Lending Club Case Study

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Lending Club Case Study

Lending Club is a marketplace for personal loans that matches borrowers who are seeking a loan with investors looking to lend money and make a return.

Problem Statement:

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

Data cleaning

- Data cleaning is the process of removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data and also remove blank and "NA".

Data Analysis

- **There are types of Data Analysis**
1. **Univariate Analysis**
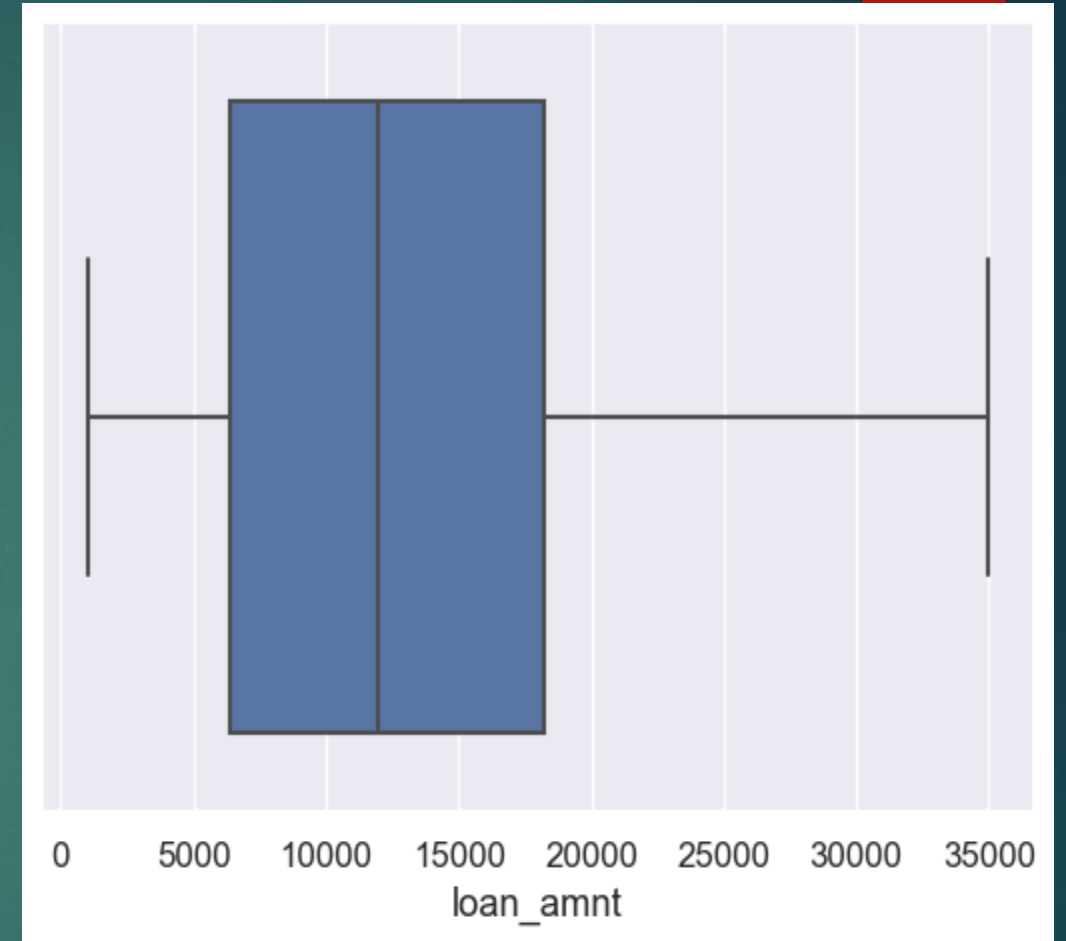2. **Bivariate Analysis**
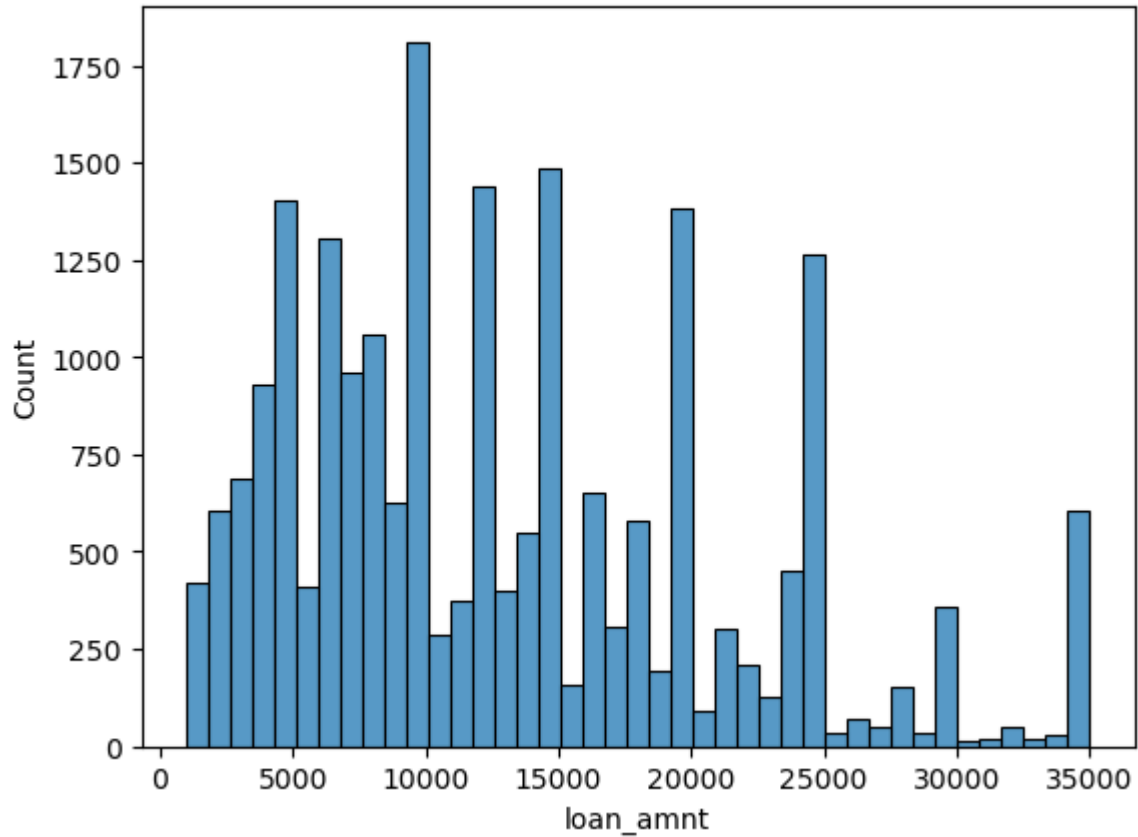3. **Multivariate Analysis**
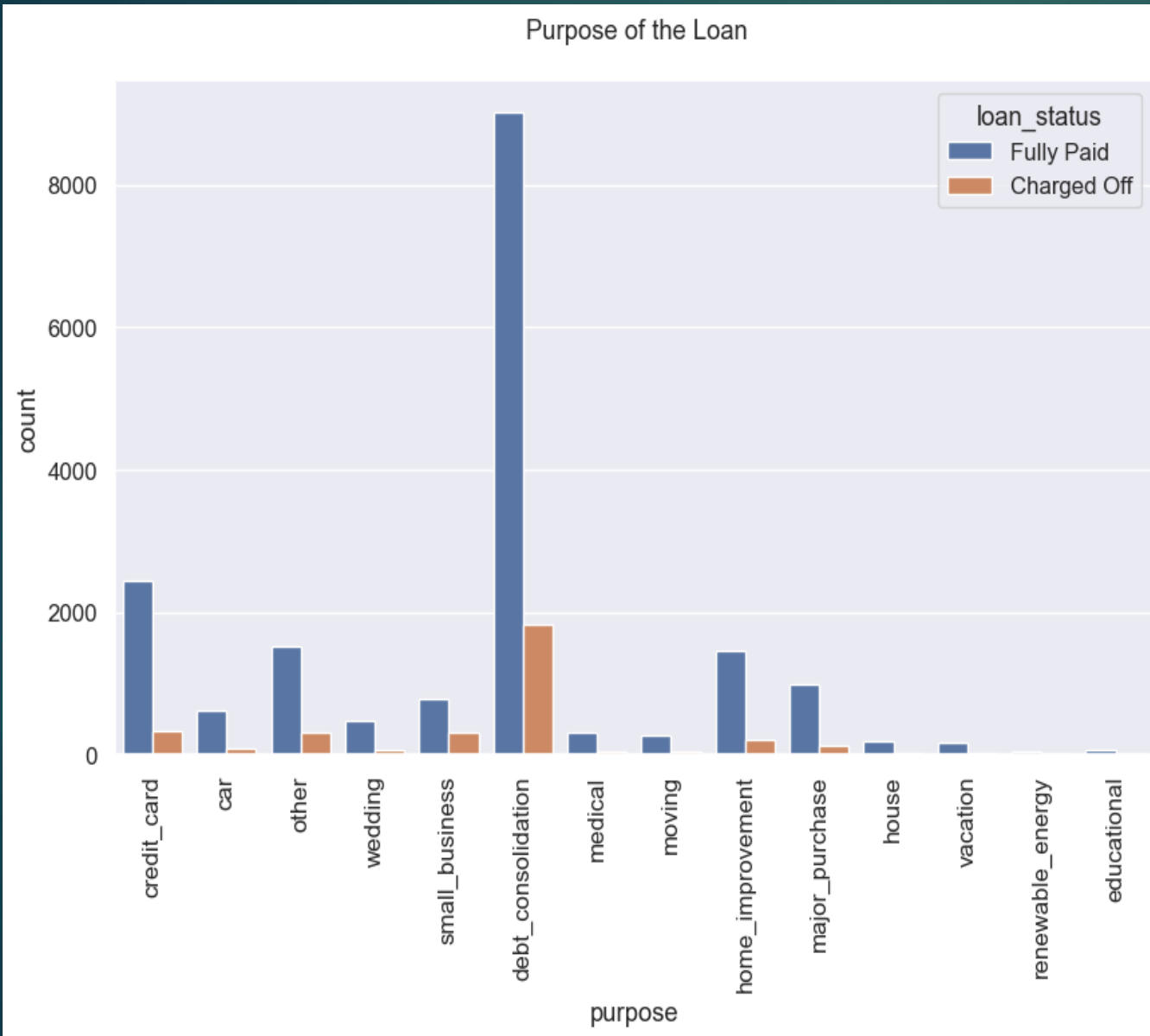
Univariate Analysis

- Analysing Loan Amount
- Analysing Purpose of Loan
- Analysing Annual income
- Analysing interest Rate
- Analysing Term
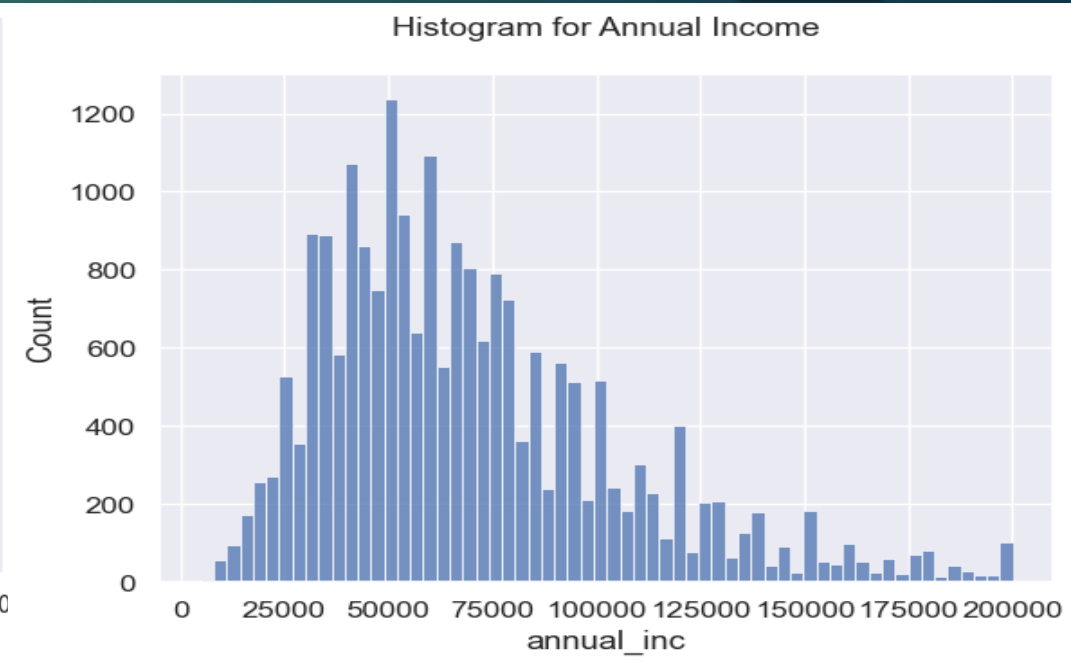- Analysing Loan Status
- Analysing Home Ownership

