

LENDING CLUB CASE STUDY

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Problem Statement

Loan Decisions :

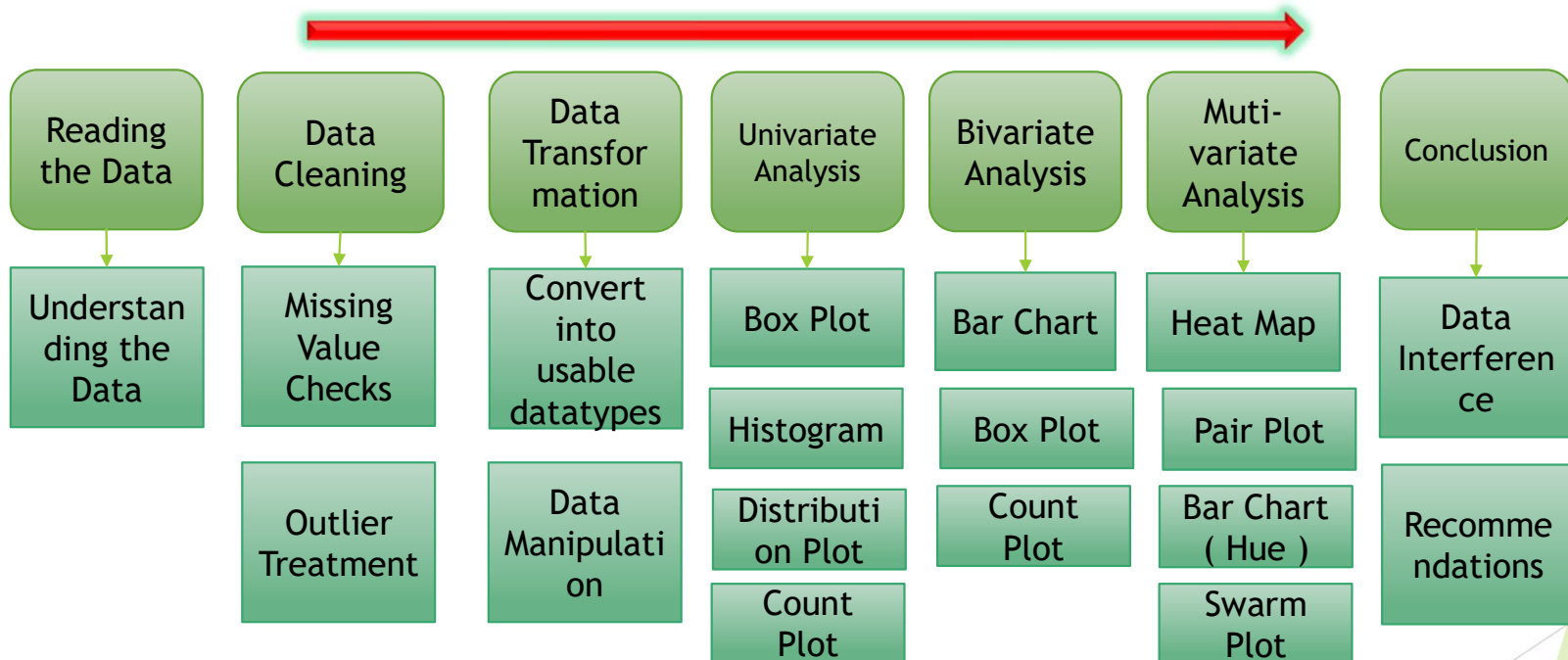
- ▶ When a person applies for a loan, two decisions can be made:
- ▶ **Loan accepted:** If approved, there are three scenarios:
 - **Fully paid:** The applicant has repaid the principal and interest.
 - **Current:** The applicant is still paying installments; not considered defaulted.
 - **Charged-off:** The applicant has defaulted by not paying installments for a long time

Loan Default Drivers

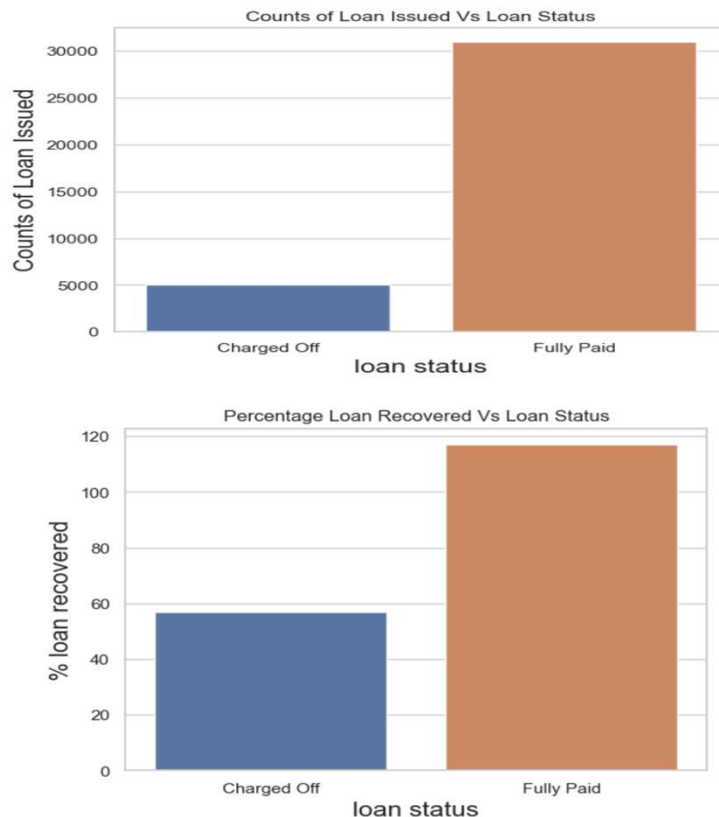
- ▶ **Loan rejected :** The company had rejected the loan because the candidate does not meet their requirements etc.
- ▶ Rejected loans lack transactional history, hindering analysis.
- ▶ The company wants to understand the driving factors (or driver variables) behind loan default, i.e. the variables which are strong indicators of default. The company can utilize this knowledge for its portfolio and risk assessment.



