Lending Club Case Study

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Lending Club Case Study

Description :

This study is based on a consumer finance company which specializes in lending various types of loans to urban customers.

Company has to take decision to approve the loan application based on data of past loan applicants to reduce/avoid defaulters hence reduce the financial loses to the company.

Task :

Our aim is to study **consumer attributes** and **loan attributes** with the help of data from past loan applicants using EDA then identify patterns, which leads to a person is likely to default.

Libraries and data set used for case study :

Libraries:

- Numpy
- Pandas
- Matplotlib.pyplot
- Seaborn

Data set:

Loan.csv

Number of Rows in the Dataset= 39717

Number of Columns in the Dataset= 111

Manipulation of Data:

- After dropping null values left out Rows = 39717, Columns = 57

- After removing single valued columns, which are not useful for analysis
  remaining Rows = 39717, Columns = 48

- Columns such as **id, member_id, url, zip_code, last_credit_pull_d,** and **desc** do not contribute to loan risk analysis. Hence, removed these columns from the dataset.

- Columns with **more than 60% missing values** cannot be imputed without introducing bias into our analysis. Therefore, removed these columns.
  Final shape of the data set is 39717 rows and 26 columns.

Filtering Loan Status for Analysis:

The objective of this analysis is to determine the likelihood of loan default. This can only be assessed for loans that are either fully paid or charged off. Current loans cannot provide meaningful insights into default risk. Therefore, we excluded records with a current loan status from our dataset.

```
loan_data=loan_data[~(loan_data['loan_status']=='Current')]
loan_data.loan_status.value_counts()
```

```
loan_status
Fully Paid     32950
Charged Off     5627
Name: count, dtype: int64
```

Checking and Imputing Missing Values:

To ensure the quality of our data, we need to identify and handle missing values appropriately.

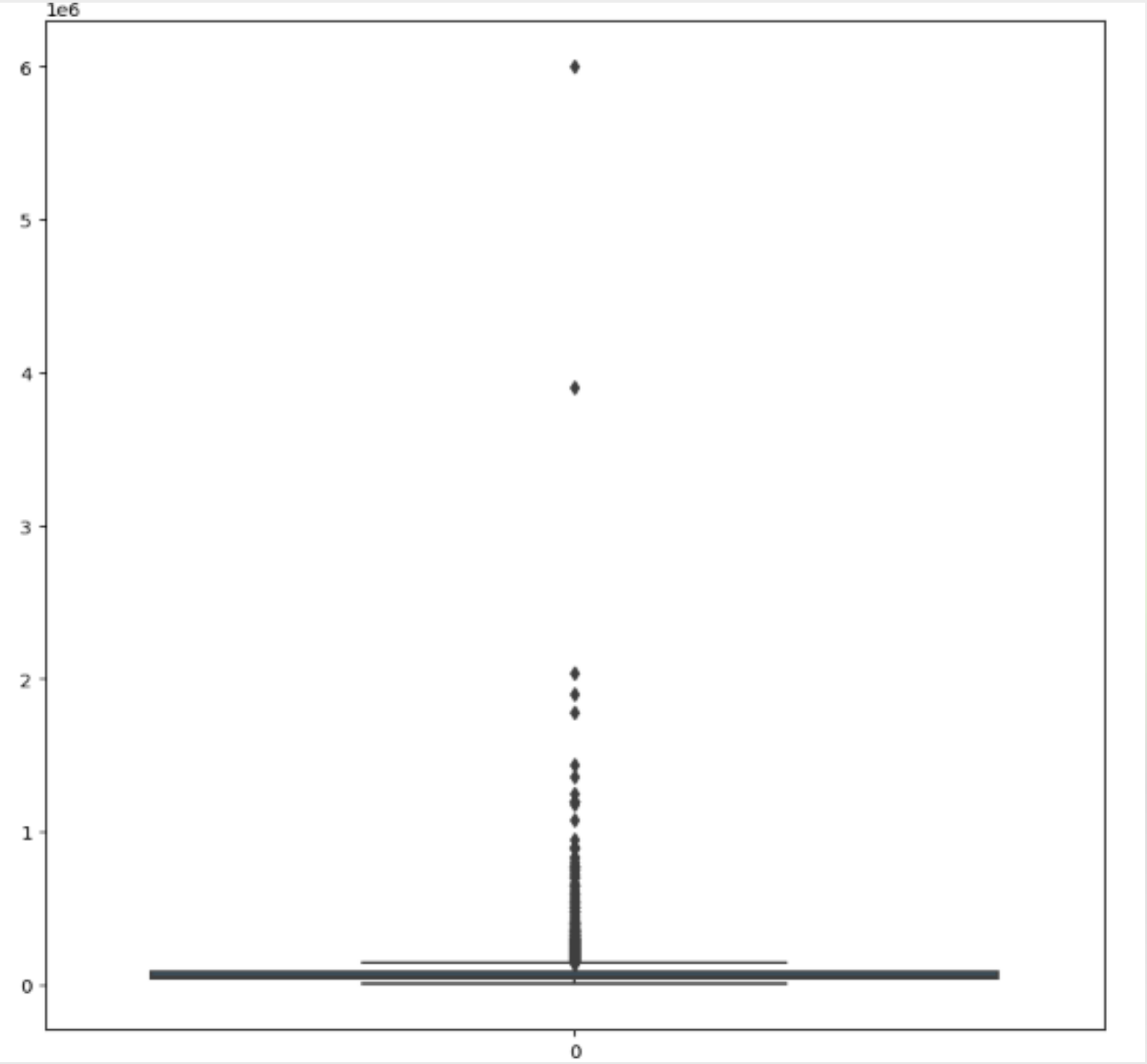
Imputing missing values helps maintain the integrity of the dataset without introducing bias.

```
missing_values=round(loan_data.isnull().mean()*100,2)
missing_values[missing_values>0]
```

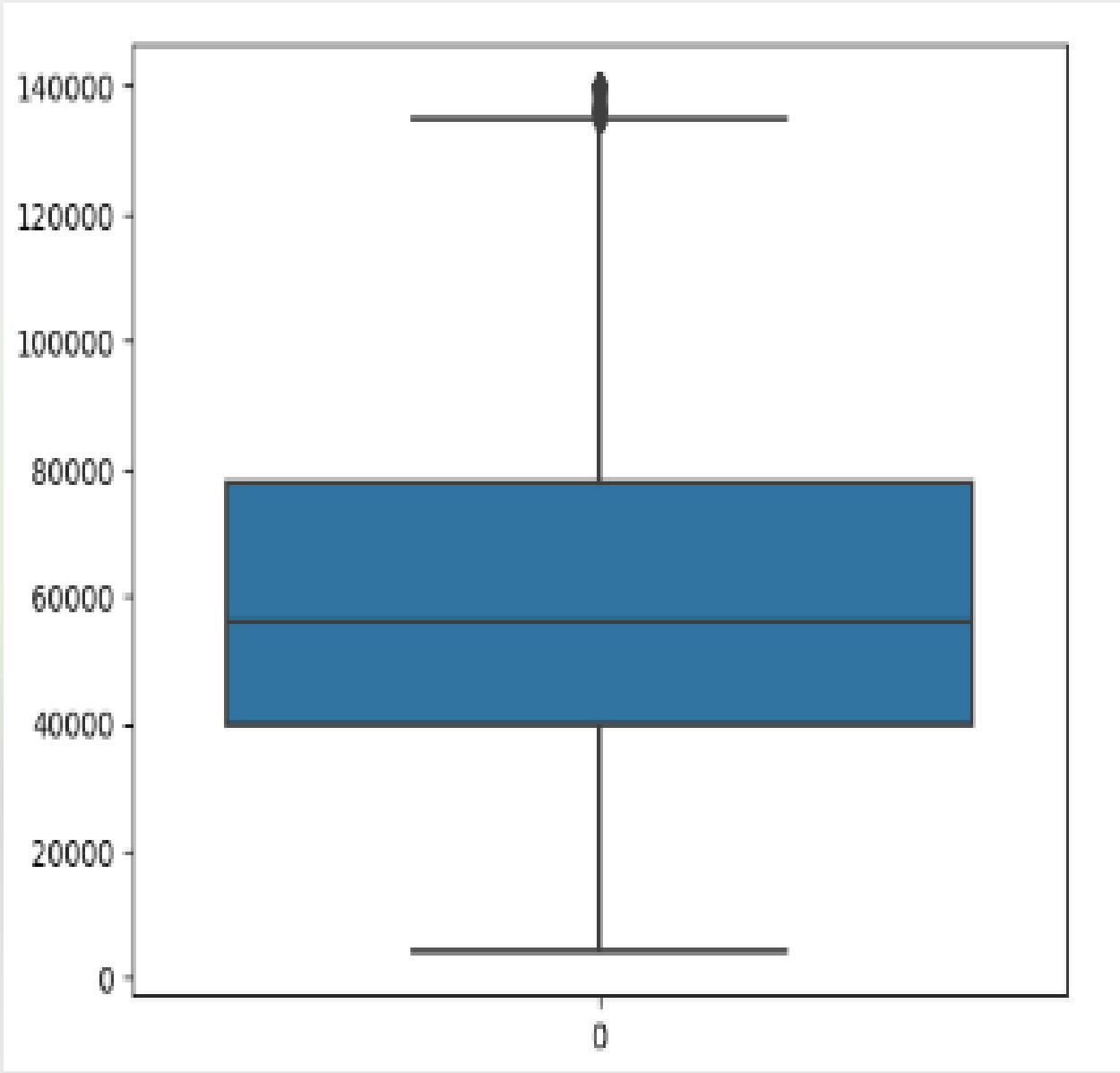
```
emp_title                6.19
emp_length               2.68
title                    0.03
revol_util               0.13
pub_rec_bankruptcies     1.81
dtype: float64
```

Imputed missing values with Mode to maintain integrity of data set.

