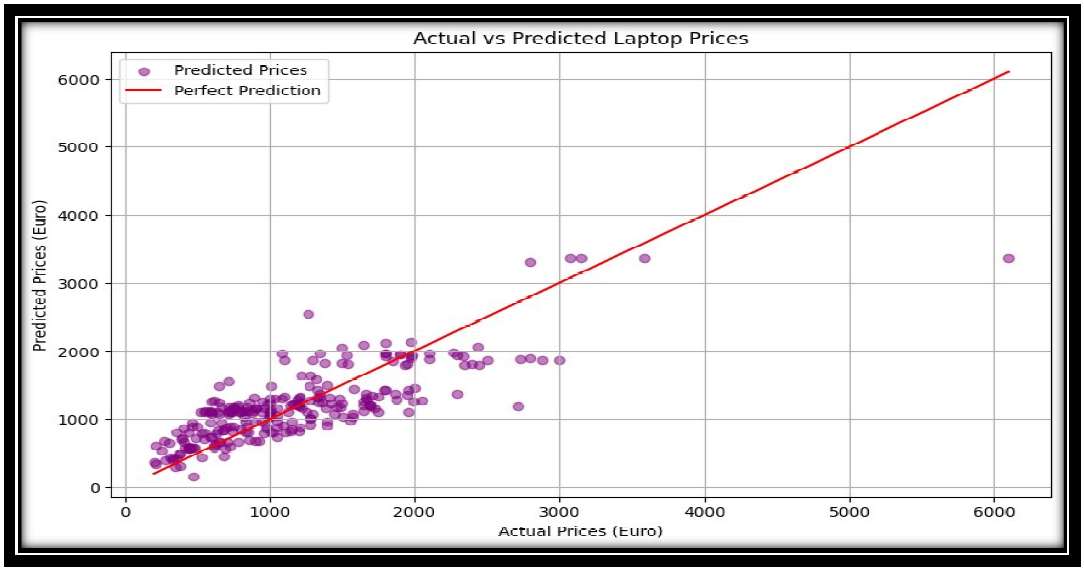
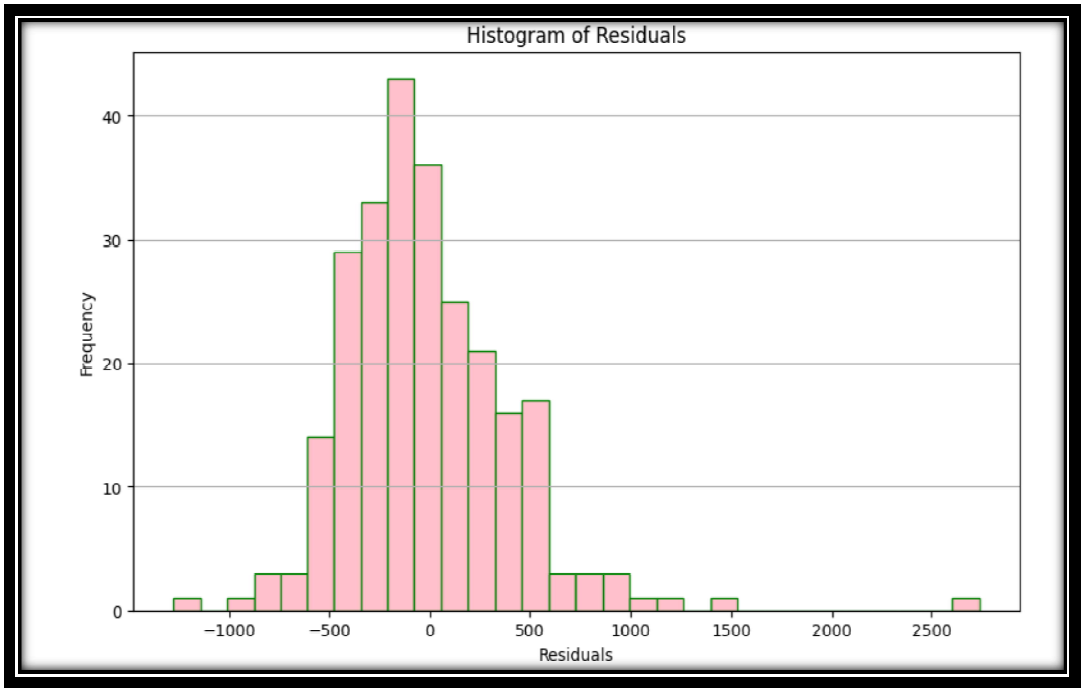
