```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
from matplotlib.ticker import StrMethodFormatter, NullFormatter
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')


file = pd.read_csv("loan.csv", header = 0)

file.shape
```

```
(39717, 111)
```

```
fil.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
```

```
loan=file.dropna(axis=1,how='all')


loan.shape
```

```
(39717, 57)
```

```
loan.isnull().sum()
```

```
id                                0
member_id                         0
loan_amnt                         0
funded_amnt                       0
funded_amnt_inv                   0
term                              0
int_rate                          0
```

```
installment                      0
grade                            0
sub_grade                        0
emp_title                     2459
emp_length                    1075
home_ownership                   0
annual_inc                       0
verification_status              0
issue_d                          0
loan_status                      0
pymnt_plan                       0
url                              0
desc                         12940
purpose                          0
title                           11
zip_code                         0
addr_state                       0
dti                              0
delinq_2yrs                      0
earliest_cr_line                 0
inq_last_6mths                   0
mths_since_last_delinq       25682
mths_since_last_record       36931
open_acc                         0
pub_rec                          0
revol_bal                        0
revol_util                      50
total_acc                        0
initial_list_status              0
out_prncp                        0
out_prncp_inv                    0
total_pymnt                      0
total_pymnt_inv                  0
total_rec_prncp                  0
total_rec_int                    0
total_rec_late_fee               0
recoveries                       0
collection_recovery_fee          0
last_pymnt_d                    71
last_pymnt_amnt                  0
next_pymnt_d                 38577
last_credit_pull_d               2
collections_12_mths_ex_med      56
policy_code                      0
application_type                 0
acc_now_delinq                   0
chargeoff_within_12_mths        56
delinq_amnt                      0
pub_rec_bankruptcies           697
```

```
tax_liens                       39
dtype: int64
```

```
loan.drop(['title','emp_title','desc','mths_since_last_delinq','mths_s
ince_last_record','last_pymnt_d','next_pymnt_d','last_credit_pull_d','
collections_12_mths_ex_med','chargeoff_within_12_mths','tax_liens'],
axis=1, inplace=True)
```

```
loan.isnull().sum()
```

```
id                            0
member_id                     0
loan_amnt                     0
funded_amnt                   0
funded_amnt_inv               0
term                          0
int_rate                      0
installment                   0
grade                         0
sub_grade                     0
emp_length                 1075
home_ownership                0
annual_inc                    0
verification_status           0
issue_d                       0
loan_status                   0
pymnt_plan                    0
url                           0
purpose                       0
zip_code                      0
addr_state                    0
dti                           0
delinq_2yrs                   0
earliest_cr_line              0
inq_last_6mths                0
open_acc                      0
pub_rec                       0
revol_bal                     0
revol_util                   50
total_acc                     0
initial_list_status           0
out_prncp                     0
out_prncp_inv                 0
total_pymnt                   0
total_pymnt_inv               0
total_rec_prncp               0
total_rec_int                 0
total_rec_late_fee            0
recoveries                    0
collection_recovery_fee       0
```

```
last_pymnt_amnt               0
policy_code                   0
application_type              0
acc_now_delinq                0
delinq_amnt                   0
pub_rec_bankruptcies        697
dtype: int64
```

```
loan.nunique().sort_values()
```

```
acc_now_delinq                1
application_type              1
policy_code                   1
initial_list_status           1
delinq_amnt                   1
pymnt_plan                    1
term                          2
pub_rec_bankruptcies          3
loan_status                   3
verification_status           3
pub_rec                       5
home_ownership                5
grade                         7
inq_last_6mths                9
delinq_2yrs                  11
emp_length                   11
purpose                      14
sub_grade                    35
open_acc                     40
addr_state                   50
issue_d                      55
total_acc                    82
int_rate                    371
earliest_cr_line            526
zip_code                    823
loan_amnt                   885
funded_amnt                1041
revol_util                 1089
out_prncp                  1137
out_prncp_inv              1138
total_rec_late_fee         1356
collection_recovery_fee    2616
dti                        2868
recoveries                 4040
annual_inc                 5318
total_rec_prncp            7976
funded_amnt_inv            8205
installment               15383
revol_bal                 21711
```

```
last_pymnt_amnt            34930
total_rec_int              35148
total_pymnt_inv            37518
total_pymnt                37850
url                        39717
member_id                  39717
id                         39717
dtype: int64
```

```
loan.drop(['acc_now_delinq','application_type','policy_code','initial_
list_status','delinq_amnt','pymnt_plan'], axis=1, inplace=True)
```

```
loan.drop(["id", "member_id","url","funded_amnt",'out_prncp',
'out_prncp_inv','total_rec_int','total_rec_prncp','total_rec_late_fee'
,'recoveries','collection_recovery_fee'],axis=1,inplace=True)
```

```
loan = loan[loan.loan_status != 'Current']
```

```
loan.isnull().sum()
```

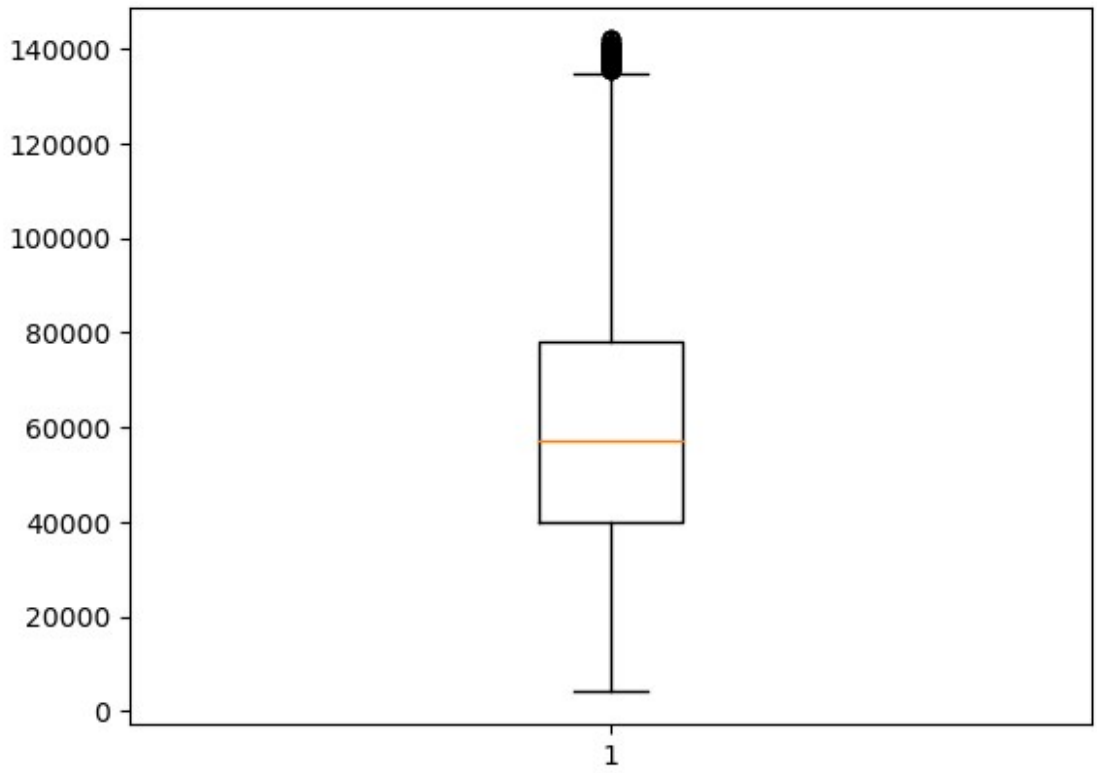
```
loan.dropna(subset=['emp_length','revol_util','pub_rec_bankruptcies'],
inplace=True)
```

```
loan.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 36800 entries, 0 to 39680
Data columns (total 29 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   loan_amnt             36800 non-null  int64
 1   funded_amnt_inv       36800 non-null  float64
 2   term                  36800 non-null  object
 3   int_rate              36800 non-null  object
 4   installment           36800 non-null  float64
 5   grade                 36800 non-null  object
 6   sub_grade             36800 non-null  object
 7   emp_length            36800 non-null  object
 8   home_ownership        36800 non-null  object
 9   annual_inc            36800 non-null  float64
 10  verification_status   36800 non-null  object
 11  issue_d               36800 non-null  object
 12  loan_status           36800 non-null  object
 13  purpose               36800 non-null  object
 14  zip_code              36800 non-null  object
 15  addr_state            36800 non-null  object
 16  dti                   36800 non-null  float64
 17  delinq_2yrs           36800 non-null  int64
```

