```
## import libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

```
#dataload
data_loan = pd.read_csv("loan.csv")
```

```
#see the data
data_loan.head(5)
```

| | id | member_id | loan_amnt | funded_amnt | funded_amnt_inv | term | int_rate | instal |
|---|---|---|---|---|---|---|---|---|
| **0** | 1077501 | 1296599 | 5000 | 5000 | 4975.0 | 36 months | 10.65% | 1 |
| **1** | 1077430 | 1314167 | 2500 | 2500 | 2500.0 | 60 months | 15.27% | |
| **2** | 1077175 | 1313524 | 2400 | 2400 | 2400.0 | 36 months | 15.96% | |
| **3** | 1076863 | 1277178 | 10000 | 10000 | 10000.0 | 36 months | 13.49% | 3 |
| **4** | 1075358 | 1311748 | 3000 | 3000 | 3000.0 | 60 months | 12.69% | |

5 rows × 111 columns

```
data_loan.shape
```

```
(39717, 111)
```

```
#getting the null values
data_loan.isnull().sum()
```

```
id                            0
member_id                     0
loan_amnt                     0
funded_amnt                   0
funded_amnt_inv               0
                            ...
tax_liens                    39
tot_hi_cred_lim           39717
total_bal_ex_mort         39717
total_bc_limit            39717
total_il_high_credit_limit    39717
Length: 111, dtype: int64
```

## *FROM the above analysis lots of data is null so revoving null characters *

Start coding or generate with AI.

```
data_loan.dropna(axis = 1, how = 'all', inplace = True)
data_loan.head(5)
```

|  | id | member_id | loan_amnt | funded_amnt | funded_amnt_inv | term | int_rate | instal |
|---|---|---|---|---|---|---|---|---|
| **0** | 1077501 | 1296599 | 5000 | 5000 | 4975.0 | 36 months | 10.65% | 1 |
| **1** | 1077430 | 1314167 | 2500 | 2500 | 2500.0 | 60 months | 15.27% |  |
| **2** | 1077175 | 1313524 | 2400 | 2400 | 2400.0 | 36 months | 15.96% |  |
| **3** | 1076863 | 1277178 | 10000 | 10000 | 10000.0 | 36 months | 13.49% | 3 |
| **4** | 1075358 | 1311748 | 3000 | 3000 | 3000.0 | 60 months | 12.69% |  |

5 rows × 57 columns

```
data_loan.info()
```

```
 1   member_id                   39717 non-null  int64
 2   loan_amnt                   39717 non-null  int64
 3   funded_amnt                 39717 non-null  int64
 4   funded_amnt_inv             39717 non-null  float64
 5   term                        39717 non-null  object
 6   int_rate                    39717 non-null  object
 7   installment                 39717 non-null  float64
 8   grade                       39717 non-null  object
 9   sub_grade                   39717 non-null  object
 10  emp_title                   37258 non-null  object
 11  emp_length                  38642 non-null  object
 12  home_ownership              39717 non-null  object
 13  annual_inc                  39717 non-null  float64
 14  verification_status         39717 non-null  object
 15  issue_d                     39717 non-null  object
 16  loan_status                 39717 non-null  object
 17  pymnt_plan                  39717 non-null  object
 18  url                         39717 non-null  object
 19  desc                        26775 non-null  object
 20  purpose                     39717 non-null  object
 21  title                       39706 non-null  object
 22  zip_code                    39717 non-null  object
 23  addr_state                  39717 non-null  object
 24  dti                         39717 non-null  float64
 25  delinq_2yrs                 39717 non-null  int64
 26  earliest_cr_line            39717 non-null  object
 27  inq_last_6mths              39717 non-null  int64
 28  mths_since_last_delinq      14035 non-null  float64
 29  mths_since_last_record      2786 non-null   float64
 30  open_acc                    39717 non-null  int64
 31  pub_rec                     39717 non-null  int64
 32  revol_bal                   39717 non-null  int64
 33  revol_util                  39667 non-null  object
 34  total_acc                   39717 non-null  int64
 35  initial_list_status         39717 non-null  object
 36  out_prncp                   39717 non-null  float64
 37  out_prncp_inv               39717 non-null  float64
 38  total_pymnt                 39717 non-null  float64
 39  total_pymnt_inv             39717 non-null  float64
 40  total_rec_prncp             39717 non-null  float64
 41  total_rec_int               39717 non-null  float64
 42  total_rec_late_fee          39717 non-null  float64
 43  recoveries                  39717 non-null  float64
 44  collection_recovery_fee     39717 non-null  float64
 45  last_pymnt_d                39646 non-null  object
 46  last_pymnt_amnt             39717 non-null  float64
 47  next_pymnt_d                1140 non-null   object
 48  last_credit_pull_d          39715 non-null  object
 49  collections_12_mths_ex_med  39661 non-null  float64
 50  policy_code                 39717 non-null  int64
 51  application_type            39717 non-null  object
 52  acc_now_delinq              39717 non-null  int64
 53  chargeoff_within_12_mths    39661 non-null  float64
 54  delinq_amnt                 39717 non-null  int64
 55  pub_rec_bankruptcies        39020 non-null  float64
 56  tax_liens                   39678 non-null  float64
dtypes: float64(20), int64(13), object(24)
memory usage: 17.3+ MB
```

```
data_loan.columns
```

```
Index(['id', 'member_id', 'loan_amnt', 'funded_amnt', 'funded_amnt_inv',
       'term', 'int_rate', 'installment', 'grade', 'sub_grade', 'emp_title',
       'emp_length', 'home_ownership', 'annual_inc', 'verification_status',
       'issue_d', 'loan_status', 'pymnt_plan', 'url', 'desc', 'purpose',
       'title', 'zip_code', 'addr_state', 'dti', 'delinq_2yrs',
       'earliest_cr_line', 'inq_last_6mths', 'mths_since_last_delinq',
       'mths_since_last_record', 'open_acc', 'pub_rec', 'revol_bal',
       'revol_util', 'total_acc', 'initial_list_status', 'out_prncp',
       'out_prncp_inv', 'total_pymnt', 'total_pymnt_inv', 'total_rec_prncp',
       'total_rec_int', 'total_rec_late_fee', 'recoveries',
       'collection_recovery_fee', 'last_pymnt_d', 'last_pymnt_amnt',
       'next_pymnt_d', 'last_credit_pull_d', 'collections_12_mths_ex_med',
       'policy_code', 'application_type', 'acc_now_delinq',
       'chargeoff_within_12_mths', 'delinq_amnt', 'pub_rec_bankruptcies',
       'tax_liens'],
      dtype='object')
```

```
data_loan =data_loan[data_loan.loan_status != "Current"]
data_loan.loan_status.unique()
```