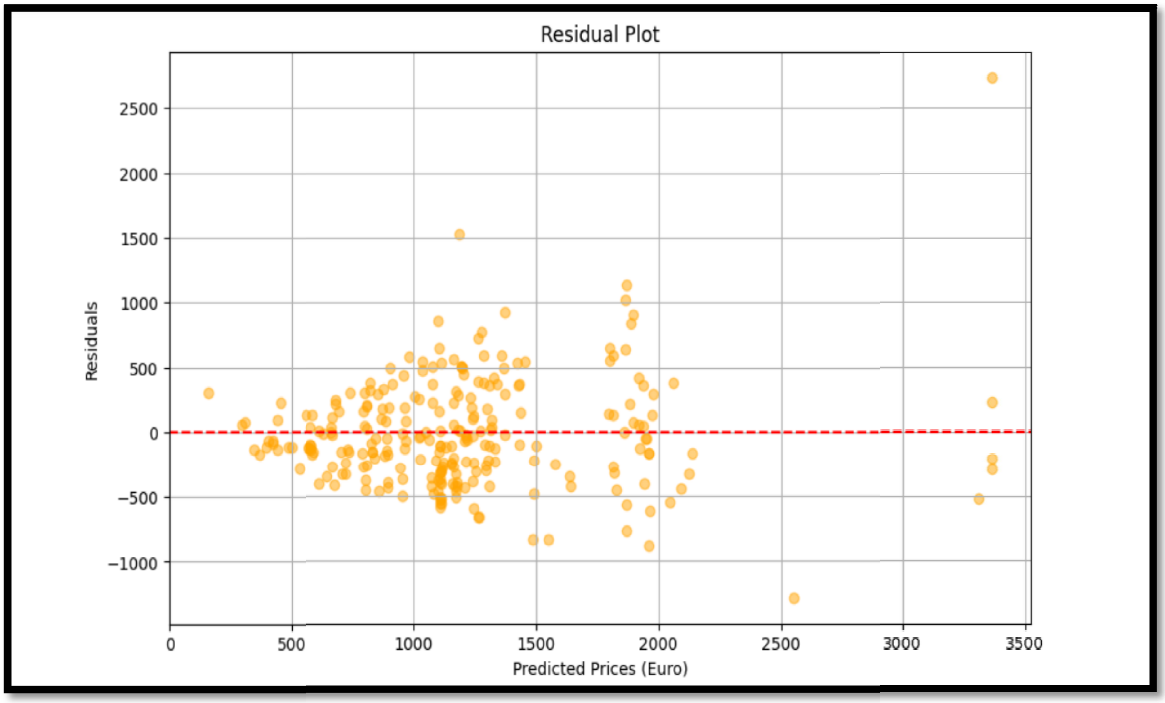
# PREDICT LAPTOP PRICES DASHBOARDS AND INSIGHTS

