



# LENDING CLUB CASE STUDY

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# BACKGROUND INFORMATION

- The company is the largest **online loan marketplace, facilitating personal loans, business loans, and financing of medical procedures**. Borrowers can easily access lower interest rate loans through a fast online interface. Like most other lending companies, lending loans to '**risky**' applicants is the largest source of financial loss (called credit loss). **Credit loss** is the amount of money lost by the lender when the borrower refuses to pay or runs away with the money owed. In other words, borrowers who default cause the largest amount of loss to the lenders. In this case, the customers labelled as 'charged-off' are the 'defaulters'

# PROBLEM STATEMENT

What is the problem?

- Company gives out charged off or default loans which they are unable to recover

Who has this problem?

- Largest Online Loan Marketplace which facilitates personal loans, business loans etc.

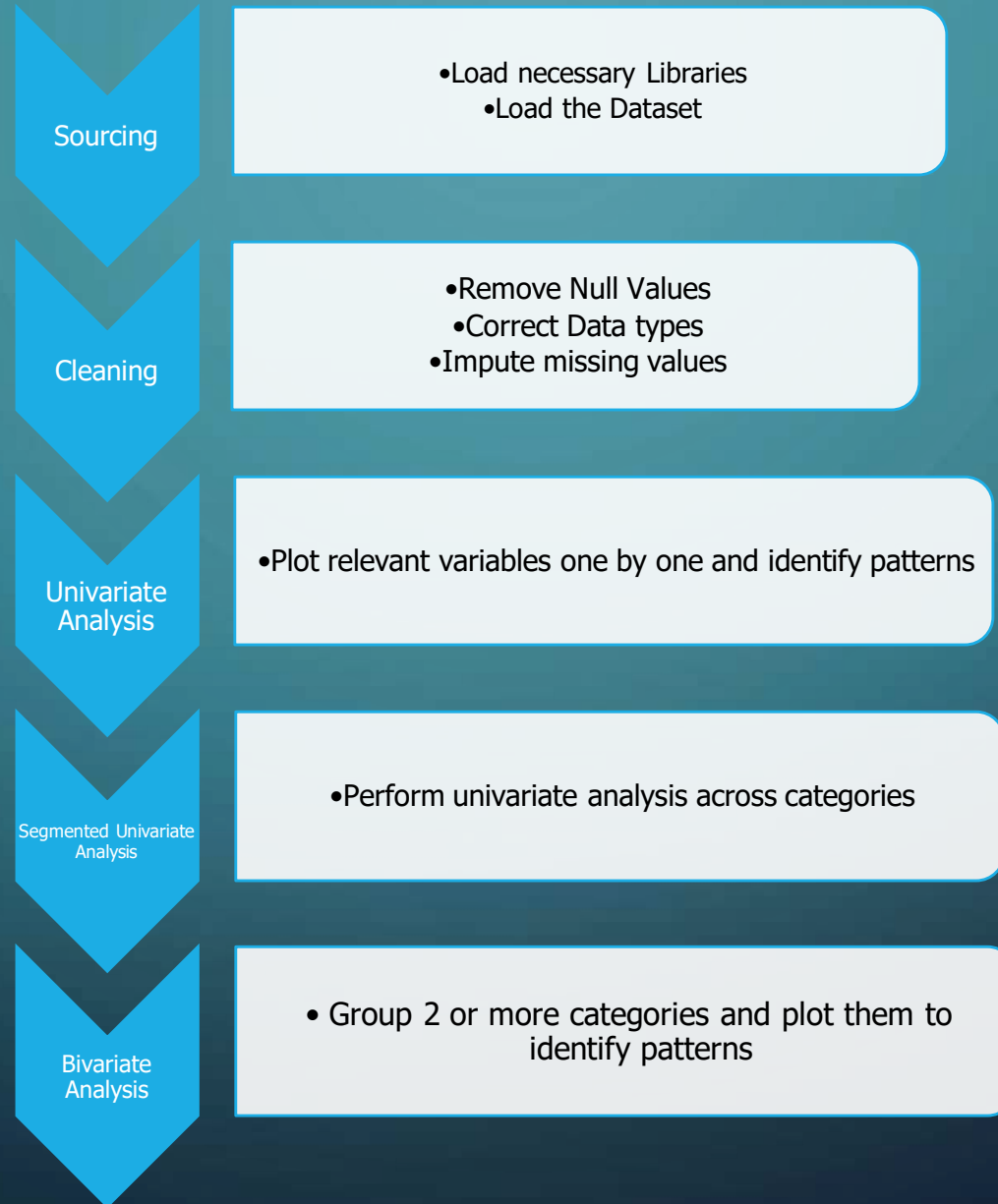
Why should this problem be solved?

- Charged off or default Loans results in Credit Loss for the company

How to solve the problem?

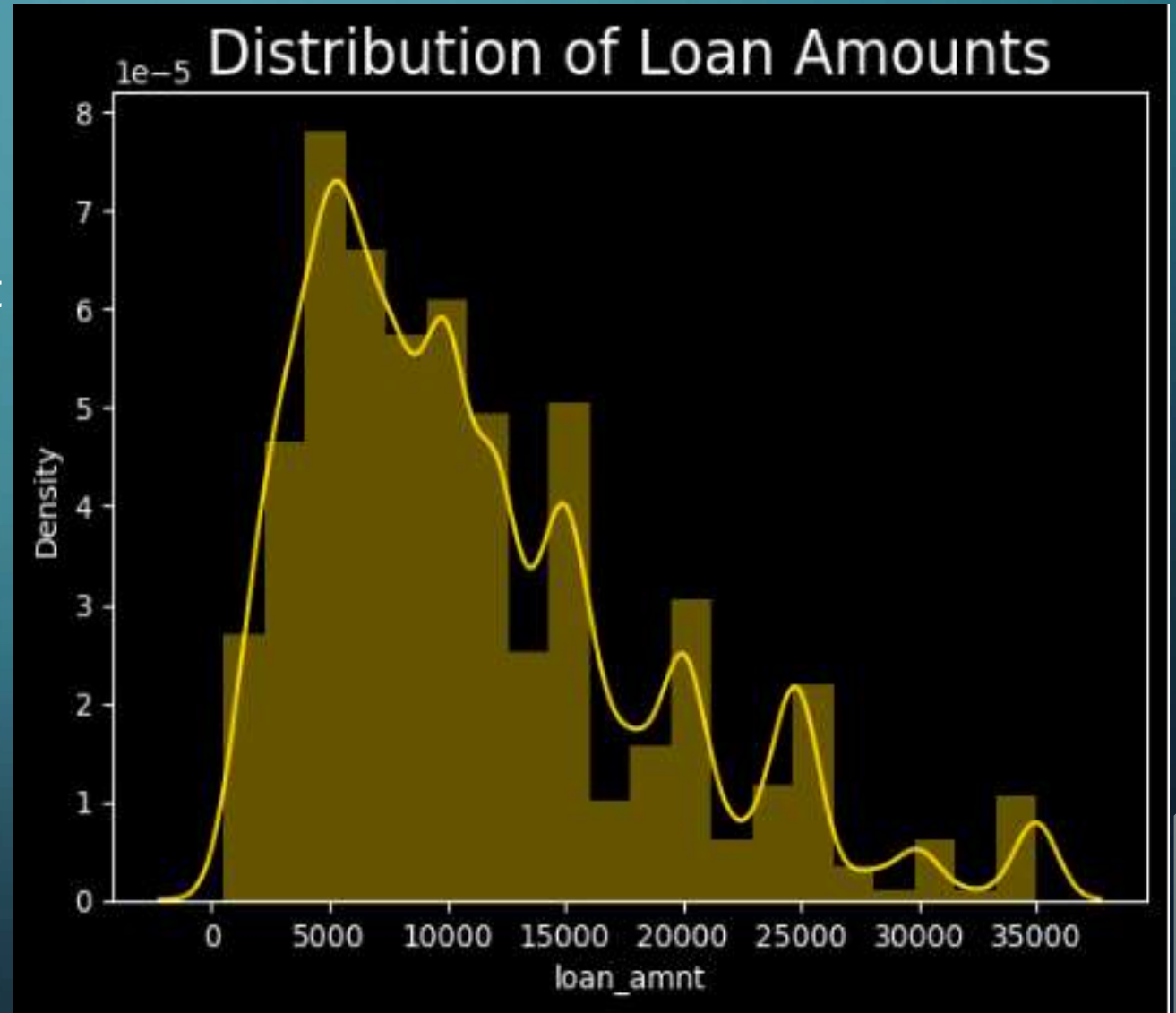
- Use EDA to identify/characterize behaviors or data points to identify charged off or default loans

