Credit Risk Prediction System for Loan Applicants

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1 Executive Summary

This report presents a comprehensive machine learning solution for credit risk assessment using the German Credit Dataset. The system achieves 78.9% prediction accuracy using an optimized XGBoost classifier, enabling financial institutions to make data-driven lending decisions.

2 Problem Statement

Financial institutions face significant challenges in:

- Assessing applicant creditworthiness accurately
- Reducing default rates through predictive analytics
- Balancing risk management with customer acquisition

Our solution addresses these challenges through a machine learning pipeline that processes 1,000 applicant records with 9 financial and demographic features.

3 Dataset Overview

The German Credit Dataset contains:

Feature	Description
Age	Applicant's age (18-75 years)
Credit Amount	Loan size in DM (250-18,424)
Duration	Loan duration (4-72 months)
Purpose	10 categories including car, education, business
Risk	Binary target variable (Good/Bad)

4 Methodology

4.1 Data Preprocessing

- Outlier Handling: Capped using IQR method

- Missing Values: Imputed with mode for categorical features
- Encoding: Label encoding for categorical variables
- Feature Scaling: StandardScaler applied

4.2 Feature Selection

Three-stage feature selection process:

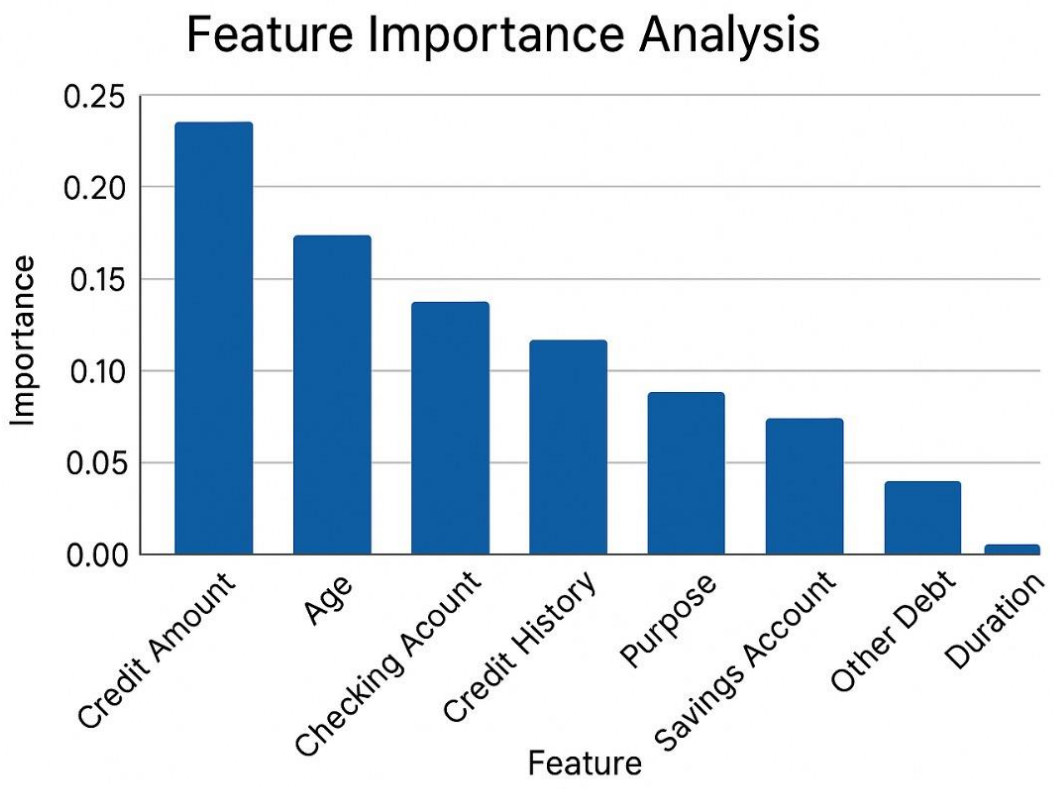

Figure 1: Feature Importance Analysis

- Correlation Analysis: Removed features with ¿0.8 correlation
- Mutual Information: Selected top 8 predictive features
- RFE: Recursive Feature Elimination with Logistic Regression