Data Analysis Approach



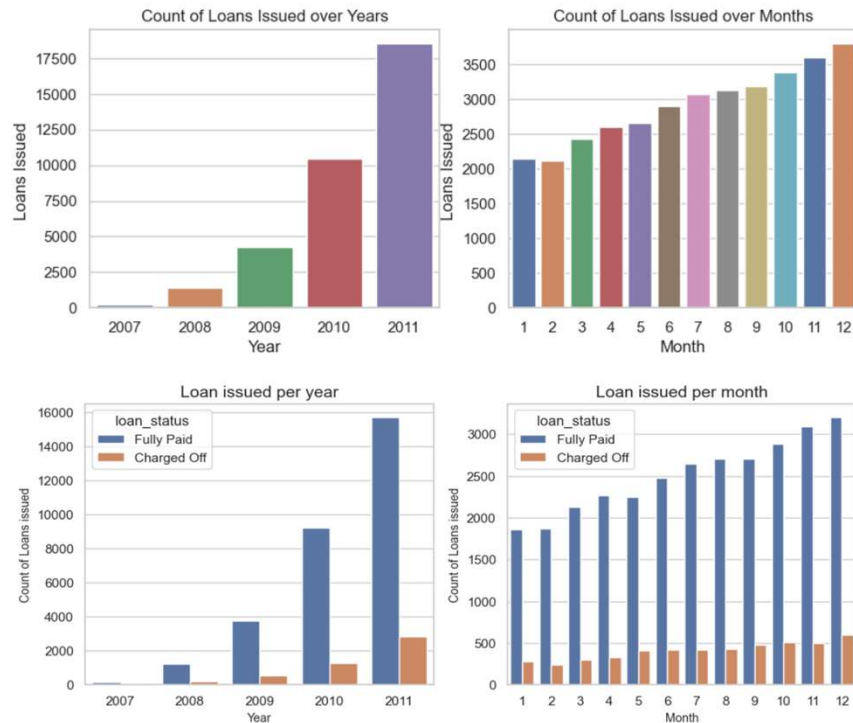
Charged Off and Fully Paid Loans



Observations :

- **"Fully Paid" Loans:** Predominate with around 30,000 instances.
- **"Charged Off" Loans:** Fewer, estimated at approximately 5,000.
- **High Repayment Rate:** Majority fulfill loan obligations successfully.
- **Default Risk:** Despite high repayment, a notable fraction defaults, indicating inherent lending risks.

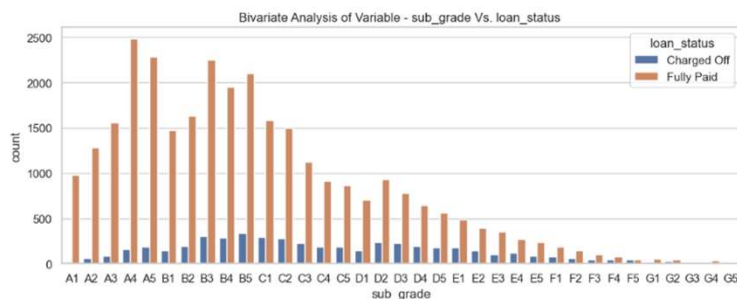
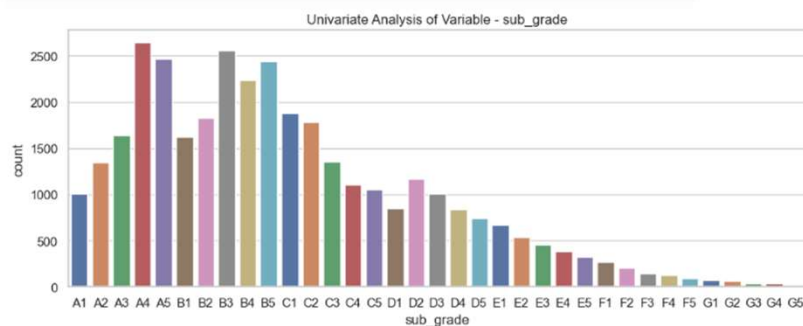
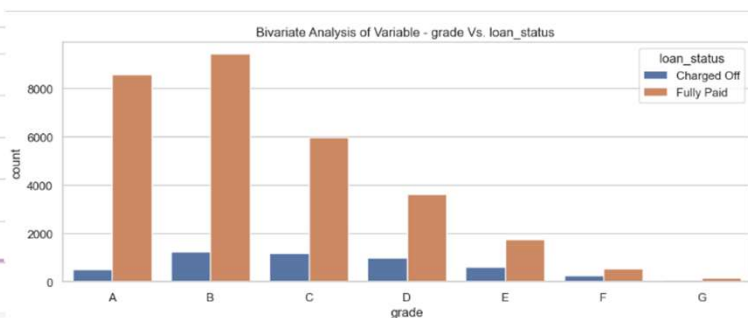
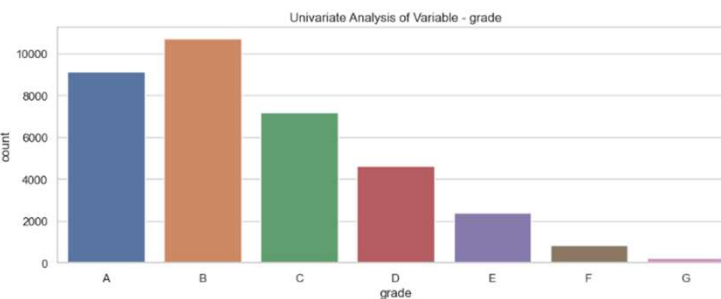
Loans Issued over Years and Months



Observations :

- Loan Issuing Year: Clear increasing trend in loans issued, notably from 2009 to 2011.
- Loan Issuing Month: Monthly issuance shows consistent growth throughout the year.
- Additional Insights: Q4 (Oct to Dec) approvals have higher default rates

Different Grades and Subgrades



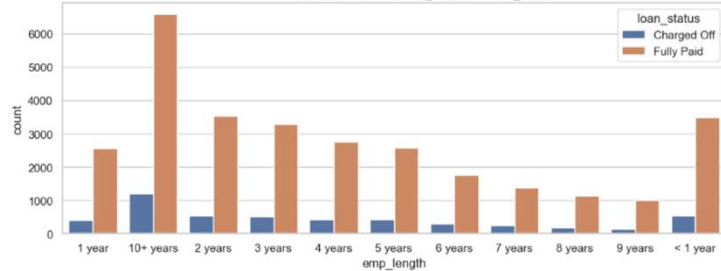
Observations :

Grade and Subgrade Distribution:

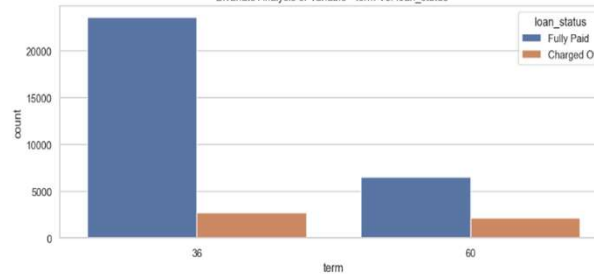
- B grade most issued, followed by A grade.
- A4 subgrade tops A grade, then B5.
- A grade has lower defaults than total issuance.
- A4 subgrade shows lower defaults than total issuance.
- Majority of loans are high graded, indicating lower default risk.

