Lab 02 Report – Regression

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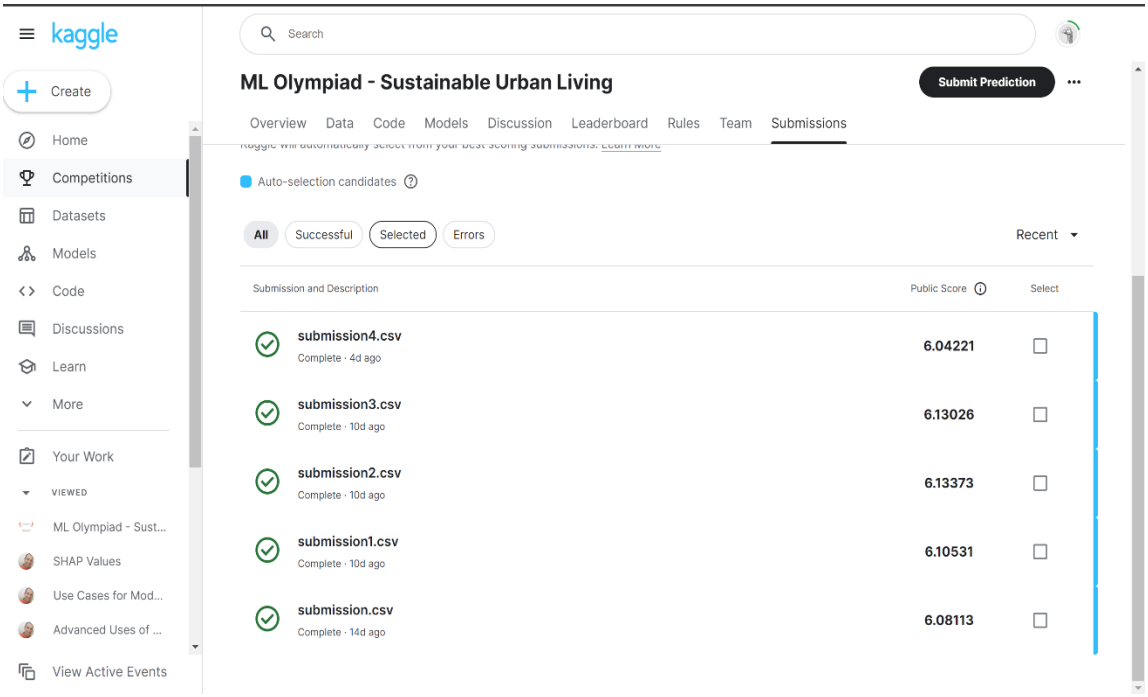
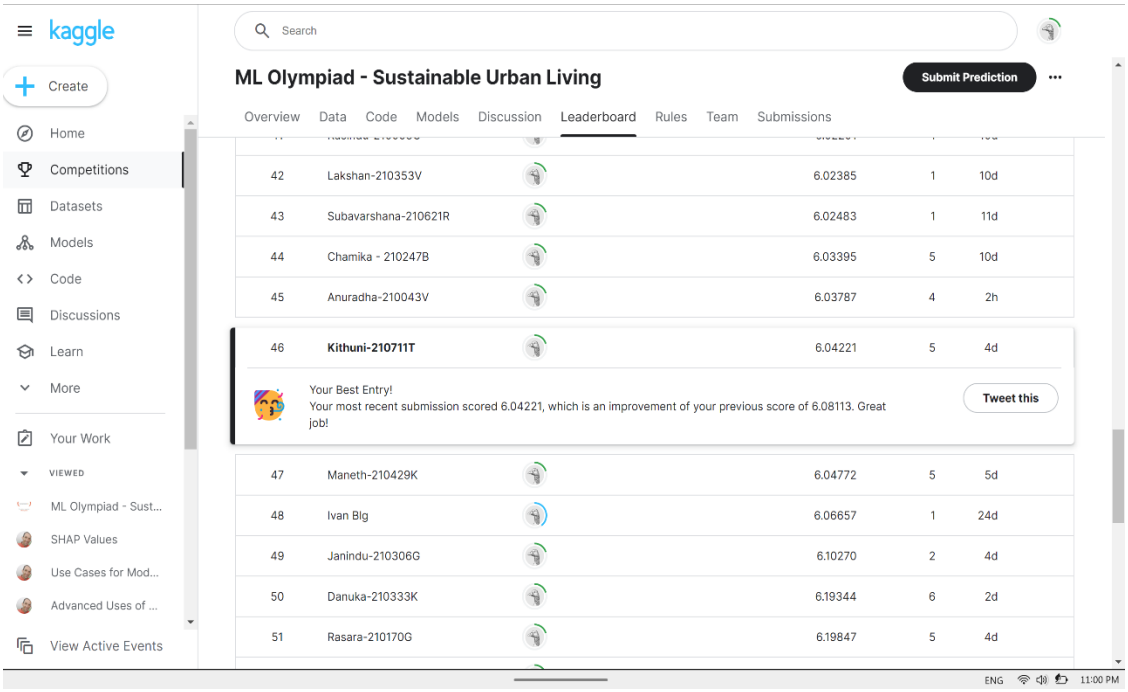
Introduction

This report aims to compare the performance of four different regression model approaches applied to the dataset. The evaluation of these approaches is based on various regression evaluation metrics including Mean Squared Error (MSE), Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), R-squared (R^2) score, and Adjusted R-squared.

Proofs of the Submissions



Score and the rank.



Evaluation metrics

1. Random Forest Regressor:

- Mean Squared Error (MSE): 36.29
- Root Mean Squared Error (RMSE): 6.02
- Mean Absolute Error (MAE): 4.64
- R-squared (R^2) Score: 0.82
- Adjusted R-squared: 0.82

2. XGBoost Regressor:

- Mean Squared Error (MSE): 36.35
- Root Mean Squared Error (RMSE): 6.03
- Mean Absolute Error (MAE): 4.67
- R-squared (R^2) Score: 0.8
- Adjusted R-squared: 0.82

3. **LightGBM Regressor:**

- Mean Squared Error (MSE): 37.48

- Root Mean Squared Error (RMSE): 6.12

- Mean Absolute Error (MAE): 4.81

- R-squared (R^2) Score: 0.81

- Adjusted R-squared: 0.81

4**. Linear Regressor:**

- Mean Squared Error (MSE): 86.46

- Root Mean Squared Error (RMSE): 9.30

- Mean Absolute Error (MAE): 7.45

- R-squared (R^2) Score: 0.57

- Adjusted R-squared: 0.57

Comparison of results

- Random Forest, XGBoost, and LightGBM regressors demonstrate similar performance in terms of MSE, RMSE, MAE, R^2 score, and Adjusted R^2 score.
- These tree-based ensemble methods outperform the Linear Regressor across all evaluation metrics.
- Random Forest and XGBoost regressors achieve the lowest MSE, RMSE, and MAE, indicating superior predictive accuracy and smaller prediction errors compared to LightGBM and Linear regression models.
- Linear Regressor exhibits the highest MSE, RMSE, and MAE values, signifying poorer predictive performance and larger prediction errors compared to tree-based models.
- The R^2 scores and Adjusted R^2 scores are highest for Random Forest and XGBoost regressors, indicating better model fit and higher explanatory power compared to LightGBM and Linear regression models.

Conclusion

In conclusion, tree-based ensemble methods such as Random Forest and XGBoost regressors outperform traditional linear regression and LightGBM regressors in terms of prediction accuracy and model fit. These findings suggest that ensemble methods are more effective for modeling complex relationships in the dataset, resulting in improved predictive performance and better explanatory power.