Credit Risk Modelling – Loan Classification

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Loan Classification Analysis Report

- **Executive Summary**

- This report provides a comprehensive analysis of the loan classification dataset, highlighting key insights into applicant demographics, financial history, and loan approval trends. The study leverages statistical summaries, correlation analyses, and machine learning techniques to deliver actionable insights for financial institutions. The findings aim to optimize risk assessment, streamline loan approvals, and enhance decision-making.

- **1. Dataset Overview**

- **Total Records**: 41,188

- **Total Features**: 60
  - **Numerical Features**: Age, previous campaigns, days since last contact
  - **Categorical Features**: Job type, marital status, education, loan history, contact type, past outcomes

- **Missing Values**: None observed in the dataset

2. Key Findings

2.1 Loan Approval Distribution

The dataset is imbalanced, with a lower percentage of applicants getting approved.

Applicants with a strong financial background and stable employment are more likely to get approval.

Visualization: A Bar Chart (Figure 1) highlights the comparison between number of rejected loans and number of approved loans.
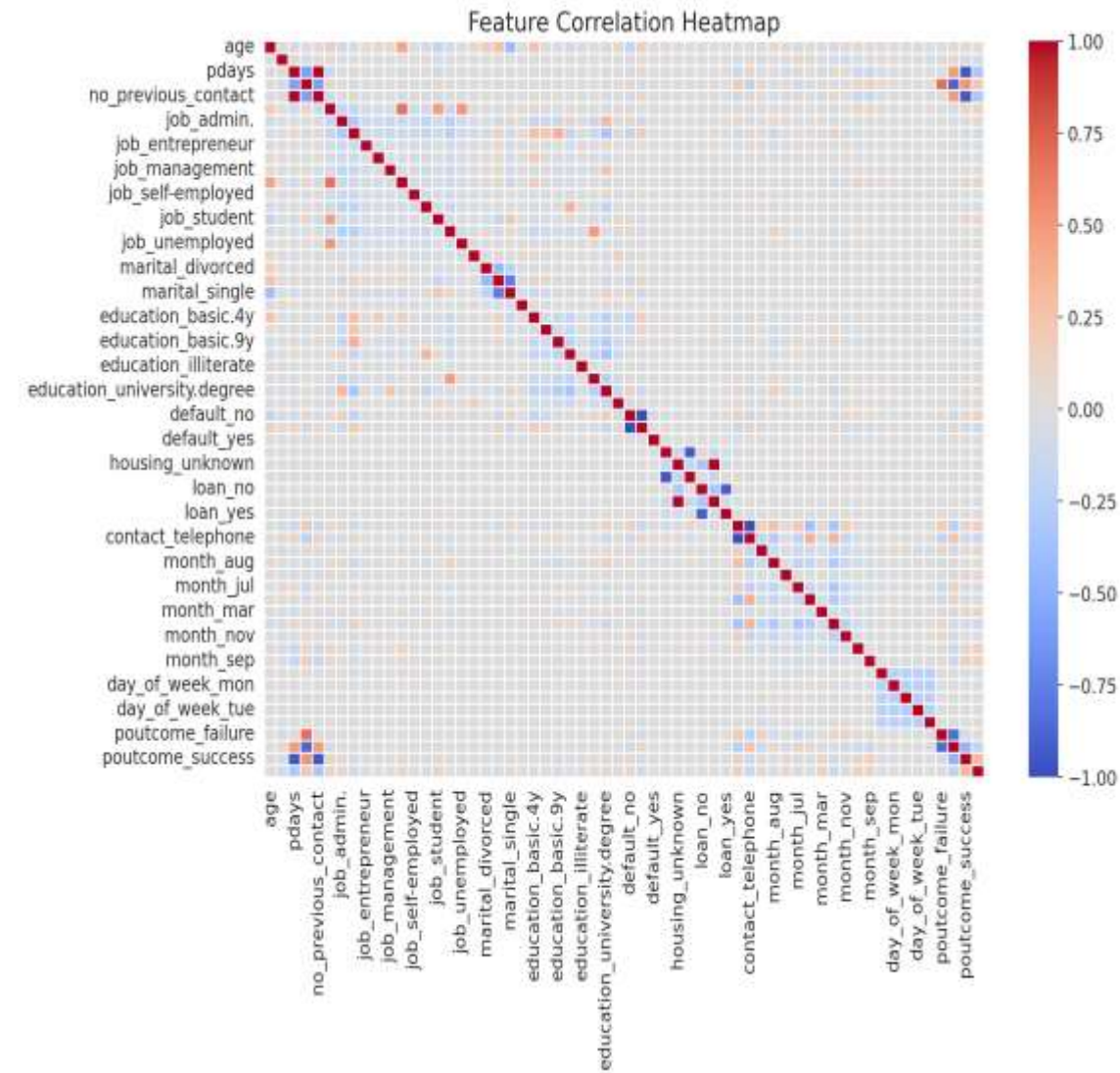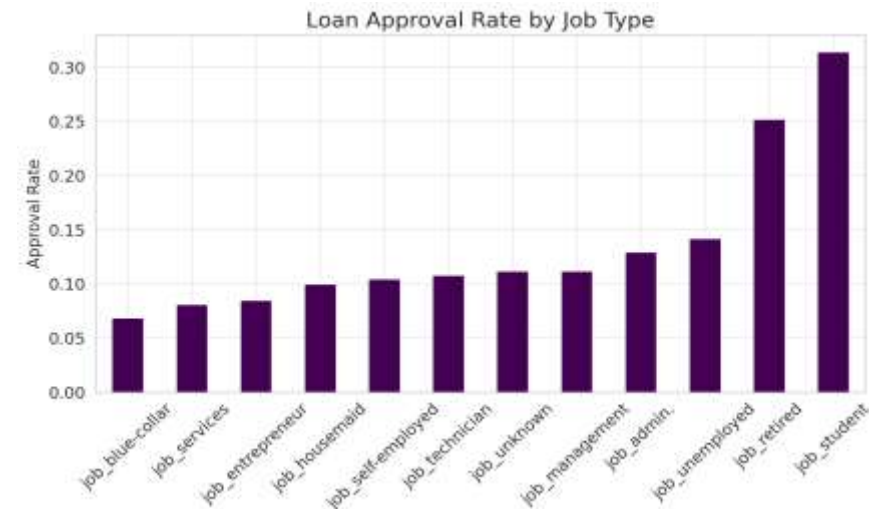