Experience , Terms , Home Ownership and Purpose

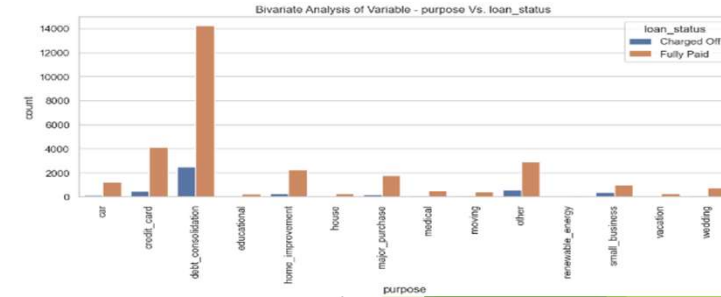
Bivariate Analysis of Variable - emp_length Vs. loan_status



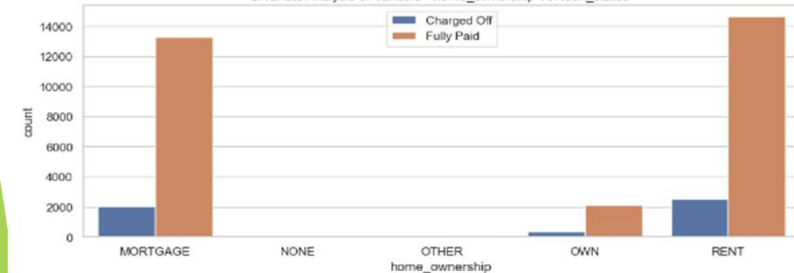
Bivariate Analysis of Variable - term Vs. loan_status



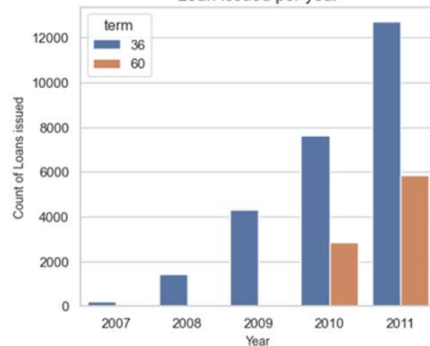
Bivariate Analysis of Variable - purpose Vs. loan_status



Bivariate Analysis of Variable - home_ownership Vs. loan_status



Loan issued per year

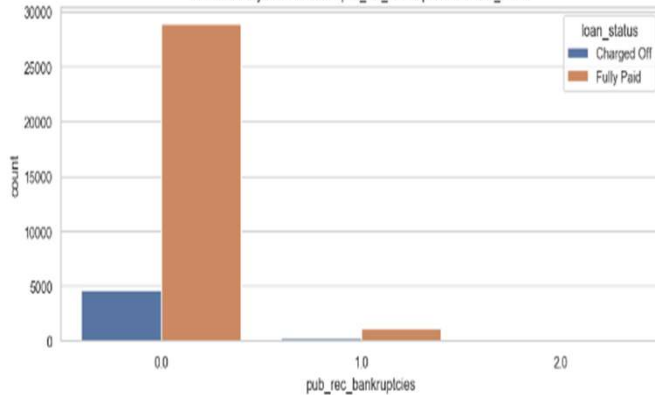


- **Observations :**
- **Employment Length:**
 - Most loans to Borrowers with 10+ years experience.
 - Defaults peak at 10+ years.
- **Loan Term:**
 - 36-month loans mostly fully paid.
 - More 36-month loans issued.
 - Borrowers increasingly choose 36-month tenure each year.
- **Loan Purpose:**
 - Majority for debt consolidation.
 - Highest defaults in debt consolidation.
- **Home Ownership:**
 - Homeowners default less than renters and mortgage holders.

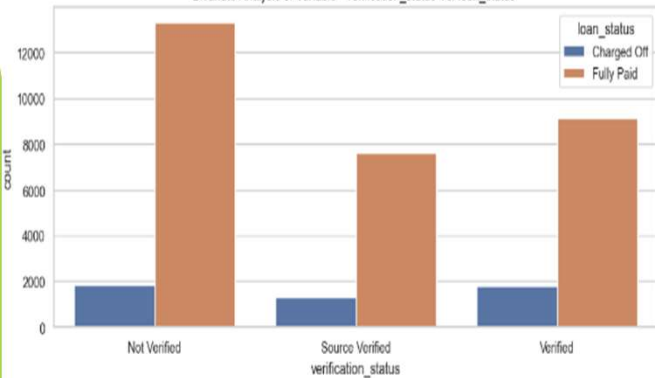


Verification Status , State , and Public Record

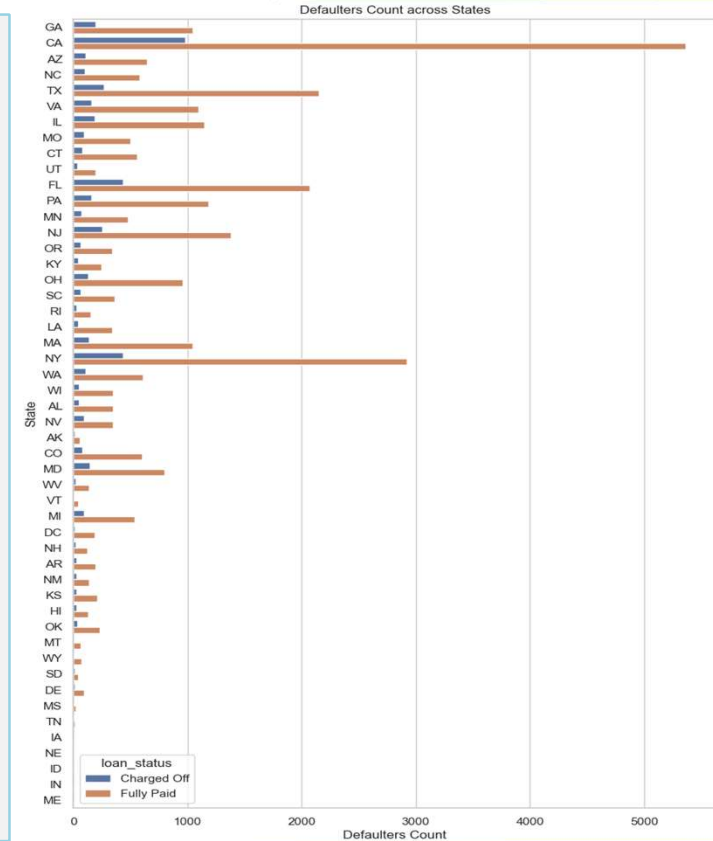
Bivariate Analysis of Variable - pub_rec_bankruptcies Vs. loan_status