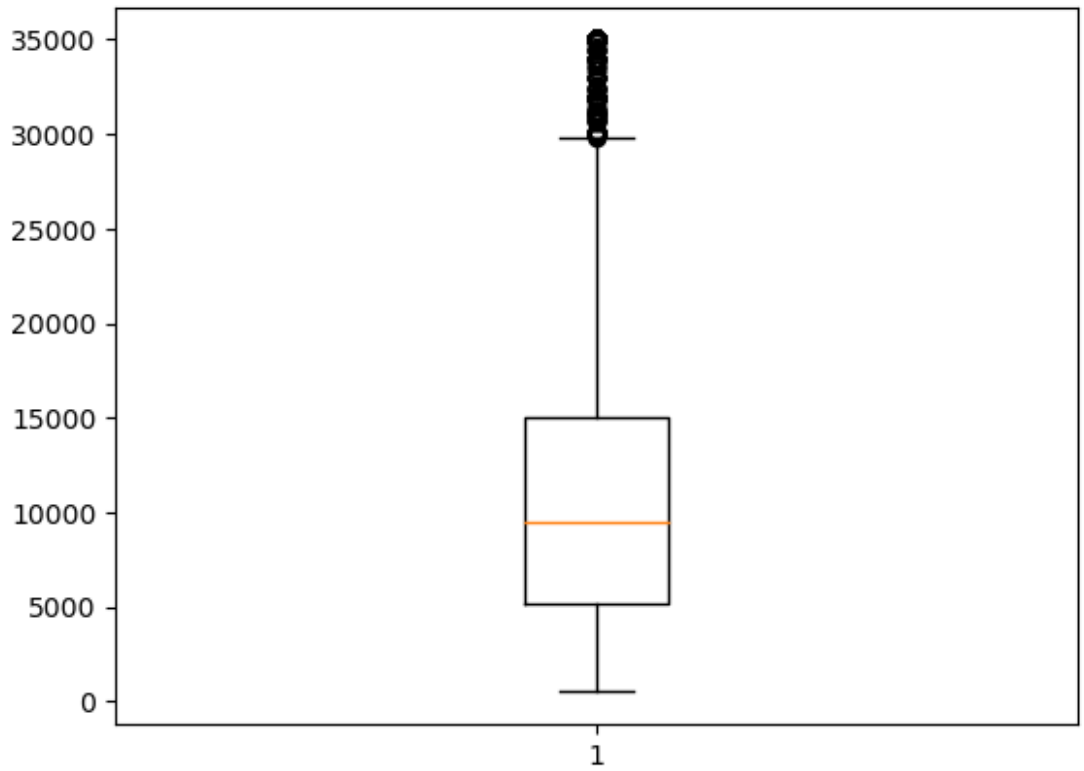
```
 18  earliest_cr_line      36800 non-null  object
 19  inq_last_6mths        36800 non-null  int64
 20  open_acc              36800 non-null  int64
 21  pub_rec               36800 non-null  int64
 22  revol_bal             36800 non-null  int64
 23  revol_util            36800 non-null  object
 24  total_acc             36800 non-null  int64
 25  total_pymnt           36800 non-null  float64
 26  total_pymnt_inv       36800 non-null  float64
 27  last_pymnt_amnt       36800 non-null  float64
 28  pub_rec_bankruptcies  36800 non-null  float64
dtypes: float64(8), int64(7), object(14)
memory usage: 8.4+ MB
```

```
                    #DATA FIXING

limit_data = loan['annual_inc'].quantile(0.95)
valid = loan[loan['annual_inc'] < limit]
plt.title(" Annual Income \n", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.boxplot(valid.annual_inc)
plt.show()

valid['annual_inc'].median()
```



57000.0

```
plt.title("Outliers in Loan Amount  \n", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.boxplot(valid['loan_amnt'])
ax=plt.gca()
ax.xaxis.set_major_formatter(StrMethodFormatter('{x:.0f}'))
plt.show()
valid['loan_amnt'].median()
```




```
9500.0
```

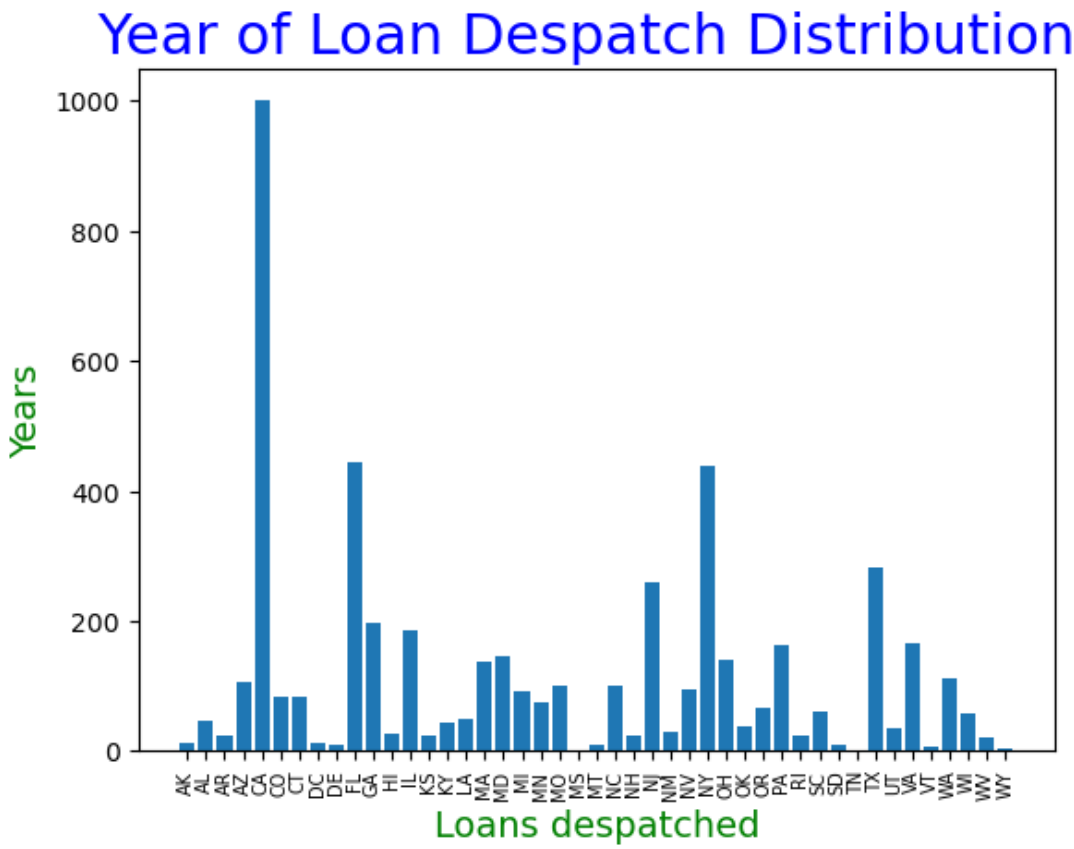
```
valid_charge=valid[valid['loan_status'] == 'Charged
Off'].reset_index()
```

```
valid_charge['int_rate']=valid_charge['int_rate'].str.strip('%')
valid_charge['revol_util']=valid_charge['revol_util'].str.strip('%')
valid_charge.int_rate=pd.to_numeric(valid_charge.int_rate)
```

```
valid_charge['issue_d']=pd.to_datetime(valid_charge["issue_d"],format=
"%b-%y")
valid_charge['issue_d_yr']=pd.DatetimeIndex(valid_charge["issue_d"]).y
ear
valid_charge['issue_d_mth']=pd.DatetimeIndex(valid_charge["issue_d"]).
strftime('%b')
```

