

Loan Default Risk Analysis

SQL- Based Lending Risk Insights

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Data Analytics Portfolio Project

Project Overview & Objective

This project leverages a comprehensive LendingClub loan dataset to uncover critical risk factors influencing personal loan defaults using SQL. By transforming raw data into actionable insights, the goal is to showcase advanced skills in data cleaning, SQL querying, and analytical interpretation for robust lending risk assessment.

Uncover Key Risk Factors

Identify which loan attributes correlate most strongly with default rates.

Generate Actionable Insights

Provide data-driven recommendations for improving loan underwriting processes.



Tools & Dataset

Dataset: LendingClub Loan Data

A publicly available dataset from Kaggle, containing millions of past loan applications with various attributes and their default status.

This rich dataset provides a realistic scenario for analyzing financial risk in consumer lending.



Tools Used for Analysis



SQL (SQLite)

For efficient data querying, cleaning, and transformation.



Excel

Initial data cleaning and preliminary exploration.



DB Browser

Visual interface for SQLite database management.



GitHub

Version control and project portfolio showcase.



Data Cleaning & Transformation

The raw LendingClub dataset required significant cleaning and transformation to ensure accuracy and usability for analysis. This critical step involved:

Handling Missing Values

Identified and addressed nulls, especially in critical financial fields.

Parsing & Formatting

Extracted numerical values from text fields (e.g., loan term from "36 months").

Categorization

Grouped continuous data (like DTI, income) into meaningful bands for easier analysis.

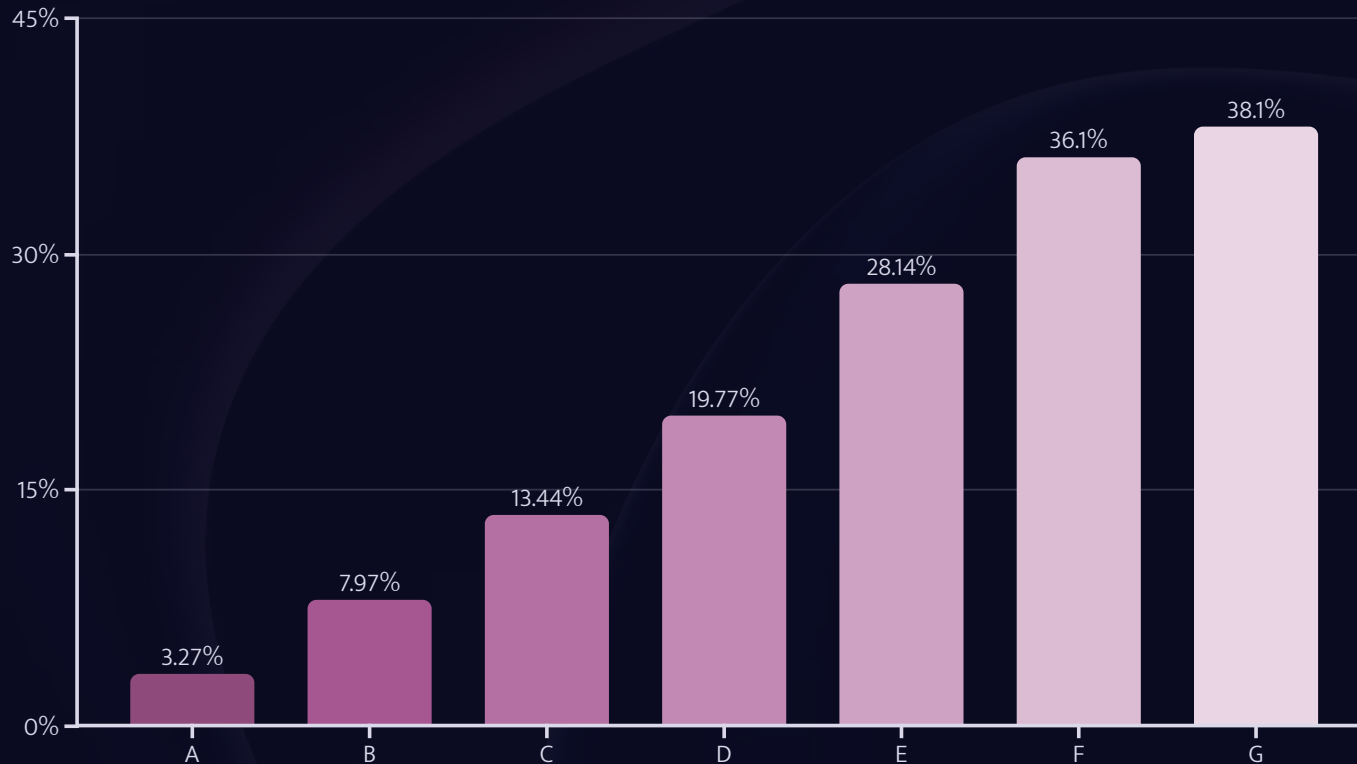
Schema Refinement

Simplified and optimized table structure for efficient querying.

