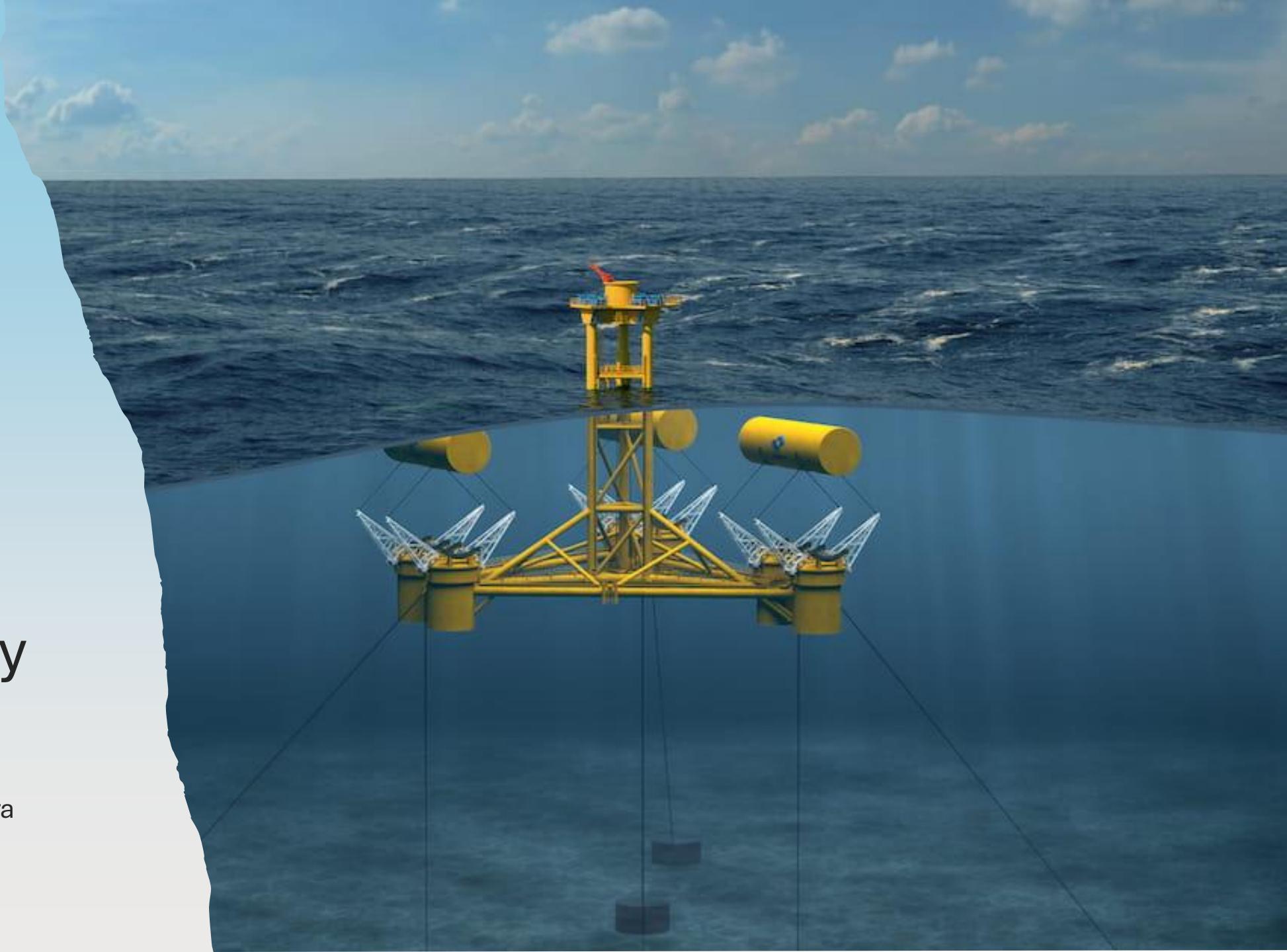


Wave Energy Converters

Paweł Nykiel, Jakub Figura



Problem: prediction of produced energy by farms of wave energy converters.

Data set

- Features:
 - Positions of Energy converters
 - Amount of produced power

Strategy

- Data preprocessing and splitting
- Scatter plots of features and dependant variable plot
- Checking assumptions for linear regression
- Testing various models