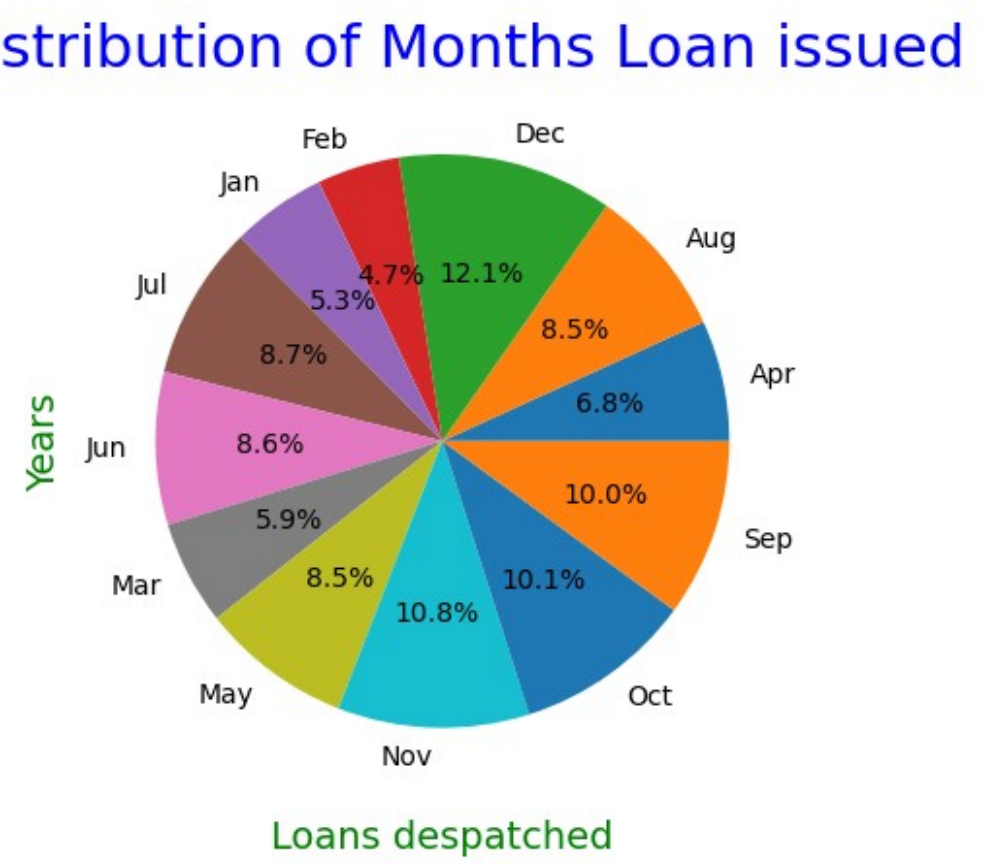
```
group_data=valid_charge.groupby('issue_d_yr').count()
x = []
y =  []
for i in range(5):
```

```
    y.append(group_data.iloc[i,0])
    x.append(group_data.index[i])
plt.bar(x_vals,y_vals)
plt.title("Year of Loan Despatch Distribution ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Loans despatched", fontdict={'fontsize': 14,
'fontweight' : 5, 'color' : 'green'},)
plt.ylabel("Years", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.xticks(rotation=90, fontsize=7)
plt.show()
```

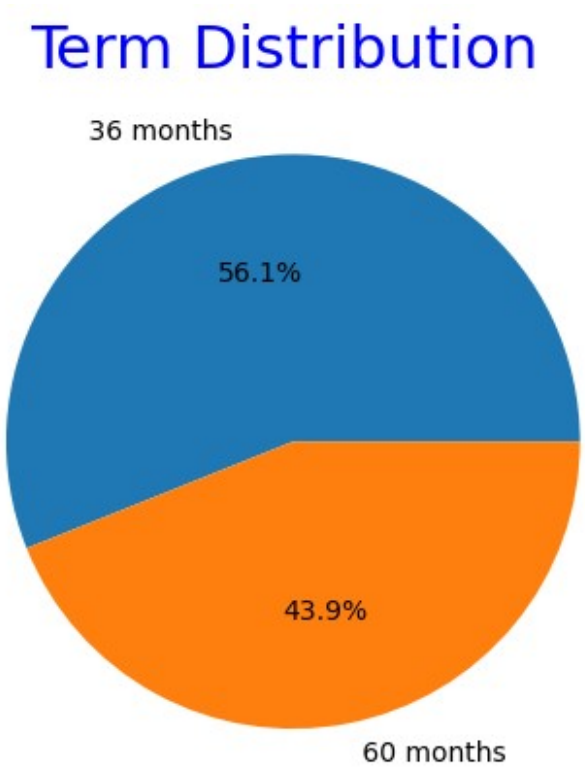



```
group=valid_charge.groupby('issue_d_mth').count()
x = []
y =  []
for i in range(12):

    y.append(group.iloc[i,0])
    x.append(group.index[i])
plt.pie(y, labels=x, autopct='%1.1f%%')
plt.title(" Distribution of Months Loan issued", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Loans despatched", fontdict={'fontsize': 14,
```

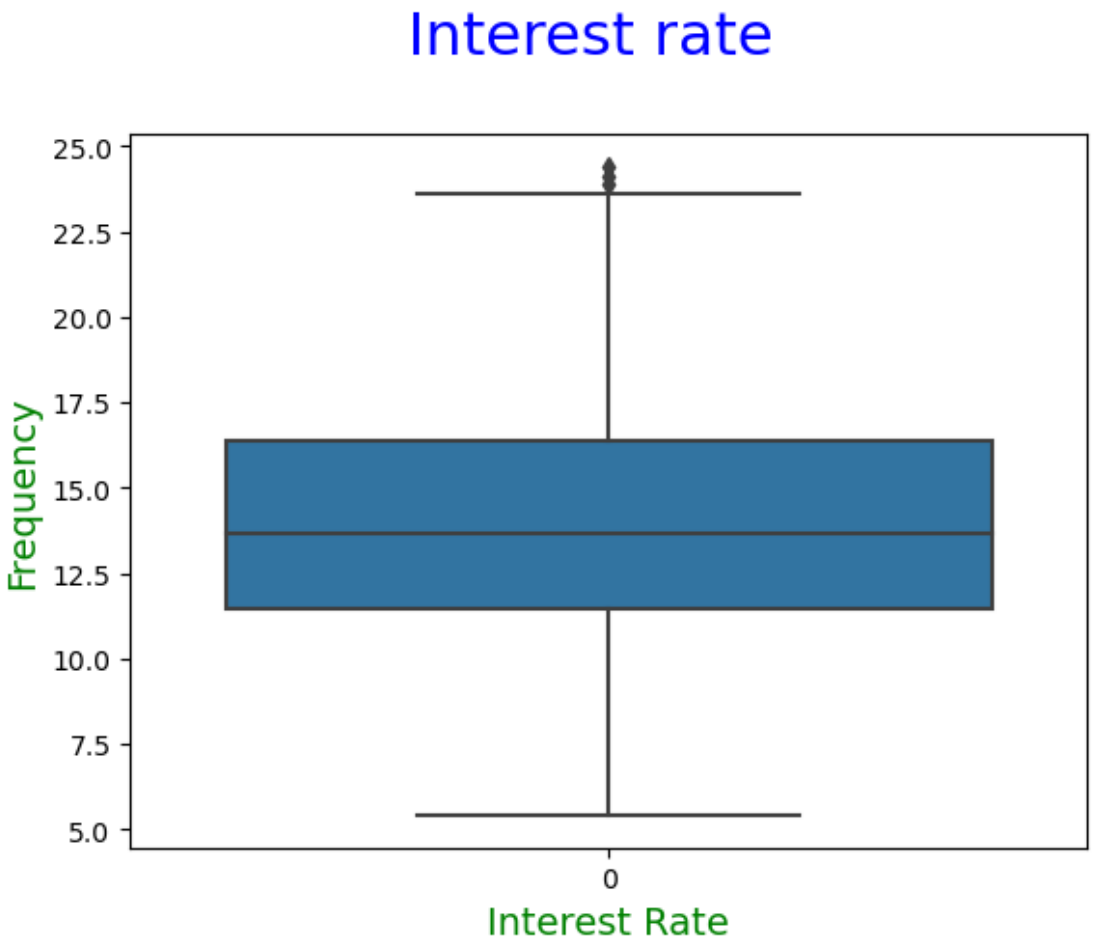
```
'fontweight' : 5, 'color' : 'green'})
plt.ylabel("Years", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



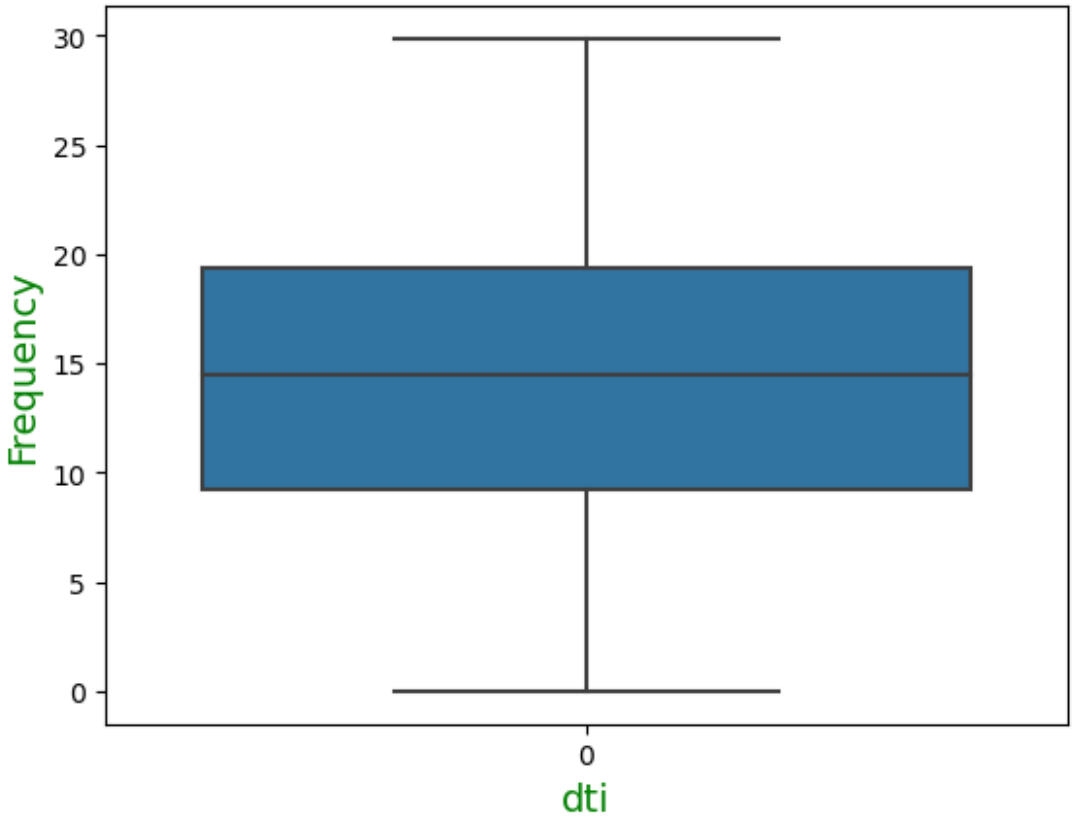

