# Model Optimization and Tuning Phase Template

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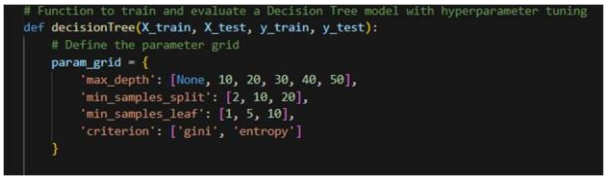
| Date | 15 July 2024 |
| Team ID | xxxxxx |
| Project Title | Human Resource Management: Predicting Employee Promotions Using Machine Learning |
| Maximum Marks | 10 Marks |

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 |  |   |

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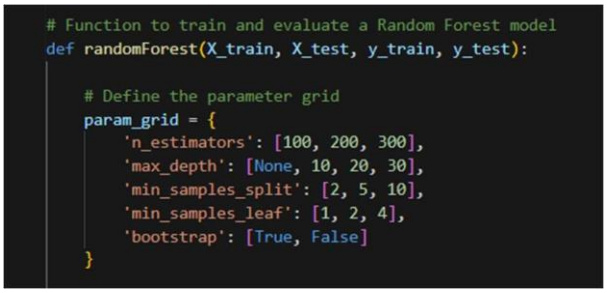
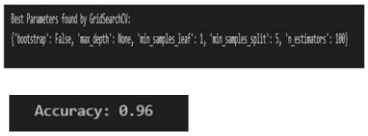
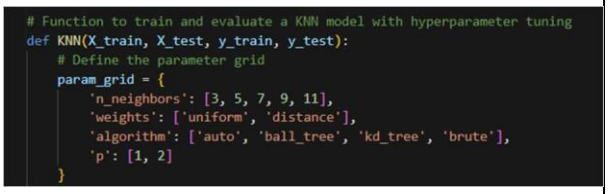
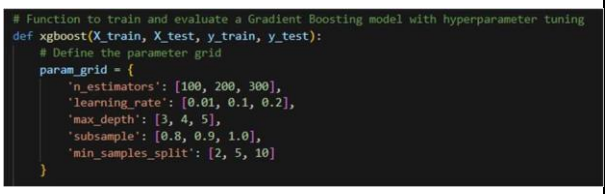
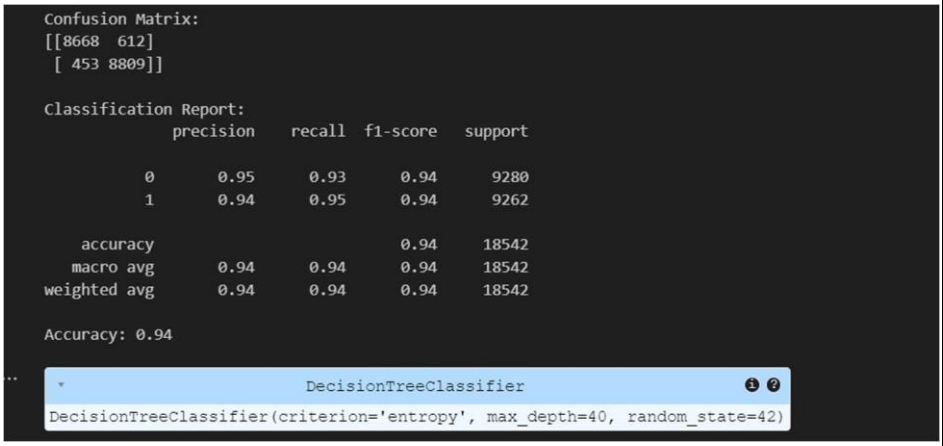
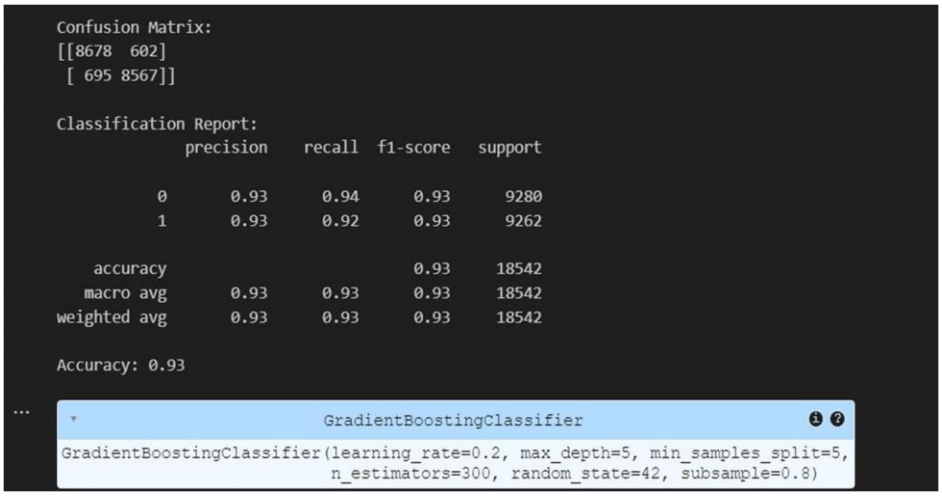
|---|---|---|
| Random Forest |  |  |
| KNN |  |  |
| Gradient Boost |  |  |

