Model Development Phase Template

Date	19 June 2025
Team ID	SWTID1750050475
Project Title	SmartLender - Applicant Credibility Prediction for Loan Approval
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:

```
#--------------------------------
# MODEL TRAINING ABD EVALUATION
# --------------------------------
def train_models(X_train, X_test, y_train, y_test):
    models = {
        'Decision Tree': DecisionTreeClassifier(),
        'Random Forest': RandomForestClassifier(),
        'KNN': KNeighborsClassifier(),
        'Gradient Boosting': GradientBoostingClassifier()
    }

    results = {}

    for name, model in models.items():
        model.fit(X_train, y_train)
        y_pred = model.predict(X_test)

        acc = accuracy_score(y_test, y_pred)
        f1 = f1_score(y_test, y_pred)

        # 5-Fold Cross Validation on training data
        cv_scores = cross_val_score(model, X_train, y_train, cv=5)
        cv_mean = cv_scores.mean()
        cv_std = cv_scores.std()
```

```
    results[name] = {
        'model': model,
        'accuracy': acc,
        'f1_score': f1,
        'cv_mean': cv_mean,
        'cv_std': cv_std
    }

    print(f"Model: {name}")
    print(f"Test Accuracy: {acc:.4f}")
    print(f"F1 Score: {f1:.4f}")
    print(f"Cross-Validation Mean Accuracy: {cv_mean:.4f}")
    print(f"Cross-Validation Std Dev: {cv_std:.4f}")
    print("\nConfusion Matrix:")
    print(confusion_matrix(y_test, y_pred))
    print("\nClassification Report:")
    print(classification_report(y_test, y_pred))
    print("-" * 60)

model_selection(results)
```

Model Validation and Evaluation Report

Model	Classification Report	F1 Score	Confusion Matrix
Random Forest	Classification Report: precision recall f1-score support 0 0.94 0.74 0.83 129 1 0.76 0.95 0.84 111 accuracy 0.84 240 macro avg 0.85 0.85 0.84 240 weighted avg 0.86 0.84 0.84 240	84%	Confusion Matrix: [[96 33] [6 105]]

Decision Tree	Classification Report: precision recall f1-score support 0 0.83 0.78 0.81 129 1 0.76 0.82 0.79 111 accuracy 0.80 240 macro avg 0.80 0.80 0.80 240 weighted avg 0.80 0.80 0.80 240	79%	Confusion Matrix: [[101 28] [20 91]]
KNN	Classification Report: precision recall f1-score support 0 0.74 0.70 0.72 129 1 0.67 0.71 0.69 111 accuracy 0.70 240 macro avg 0.70 0.70 0.70 240 weighted avg 0.71 0.70 0.70 240	69%	Confusion Matrix: [[90 39] [32 79]]
Gradient Boosting	Classification Report: precision recall f1-score support 0 0.90 0.76 0.82 129 1 0.76 0.90 0.83 111 accuracy 0.82 240 macro avg 0.83 0.83 0.82 240 weighted avg 0.84 0.82 0.82 240	83%	Confusion Matrix: [[98 31] [11 100]]