

# Lending Club Case Study

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ML C44

# Objectives

- Help to decide whether to approve or reject the loan application by analyzing the past data
- Reduce the charged off loans accounts
- Increase the fully paid loans accounts

- Data cleanup (Columns & Rows)
- Outliers detection and removal
- Univariate Data Analysis
- Bivariate Data Analysis

# Data cleanup

- Remove all columns containing more than 50% NaN values.
- Remove "id", "member\_id" and "application\_type" column
- Replace all NaN with 0
- Remove % sign from "int\_rate" column
- Change the data type of "int\_rate" column to float
- Remove all the records with employment status as "n/a"

# Outliers detection and removal

- Boxplot “loan\_amnt” and “annual\_inc” columns to find the outliers
- Remove all the record having loan amount greater than 30,000
- Remove all the record having annual income greater than 100,000

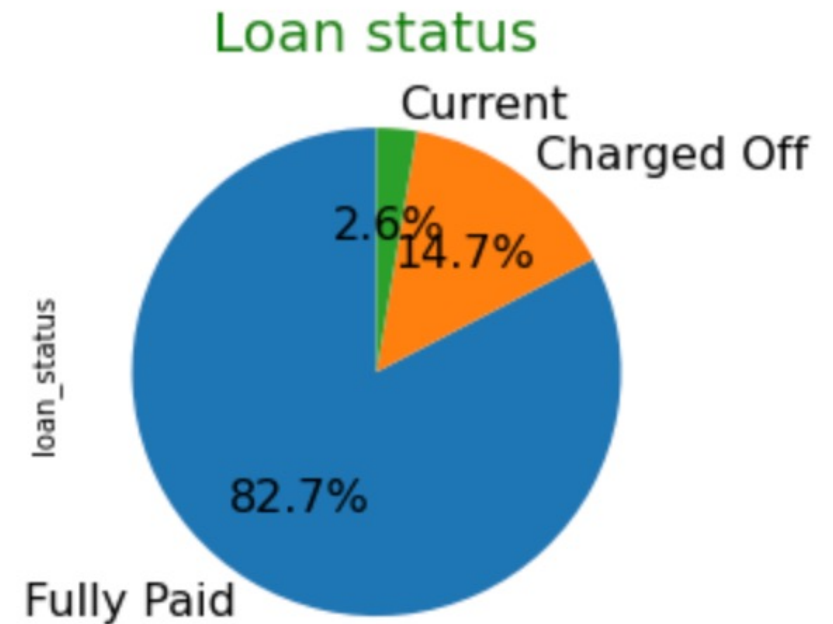
# Univariate Data Analysis

- Loan Amount

- Total loan applications: 33155
- Average loan amount: 9990.15
- Minimum loan amount: 500
- Maximum loan amount: 30000