# STEPS TO SOLVE THE PROBLEM



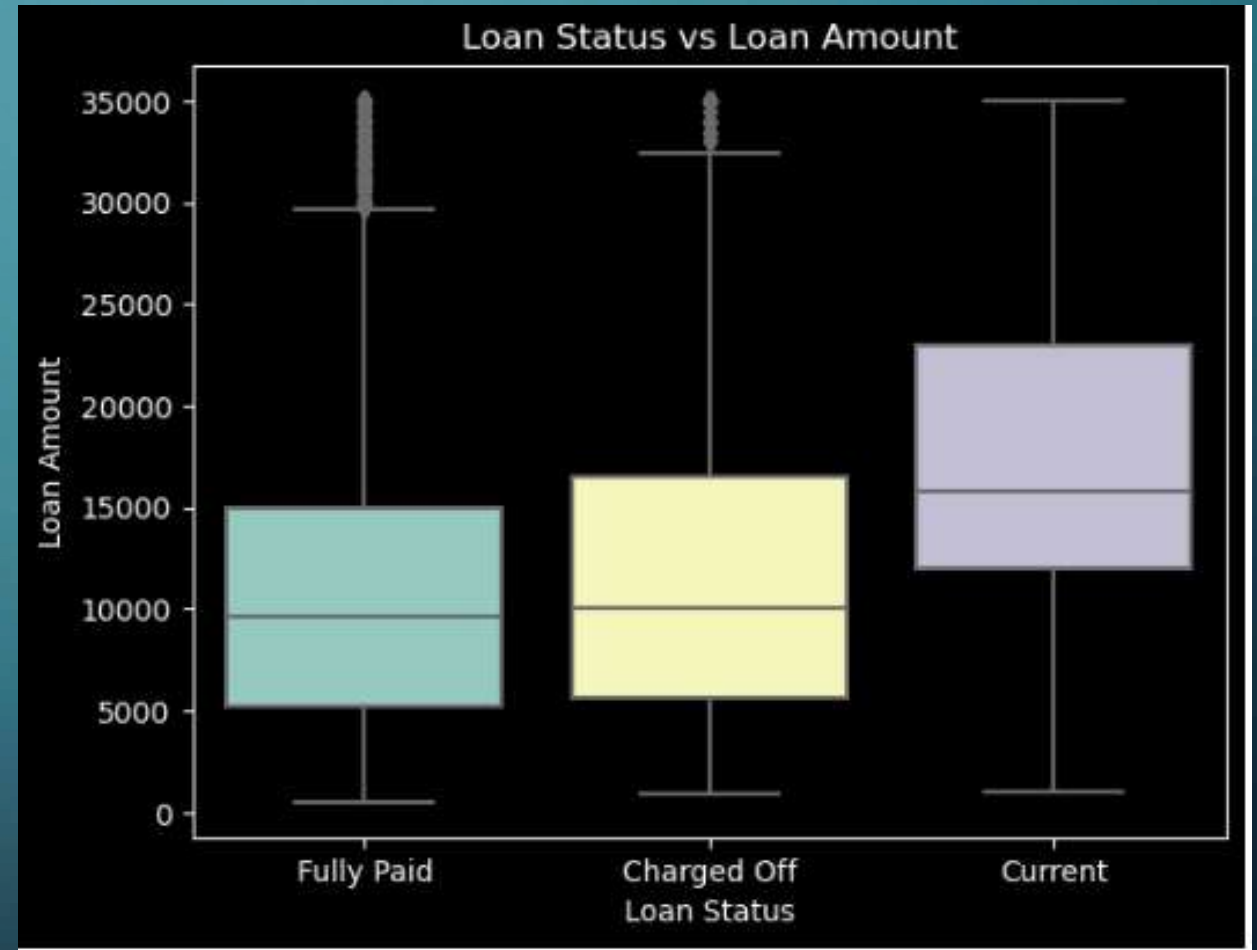
# ANALYSIS OF LOAN AMOUNTS

- Distribution plot to visualize the spread of the amount of loan given out by the lender. As observed, most of the loans given out have an approx. value of 5000.
- Mostly the frequency lies between the amount of 1000 to 15000.



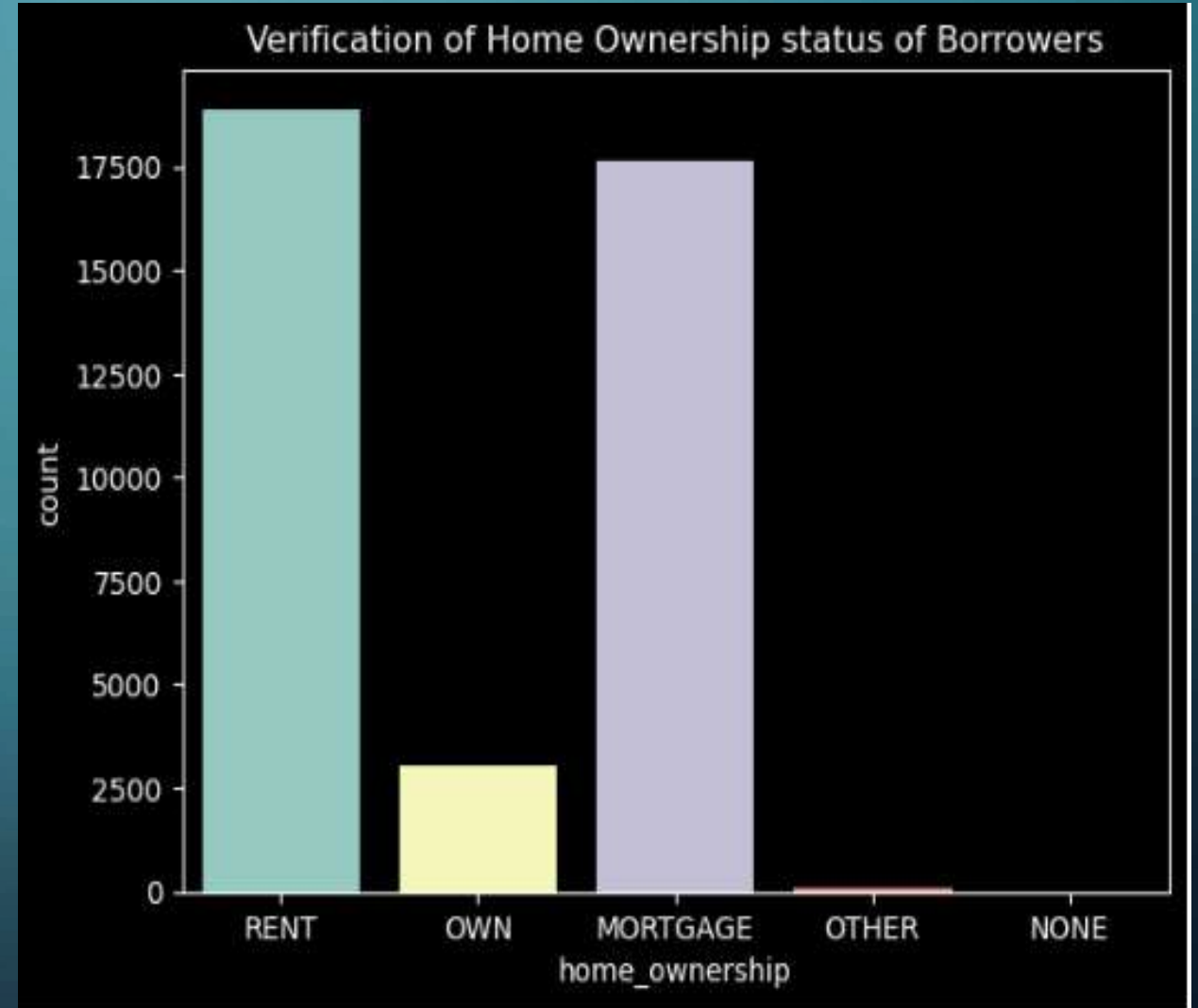
# ANALYSIS OF LOAN AMOUNT VS. LOAN STATUS

- Boxplot to visualize the distribution of loan amount across the loan status. As clearly visible, the loan amounts of the current ongoing loans are higher than past loans. This also emphasizes the need for being able to identify characteristics to detect defaulters as quickly as possible.



# ANALYSIS OF HOME OWNERSHIP

- Plots to visualize the home ownership status of the borrowers. Most of the borrowers fall in the "Rent" and "Mortgage" category.
- Conclusion can be drawn that the Lending Company is giving out more loans to "Rent" and "Mortgage" customers.





# ANALYSIS OF VERIFICATION STATUS

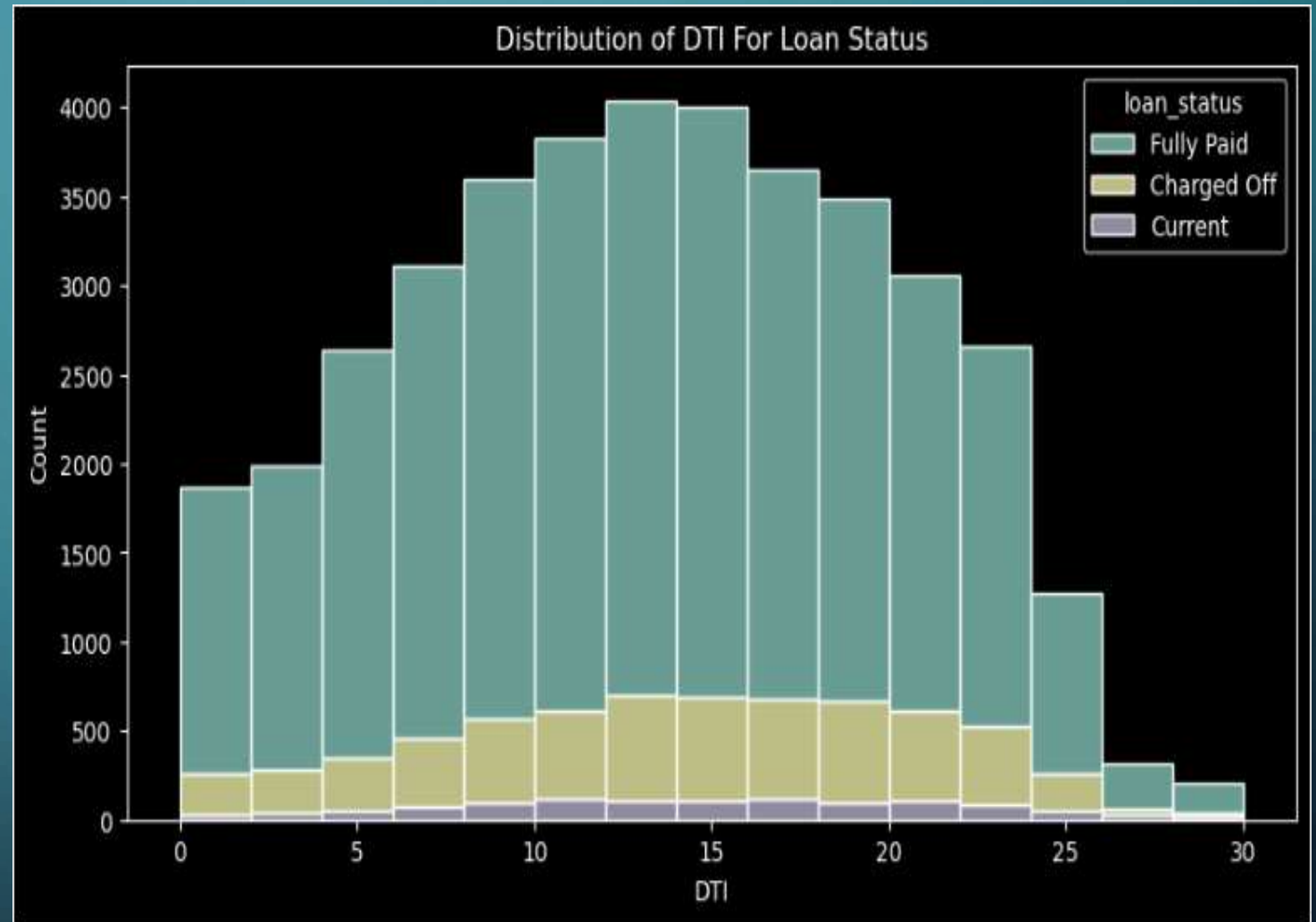
- Plots to visualize the income verification status of the loans.
- Conclusion can be drawn that most of the loans were given out without properly verifying the income status of the borrowers.