Performance Metrics Comparison Report (2 Marks):

| Model | Optimized Metric |
|---|---|
| Decision Tree |  |
| Gradient Boost |  |

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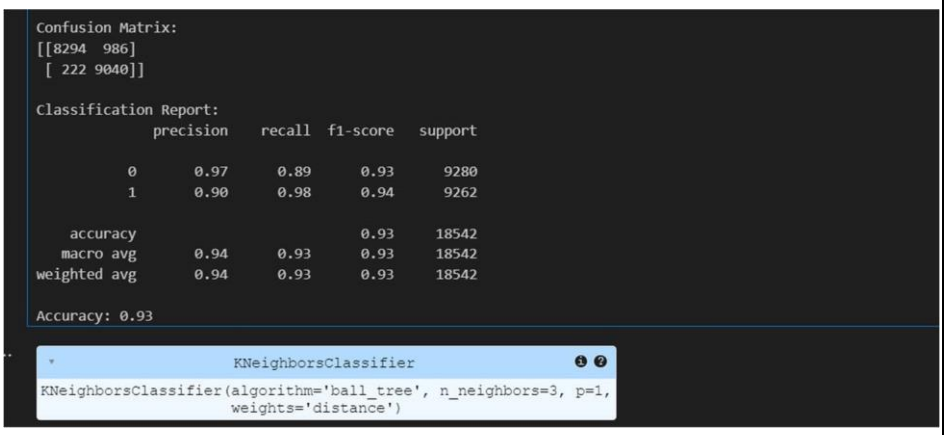
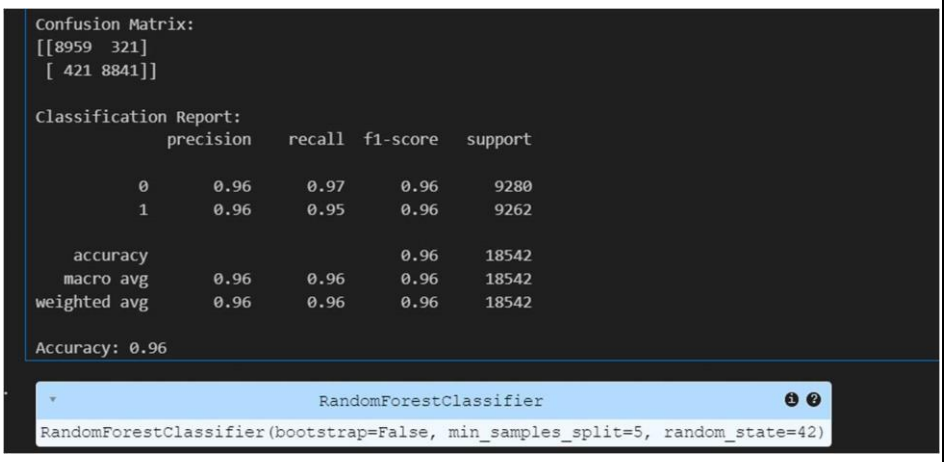
|---|---|
| KNN |  |
| Random Forest |  |

Final Model Selection Justification (2 Marks):

| Final Model | Reasoning |
|---|---|
| **Random Forest** | I chose the Random Forest model as the final model for predicting employee promotions due to its superior accuracy (96%) compared to other models like Decision Tree, KNN, and Gradient Boosting. Random Forest is robust, handles overfitting well, and provides insights into feature importance. It captures complex, non-linear relationships within the data and is scalable for large datasets. Additionally, hyperparameter tuning further optimized its performance, making it a reliable and efficient choice for this task |