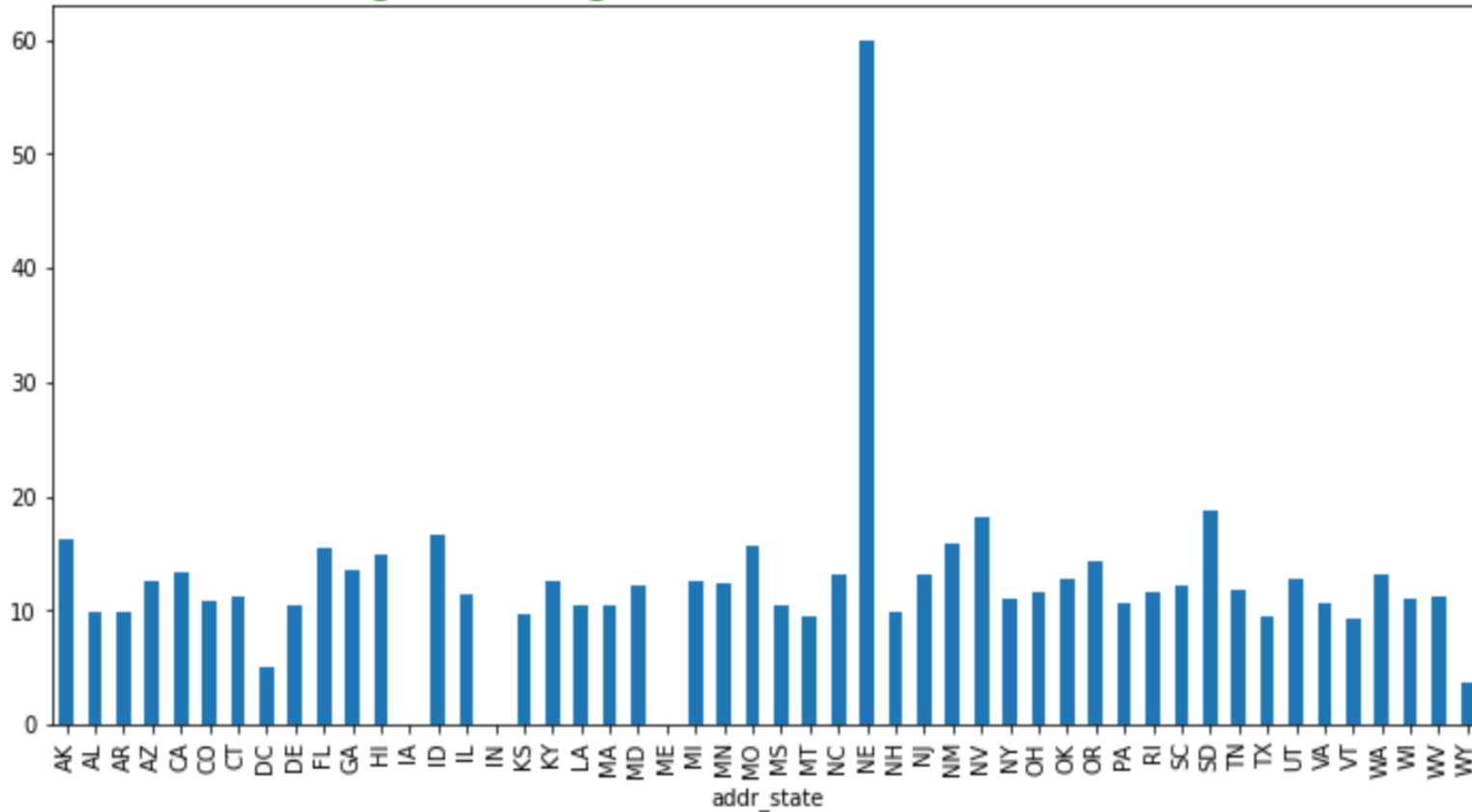
- Interest Rate

- Total loan applications: 33155
- Average interest rate: 11.88
- Minimum interest rate: 5.42
- Maximum interest rate: 24.4