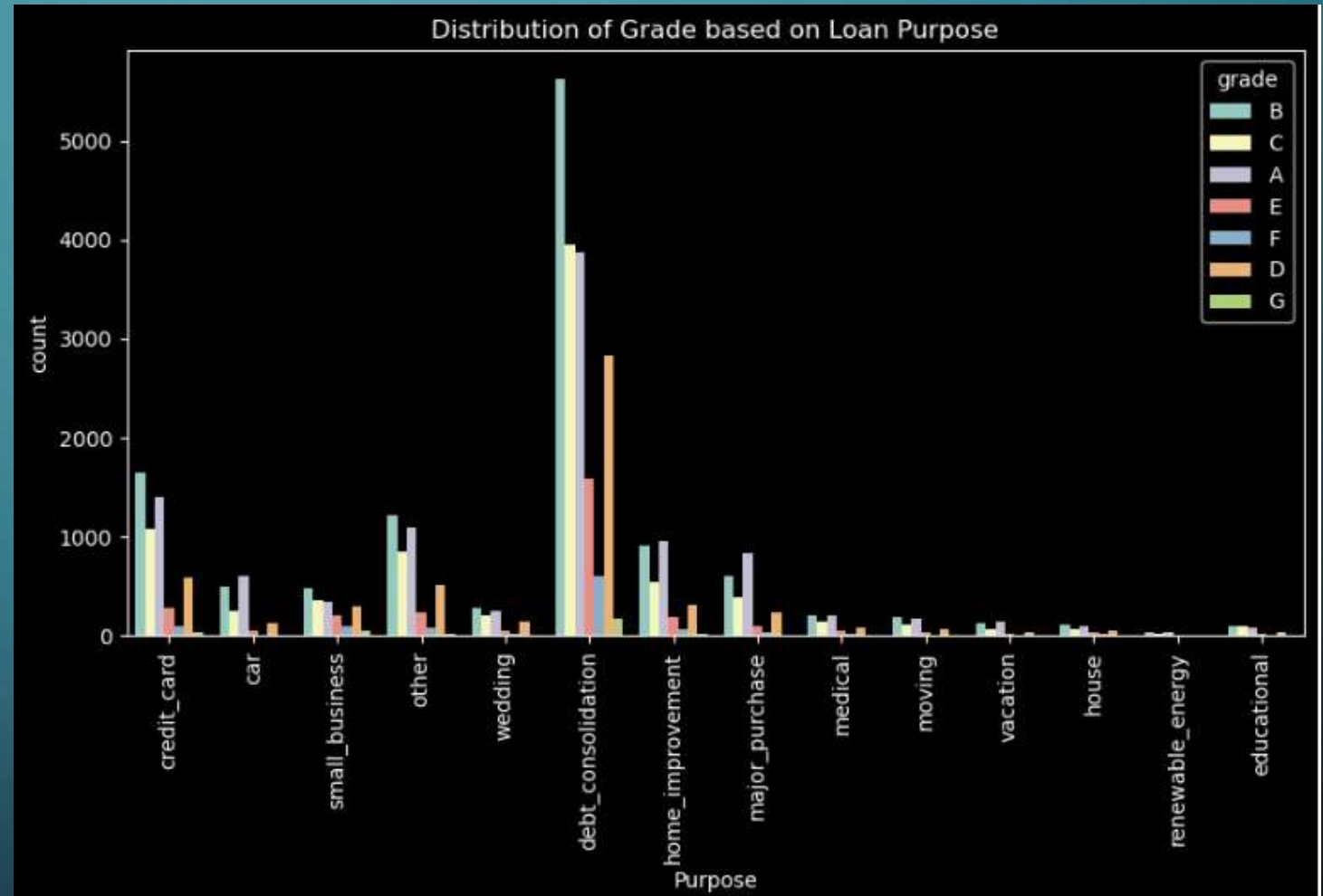
# ANALYSIS OF DTI BASED ON LOAN STATUS

- DTI (Debt to Income Ratio) indicates the installment paying capability of the borrower. A lower value indicates less risk as it suggests that a lower percentage of the borrowers income is used to repay debt and can also indicate financial stability of the borrower.
- Most of the borrowers have a DTI between 10 to 20.



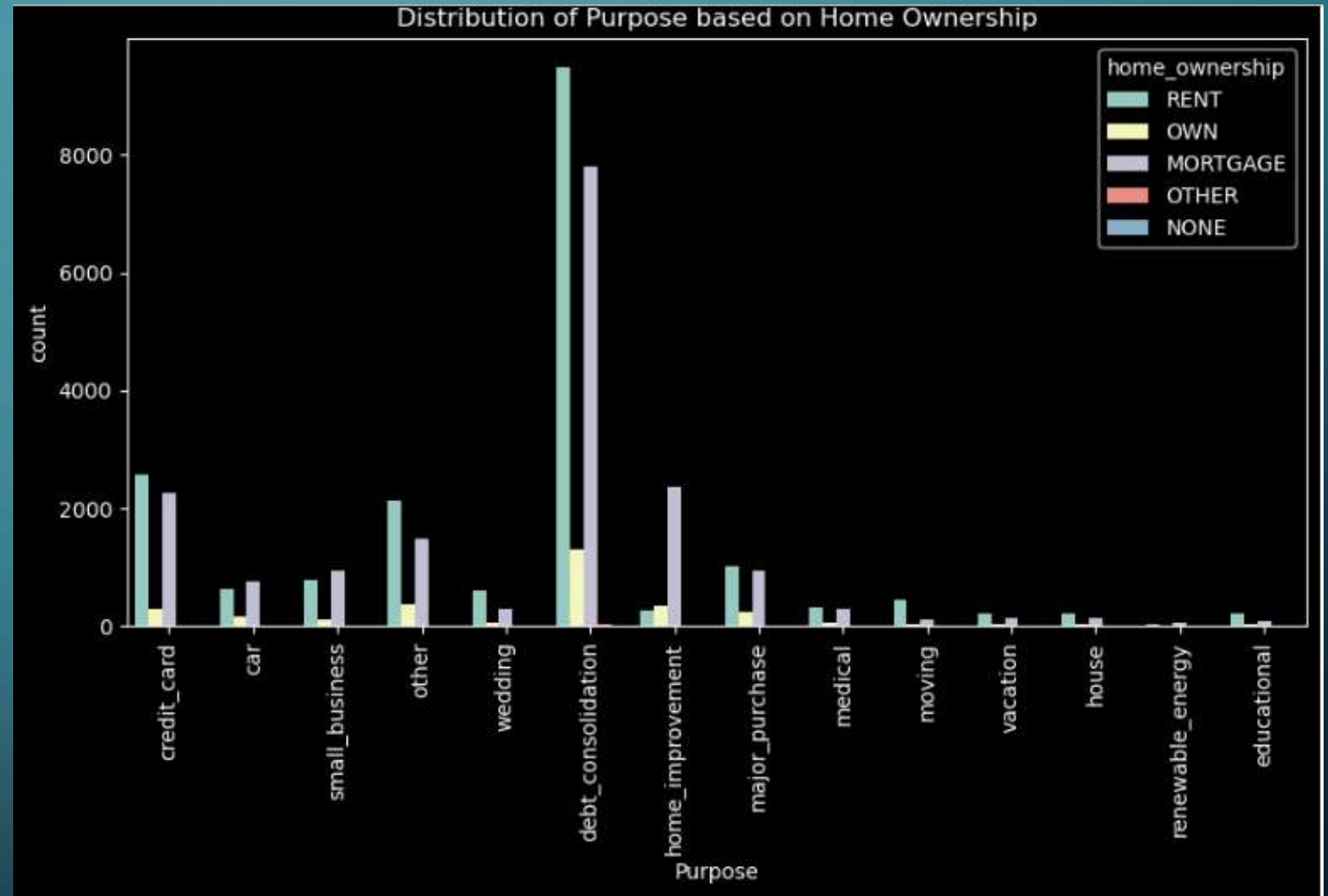
# ANALYSIS OF GRADE VS. LOAN PURPOSE

- Plot to show the distribution of LC assigned Grade across the various Loan Purposes.
- The highest purpose for which loan was taken out by borrowers was debt consolidation and it definitely poses a high risk.



# ANALYSIS OF LOAN PURPOSE VS. HOME OWNERSHIP STATUS

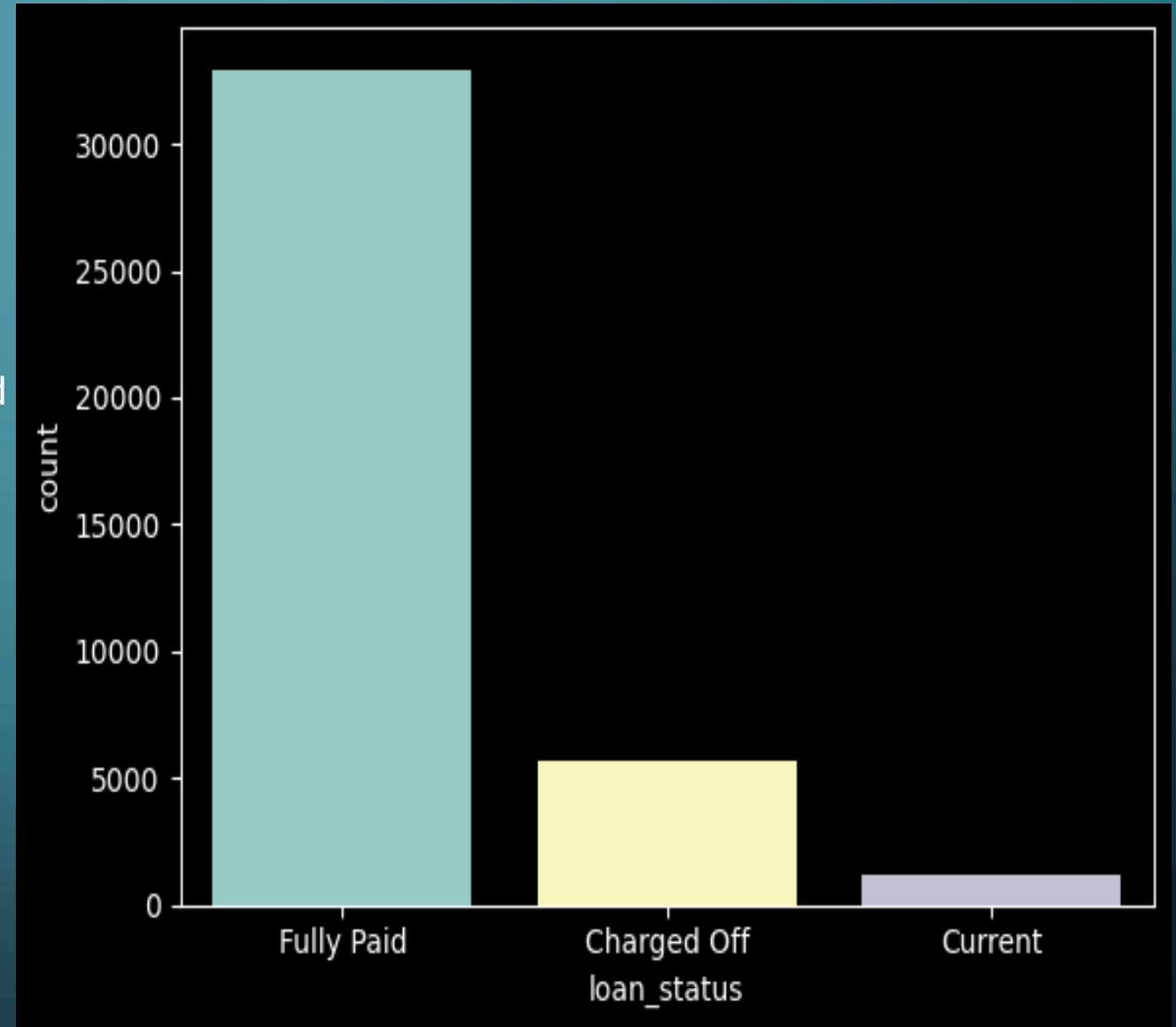
- Plot to show the distribution of home ownership status across the various loan purposes.
- Borrowers staying on Rent or Mortgage have taken out maximum number of loans and purpose for the loans is Debt Consolidation. This poses a risk.