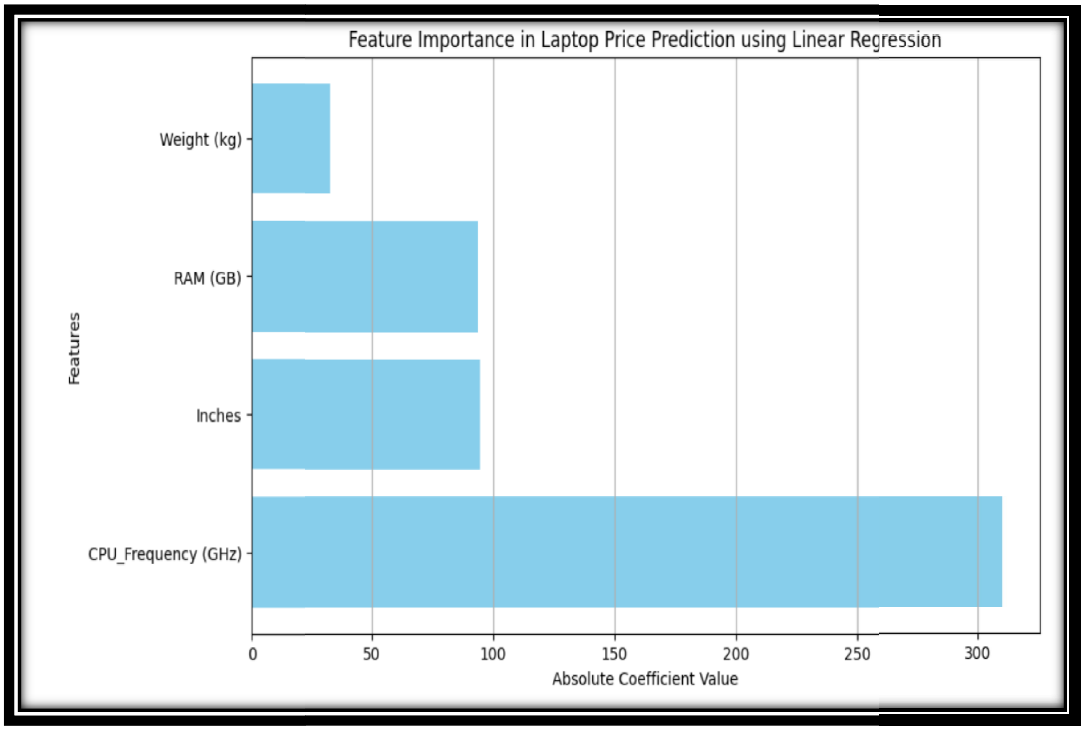


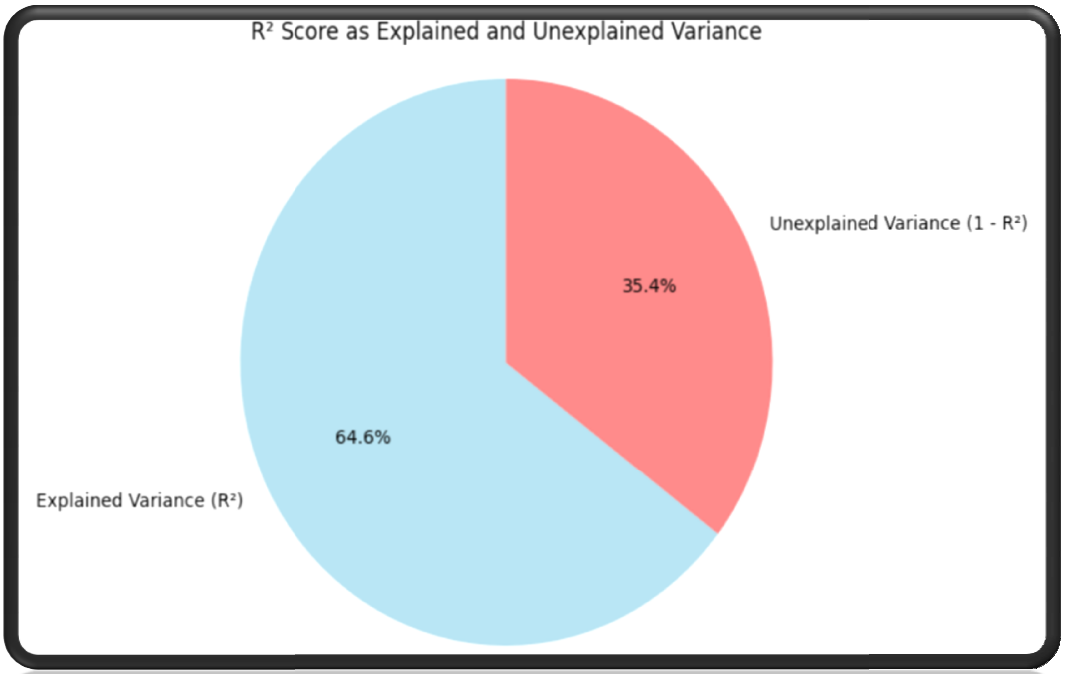