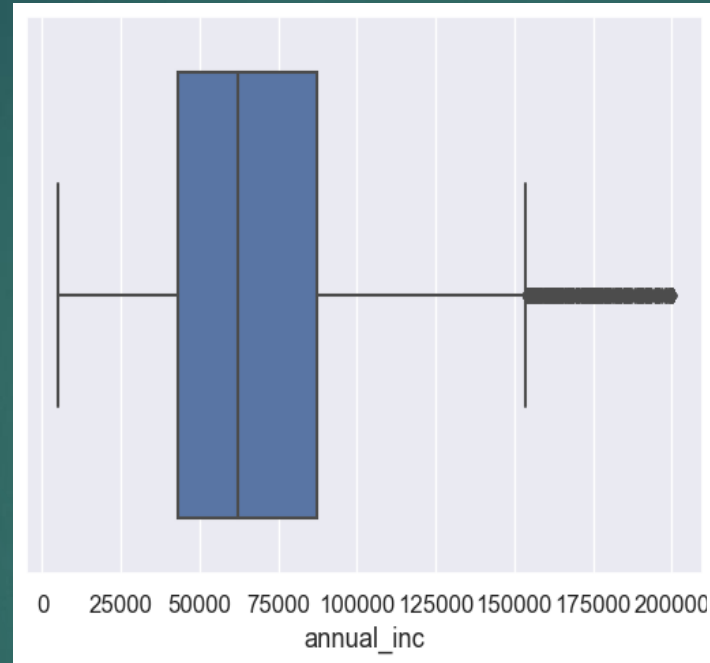# Analysing Loan Amount

Histogram for Loan Amount
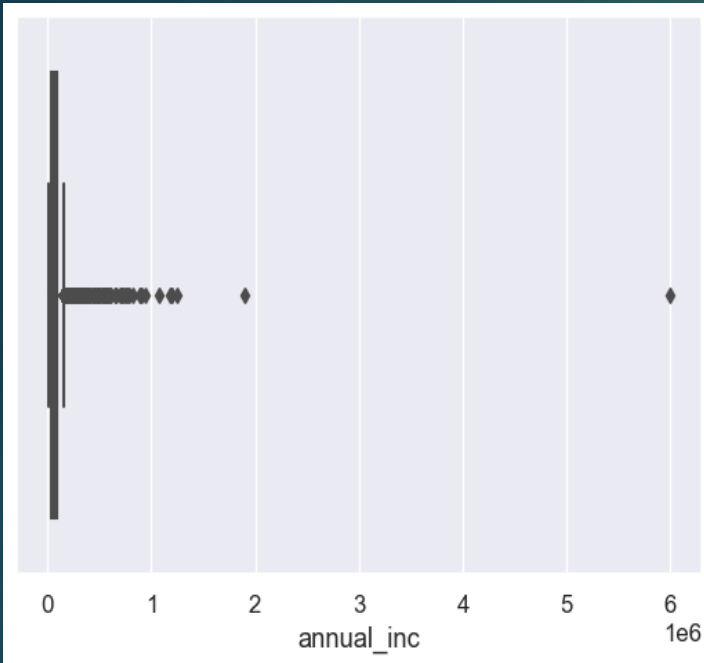
Analysing Purpose of Loan

Purpose of the Loan

- Most of the loans taken for debt consolidation and Number of charged off count also high too for these loans.

Analysing Annual Income

Histogram for Annual Income

- Remove Outliers quantile .98 from Annual Income.
- it will make it easier to visualize the plots.
- most of the borrower's Annual incomes are in range of 40000- 80000.

Analysing Interest Rate
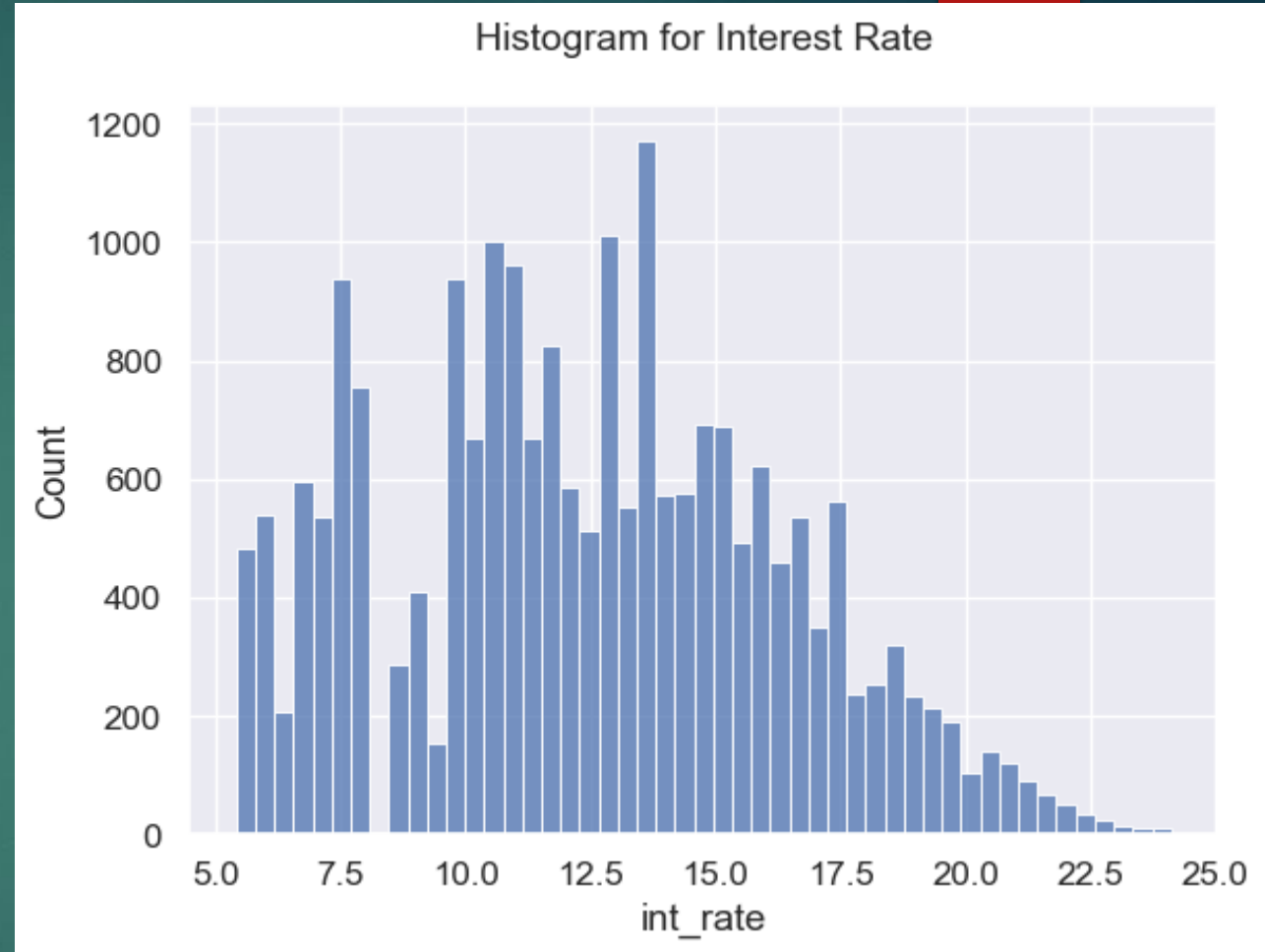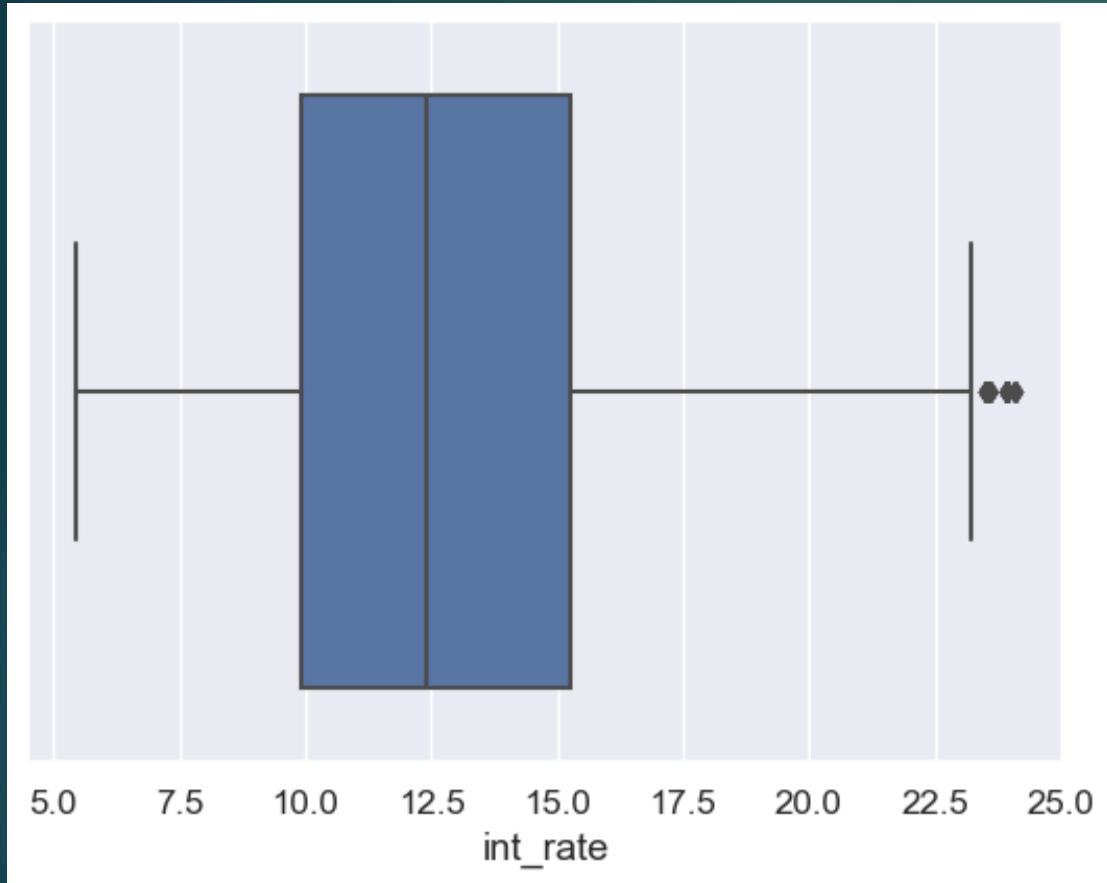
- Average interest rate is 12%.
- After 75% percentile interest rate increased to 24% from 15%.
- From range of 12.5 to 13% interest rate on loans are given at a higher rate.

Analysing Term
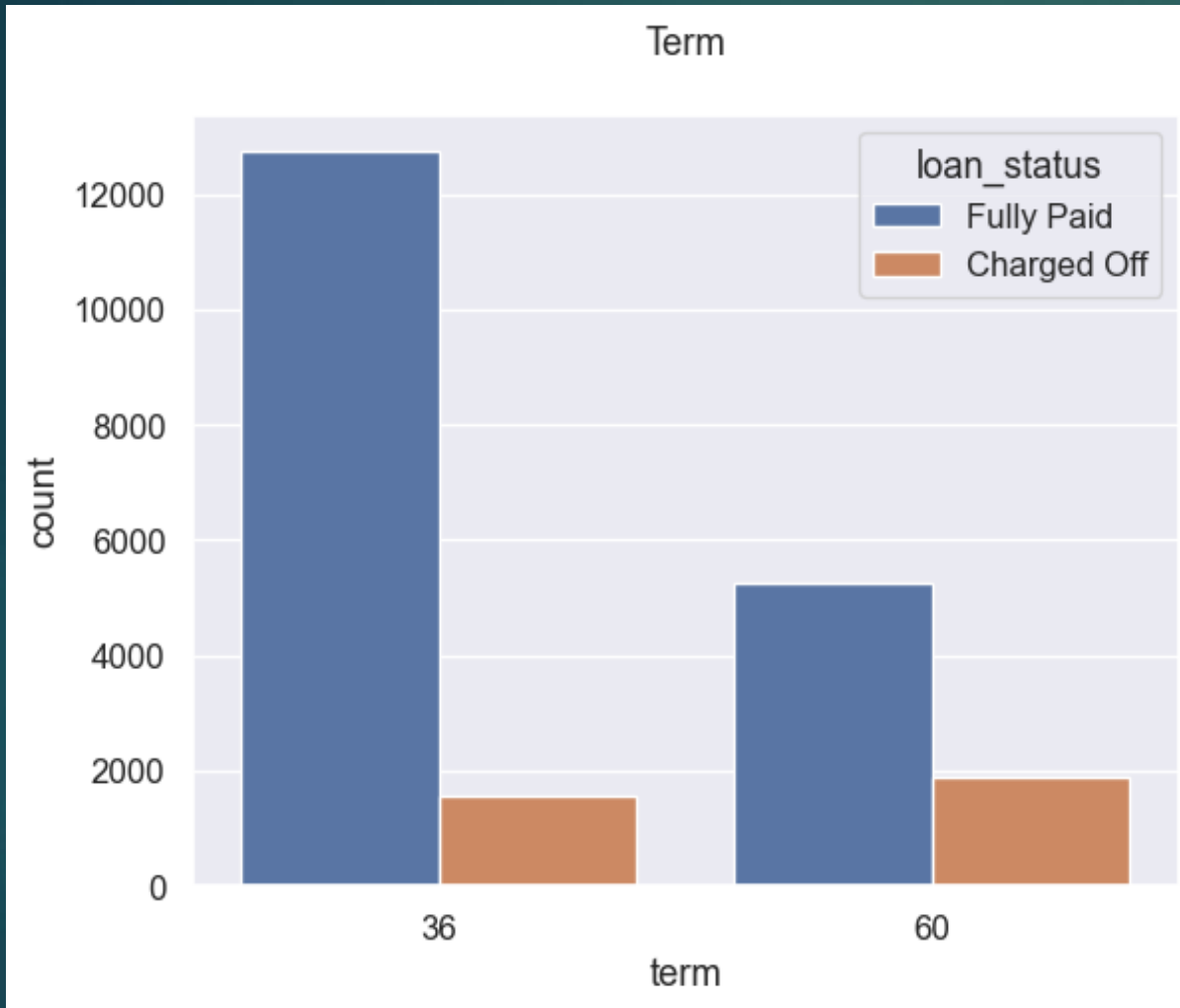
- There is not much difference in charged-off