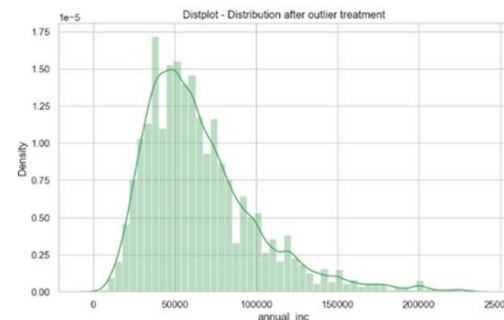
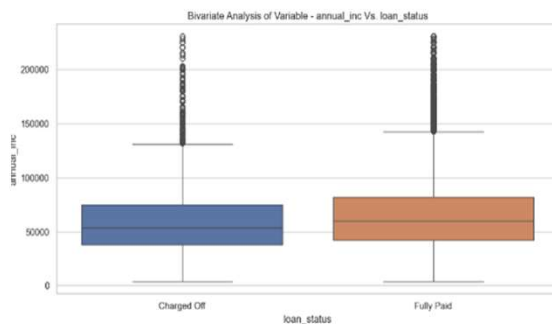
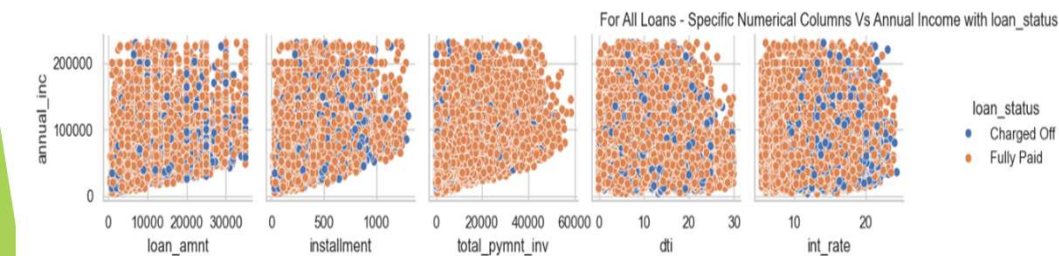
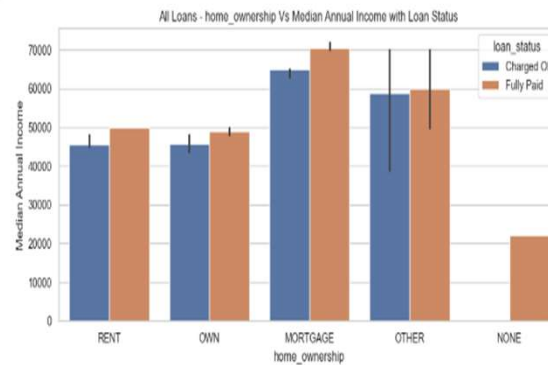
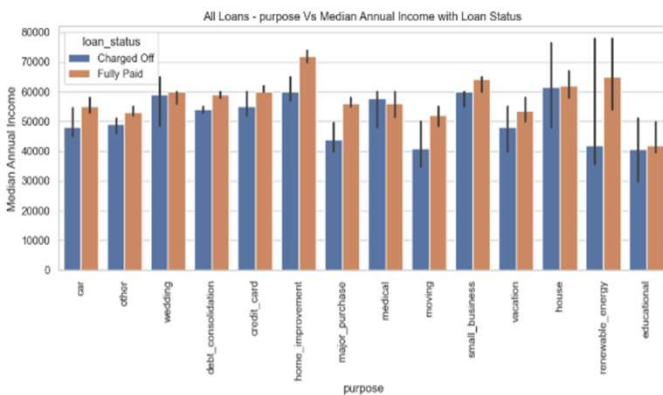
Bivariate Analysis of Variable - verification_status Vs. loan_status



- **Observations :**
- **State :**
 - CA has the highest loan applications (1,125) , fully paid, and charged off loans.
 - Low counts in ID (1) and NE (3).
 - Higher population states (CA, NY, FL) have more loan statuses.
- **Public Record Bankruptcies :**
 - Charged off loans: Avg. bankruptcies 0.067.
 - Fully paid loans: Avg. bankruptcies 0.039.
 - Active loans: Avg. bankruptcies 0.036.
- **Verification Status:**
 - Majority of loans not verified.
 - Charged off count similar across all verification categories.

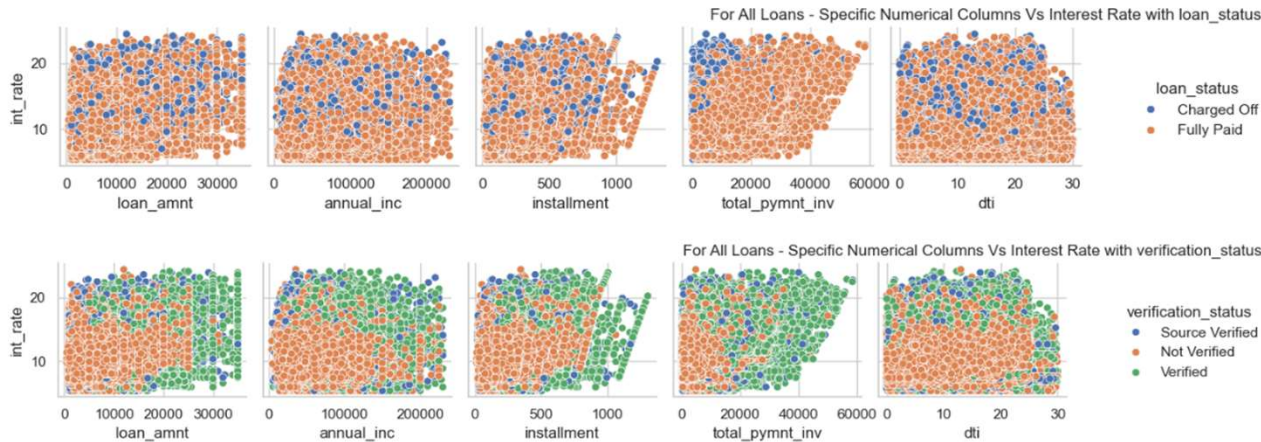
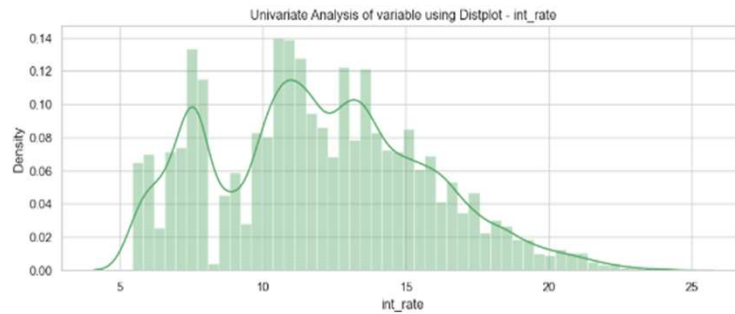
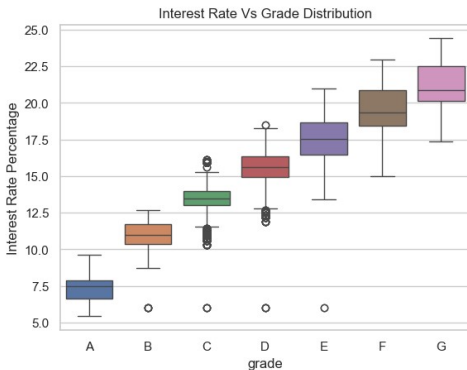