Metrics

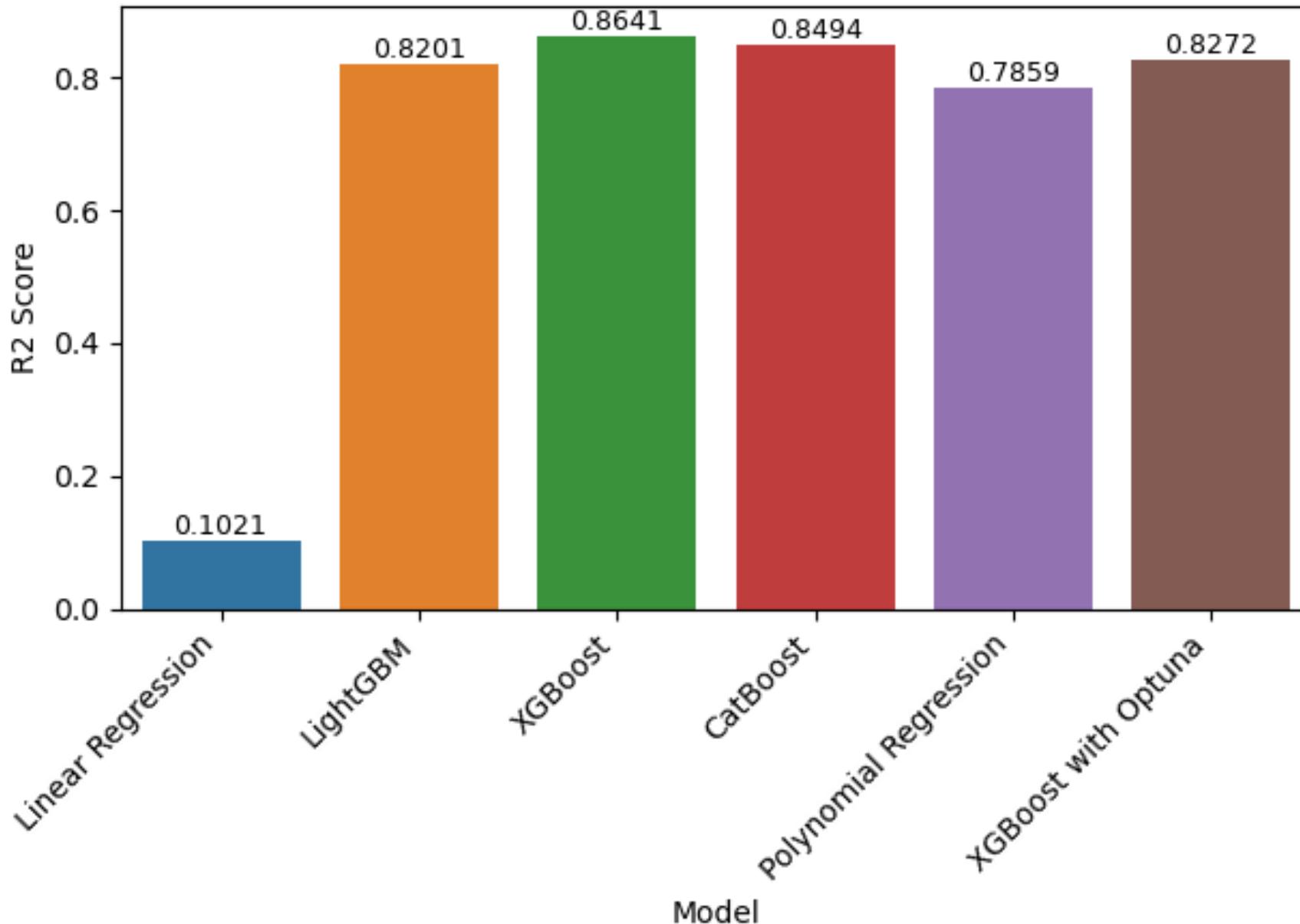
- R²
- RMSE
- MAPE

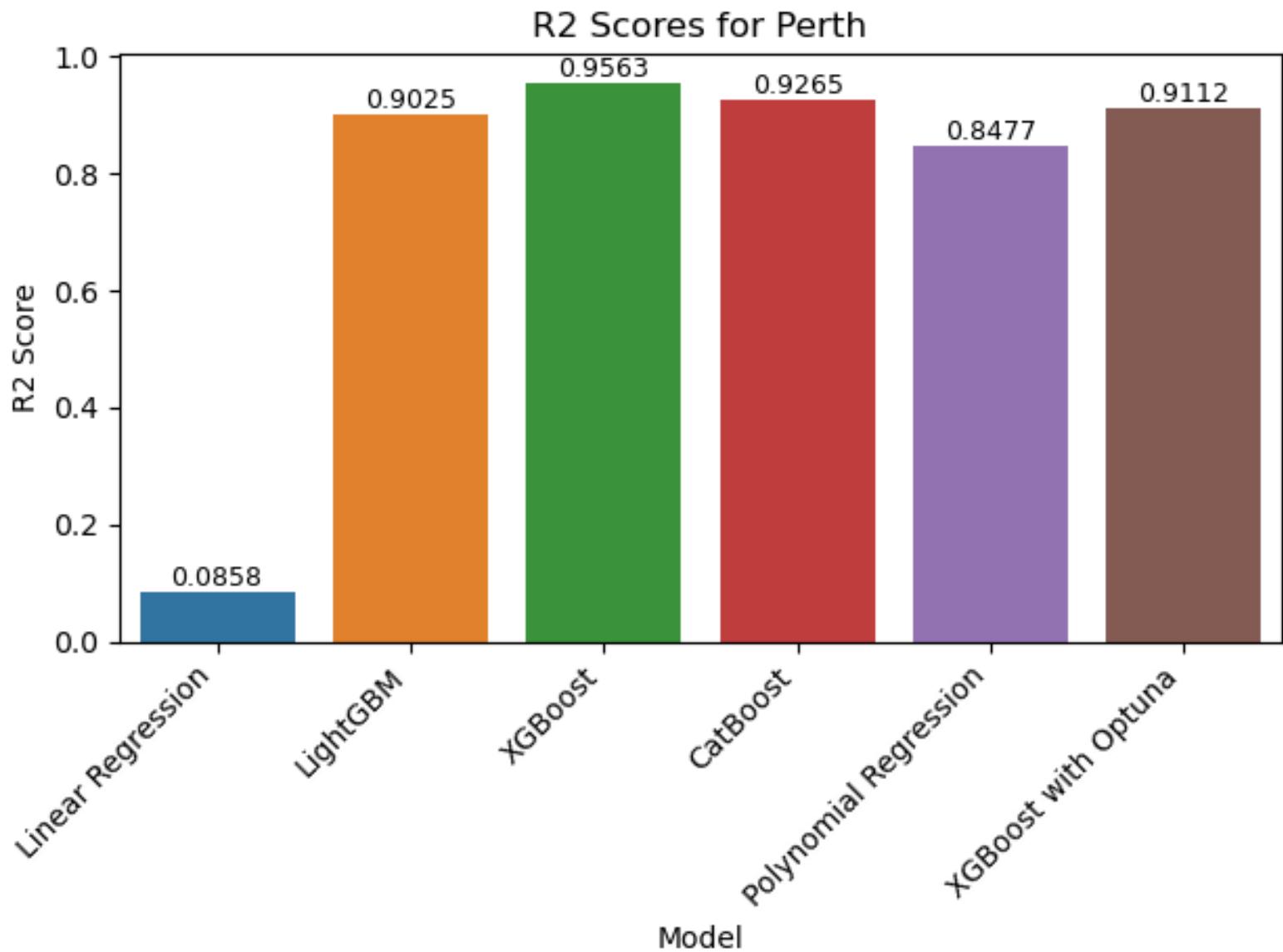
Models

- Linear regression
- Linear regression with polynomial features
- XGBoost
- LightGBM
- XGBoost with Optuna HPT Tuning
- CatBoost with Optuna HPT

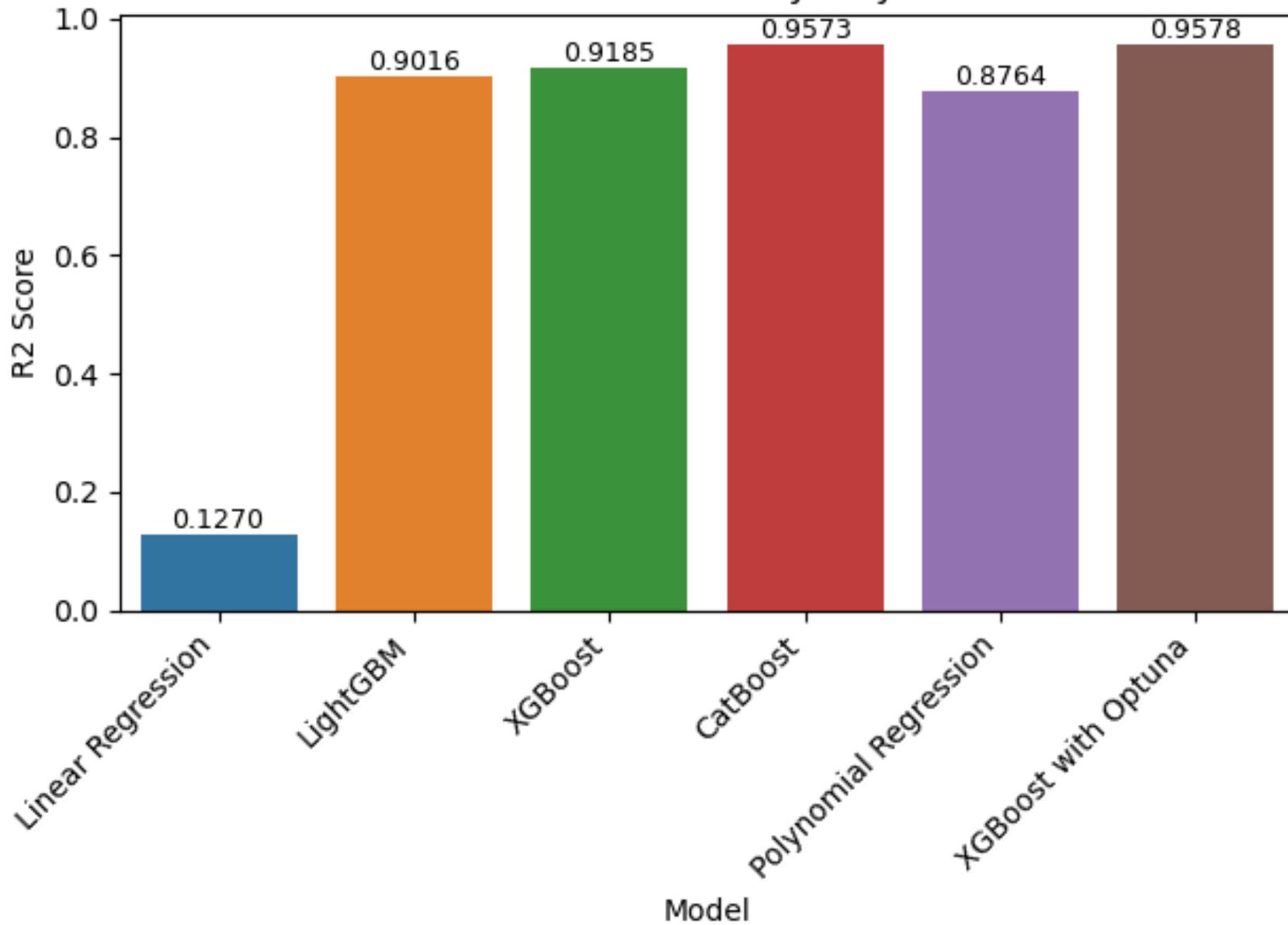
	City	Model	R2	MAPE	RMSE
0	Adelaide	Linear Regression	0.102110	0.029699	52922.895090
1	Perth	Linear Regression	0.085818	0.030111	49286.601950
2	Sydney	Linear Regression	0.127045	0.011551	20374.506820
3	Tasmania	Linear Regression	0.232086	0.020104	100711.474459
4	Adelaide	LightGBM	0.820057	0.013678	23691.888586
5	Perth	LightGBM	0.902467	0.009861	16098.568043
6	Sydney	LightGBM	0.901583	0.003420	6841.117350
7	Tasmania	LightGBM	0.757414	0.011133	56605.073240
8	Adelaide	XGBoost	0.864102	0.011217	20589.183595
9	Perth	XGBoost	0.956256	0.005966	10781.354957
10	Sydney	XGBoost	0.918479	0.003389	6226.242733
11	Tasmania	XGBoost	0.799773	0.011126	51426.106300
12	Adelaide	CatBoost	0.849445	0.012039	21671.042117
13	Perth	CatBoost	0.926522	0.008931	13973.042628
14	Sydney	CatBoost	0.957264	0.002127	4508.026156
15	Tasmania	CatBoost	0.786330	0.011876	53124.411692
16	Adelaide	Polynomial Regression	0.785891	0.014993	25843.404433
17	Perth	Polynomial Regression	0.847742	0.011601	20114.213051
18	Sydney	Polynomial Regression	0.876419	0.004057	7665.975802
19	Tasmania	Polynomial Regression	0.781127	0.012042	53767.307170
20	Adelaide	XGBoost with Optuna	0.826927	0.013687	23235.222592
21	Perth	XGBoost with Optuna	0.937779	0.007474	12858.243845
22	Sydney	XGBoost with Optuna	0.981051	0.001329	3001.847932
23	Tasmania	XGBoost with Optuna	0.805410	0.010716	50697.001995