```
array(['Fully Paid', 'Charged Off'], dtype=object)
```

```
(data_loan.isna().sum()/len(data_loan.index))*100
```

```
id                              0.000000
member_id                       0.000000
loan_amnt                       0.000000
funded_amnt                     0.000000
funded_amnt_inv                 0.000000
term                            0.000000
int_rate                        0.000000
installment                     0.000000
grade                           0.000000
sub_grade                       0.000000
emp_title                       6.185033
emp_length                      2.677761
home_ownership                  0.000000
annual_inc                      0.000000
verification_status             0.000000
issue_d                         0.000000
loan_status                     0.000000
pymnt_plan                      0.000000
url                             0.000000
desc                           32.477901
purpose                         0.000000
title                           0.028514
zip_code                        0.000000
addr_state                      0.000000
dti                             0.000000
delinq_2yrs                     0.000000
earliest_cr_line                0.000000
inq_last_6mths                  0.000000
mths_since_last_delinq         64.559193
mths_since_last_record         92.897322
open_acc                        0.000000
pub_rec                         0.000000
revol_bal                       0.000000
revol_util                      0.129611
total_acc                       0.000000
initial_list_status             0.000000
out_prncp                       0.000000
out_prncp_inv                   0.000000
total_pymnt                     0.000000
total_pymnt_inv                 0.000000
total_rec_prncp                 0.000000
total_rec_int                   0.000000
total_rec_late_fee              0.000000
recoveries                      0.000000
collection_recovery_fee         0.000000
last_pymnt_d                    0.184047
last_pymnt_amnt                 0.000000
next_pymnt_d                  100.000000
last_credit_pull_d              0.005184
collections_12_mths_ex_med      0.145164
policy_code                     0.000000
application_type                0.000000
acc_now_delinq                  0.000000
chargeoff_within_12_mths        0.145164
delinq_amnt                     0.000000
pub_rec_bankruptcies            1.806776
```

```
tax_liens                      0.101097
dtype: float64
```

```
data_loan.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 38577 entries, 0 to 39716
Data columns (total 57 columns):
 #   Column                      Non-Null Count  Dtype  
---  ------                      --------------  -----  
 0   id                          38577 non-null  int64  
 1   member_id                   38577 non-null  int64  
 2   loan_amnt                   38577 non-null  int64  
 3   funded_amnt                 38577 non-null  int64  
 4   funded_amnt_inv             38577 non-null  float64
 5   term                        38577 non-null  object 
 6   int_rate                    38577 non-null  object 
 7   installment                 38577 non-null  float64
 8   grade                       38577 non-null  object 
 9   sub_grade                   38577 non-null  object 
 10  emp_title                   36191 non-null  object 
 11  emp_length                  37544 non-null  object 
 12  home_ownership              38577 non-null  object 
 13  annual_inc                  38577 non-null  float64
 14  verification_status         38577 non-null  object 
 15  issue_d                     38577 non-null  object 
 16  loan_status                 38577 non-null  object 
 17  pymnt_plan                  38577 non-null  object 
 18  url                         38577 non-null  object 
 19  desc                        26048 non-null  object 
 20  purpose                     38577 non-null  object 
 21  title                       38566 non-null  object 
 22  zip_code                    38577 non-null  object 
 23  addr_state                  38577 non-null  object 
 24  dti                         38577 non-null  float64
 25  delinq_2yrs                 38577 non-null  int64  
 26  earliest_cr_line            38577 non-null  object 
 27  inq_last_6mths              38577 non-null  int64  
 28  mths_since_last_delinq      13672 non-null  float64
 29  mths_since_last_record      2740 non-null   float64
 30  open_acc                    38577 non-null  int64  
 31  pub_rec                     38577 non-null  int64  
 32  revol_bal                   38577 non-null  int64  
 33  revol_util                  38527 non-null  object 
 34  total_acc                   38577 non-null  int64  
 35  initial_list_status         38577 non-null  object 
 36  out_prncp                   38577 non-null  float64
 37  out_prncp_inv               38577 non-null  float64
 38  total_pymnt                 38577 non-null  float64
 39  total_pymnt_inv             38577 non-null  float64
 40  total_rec_prncp             38577 non-null  float64
 41  total_rec_int               38577 non-null  float64
 42  total_rec_late_fee          38577 non-null  float64
 43  recoveries                  38577 non-null  float64
 44  collection_recovery_fee     38577 non-null  float64
 45  last_pymnt_d                38506 non-null  object 
 46  last_pymnt_amnt             38577 non-null  float64
 47  next_pymnt_d                0 non-null      object 
 48  last_credit_pull_d          38575 non-null  object 
 49  collections_12_mths_ex_med  38521 non-null  float64
 50  policy_code                 38577 non-null  int64  
 51  application_type            38577 non-null  object 
 52  acc_now_delinq              38577 non-null  int64  
```

```
print("Mode : " + data_loan.emp_length.mode()[0])
data_loan.emp_length.value_counts()
```

```
Mode : 10+ years
emp_length
10+ years    8488
< 1 year     4508
2 years      4291
3 years      4012
4 years      3342
5 years      3194
1 year       3169
6 years      2168
7 years      1711
8 years      1435
9 years      1226
Name: count, dtype: int64
```

Start coding or generate with AI.

## We can come to the conclusion that the mode value is higher than most frequent value

```
data_loan.emp_length.fillna(data_loan.emp_length.mode()[0], inplace = True)
data_loan.emp_length.isna().sum()
```

```
0
```

```
data_loan.emp_length.fillna(data_loan.emp_length.mode()[0], inplace = True)
data_loan.emp_length.isna().sum()
```

```
0
```

## STANDERDIZE THE DATA

```
data_loan.int_rate = pd.to_numeric(data_loan.int_rate.apply(lambda x : x.split('%')[0]))
```

```
data_loan.emp_length = pd.to_numeric(data_loan.emp_length.apply(lambda x: 0 if "<" in x else (x.split('+')[0] if "+" in x else x.split()[0])
```

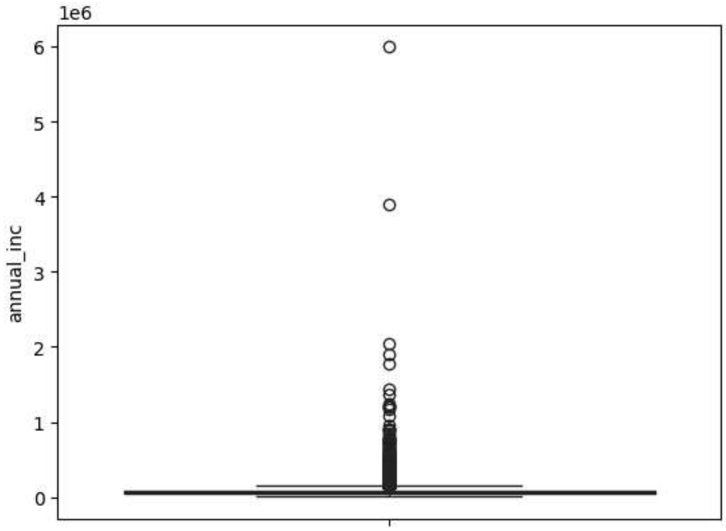
```
data_loan.head(20)
```

| | id | member_id | loan_amnt | funded_amnt | funded_amnt_inv | term | int_rate | in |
|---|---|---|---|---|---|---|---|---|
| **0** | 1077501 | 1296599 | 5000 | 5000 | 4975.00000 | 36 months | 10.65 | |
| **1** | 1077430 | 1314167 | 2500 | 2500 | 2500.00000 | 60 months | 15.27 | |
| **2** | 1077175 | 1313524 | 2400 | 2400 | 2400.00000 | 36 months | 15.96 | |
| **3** | 1076863 | 1277178 | 10000 | 10000 | 10000.00000 | 36 months | 13.49 | |
| **5** | 1075269 | 1311441 | 5000 | 5000 | 5000.00000 | 36 months | 7.90 | |
| **6** | 1069639 | 1304742 | 7000 | 7000 | 7000.00000 | 60 months | 15.96 | |
| **7** | 1072053 | 1288686 | 3000 | 3000 | 3000.00000 | 36 months | 18.64 | |
| **8** | 1071795 | 1306957 | 5600 | 5600 | 5600.00000 | 60 months | 21.28 | |
| **9** | 1071570 | 1306721 | 5375 | 5375 | 5350.00000 | 60 months | 12.69 | |
| **10** | 1070078 | 1305201 | 6500 | 6500 | 6500.00000 | 60 months | 14.65 | |
| **11** | 1069908 | 1305008 | 12000 | 12000 | 12000.00000 | 36 months | 12.69 | |
| **12** | 1064687 | 1298717 | 9000 | 9000 | 9000.00000 | 36 months | 13.49 | |
| **13** | 1069866 | 1304956 | 3000 | 3000 | 3000.00000 | 36 months | 9.91 | |
| **14** | 1069057 | 1303503 | 10000 | 10000 | 10000.00000 | 36 months | 10.65 | |
| **15** | 1069759 | 1304871 | 1000 | 1000 | 1000.00000 | 36 months | 16.29 | |
| **16** | 1065775 | 1299699 | 10000 | 10000 | 10000.00000 | 36 months | 15.27 | |
| **17** | 1069971 | 1304884 | 3600 | 3600 | 3600.00000 | 36 months | 6.03 | |
| **18** | 1062474 | 1294539 | 6000 | 6000 | 6000.00000 | 36 months | 11.71 | |
| **19** | 1069742 | 1304855 | 9200 | 9200 | 9200.00000 | 36 months | 6.03 | |

## Outlier boxplot