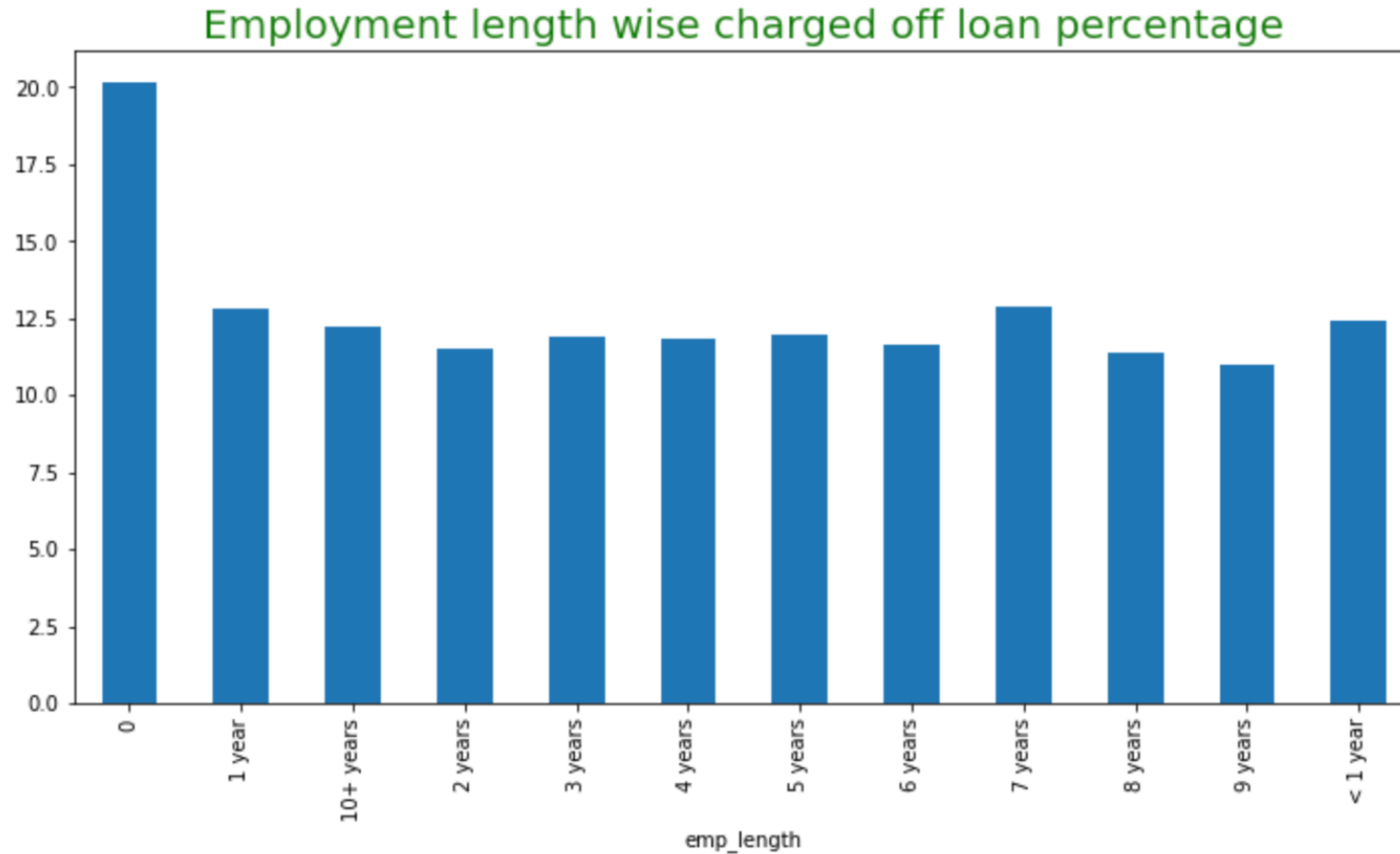
# Observation: Loan Application State

Percentage of charged off loans across different states



- Charged Off loans
  - Nebraska (60%)
  - South Dakota (18.75%)
  - Nevada (18.1%)
- Fully Paid loans
  - Wyoming (96.39%)
  - Washington D.C. (94.86%)
  - Vermont (90.74%)

