Model Optimization and Tuning Phase

Date	2 July 2024
Team ID	739945
Project Title	Power Consumption Analysis for Households
Maximum Marks	10 Marks

Model Optimization and Tuning Phase

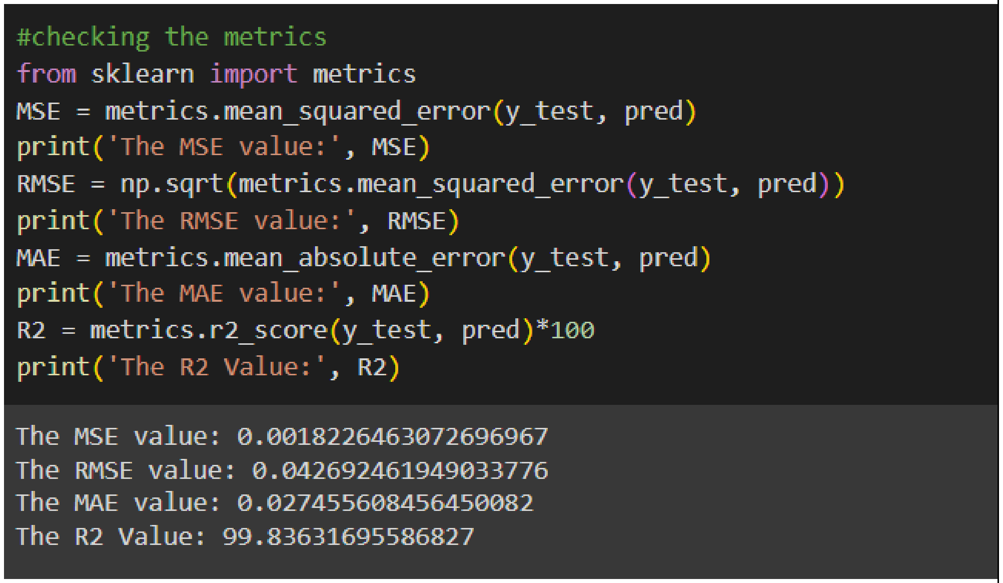
The Model Optimization and Tuning Phase involves refining machine learning models for peak performance. It includes optimized model code, fine-tuning hyperparameters, comparing performance metrics, and justifying the final model selection for enhanced predictive accuracy and efficiency.

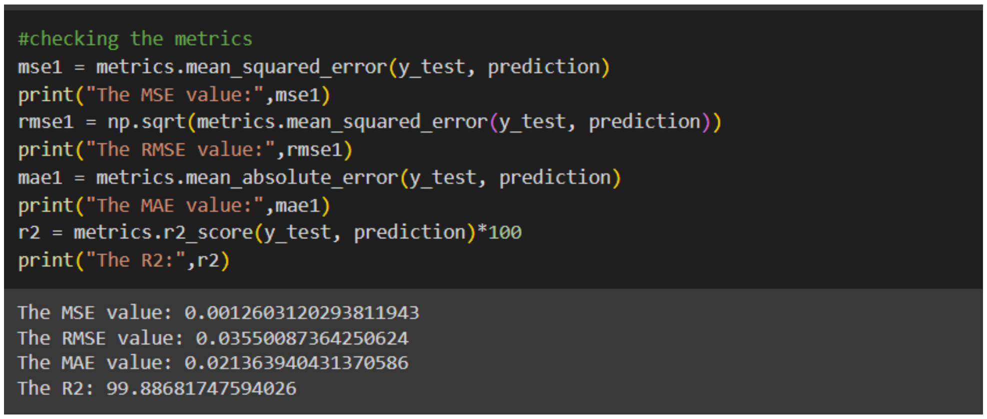
Hyperparameter Tuning Documentation (6 Marks):