Key Business Insights

Risk Assessment Across Loan Grades

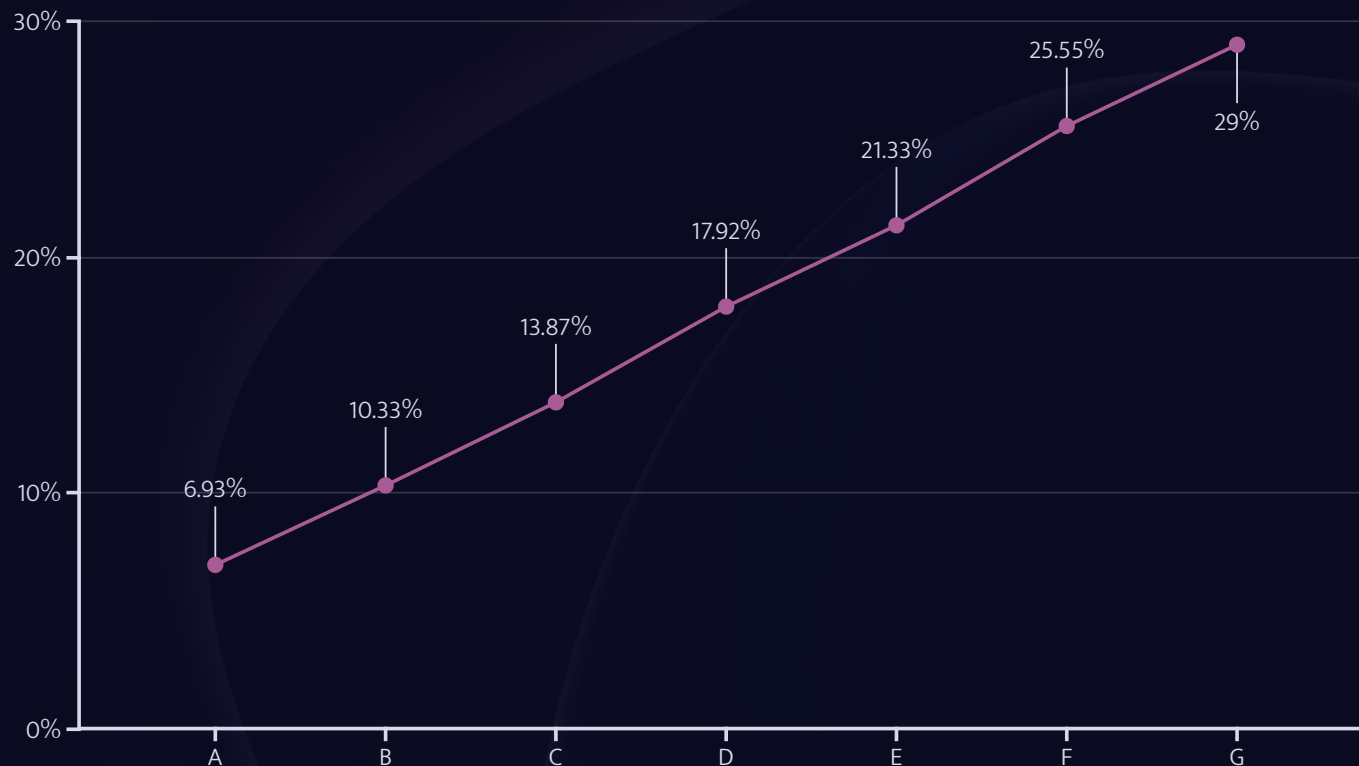
Loan grade is a primary indicator of risk, with a stark contrast in default rates across the spectrum.



⊗ **Observation:** Default rates escalate significantly with lower loan grades, indicating higher inherent risk.

