Video Game Sales on Steam Prediction

Phase 2 | Team ID: CS_8

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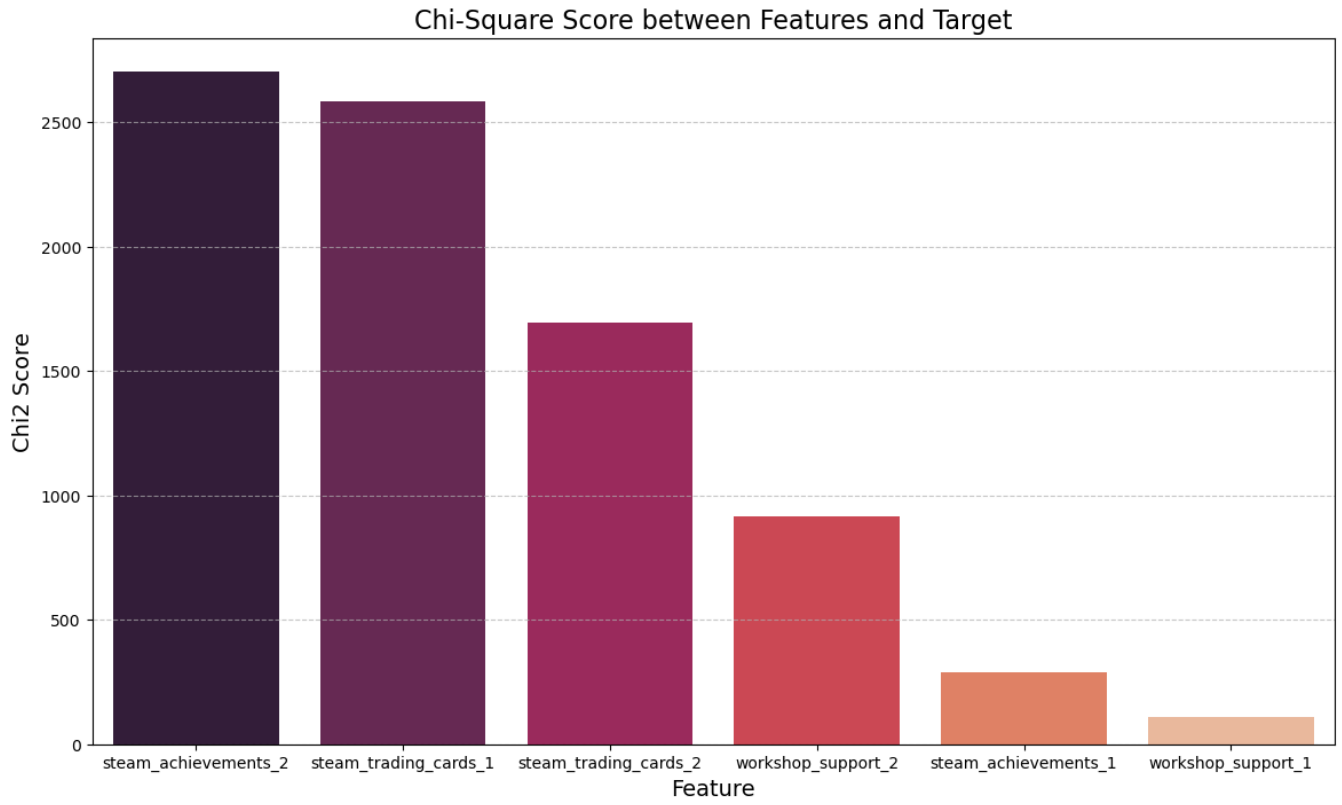
Feature Selection

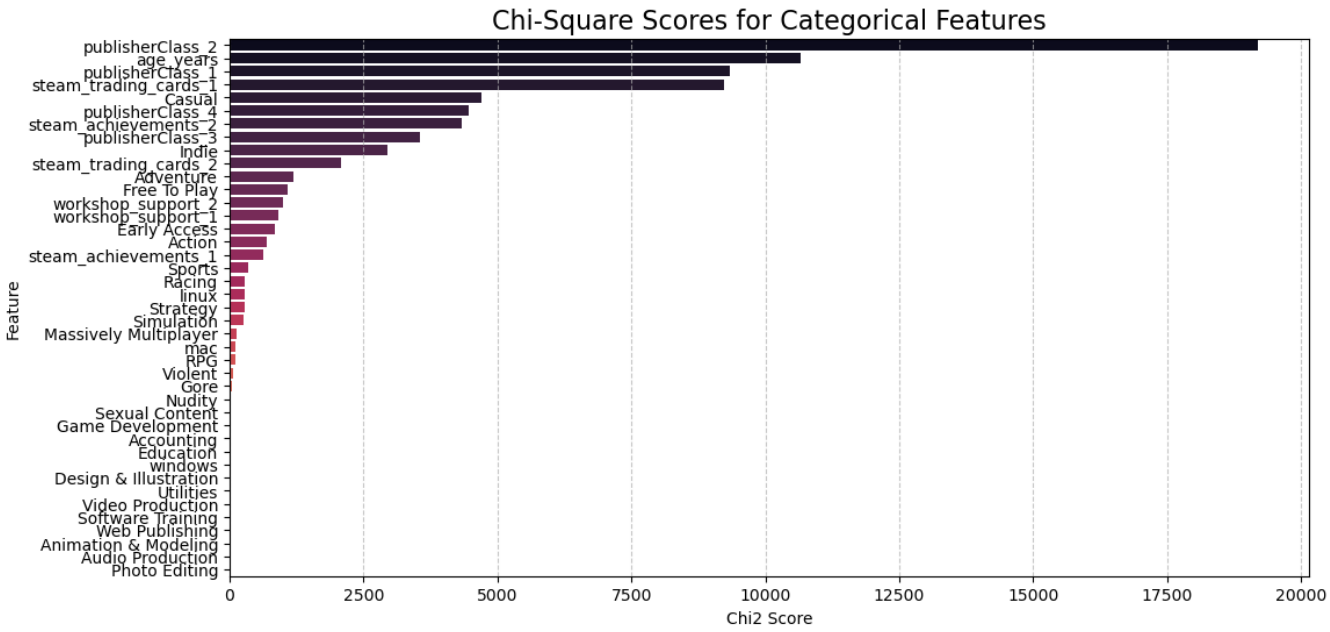
Binary features:

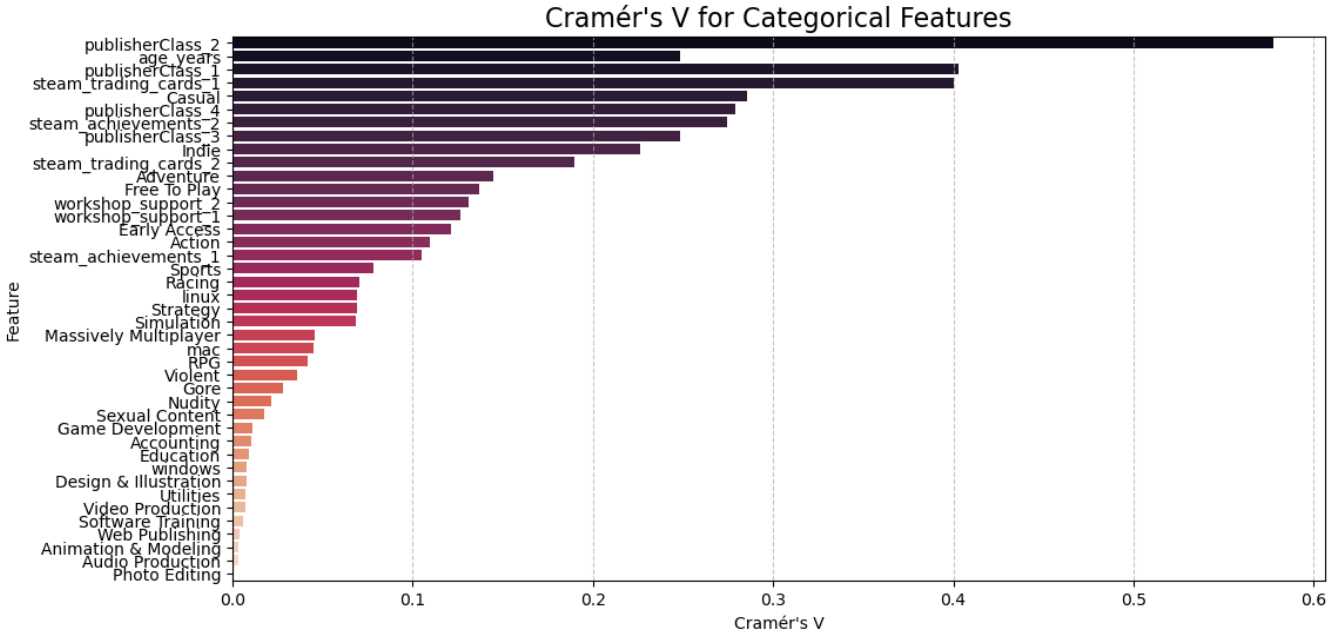
- using **Chi-square**.
- all features had **good Chi-square** scores.
- **removed no features**.



Categorical features:

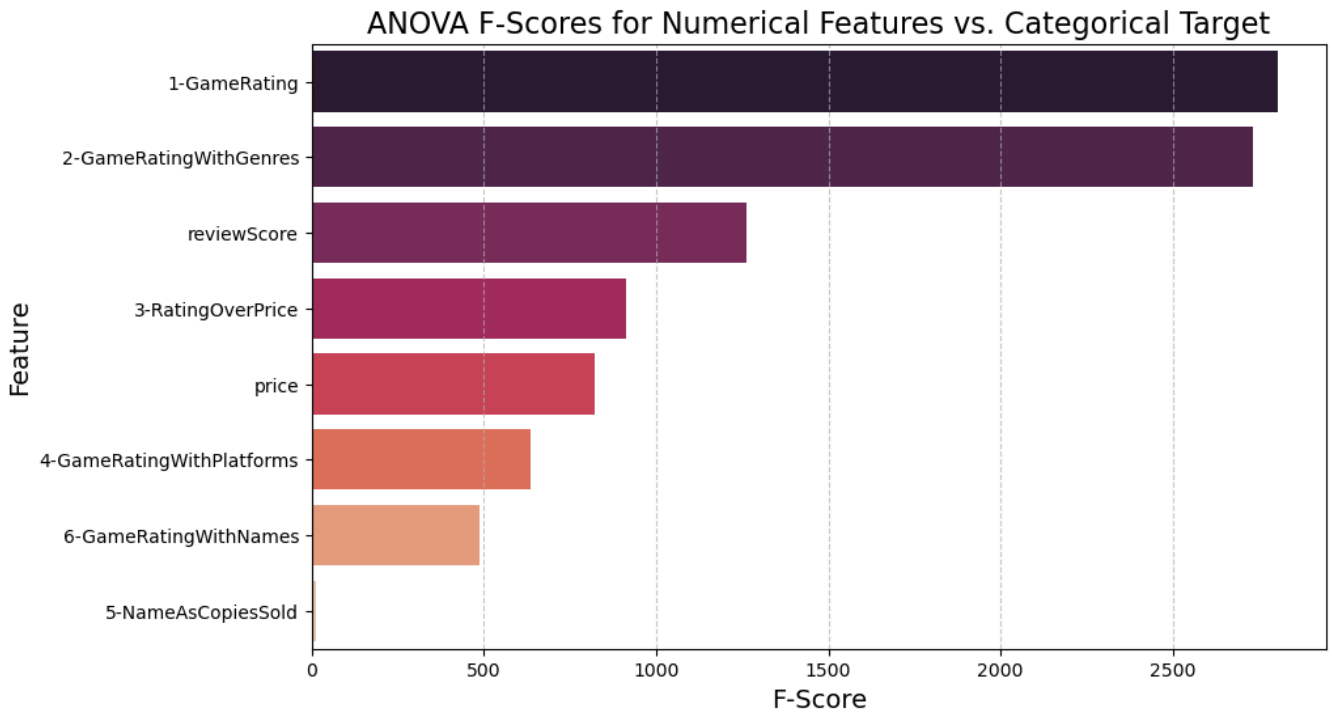
- using **Chi-square** and **Cramér's V**.
- **low** Chi-square and Cramér's V scores **made a difference** in evaluation.
- **removed features** with (**Chi-square < 10**) and (**Cramér's V < 0.04**)





Continuous features:

- using **ANOVA** (**like MS1**).
- **low** F-score features made **no difference**.
- **removed no features**.