R2 Scores for Adelaide

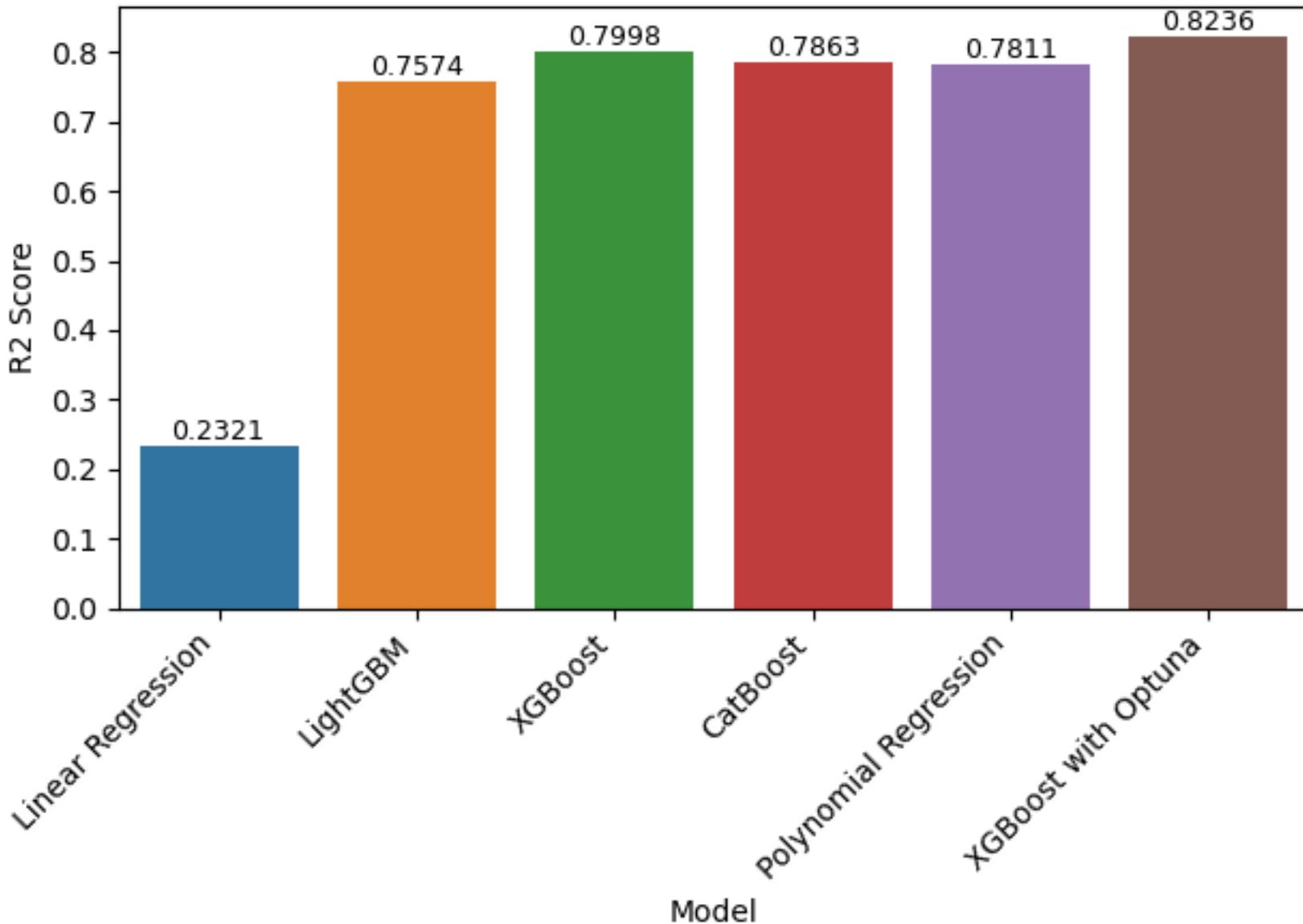




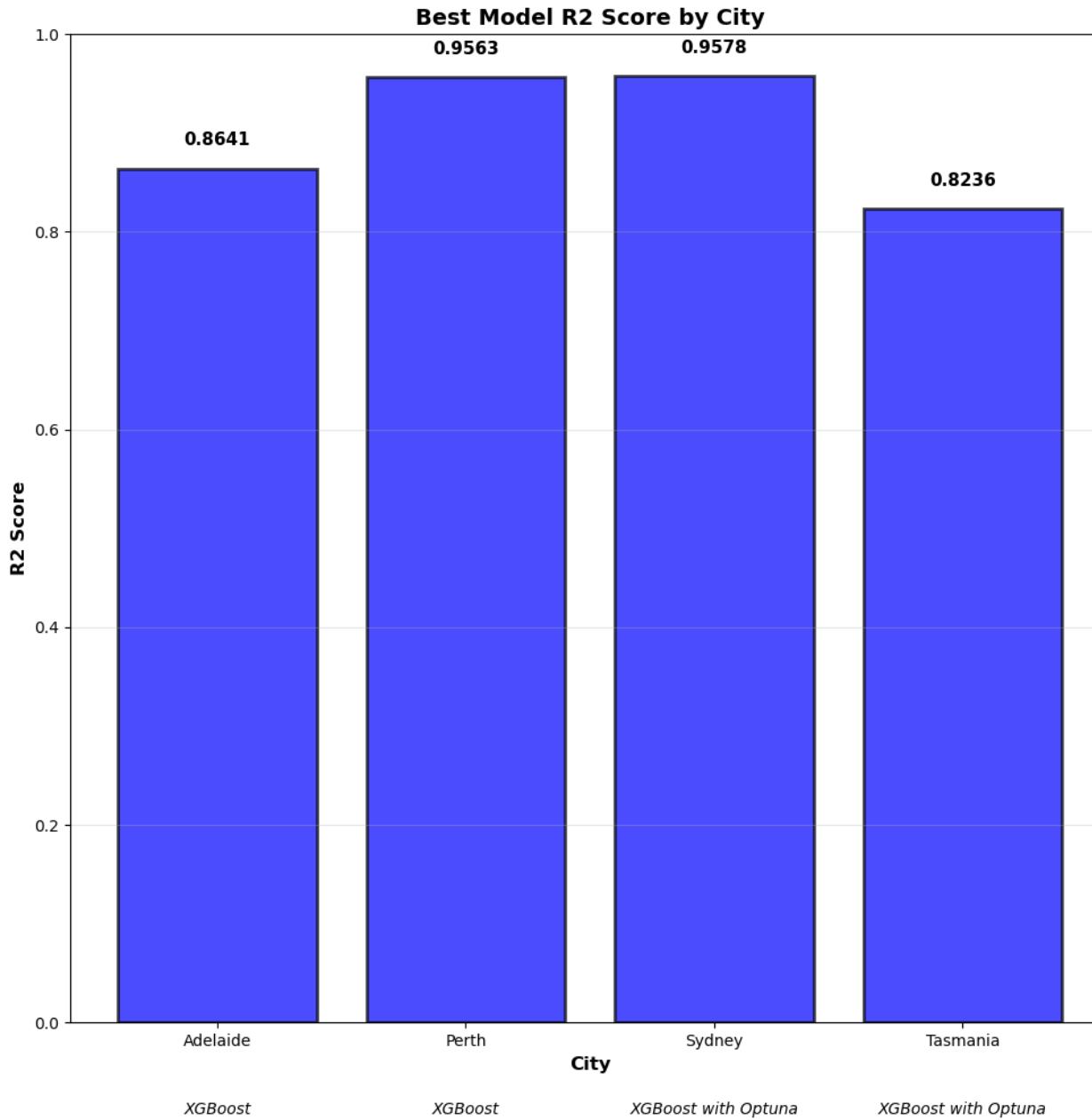