Outlier Detection and Removal Using Boxplots :

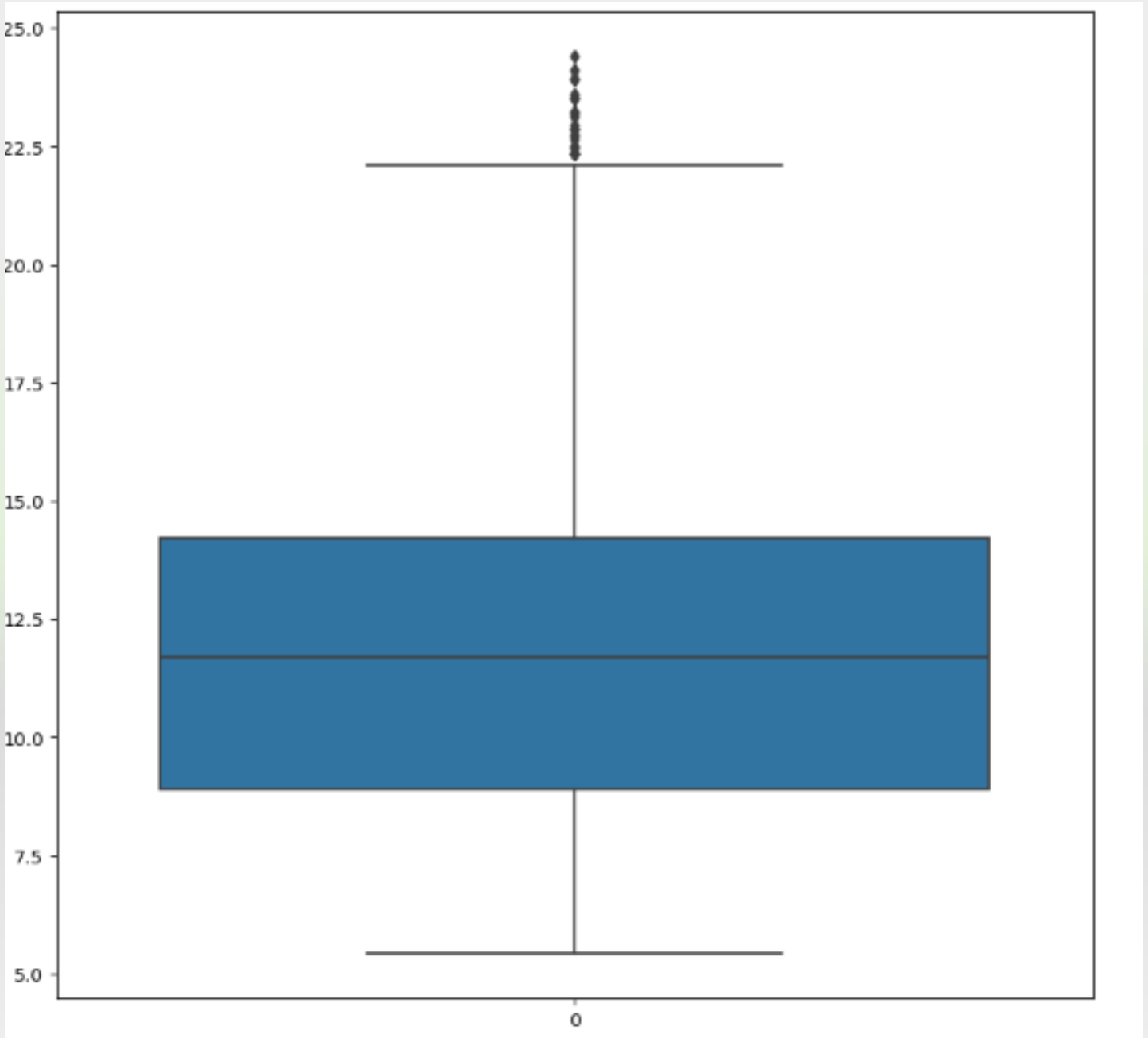


Annual Income Box Plot at 100%

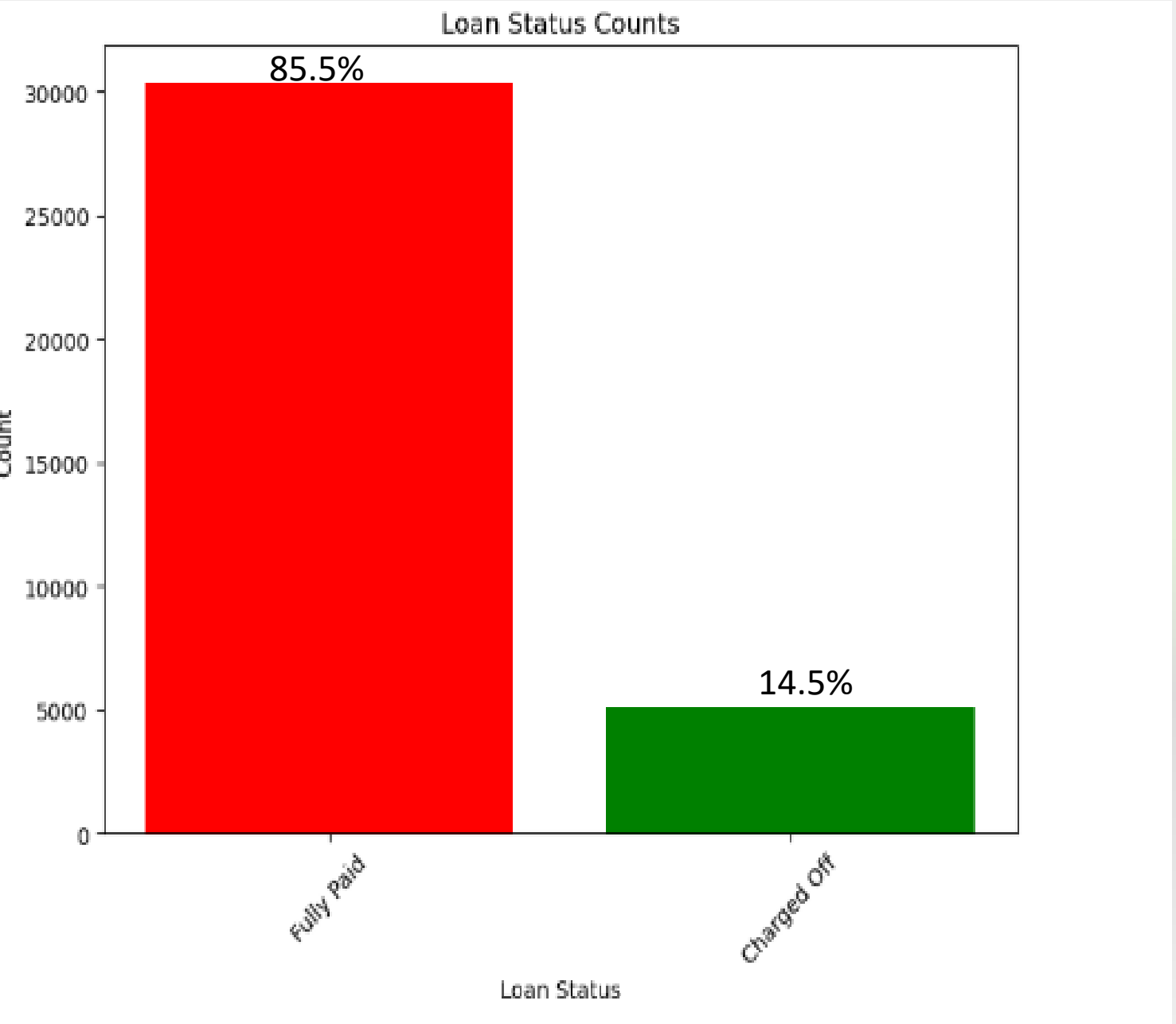


Annual Income Box Plot at 95% quantile

Interest Rate Box Plot



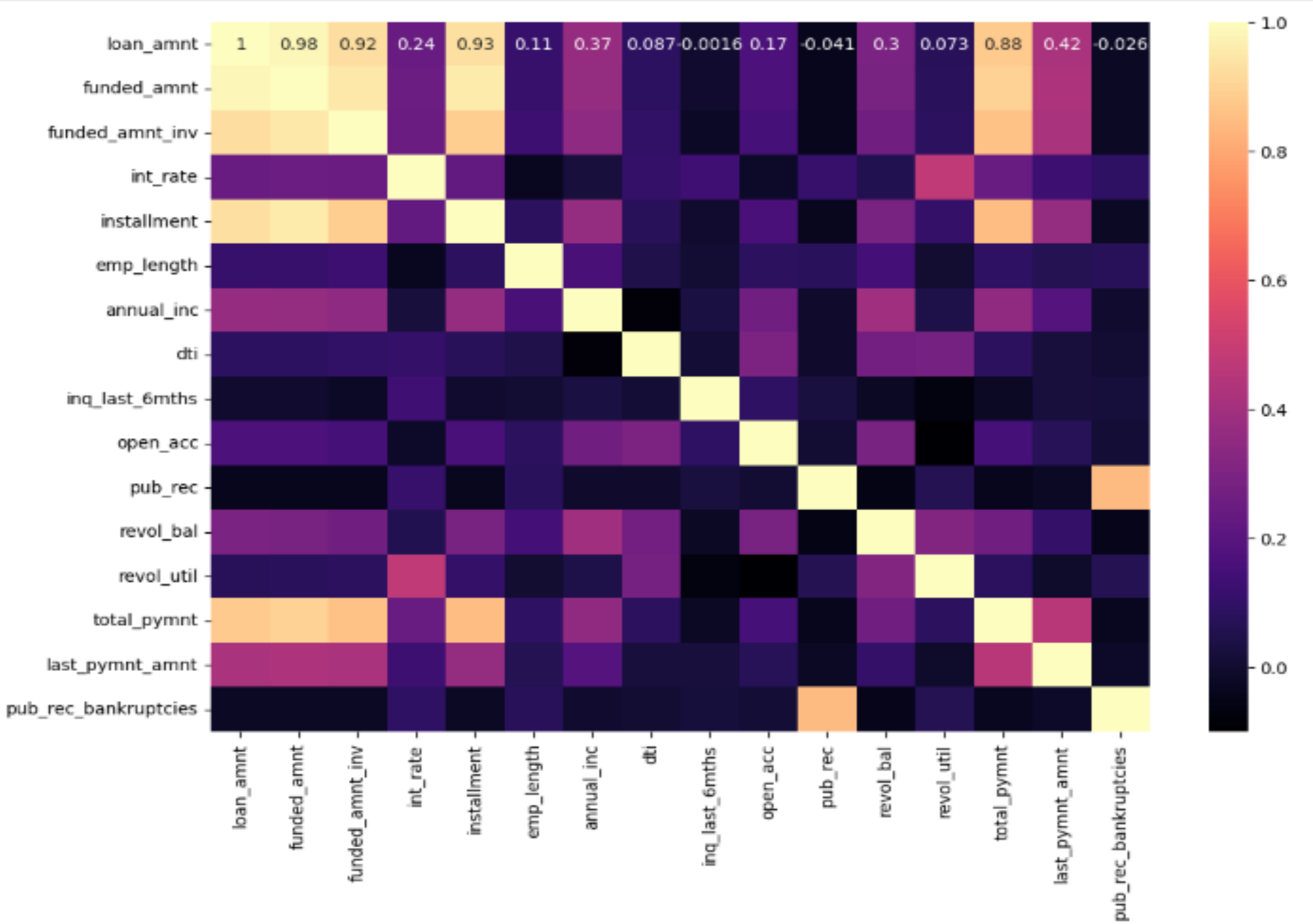
Bar Plot of Loan Status



Percentage of customers fully paid =85.5

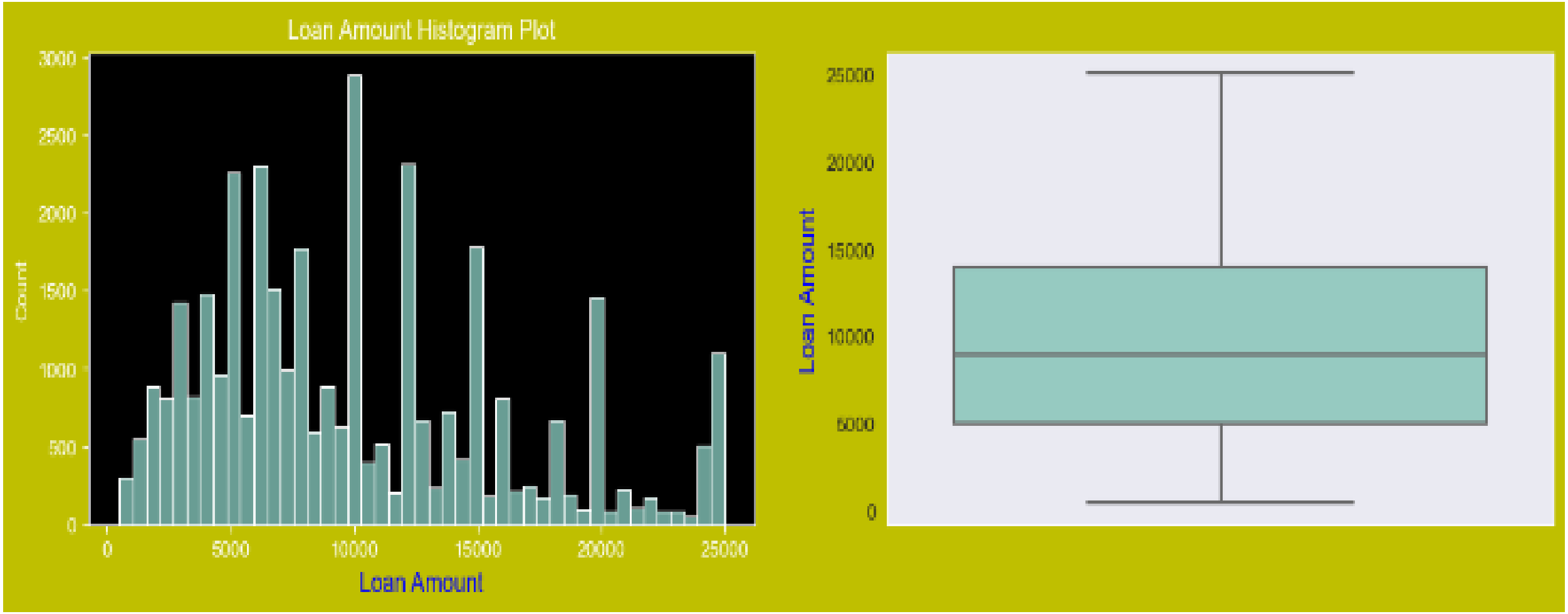
Percentage of customers Charged off =14.5

Heat Map


loan_amnt
funded_amnt
funded_amnt_inv
int_rate
installment
emp_length
annual_inc
dti
inq_last_6mths
open_acc
pub_rec
revol_bal
revol_util
total_pymnt
last_pymnt_amnt