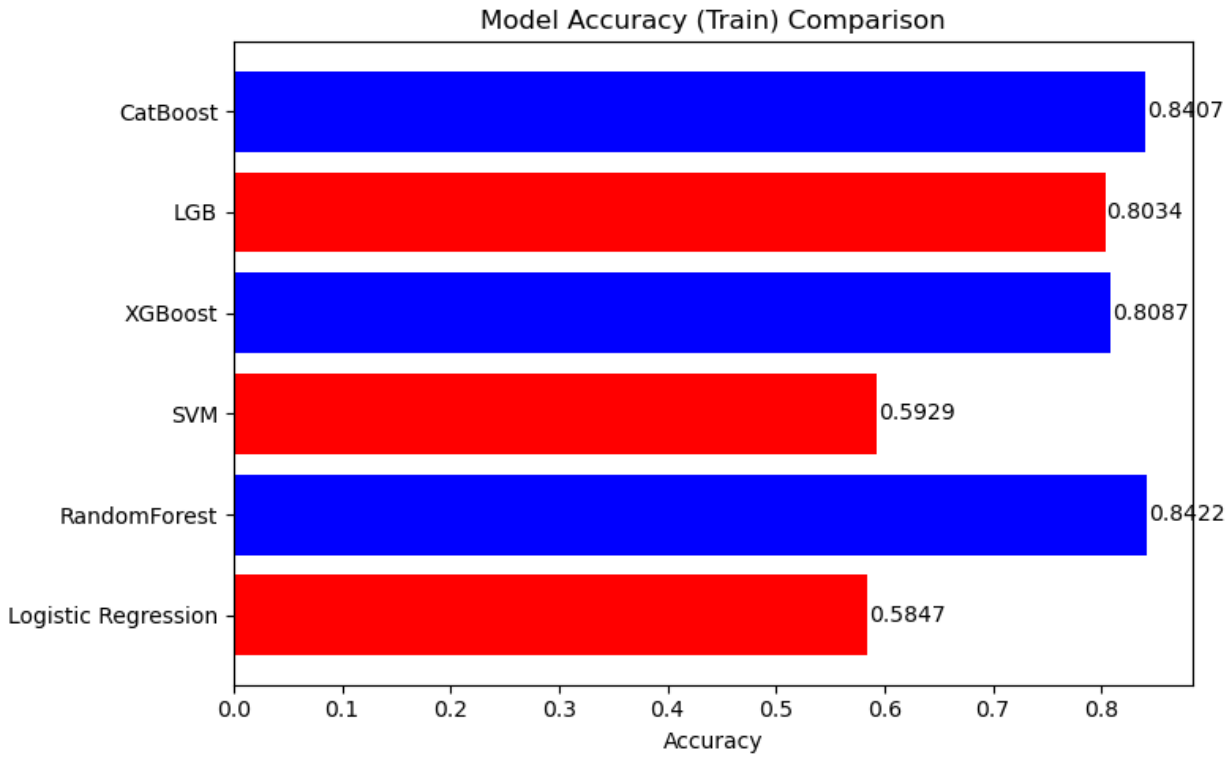


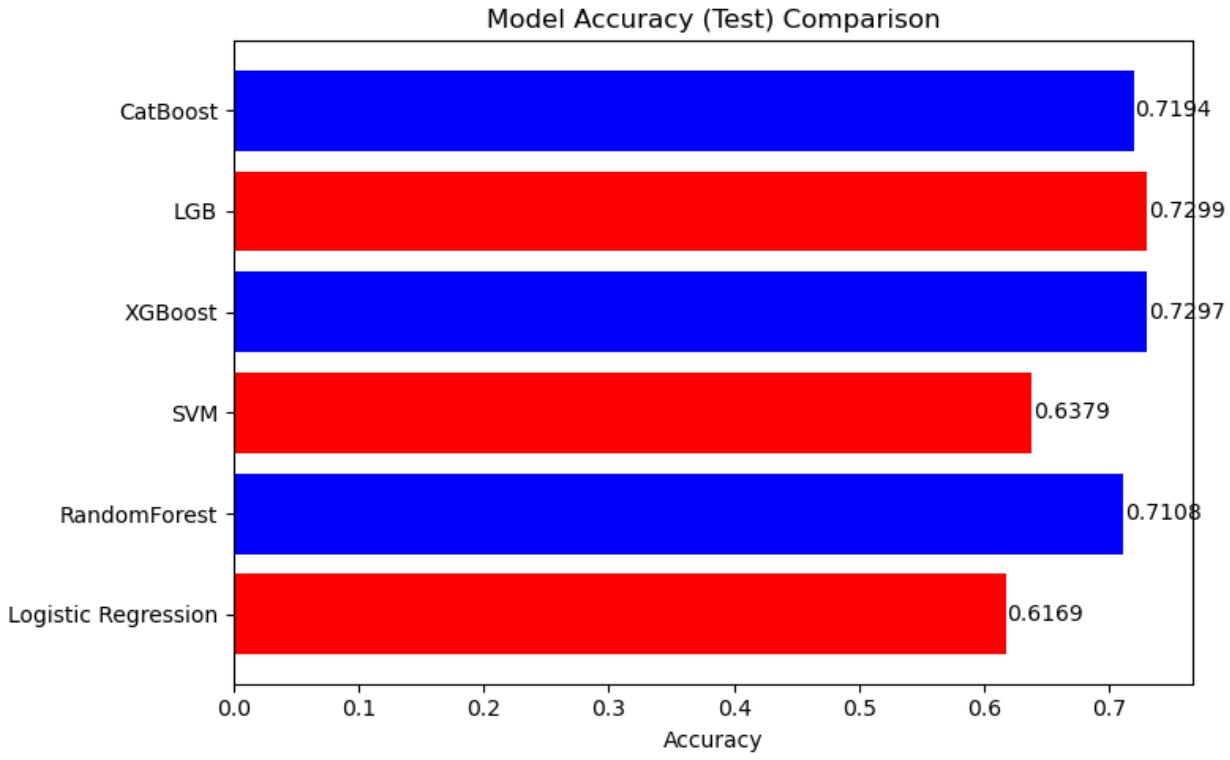
Hyperparameter Tuning

After manually tuning hyperparameters and finishing it up with GridSearch, the best hyperparamter values were:

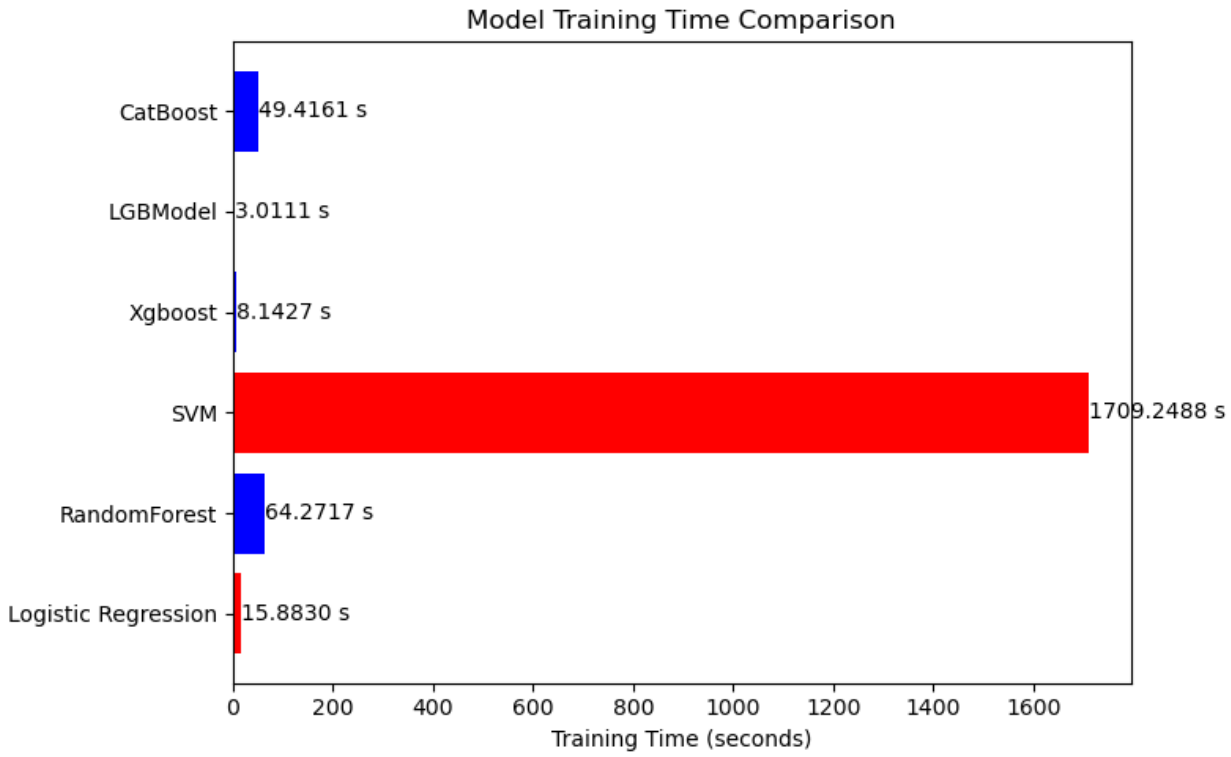
- **Logistic:** (C=10, penalty='l2', solver='lbfgs', max_iter=1000)
- **RandomForest:** (max_depth=20, max_features='sqrt', min_samples_leaf=3, min_samples_split=15, n_estimators=600, random_state=42)
- **SVM:** (C=5, kernel='rbf', gamma='scale', probability=True)
- **XGBoost:** (n_estimators=470, learning_rate=0.11, max_depth=5, subsample=0.9, colsample_bytree=0.8, random_state=42, n_jobs=-1)
- **LGBM:** (learning_rate=0.06, max_depth=15, n_estimators=200, num_leaves=50)
- **CatBoost:** (iterations=350, learning_rate=0.1, depth=10, verbose=0, random_state=42)