Figure 1

Feature Correlation Heatmap

Figure 2

Loan Approval Rate by Job Type
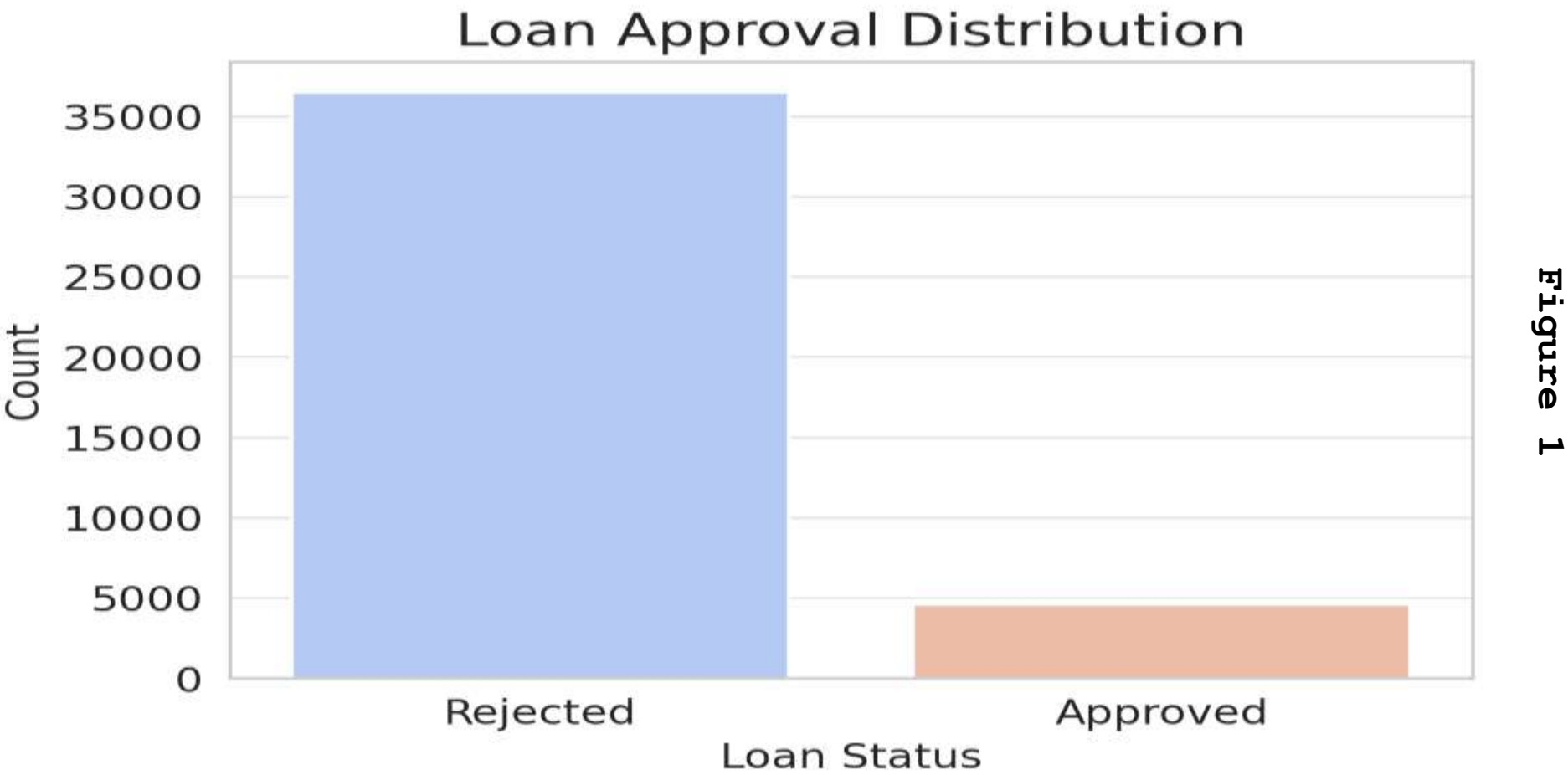
Figure 3

2.2 Correlations → **Loan approval is strongly correlated with:**
- Employment status and job type
- Housing loan status
- Past loan repayment history

Weak correlations with certain demographic factors such as marital status → **Visualization:**

The **Correlation Heatmap (Figure 2)** highlights relationships between key features, showing which attributes are most strongly linked to loan approval.