Annual Income and Other Variables



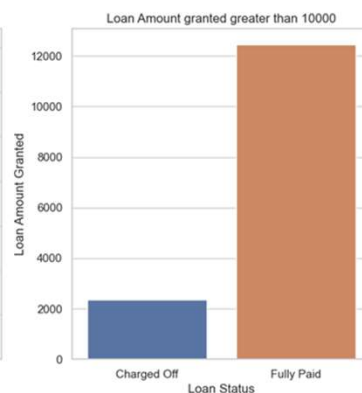
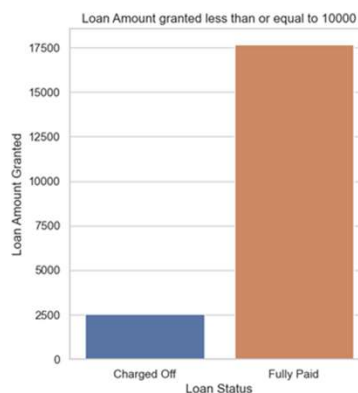
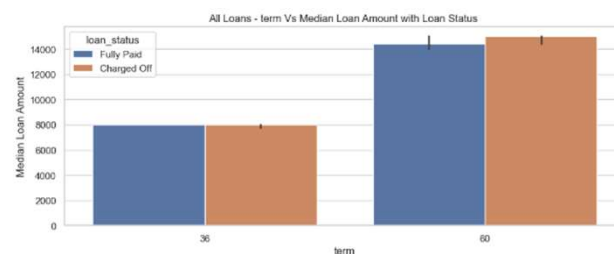
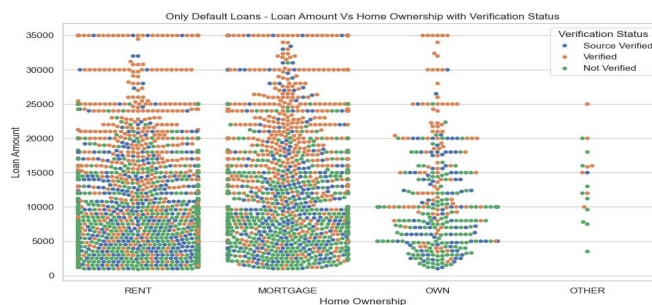
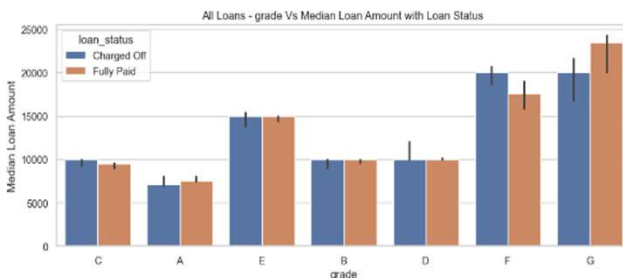
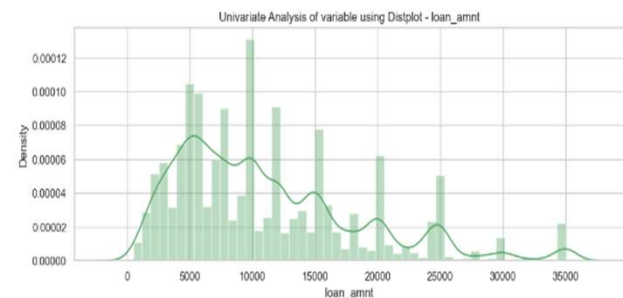
- **Observations :**
- **Annual Income Distribution:** Few have very high incomes.
- **Purpose Home Improvement (Income > 60k):** Increased default probability.
- **Purpose Renewable Energy (Income > 45k):** Higher default likelihood.
- **Home Ownership Mortgage (Income 60-70k):** Elevated default probability.
- **High Interest Rates (Income 70-80k):** Heightened default risk.

Interest Rate and Others



- **Observations :**
- **Loan Amount Impact:**
 - Higher loan amounts and interest rates increase the likelihood of loans being charged off.
- **Grade and Interest Rate:**
 - Inverse relationship: Higher grades receive lower interest rates.
- **Verification Status:**
 - High loan amount, installments and high interest rate loans are predominantly verified.

Loan Amount and Others



- **Observations :**
- **Loan Amounts:**
 - Left-skewed, mostly 5,000-10,000 with spikes at 5,000 intervals.
- **Loans $\leq 10,000$ and Loans $\geq 10,000$:**
 - More fully paid than charged off.
 - Proportionally, charged off loans lower in both categories.
- **Grade:**
 - Average loan amount of F & G grade is higher.
- **Term:**
 - 60 Month is chosen or given only for loans > 25k