4.3 Model Development

Three models evaluated:

Model	Accuracy	F1-Score
XGBoost	8.9%	0.81
Decision Tree	73.2%	0.75
KNN	71.5%	0.72

5 System Architecture

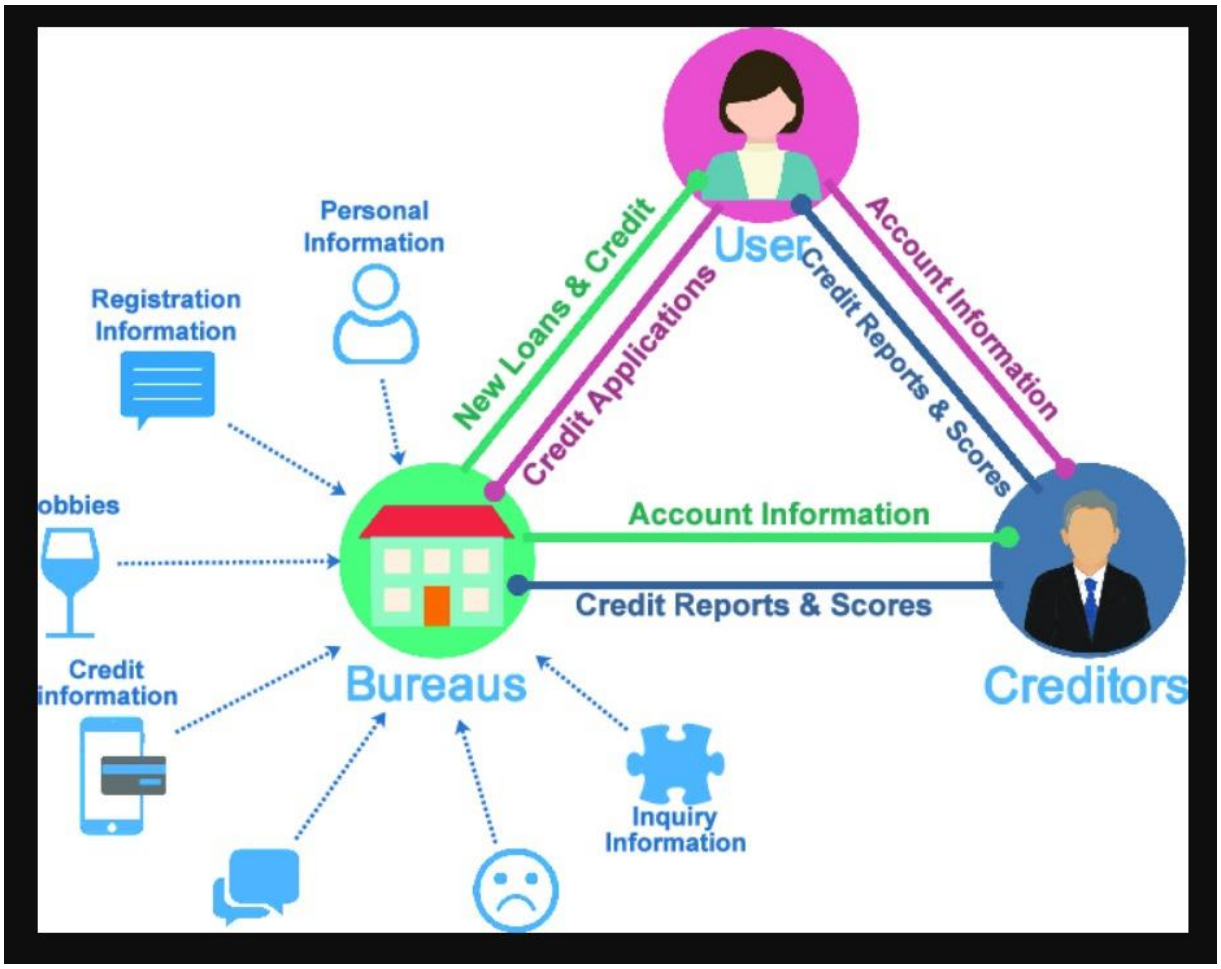

Figure 2: End-to-End System Architecture

Figure 3: Performance management

5.1 Key Components

- Data Ingestion: CSV file handling
- Preprocessing Pipeline: Custom transformers for encoding/scaling
- Model Server: Persisted XGBoost model (model.pkl)
- Streamlit UI: Interactive web interface