```
# we observed that Maximum defaults have happened in last quarter of
2011 when most loans were issued.

group=valid_charge.groupby("term").count()
x = []
y = []
for i in range(2):
    x.append(group.index[i])
    y.append(group.iloc[i,0])

plt.pie(y, labels=x, autopct='%1.1f%%')

plt.title("Term Distribution ", fontdict={'fontsize': 22, 'fontweight'
: 5, 'color' : 'blue'})
plt.show()
```




```
#we observed Most of loans have been for loans with term of 36 months

plt.title("Interest rate  \n", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})

plt.xlabel("Interest Rate", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.ylabel("Frequency", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
sns.boxplot(data=valid_charge['int_rate'])
plt.show()
```

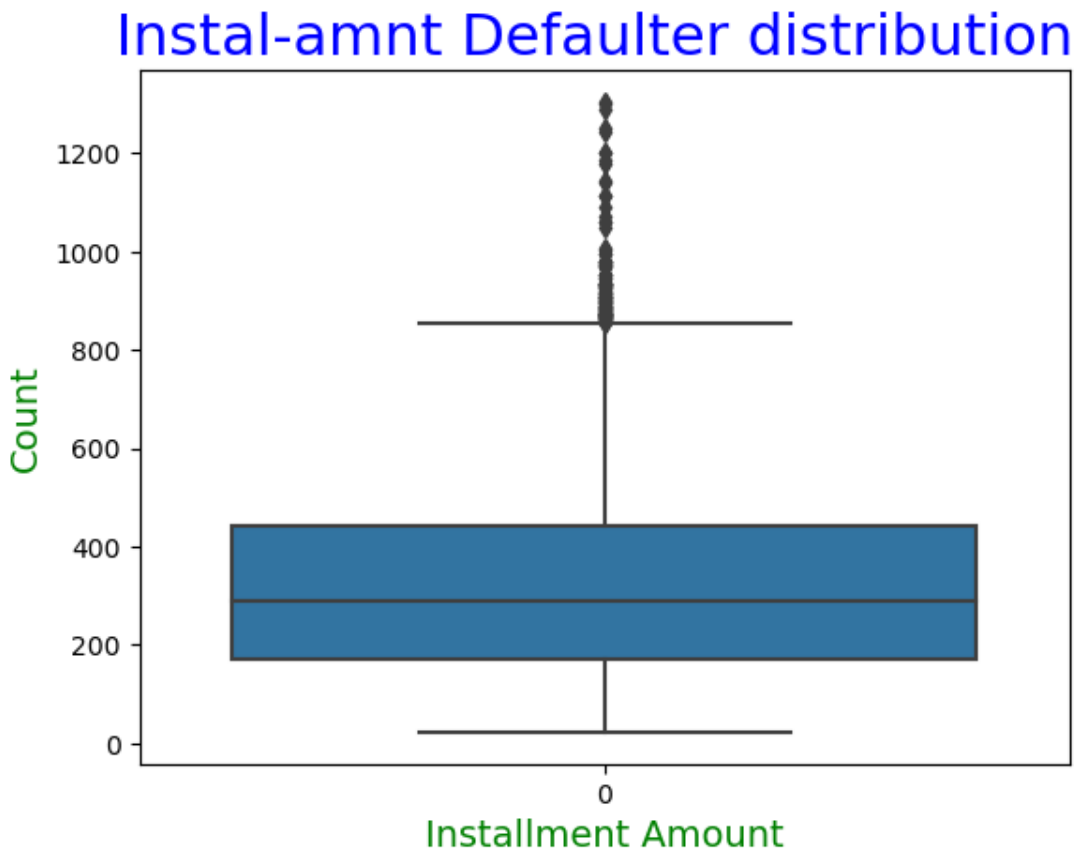



```
#Observation--> Most defaulters received interest at the rate of 11.5-
17%  against median interest of all borrowers of 10% ,Some defaulters
received loans at more than 22.5%

plt.title("DTI- Default loans distribution \n", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
sns.boxplot(data=valid_charge['dti'])
plt.xlabel("dti", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Frequency", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



#Observation that As per industry standard good DTI should be less than 36% ,since the dataset has max dti of 30% it is good.

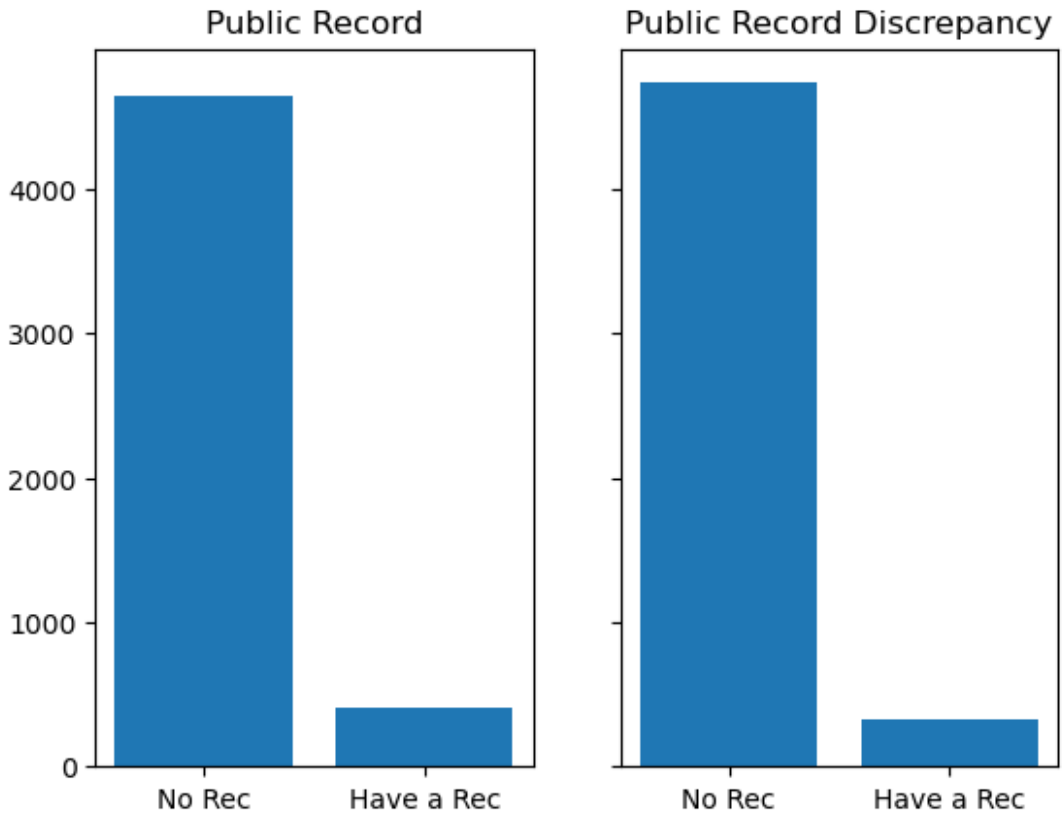
```
sns.boxplot(data=valid_charge['installment'])
plt.title("Instal-amnt Defaulter distribution ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})

plt.xlabel("Installment Amount", fontdict={'fontsize': 14,
'fontweight' : 5, 'color' : 'green'})
plt.ylabel("Count", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
valid.installment.median()
```