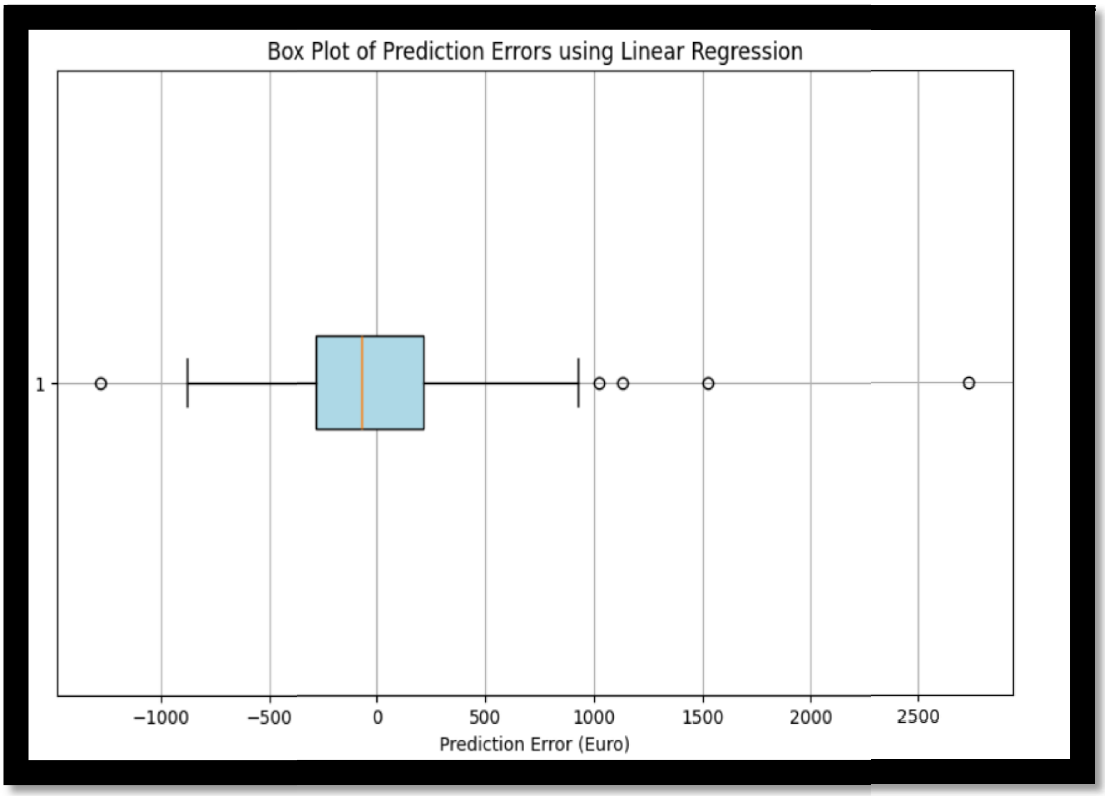
Model Performance Metric for Decision Tree Regressor