R2 Scores for Sydney

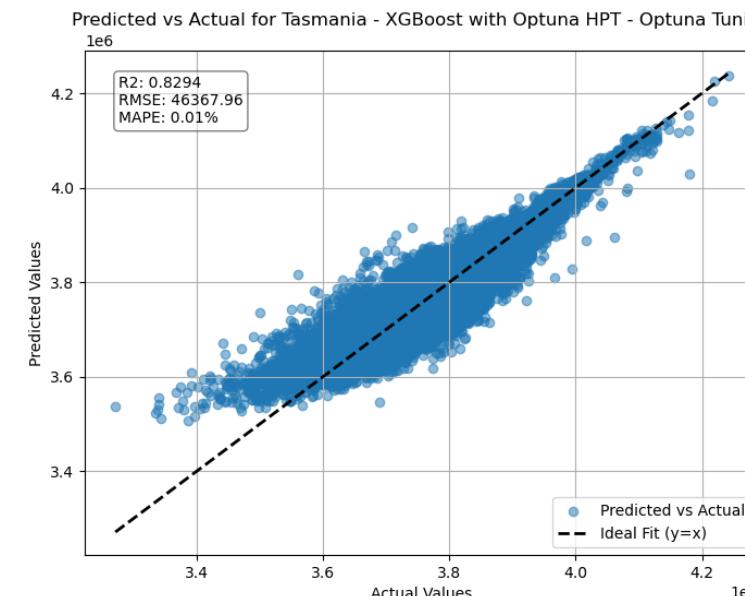
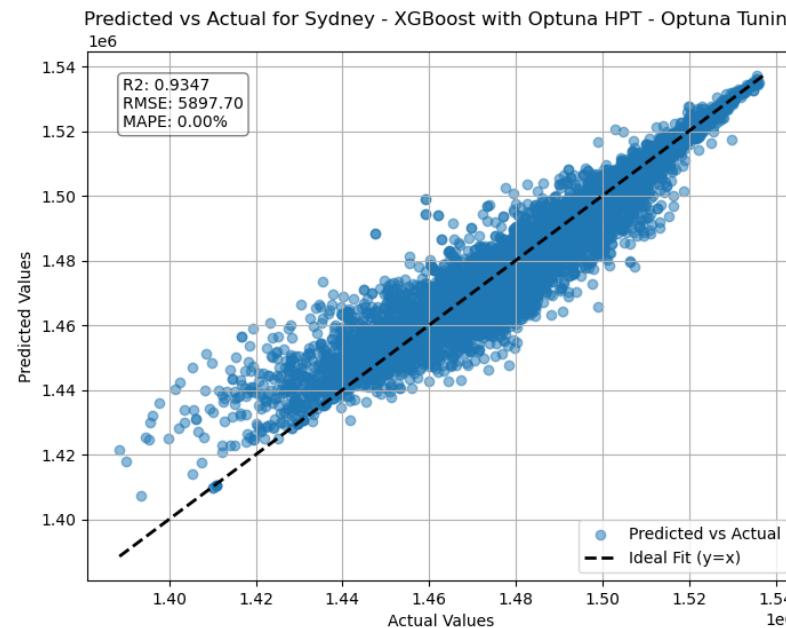
