LENDING CLUB CASE STUDY

PROBLEM STATEMENT

- YOU WORK FOR A **CONSUMER FINANCE COMPANY** WHICH SPECIALISES IN LENDING VARIOUS TYPES OF LOANS TO URBAN CUSTOMERS. WHEN THE COMPANY RECEIVES A LOAN APPLICATION, THE COMPANY HAS TO MAKE A DECISION FOR LOAN APPROVAL BASED ON THE APPLICANT'S PROFILE. TWO **TYPES OF RISKS** ARE ASSOCIATED WITH THE BANK'S DECISION:

- IF THE APPLICANT IS **LIKELY TO REPAY THE LOAN**, THEN NOT APPROVING THE LOAN RESULTS IN A **LOSS OF BUSINESS** TO THE COMPANY

- IF THE APPLICANT IS **NOT LIKELY TO REPAY THE LOAN,** I.E. HE/SHE IS LIKELY TO DEFAULT, THEN APPROVING THE LOAN MAY LEAD TO A **FINANCIAL LOSS** FOR THE COMPANY

- THE DATA GIVEN BELOW CONTAINS INFORMATION ABOUT PAST LOAN APPLICANTS AND WHETHER THEY 'DEFAULTED' OR NOT. THE AIM IS TO IDENTIFY PATTERNS WHICH INDICATE IF A PERSON IS LIKELY TO DEFAULT, WHICH MAY BE USED FOR TAKING ACTIONS SUCH AS DENYING THE LOAN, REDUCING THE AMOUNT OF LOAN, LENDING (TO RISKY APPLICANTS) AT A HIGHER INTEREST RATE, ETC.

- IN THIS CASE STUDY, USE EDA TO UNDERSTAND HOW **CONSUMER ATTRIBUTES** AND **LOAN ATTRIBUTES** INFLUENCE THE TENDENCY OF DEFAULT.
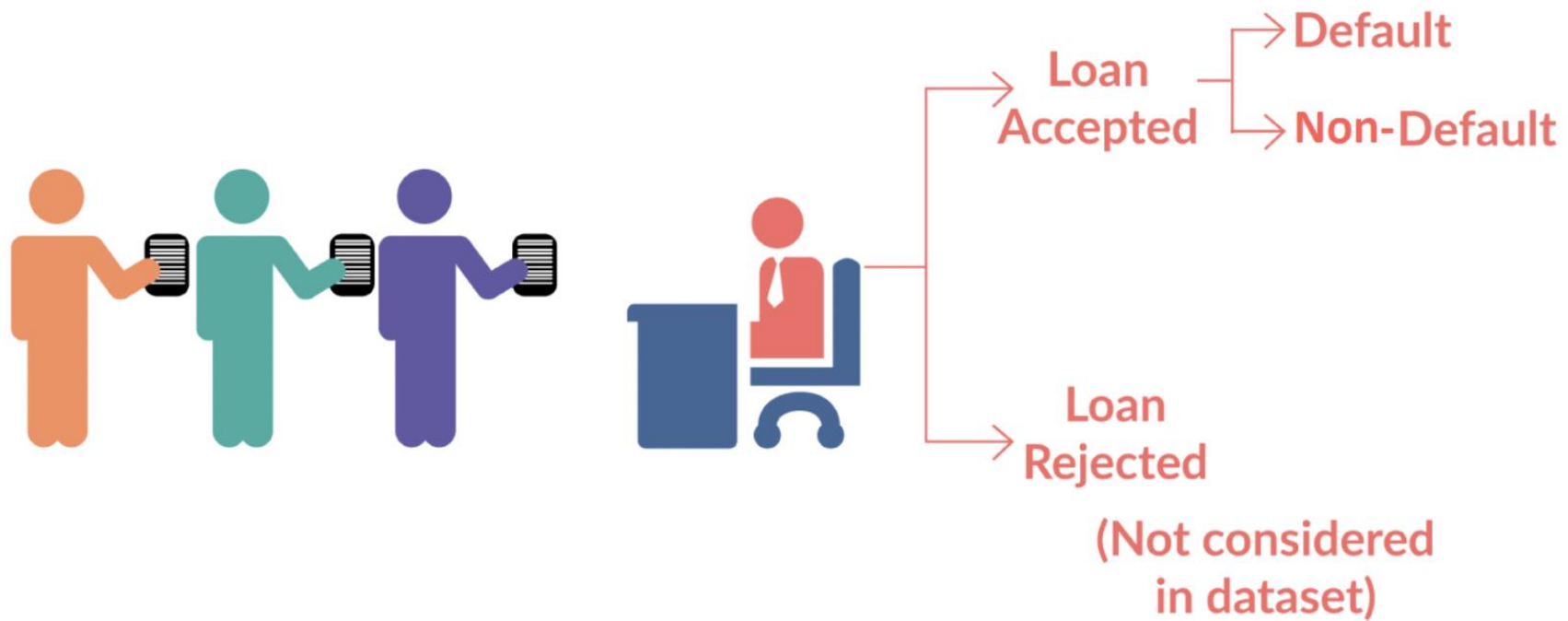
APPROACH

- DATA CLEANING

- UNIVARIATE ANALYSIS

- BIVARIATE ANALYSIS

- MULTI-VARIATE ANALYSIS

- BUSINESS ANALYSIS

- BUSINESS CONCLUSION

UNIVARIATE ANALYSIS

- LOAN AMOUNT : MOST BORROWERS HAVE APPLIED LOAN FOR AMOUNT 10000, FOLLOWED BY 5000.

- ANNUAL INCOME : MOST BORROWERS HAVE SELF PROCLAIMED INCOME OF 59000.

- 2YEAR DELINQUENCY : MOST OF THE BORROWERS HAVE DEFAULTED BEFORE FINISHING 1ST YEAR OF LOAN, WHICH IS BAD.

- EARLIEST CREDIT-LINE : MOST OF BORROWERS HAS CREDIT-LINE OPENED FOR MORE THAN 310MONTHS, WHICH IS GOOD.