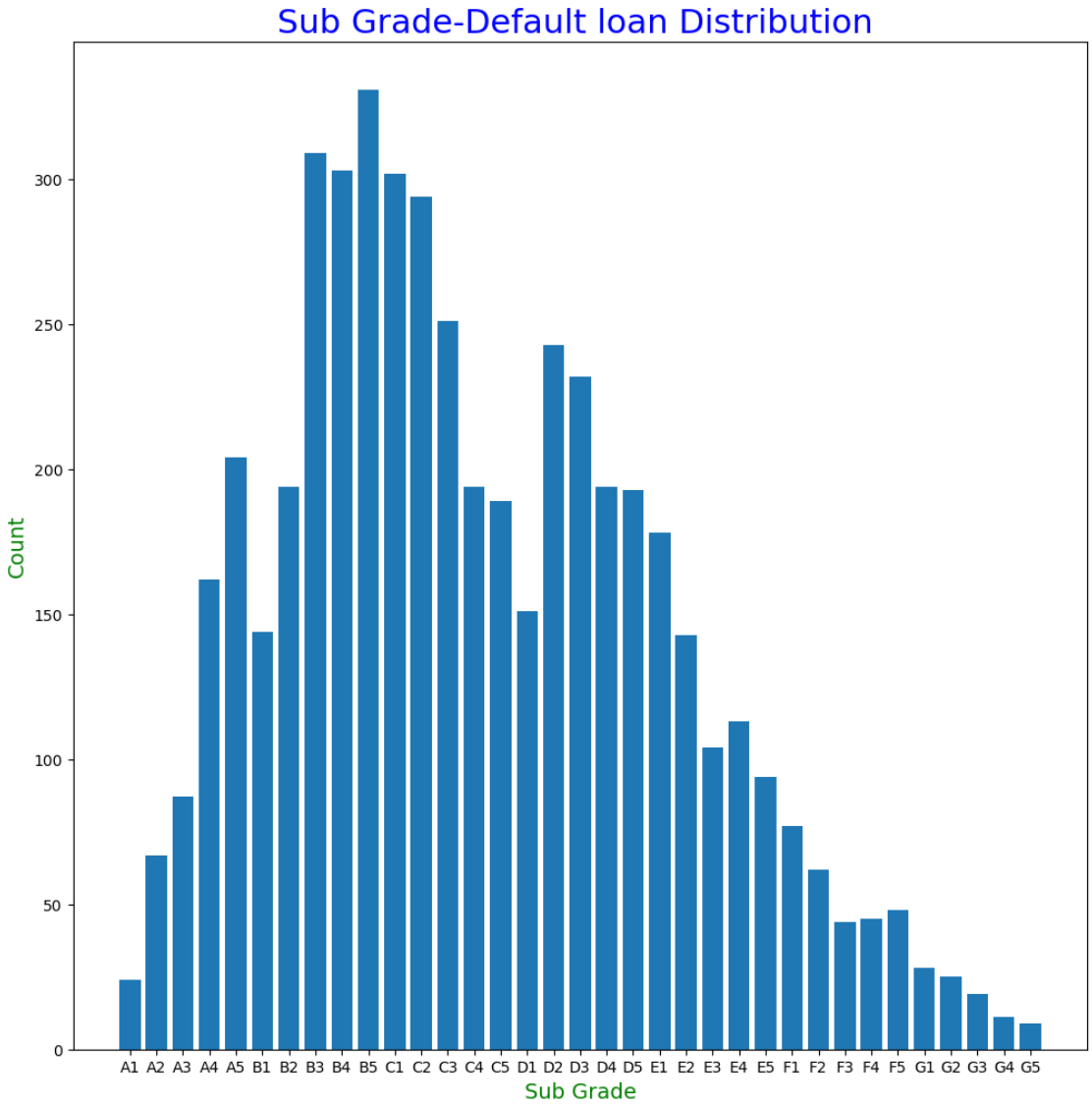
272.98

```
#Observation: Median installment amount is 273. The installment amount
is not impacted by charged off or fully paid borrowers., Most of
installment amount is around median,The defaulters had monthly
installments between 145 and 410 approximately
```

```
group=valid_charge.groupby("pub_rec").count()
group_dis=valid_charge.groupby("pub_rec_bankruptcies").count()
fig, ax =plt.subplots(nrows=1,ncols=2,sharey=True)
x = ["No Rec","Have a Rec"]
y = []
z = []
for i in range(2):
    y.append(group.iloc[i,0])
    z.append(group_dis.iloc[i,0])
ax[0].bar(x,y)
ax[1].bar(x,z)
ax[0].set_title('Public Record')
ax[1].set_title('Public Record Discrepancy')
plt.show()
```