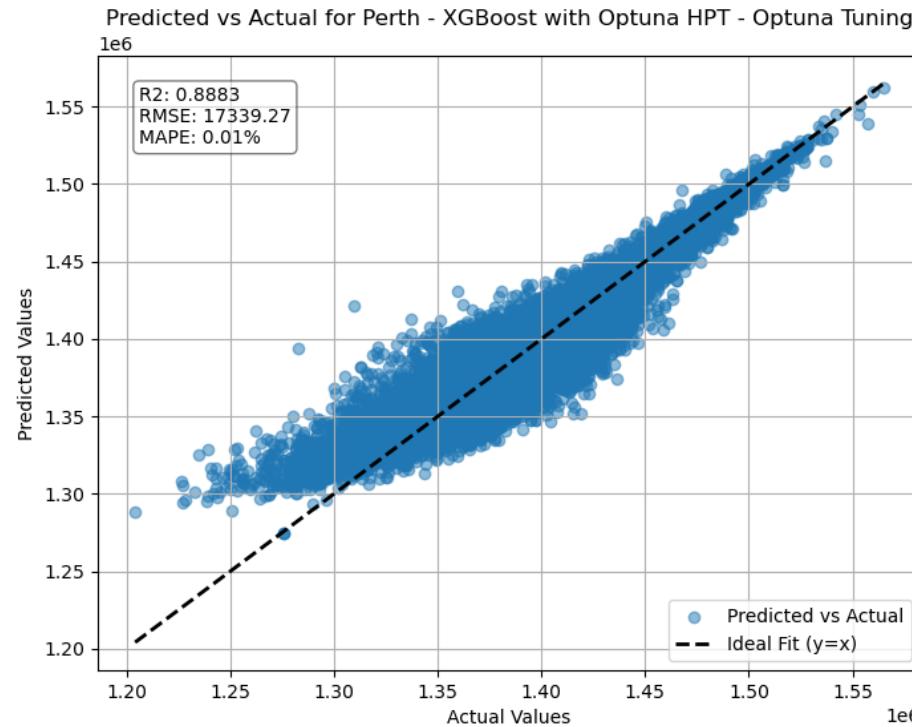
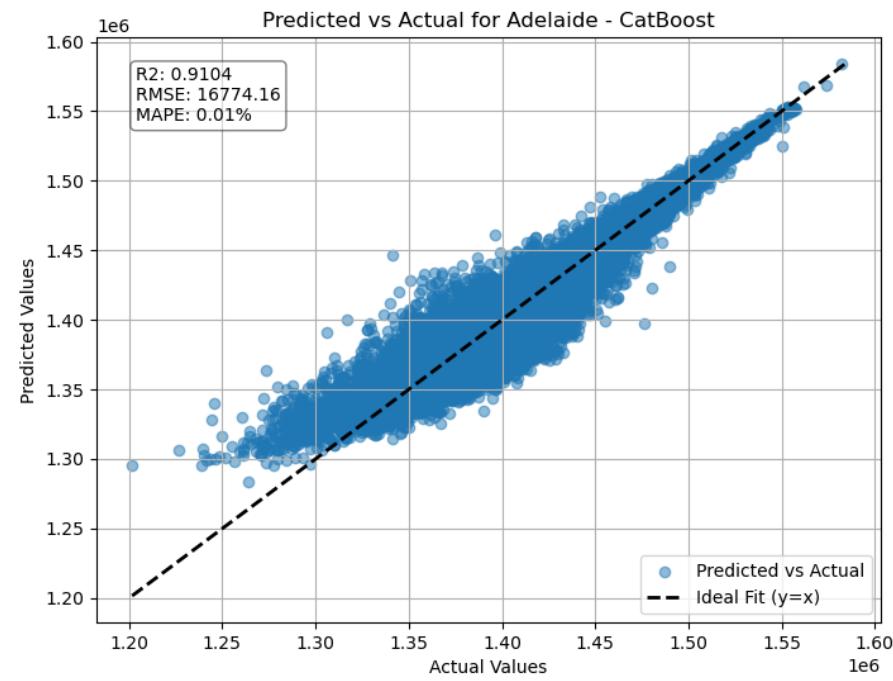