Analysing Loan Status
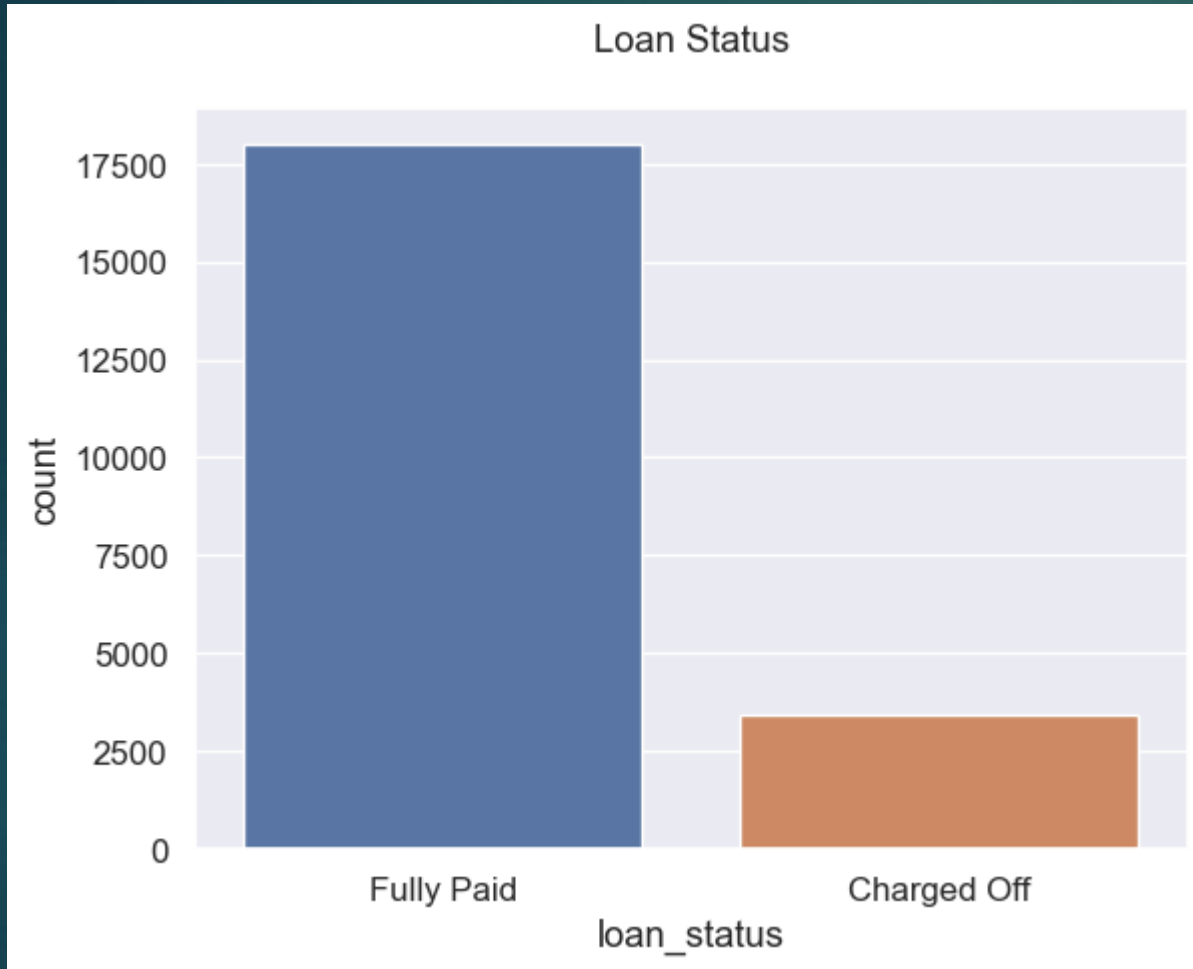
- Most of them are from fully paid

Analysing Home Ownership
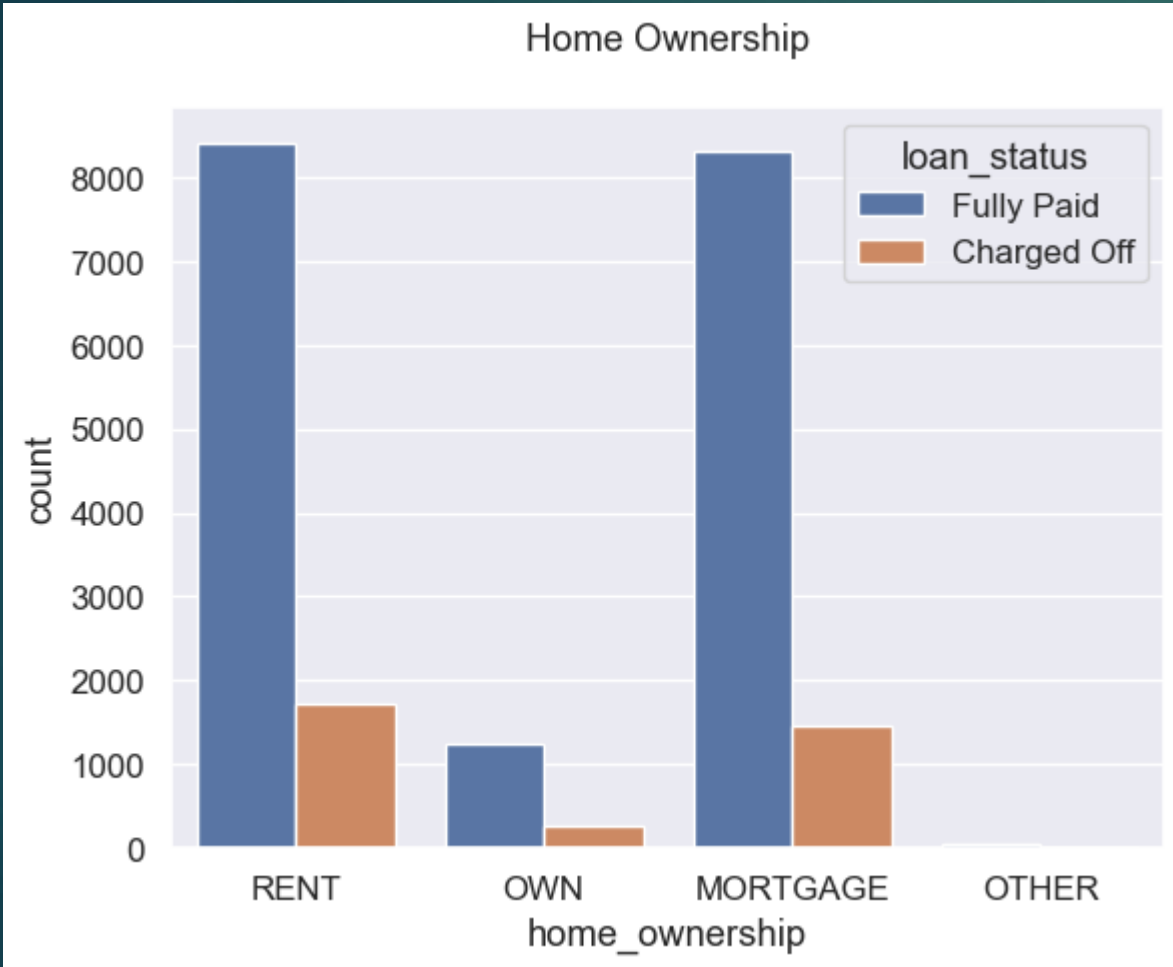
- Most of them are from RENT and MORTGAGE and Number of charged off count also high too for these loans.

Bivariate Analysis

- Analysis on annual income against Charged-off Proportion
- Analysis on purpose of loan against Charged-off Proportion.
- Analysis on Grade against Charged-off Proportion.
- Analysis on Sub-Grade against Charged-off Proportion.
- Analysis on Int rate against Charged-off Proportion.
- Analysis on Int rate against Charged-off Proportion.
- Analysis on emp length against Charged-off Proportion.
- Analysis on verification status against Charged-off Proportion.
- Purpose of loan vs Loan amount.
- Purpose vs Interest Rate.
- Comparing loan amount and grade.
- Comparing Grade with Purpose of Loan.
- Grade vs Interest Rate.
- Comparing Term of loan vs Interest Rate.
- Loan Amount vs Interest Rate.
- Dti vs Interest Rate.

Analysis on annual income against Charged-off Proportion

| loan_status	annual_inc_cats	Charged Off	Fully Paid	Total	Chargedoff_Proportion
1	20000-40000	822	3244	4066	0.202164
0	0-20000	109	440	549	0.198543
2	40000-60000	1049	4875	5924	0.177076
3	60000-80000	665	3803	4468	0.148836
4	80000+	796	5639	6435	0.123699

- Income range 80000+ has less chances of charged off.
- Income range 0-20000 and 20000-40000 has high chances of charged off.
- Increase in annual income charged off proportion got decreased.

Annual Income vs Chargedoff Proportion

Analysis on purpose of loan against Charged-off Proportion

loan_status	purpose	Charged Off	Fully Paid	Total	Chargedoff_Proportion
11	small_business	313	755	1068	0.293071
3	educational	17	78	95	0.178947
8	moving	58	275	333	0.174174
9	other	309	1487	1796	0.172049
2	debt_consolidation	1809	8862	10671	0.169525
5	house	34	185	219	0.155251
7	medical	56	310	366	0.153005
10	renewable_energy	9	53	62	0.145161
12	vacation	29	174	203	0.142857
0	car	92	607	699	0.131617
4	home_improvement	196	1378	1574	0.124524
1	credit_card	333	2401	2734	0.121800
13	wedding	63	478	541	0.116451
6	major_purchase	123	958	1081	0.113784

- small Business applicants have high chances of getting charged-off.

