

## Model Optimization and Tuning Phase Report

Date	31 July 2024
Team ID	739853
Project Title	Software Employee Salary Predictions
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
Decision Tree	—	—

Random Forest	—	—
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Model	Optimized Metric
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Decision Tree	<pre>[51] train_r2 = r2_score(y_train, y_train_pred) * 100       print("Training R²",train_r2)        # Calculate and print the R² score for the testing data       test_r2 = r2_score(y_test, y_test_pred) * 100       print("Testing R²: ",test_r2)</pre> <div>        Training R² 99.88283394123113        Testing R²: -306.5997015507768     </div>	
KNN	—	—
<b>XG</b> Boosting	—	—

**Performance Metrics Comparison Report (2 Marks):**

Random Forest	<pre> y_test_pred=rfr.predict(X_test) y_train_pred=rfr.predict(X_train)  train_r2 = r2_score(y_train, y_train_pred) * 100 print("Training R²:",train_r2) #Calculate and print the R² score for the testing data test_r2 = r2_score(y_test, y_test_pred) * 100 print("Testing R²",test_r2)  Training R²: 86.03987604146623 Testing R² 0.19943667460349257 </pre>
Linear Regression	<pre> y_test_pred=reg.predict(X_test) y_train_pred=reg.predict(X_train)  train_r2 = r2_score(y_train, y_train_pred) * 100 print("Training R²",train_r2)  # Calculate and print the R² score for the testing data test_r2 = r2_score(y_test, y_test_pred) * 100 print("Testing R²: ",test_r2)  Training R² 1.7368383587085146 Testing R²: 3.8894244665287347 </pre>
XG Boost Regressor	<pre> y_test_pred=xg_reg.predict(X_test) y_train_pred=xg_reg.predict(X_train)  train_r2 = r2_score(y_train, y_train_pred) * 100 print("Training R²:",train_r2) #Calculate and print the R² score for the testing data test_r2 = r2_score(y_test, y_test_pred) * 100 print("Testing R²: ",test_r2)  Training R²: 72.57209200330892 Testing R²: -99.38207793799099 </pre>

**Final Model Selection Justification (2 Marks):**

Final Model	Reasoning
Decision Tree Model	The Decision tree model is the final model chosen because of its best overall performance compared to other models. It capture the variance in the data very well with minimal prediction error.