Grade-Linked Interest Rate Dynamics

Interest rates are directly correlated with loan grades, reflecting the risk premium for less creditworthy borrowers.



🔍 **Observation:** Higher risk (lower grade) corresponds to significantly higher average interest rates, as expected.

Risk Profiling Based on Borrower Intent

The purpose for which a loan is taken significantly impacts its likelihood of default.



Small Business

Highest Default Rate ~17.9%

Often unpredictable cash flows, higher inherent business risk.



Debt Consolidation

High Default Rate: ~13.2%

Borrowers potentially over-leveraged, seeking to simplify payments.



Home Improvement

Moderate Default Rate: ~10.4%

Often secured by property, but still subject to borrower's financial stability.



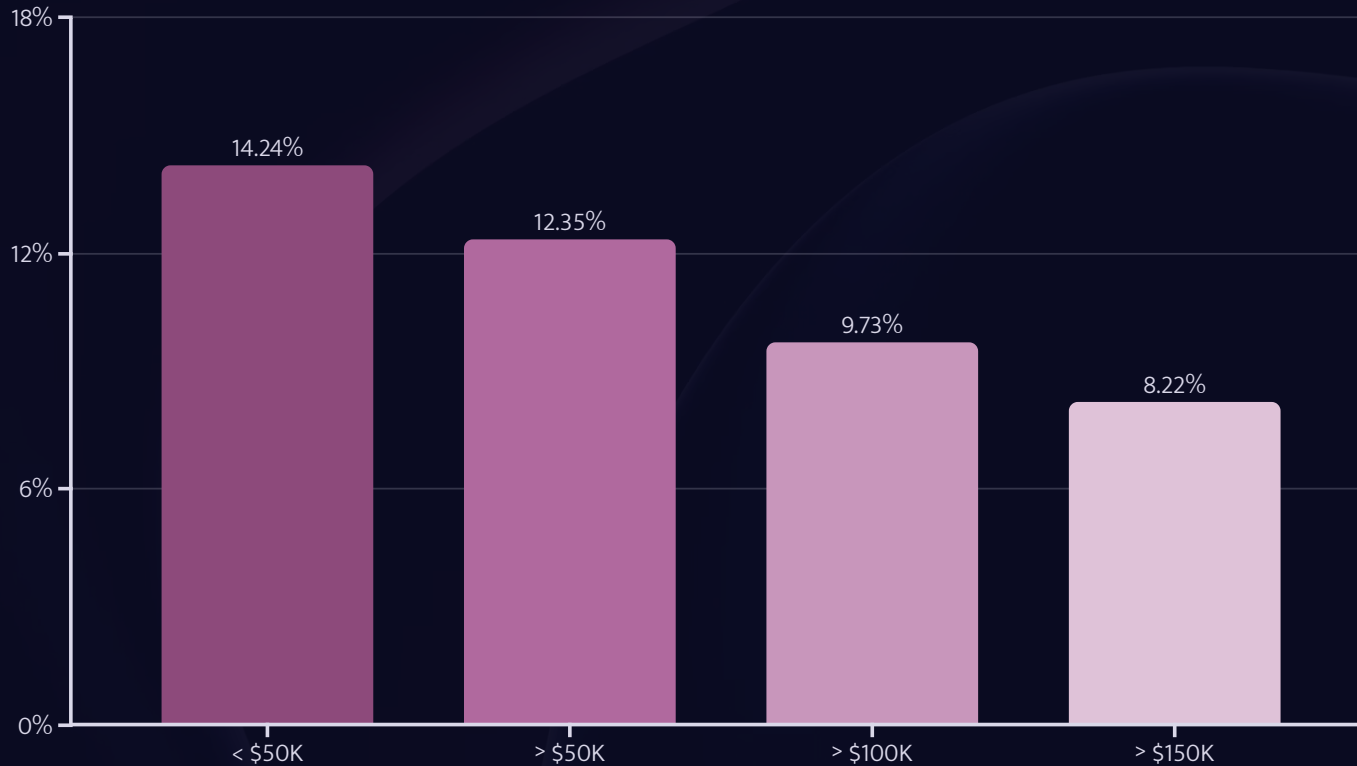
Car Financing

Lower Default Rate: ~9%

Typically secured, and vehicles are essential for daily life.

Assessing Default Risk Across Income Tiers

Income tier analysis enhances default risk prediction by highlighting repayment capacity, while acknowledging that other factors also influence borrower outcomes.