pub_rec_bankruptcies
1 0.98 0.92 0.24 0.93 0.11 0.37 0.087 -0.0016 0.17 -0.041 0.3 0.073 0.88 0.42 -0.026
1.0
0.8
0.6
0.4
0.2
0.0

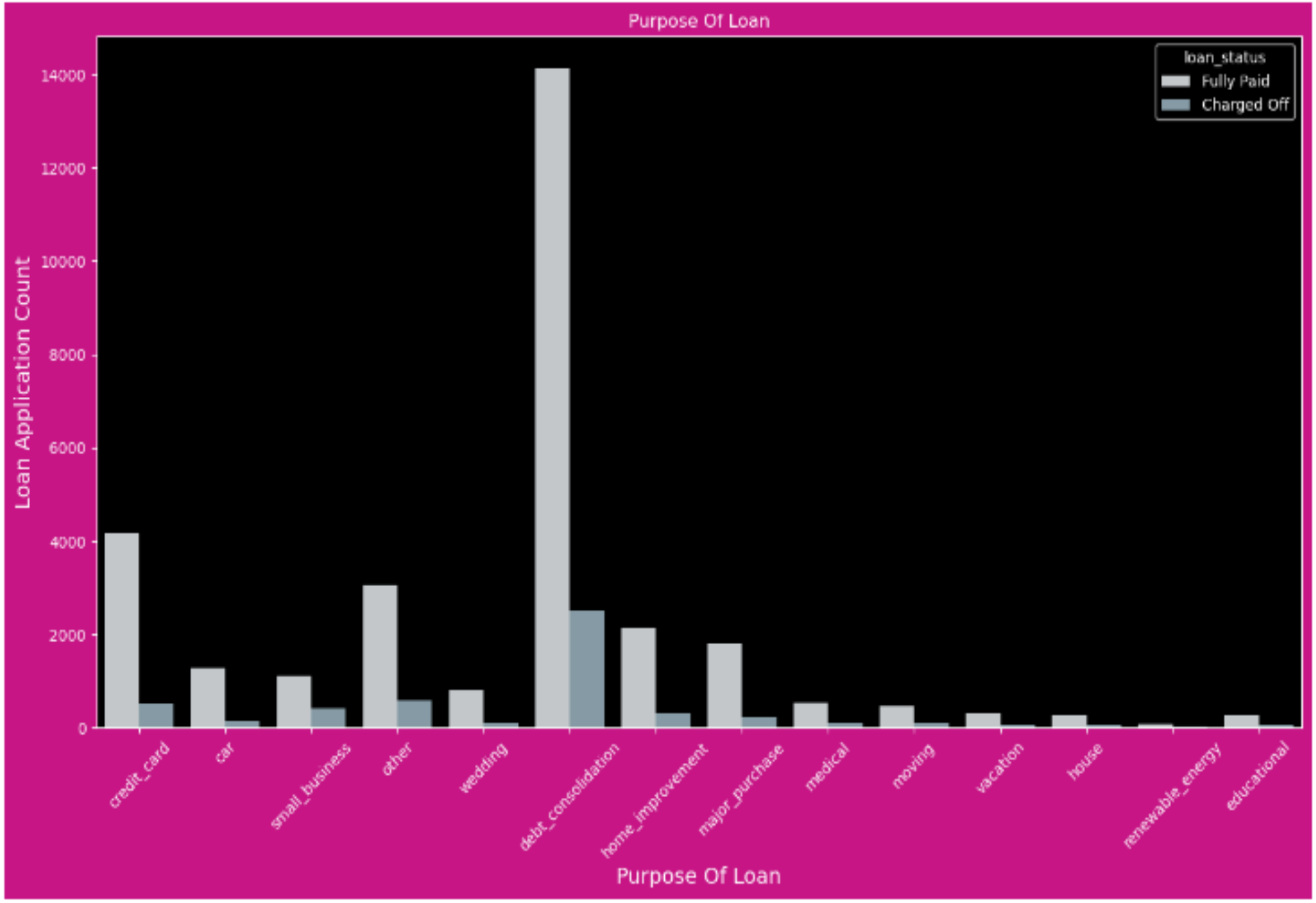
Univariate Analysis

Loan Amount Histogram and Box Plot



Observations : The majority of loan amounts fall within the range of 5000 to 15000

Histogram Plot for Purpose of Loan

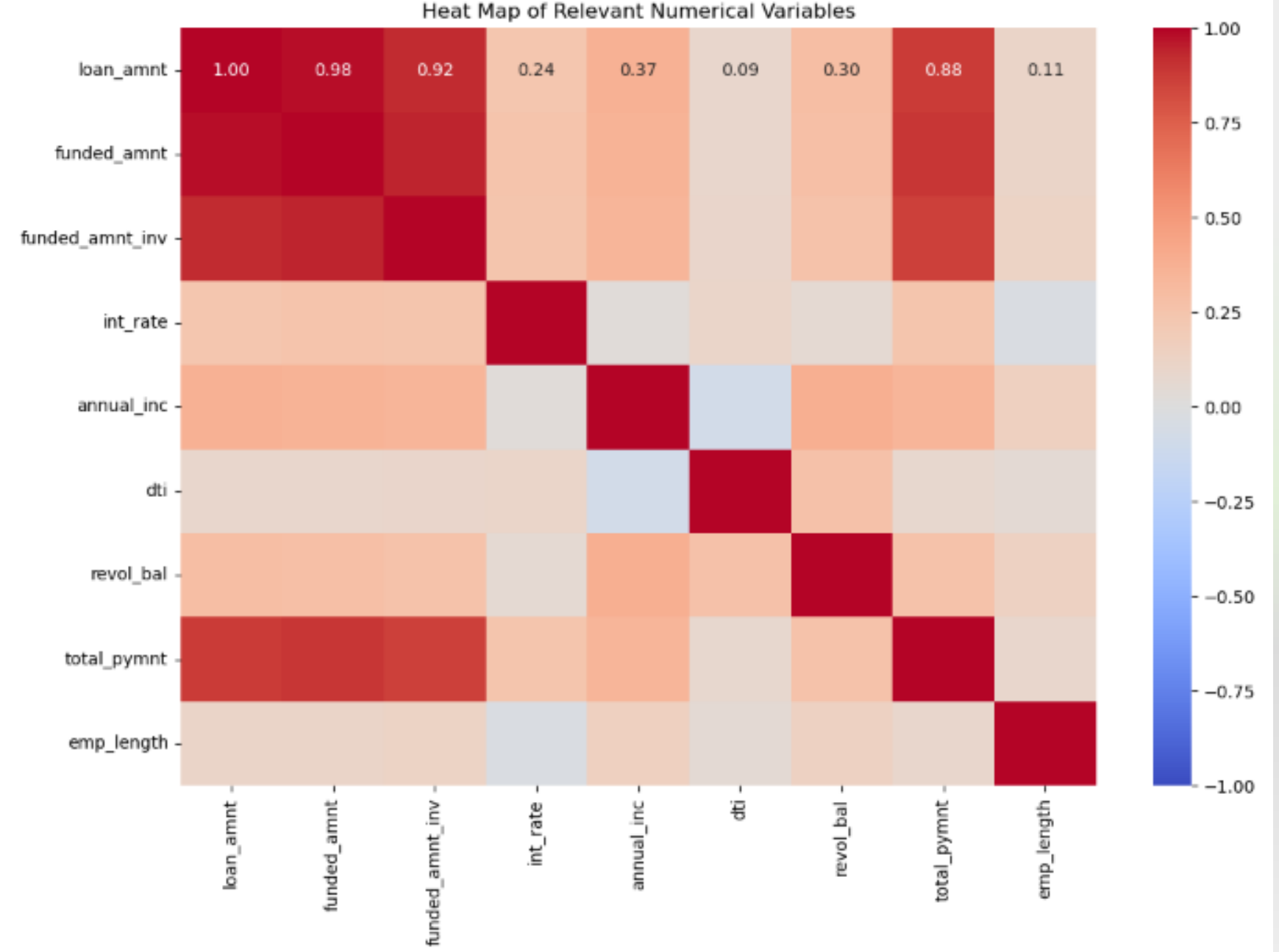


Observations :

The count plot shows that debt consolidation accounted for the majority of loans taken out. Furthermore, a very high number of loans that have been charged off are connected to these uses.

