Hi Professor!

Here are all the Text Outputs & Plots for Lab 05

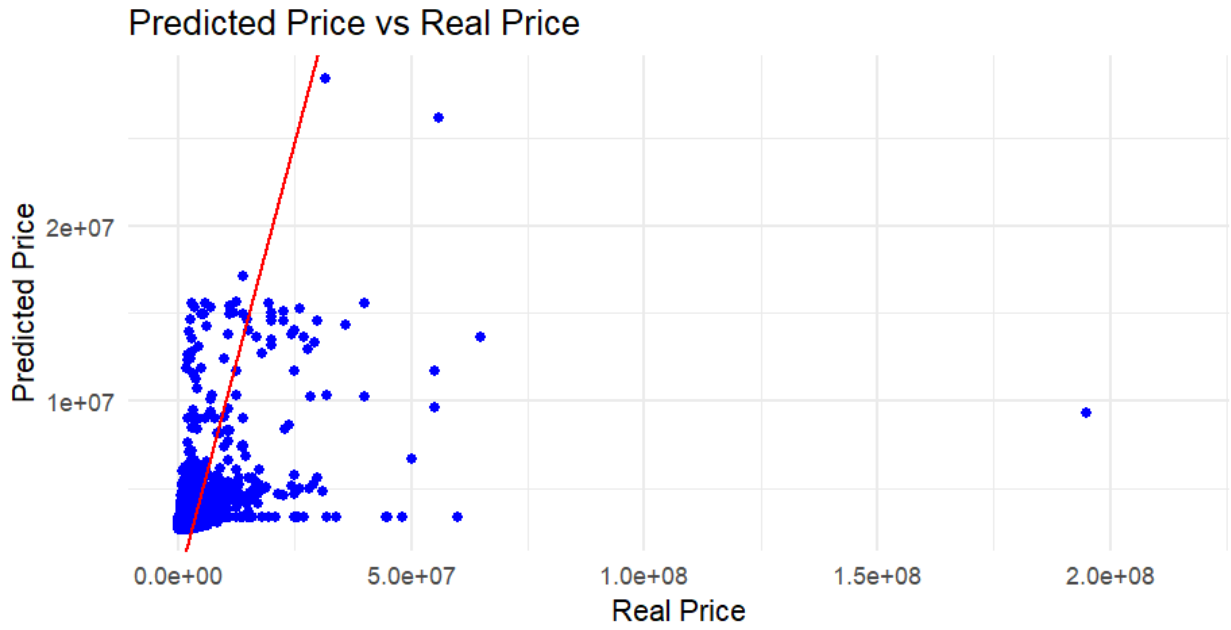
Lab 05

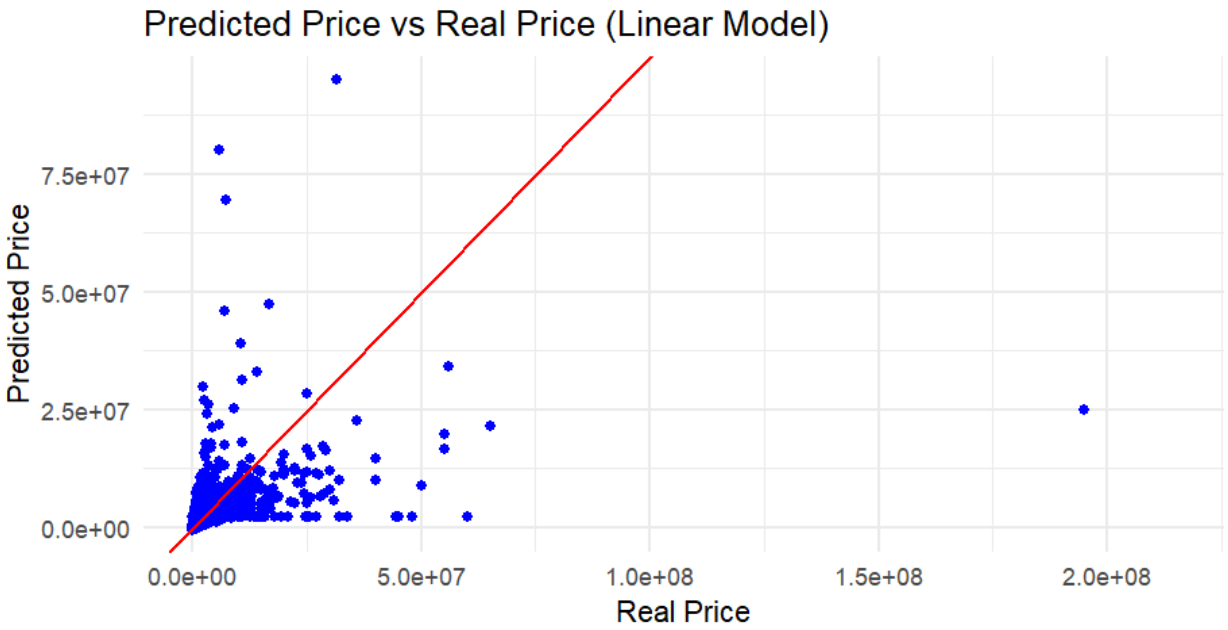
```
> # Train an SVM with an RBF Kernel using tune.svm
> rbf_tune <- tune.svm(
+   x = X, y = Y,
+   kernel = "radial",
+   cost = 10^(-1:2),  # Range of cost values
+   gamma = c(0.01, 0.1, 1)  # Range of gamma values
+ )
>
> # Print results and best model for RBF kernel
> print(rbf_tune)

Parameter tuning of 'svm':

- sampling method: 10-fold cross validation

- best parameters:
 gamma cost
  0.01    1

- best performance: 0.01143791

> best_rbf <- rbf_tune$best.model
> summary(best_rbf)

Call:
best.svm(x = X, y = Y, gamma = c(0.01, 0.1, 1), cost = 10^(-1:2), kernel = "radial")


Parameters:
   SVM-Type:  C-classification
 SVM-Kernel:  radial
       cost:  1

Number of Support Vectors:  86

 ( 25 39 22 )


Number of Classes:  3

Levels:
 1 2 3
```

```
> # Evaluate both models on the training dataset
> linear_predictions <- predict(best_linear, X)
> rbf_predictions <- predict(best_rbf, X)
>
> # Confusion Matrix for Linear Kernel
> cat("Confusion Matrix - Linear Kernel:\n")
Confusion Matrix - Linear Kernel:
> print(table(Actual = Y, Predicted = linear_predictions))
      Predicted
Actual  1  2  3
     1 59  0  0
     2  0 70  1
     3  0  0 48
>
> # Confusion Matrix for RBF Kernel
> cat("Confusion Matrix - RBF Kernel:\n")
Confusion Matrix - RBF Kernel:
> print(table(Actual = Y, Predicted = rbf_predictions))
      Predicted
Actual  1  2  3
     1 59  0  0
     2  0 70  1
     3  0  0 48
>
```

```
[1] "Confusion Matrix (kNN):"
> print(confusion_matrix_knn)
         Actual
Predicted  1  2  3
        1 19  1  0
        2  0 23  0
        3  0  0 11
>
> # Calculate accuracy
> accuracy_knn <- sum(diag(confusion_matrix_knn)) / sum(confusion_matrix_knn)
> print(paste("Accuracy (kNN):", accuracy_knn))
[1] "Accuracy (kNN): 0.981481481481482"
>
```


Model Metrics Comparison
f1
precision
recall
1.00
0.75
0.50
0.25
0.00
Score
Decision Tree
LDA
Logistic Regression
Model
Metric
f1
precision
recall


Predicted Price vs Real Price
Predicted Price
2e+07
1e+07
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08
Real Price


Predicted Price vs Real Price (Linear Model)
Predicted Price
7.5e+07
5.0e+07
2.5e+07
0.0e+00
0.0e+00
5.0e+07
1.0e+08
1.5e+08
2.0e+08
Real Price