R2 Scores for Tasmania

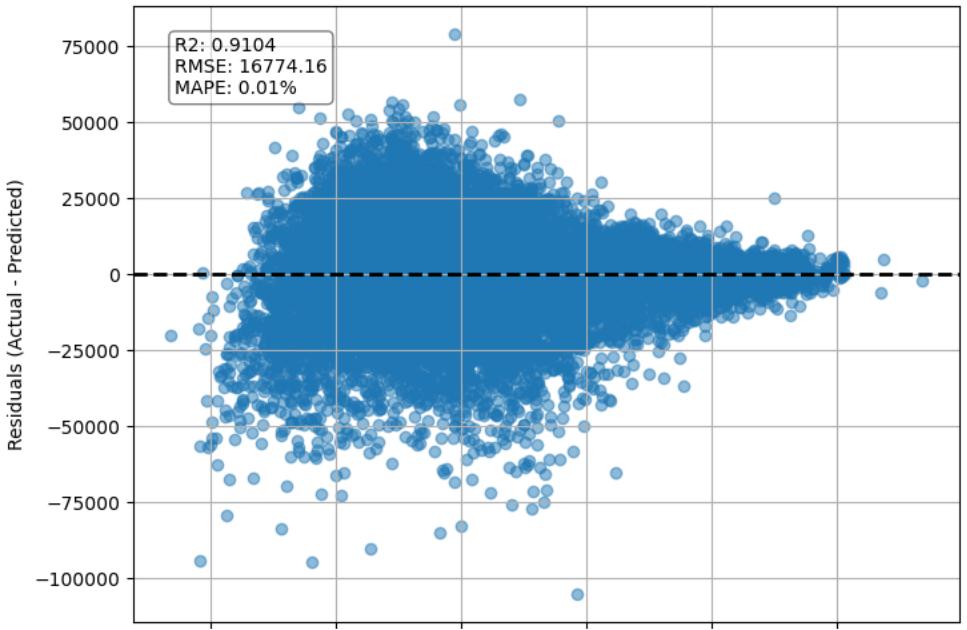


Results

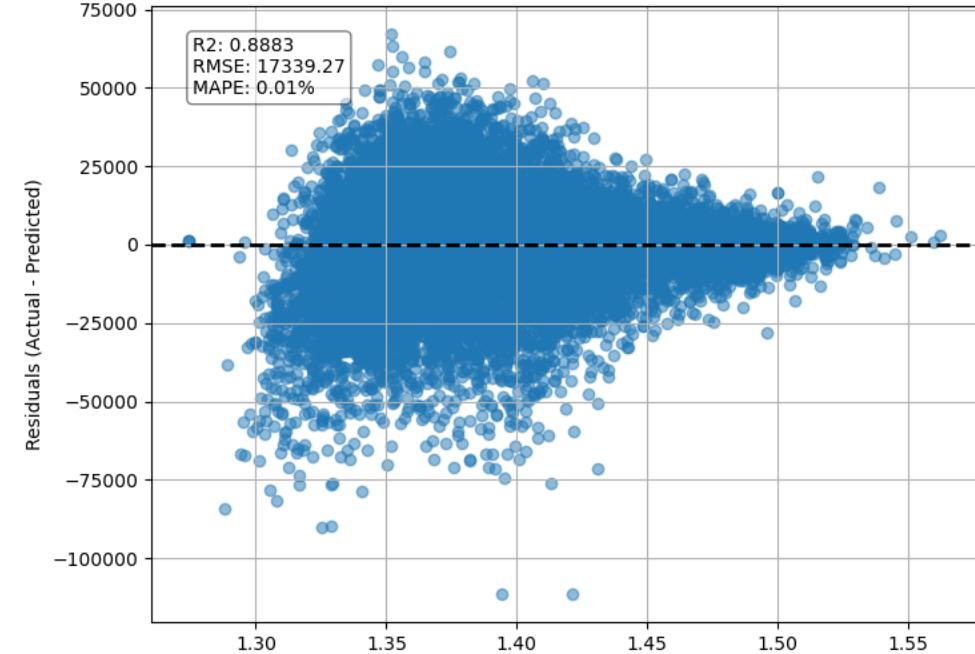




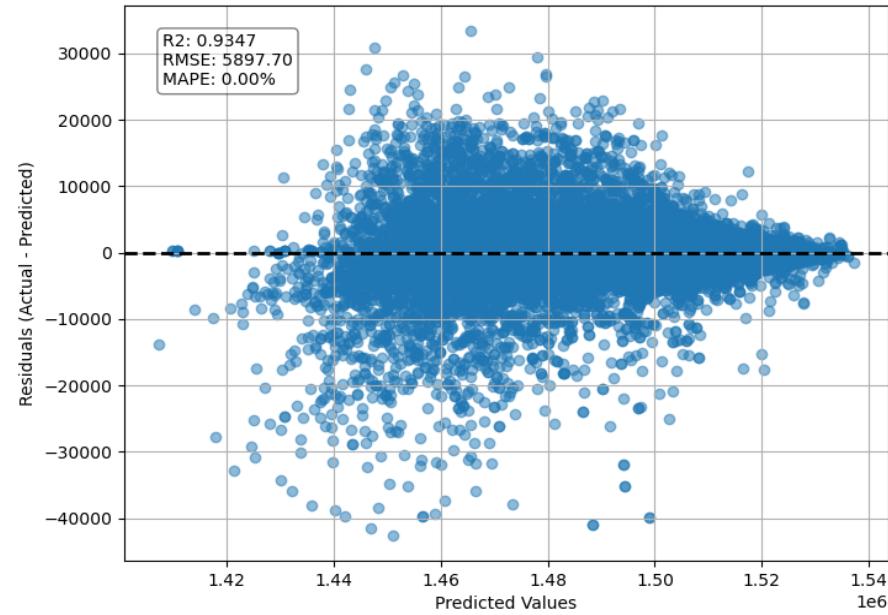
Residuals vs Predicted Values for Adelaide - CatBoost