- VERIFICATION STATUS : MOST BORROWERS HAD INCOME VERFIED, WHICH IS GOOD.
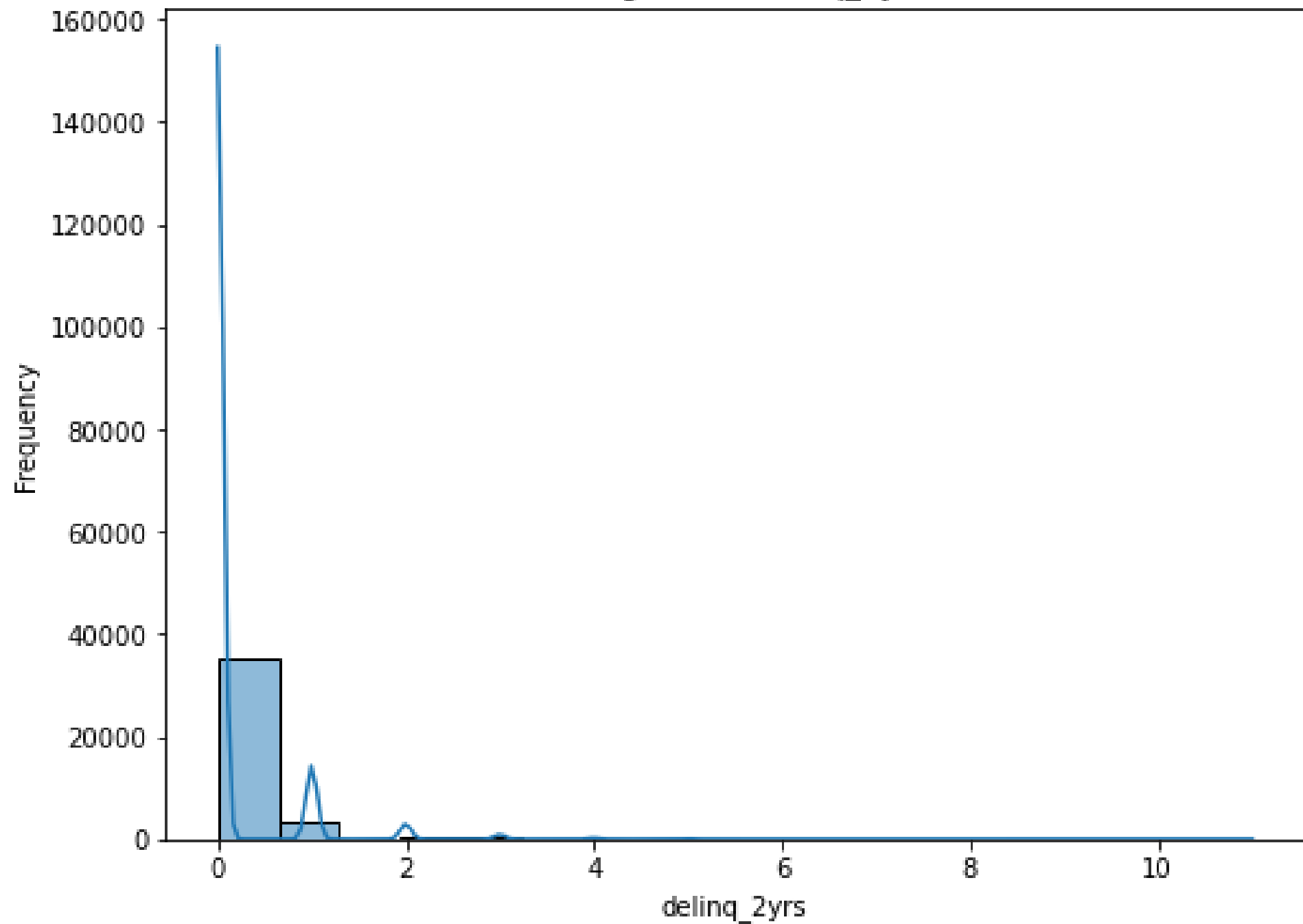
- LOAN STATUS : MOST BORROWERS HAVE