```
sns.boxplot(data_loan['annual_inc'], color ="green")
```

```
<Axes: ylabel='annual_inc'>
```



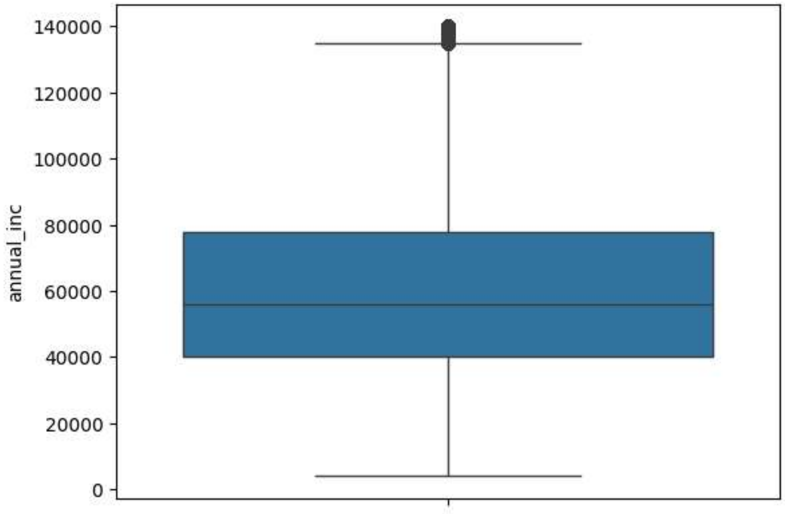
```
quantile = data_loan.annual_inc.quantile([0.5, 0.75,0.90, 0.95, 0.97,0.98, 0.99])
quantile
```

```
0.50     58868.0
0.75     82000.0
0.90    115000.0
0.95    140004.0
0.97    165000.0
0.98    187000.0
0.99    234144.0
Name: annual_inc, dtype: float64
```

```
per_95_annual_inc = data_loan['annual_inc'].quantile(0.95)
data_loan = data_loan[data_loan.annual_inc <= per_95_annual_inc]
```

```
sns.boxplot(data_loan.annual_inc)
```

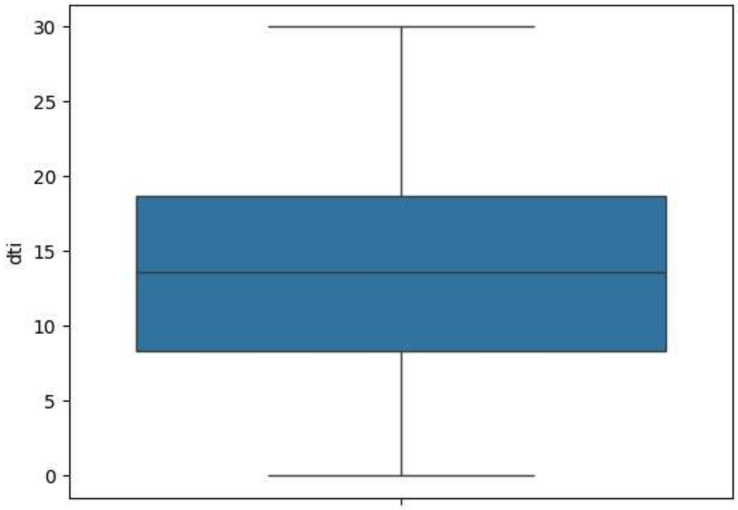
```
<Axes: ylabel='annual_inc'>
```



## Now the "annual_inc" data looks good

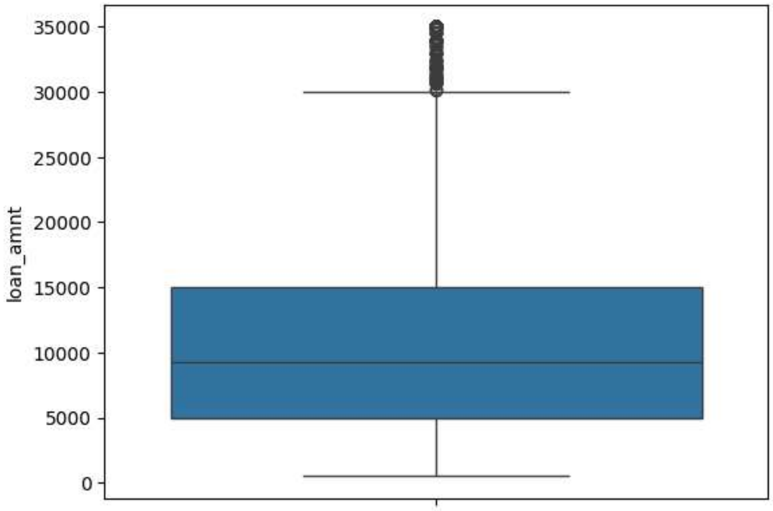
```
sns.boxplot(data_loan.dti)
```

```
<Axes: ylabel='dti'>
```



```
sns.boxplot(data_loan.loan_amnt)
```

```
<Axes: ylabel='loan_amnt'>
```

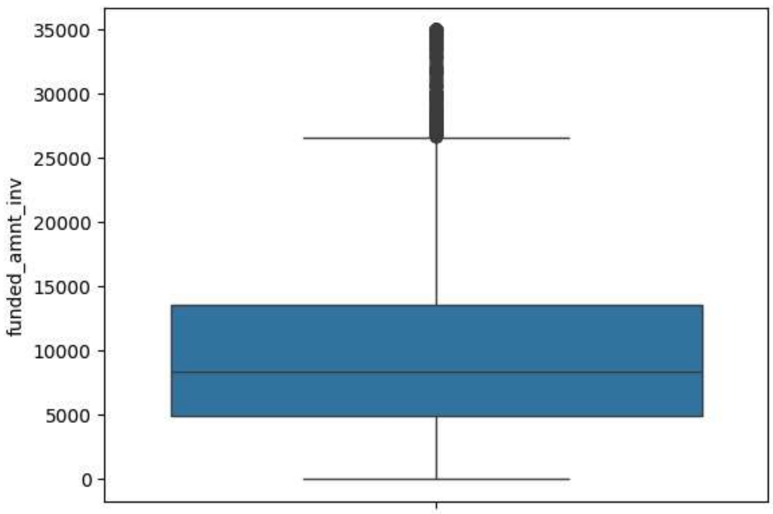


```
data_loan.loan_amnt.quantile([0.75,0.90,0.95,0.97,0.975, 0.98, 0.99, 1.0])
```