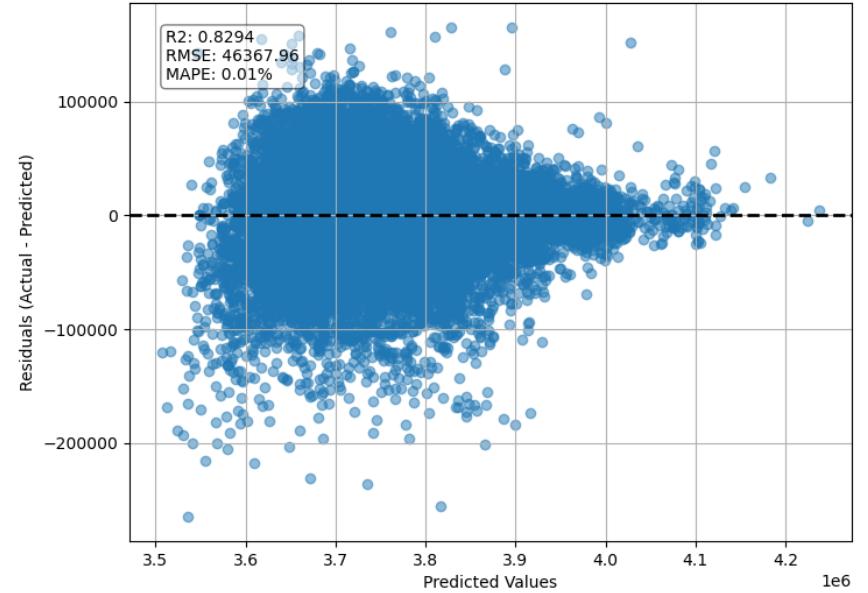
Residuals vs Predicted Values for Perth - XGBoost with Optuna HPT - Optuna Tuning



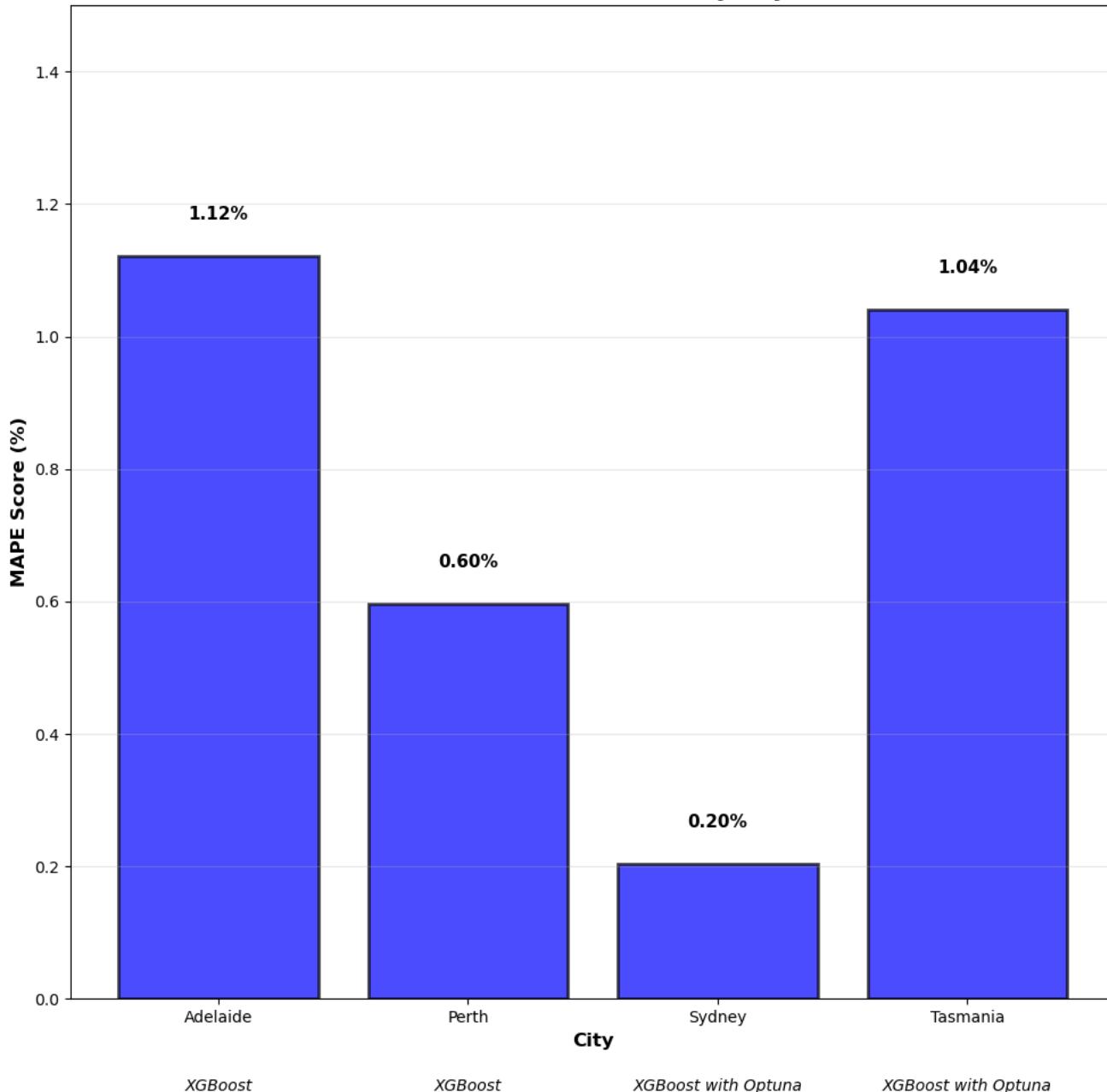
Residuals vs Predicted Values for Sydney - XGBoost with Optuna HPT - Optuna Tuning



Residuals vs Predicted Values for Tasmania - XGBoost with Optuna HPT - Optuna Tuning



Best Model MAPE Score by City



Best Model RMSE Score by City