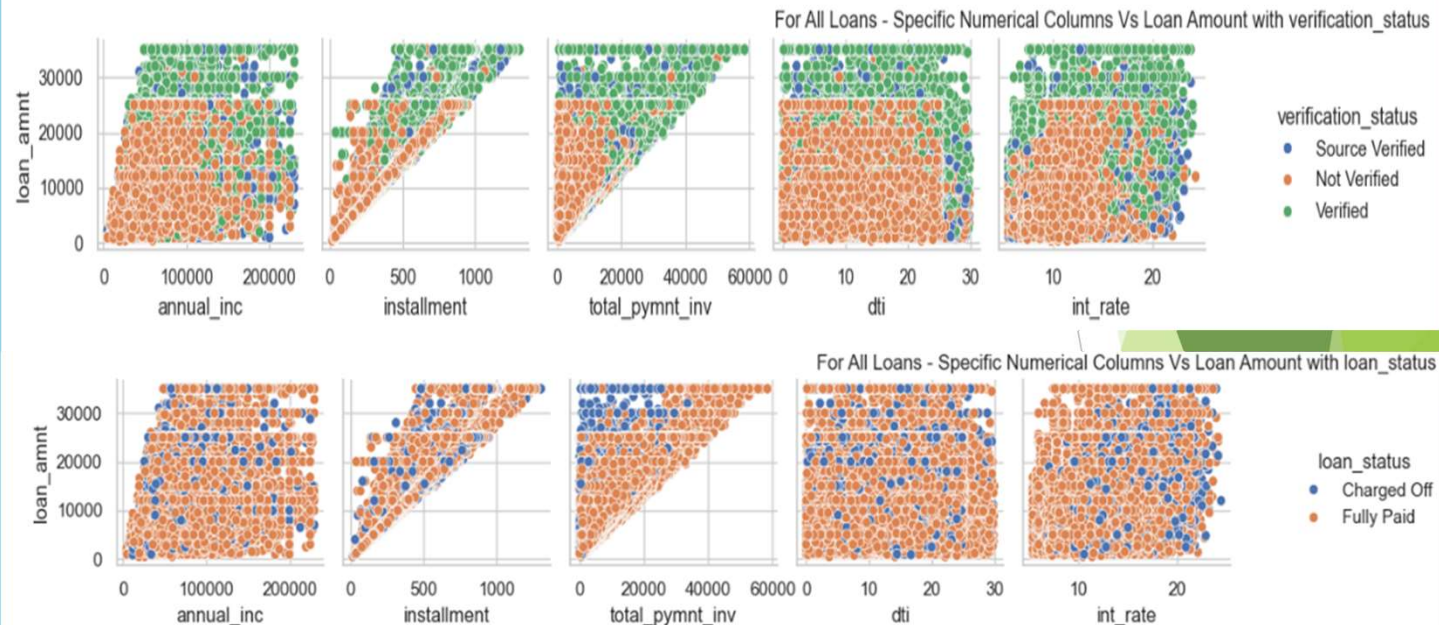


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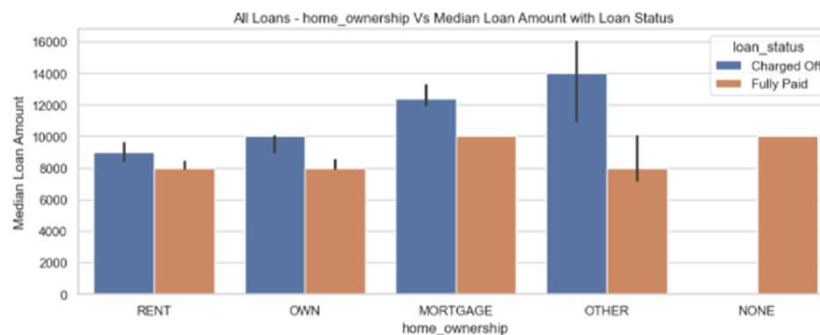
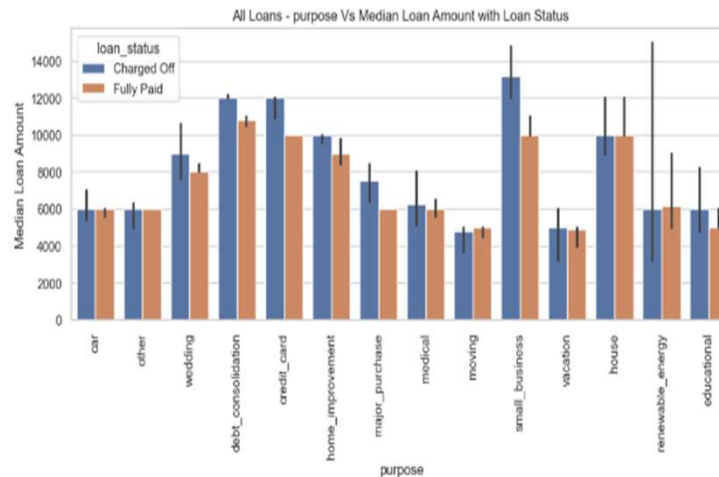
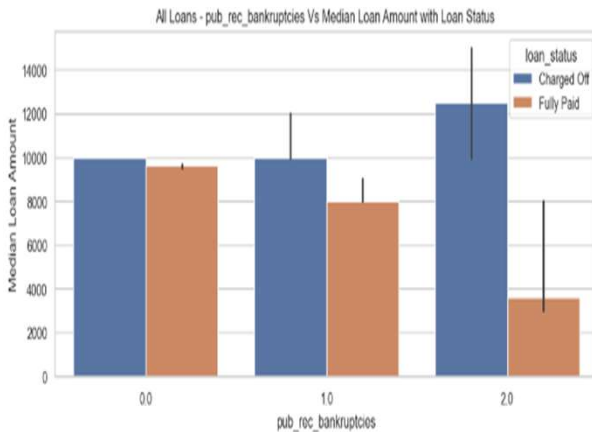
Loan Amount and Others

- **Observations :**
- **Verification:**
 - Loan amount < 25k: Most likely not verified or source verified.
 - Loan amount > 25k: Typically verified.
 - Low loan amount and DTI values loans are typically not verified.
- **Impact on Other Variables:**
 - Increase in loan amount leads to higher installments, total payment, and sometimes interest rate..



To be
Continued ...

Loan Amount and Others



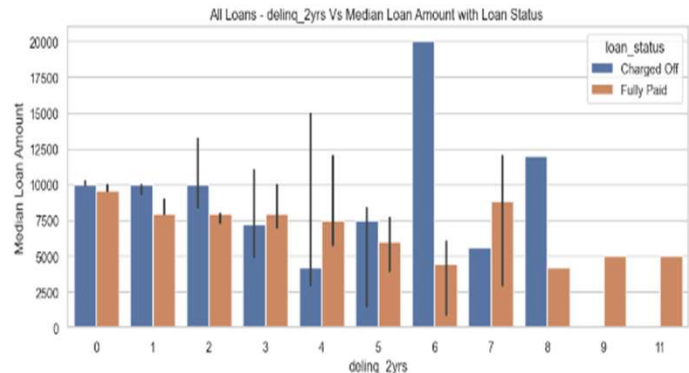
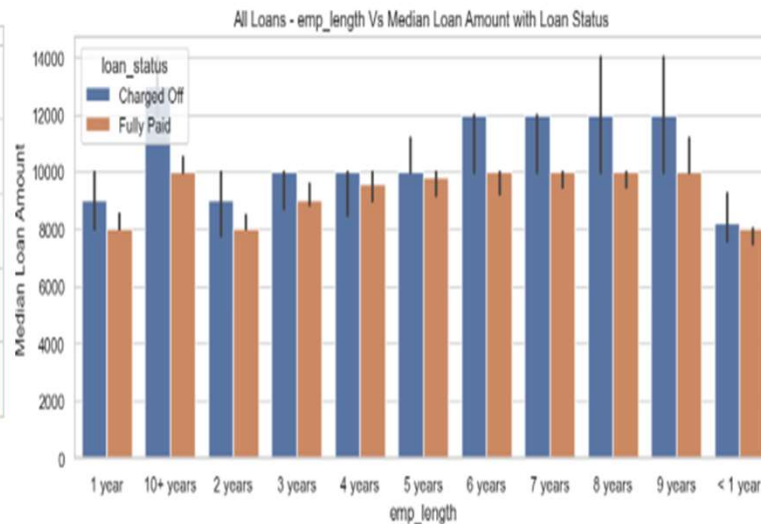
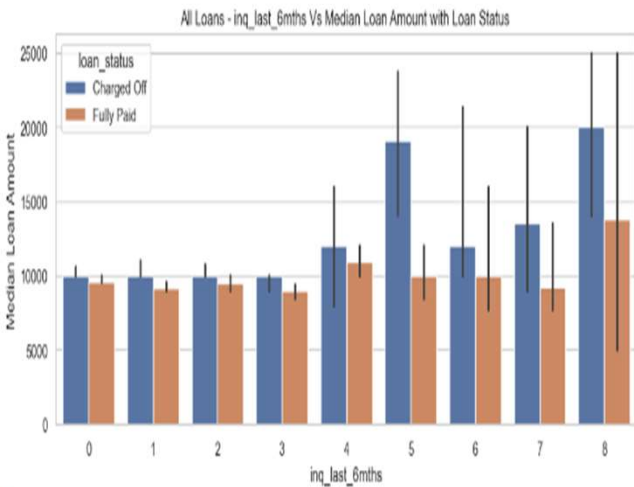
- **Observations :**
- **Public Record Bankruptcies:**
 - 50% of loans with amounts > 3500 and 2 public record bankruptcies are charged off.
- **Home Ownership:**
 - Loans above 800 when Home Ownership is "Other" are risky.
- **Purpose:**
 - Loans above 10000 when purpose is "Small Business" are prone to charge off.