# DATA SLICING

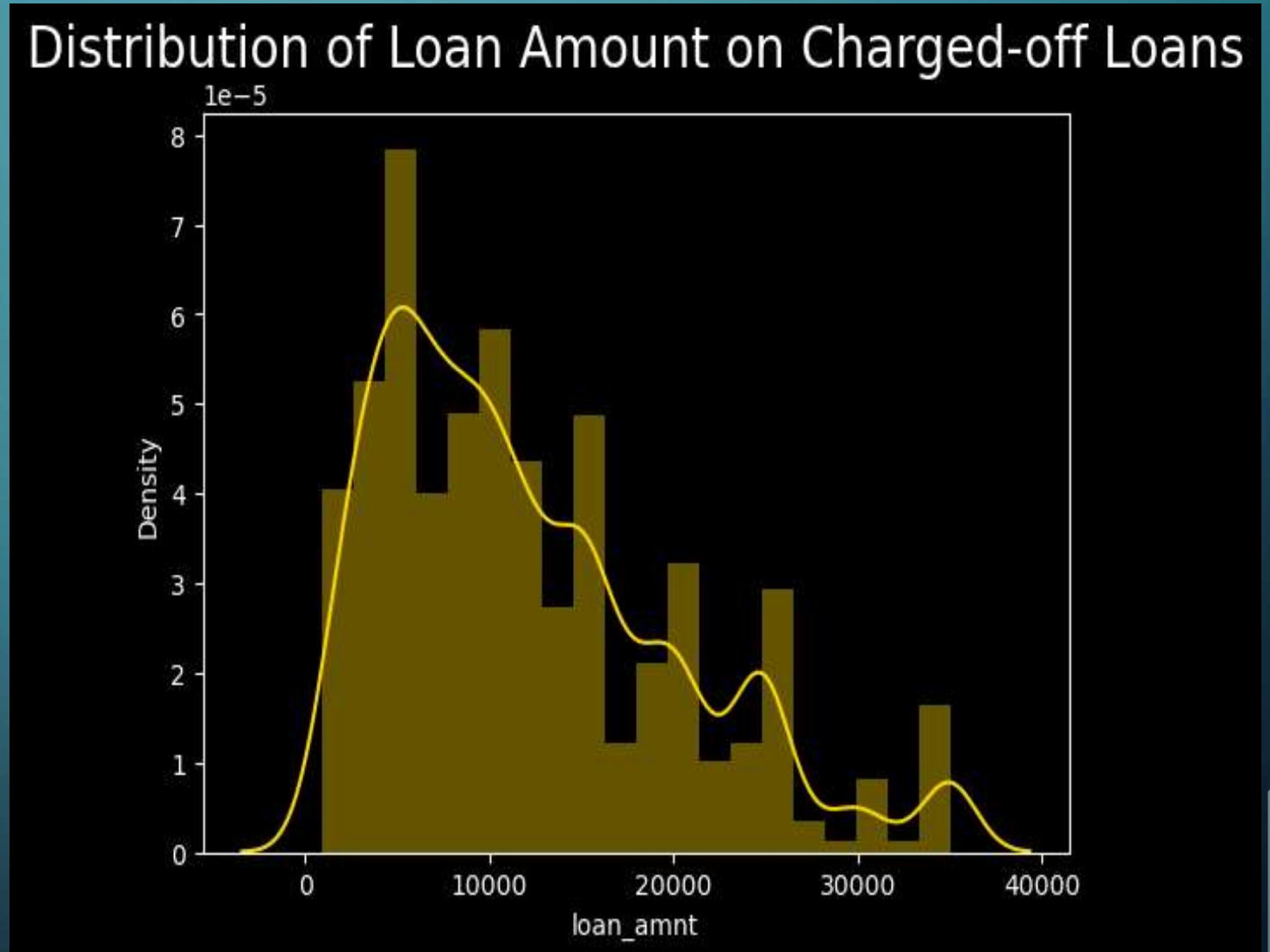
- Loans are broadly divided into 3 categories based on status: Fully Paid, Charged Off and Current.
- The goal is to analyze the Charged off Loans and identify characteristics which will help the company to identify characteristics or tell-tale signs of Charged Off/Default loans.
- This analysis can then be applied across the Current loans to determine the possibility of borrowers defaulting on those loans

Note → Further Slides having the Analysis only on Charged-Off Loans to Analyze the Risk



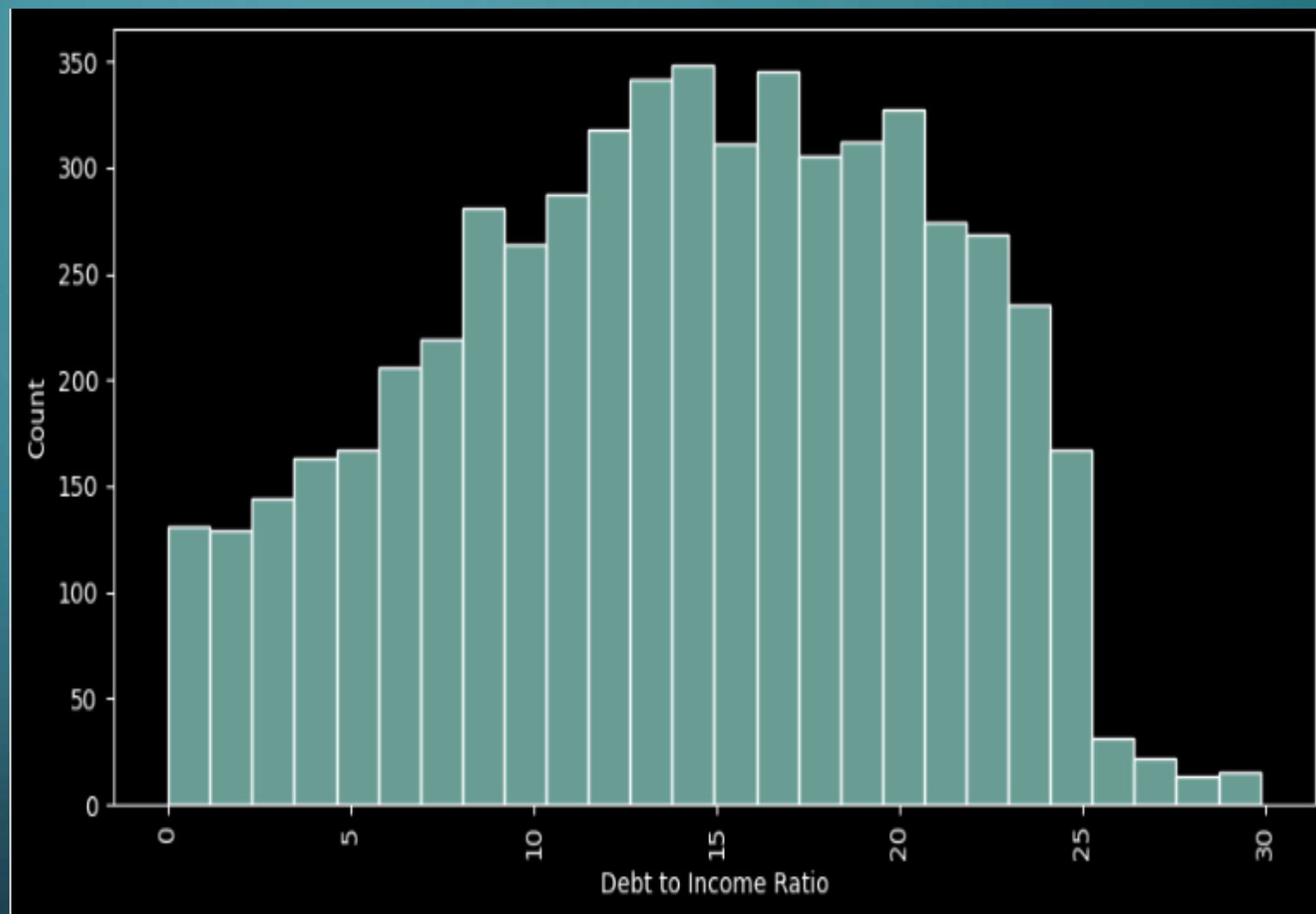
## DISTRIBUTION OF LOAN AMOUNT ON THE CHARGED-OFF LOANS

- Distribution plot to visualize the spread of the loan Amount on Charged-Off Loans given out by the lender. As observed, most of the loans given out have an approx. value of 5000.
- Mostly the frequency lies between the amount of 5000 to 15000.