The **Loan Approval Rate by Job Type (Figure 3) bar chart** shows how different professions impact loan approval rates. Certain Job types have higher approval rates, likely due to financial stability.
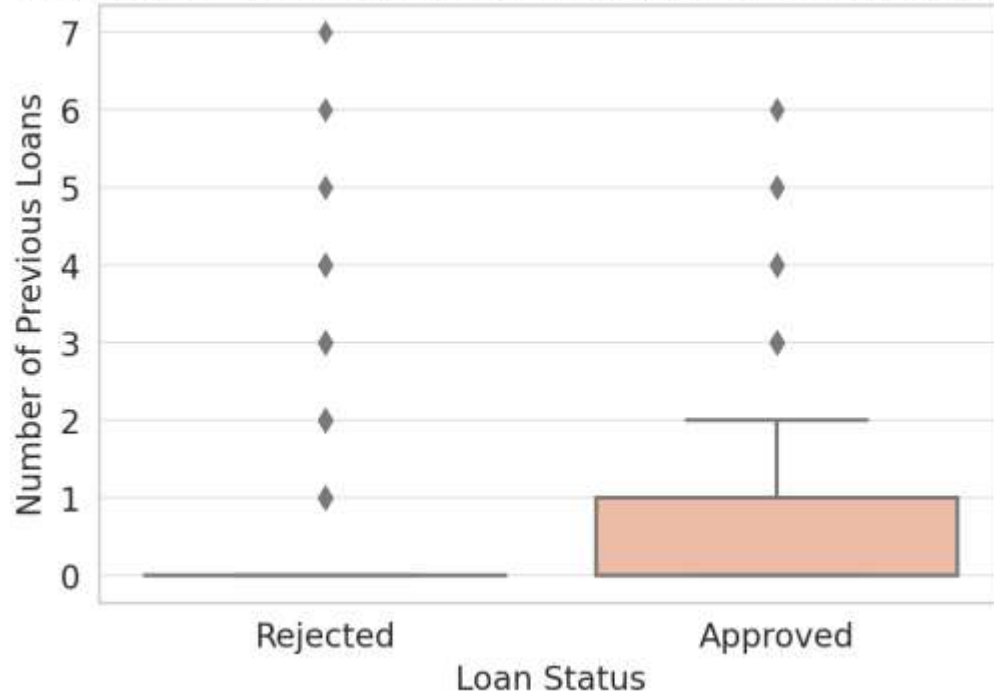
Impact of Previous Loan Repayments on Approval

Figure 4

- **2.3 Influence of Financial History**

- Applicants with a history of **successful loan repayments** have a higher chance of approval.

- Loan defaults and unknown credit history negatively impact approval rates.