FULLY PAID THEIR LOAN.
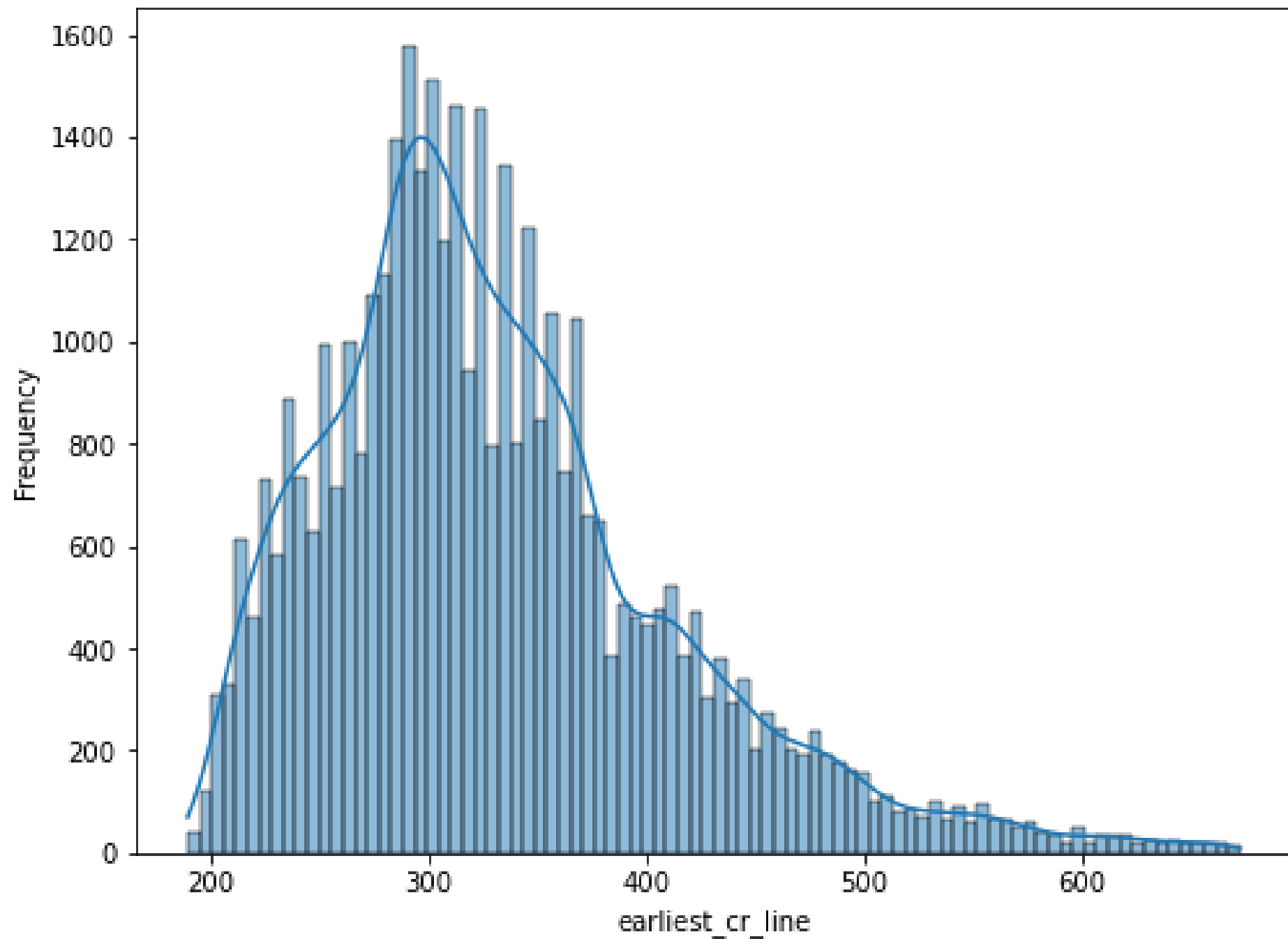
Histogram of loan_amnt
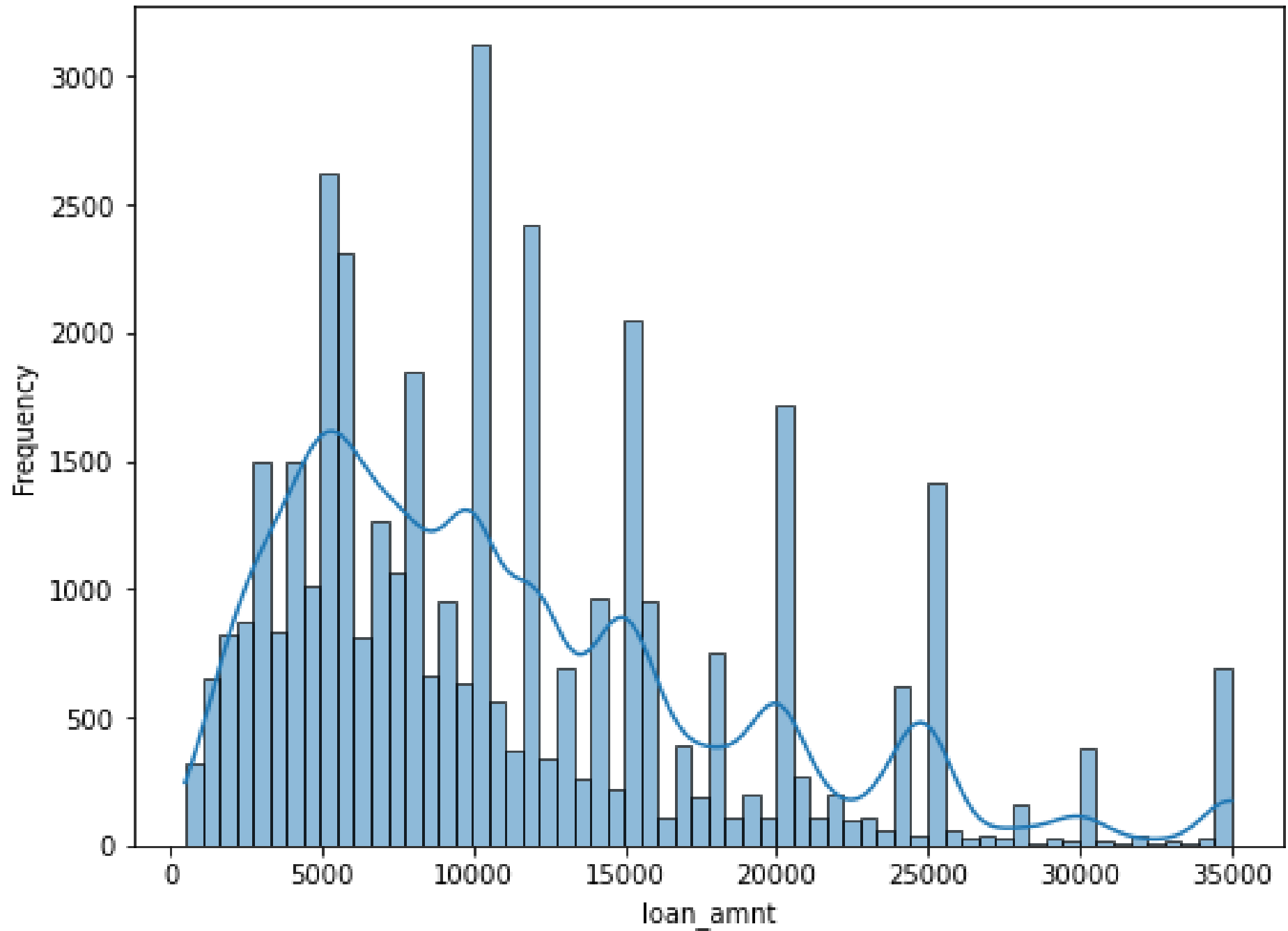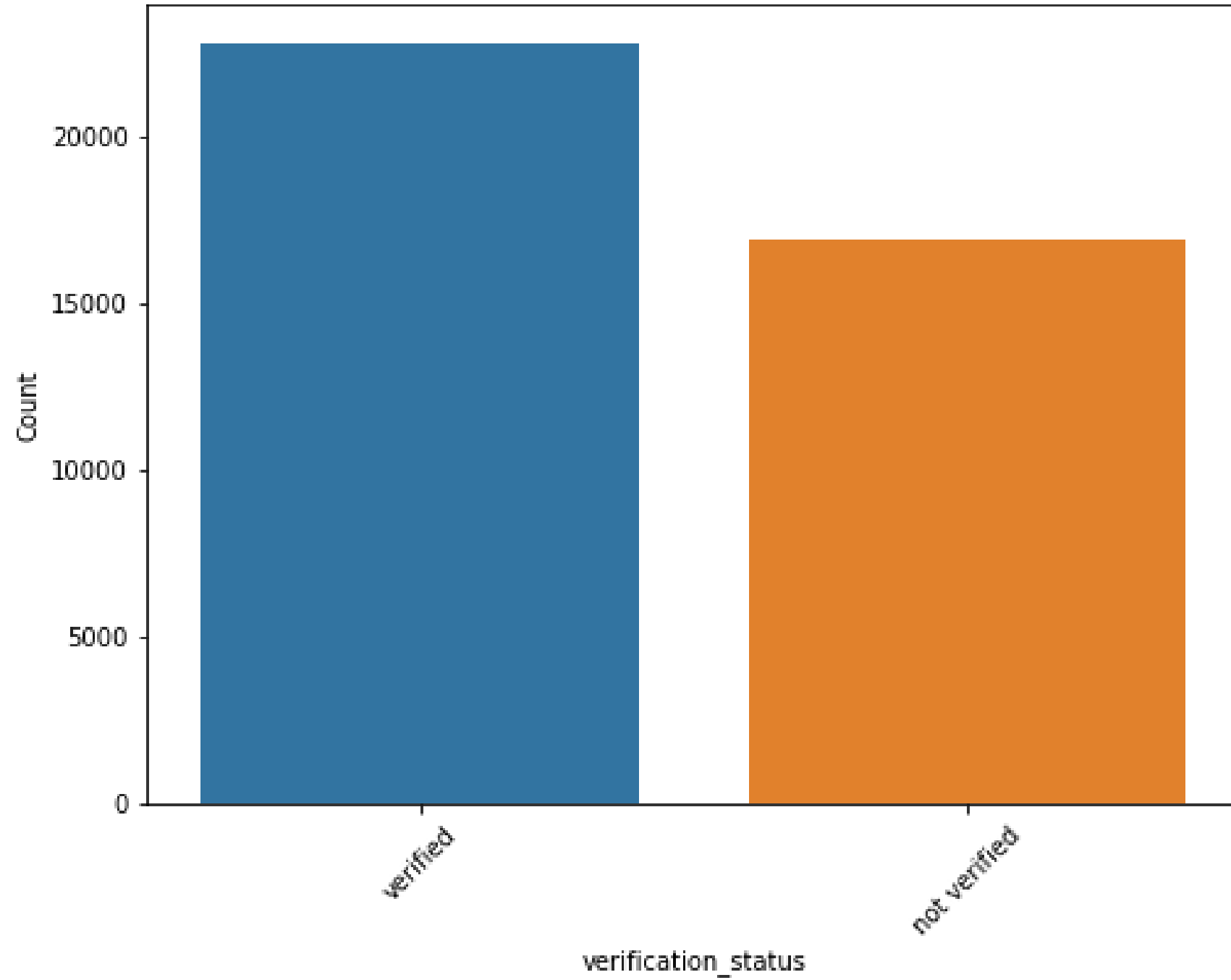