Bivariate Analysis

Heat Map



Observations

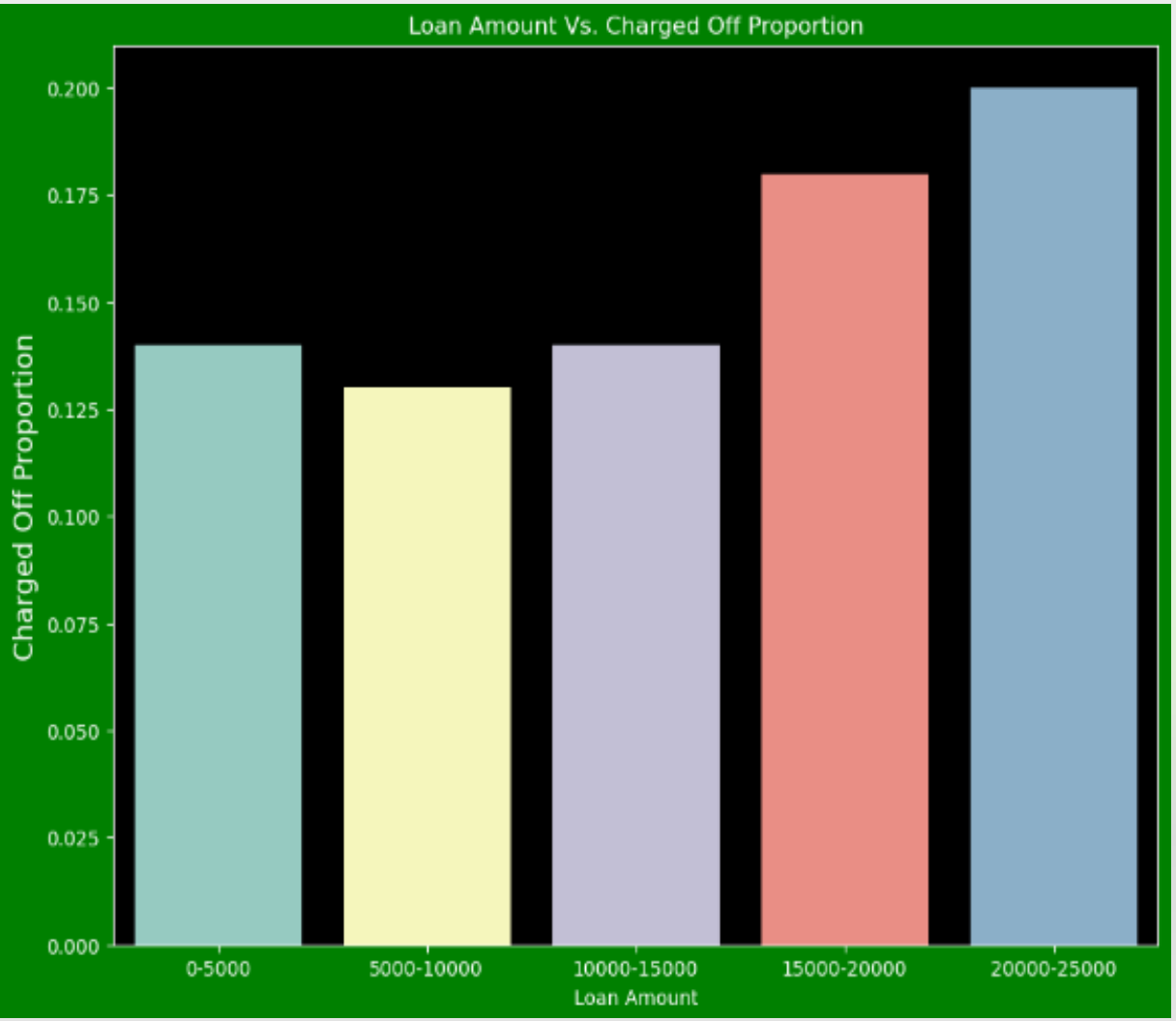
- **Loan amount, funding amount, and funded amount invested are strongly correlated**: These three variables are closely related, indicating that as one increases, the others tend to increase as well.
- **Interest rate and employee length are negatively correlated**: This suggests that longer employee tenure is associated with lower interest rates, possibly reflecting lower risk for long-term employed individuals.
- **Delinquency in the past 2 years and inquiries in the last 6 months are positively correlated with the interest rate**: This suggests a tendency towards higher interest rates for borrowers with recent delinquencies and numerous recent credit inquiries, indicating a higher risk of default.
- **Annual income is positively correlated with loan amount, revol_bal, and total payment**: Higher income individuals tend to take out larger loans, have higher revolving balances, and make higher total payments.
- **Debt-to-income (DTI) ratio is positively correlated with revolving balance**: This indicates that individuals with higher revolving balances tend to have higher debt-to-income ratios.
- **Total payment is strongly correlated with loan amount, funded amount, and funded amount invested**: This shows that larger loans lead to higher total payments over time.

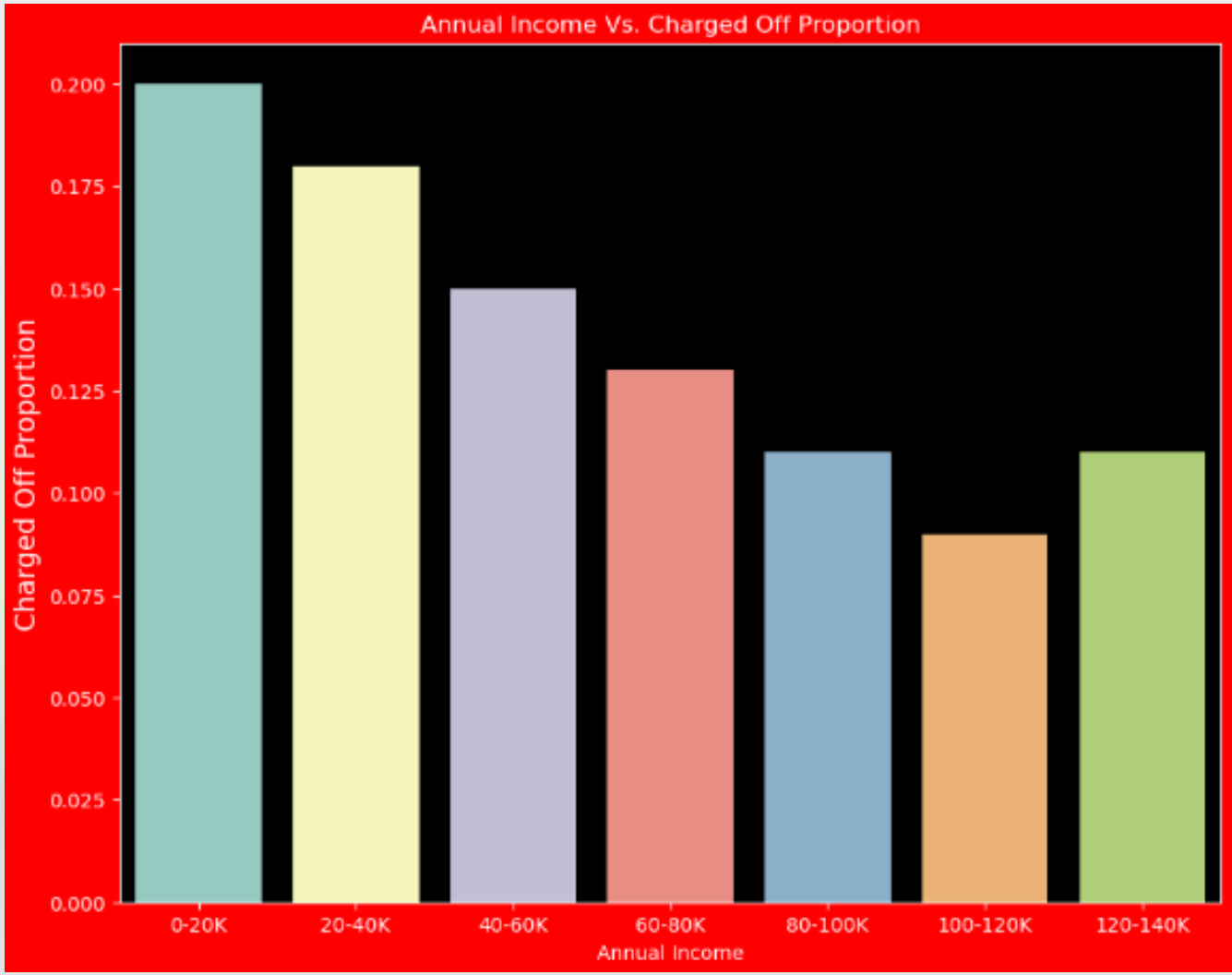
Bi variate Analysis, Part One with loan status

In this section, we will compare the loan status to certain important columns that might have an impact on debts that have been charged off.

- LOAN AMOUNT
- INTEREST RATE
- ANNUAL INCOME
- PURPOSE OF LOAN
- GRADE
- SUB GRADE
- EMP LENGTH (EMPLOYEE EXPERIENCE)
- DTI
- HOME OWNERSHIP
- VERIFICATION STATUS
- ADDRESS STATE
- PUB_REC_BANKRUPTICIES (BANKRUPTICIES)

