Model Development Phase Template

Date	24 June 2025
Team ID	SWUID20250176341
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:

```python
# 1. Linear Regression Model
model_lr = LinearRegression()
model_lr.fit(X_train, y_train)
pred_test = model_lr.predict(X_test)

mae_lr = mean_absolute_error(y_test, pred_test)
mse_lr = mean_squared_error(y_test, pred_test)
r2_lr = r2_score(y_test, pred_test)

print("\nLinear Regression:")
print("MAE:", mae_lr)
print("MSE:", mse_lr)
print("R² Score:", r2_lr)
```

```python
# 2. Random Forest Model
model_rf = RandomForestRegressor(random_state=42)
model_rf.fit(X_train, y_train)
pred = model_rf.predict(X_test)

mae_rf = mean_absolute_error(y_test, pred)
mse_rf = mean_squared_error(y_test, pred)
r2_rf = r2_score(y_test, pred)

print("\nRandom Forest:")
print("MAE:", mae_rf)
print("MSE:", mse_rf)
print("R² Score:", r2_rf)
```

```
# 3. XGBoost Model
model_xgb = XGBRegressor(random_state=42, verbosity=0)
model_xgb.fit(X_train, y_train)
pred3 = model_xgb.predict(X_test)

mae_xgb = mean_absolute_error(y_test, pred3)
mse_xgb = mean_squared_error(y_test, pred3)
r2_xgb = r2_score(y_test, pred3)

print("\nXGBoost:")
print("MAE:", mae_xgb)
print("MSE:", mse_xgb)
print("R² Score:", r2_xgb)
```

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: 0.9046454767726161

| 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 success
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 success
F2 Score: 0.9046454767726161
``` |