📌 **Observation:** Generally, higher income bands correlate with lower default rates, as expected, reinforcing financial stability as a key factor.

A Risk Level Map Map

Geographic Insights into Loan Default Patterns

Regional economic and demographic conditions play a crucial role in shaping borrower default behavior

Top Risky States:

Arkansas (AR)

Alabama (AL)

South Dakota (SD)

Lowest Risk States:

Maine (ME)

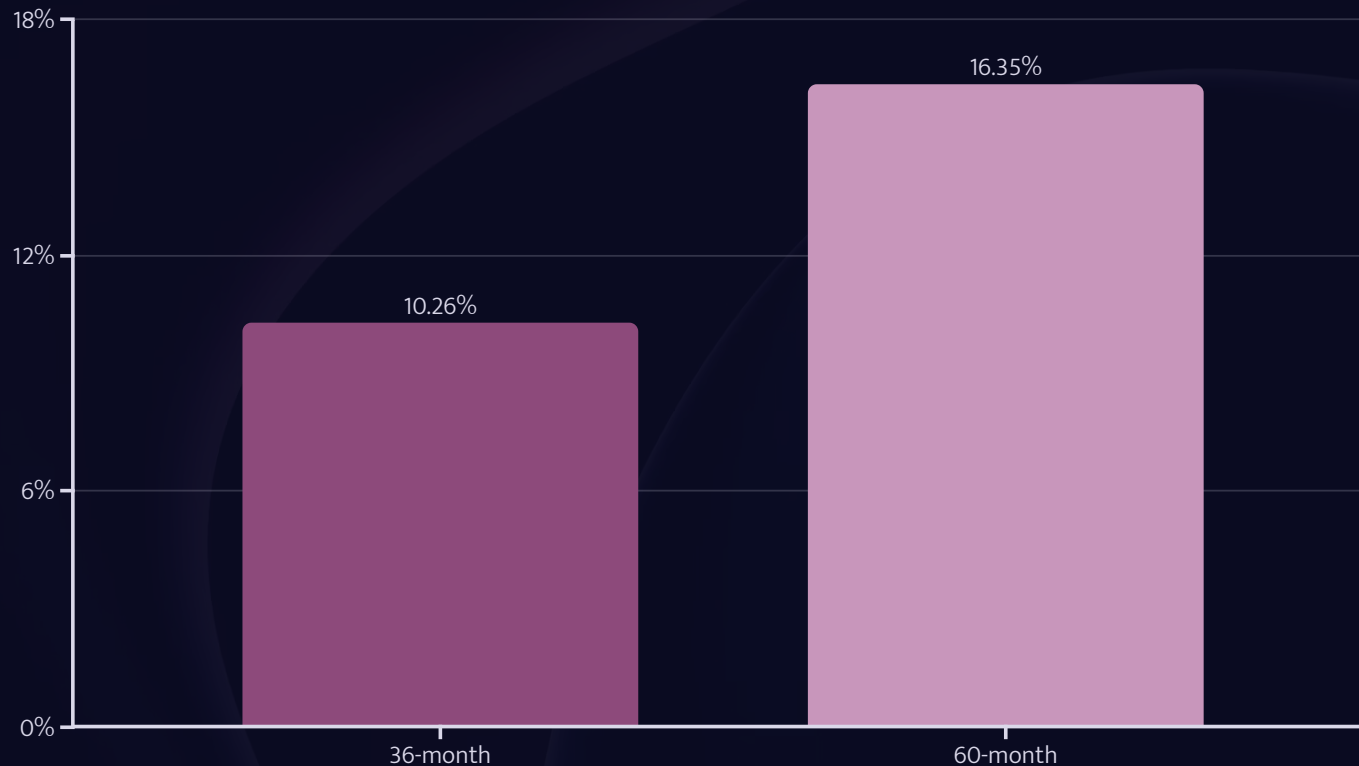
Vermont (VT)

Idaho (ID)

⊗ **Insight:** States with lower average incomes or higher unemployment rates tend to show elevated default risks.