# DTI\_RISKLEVEL

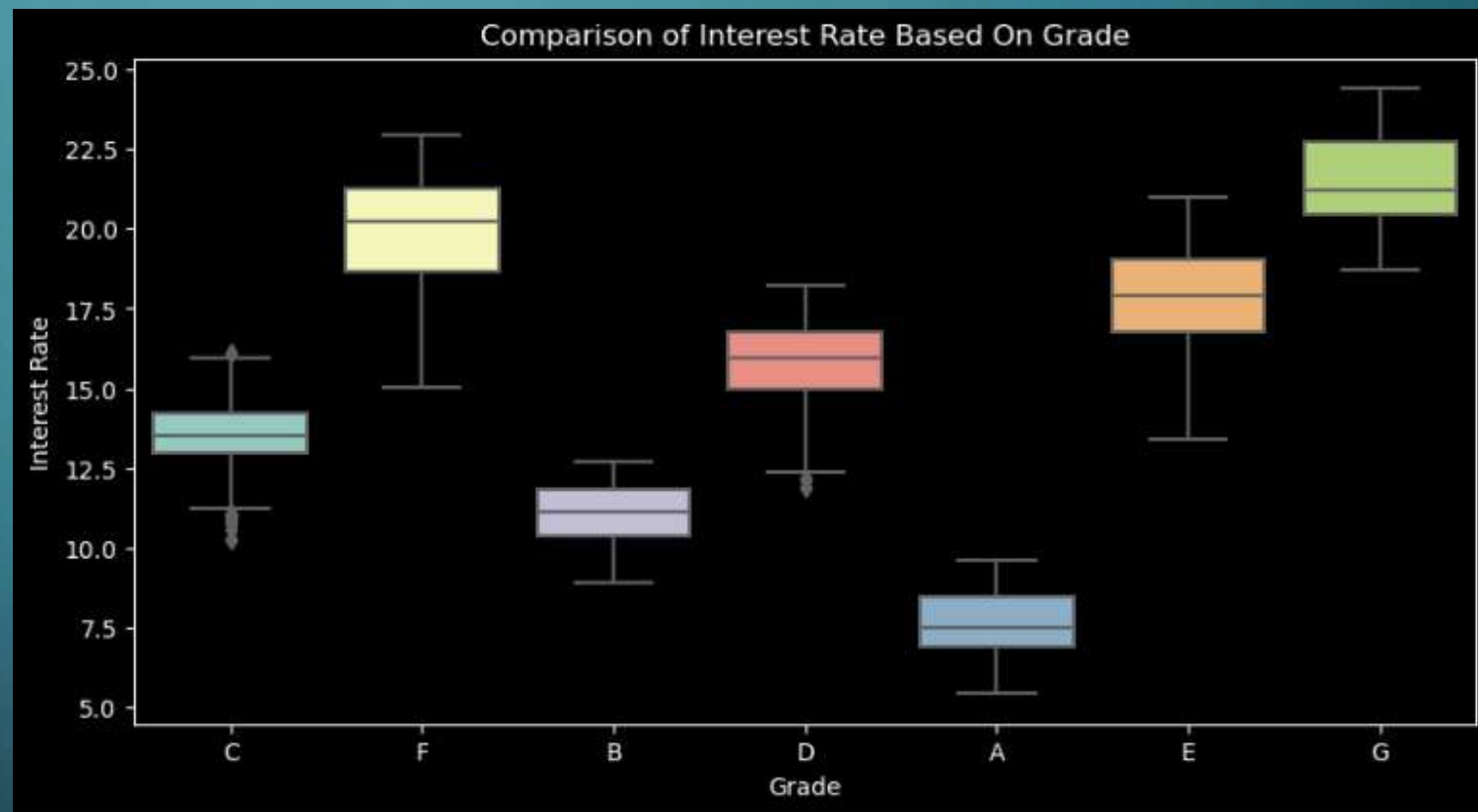
- DTI\_RiskLevel Buckets have been derived for better analysis of the Charged Off loans
- Based on the distribution of DTI on the charged off loans , following buckets have been derived:
  - 0 – 0.2 --> Low Risk
  - 0.2 – 0.4 -> High-risk
  - 0.4 – 0.6 -> Very High Risk
  - 0.6 – 0.8 -> Medium Risk
  - 0.8 – 1.0 -> Very Low Risk





# ANALYSIS OF GRADE VS. INTEREST RATE

- Analysis of Interest rates across the various Loan Grades. This plot indicates that interest rates should not be the sole factor for determining whether borrowers will default on their loans or not.

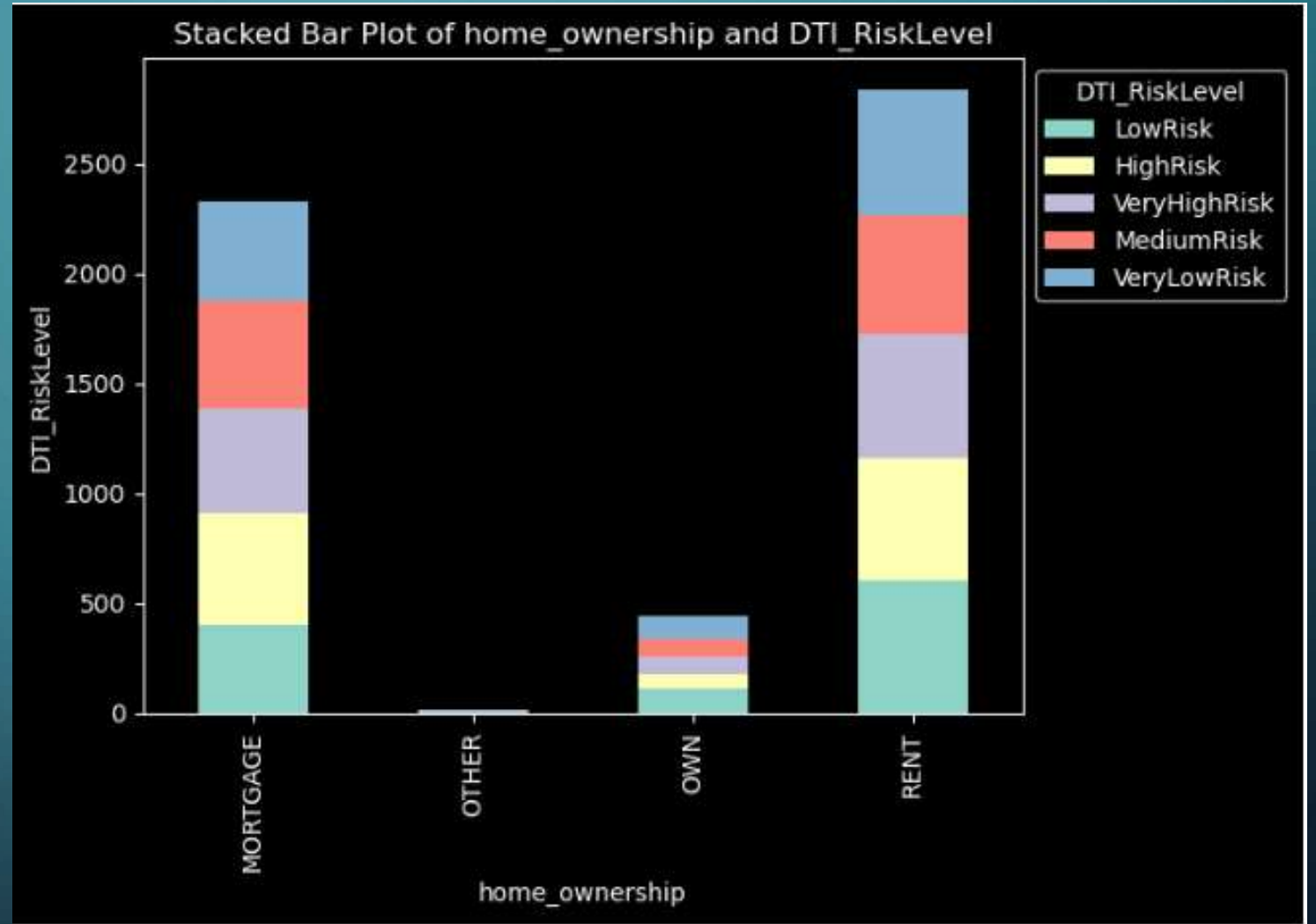




# ANALYSIS OF HOME OWNERSHIP VS. DTI\_RISKLEVEL

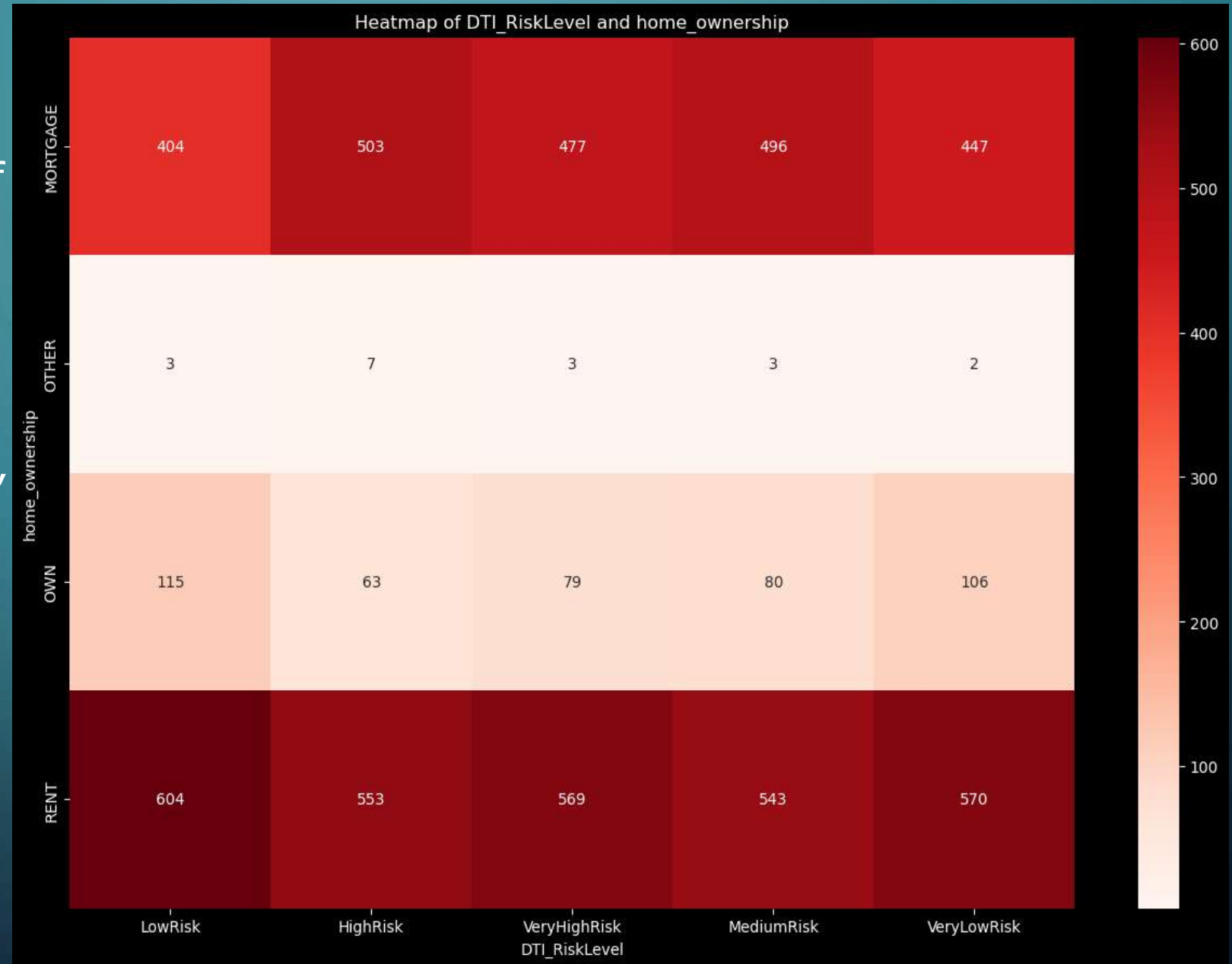
- Plot for the DTI\_RiskLevel across various Home Ownership categories for Charged Off Loans.
- "Rent" and "Mortgage" carry high amounts of risks across all the Risk Levels.