Purpose of Loans vs Chargedoff Proportion
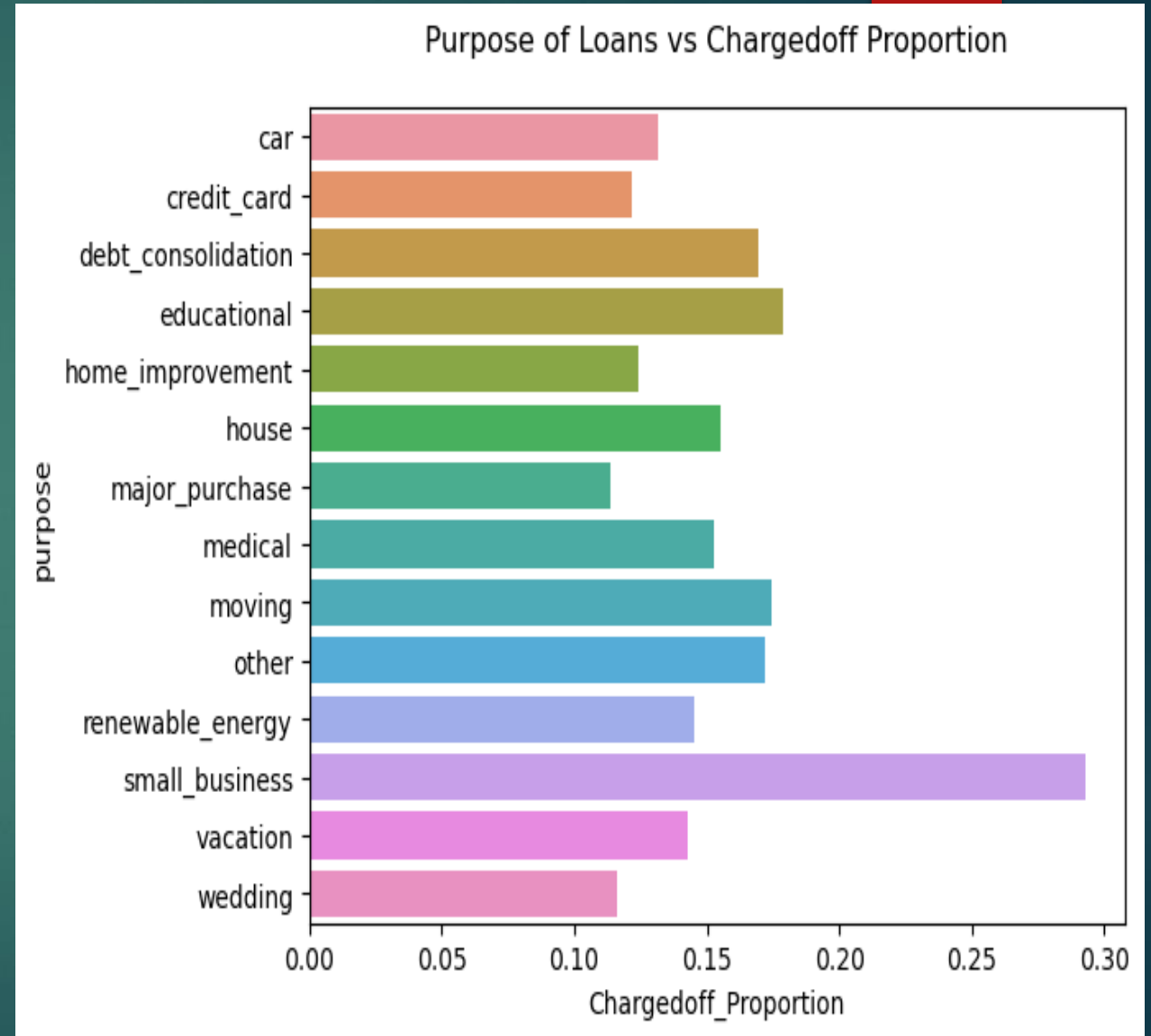
Analysis on Grade against Charged-off Proportion

loan_status	grade	Charged Off	Fully Paid	Total	Chargedoff_Proportion
5	F	266	516	782	0.340153
6	G	80	163	243	0.329218
4	E	552	1411	1963	0.281202
3	D	705	2403	3108	0.226834
2	C	755	3552	4307	0.175296
1	B	798	5439	6237	0.127946
0	A	285	4517	4802	0.059350

- Grade "A" has very less chances of charged-off.
- Grade "F" and "G" have very high chances of charged-off.
- Chances of charged of is increasing with grade moving from "A" towards "G".
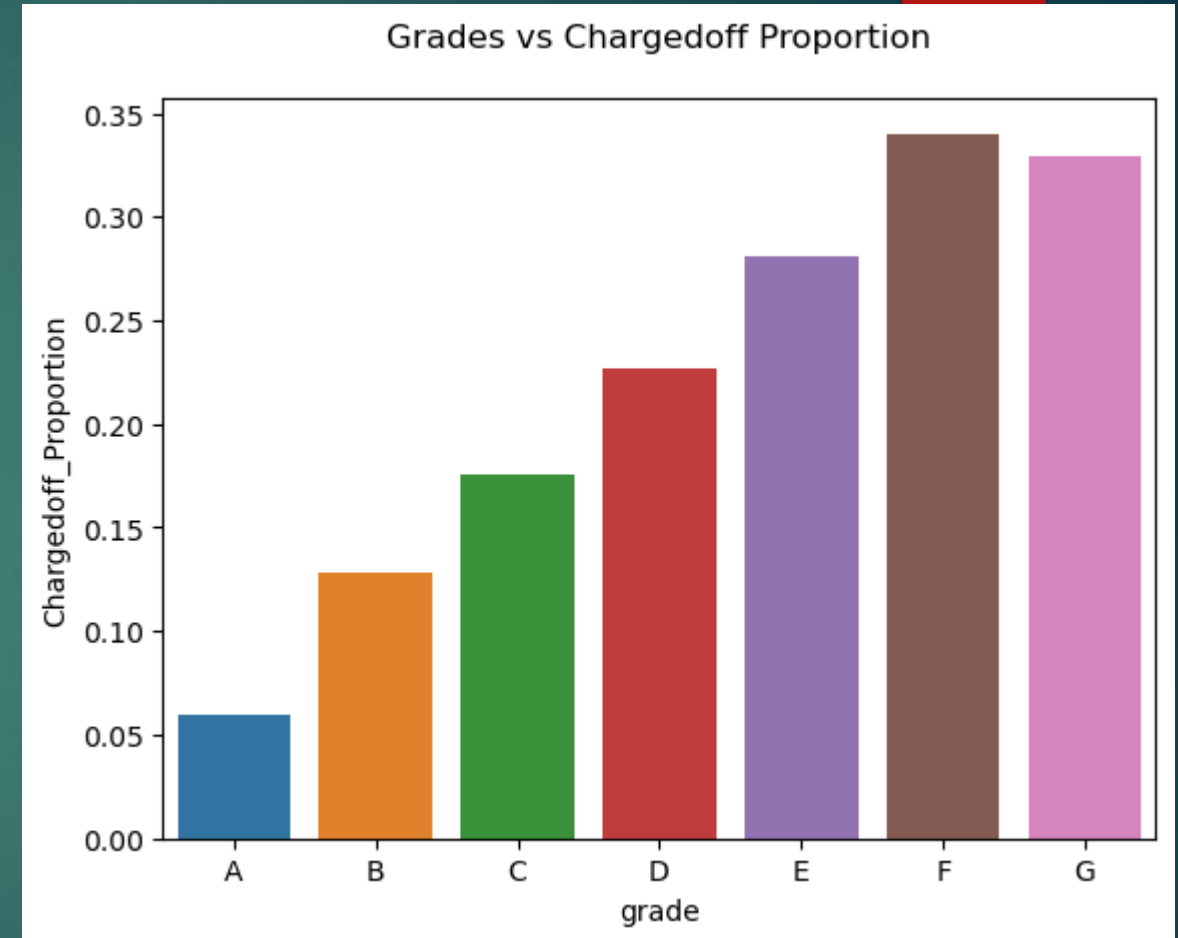
Analysis on Sub-Grade against Charged-off Proportion

loan_status	sub_grade	Charged Off	Fully Paid	Total	Chargedoff_Proportion
29	F5	44	50	94	0.468085
32	G3	16	23	39	0.410256
28	F4	46	72	118	0.389831
30	G1	27	51	78	0.346154
31	G2	22	43	65	0.338462
34	G5	6	12	18	0.333333
25	F1	75	165	240	0.312500
26	F2	59	130	189	0.312169
27	F3	42	99	141	0.297872
23	E4	97	231	328	0.295732
24	E5	87	212	299	0.290970
20	E1	145	362	507	0.285996
21	E2	121	313	434	0.278802
19	D5	155	433	588	0.263605
22	E3	102	293	395	0.258228
18	D4	141	431	572	0.246503
17	D3	163	512	675	0.241481
16	D2	167	617	784	0.213010
33	G4	9	34	43	0.209302
11	C2	204	896	1100	0.185455
12	C3	143	650	793	0.180328
14	C5	108	518	626	0.172524
13	C4	112	543	655	0.170992
10	C1	188	945	1133	0.165931
15	D1	79	410	489	0.161554
9	B5	219	1266	1485	0.147475
8	B4	186	1157	1343	0.138496
7	B3	199	1352	1551	0.128304
6	B2	110	866	976	0.112705
5	B1	84	798	882	0.095238
4	A5	105	1246	1351	0.077720
3	A4	86	1342	1428	0.060224
2	A3	48	766	814	0.058968
1	A2	33	664	697	0.047346
0	A1	13	499	512	0.025391
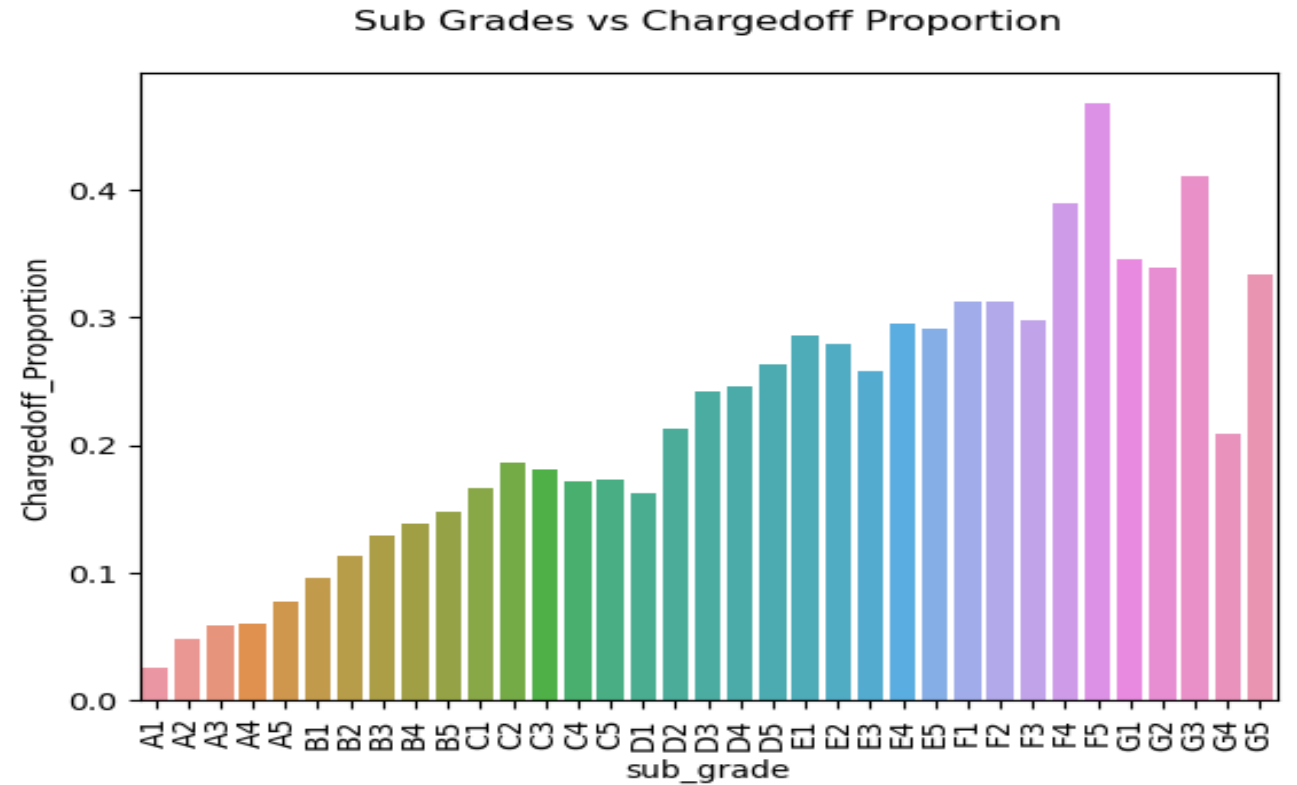
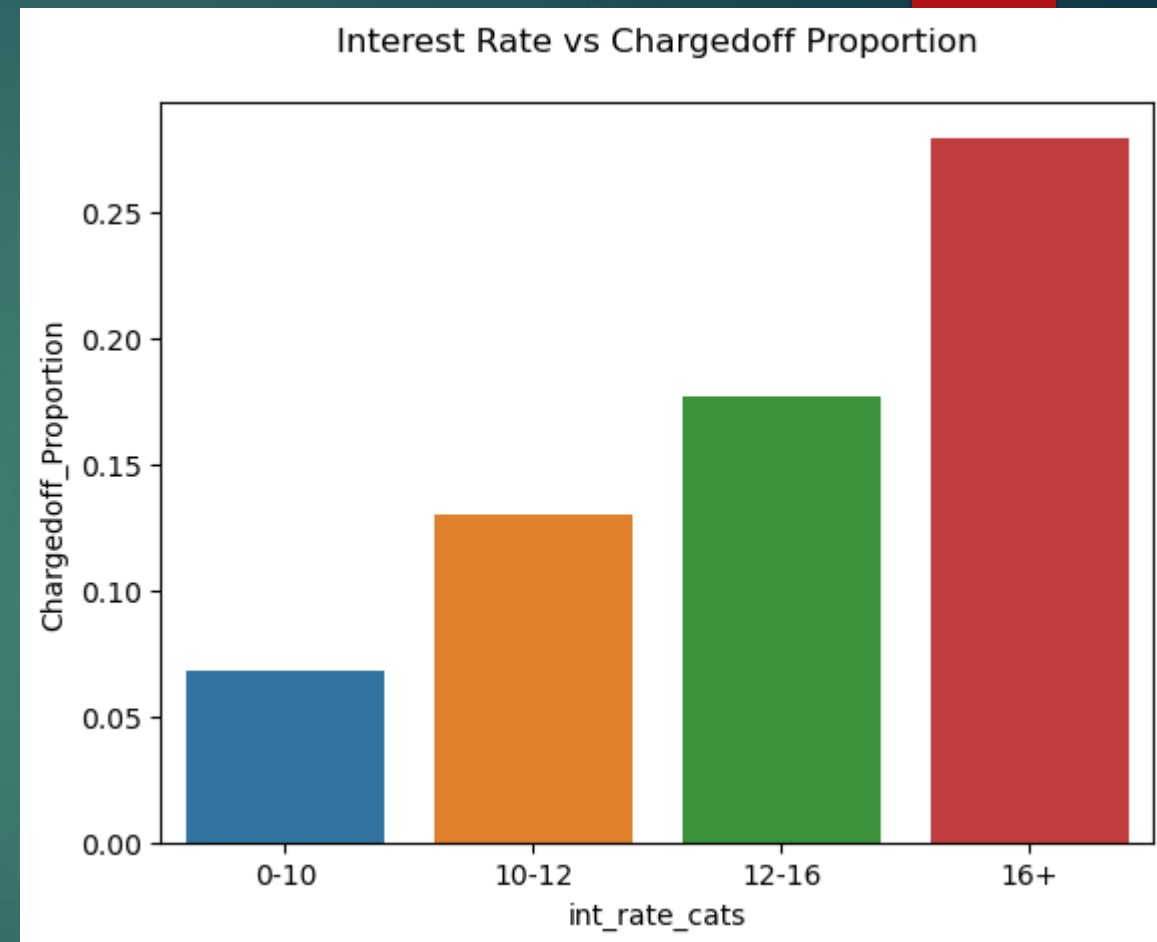Sub Grades vs Chargedoff Proportion