```
0.750    15000.0
0.900    20000.0
0.950    25000.0
0.970    25475.0
0.975    28000.0
0.980    30000.0
0.990    35000.0
1.000    35000.0
Name: loan_amnt, dtype: float64
```

```
sns.boxplot(data_loan.funded_amnt_inv)
```

```
<Axes: ylabel='funded_amnt_inv'>
```



```
data_loan.funded_amnt_inv.quantile([0.5,0.75,0.90,0.95,0.97,0.975, 0.98,0.985, 0.99, 1.0])
```

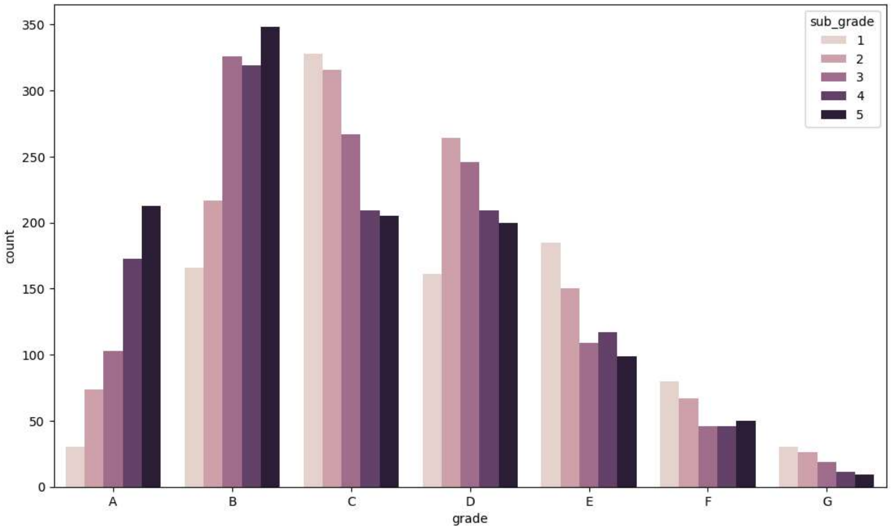
```
0.500     8375.000000
0.750    13623.731415
0.900    19750.000000
0.950    23941.875589
0.970    24975.000000
0.975    25350.000000
0.980    27950.000000
0.985    29925.000000
0.990    31954.028576
1.000    35000.000000
Name: funded_amnt_inv, dtype: float64
```

## Visualizing Categorical Data

```
data_loan.sub_grade = pd.to_numeric(data_loan.sub_grade.apply(lambda x : x[-1]))
data_loan.sub_grade.head(5)
```

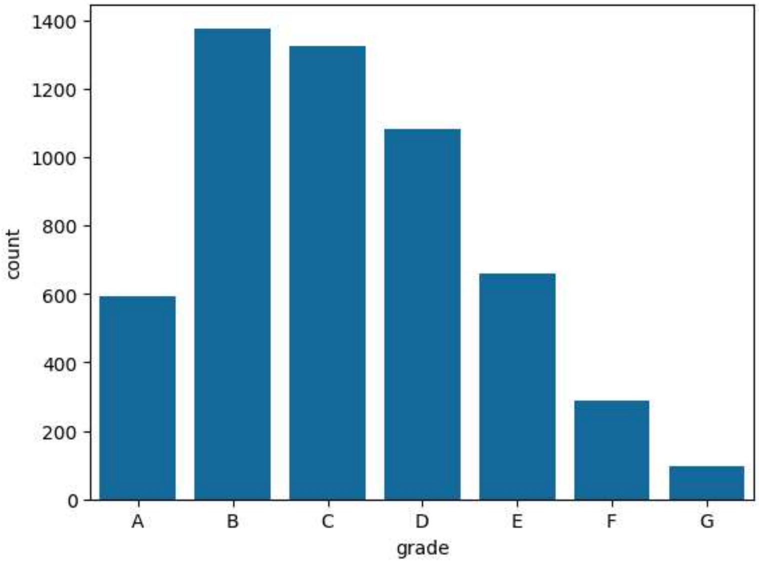
```
0    2
1    4
2    5
3    1
5    4
Name: sub_grade, dtype: int64
```

```
fig, ax = plt.subplots(figsize=(12,7))
sns.set_palette('colorblind')
sns.countplot(x = 'grade', order = ['A', 'B', 'C', 'D', 'E', 'F', 'G'] , hue = 'sub_grade',data = data_loan[data_loan.loan_status == 'Charge
<Axes: xlabel='grade', ylabel='count'>
```



```
sns.countplot(x = 'grade', data = data_loan[data_loan.loan_status == 'Charged Off'], order = ['A', 'B', 'C', 'D', 'E', 'F', 'G'])
```

```
<Axes: xlabel='grade', ylabel='count'>
```



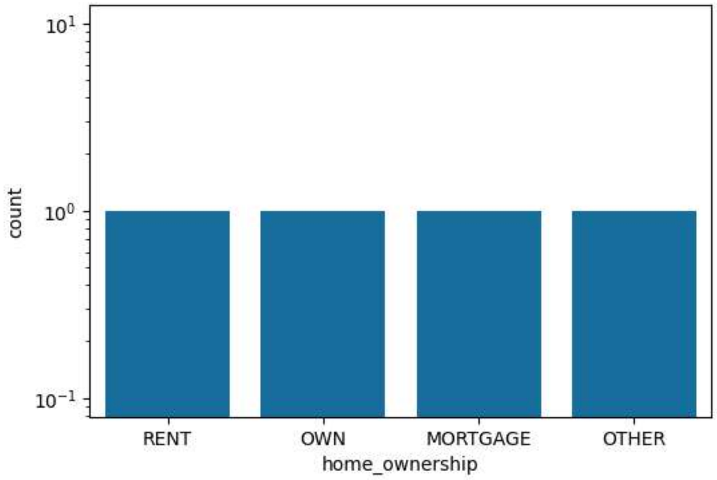
```
data_loan['home_ownership'].unique()
```

```
array(['RENT', 'OWN', 'MORTGAGE', 'OTHER', 'NONE'], dtype=object)
```

```
# replacing none values
data_loan['home_ownership'].replace(to_replace = ['NONE'],value='OTHER',inplace = True)
```

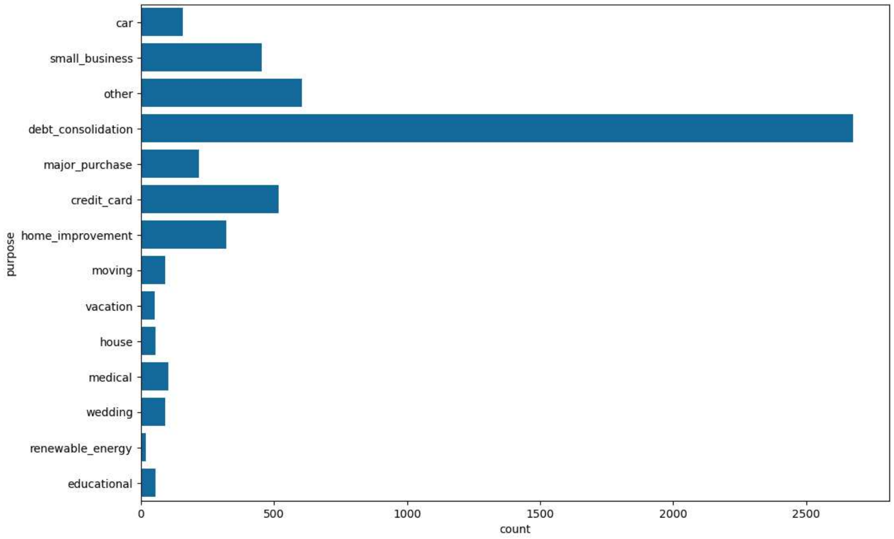
```
fig, ax = plt.subplots(figsize = (6,4))
ax.set(yscale = 'log')
sns.countplot(x='home_ownership', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='home_ownership', ylabel='count'>
```