Bi variate Analysis, Part One with loan status

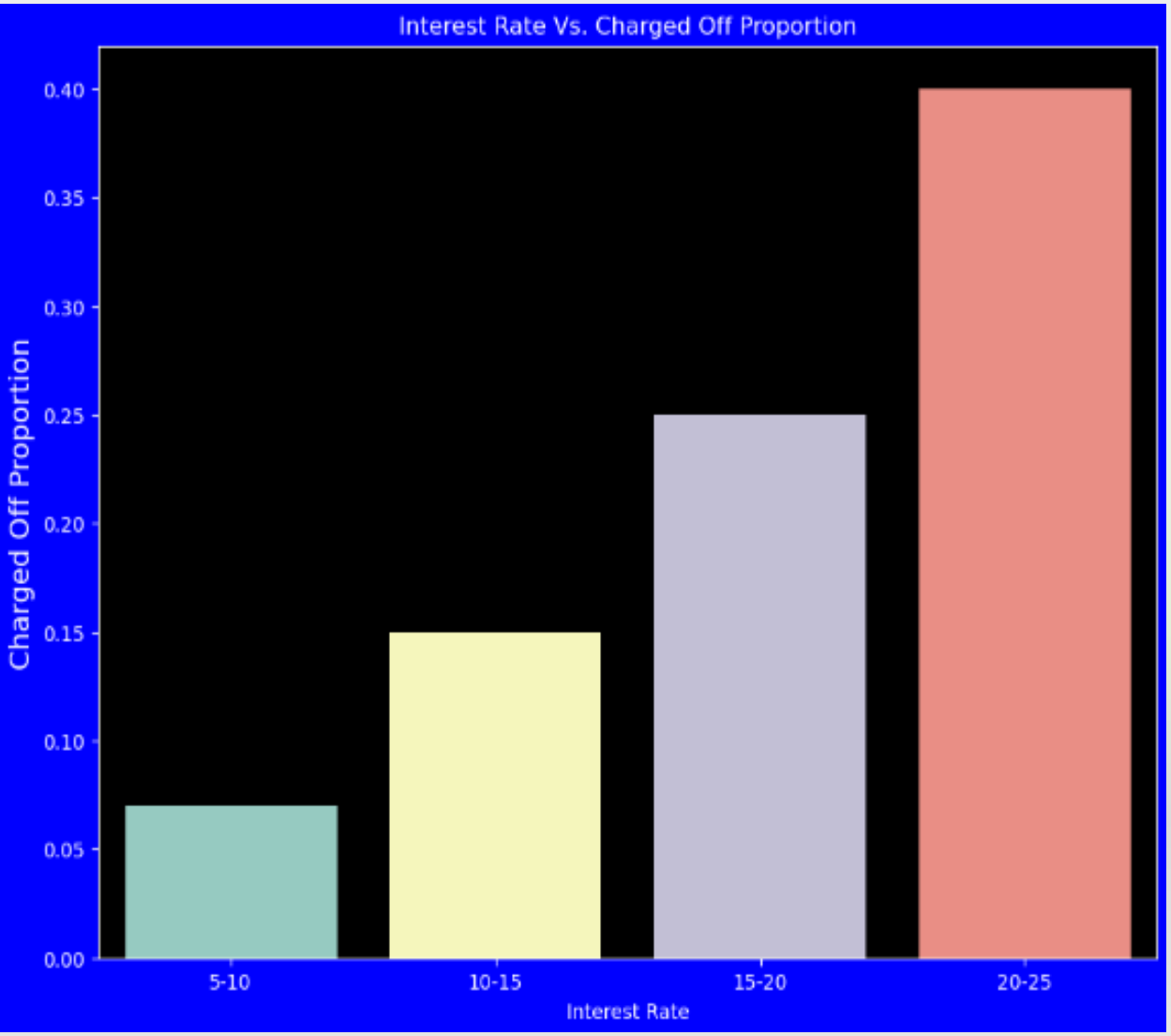


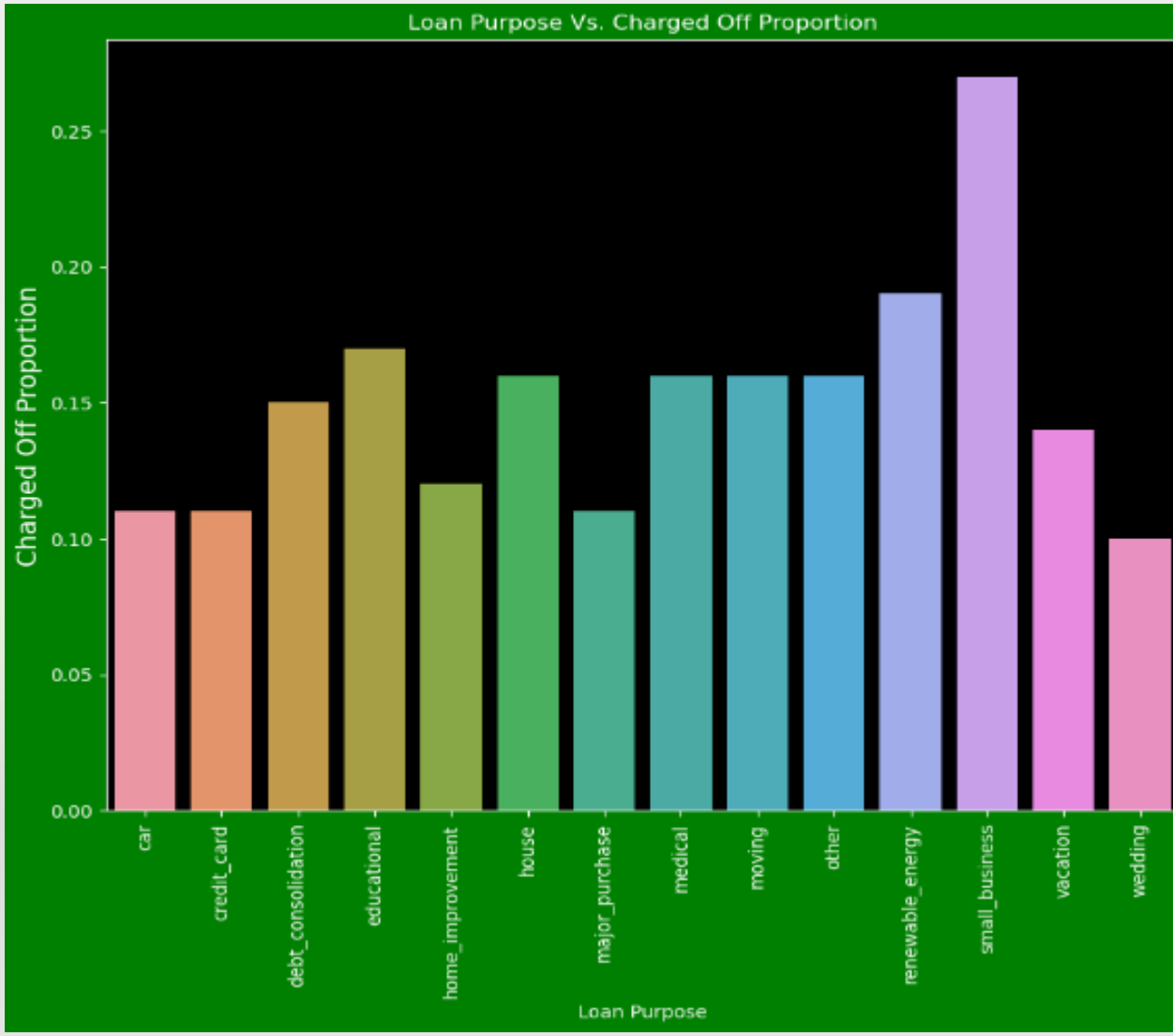


Loan Amount Vs Charged off Proportion

Annual Income Vs Charged off Proportion

Bi variate Analysis, Part One with loan status