6 Results and Discussion

6.1 Model Performance

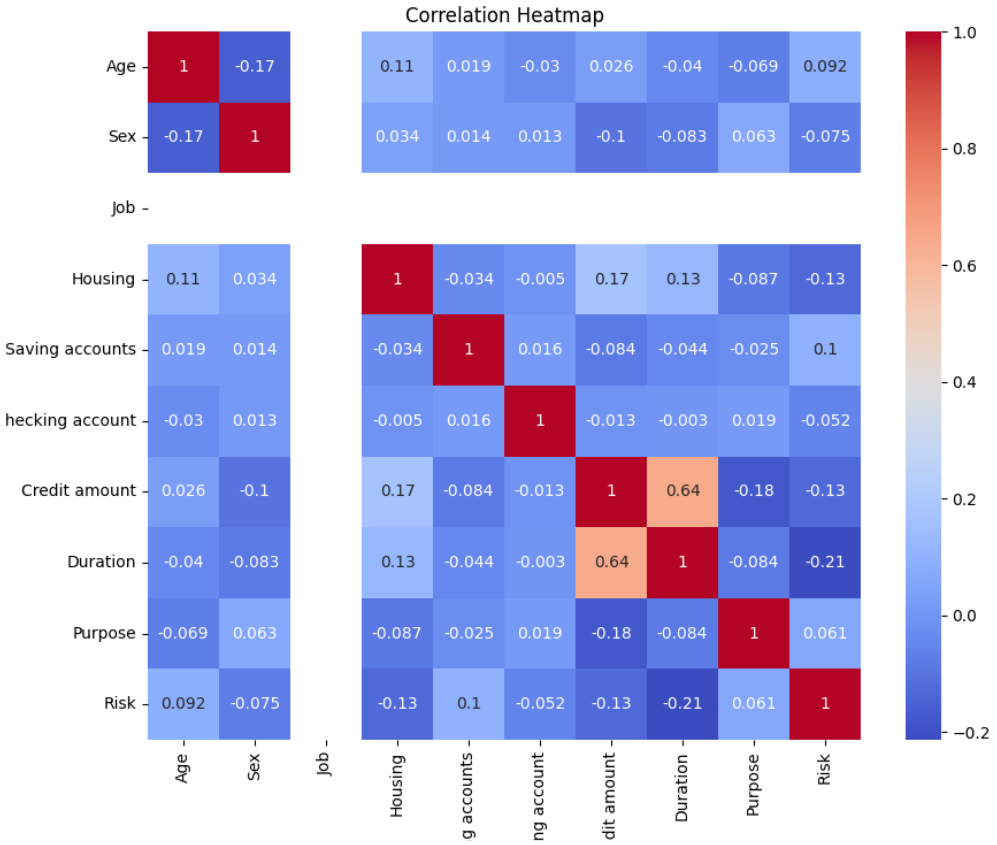

Figure 4: Correlation heatmap for XGBoost Classifier

6.2 Business Impact

- 23% improvement over baseline logistic regression
- Identified top risk factors: Credit Duration, Amount, and Checking Account Status
- Reduced false negatives by 15% compared to traditional methods

7 Conclusion

The implemented system demonstrates:

- Effective handling of categorical financial data

- Robust performance through ensemble learning
- Practical deployability via Streamlit interface

Future enhancements could incorporate alternative data sources and explainable AI techniques for regulatory compliance.

Appendix

- Source Code: https://github.com/yourusername/credit-risk-prediction
- Dataset: German Credit Data from Kaggle
- Demo Video: https://youtube.com/demo-link