```
fig, ax = plt.subplots(figsize = (12,8))
ax.set(xscale = 'linear')
sns.countplot(y ='purpose', data=data_loan[data_loan.loan_status == 'Charged Off'])
```

```
<Axes: xlabel='count', ylabel='purpose'>
```

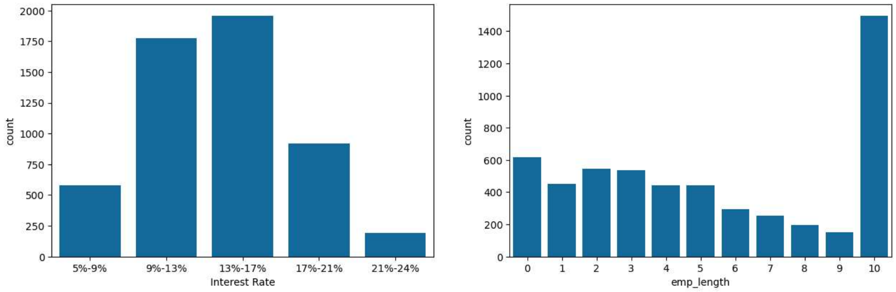


```
#creating bins for int_rate,open_acc,revol_util,total_acc
data_loan['int_rate_groups'] = pd.cut(data_loan['int_rate'], bins=5,precision =0,labels=['5%-9%','9%-13%','13%-17%','17%-21%','21%-24%'])
data_loan['open_acc_groups'] = pd.cut(data_loan['open_acc'],bins = 5,precision =0,labels=['2-10','10-19','19-27','27-36','36-44'])
data_loan['total_acc_groups'] = pd.cut(data_loan['total_acc'], bins=5,precision =0,labels=['2-20','20-37','37-55','55-74','74-90'])
data_loan['annual_inc_groups'] = pd.cut(data_loan['annual_inc'], bins=5,precision =0,labels =['3k-31k','31k-58k','58k-85k','85k-112k','112k-
```

## Intrest rate wrt bins

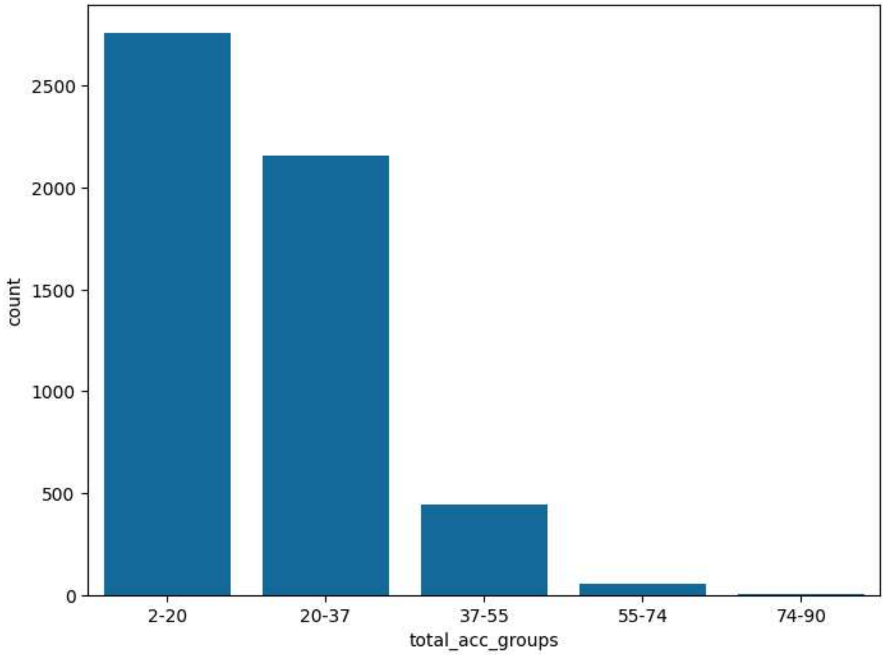
```
fig, ax = plt.subplots(figsize = (15,10))
plt.subplot(221)
sns.countplot(x='int_rate_groups', data=data_loan[data_loan.loan_status == 'Charged Off'])
plt.xlabel('Interest Rate')
plt.subplot(222)
sns.countplot(x='emp_length', data=data_loan[data_loan.loan_status == 'Charged Off'])
```

```
<Axes: xlabel='emp_length', ylabel='count'>
```



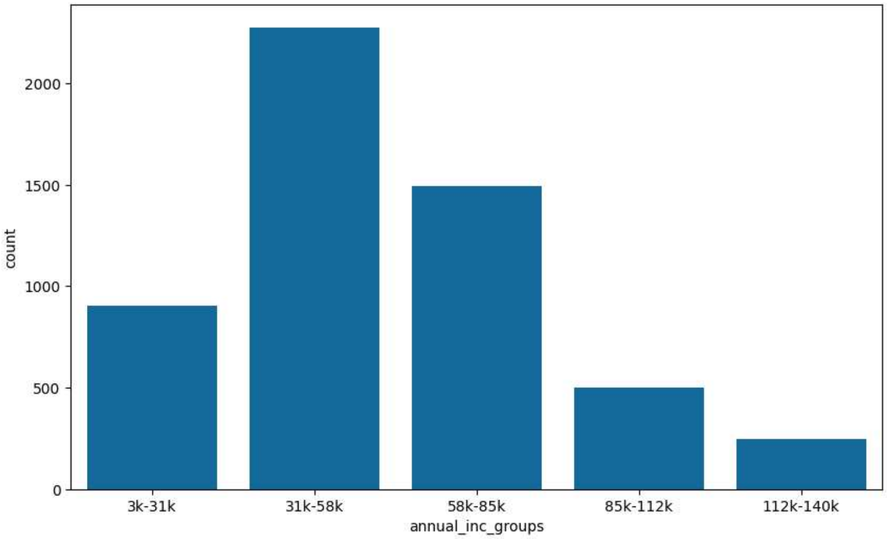
```
fig, ax = plt.subplots(figsize = (8,6))
ax.set_yscale('linear')
sns.countplot(x='total_acc_groups', data=data_loan[data_loan.loan_status == 'Charged Off'])
```

```
<Axes: xlabel='total_acc_groups', ylabel='count'>
```



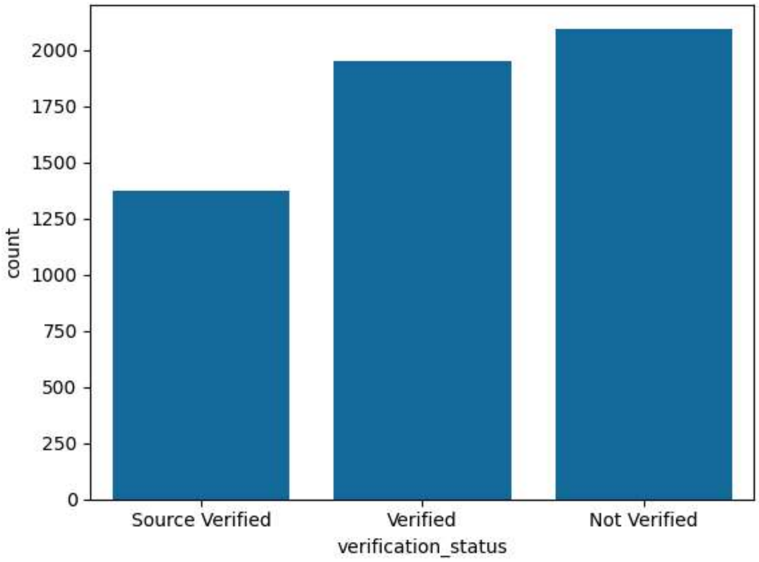
```
fig, ax = plt.subplots(figsize = (10,6))
sns.countplot(x='annual_inc_groups', data=data_loan[data_loan.loan_status == 'Charged Off'])
```

