Financial Risk Modeling & Visualization

Duration: October 2024 – December 2024

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# 1. Objective

To analyze borrower profiles and predict the likelihood of loan default using machine learning models, visual analytics, and statistical methods. The goal is to support credit policy refinement and enable proactive risk detection in loan approval processes.

# 2. Dataset Overview

Source: Anand\_Gopalakrishnamurthy\_loan\_data.xlsx

Size: 45,000 records × 14 features

Key Fields: Demographics (person\_age, person\_gender, person\_education, person\_income), Credit factors (credit\_score, previous\_loan\_defaults\_on\_file, loan\_int\_rate, loan\_status), Target variable: loan\_status (1 = Default, 0 = No Default)

# 3. Methodology

Tools Used: Python (Pandas, Scikit-learn, Seaborn, Matplotlib), SQL, Tableau

Techniques Applied:  
- Data Cleaning & Preprocessing (encoding, scaling)  
- Logistic Regression and Decision Tree modeling  
- ROC-AUC, Accuracy, Classification Reports for evaluation

# 4. Modeling Results

|  |  |  |
| --- | --- | --- |
| Model | ROC-AUC | Accuracy |
| Logistic Regression | 0.943 | 89.0% |
| Decision Tree | 0.948 | 88.4% |

Key Findings:  
- Credit Score and Loan Interest Rate were top predictors of default.  
- Loan Percent of Income and Previous Defaults also contributed significantly.  
- Model output was exported to Tableau for segmentation and dashboard creation.

# 5. Visual Insights (Tableau & PPT Highlights)

- Approval Rate by Demographics: Peak at 100% among 63-year-old females with a Master’s degree.  
- Loan Amount vs Income: Females surpassed males at some income levels.  
- Default Rate by Credit History: Higher approvals for females despite higher past defaults.  
- Credit Score Distribution: Higher scores among higher-income males.  
- Previous Defaults: Females >55% prior defaults, indicating higher risk.

# 6. Business Impact

- Enabled targeted credit decisions through risk segmentation.  
- Identified demographic approval biases not aligned with default risk.  
- Equipped stakeholders with actionable insights via Tableau dashboards.

# 7. Conclusion

Combining machine learning and visualization exposed risk profiles missed by traditional rules. A data-driven strategy is key to refining credit approval and mitigating risk.

# 8. Deliverables

- Tableau Dashboard: Anand\_Gopalakrishnamurthy\_LOAN APPROVAL RISK.twbx  
- Data File: Anand\_Gopalakrishnamurthy\_loan\_data.xlsx  
- Model Output: loan\_risk\_model\_results.csv  
- Python Notebook: Untitled.ipynb  
- Presentation Slides: Anand\_Gopalakrishnamurthy\_LOAN APPROVAL RISK.pptx