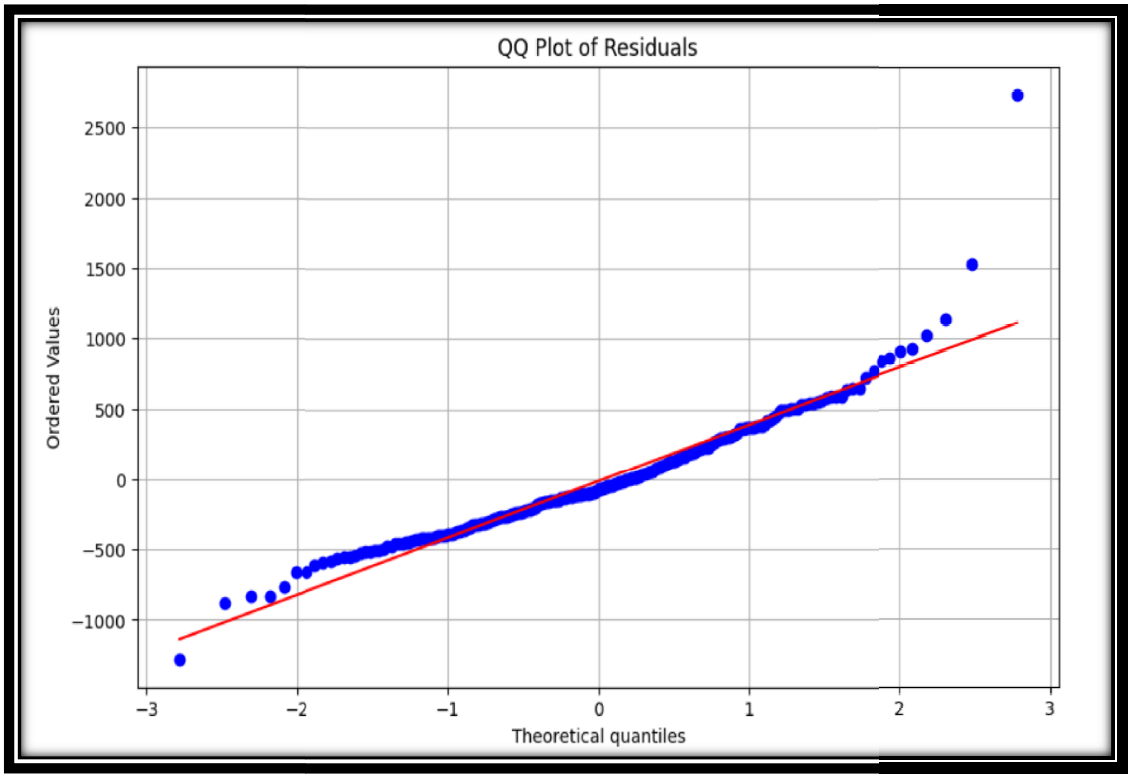
$R^2$ Score: 0.646




Feature Importance in Laptop Price Prediction using Linear Regression
Weight (kg)
RAM (GB)
Inches
CPU_Frequency (GHz)
Features
0
50
100
150
200
250
300
Absolute Coefficient Value


R² Score as Explained and Unexplained Variance
Unexplained Variance (1 - R²)
35.4%
64.6%
Explained Variance (R²)


Box Plot of Prediction Errors using Linear Regression
1
−1000
−500
0
500
1000
1500
2000
2500
Prediction Error (Euro)


QQ Plot of Residuals
Ordered Values
2500
2000
1500
1000
500
0
−500
−1000
−3
−2
−1
0
1
2
3
Theoretical quantiles

# INSIGHTS:

- The data shape (1275, 942) indicates that the dataset has 1275 rows (instances or laptop records) and 942 columns (features or variables). This suggests a high-dimensional dataset, which may require dimensionality reduction techniques like PCA or feature selection to avoid overfitting and improve model performance.
- The **df.isnull().sum()** output shows that there are no missing values (all columns have 0 null values) in any of the features of the dataset. This is ideal for machine learning models, as it avoids the need for imputation or handling of missing data, ensuring a clean dataset for training.
- The performance of different regression models on the dataset is summarized with their R2R^2R2 scores:
- **LinearRegression**: The score is highly negative (-2.74e+18), indicating a poor fit with extreme overfitting or numerical instability. This model is not suitable for the dataset.
- **Lasso**: The score is 0.87, indicating a strong fit with regularization that prevents overfitting.
- **DecisionTreeRegressor**: The score is 0.77, which suggests the model captures patterns but may be overfitting or lacking generalization.
- **RandomForestRegressor**: The score is 0.89, showing the best performance, suggesting a good balance between variance and bias for predicting laptop prices.
- Based on these results, **RandomForestRegressor** and **Lasso** are the most reliable models for this prediction task.
- This graph is a scatter plot comparing **actual vs predicted laptop prices**. Here are some insights, along with relevant machine learning topics:
- **Regression Performance:** The graph shows a regression model's performance. The predicted prices (y-axis) deviate from the actual prices (x-axis). Ideally, if the model predicted perfectly, all points would lie on the red line, which represents a **perfect prediction**.

- **Model Accuracy:** The spread of points below the red line indicates **underestimation**, while points above the red line indicate **overestimation**. Most predictions are clustered between 500 and 2500 Euros, but there are noticeable deviations, particularly at higher price ranges.
- **Residuals and Error:** The larger deviations between predicted and actual prices indicate that the model struggles with higher-priced laptops. This suggests the potential presence of **heteroscedasticity** (variance of errors differs across price ranges), affecting prediction accuracy.
- This **residual plot** shows that predictions are fairly scattered, with most residuals between **-500 and 500 Euros**, indicating moderate accuracy. There are some large outliers, particularly for higher-priced laptops, suggesting the model may struggle with **heteroscedasticity** and **non-linearity**.

- This **histogram of residuals** shows a nearly symmetric distribution centered around 0, indicating that the model has a relatively unbiased prediction. However, there are significant outliers, with residuals ranging from **-1000 to over 2500 Euros**, suggesting some large prediction errors for certain data points.
- This relates to **model evaluation** and **error distribution analysis** in machine learning, pointing towards potential improvements in the model's generalization.
- The $R^2$ score of 0.646 indicates a moderately strong model fit, meaning 64.6% of the variance in laptop prices is explained by the model. Improvements could involve exploring feature engineering, hyperparameter tuning, or adding more data to increase prediction accuracy.
- The predicted laptop price is likely to be in the range of €700 to €1,200, depending on the specific features and specifications of the model.