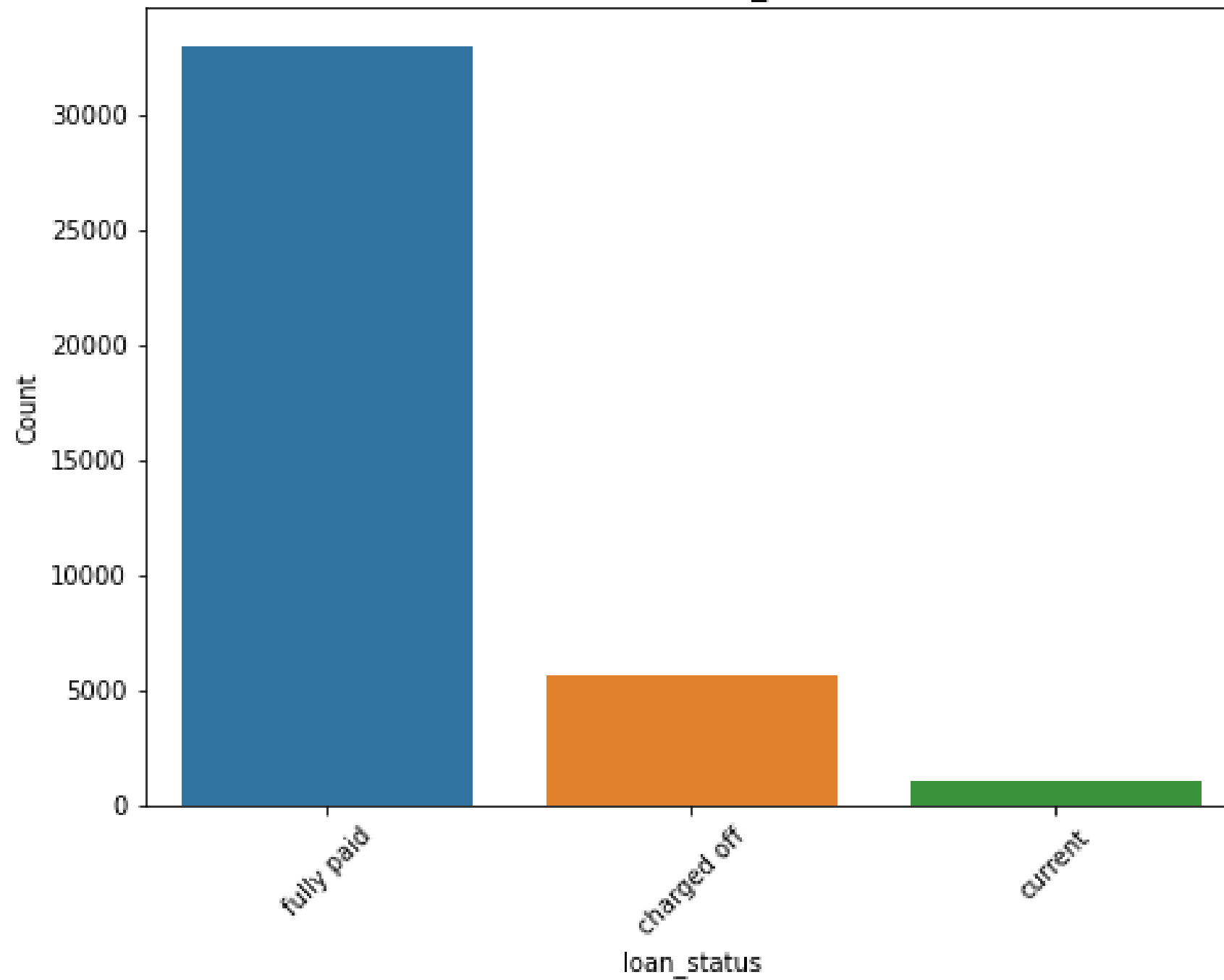
Histogram of annual_inc
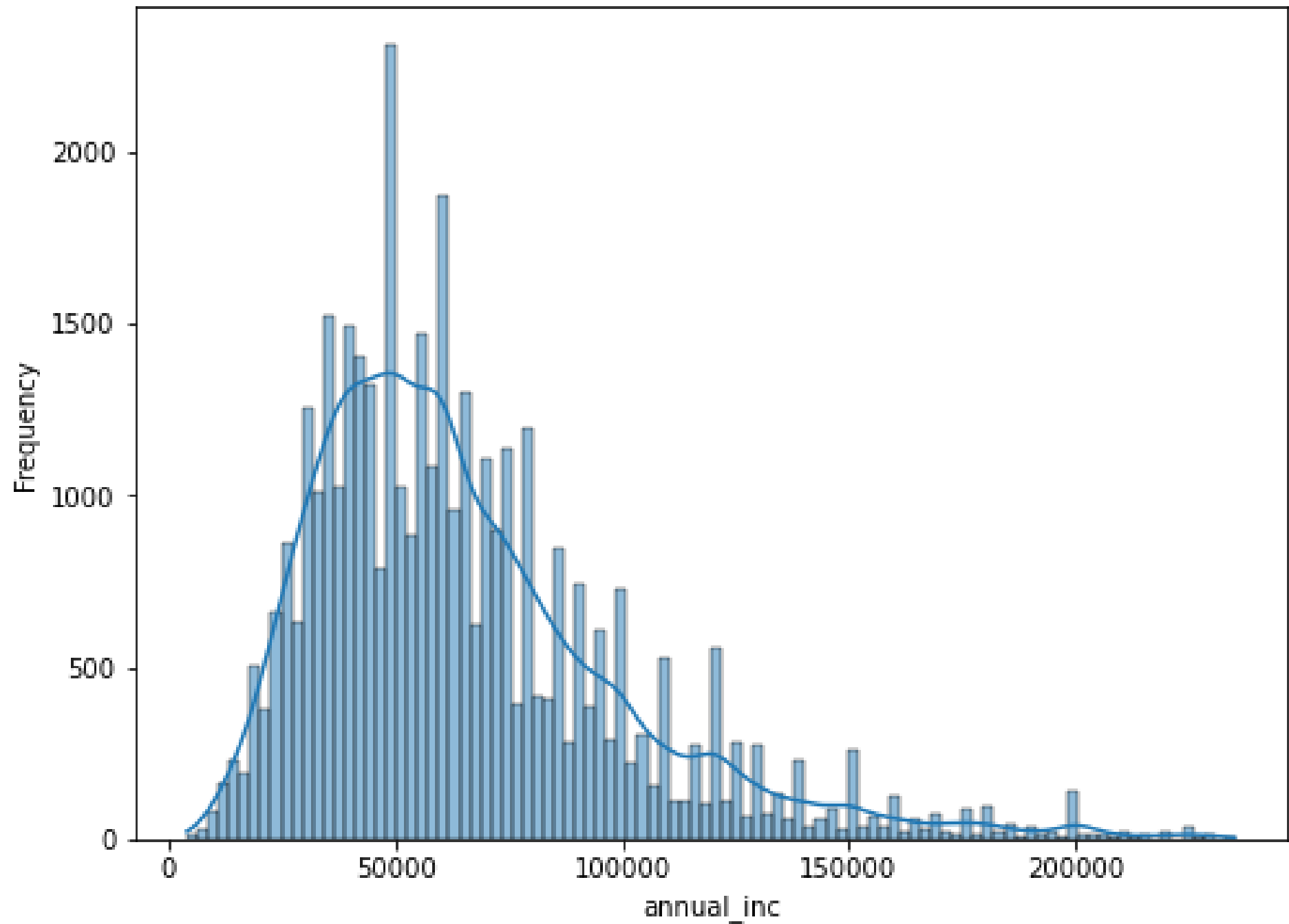
Histogram of delinq_2yrs