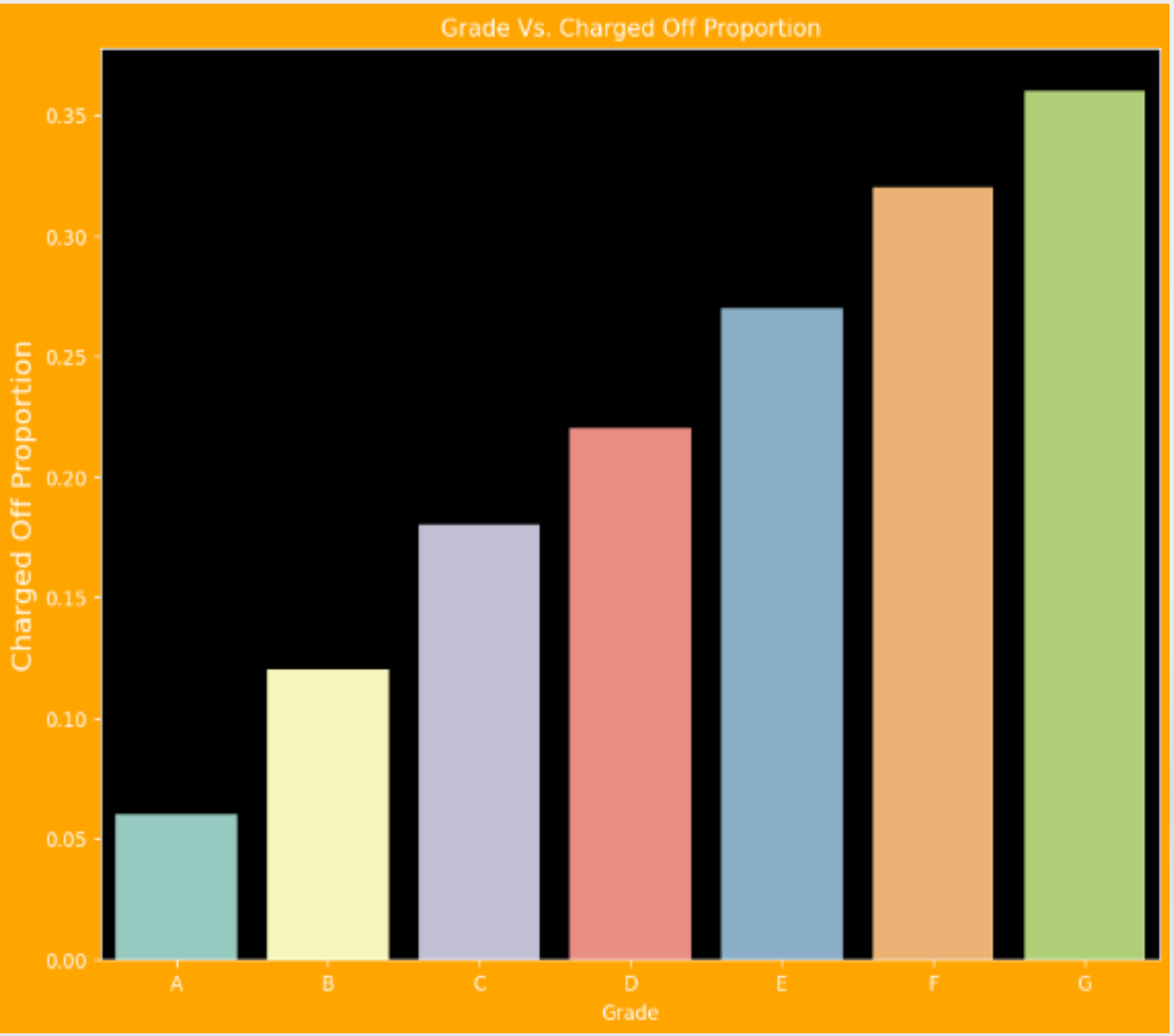




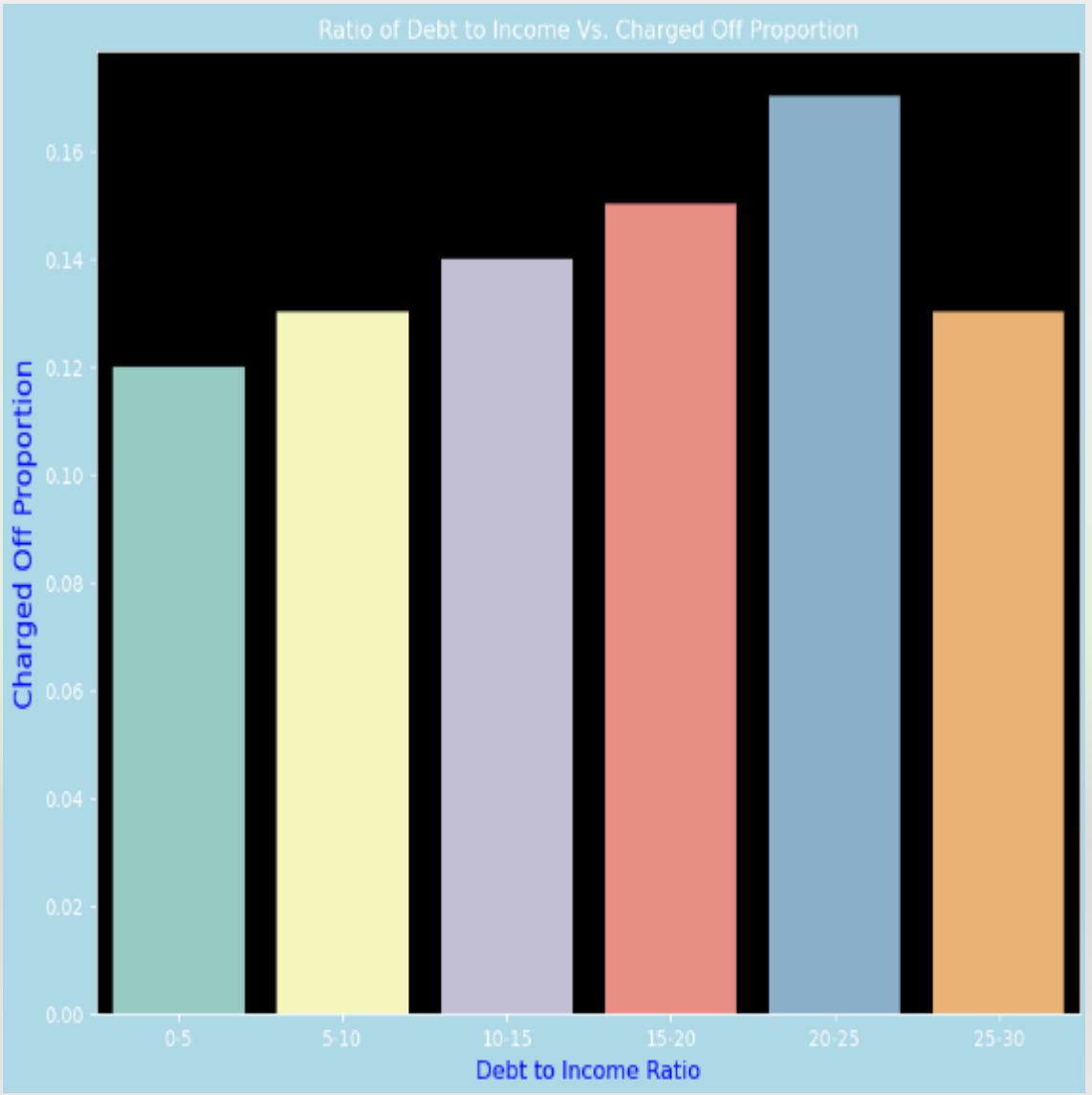
Interest Rate Vs Charged off Proportion

Loan Purpose Vs Charged off Proportion

Bi variate Analysis, Part One with loan status

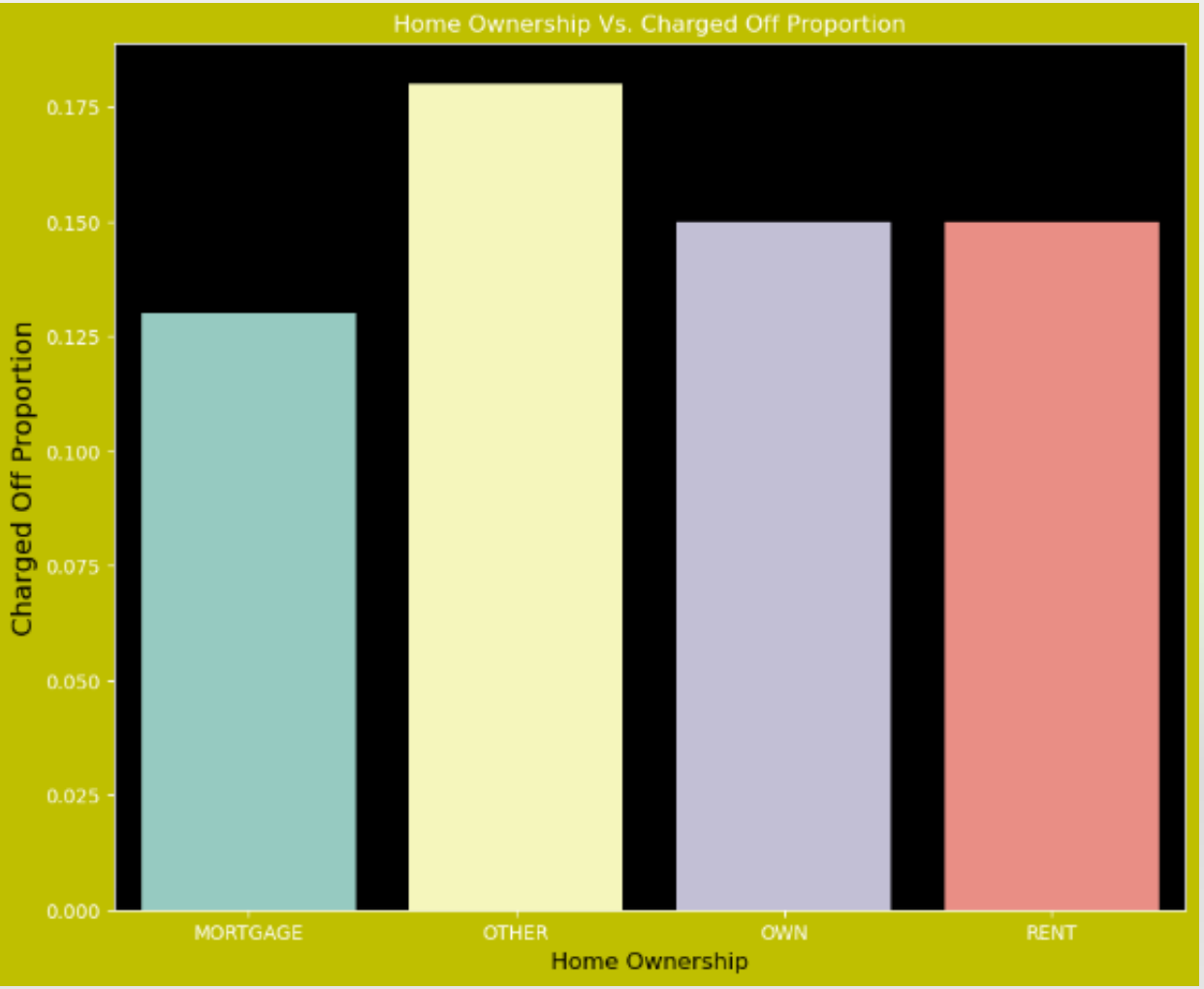


Grade Vs Charged off Proportion