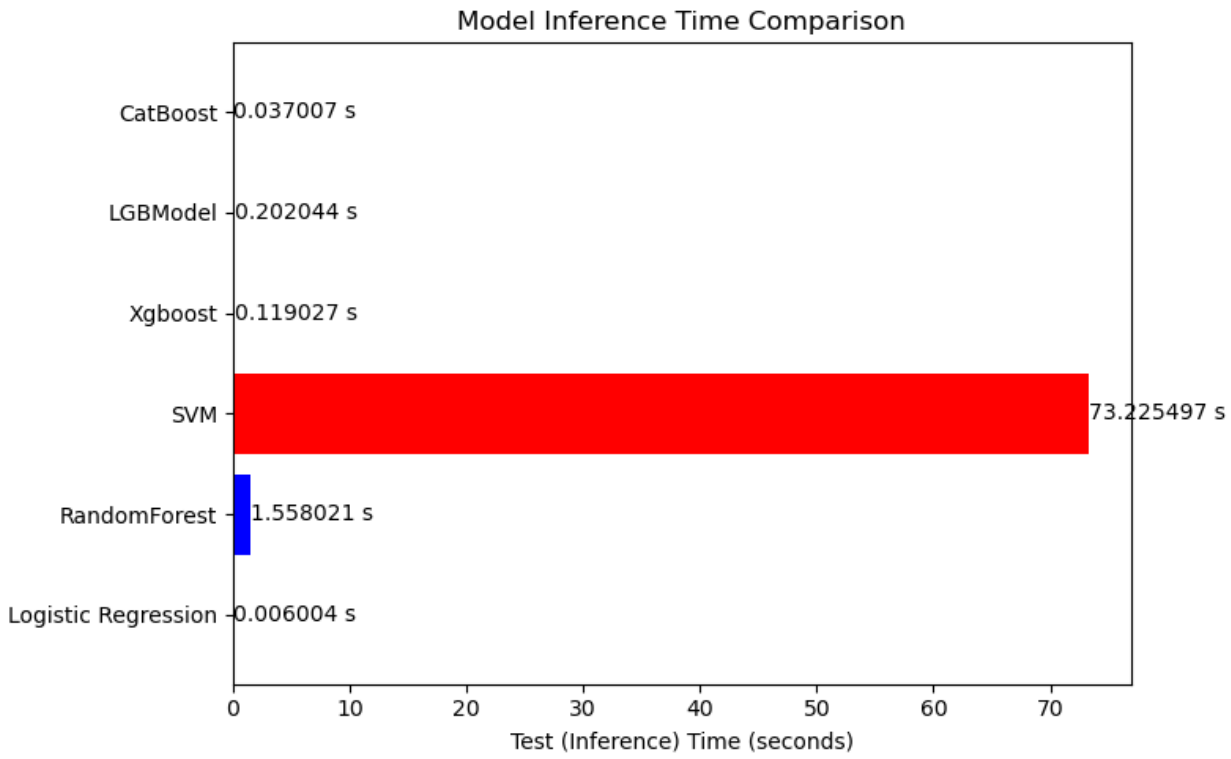
Classification Accuracy





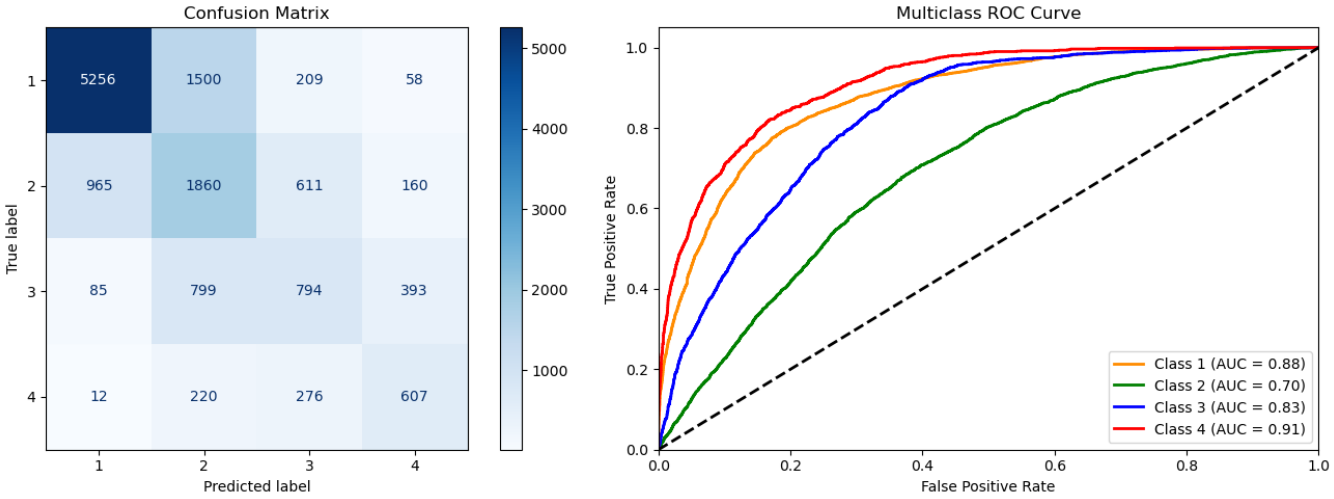
Classification Time



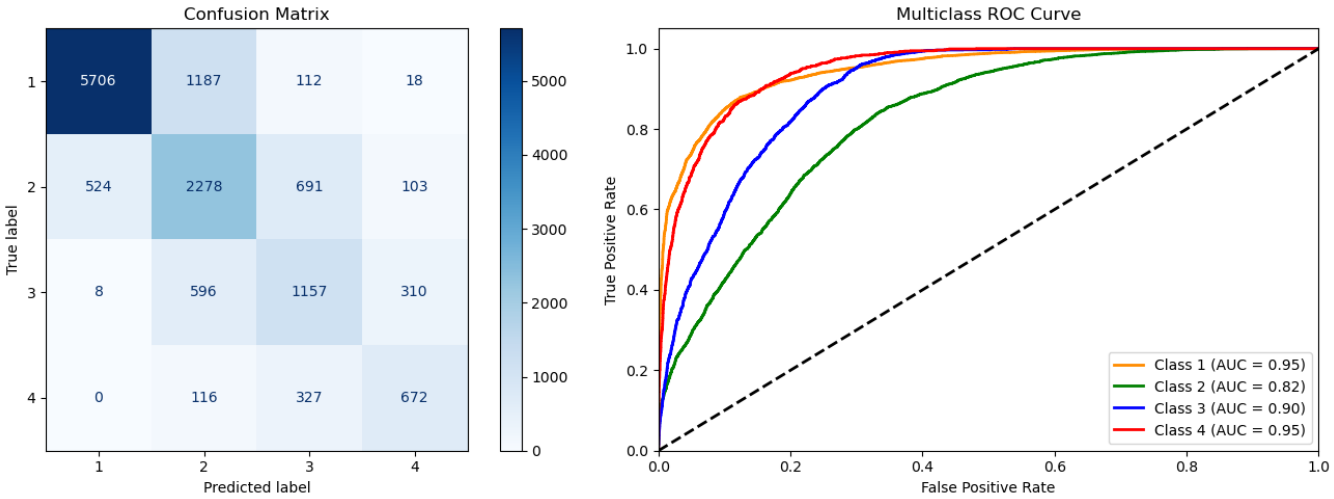


Confusion Matrix & ROC

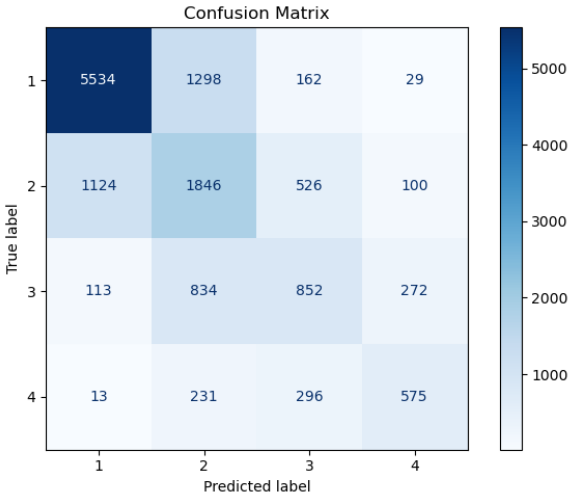
Logistic:

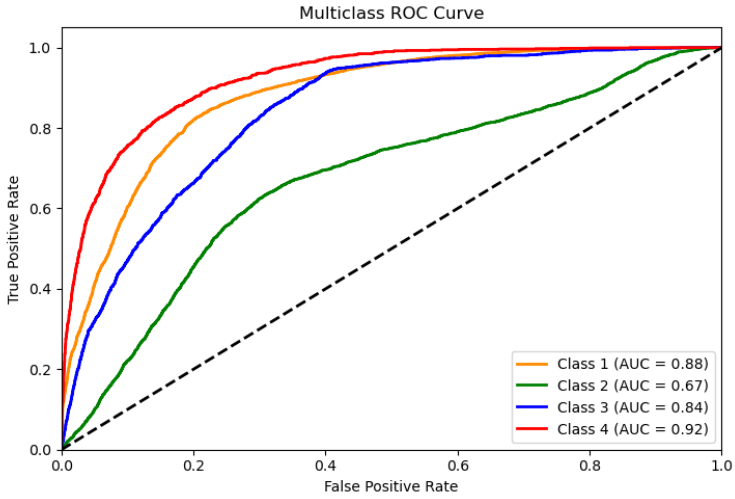


Random Forest:

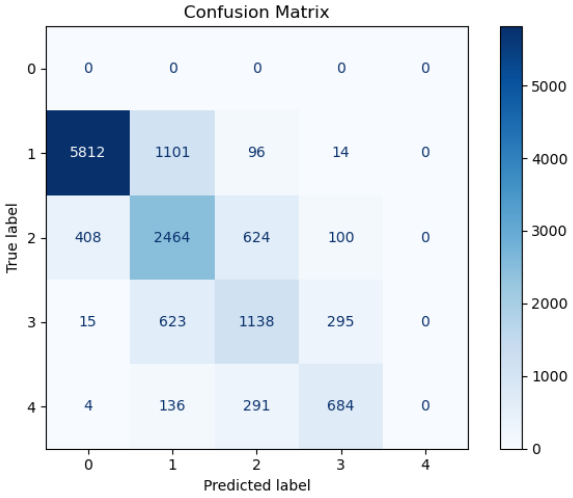


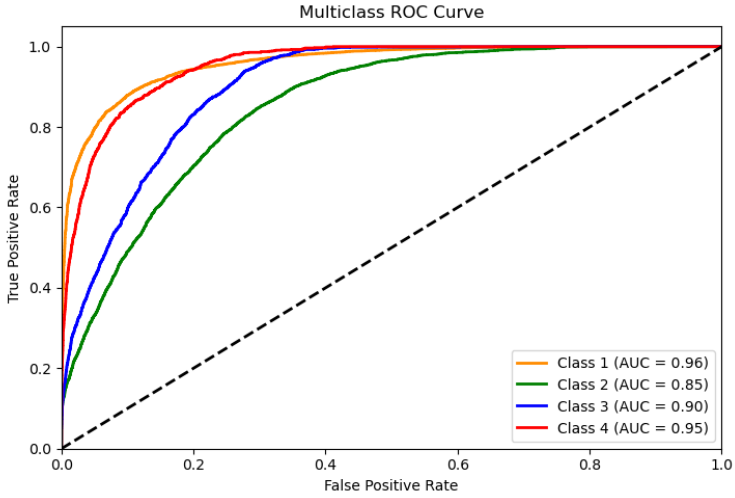
SVM:


Confusion Matrix
5534
1298
162
29
1124
1846
526
100
113
834
852
272
13
231
296
575
True label
Predicted label
1
2
3
4
5000
4000
3000
2000
1000

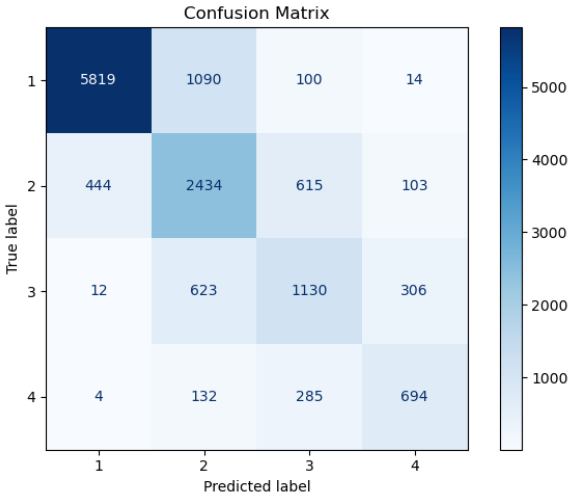

Multiclass ROC Curve
True Positive Rate
False Positive Rate
Class 1 (AUC = 0.88)
Class 2 (AUC = 0.67)
Class 3 (AUC = 0.84)
Class 4 (AUC = 0.92)
0.0
0.2
0.4
0.6
0.8
1.0

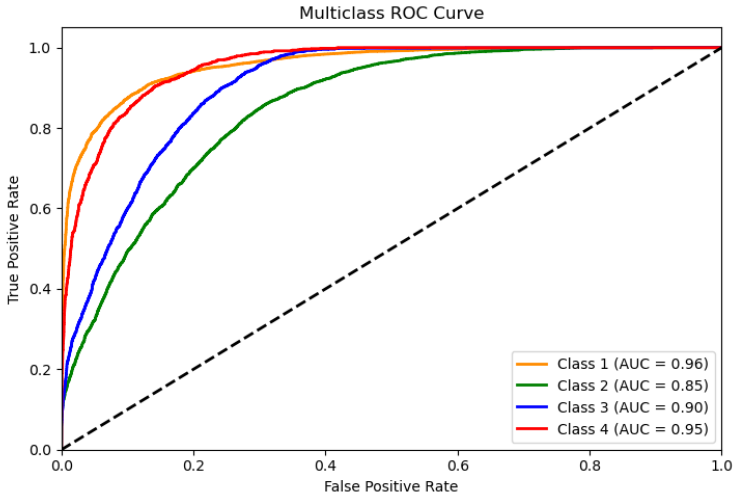
XGBoost:


Confusion Matrix
0
0
0
0
0
5812
1101
96
14
0
408
2464
624
100
0
15
623
1138
295
0
4
136
291
684
0
True label
Predicted label
0
1
2
3
4
5000
4000
3000
2000
1000
0

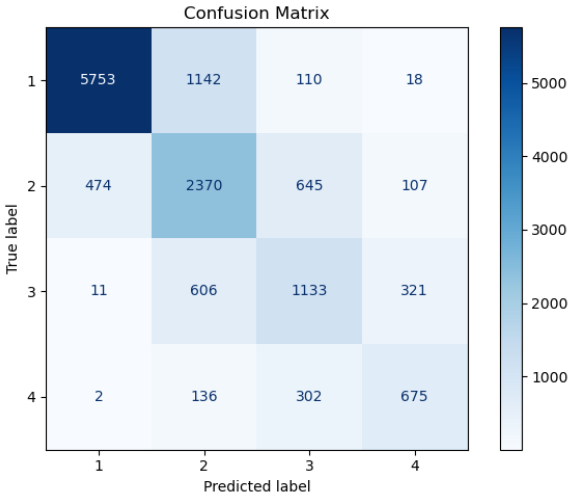

Multiclass ROC Curve
True Positive Rate
False Positive Rate
Class 1 (AUC = 0.96)
Class 2 (AUC = 0.85)
Class 3 (AUC = 0.90)
Class 4 (AUC = 0.95)
0.0
0.2
0.4
0.6
0.8
1.0

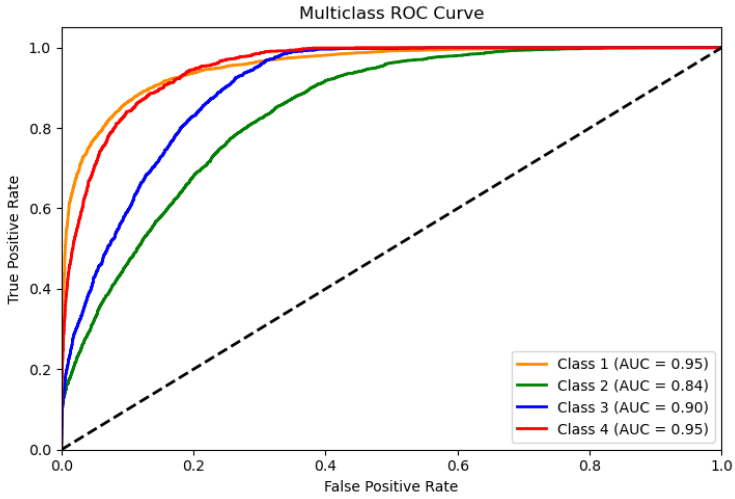
LGBM:





CatBoost:





Test Script

- We took a subset of the data (**3404 rows**) to test the Test Script.
- We trained the best model with the rest (**65628 rows**).

```
model=joblib.load(r'C:\Users\moham\Downloads\College\Machine_Learning

y_pred = model.predict(df)
acc=accuracy_score(test, y_pred)

print(acc)
print(classification_report(test, y_pred))
```

✓ 0.0s

```
0.6554054054054054
              precision    recall  f1-score   support

           1       0.87      0.82      0.85       924
           2       0.58      0.48      0.53       906
           3       0.45      0.67      0.54       732
           4       0.77      0.65      0.71       842

    accuracy                           0.66      3404
   macro avg       0.67      0.66      0.65      3404
weighted avg       0.68      0.66      0.66      3404
```

```
df.shape
```

[111] ✓ 0.0s

```
(69428, 23)
```

```
out_df=df.loc[66024:,:]
df=df.loc[:66024,:]
```

[112] ✓ 0.0s

```
(3404, 23)
```

```
df.shape
```

[187] ✓ 0.0s

```
(65628, 17)
```

```
out_df.to_csv('output.csv')
```

[113] ✓ 0.0s

- Then we did the same thing in Regression (**MS1**):

```
model = CatBoostRegressor()
model.load_model(r'C:\Users\moham\Downloads\College\Machine_Learning\P

y_pred = model.predict(df)
r2=r2_score(test, y_pred)

print("R2 Score: ",r2)
print("MSE: ",mean_squared_error(test, y_pred))
print("MAE",mean_absolute_error(test, y_pred))
```

[301] ✓ 0.0s

```
R2 Score:  0.9203678789566684
MSE:  4237381108466.8027
MAE 329092.7251957216
```

```
df.shape
```

[314] ✓ 0.0s

```
(69428, 23)
```

```
put_df=df.loc[66428:,:]
df=df.loc[:66428,:]

df.shape
```

[315] ✓ 0.0s

```
(66429, 23)
```

```
put_df.shape
```

[316] ✓ 0.0s

```
(3000, 23)
```

```
put_df.to_csv("put_df.csv")
```

[317] ✓ 0.0s

Concluding Remarks

After comparison of models in terms of (Accuracy, train/test time): **LGBM** is the best model for deployment.

Intuition (just like Phase 1):

- Features such as (name, genres, release date, price, platforms, publisher and review score) are expected to have the highest effect on our prediction.
- Features such as (achievements, trading cards and workshop support) are expected to have no significant effect.

Actual (just like Phase 1):

- The first intuition was correct.
- However, our second intuition was wrong, those features did have an effect in feature engineering better features for our prediction.