Analyzing Default Trends by Loan Term

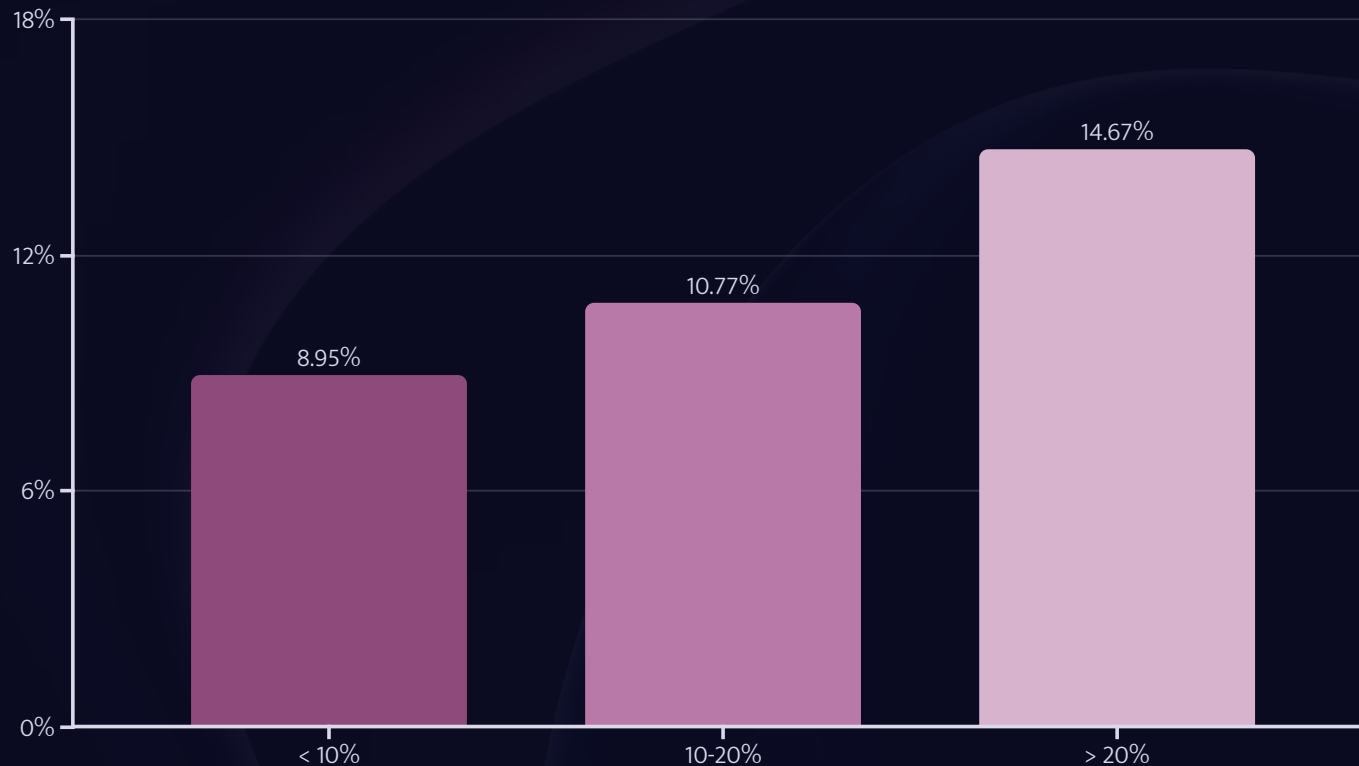
The duration of a loan directly impacts its associated risk. Longer terms generally increase exposure to unforeseen financial events.



⊗ **Observation:** 60-month term loans exhibit significantly higher default rates than 36-month terms, nearly doubling the risk.