- proportion of charged-off is increasing with sub grades moving from sub grades of "A" towards sub grades of "G"

Analysis on Int rate against Charged-off Proportion

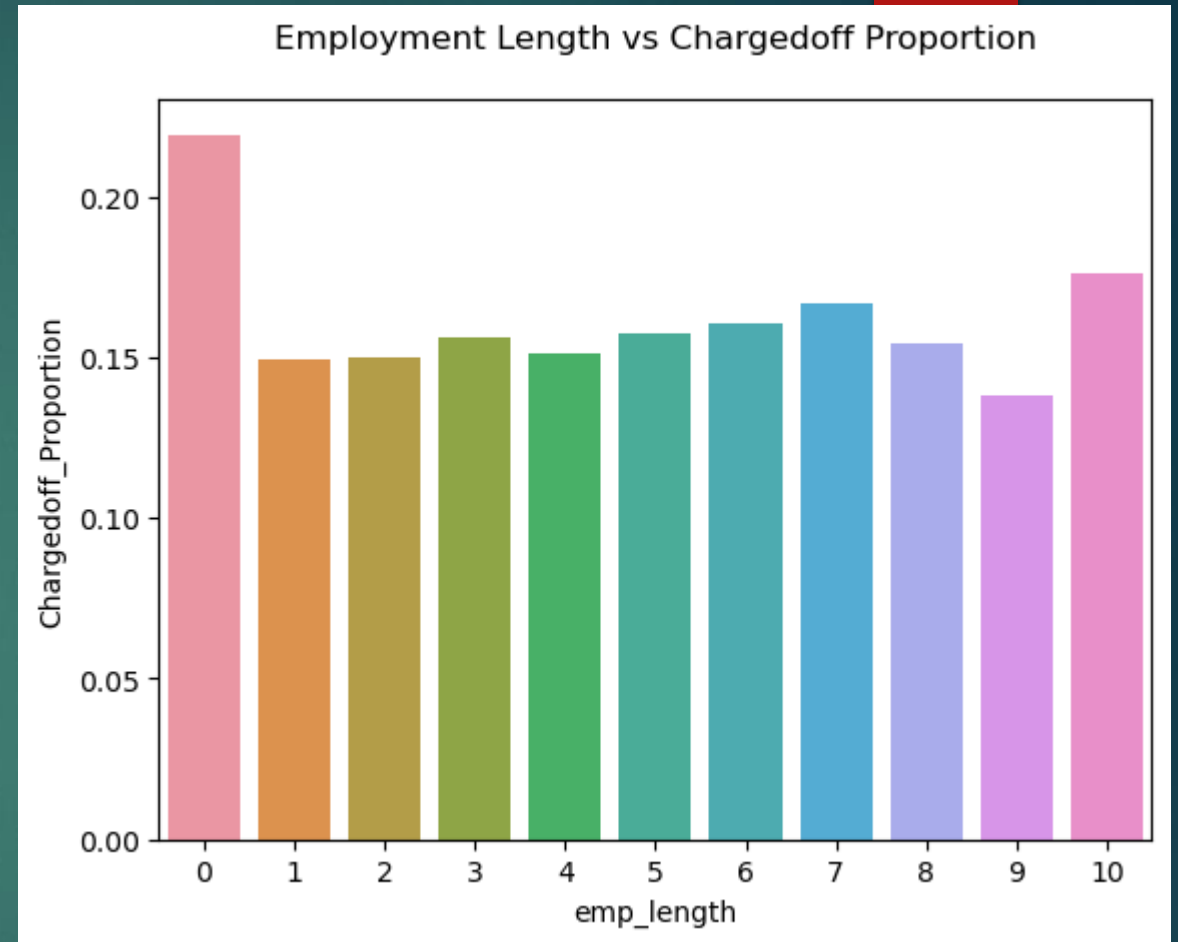| loan_status	int_rate_cats	Charged Off	Fully Paid	Total	Chargedoff_Proportion
3	16+	977	2515	3492	0.279782
2	12-16	1238	5757	6995	0.176984
1	10-12	561	3747	4308	0.130223
0	0-10	408	5580	5988	0.068136

- interest rate more than 16% has good chances of charged-off as compared to other category interest rates.
- Charged-off proportion is increasing with higher interest rates.

Interest Rate vs Chargedoff Proportion

Analysis on emp length against Charged-off Proportion

loan_status	emp_length	Charged Off	Fully Paid	Total	Chargedoff_Proportion
0	0	134	477	611	0.219313
10	10	895	4180	5075	0.176355
7	7	163	816	979	0.166496
6	6	196	1027	1223	0.160262
5	5	276	1480	1756	0.157175
3	3	337	1824	2161	0.155946
8	8	124	679	803	0.154421
4	4	280	1570	1850	0.151351
2	2	332	1881	2213	0.150023
1	1	611	3487	4098	0.149097
9	9	93	580	673	0.138187

Employment Length vs Chargedoff Proportion

- Those who are not working or have less than 1 year of work experience have high chances of getting charged-off.

# Analysis on verification status against Charged-off Proportion

loan_status	verification_status	Charged Off	Fully Paid	Total	Chargedoff_Proportion
1	Verified	2023	9910	11933	0.169530
0	Source Verified	1418	8091	9509	0.149122

- There is not much difference in charged off proportion

Verification Status vs Chargedoff Proportion
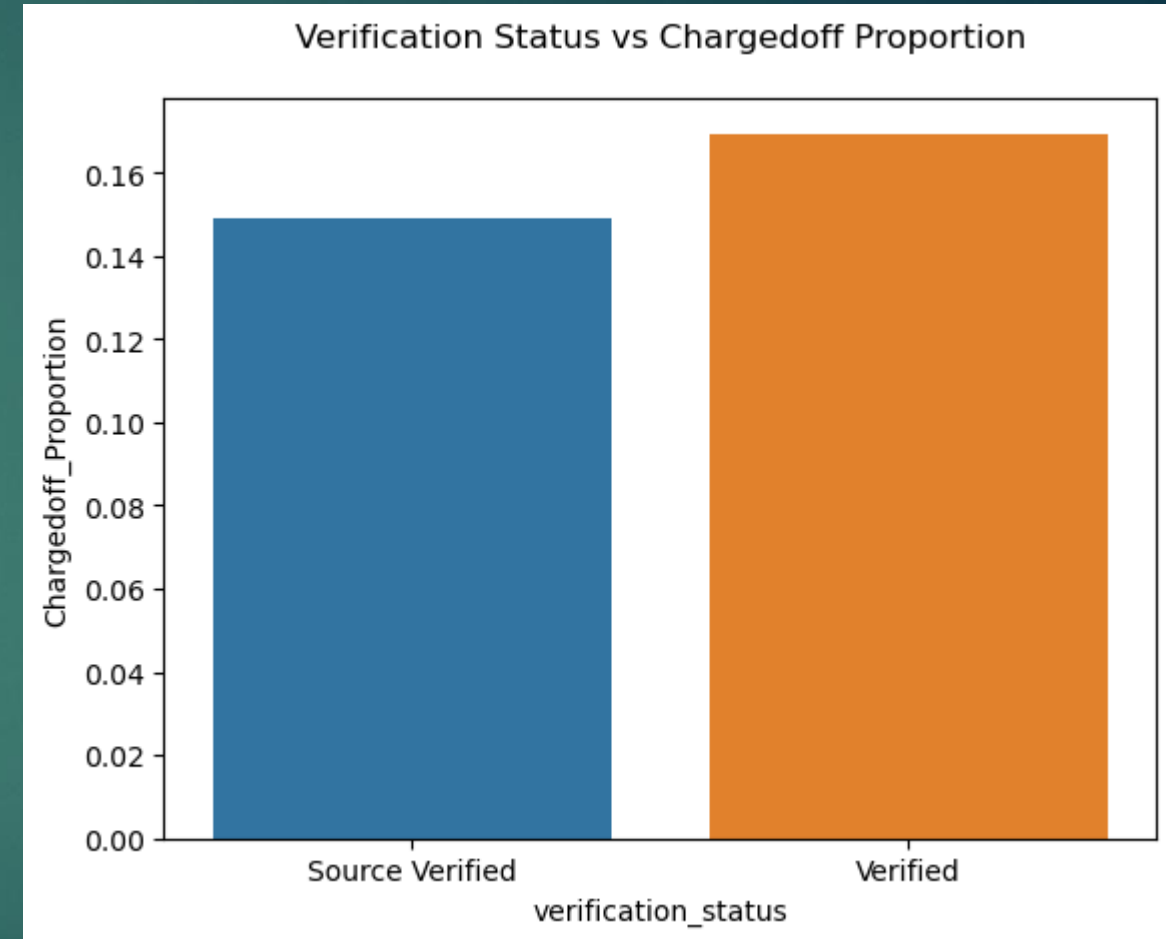
Purpose of loan vs Loan amount