```
<Axes: xlabel='annual_inc_groups', ylabel='count'>
```



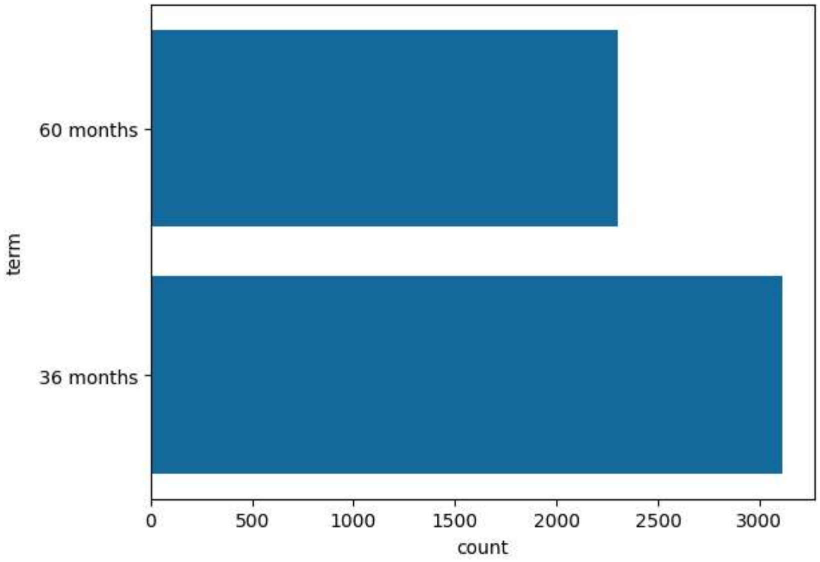
```
sns.countplot(x='verification_status', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='verification_status', ylabel='count'>
```



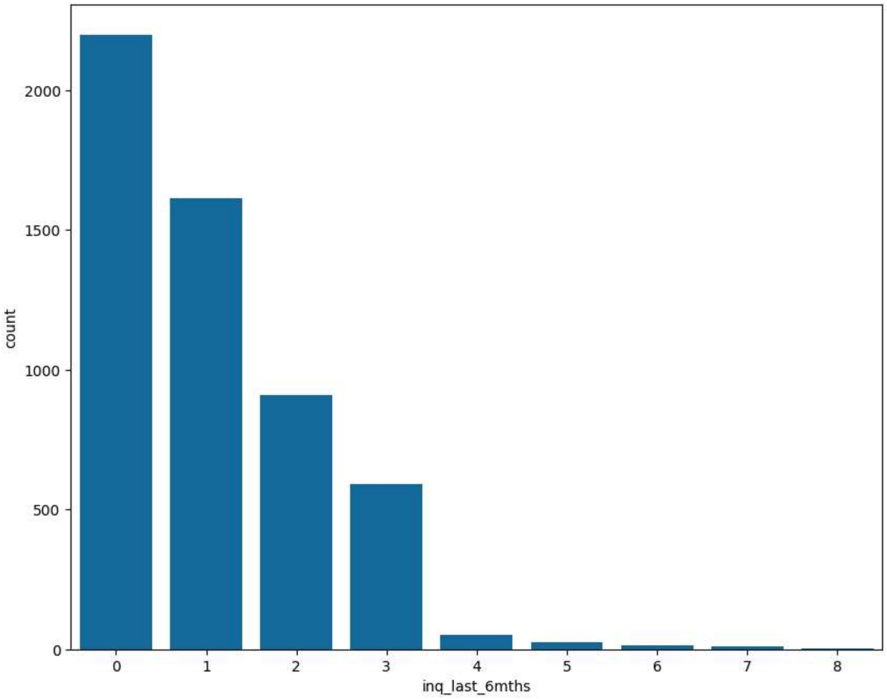
```
sns.countplot(y='term', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='count', ylabel='term'>
```



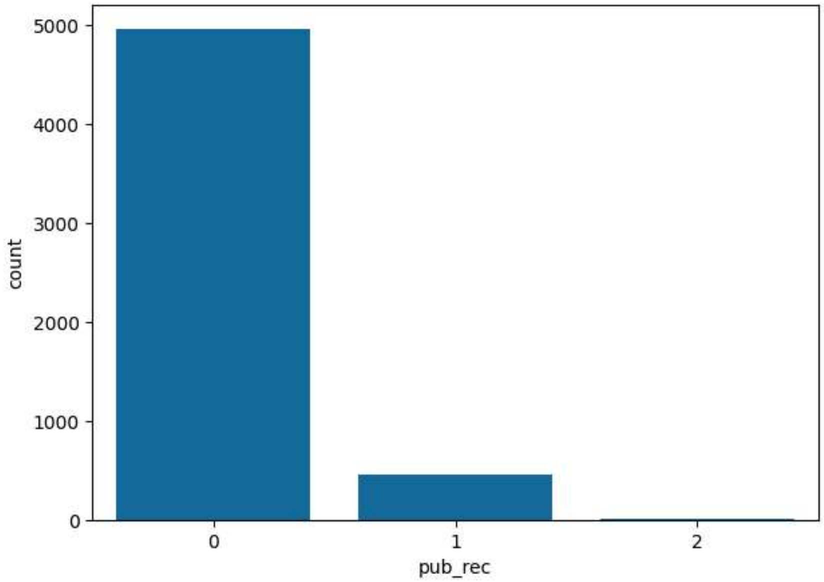
```
fig,ax = plt.subplots(figsize = (10,8))
ax.set_yscale('linear')
sns.countplot(x='inq_last_6mths', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='inq_last_6mths', ylabel='count'>
```



```
fig,ax = plt.subplots(figsize = (7,5))
ax.set_yscale('linear')
sns.countplot(x='pub_rec', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

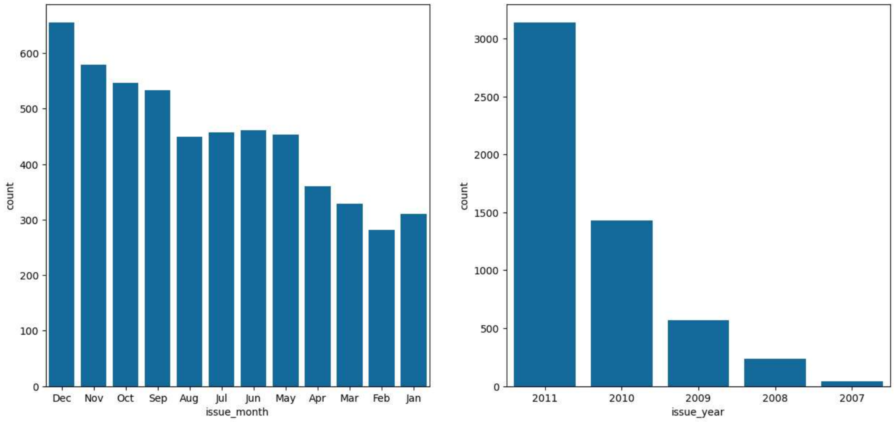
```
<Axes: xlabel='pub_rec', ylabel='count'>
```



```
df_month_year = data_loan['issue_d'].str.partition("-", True)
data_loan['issue_month']=df_month_year[0]
data_loan['issue_year']='20' + df_month_year[2]
```

```
plt.figure(figsize=(15,15))
plt.subplot(221)
sns.countplot(x='issue_month', data=data_loan[data_loan['loan_status']=='Charged Off'])
plt.subplot(222)
sns.countplot(x='issue_year', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='issue_year', ylabel='count'>
```



