Model Development Phase Template

Date	24 June 2025
Team ID	SWUID20250176345
Project Title	Machine Learning Approach for Employee Performance Prediction
Maximum Marks	4 Marks

Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include classification reports, accuracy, and confusion matrices for multiple models, presented through respective screenshots.

Initial Model Training Code:

```
# XGBoost
xgb_model = xgb.XGBRegressor()
xgb_model.fit(X_train, y_train)
xgb_preds = xgb_model.predict(X_test)
xgb_mae = mean_absolute_error(y_test, xgb_preds)
xgb_mse = mean_squared_error(y_test, xgb_preds)
xgb_r2 = r2_score(y_test, xgb_preds)
print("\nXGBoost:")
print(f"MAE: {xgb_mae:.4f}")
print(f"MSE: {xgb_mse:.4f}")
print(f"R² Score: {xgb_r2:.4f}")

```

```
# Random Forest
rf = RandomForestRegressor(random_state=42)
rf.fit(X_train, y_train)
rf_preds = rf.predict(X_test)
rf_mae = mean_absolute_error(y_test, rf_preds)
rf_mse = mean_squared_error(y_test, rf_preds)
rf_r2 = r2_score(y_test, rf_preds)
print("\nRandom Forest:")
print(f"MAE: {rf_mae:.4f}")
print(f"MSE: {rf_mse:.4f}")
print(f"R² Score: {rf_r2:.4f}")
```

```
61
62  # Linear Regression
63  lr = LinearRegression()
64  lr.fit(X_train, y_train)
65  lr_preds = lr.predict(X_test)
66  lr_mae = mean_absolute_error(y_test, lr_preds)
67  lr_mse = mean_squared_error(y_test, lr_preds)
68  lr_r2 = r2_score(y_test, lr_preds)
69  print("\nLinear Regression:")
70  print(f"MAE: {lr_mae:.4f}")
71  print(f"MSE: {lr_mse:.4f}")
72  print(f"R² Score: {lr_r2:.4f}")
```

Model Validation and Evaluation Report:

Model	Performance Summary	MAE / RMSE	Prediction vs Actual Plot / Residual Plot
Linear Regression	Linear Regression: MAE: 0.04347336915994117 MSE: 0.004133703766872829 R² Score: 0.8012302992785618	~0.12 / ~0.15	----- Model Comparison (Based on Test Set) ----- Model MAE MSE R² Score Linear Regression 0.0435 0.0041 0.8012 Random Forest 0.0325 0.0036 0.8289 XGBoost 0.0339 0.0037 0.8220 ✅ Random Forest model and feature order saved successfully. F2 Score: 0.9046547677261 61

Random Forest	Random Forest: MAE: 0.03253990252410063 MSE: 0.0035580692923302647 R² Score: 0.8289097602855915	~0.08/ ~0.11	----- Model Comparison (Based on Test Set) ----- Model MAE MSE Linear Regression 0.0435 0.0041 Random Forest 0.0325 0.0036 XGBoost 0.0339 0.0037 ✅ Random Forest model and feature order saved succes F2 Score: 0.9046454767726161
XgBoost	XGBoost: MAE: 0.033858053386211395 MSE: 0.0037014407571405172 R² Score: 0.8220157623291016	~0.09/ ~0.12	----- Model Comparison (Based on Test Set) ----- Model MAE MSE Linear Regression 0.0435 0.0041 Random Forest 0.0325 0.0036 XGBoost 0.0339 0.0037 ✅ Random Forest model and feature order saved succes F2 Score: 0.9046454767726161