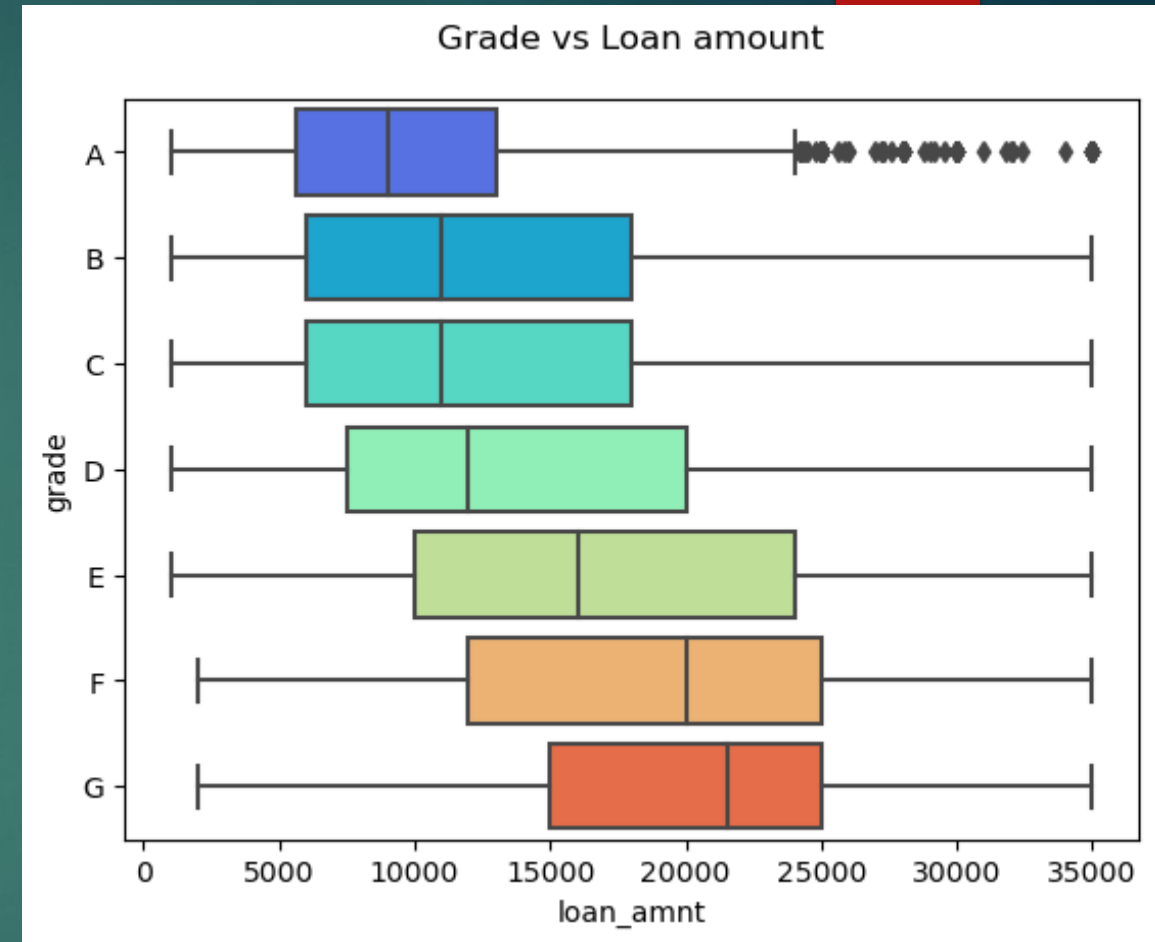- loan amount is highest for loan taken for small business.
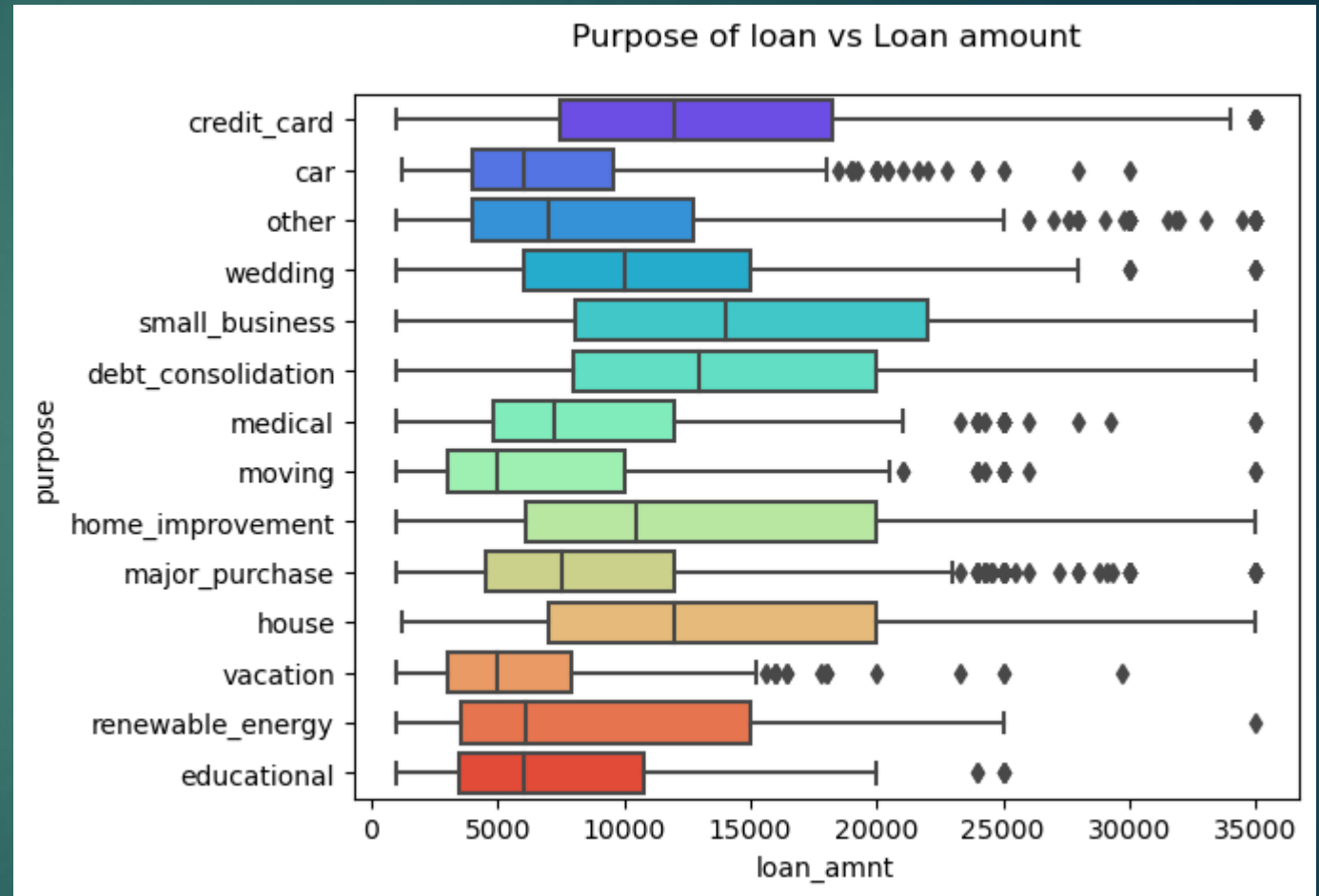
Purpose vs Interest Rate

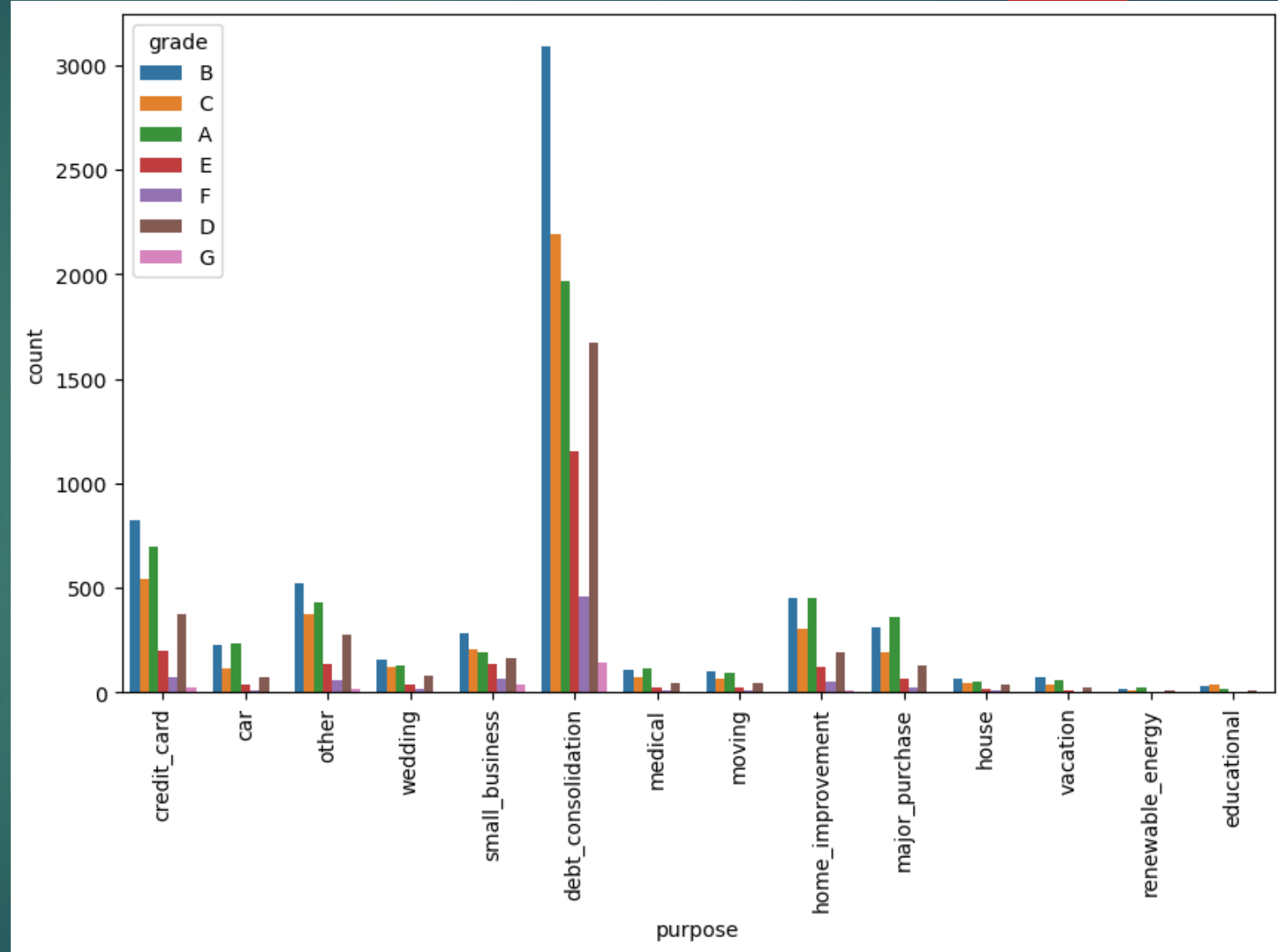- It is clear that average interest rate is highest for small business purpose.

Purpose of loan vs Interest Rate
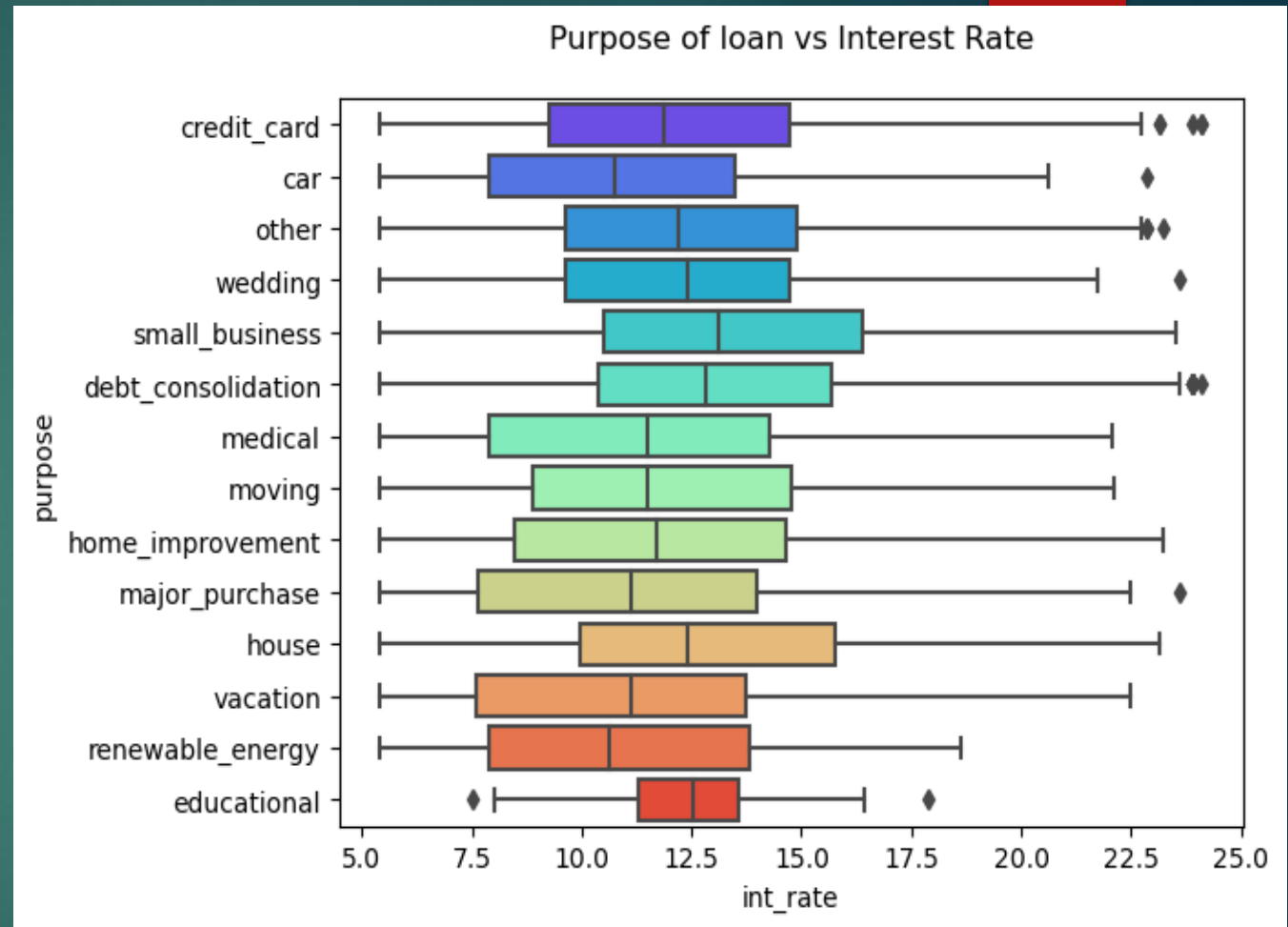
Comparing loan amount and grade