Histogram of earliest_cr_line

BIVARIATE ANALYSIS

- LOAN AMOUNT VS. ANNUAL INCOME:
  - AS INCOME INCREASES FROM 0 TO 50000, LOAN AMOUNT GRATUALLY INCREASES
  - AS INCOME CROSSES 100000, NUMBER OF LOANS TAKEN DECREASES
  - MOST BORROWER HAVE TAKEN LOAN WITH ANNUAL INCOME LESS THAN 100000 AND LOAN AMOUNT LESS THAN 20000.

- VERIFICATION STATUS VS. LOAN STATUS:
  - FULL PAID LOANS ARE MORE WHEN INCOME WAS VERIFIED AS COMPARE TO NOT-VERIFIED.
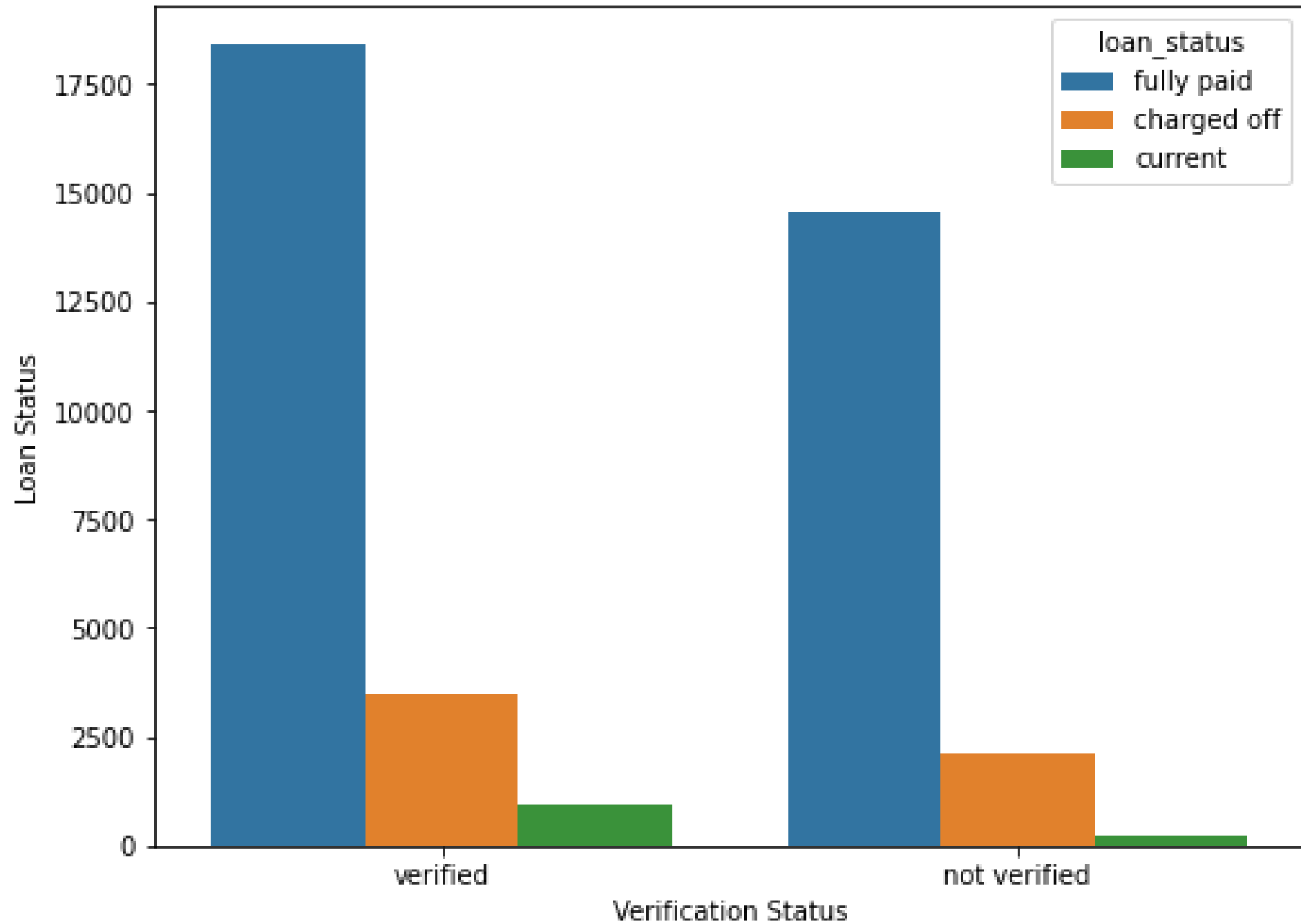
- LOAN STATUS VS. DEBT-TO-INCOME RATIO:
  - WHEN DTI RATIO IS LOWER FOR FULLY PAID LOANS

- EARLIEST CREDIT LINE VS. LOAN AMOUNT:
  - EALIEST CRESIT LINE IS DIRECTLY PROPORTIONAL TO LOAN AMOUNT.