→DTI:-Debt To Income Ratio



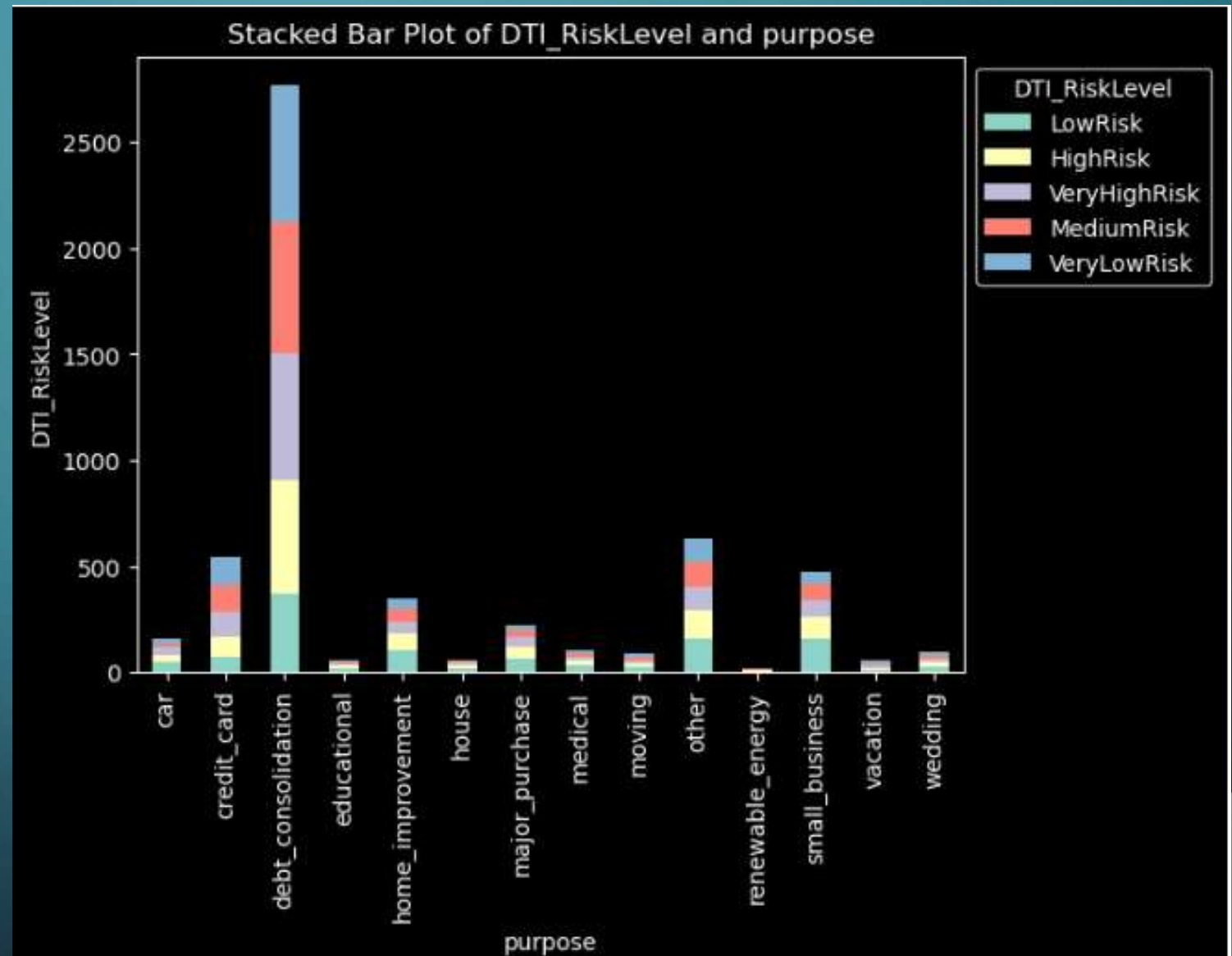
# HEATMAP OF HOME OWNERSHIP VS. DTI\_RISKLEVEL

- Heatmap illustration of Home ownership status of the borrowers and the associated Risk levels.
- “Rent” and “Mortgage” have highest risks associated with them.
- In this plot clearly getting the counts of each risk level.



# ANALYSIS OF LOAN PURPOSE VS. DTI\_RISKLEVEL

- Plot for the DTI\_RiskLevel across various Loan Purpose.
- Debt Consolidation for Charged Off loans have the highest risks associated with it.



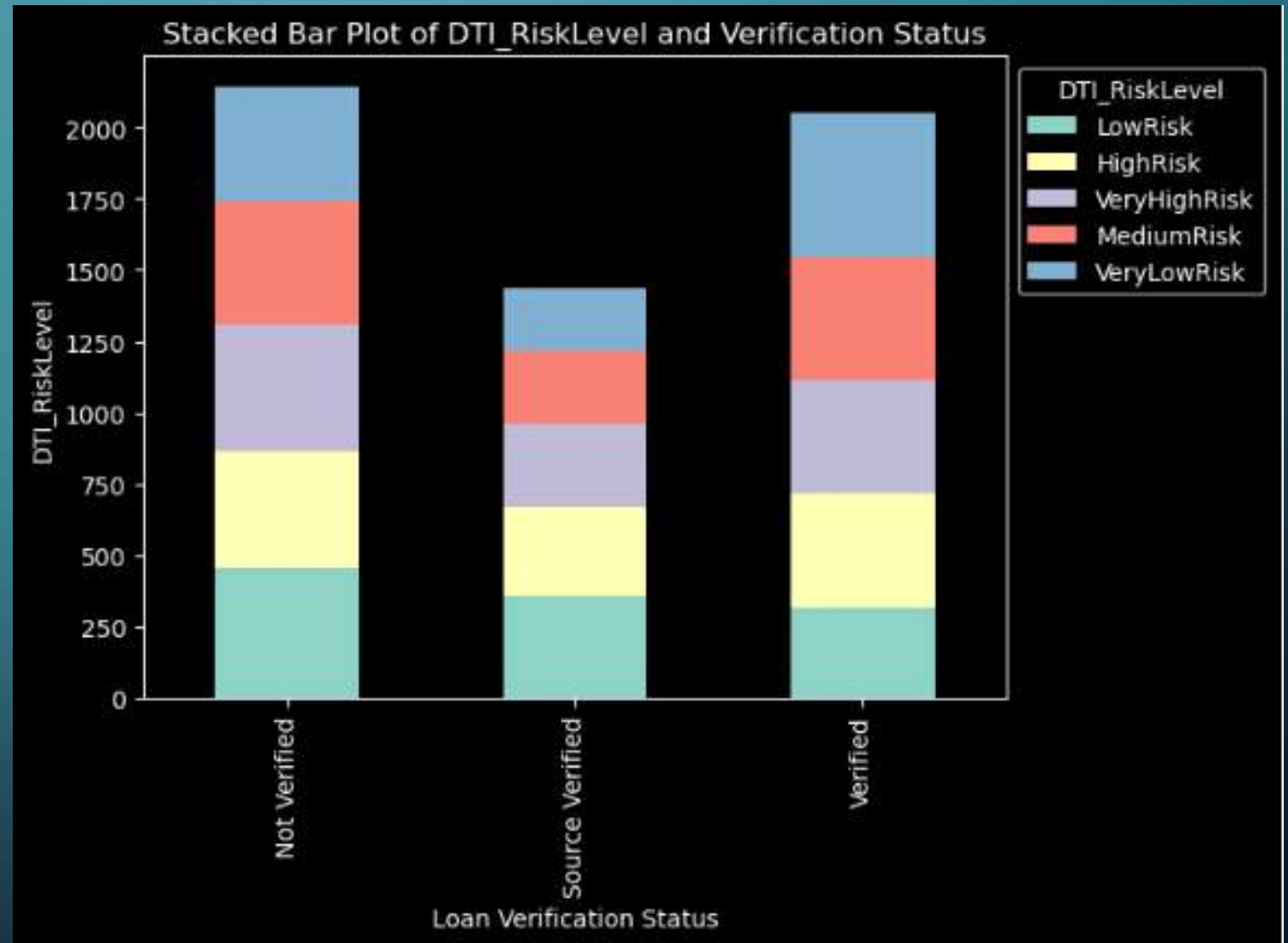
# HEATMAP OF LOAN PURPOSE VS. DTI\_RISKLEVEL

- Heatmap illustration of Loan Purpose and the associated Risk levels.
- “Debt Consolidation” has highest risks associated with them.