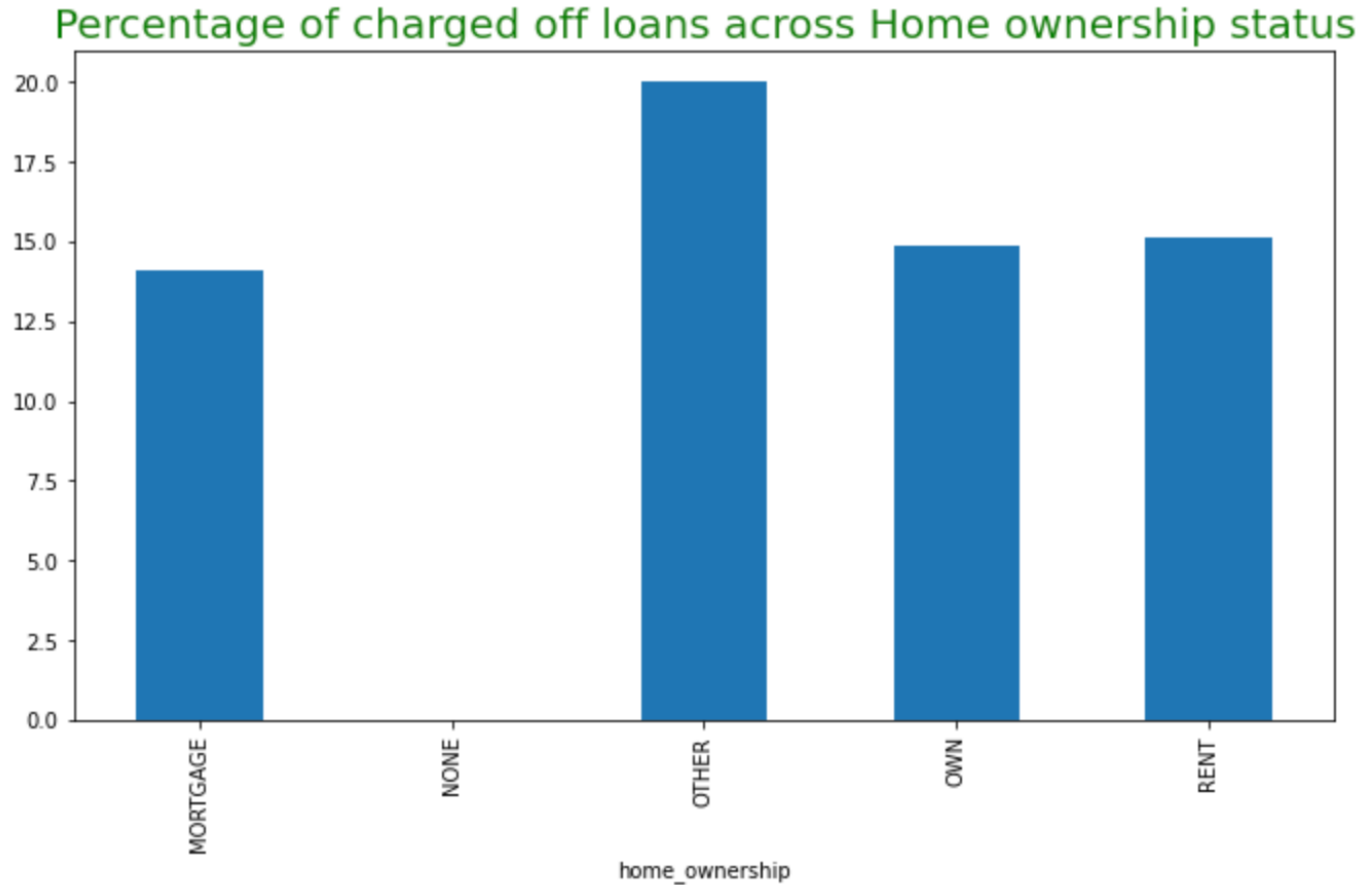
# Observation: Employment Length



- Loan applicants without any work experience have charged off more than 20% of loans
- Loan account charged off % is relatively flat across other employment length categories.