Evaluating Borrower Risk via DTI Levels

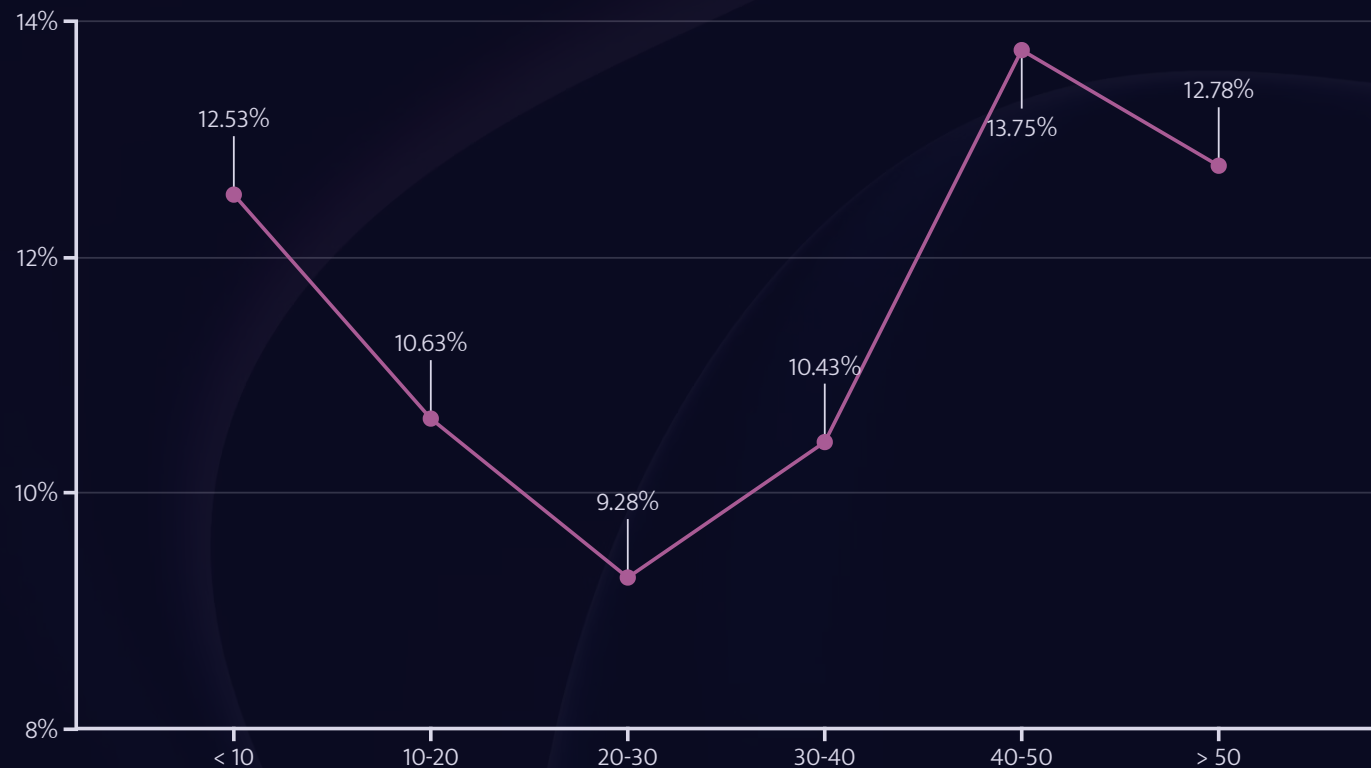
Debt-to-Income (DTI) ratio is a crucial metric, indicating a borrower's capacity to manage debt payments.



⊗ **Observation:** Higher DTI bands correlate with increased default rates, with DTI over 30% showing a clear elevation in risk.

Default Trends Relative to Credit Age

The length of a borrower's credit history often reflects financial maturity and stability, influencing default risk.



🔍 **Insight:** Borrowers with 20–40 years of credit history show the lowest default rates, emphasizing the reduced credit risk associated with long-term financial stability.

Key Recommendations

Actionable Insights for Underwriting

Based on the analysis, here are key recommendations for refining loan underwriting processes to mitigate default risk.

Risk-Adjusted Lending

Implement dynamic interest rates and loan terms strictly based on loan grade and DTI.

Purpose-Specific Vetting

Apply stricter criteria for "Small Business" and "Debt Consolidation" loans, considering their higher default rates.

Geographic Risk Scoring

Integrate state-level economic indicators into risk models, with special attention to high-risk states identified.

Credit History Emphasis

Prioritize applicants with longer, established credit histories, indicating proven financial responsibility.

Skills & Contact

My SQL & Data Analytics Skills



Advanced SQL Querying

Complex joins, subqueries, window functions.



Statistical Correlation and Trend Analysis

Identifying correlations, trends, and anomalies.



Business Acumen

Connecting data insights to practical business recommendations.



Data Visualization & Storytelling

Translating complex data into clear, impactful visuals.



ETL Processes

Extracting, transforming, and loading data for analysis.



Version Control (Git)

Managing code and collaborating on projects effectively.

Let's Connect!



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Explore the Project

🔗 GitHub: github.com/abhiv0040/loan-default-risk-analysis

👤 LinkedIn: linkedin.com/in/averma2025

"Data is not just about numbers; it's about telling a compelling story and solving real-world problems."