- HOME OWNERSHIP VS. LOAN STATUS:
  - BORROWER WITH HOME OWNERSHIP AS RENT OR OWN HAS MOSTLY PAID THE LOANS FULLY.
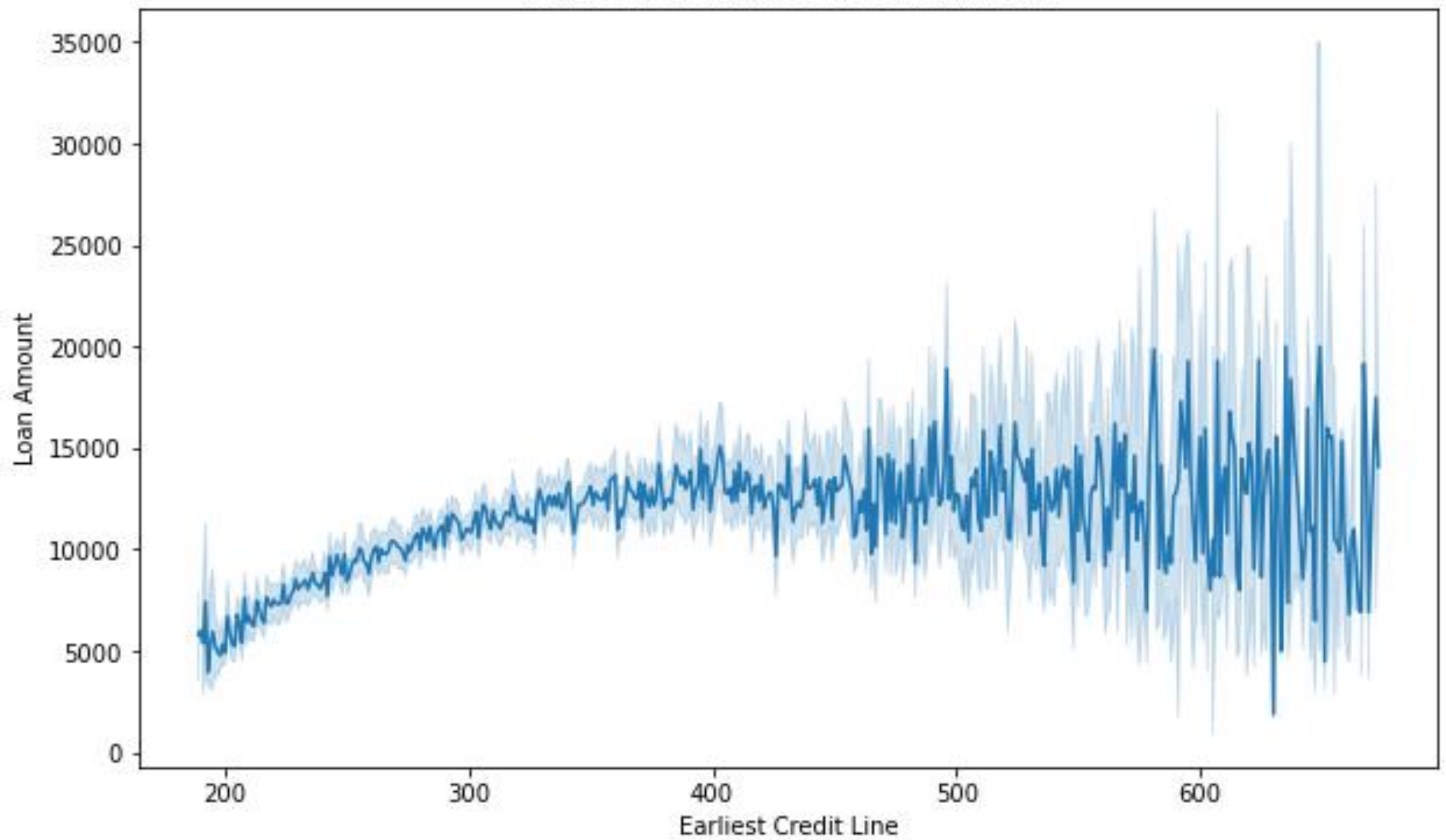
Home Ownership vs. Loan Status
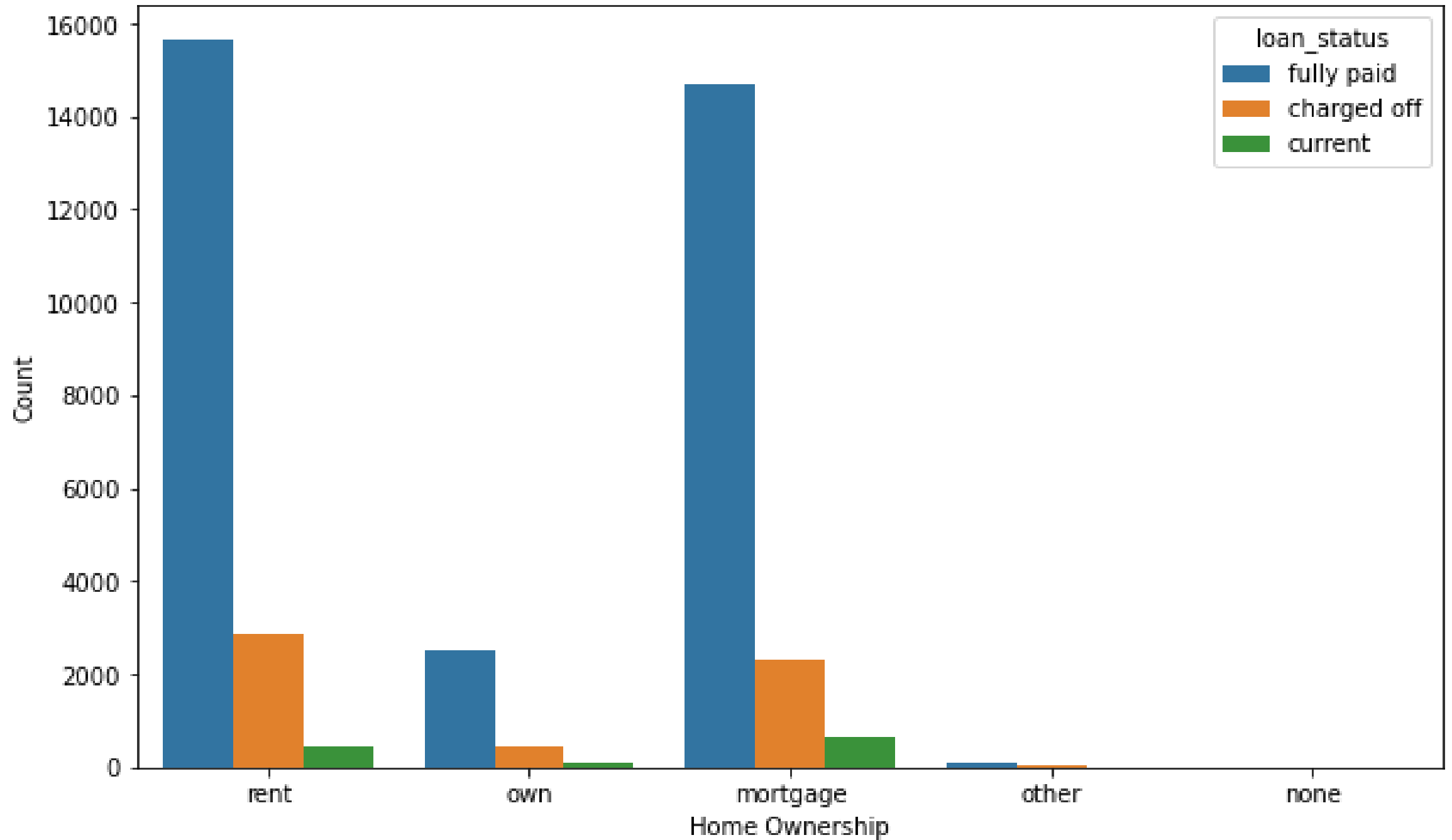
MULTIVARIATE ANALYSIS

- LOAN AMOUNT, ANNUAL INCOME, AND LOAN STATUS
  - MOST BORROWER HAVE TAKEN LOAN WITH ANNUAL INCOME LESS THAN 100000 AND LOAN AMOUNT LESS THAN 20000.
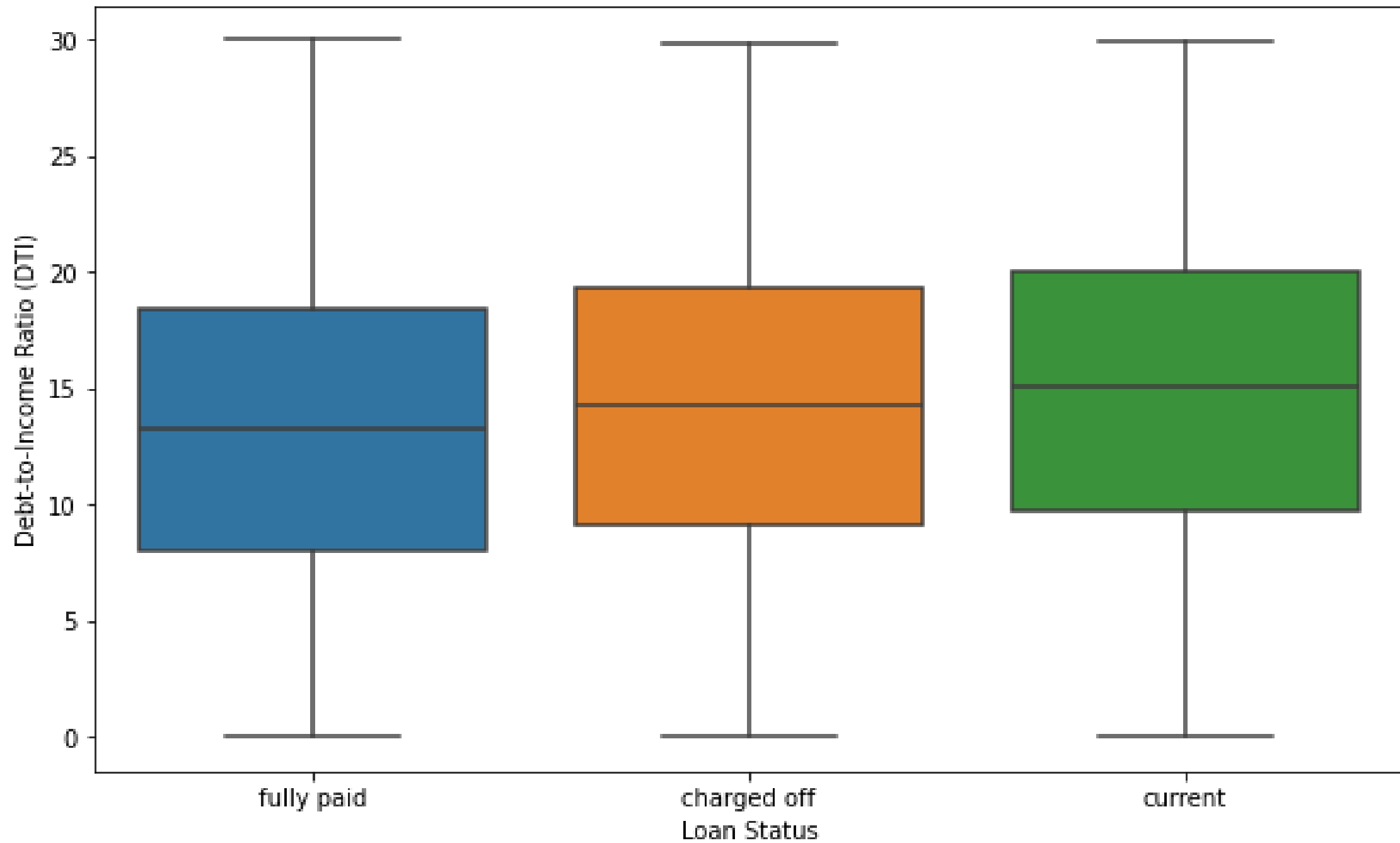 - MOST OF THE LOANS ARE FULLY PAID
  - WHEN INCOME IS BETWEEN 50,000 TO 100,000 AND LOAN AMOUNT IS LESS THAN 7,500, THE CHARGED OFF ARE LESS