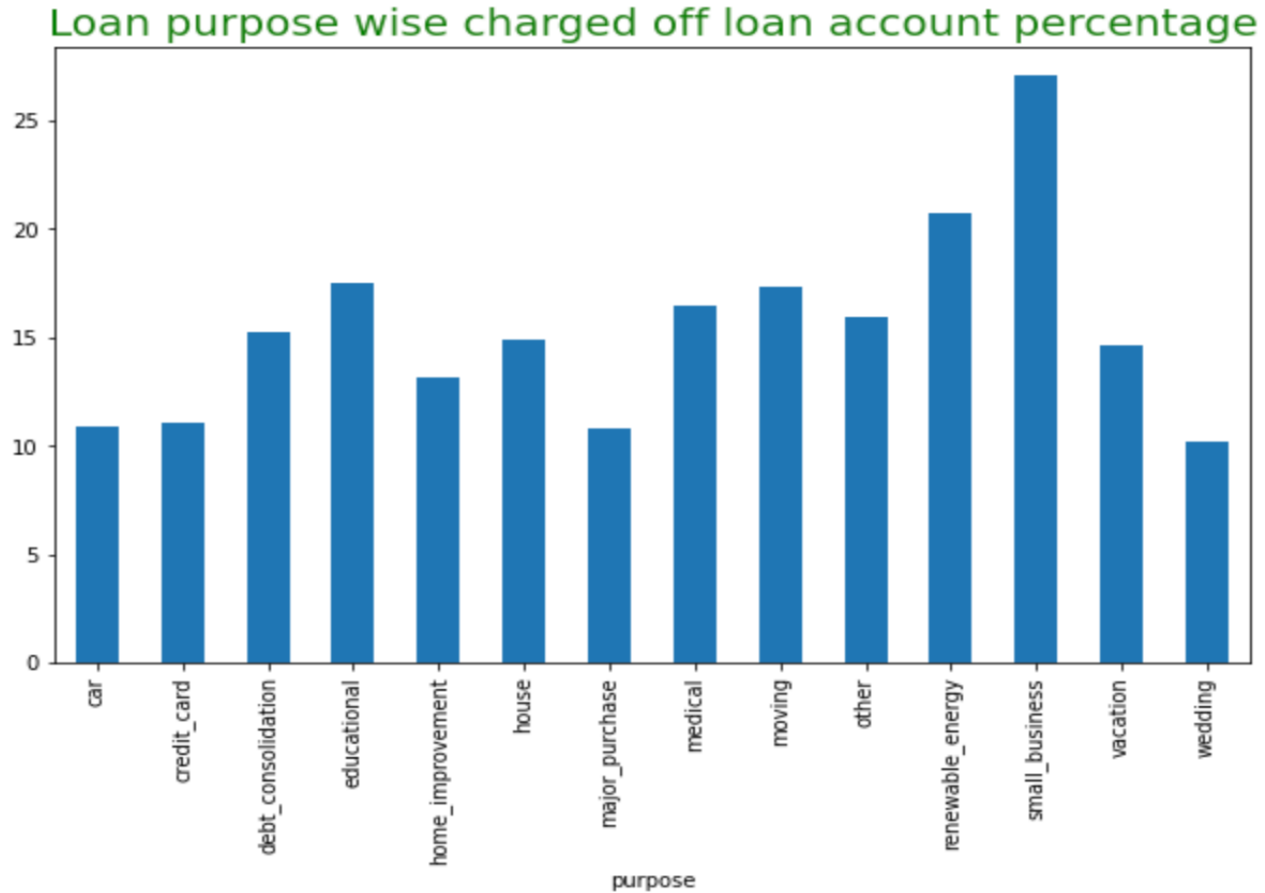


# Observation: Home Ownership



- Loan applicants with home ownership status as Other have charged off 20% of loans
- Loan account charged off % is relatively flat across other home ownership categories.