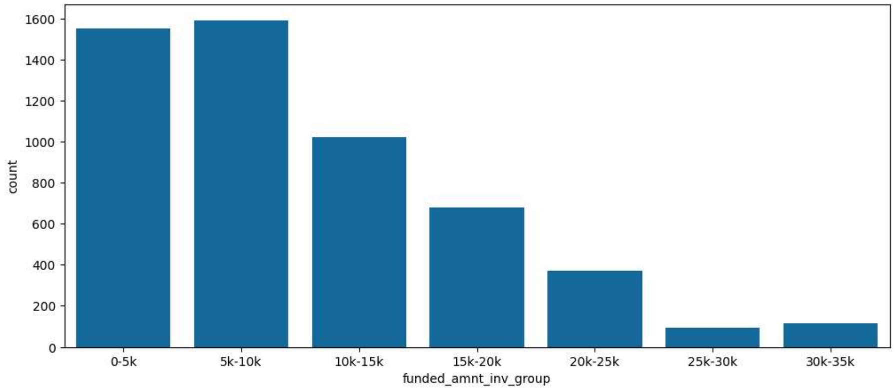
## **Maximum number of defaults occured when the loan was sanctioned/issued in December Loan issued in the year 2011 were also as compared to other

Analyzing installment,dti, loan_amnt **

```
data_loan['installment_groups'] = pd.cut(data_loan['installment'], bins=10,precision =0,labels=['14-145','145-274','274-403','403-531','531-
data_loan['funded_amnt_inv_group'] = pd.cut(data_loan['funded_amnt_inv'], bins=7,labels=['0-5k','5k-10k','10k-15k','15k-20k','20k-25k','25k-
data_loan['loan_amnt_groups'] = pd.cut(data_loan['loan_amnt'], bins=7,precision =0,labels=['0-5k','5k-10k','10k-15k','15k-20k','20k-25k','25
data_loan['dti_groups'] = pd.cut(data_loan['dti'], bins=5,precision =0,labels=['0-6','6-12','12-18','18-24','24-30'])
```

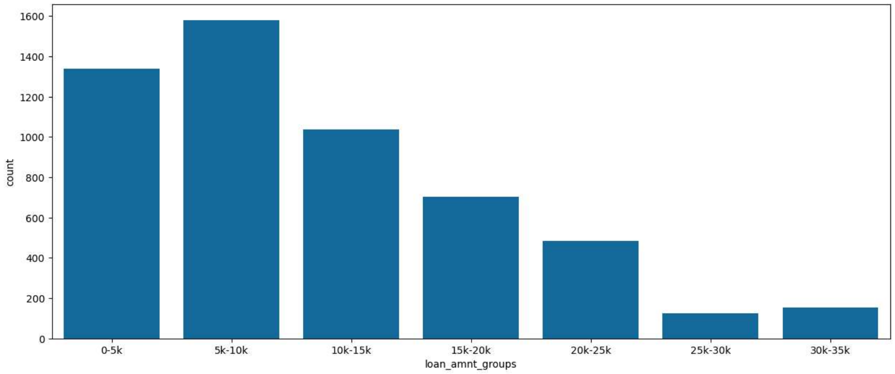
```
fig,ax = plt.subplots(figsize = (12,5))
ax.set_yscale('linear')
sns.countplot(x='funded_amnt_inv_group', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='funded_amnt_inv_group', ylabel='count'>
```



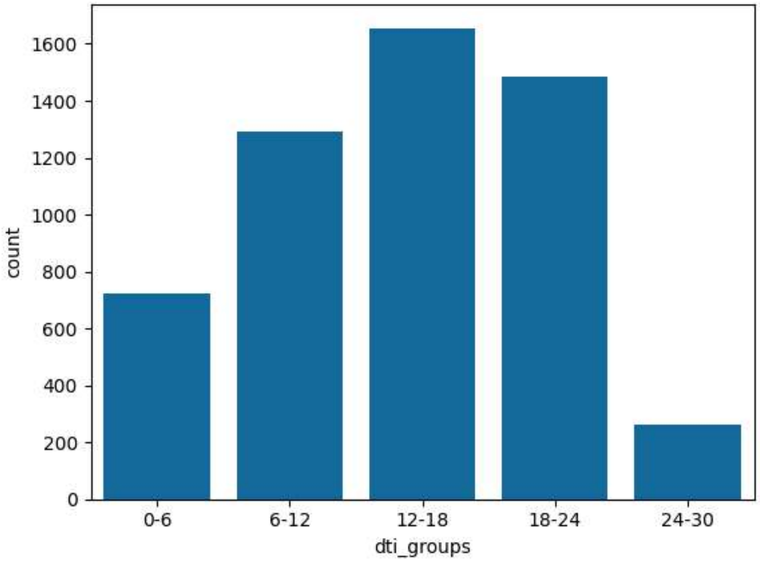
```
fig,ax = plt.subplots(figsize = (15,6))
ax.set_yscale('linear')
sns.countplot(x='loan_amnt_groups', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='loan_amnt_groups', ylabel='count'>
```



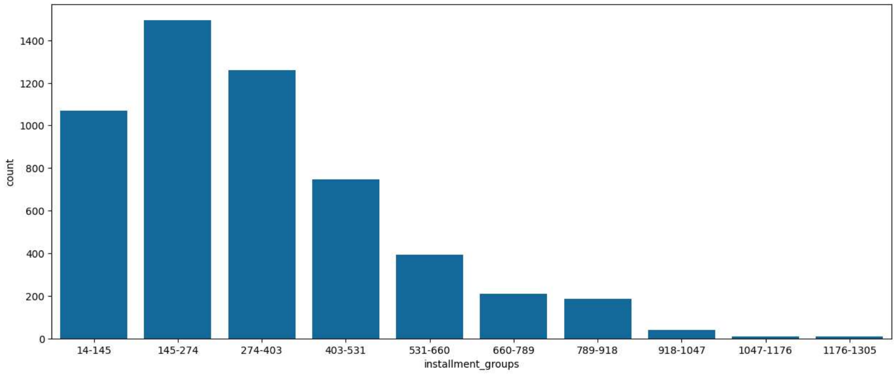
```
sns.countplot(x='dti_groups', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