To be Continued ...



Loan Amount and Others



- **Observations :**
- **Number of inquiries in past 6 months:**
 - Loans with 5-8 inquiries and a 10,000 loan amount have a charge-off history.
- **Delinquency in past 2 years :**
 - Loans with 6 or 8 incidences of delinquency in the past 2 years have been significantly charged off.
- **Employment Length:**
 - Loans > 10,000 and employment length of 7, 8, 9, or 10+ years are frequently charged off.

Heatmap Analysis

➤ Observations :

➤ Strong Positive Correlations:

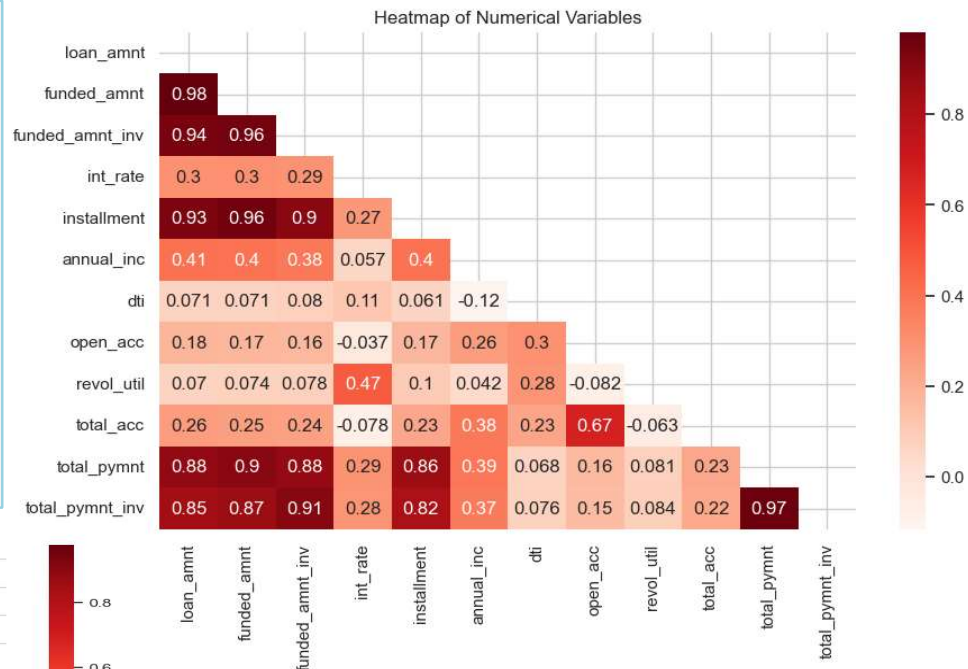
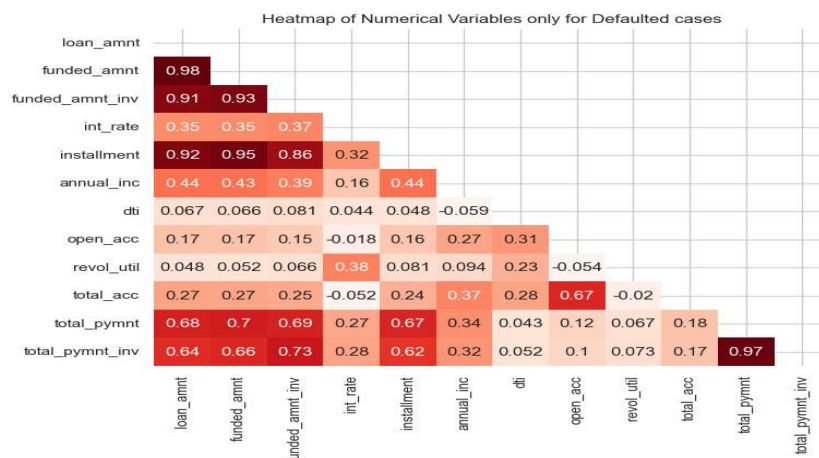
- Loan amount, funded amount, and installment.
- Total payment and total payment invested.

➤ Moderate Positive Correlations:

- Loan amount, funded amount, and installment with annual income.
- Total payment and total payment invested with annual income.

➤ Weak Positive Correlations:

- Interest rate with loan amount, funded amount, funded amount invested, and installment.
- Revolving line utilization with interest rate.



➤ Observations :

➤ Weak Negative Correlations:

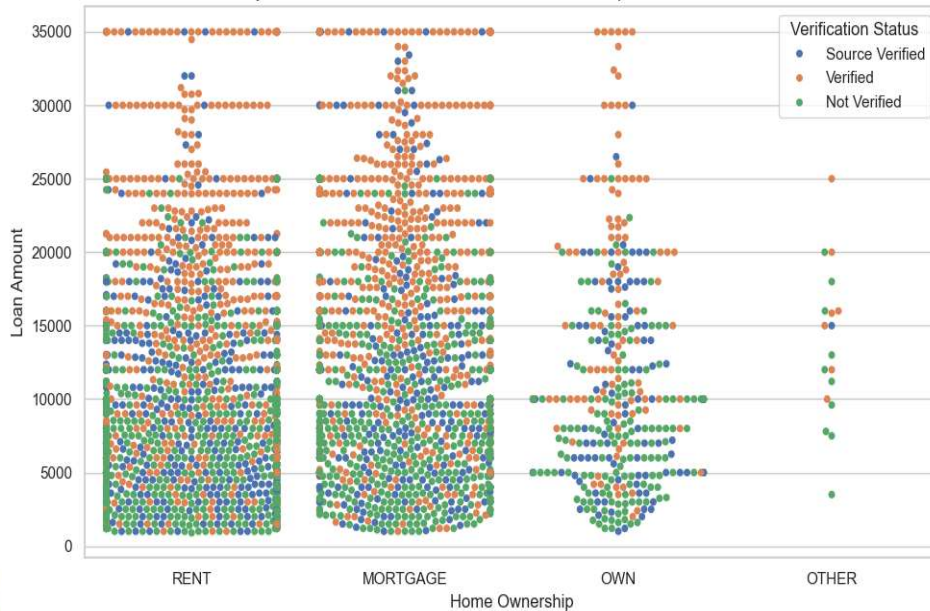
- Interest rate with total accounts.

➤ Neutral Correlations:

- DTI, open accounts, and total accounts.