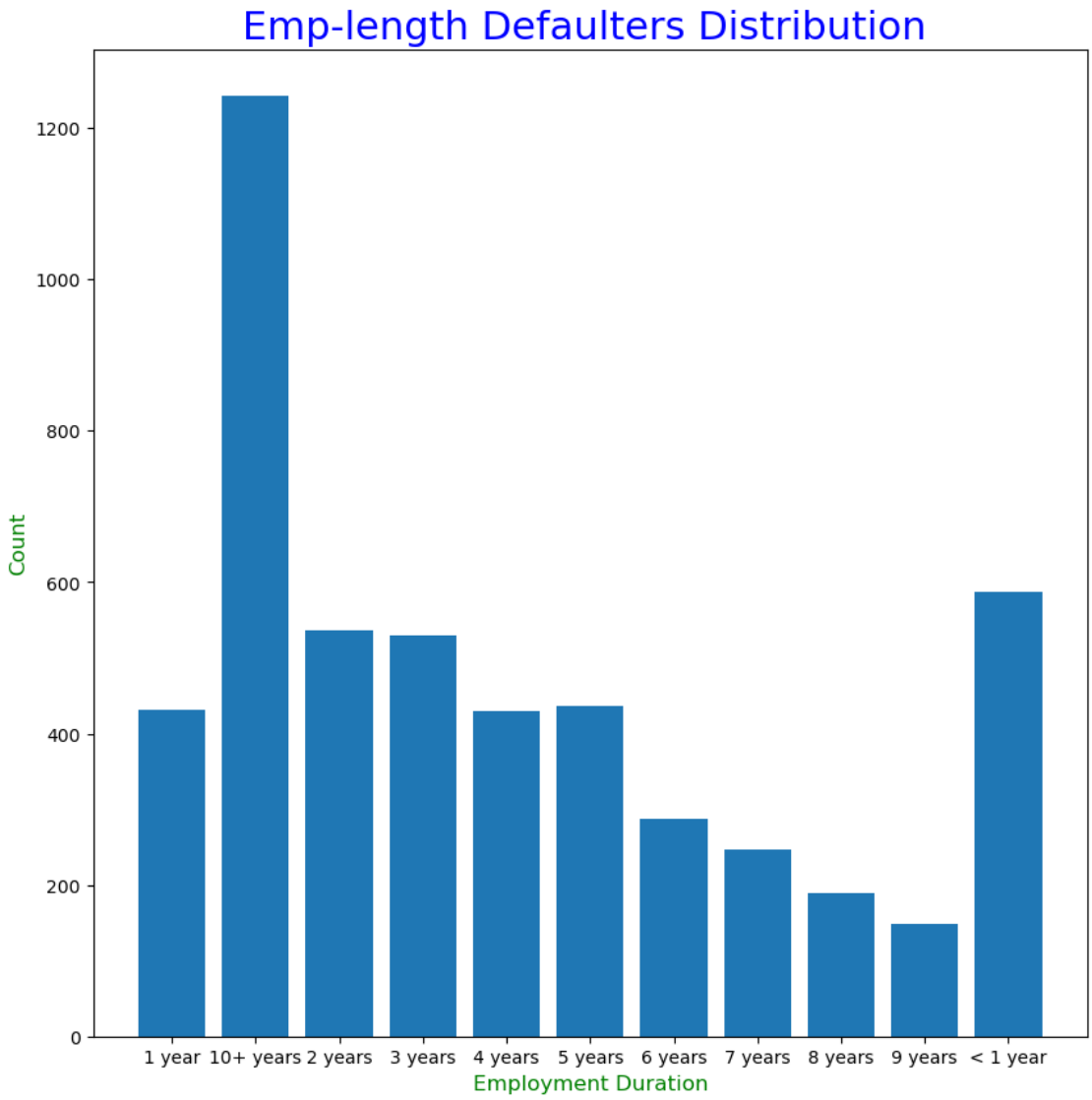



```
#Observation , 96% people have not went bankrupt or have a
disciplinary record .

plt.figure(figsize=(12,12))
group=valid_charge.groupby("sub_grade").count()
x = []
y = []
for i in range(35):
   x.append(group.index[i])
   y.append(group.iloc[i,0])

plt.bar(x,y)
plt.title("Sub Grade-Default loan Distribution ",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Sub Grade", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Count", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



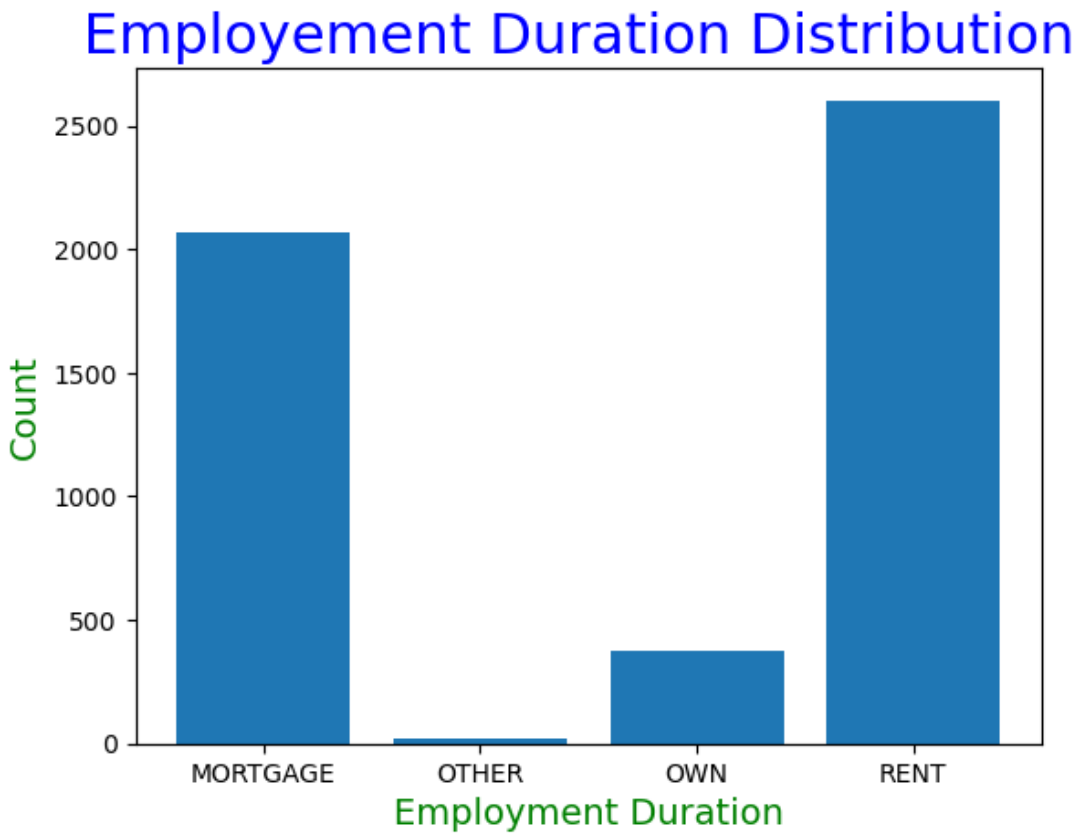

```
#Observation
#Most defaulters fall into grade B & C and Subgrade of C1 and B5. As
most borrowers are from B grade.

group=valid_charge.groupby("emp_length").count()
plt.figure(figsize=(10,10))
x = []
y = []
for i in range(11):
    x.append(group.index[i])
    y.append(group.iloc[i,0])

plt.bar(x,y)
# Labeling Axes
plt.title("Emp-length Defaulters Distribution ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
```

```
plt.xlabel("Employment Duration", fontdict={'fontsize': 12,
'fontweight' : 5, 'color' : 'green'})
plt.ylabel("Count", fontdict={'fontsize': 12, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



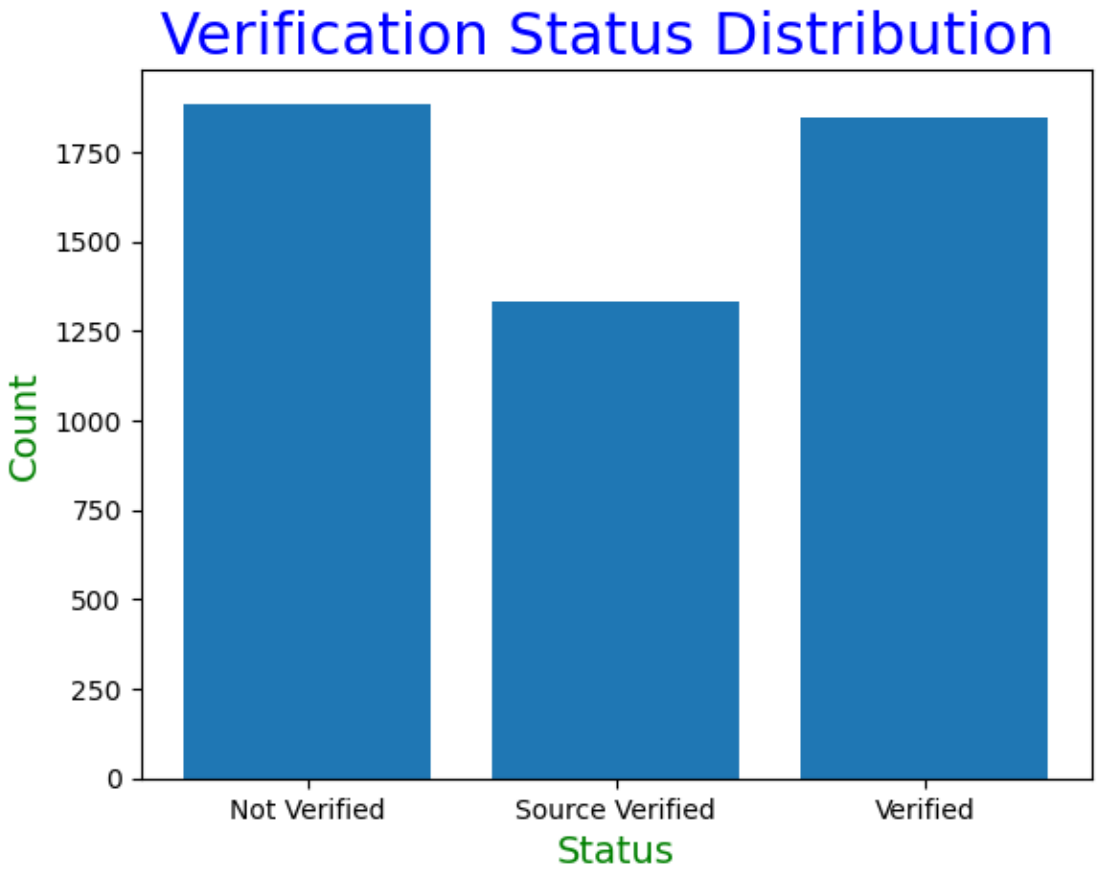

```
#Observation
#Defaulters are mostly 10+ years emploment length or are some people
having less than 1 year or 2 years of employement

group=valid_charge.groupby("home_ownership").count()
x = []
y = []
for i in range(4):
    x.append(group.index[i])
    y.append(group.iloc[i,0])
plt.bar(x,y)
```

```
# Labeling Axes
plt.title("Employement Duration Distribution ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Employment Duration", fontdict={'fontsize': 14,
'fontweight' : 5, 'color' : 'green'})
plt.ylabel("Count", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



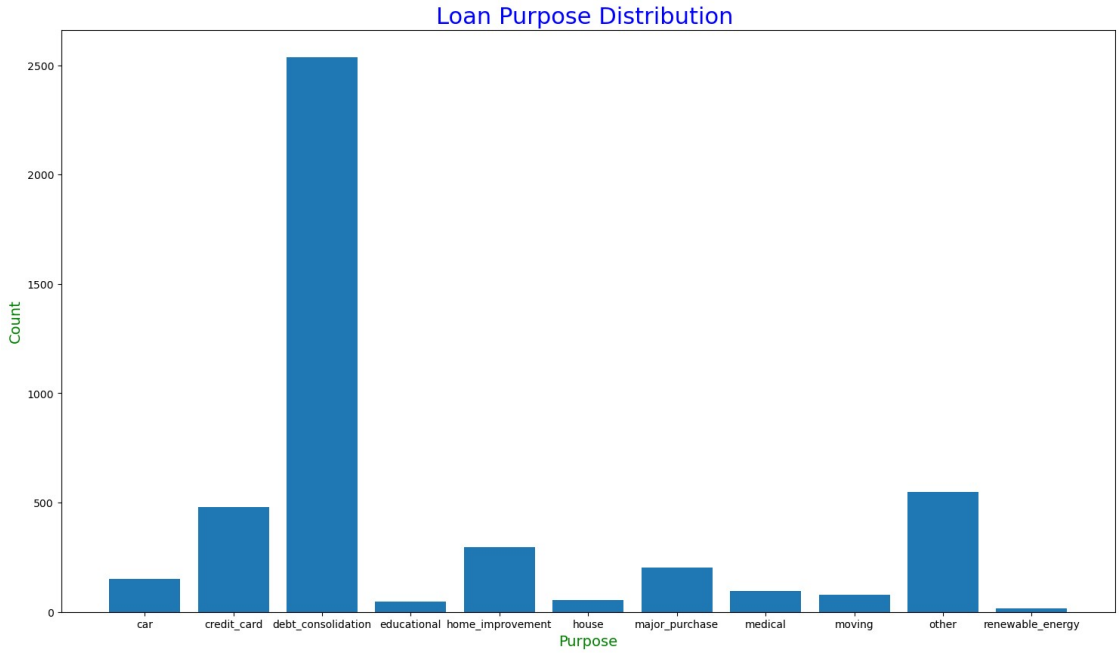