- **Visualization:**

  The **boxplot (Figure 4)** illustrates the impact of past loans on approval. Applicants with a history of previous loans tend to have higher approval chances, indicating that financial institutions favor borrowers with established credit histories.
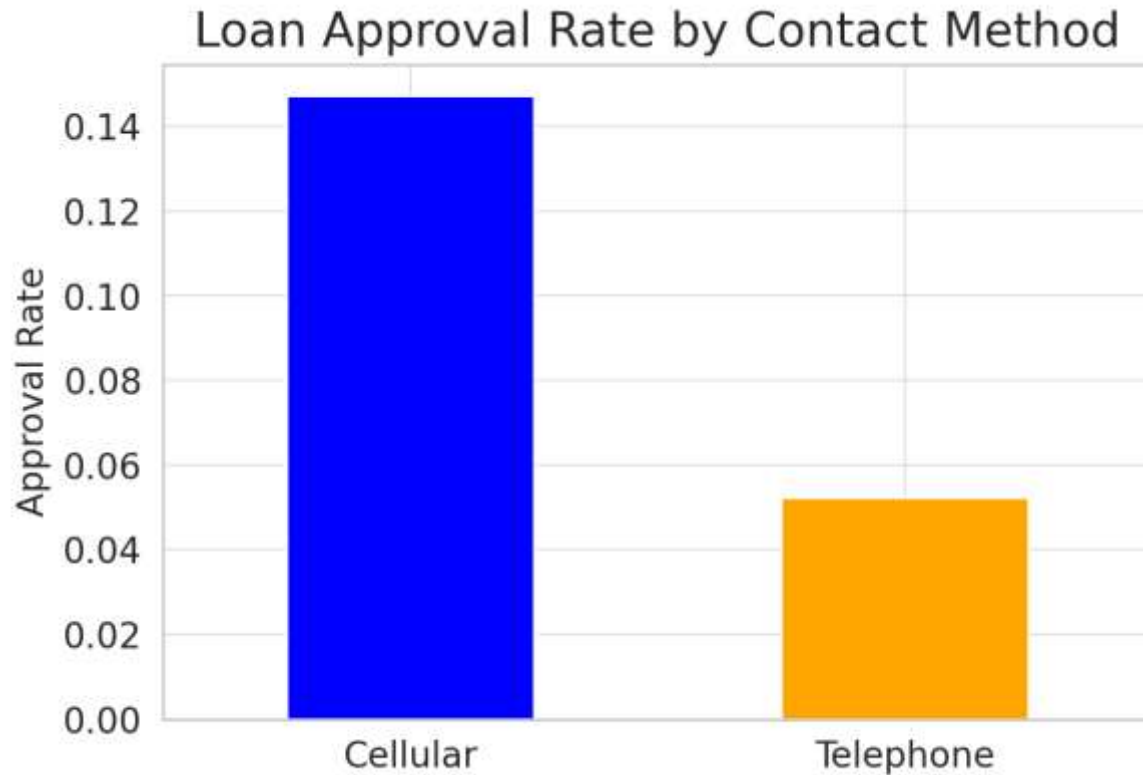
Loan Approval Rate by Contact Method

Figure 5

- **2.4 Contact Method and Loan Approval**
- Applicants contacted via **cellular networks** have a slightly higher approval rate compared to those contacted via telephone.
- The effectiveness of loan offers is dependent on the timing of outreach (day and month of contact).
- **Visualization:**

  The **Loan Approval Rate by Contact Method** chart (Figure 5) shows that applicants contacted via **cellular networks** tend to have a slightly higher approval rate than those contacted via telephone.

- ## **2.5 Feature Interactions**

- A combination of job type, previous loan approvals, and housing loan status plays a significant role in determining loan outcomes.

- # **3. Recommendations**

- ## **For Financial Institutions:**

- Prioritize applicants with **stable employment** and a positive loan repayment history.

- Implement more robust **risk assessment models** using machine learning techniques.

- ## **For Loan Applicants:**

- Maintain a **good credit history** and ensure timely loan repayments.

- Consider improving financial stability through secure employment and asset ownership.

- ## **For Marketing Teams:**

- Optimize **loan offer campaigns** based on contact preferences and historical success rates.

- Leverage insights from past loan approvals to improve outreach strategies.

4. Appendices Data Visualization

- **Figure 1:** Comparison between number of rejected loans and number of approved loans bar chart

- **Figure 2:** Correlation Heatmap

- **Figure 3:** Loan Approval Rate by Job Type (Figure 3) bar chart

- **Figure 4:** The boxplot about impact of previous Loan Payments

- **Figure 5:** The Loan Approval Rate by Contact Method bar chart

5. Conclusion

The analysis highlights key factors influencing loan approvals, such as employment status, financial history, and contact methods. By leveraging data-driven insights, financial institutions can enhance their decision-making processes, reduce risks, and improve customer satisfaction. Future work can involve **advanced machine learning models** to further refine loan prediction accuracy and automate the approval process efficiently.