- Here we comparing loan and grade amount.
- On X-axis (loan amount).
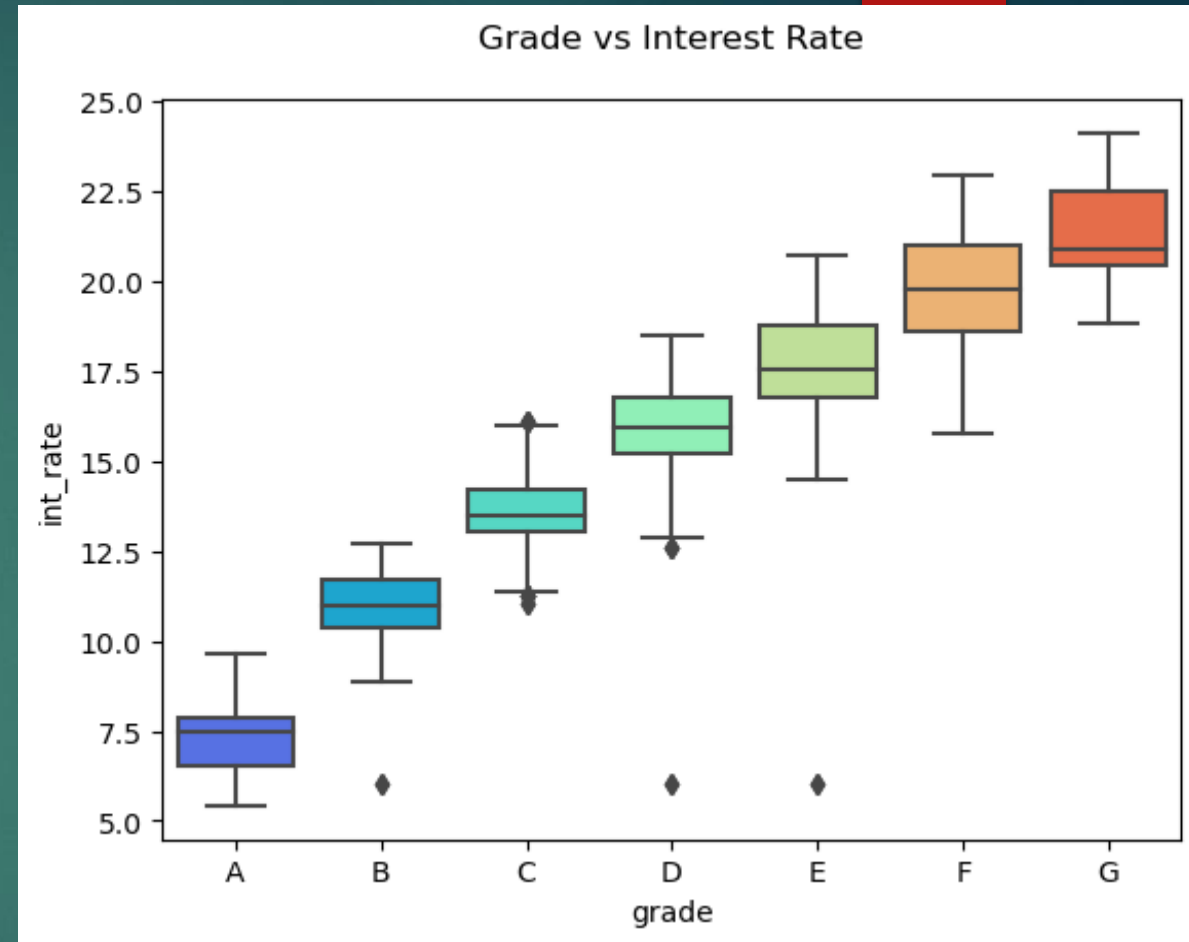- On Y-axis (grade amount).

Grade vs Loan amount

Comparing Grade with Purpose of Loan

- Here we comparing grade and Purpose of loan.
- On X-axis (Purpose).
- On Y-axis (Count).
- Grade value of B is higher in debt consolidation.
-

Grade vs Interest Rate

- A-grade is a top letter grade for a lender to assign to a borrower.
- It is clear that interest rate is increasing with grades moving from A to G.

Comparing Term of loan vs Interest Rate

- It is clear that average interest rate is higher for 60 months loan term.
- Most of the loans issued for longer term had higher interest rates for repayments.


Term of loan vs Interest Rate
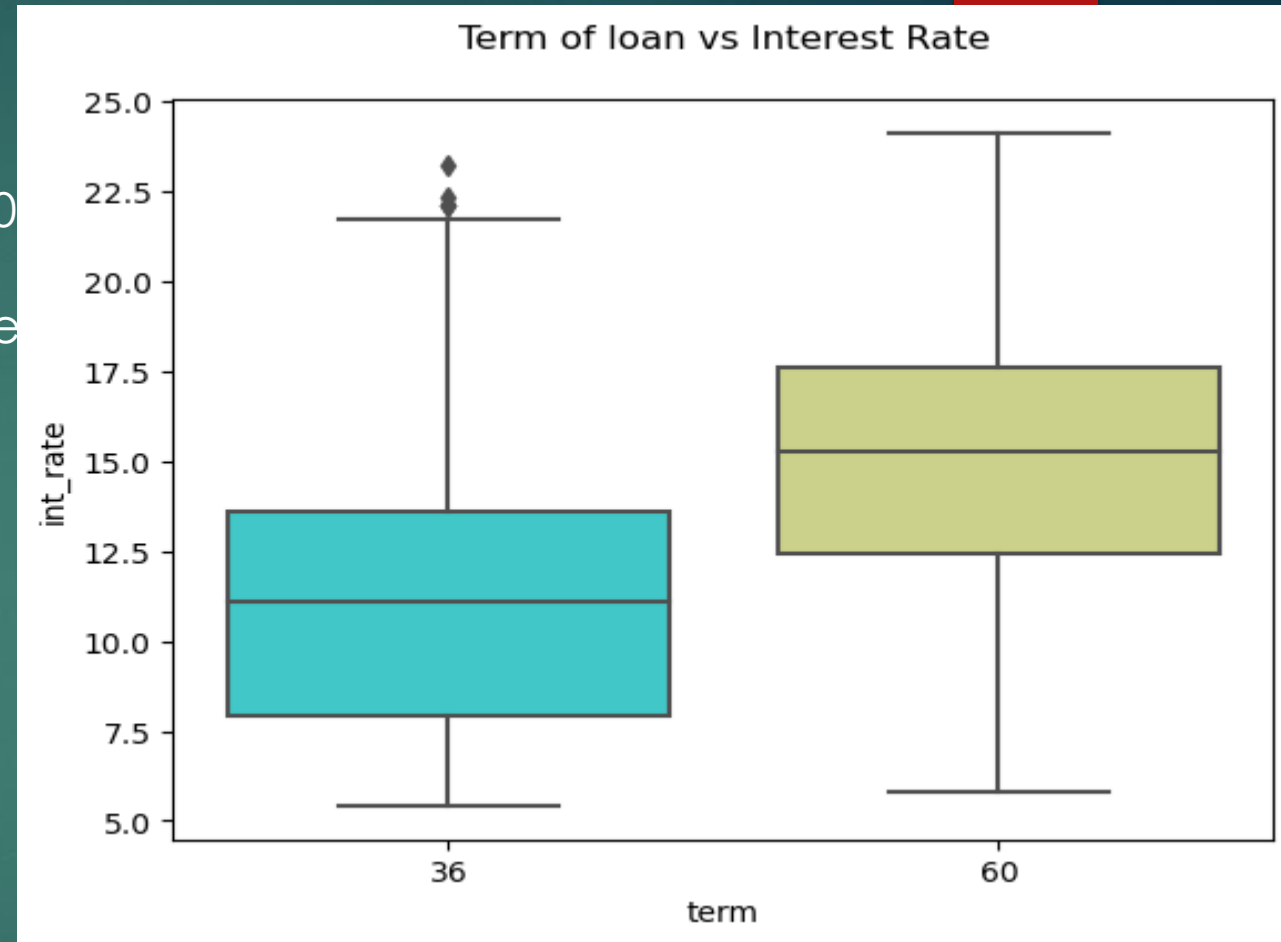
Loan Amount vs Interest Rate

- interest rate is increasing with loan amount increase.
- probably when loan amount is more it is taken for longer loan term, we saw earlier that longer the loan term more the interest rate.
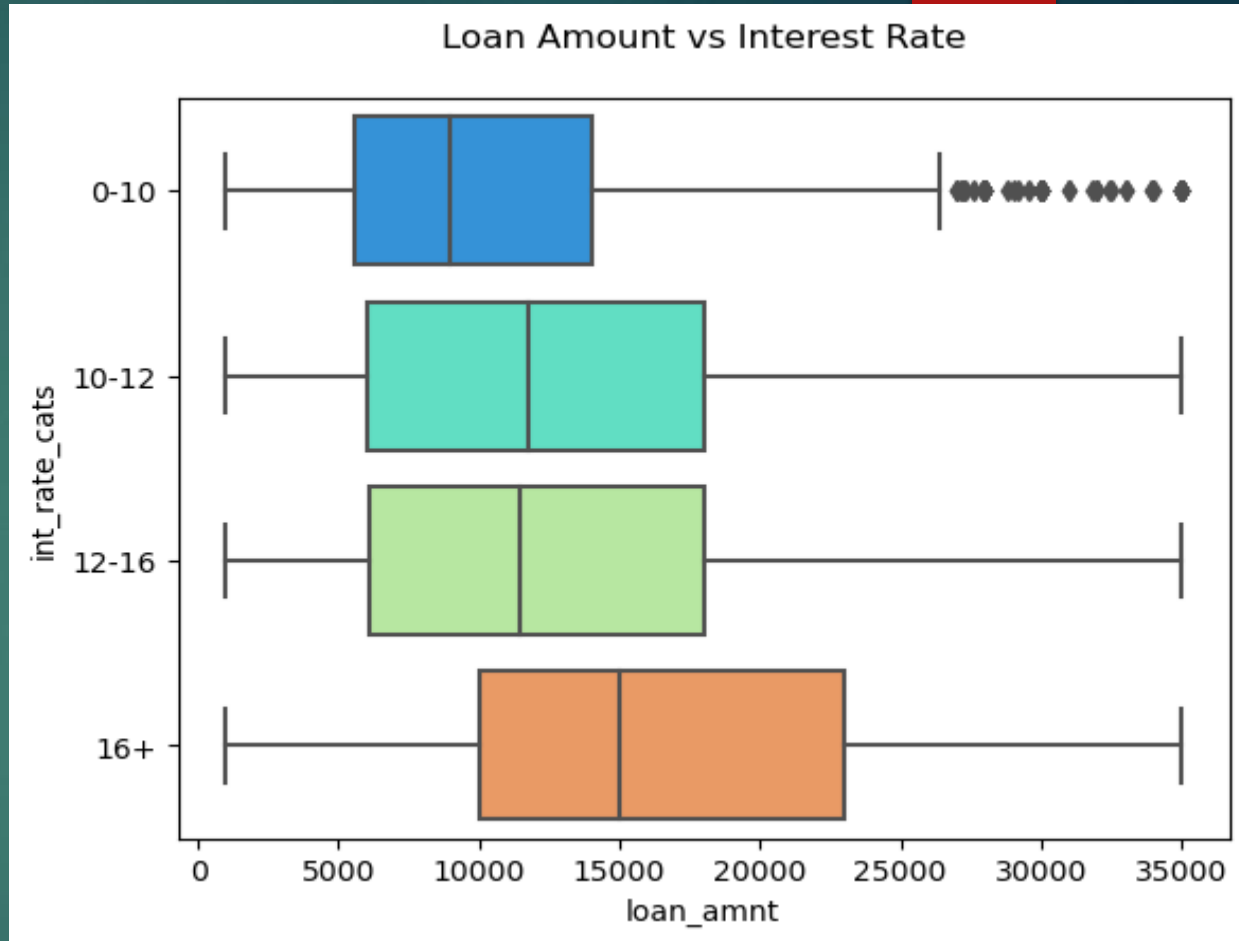
Dti vs Interest Rate