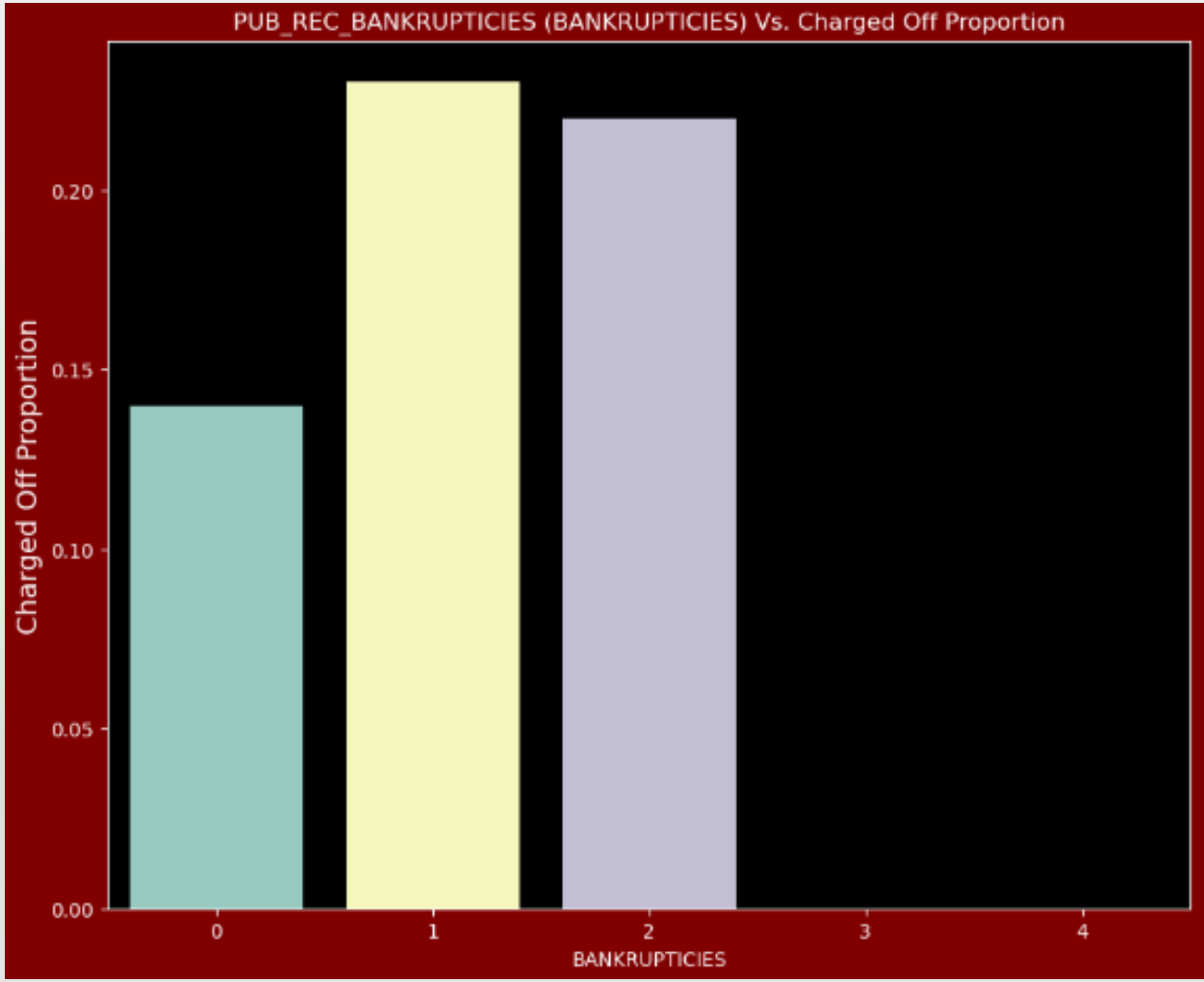


Debt to Income Ratio Vs Charged off Proportion

Bi variate Analysis, Part One with loan status

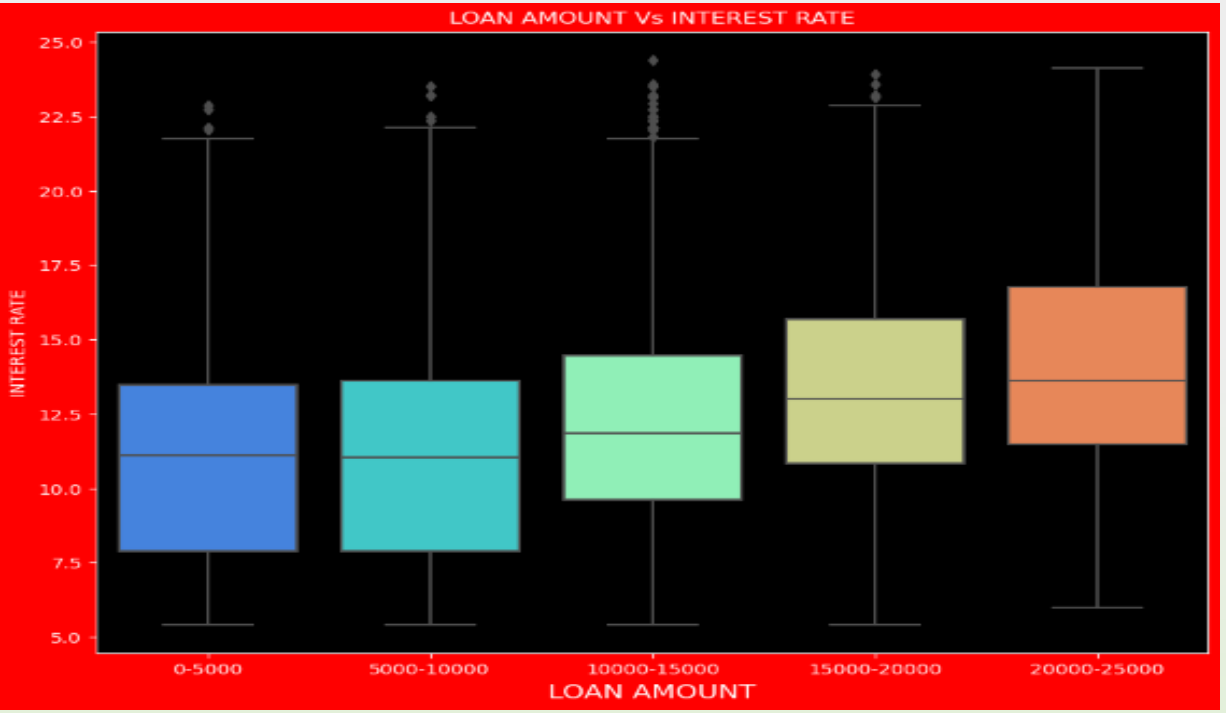


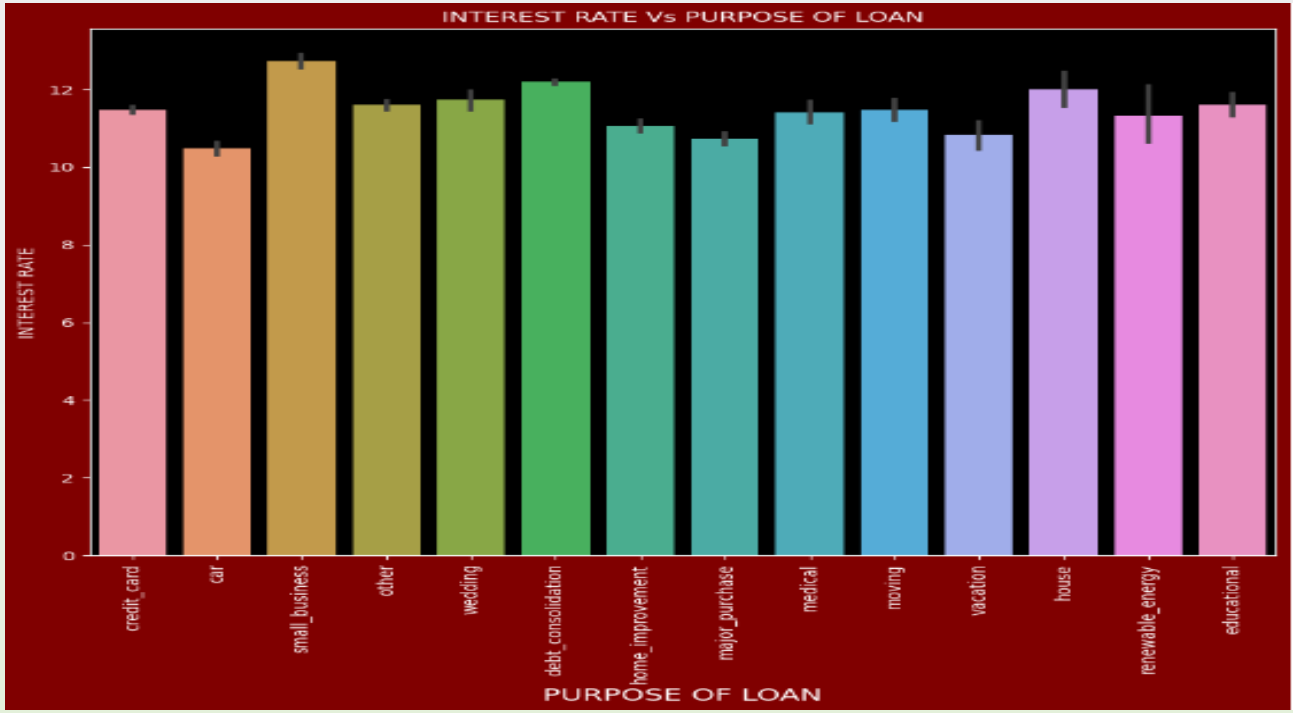
Home Ownership Vs Charged off Proportion