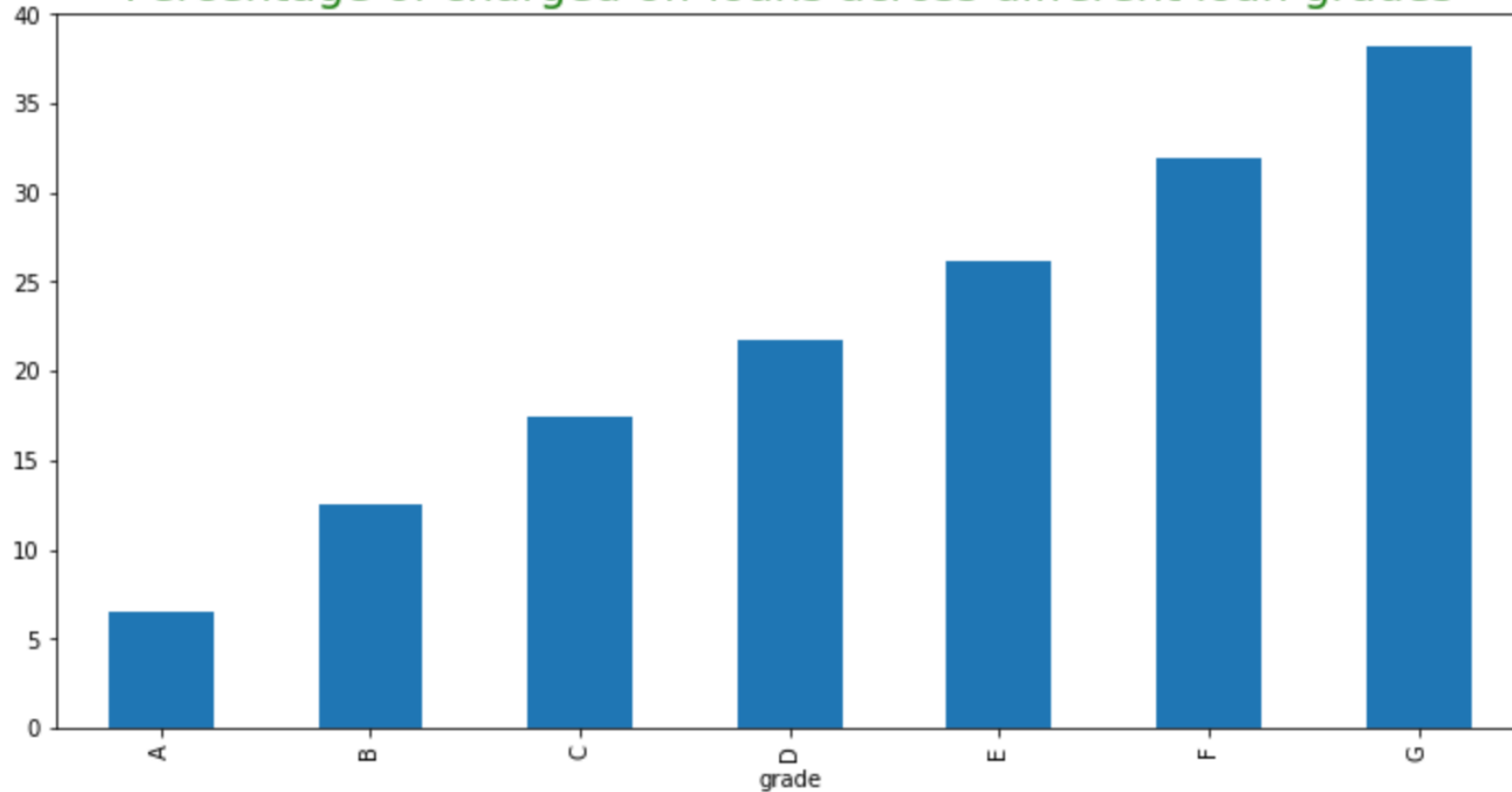
# Observation: Loan Purpose



- Charged Off loans
  - Small Business (27.06%)
  - Renewable Energy (20.73%)
  - Educational (17.48%)
- Fully Paid loans
  - Wedding (89.2%)
  - Major Purchase (89.17%)
  - Car (89.07%)