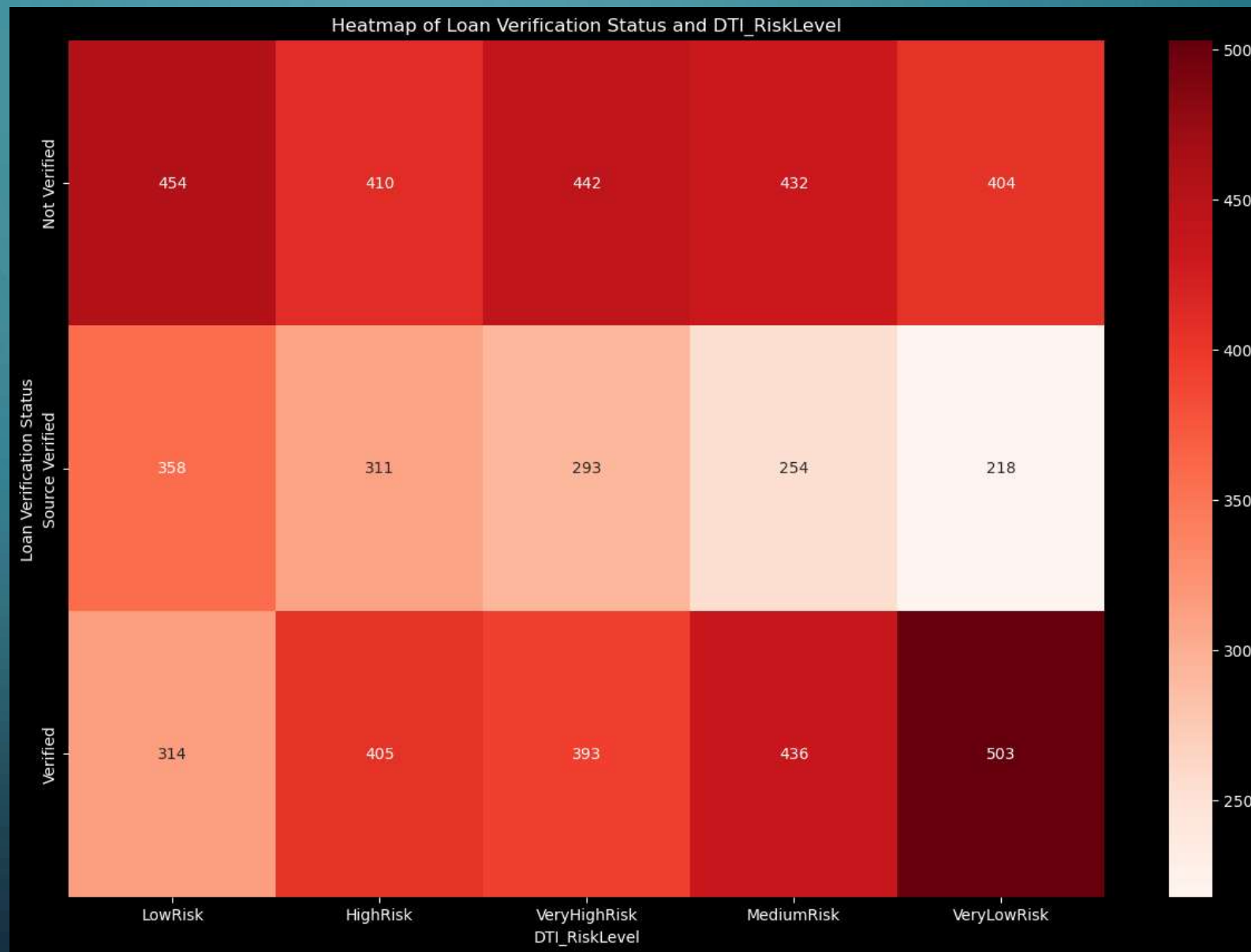
# ANALYSIS OF VERIFICATION STATUS VS. DTI\_RISKLEVEL

- Plot for the DTI\_RiskLevel across Verification status.
- Conclusion can be drawn that for most of the Charged-Off loans, proper verification of the borrowers income was not performed.



# HEATMAP OF VERIFICATION STATUS VS. DTI\_RISKLEVEL

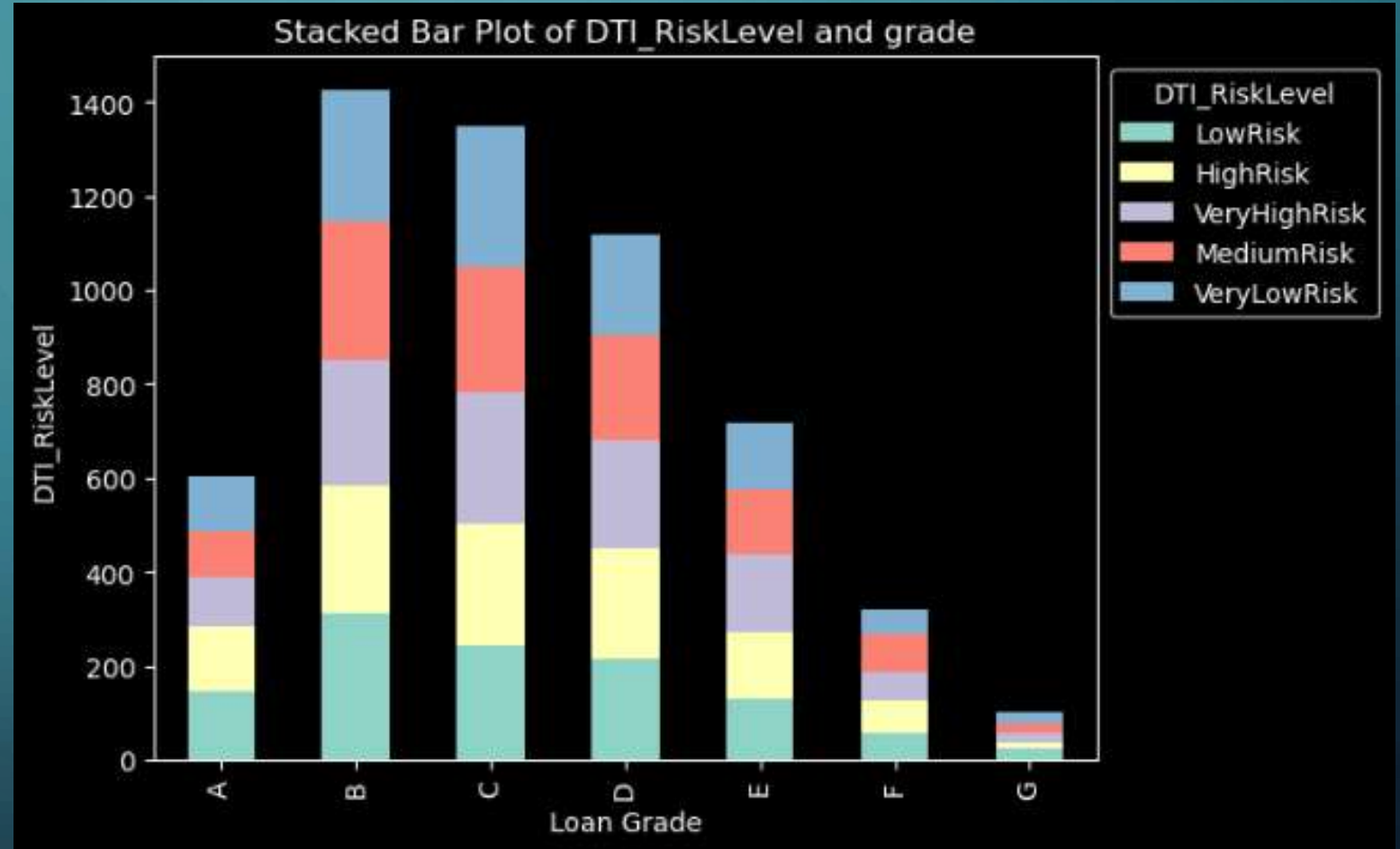
- Heatmap illustration of Verification Status and the associated Risk levels.
- Count of Charged-off Loans was higher for the borrowers where proper verification of income source was not done.





# ANALYSIS OF GRADE VS. DTI\_RISKLEVEL

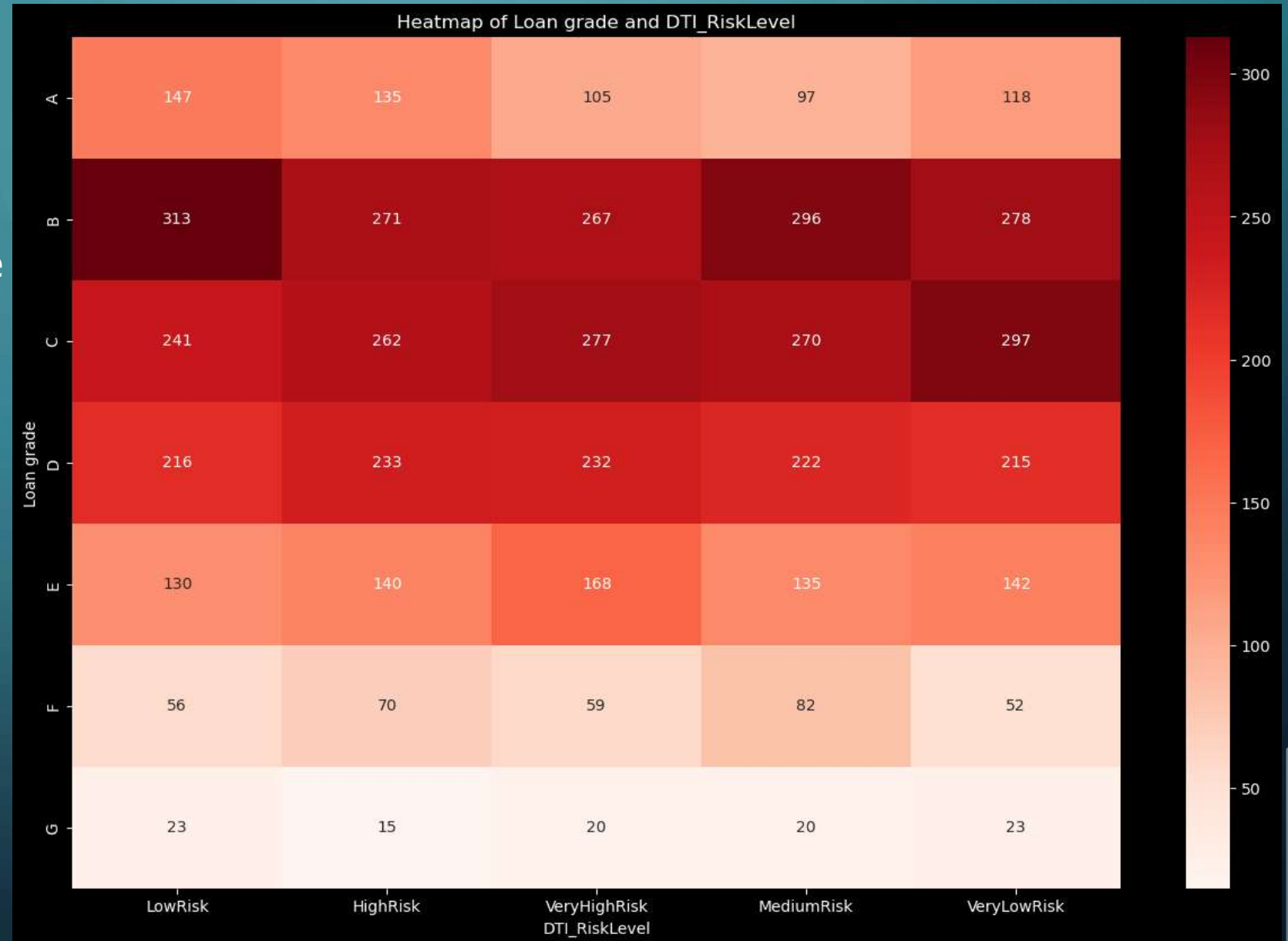
- Plot for the DTI\_RiskLevel across LC assigned Grades for Charged-Off Loans.
- Conclusion can be drawn that Loans having a grade of "F" or "G" have a lower chance of defaulting.