Swarm Plot Analysis for Charged Off Loans

Only Default Loans - Loan Amount Vs Home Ownership with Verification Status

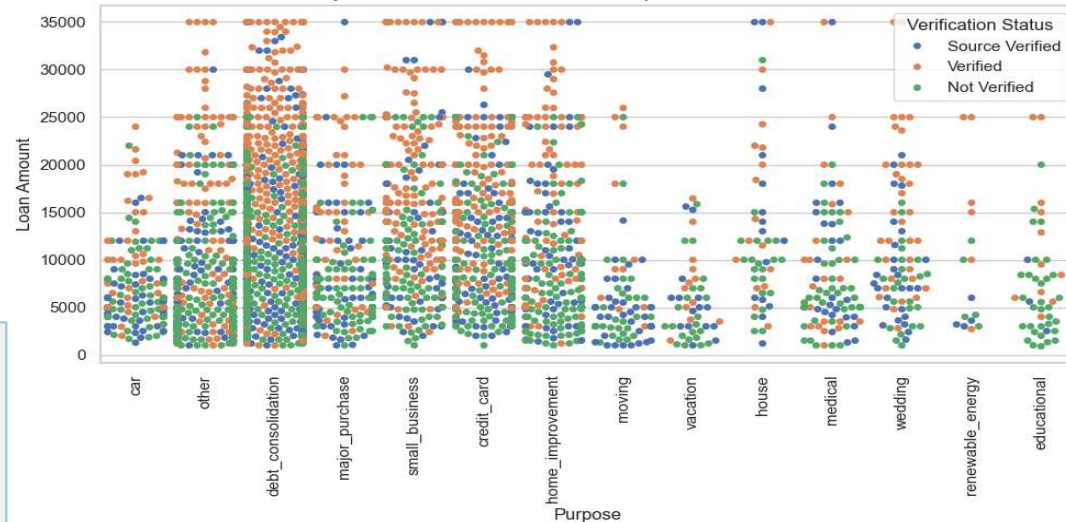


- **Observations :**
- **Credit Card:** Verified applicants request higher amounts.
 - **Debt Consolidation:** Highest amounts for verified applicants.
 - **Small Business:** Verified applicants seek significantly higher loans.

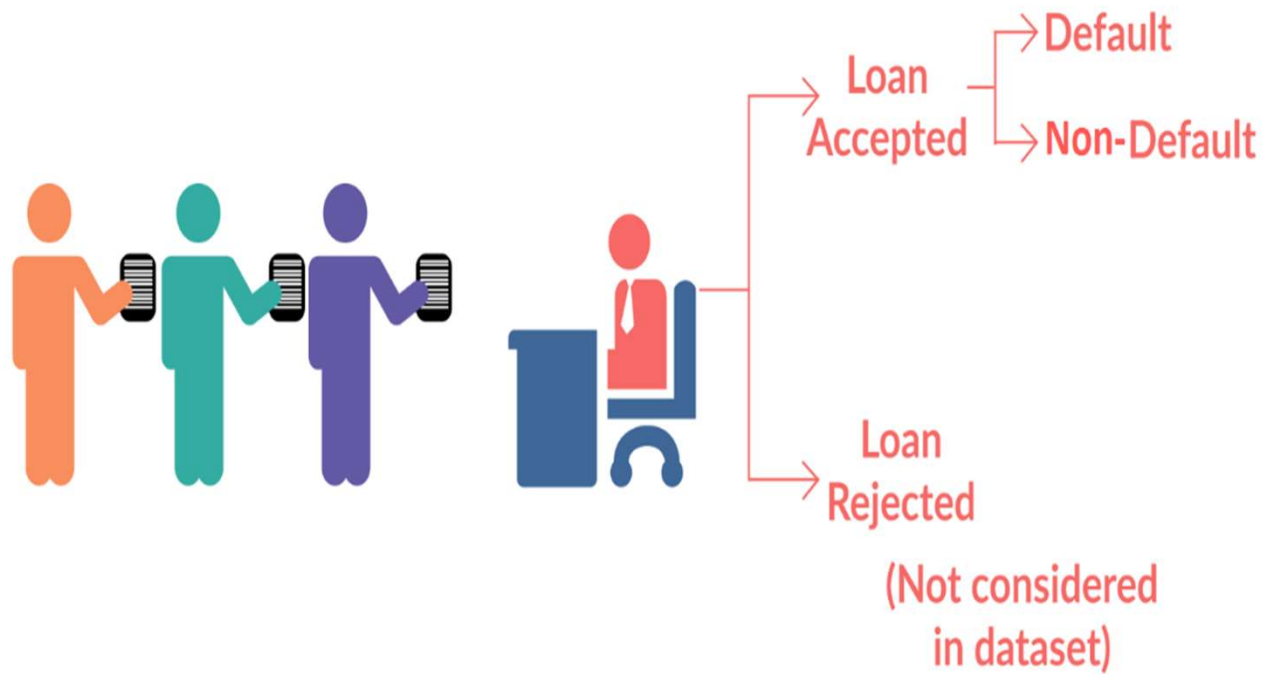
➤ Observations :

- **Mortgage:** Verified applicants request the highest amounts.
- **Other:** Verified applicants also seek high loans.
- **Own:** Verified applicants request higher loans.

Only Default Loans - Loan Amount Vs Purpose with Verification Status



Conclusion



Interferences and Recommendations

➤ Recommendations for Reducing Charge Offs :

- ❑ High interest rates and 10+ years of employment increase default probability.
- ❑ Mortgage holders with loans exceeding 12,000 are at higher risk.
- ❑ Avoid loans for debt consolidation, credit cards, or small businesses exceeding 12,000.
- ❑ House loans with average interest rates over 12% should be carefully evaluated.
- ❑ Prefer 36-month tenure loans with average interest rates around 11%.
- ❑ Loans exceeding 15,000 with grades F and G should be scrutinized.
- ❑ Exercise caution with installments between 800 and 12,000, especially with average interest rates over 15%.

To be continued ..in Next page..



Interferences and Recommendations

- ❑ Stricter screening is advised for applicants with 5-8 inquiries and a loan amount of 10,000 to mitigate charge-offs.
- ❑ Applicants with a history of 6 or 8 delinquency incidences in the past 2 years should be carefully scrutinized to reduce risk.
- ❑ Longer employment lengths, particularly 7, 8, 9, or 10+ years, in combination with loans over 10,000, warrant thorough assessment for financial stability.
- ❑ Loans exceeding 3,500 with 2 public record bankruptcies have a high charge-off rate, highlighting the need for comprehensive background checks.
- ❑ Loans with a home ownership status of "Other" and amounts above 800 pose increased risk
- ❑ Extra scrutiny is recommended for loans above 10,000 intended for small business purposes, possibly including the submission of business plans or financial statements.
- ❑ Reassess verification procedures for loans with low loan amounts and DTI values to enhance risk assessment accuracy.



To be continued ..in Next page..



Interferences and Recommendations

- ❑ Be wary of installments exceeding 1,200 and an average interest rate of 17%.
- ❑ Home improvement loans should be limited to applicants with incomes over 60k.
- ❑ Renewable energy loans should be granted to applicants with incomes over 45k.
- ❑ Mortgage holders with incomes of 60k-70k should be closely monitored.
- ❑ Applicants with incomes of 70k-80k and interest rates of 21-24% are at higher risk.
- ❑ Grade G loans with interest rates above 17% should be carefully considered.
- ❑ Verify loans exceeding 16,000 and scrutinize small business loans exceeding 12,000.
- ❑ Exercise caution with mortgage holders with loans of 14,000-16,000.

Addressing these factors through targeted risk assessment, loan structuring, and borrower education can help reduce charge offs and improve overall loan performance.



THANK YOU