```
#Observation
#Most of the defaulters are on rent.

group=valid_charge.groupby("verification_status").count()
x = []
y = []
for i in range(3):
    x.append(group.index[i])
    y.append(group.iloc[i,0])
plt.bar(x,y)
# Labeling Axes
plt.title("Verification Status Distribution ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Status", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
```

```
plt.ylabel("Count", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```

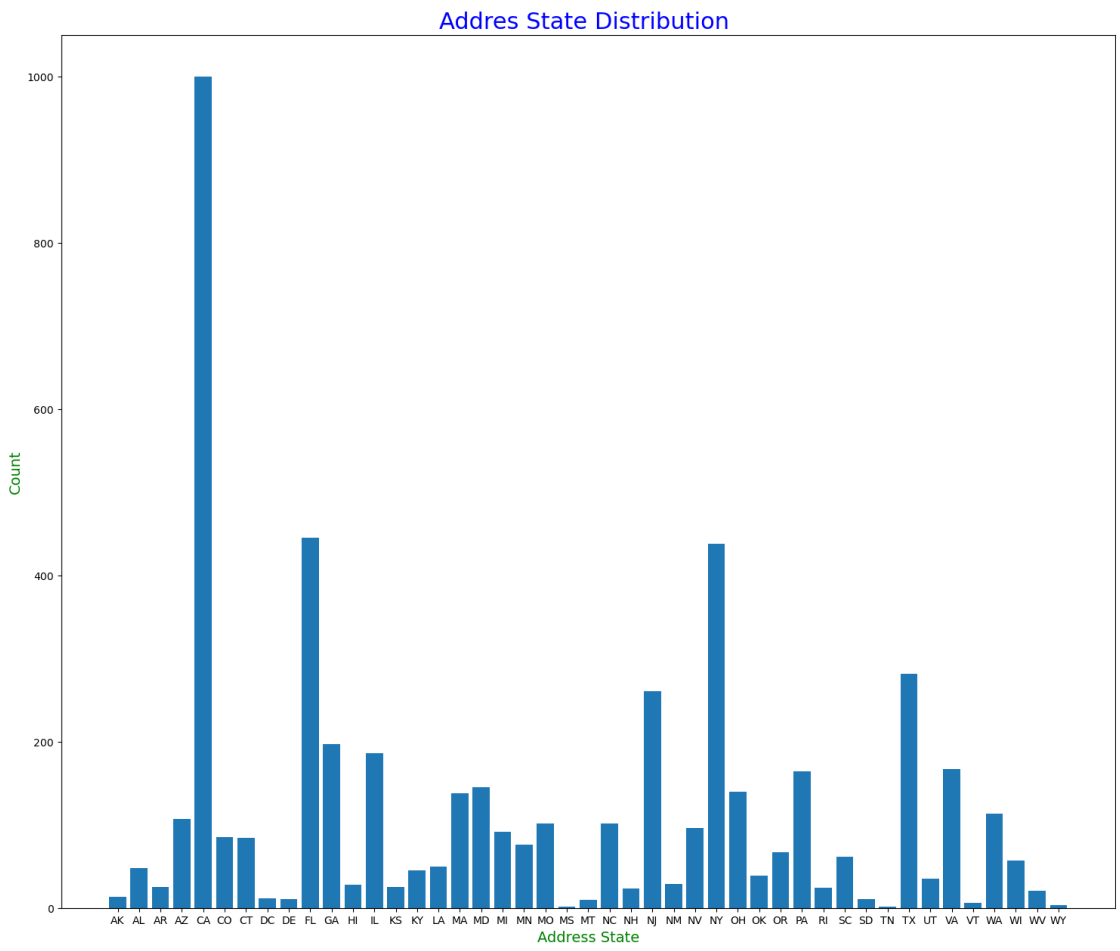



```
#Observation
#Most of the loans were assigned without annual income verification.

group=valid_charge.groupby("purpose").count()
plt.figure(figsize=(18,10))
x = []
y = []
for i in range(11):
    x.append(group.index[i])
    y.append(group.iloc[i,0])

plt.bar(x,y)
# Labeling Axes
plt.title("Loan Purpose Distribution ", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Purpose", fontdict={'fontsize':14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Count", fontdict={'fontsize': 14, 'fontweight' : 10,
```

```
'color' : 'green'})
plt.show()
```

