Executive Summary Credit Risk Modeling with Regulatory Compliance and Fairness Analysis

This project presents a credit risk modeling framework designed to estimate the probability of loan default while ensuring regulatory compliance, fairness, and interpretability. The solution supports loan officers and management in making informed, risk-aware lending decisions.

BUSSINESS PROBLEM:

Business Problem

Loan defaults lead to financial losses, increased provisioning requirements, and regulatory scrutiny. Traditional rule-based systems often fail to balance risk reduction with customer inclusion. The objective of this project is to reduce default risk while maintaining profitable and fair loan approval decisions.

MODEL SOLUTION:

Proposed Solution

A two-model approach was implemented:

• Logistic Regression – used as an interpretable baseline model

• LightGBM – used as an advanced model to capture complex risk patterns

The models were trained and validated using structured loan applicant data,

with emphasis on transparency and fairness.

PERFORMANCE → BUSINESS IMPACT:

Model Performance Interpretation

The advanced LightGBM model achieved a very high AUC score, indicating strong

separation between high-risk and low-risk applicants.

This allows the institution to:

• Approve more low-risk customers confidently

• Reduce approvals for high-risk applicants

• Improve overall loan portfolio quality

EXPECTED BUSINESS OUTCOMES:

Expected Impact

By applying risk-based approval thresholds, the institution can expect:

• Reduction in loan defaults

• Improved credit portfolio stability

• Better capital efficiency

• Increased long-term profitability

FINAL RECOMMENDATION:

Recommendation

It is recommended to deploy the model as a decision-support system with human oversight. Continuous monitoring of performance, fairness metrics, and data drift should be implemented to ensure long-term effectiveness.