- LOAN AMOUNT, DTI, AND LOAN STATUS
  - MOST BORROWERS HAS DTI LESS THAN 25 AND LOAN AMOUNT UNDER 10,000 ARE FULLY PAID OFF
  - LESSER THE DTI AND LOAN AMOUNT, GREATER IS NUMBER OF LOAN FULLY PAID AND VISE-VERSA.

- ANNUAL INCOME, VERIFICATION STATUS, AND LOAN STATUS
  - MOST BORROWERS IRRESPECTIVE OF LOAN STATUS OR INCOME VERIFICATION HAS ANNUAL INCOME BETWEEN 40,000 TO 100,000.
  - INCOME OF BORROWERS WITH INCOME VERIFIED ARE BETTER THAN THAN OF NON-VERFIED

- TOTAL RECOVERIES, LOAN STATUS, AND PUBLIC RECORDS
  - TOTAL RECOVERIES AND PUBLIC RECORDS ARE ONLY FOR CHARGED OFF LOANS.
  - EVEN FOR CHARGED OFF LOANS, MOST BORROWERS HAVE PUBLIC RECORDS AS CLEAR.

Loan Amount vs. Annual Income by Loan Status
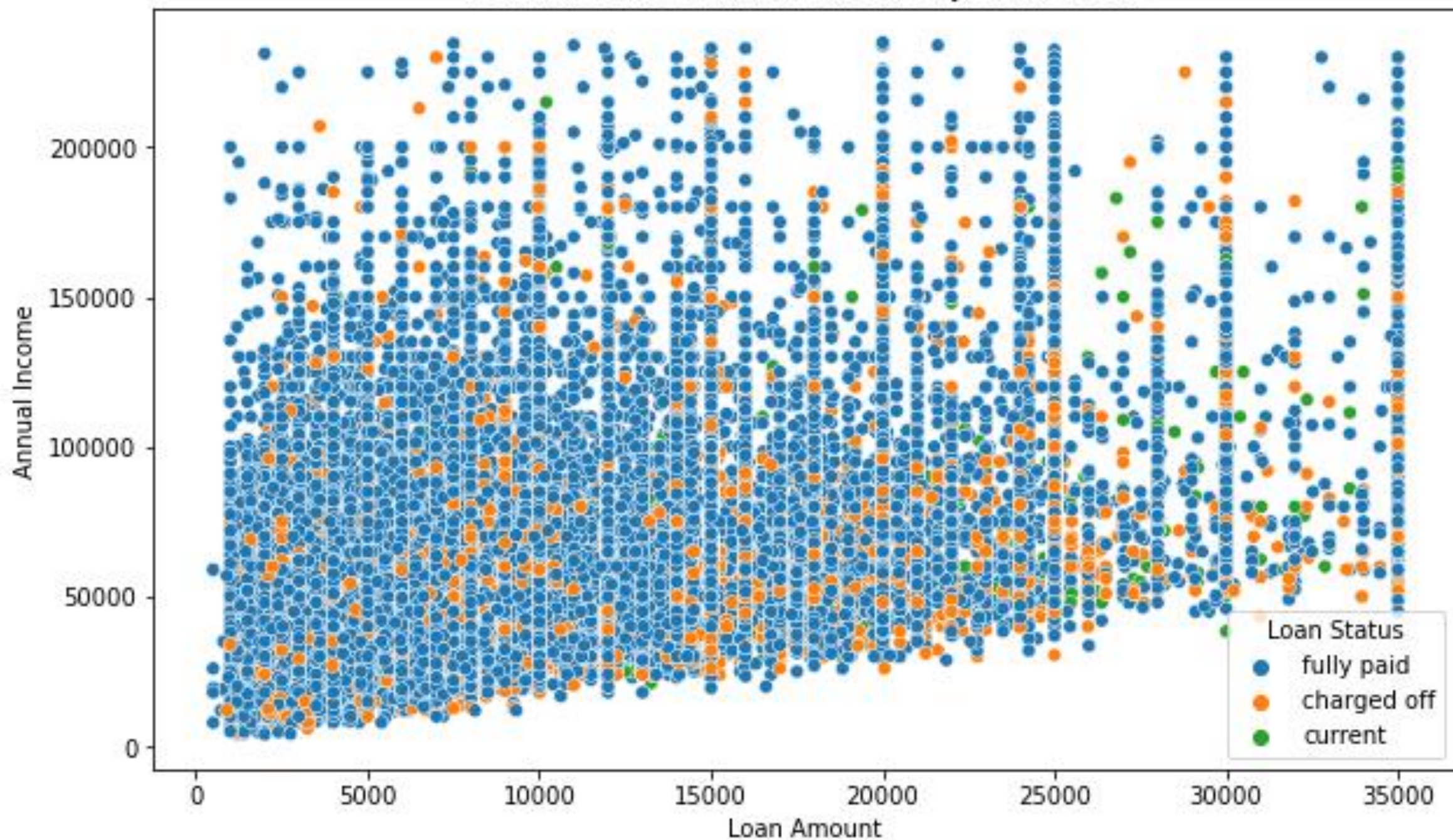
Loan Amount vs. DTI by Loan Status
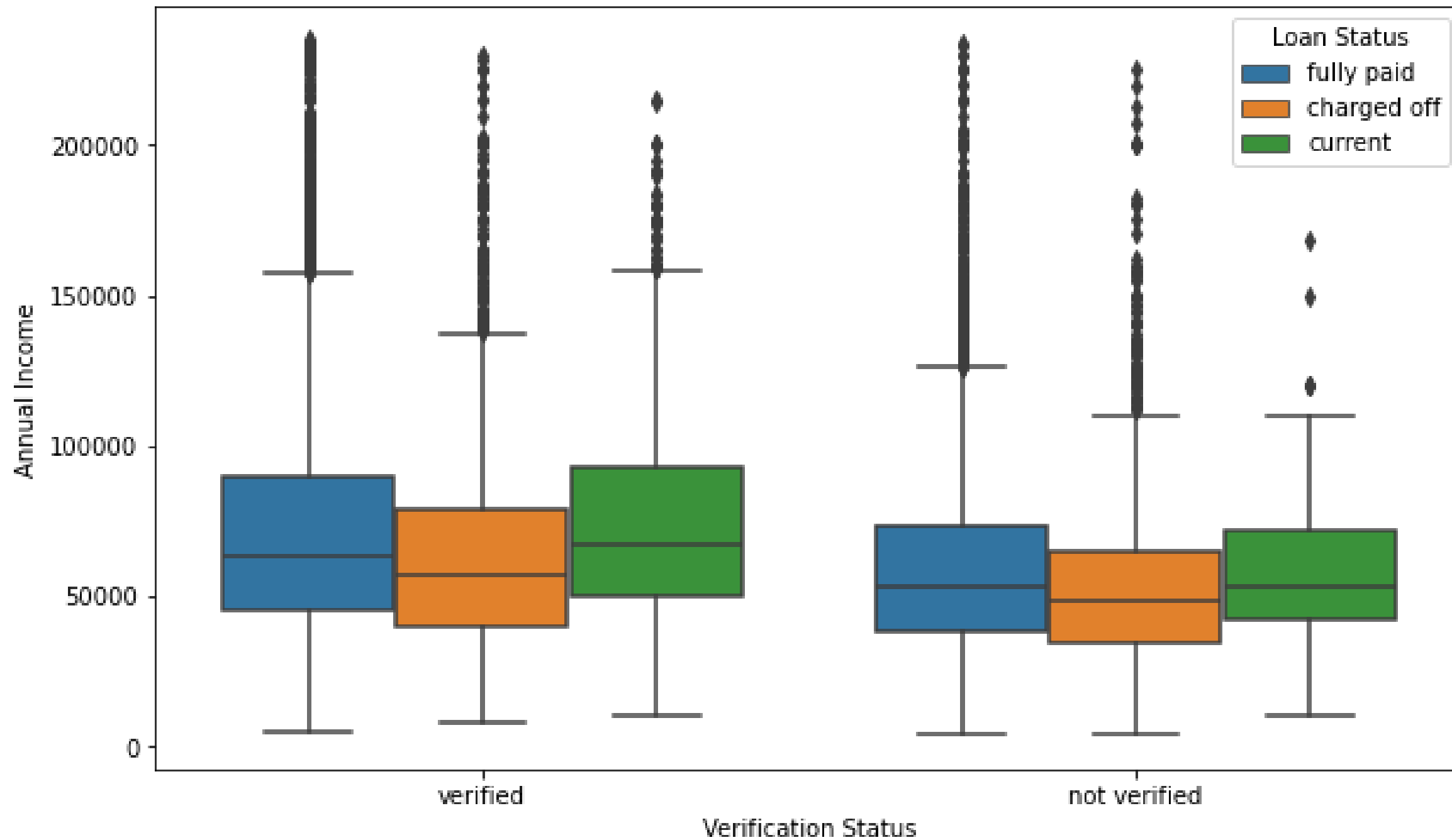
Loan Status vs. Total Recoveries by Public Records