- Here we compare dti vs interest rate by using box plot.
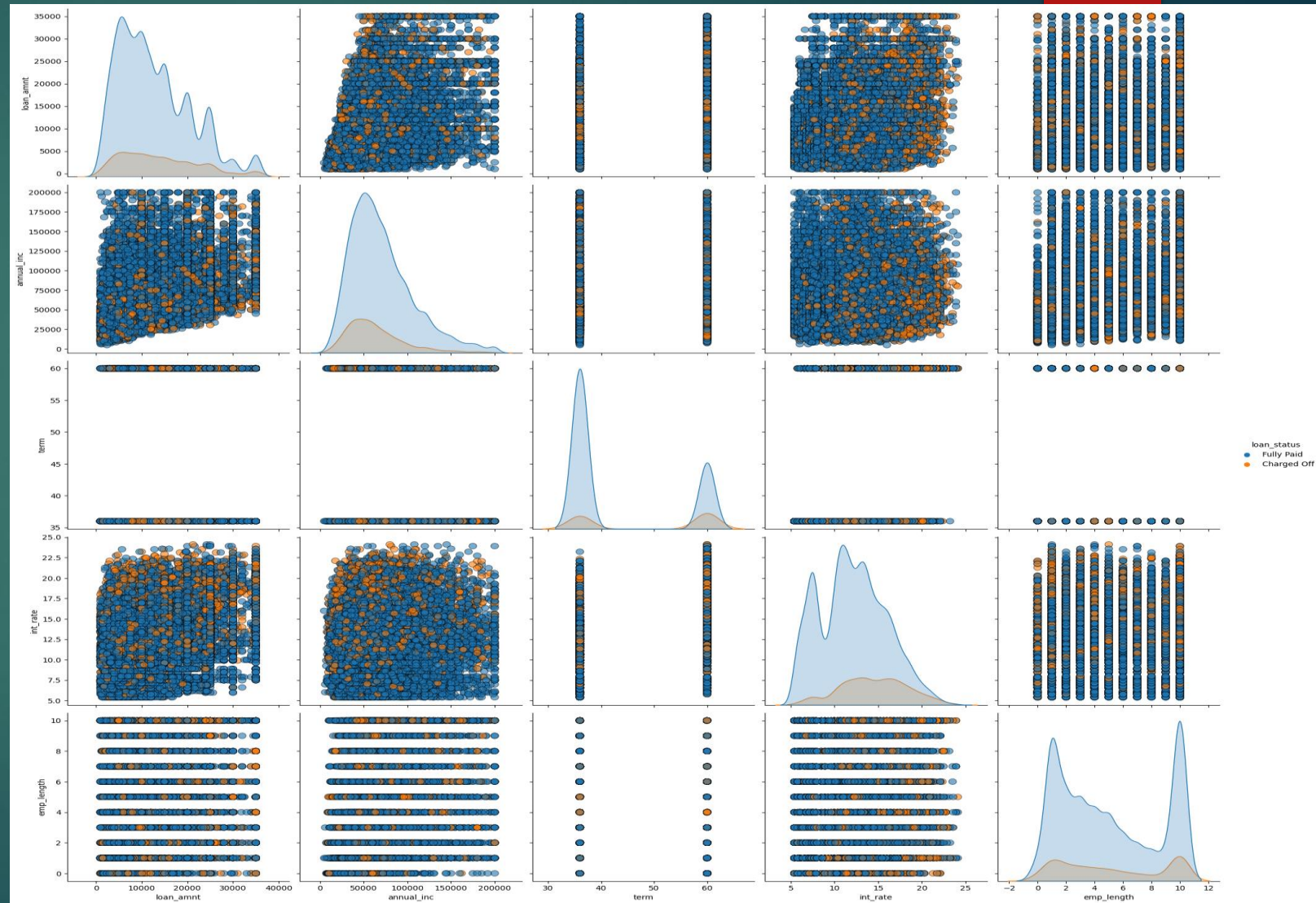- If your DTI is low then its enough you may get a lower interest rate.

dti vs Interest Rate
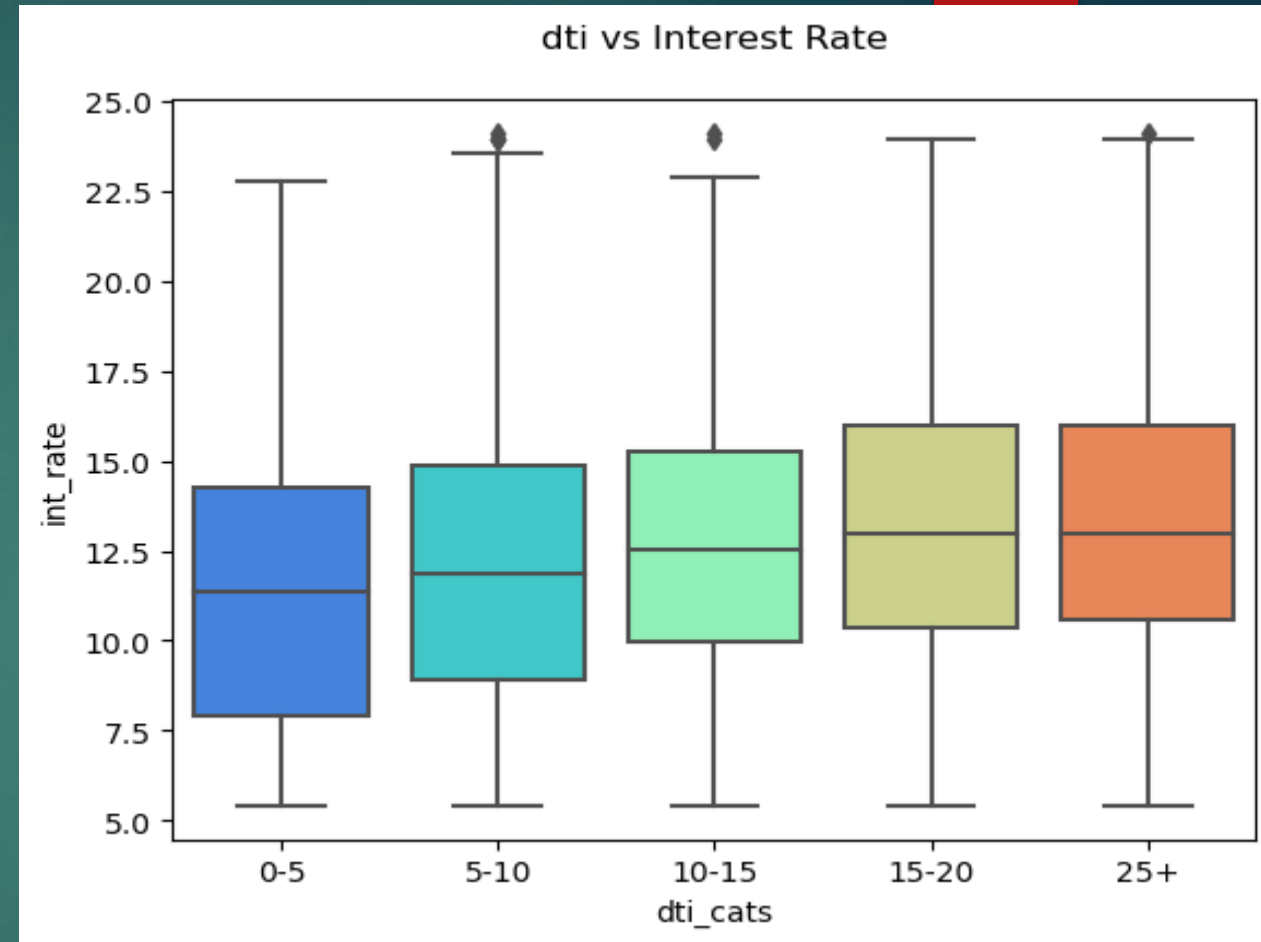
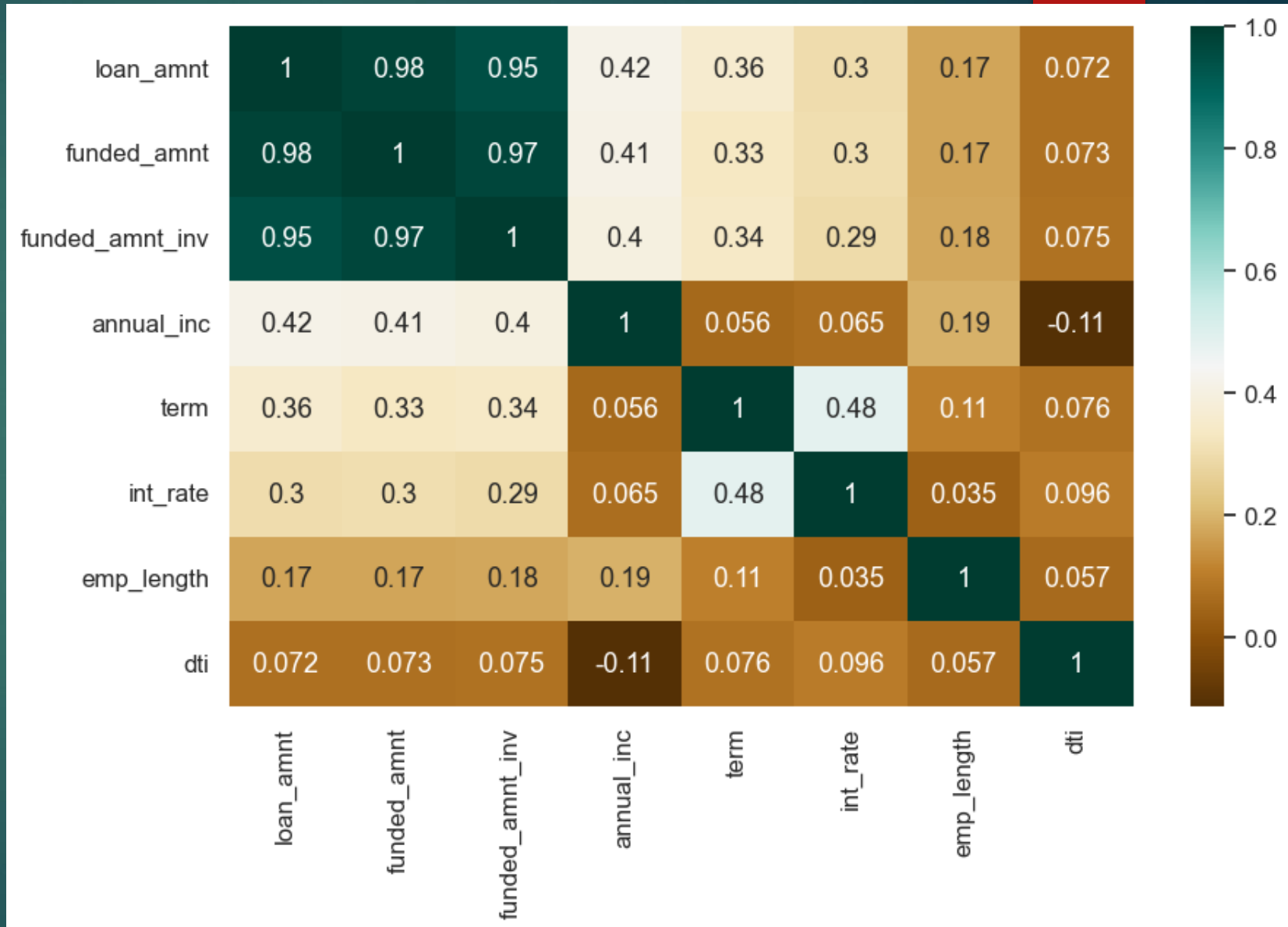# Multivariate Analysis

- Pair-plot.
- Heat-map.

Pair-plot

- Higher the annual income higher the loan amount slightly.
- interest rate is increasing with loan amount increase

Analysis by Heat-map

- The Loan amount, investor amount, funding amount are strongly correlated.
- Annual income is low DTI is high.

Recommendations

- **LOAN**
- **INTEREST**
- **CHARGED-OFF**
- **GRADE**
- **DTI**

LOAN

- Higher the annual income higher the loan amount slightly.
- Most of the Loan amounts are in range of 5000 - 15000
- Most of the loans were taken for the purpose of debt consolidation & paying credit card bill.
- Loan taken for small business purpose, Debt consolidation and Credit card are more as compare to loan taken for other purposes.
- Most of the Loan borrower's Annual incomes are in range of 40000- 80000
- Most of them living in rented home or mortgaged their home.
- Most of the loans issued for longer term
- Probably when loan amount is more it is taken for longer loan term, as we know that longer the loan term more the interest rate.
- Loans taken for small business purposes had to repay the loan with more intrest rate as compared to other.

INTEREST

- The interest rate is increasing with loan amount increase.
- from range of 12.5 to 13% interest rate on loans are given at a higher rate
- The average interest rate is higher for 60 months loan term.
- The average interest rate is highest for small business purpose.
- Debt consolidation is 2nd where borrowers had to pay more interest rate.

CHARGED-OFF

- Income range 80000+ has less chances of charged off.
- Income range 0-20000 and 20000-40000 has high chances of charged off.
- Most of them are from RENT and MORTGAGE and Number of charged-off count also high too for these loans.
- Increase in annual income charged off proportion got decreased.
- Small Business applicants have high chances of getting charged off.
- Renewable energy where charged-off proportion is better as compare to other categories.
- Grade "A" has very less chances of charged off.
- Chances of charged off is increasing with grade moving from "A" towards "G"
- proportion of charged off is increasing with sub grades moving from sub grades of "A" towards sub grades of "G"
- Charged off proportion is increasing with higher interest rates.
- Those who are not working or have less than 1 year of work experience have high chances of getting charged off.

GRADE

- A-grade is a top letter grade for a lender to assign to a borrower.
- The higher the borrower's credit grade, the lower the interest rate offered to that borrower on a loan.
- The interest rate is increasing with grades moving from A to F.

DTI

•If your DTI is low then its enough you may get a lower interest rate.

Thank You