```
<Axes: xlabel='dti_groups', ylabel='count'>
```



```
fig,ax = plt.subplots(figsize = (15,6))
ax.set_yscale('linear')
sns.countplot(x='installment_groups', data=data_loan[data_loan['loan_status']=='Charged Off'])
```

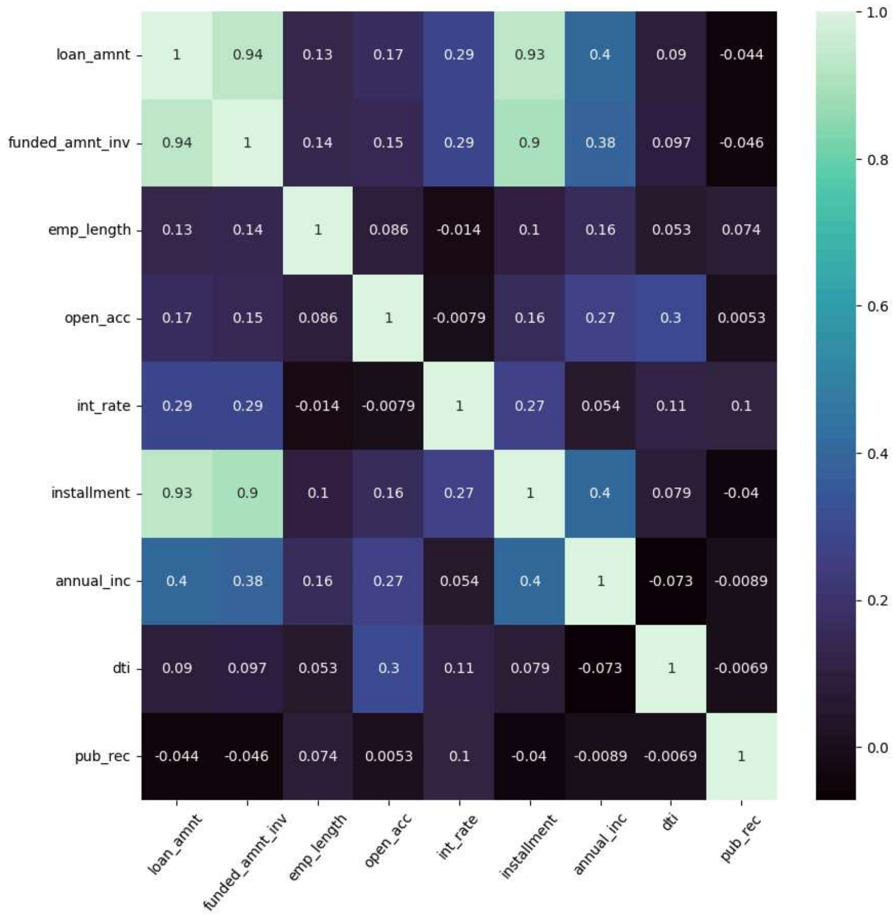
```
<Axes: xlabel='installment_groups', ylabel='count'>
```



### The above analysis with respect to the charged off loans for each variable suggests the following. There is a more probability of defaulting when :

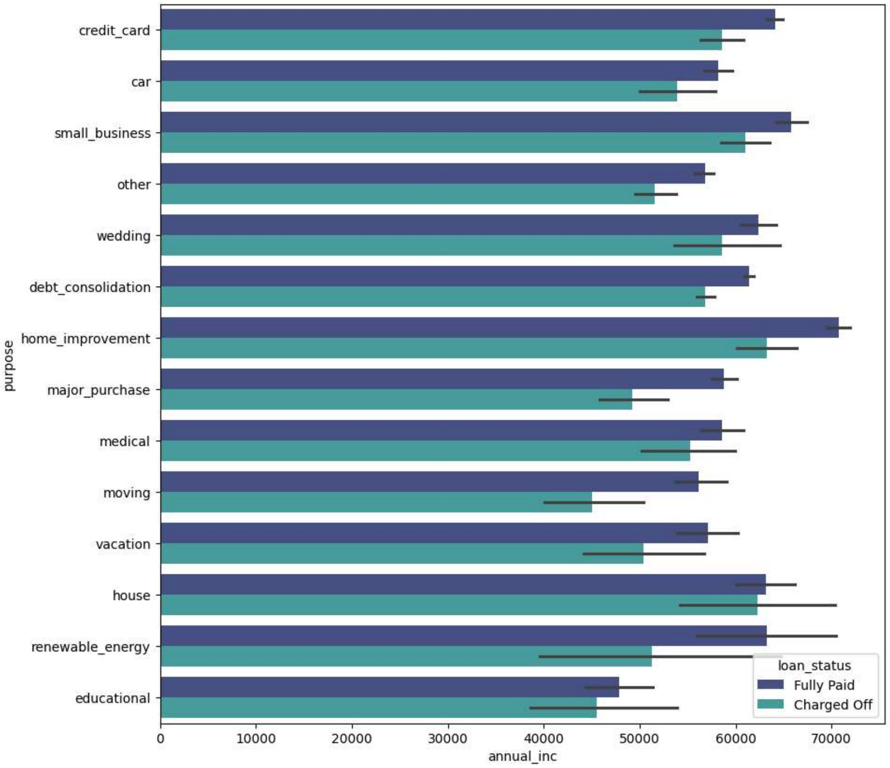
1. loan is generally charged off in istallment group 145-274
2. 5-10k is gennrally charged off

```
numeric_columns = ['loan_amnt','funded_amnt_inv','emp_length','open_acc','int_rate','installment','annual_inc','dti','pub_rec',]


correlation_matrix = data_loan[numeric_columns].corr()


f,ax = plt.subplots(figsize= (10,10))

sns.heatmap(correlation_matrix,xticklabels = correlation_matrix.columns.values,yticklabels= correlation_matrix.columns.values,
           cmap= 'mako', annot = True)
plt.xticks(rotation=50)
plt.show()
```



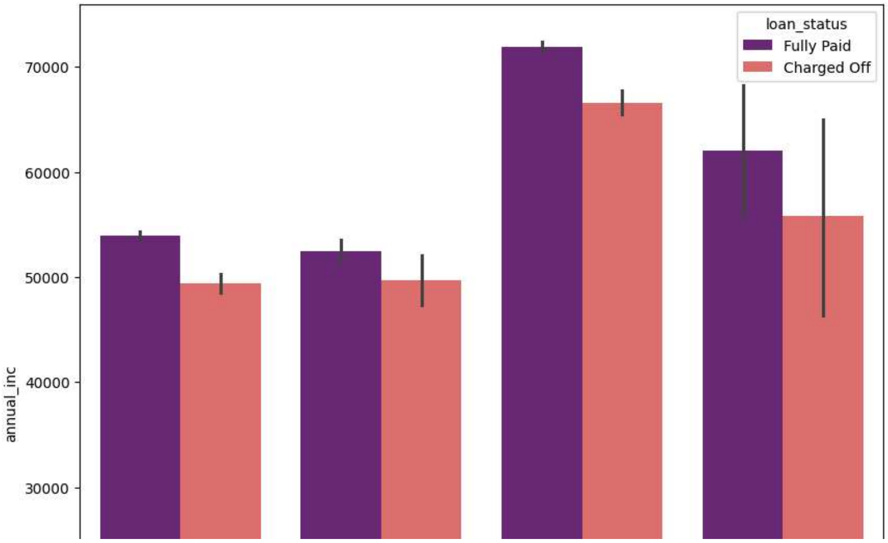
## Loan vs income plot

```
plt.figure(figsize=(10,10))
sns.barplot(data =data_loan,x='annual_inc', y='purpose', hue ='loan_status',palette="mako")
plt.show()
```



## Loan peropose and home ownership plot

```
plt.figure(figsize=(10,10))
sns.barplot(data =data_loan,x='home_ownership', y='annual_inc', hue ='loan_status',palette="magma")
plt.show()
```



## Annual Income and intrest rate plot

```
plt.figure(figsize=(10,10))
sns.barplot(data =data_loan,x='int_rate_groups', y='annual_inc', hue ='loan_status',palette="mako")
plt.show()
```

loan_status
Fully Paid
Charged Off
80000
70000