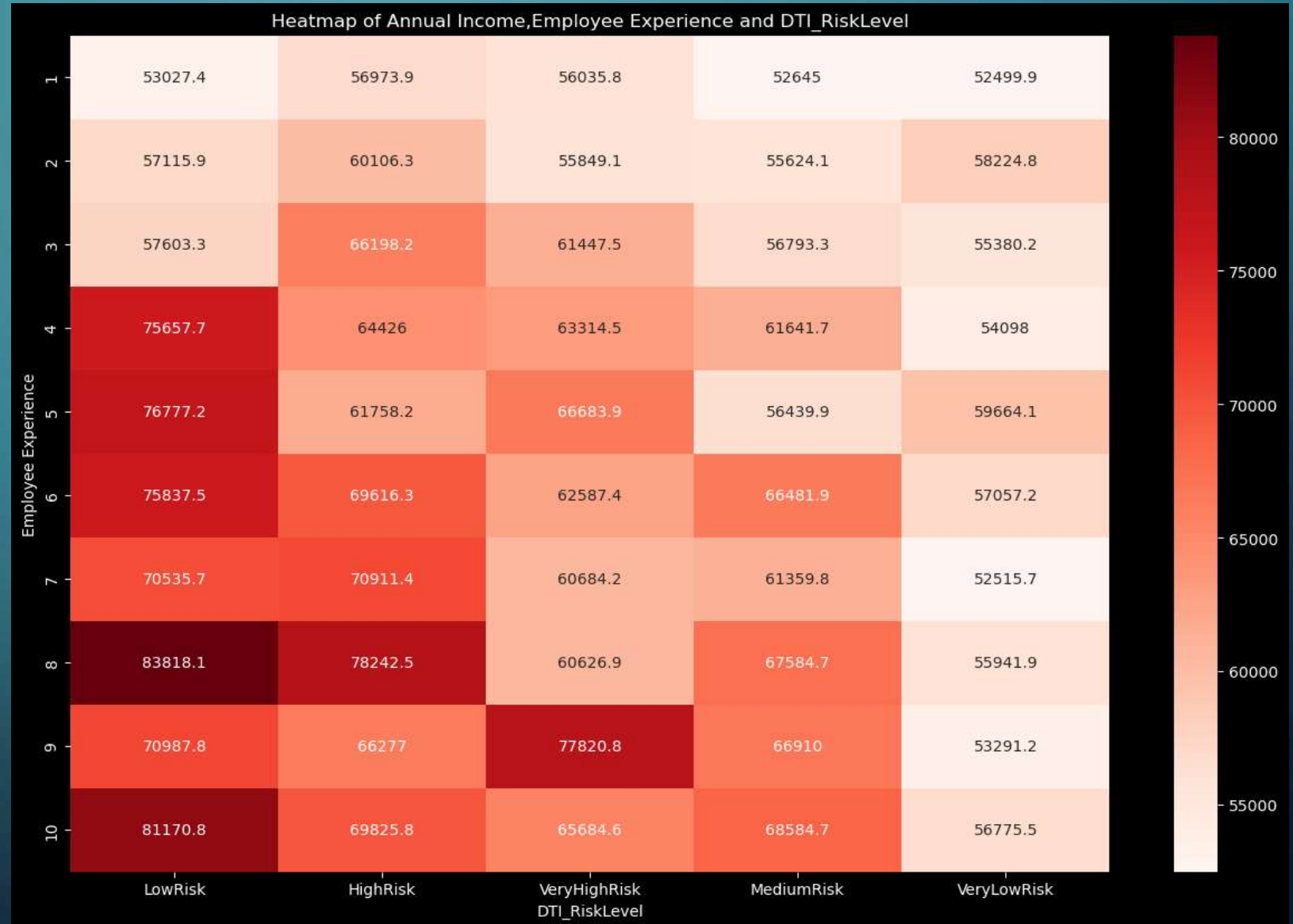
# HEATMAP OF LOAN GRADE VS. DTI\_RISKLEVEL

- Heatmap illustration of Loan Grade and the associated Risk levels.
- Count of Charged-off Loans was lower for the borrowers which were assigned a grade of "F" and "G".
- Count of Charged-off Loans was Higher for the borrowers which were assigned a grade of "B" and "C" and "D".



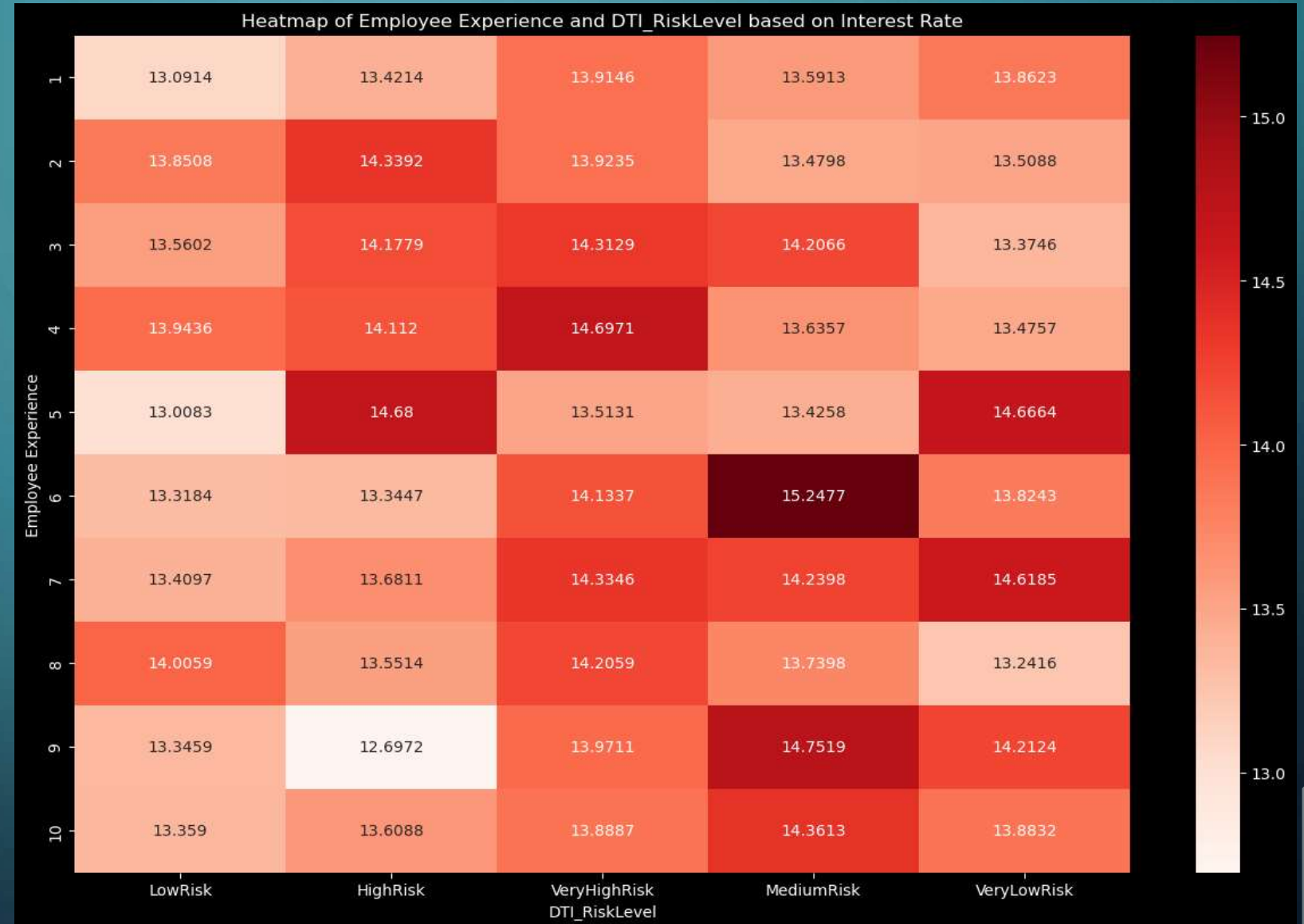
# HEATMAP OF ANNUAL INCOME, BORROWER WORK EXPERIENCE AND DTI\_RISKLEVEL

- Heatmap illustration of the reported Annual Income, Work Experience (years) of the Borrower and the associated DTI Risk levels.
- If Borrower having 10 years of experience and also having the annual income greater than 80000 having the Low Risk.
- If Borrower having 10 years of experience and also having the annual income less than 70000 having the Very High Risk.



# HEATMAP OF INTEREST RATE, BORROWER WORK EXPERIENCE AND DTI\_RISKLEVEL

- Heatmap illustration of the Interest rate, Work Experience (years) of the Borrower and the associated Risk levels.
- Based on the Interest rate, it cannot be predict the accurate Risk level because Risk is distributed uniformly in each experience level.



# CONCLUSION



Indicates Low Risk



Indicates High Risk

## Loan Amount:



- Majority of the charged-off Loans having more frequency of Loan Amount between the 5000 to 15000.

## Debt To Income Ratio (DTI):



- Majority of the charged-off Loans having more frequency of Debt To Income Ratio(DTI) between 20<sup>th</sup> percentile to 80<sup>th</sup> percentile.

## Loan Interest Rate:



- Loan Interest Rate is not the sole contributor towards the Charged-Off/Default loans.

## Home Ownership based on the DTI Risk Level:



- Chances of the defaulting on a loans are Low if the borrower having their own residency.





- Majority of the charged-off Loans are having more in Rent and Mortgage Categories of Home Ownership.


# CONCLUSION CONT..

 Indicates Low Risk  
 Indicates High Risk



## Loan Purpose based on the DTI Risk Level:

-  • Majority of the charged-off Loans were taken for Debt-Consolidation purpose.
-  • Risk on the charged-off Loans are very low in the Educational, Renewable Energy and House.

## Loan Verification Status based on the DTI Risk Level:




-  • Majority of the charged-off Loans are not having the proper Income source Verification.

## Loan Grade Levels based on the DTI Risk Level:


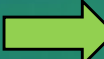
-  • Majority of the charged-off Loans having in the Grades of 'B', 'C' and 'D' so based on this we can be more cautions on the currents loans which are having these grades.
-  • Risk on the charged-off Loans are very low in the the Grades of 'G', 'F' .




# CONCLUSION CONT..

-  Indicates Low Risk
-  Indicates High Risk
-  Unpredictable Risk

## Annual Income and Borrower years of Experience based on the DTI Risk Level:

-  • If Borrower having 10 years of experience and also having the annual income less than 70000 having the Very High Risk.
-  • If Borrower having 10 years of experience and also having the annual income greater than 80000 having the Low Risk.

## Loan Interest Rate and Borrower years of Experience based on the DTI Risk Level:

-  • Based on the Interest rate, it cannot be predict the accurate Risk level because Risk is distributed uniformly in each experience level.