Bankruptcies Vs Charged off Proportion

Bi variate Analysis with Two Different components, Part Two



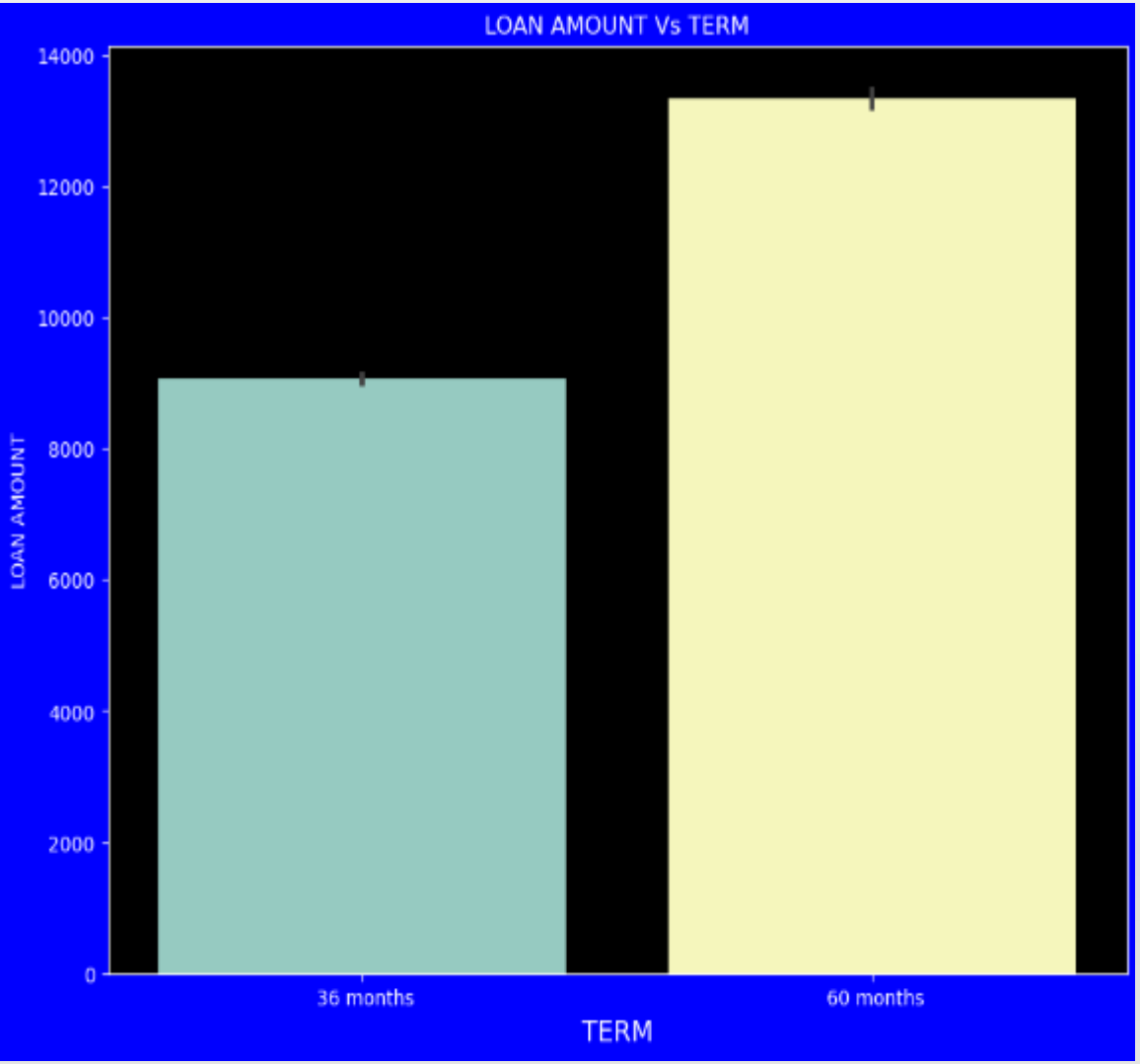


Loan Amount Vs Rate of Interest

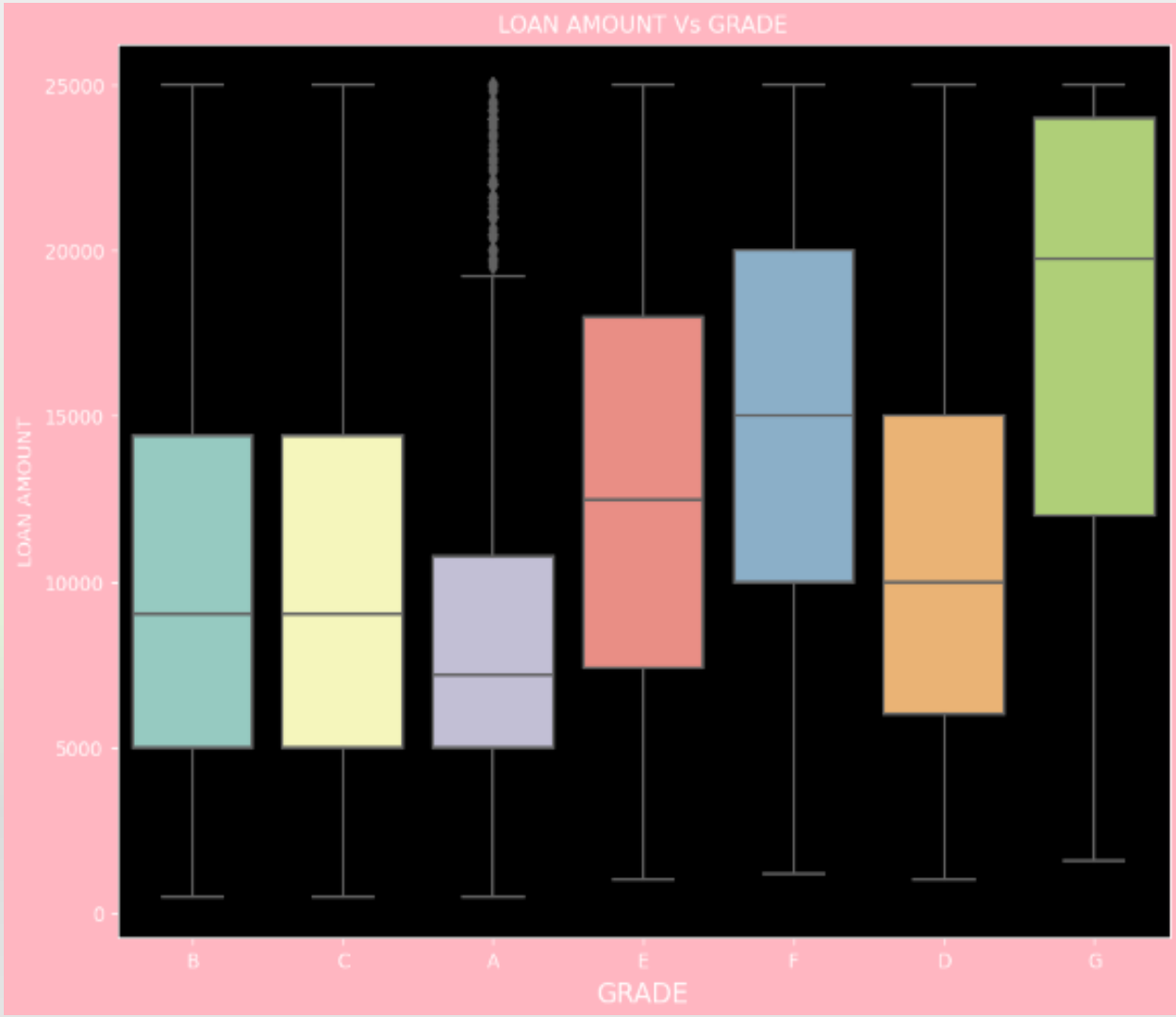
Loan Purpose Vs Rate of Interest

Debt to Income Vs Rate of Interest

Bi variate Analysis with Two Different components, Part Two

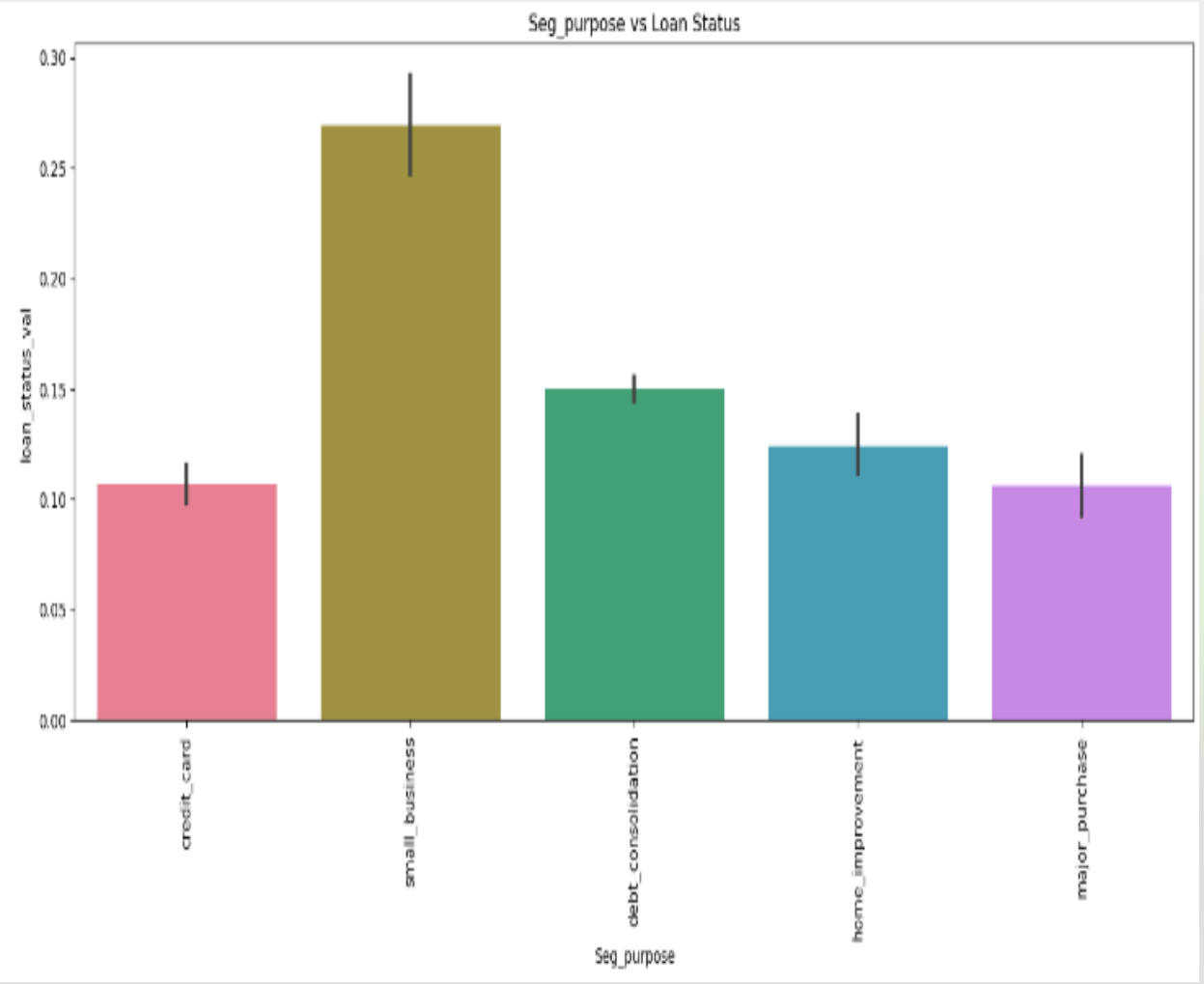


Loan Amount Vs Term

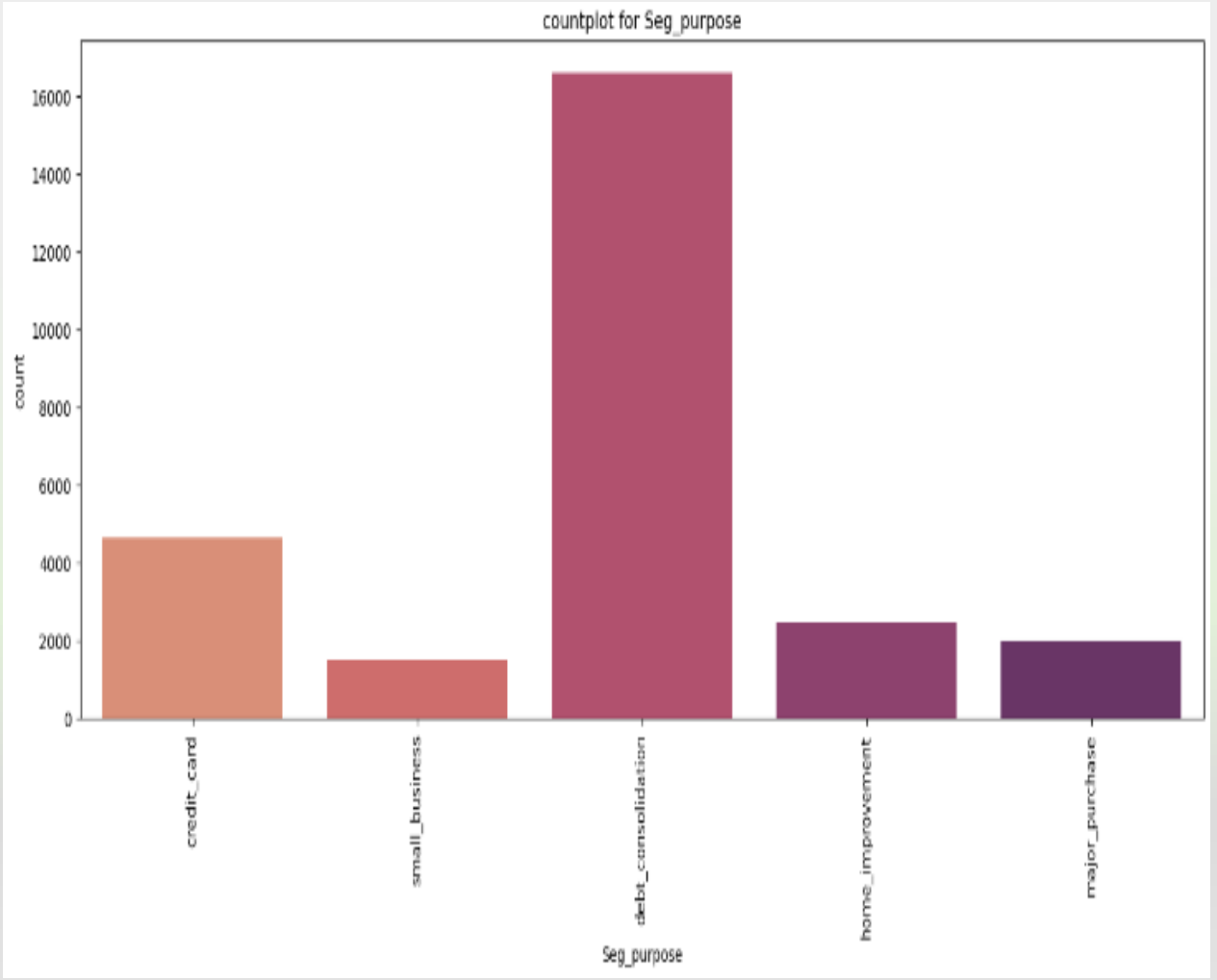


Loan Amount Vs Grade

Segmented Analysis



Purpose Vs Loan Status



Count plot for Seg_Purpose

Conclusion

- Loans with higher loan amount, higher interest rate, Grade F and Grade G are more likely to be charged off.
- Small business loans are at a higher proportion of charged off loans.
- Those who are unemployed or have less than one year of experience are more likely to be charged off.
- The likelihood of a loan being charged off increases progressively as DTI increases.
- Those with pub_rec_bankruptcies values 1 and 2 have higher charged-off percentage than those without pub_rec_bankruptcies.

It's clear that as annual income increases, the percentage of charged-off loans decreases.