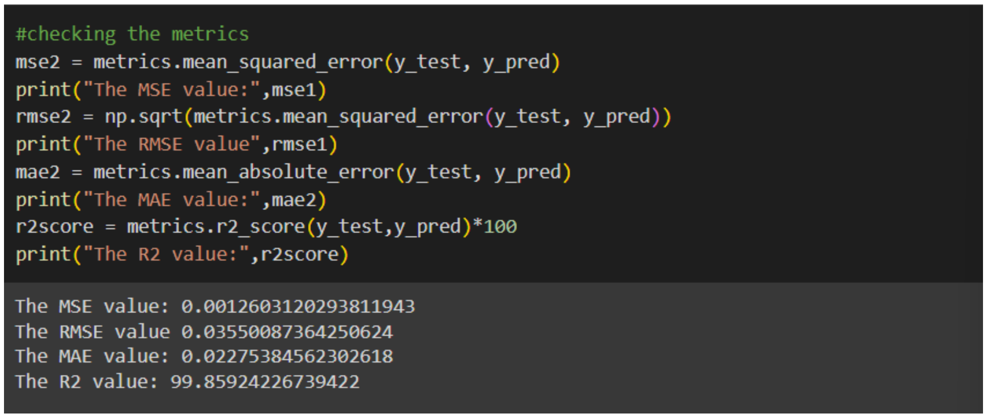
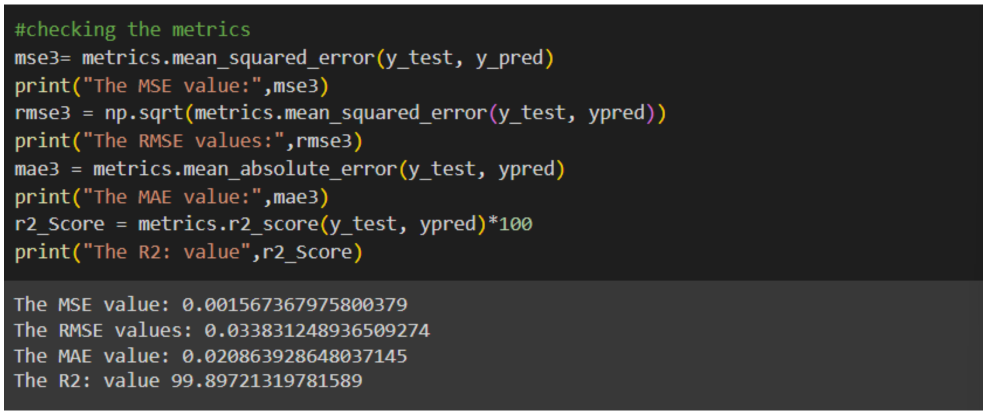
Model	Tuned Hyperparameters	Optimal Values
Linear Regression	-	-
Random Forest Regressor	-	-
Decision Tree Regressor	-	-
XGBoost Regressor	-	-

Performance Metrics Comparison Report (2 Marks):

Model	Optimized Metric

Linear Regression	
	`#checking the metrics`
	`from sklearn import metrics`
	`MSE = metrics.mean_squared_error(y_test, pred)`
	`print('The MSE value:', MSE)`
	`RMSE = np.sqrt(metrics.mean_squared_error(y_test, pred))`
	`print('The RMSE value:', RMSE)`
	`MAE = metrics.mean_absolute_error(y_test, pred)`
	`print('The MAE value:', MAE)`
	`R2 = metrics.r2_score(y_test, pred)*100`
	`print('The R2 Value:', R2)`
	
	`The MSE value: 0.0018226463072696967`
	`The RMSE value: 0.042692461949033776`
	`The MAE value: 0.027455608456450082`
	`The R2 Value: 99.83631695586827`

Random Forest Regressor	
	`#checking the metrics`
	`mse1 = metrics.mean_squared_error(y_test, prediction)`
	`print("The MSE value:",mse1)`
	`rmse1 = np.sqrt(metrics.mean_squared_error(y_test, prediction))`
	`print("The RMSE value:",rmse1)`
	`mae1 = metrics.mean_absolute_error(y_test, prediction)`
	`print("The MAE value:",mae1)`
	`r2 = metrics.r2_score(y_test, prediction)*100`
	`print("The R2:",r2)`
	
	`The MSE value: 0.0012603120293811943`
	`The RMSE value: 0.03550087364250624`
	`The MAE value: 0.021363940431370586`
	`The R2: 99.88681747594026`

Decision Tree Regressor	
XGBoost Regressor	

```python
#checking the metrics
mse2 = metrics.mean_squared_error(y_test, y_pred)
print("The MSE value:",mse1)
rmse2 = np.sqrt(metrics.mean_squared_error(y_test, y_pred))
print("The RMSE value",rmse1)
mae2 = metrics.mean_absolute_error(y_test, y_pred)
print("The MAE value:",mae2)
r2score = metrics.r2_score(y_test,y_pred)*100
print("The R2 value:",r2score)
```

```
The MSE value: 0.0012603120293811943
The RMSE value 0.03550087364250624
The MAE value: 0.02275384562302618
The R2 value: 99.85924226739422
```

```python
#checking the metrics
mse3= metrics.mean_squared_error(y_test, y_pred)
print("The MSE value:",mse3)
rmse3 = np.sqrt(metrics.mean_squared_error(y_test, ypred))
print("The RMSE values:",rmse3)
mae3 = metrics.mean_absolute_error(y_test, ypred)
print("The MAE value:",mae3)
r2_Score = metrics.r2_score(y_test, ypred)*100
print("The R2: value",r2_Score)
```

```
The MSE value: 0.0015673679758003379
The RMSE values: 0.033831248936509274
The MAE value: 0.020863928648037145
The R2: value 99.89721319781589
```

Final Model Selection Justification (2 Marks):

Final Model	**Reasoning**
XGBoost Regressor	The Extreme Gradient Boost Regression is the final model chosen because of its best overall performance compared to the other models. It captures the variance in the data very well with minimal prediction error. XGBoost can capture complex non-linear relationships.