# Observation: Loan Grade

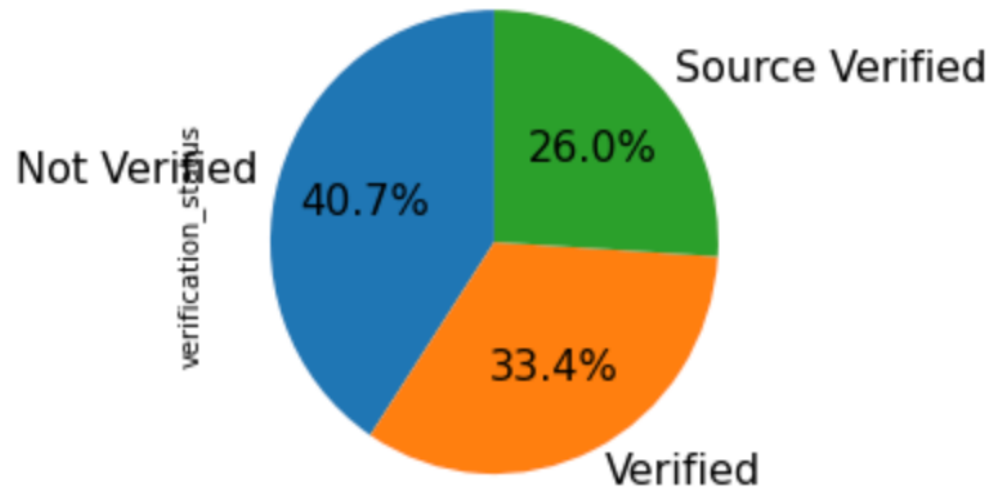
Percentage of charged off loans across different loan grades



- Charged Off loans
  - Grade G (38.14%)
  - Grade F (31.9%)
  - Grade E (26.14%)
- Fully Paid loans
  - Grade A (93.46%)
  - Grade B (87.42%)
  - Grade C (82.5%)

