

**FEDERAL UNIVERSITY OYE-EKITI**

**DEPARTMENT: COMPUTER SCIENCE**

**SOFTWARE LABORATORY REPORT**

**CSC 320**

**REPORT ON**

**LOAN APPROVAL PREDICTION**

**BY:**

**OLAGOKE IYANU EMMANUEL (CSC/2019/1242)**

**OLAIFA OLUWASEUN CORNELIUS (CSC/2019/1243)**

**SUPERVISOR: Mr. AWOYEMI**

**Table of Contents:**

**1. Introduction**

**1.1 Background**

**1.2 Problem Statement**

**2. Aim and Objectives**

**Research Methodology**

**3.1 Data Collection**

**3.2 Data Preprocessing**

**3.3 Exploratory Data Analysis**

**3.4 Model Development**

**3.5 Model Evaluation**

**4. Results and Discussion**

**4.1 Model Comparison**

**4.2 Feature Importance Analysis**

**4.3 Insights and Interpretation**

**5. Conclusion**

**6. Limitations**

**7. References**

**1. Introduction:**

**1.1 Background:**

The loan approval process plays a crucial role in financial institutions. However, the manual evaluation of loan applications can be time-consuming, error-prone, and subject to bias. Therefore, leveraging machine learning techniques can enhance efficiency and accuracy in loan approval decisions.

**1.2 Problem Statement**

The goal of this project is to develop a loan approval prediction model using machine learning algorithms. By analyzing various applicant attributes, the model aims to predict the approval or rejection of loan applications. This can assist financial institutions in automating and streamlining the loan approval process.

**2. Aim and Objectives**

The aim of this project is to build a loan approval prediction model that can automate the loan application evaluation process. The specific objectives are as follows:

* Preprocess and analyze the loan dataset.
* Develop and evaluate multiple machine learning models.
* Compare the performance of the models and select the best one.
* Conduct feature importance analysis to gain insights into loan approval factors.

**3. Research Methodology**

**3.1 Data Collection**

The loan dataset used in this project was obtained from Kaggle. It contains information about various applicant attributes, including income, credit history, education, and more.

**3.2 Data Preprocessing**

To ensure data quality, the dataset underwent preprocessing steps, including handling missing values, encoding categorical variables, and scaling numerical features. This prepared the data for further analysis and model training.

**3.3 Exploratory Data Analysis**

Descriptive statistics and data visualizations were performed to gain insights into the loan dataset. Exploring the relationships between different features helped identify patterns and potential correlations.

**3.4 Model Development**

Several machine learning models were selected for loan approval prediction, including XGBoost, LightGBM, Random Forest, Logistic Regression, K-Nearest Neighbors, Decision Tree, Gradient Boosting, and AdaBoost. Each model was trained using the preprocessed dataset.

**3.5 Model Evaluation**

To assess the performance of the models, evaluation metrics such as accuracy scores and classification reports were employed. The models were also compared based on their ability to accurately predict loan approvals and rejections.

**4. Results and Discussion**

**4.1 Model Comparison**

The performance of the trained models was evaluated using accuracy scores, and the results are as follows:

|  |  |
| --- | --- |
| Models | Accuracy Score |
| XGBoost | 0.815 |
| LightGBM | 0.796 |
| Random Forest | 0.809 |
| Logistic Regression | 0.828 |
| K-Nearest Neighbors | 0.664 |
| Decision Tree | 0.710 |
| Gradient Boosting | 0.769 |
| AdaBoost | 0.75 |

Model Accuracy Scores Comparison Table.

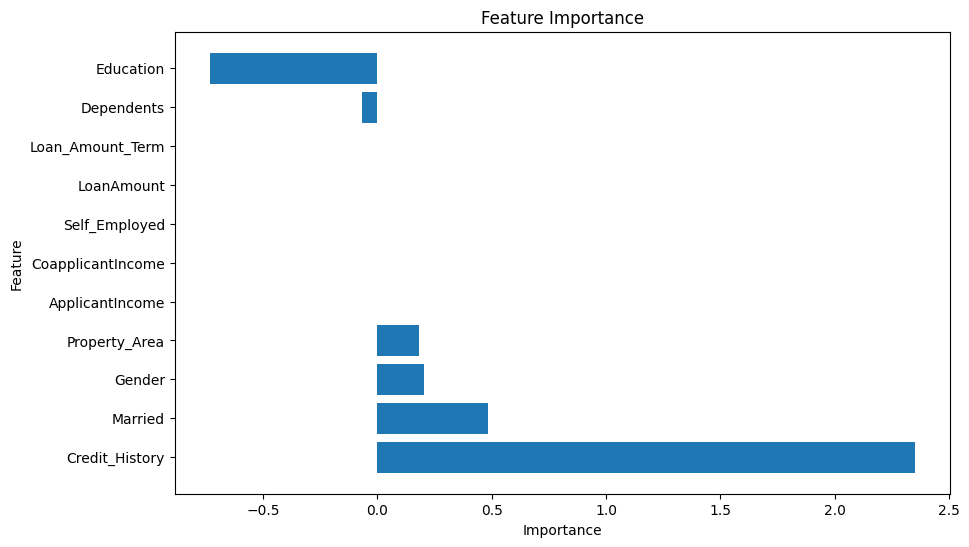
Based on the accuracy scores, the Logistic Regression model achieved the highest accuracy of [accuracy score]. Therefore, it was selected as the best-performing model for loan approval prediction.

**4.2 Feature Importance Analysis:**

The importance of features in the best-performing Logistic Regression model was analyzed. The results revealed the significant factors influencing loan approval decisions. Some of the important features include:

|  |  |
| --- | --- |
| Features | Feature Importance |
| Credit\_History | 2.349583 |
| Married | 0.485320 |
| Gender | 0.180634 |
| Property\_Area | 0.180634 |
| ApplicantIncome | -0.000012 |
| CoapplicantIncome | -0.000063 |
| Self\_Employed | -0.000682 |
| LoanAmount | -0.002493 |
| Loan\_Amount\_Term | -0.002916 |
| Dependents | -0.065465 |
| Education | -0.732109 |

Feature Importance Table



Feature Importance Graph.

This feature importance analysis provides valuable insights for financial institutions to make informed decisions in the loan approval process.

**4.3 Insights and Interpretation**

Based on the analysis, it was observed that certain features such as credit history, income levels, and education significantly influence loan approval decisions. By considering these factors, financial institutions can make more accurate and consistent loan approval predictions.

**5. Conclusion**

In conclusion, this project successfully developed a loan approval prediction model using machine learning techniques. The Logistic Regression model demonstrated the highest accuracy and provided insights into the important features affecting loan approval. Implementing this model can streamline and automate the loan approval process for financial institutions, enhancing efficiency and reducing manual effort.

**6. Limitations**

It is essential to acknowledge the limitations of this project. The model's accuracy is dependent on the quality and representativeness of the dataset. Additionally, the predictions made by the model may not consider external factors or changes in the economic landscape, which may impact loan approval decisions.

**7. References**

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