BUSINESS ANALYSIS

Loan Application

Applicant Profile Risk Evaluation

Loan Approval

Low Risk (likely to pay) — **APPROVED** → Loan Approved

Medium Risk (likely to pay) — **APPROVED** → Reduce Loan Amount or Lend at high interest rate

High Risk (Not Likely to pay) — **APPROVED** → Credit Loss

— **DENIED** → Loan Rejected

Fully paid:
Applicant has fully paid the loan (the principal and the interest rate)

Current:
Applicant is in the process of paying the instalments, i.e. the tenure of the loan is not yet completed. These candidates are not labelled as 'defaulted'.

Charged-off:
Applicant has not paid the instalments in due time for a long period of time, i.e. he/she has defaulted on the loan

Loan rejected:
The company had rejected the loan (because the candidate does not meet their requirements etc.). Since the loan was rejected, there is no transactional history of those applicants with the company and so this data is not available with the company (and thus in this dataset)

#	Paramter	Parameter Description	FICO Score Before 05-Nov-2013	Vantage Score After 05-Nov-2013	Example
1	Payment History	It includes your record of on-time payments and any delinquencies or defaults. It reflects your track record of making timely payments. Late payments will negatively impact this portion of your score.	35%	41%	1) Missed Payments Car Loan - 1 time 30 days late 6 years agao Sales Finance - 1 time 60 days late 6 years agao Credit Card - 2 times 30 days late 4 months ago 2) Debts turned over to collection agency 3) Foreclosures or Bankruptcy 4) Recent, Frequent and Server Negative items have a bigger impact
2	Amounts Owed / Credit Utilization	This measures how much of your available credit you are using, focusing on revolving credit like credit cards. This reflects your credit utilization, which is the ratio of your current revolving credit (such as credit card balances) to the total available revolving credit.	30%	20%	1) Credit card Maxed out 2) Credit Balance Accounts 3) Credit Utilization 4) Overextension of EMIs
3	Length of Credit History / Depth of Credit	A longer credit history can be beneficial to your score. It includes the age of your oldest account, the age of your newest account, and an average age of all your accounts. This factor looks at the length of your credit history, the types of credit accounts you have, and how long they've been open.	15%	20%	Student Loan - opened 5 years ago Card Loan - opened 4 years ago Credit Card - opened 3 months ago Age of Oldest Credit - 5 years Age of Newest Credit - 3 months Average age of Credit - 3 years
4	Recent Credit / New Credit	Opening several new credit accounts in a short period of time can represent a greater risk and may lower your score. This includes recent inquiries and new accounts opened. All hard inquiries within a 14-day period as a single inquiry.	10%	11%	1) new credit application - last 12 months
5	Credit Mix / Balances	This considers the variety of credit types you have, such as credit cards, installment loans, finance company accounts, and mortgage loans. This considers the total amount you owe across all your credit accounts.	10%	6%	
6	Available Credit	This looks at the total amount of credit you have available to use.	0%	2%	
	Total		**100%**	**100%**	

BUSINESS CONCLUSION

- CALCULATE NORMALIZED CBIL SCORE BASED ON DATA AVAILABLE AND MAPPED IT AGAINST LOAN STATUS

- USED CBIL SCORE TO UNDERSTAND RISK/PORTFOLIO ASSESTMENT.

- CONCLUSION:
  - IF CBIL SCORE IS GREATER THAN OF EQUAL TO 70, THEN BORROWER IS GOOD CANDIDATE FOR LOAN.
  - IF CBIL SCORE IS BETWEEN 60 TO 69, THEN BORROWER IS OK CANDIDATE FOR LOAN. WE DECREASE THE LOAN AMOUNT TO MITIGATE RISK.
  - IF CBIL SCORE IS BELOW 60, THEN BORROWER IS RISKY CANDIDATE FOR LOAN. WE CAN INCREASE THE LOAN INTEREST RATE TO MITIGATE RISK.

CBIL Score by Loan Status