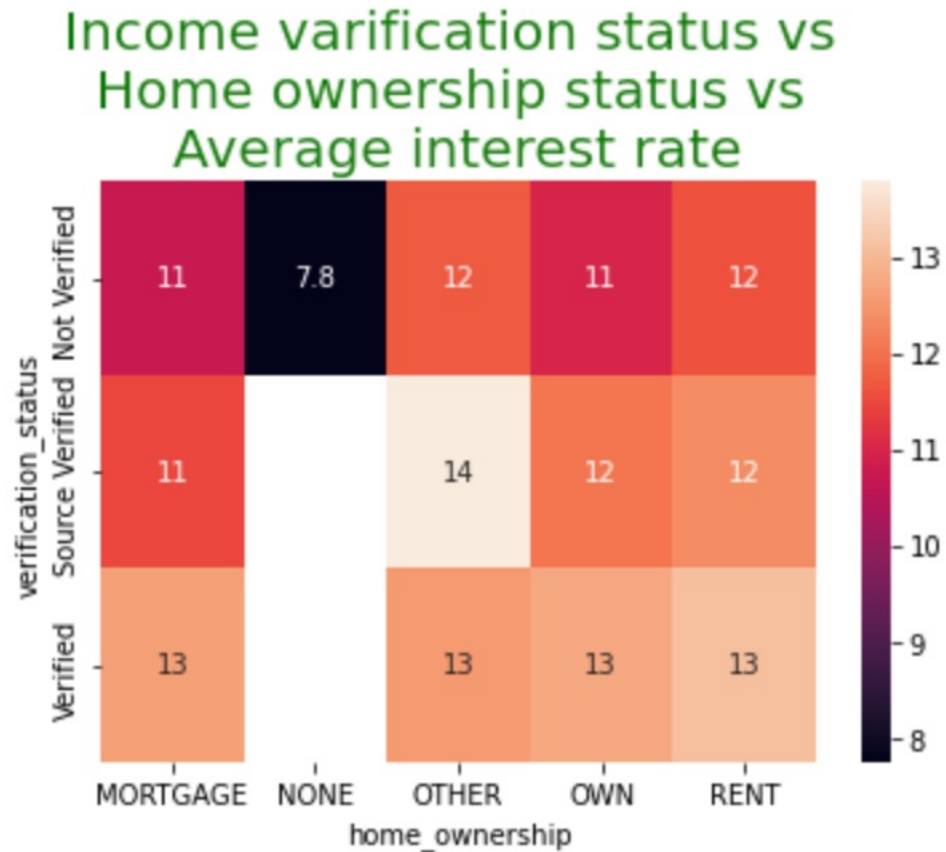
# Observations: Income Verification

Income verification status of charged off loans



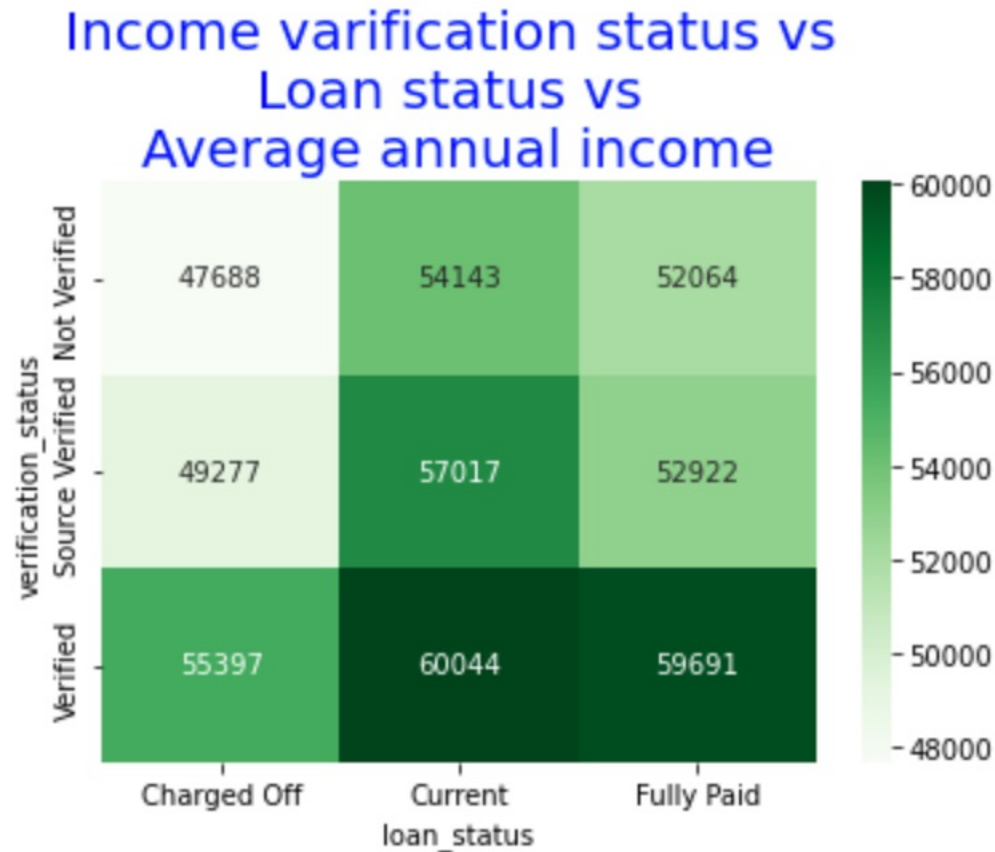
**Not Verified** income source loan accounts are more likely to be charged off than **Source Verified** loan accounts

# Average Interest rate based on Verification Status and Home Ownership



- Not Verified income source loan accounts has lowest average interest rate across all loan account categories
- Verified income source loan accounts has highest average interest rate across all loan account categories

# Average Annual income Vs Verification Status across all loans statuses



- Not Verified income source loan accounts has lowest average annual income across all loan account categories
- Verified income source loan accounts has highest average annual income across all loan account categories

# Findings

- Loans applications more likely to be Charged Off
  - Loan applications from Nebraska, South Dakota or Nevada
  - Loans given to Small Businesses, Renewable Energy and Educational purpose
  - Loans applications from Other home owners
  - Grade G, F, E loan application
  - Loan application from a person without any work experience or unemployed.
- Loan application more likely to be Fully Paid
  - Loan applications from Wyoming, Washington D. C. & Vermont
  - Loans taken for Wedding, Major Purpose or Car
  - Grade A, B, C loan applications

# Recommendations

- Charge higher interest rates to loan applications having higher chances be Charged Off.
- Increase income source verification percentage of loan applications.
- Reject the loan applications having less than 50K annual income or without any work experience.
- Married person is more likely to be repay loans.



Thank You