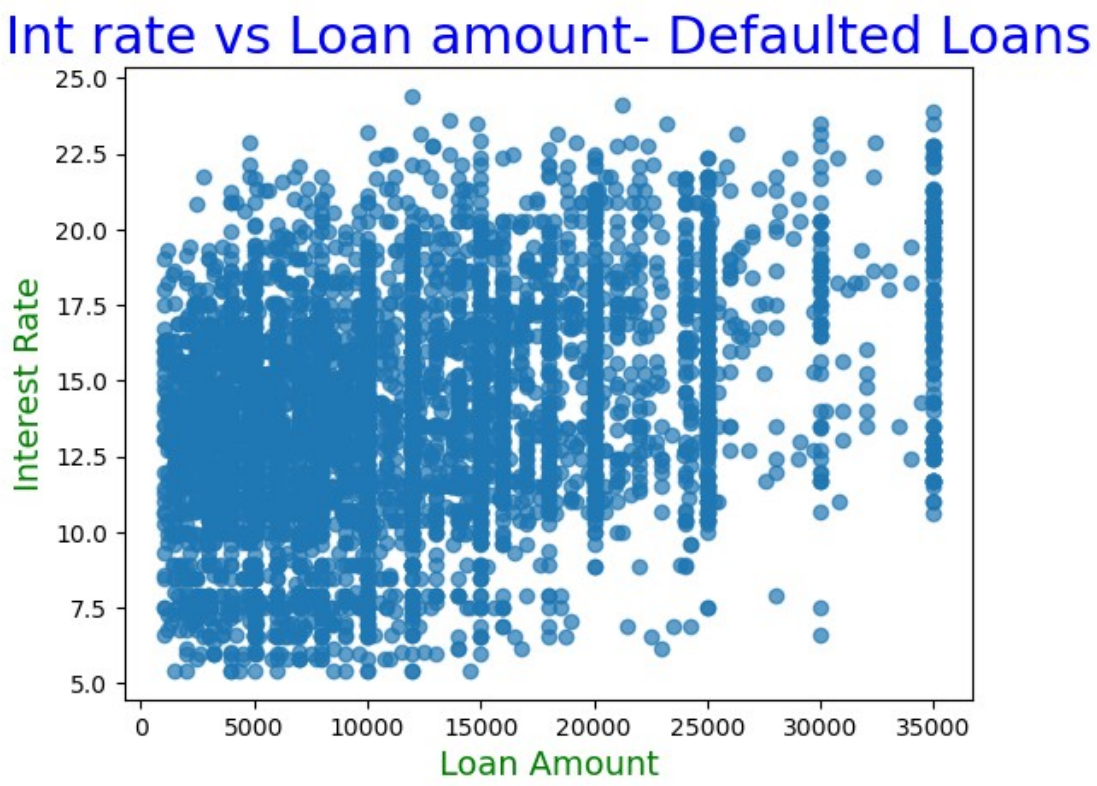



```
#Observation
#Most of the Defaults were on loans taken to pay off existing loans or
to pay of credit card debt

group=valid_charge.groupby("addr_state").count()
plt.figure(figsize=(18,15))
x = []
y = []
for i in range(45):
    x.append(group.index[i])
    y.append(group.iloc[i,0])

plt.bar(x,y)
# Labeling Axes
plt.title("Addres State Distribution ", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Address State", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.ylabel("Count", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
#Observation
#Many of the defaulters are from CA and NY
```

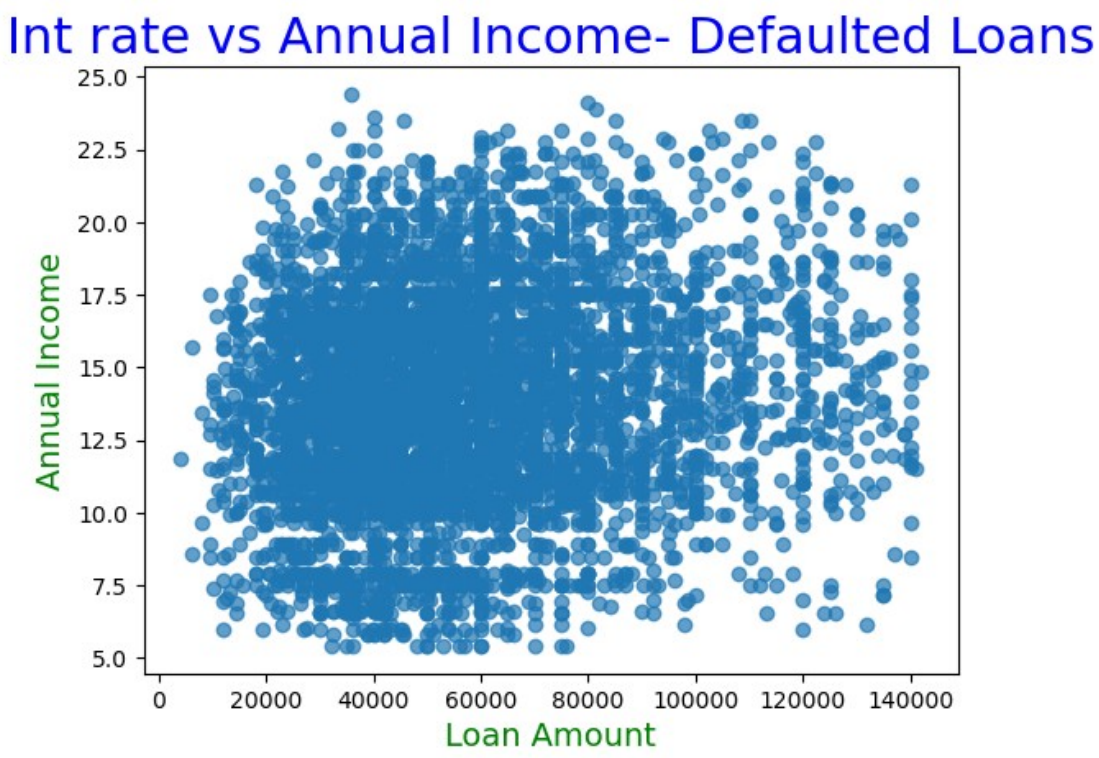



```
#BIVARIATE ANALYSIS


#Univariate analysis gave a picture of variables wrt Defaulted loans
#Bivariate analysis will particlarly call out scenarios which are
indicator of Default.

#1. Annual income
#2. Interest rate
#3. Loan Amount


plt.scatter(valid_charge.loan_amnt, valid_charge.int_rate,alpha= 0.7)
# Adding and formatting title
plt.title("Int rate vs Loan amount- Defaulted Loans",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
# Labeling Axes
plt.xlabel("Loan Amount", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Interest Rate", fontdict={'fontsize': 14, 'fontweight' :
```

```
5, 'color' : 'green'})
plt.show()
```



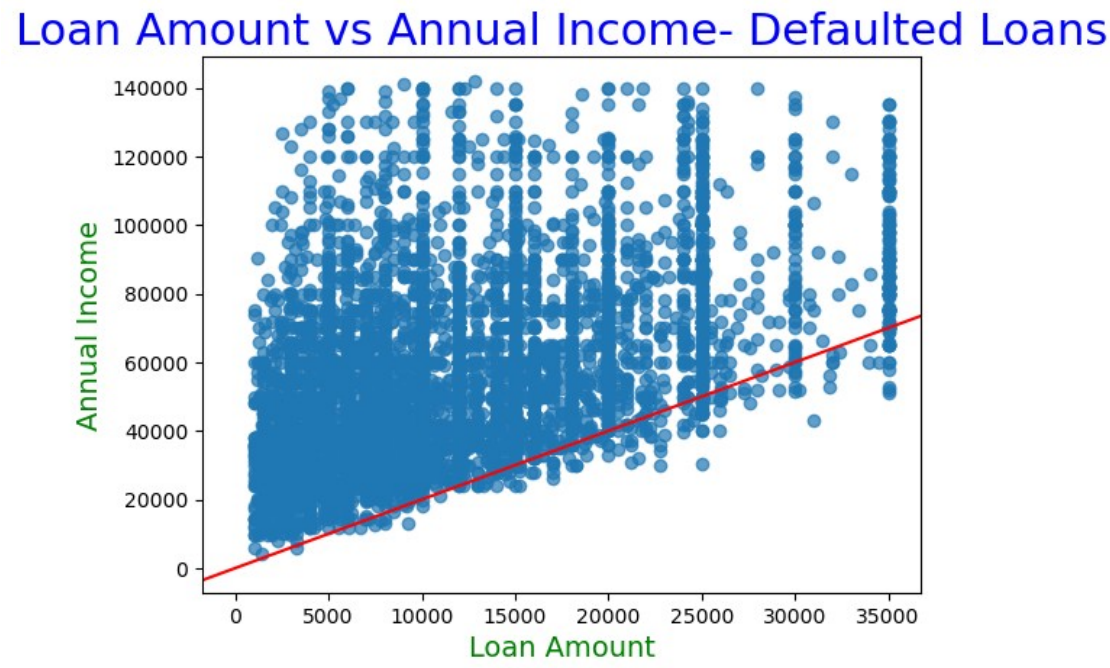

```
#Observation
#Defaulters  taken a loan in the range 5k - 10k and are charged
interest rate of 10-15 %

plt.scatter(valid_charge.annual_inc, valid_charge.int_rate,alpha= 0.7)
# Adding and formatting title
plt.title("Int rate vs Annual Income- Defaulted Loans",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
# Labeling Axes
plt.xlabel("Loan Amount", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Annual Income", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.show()
```



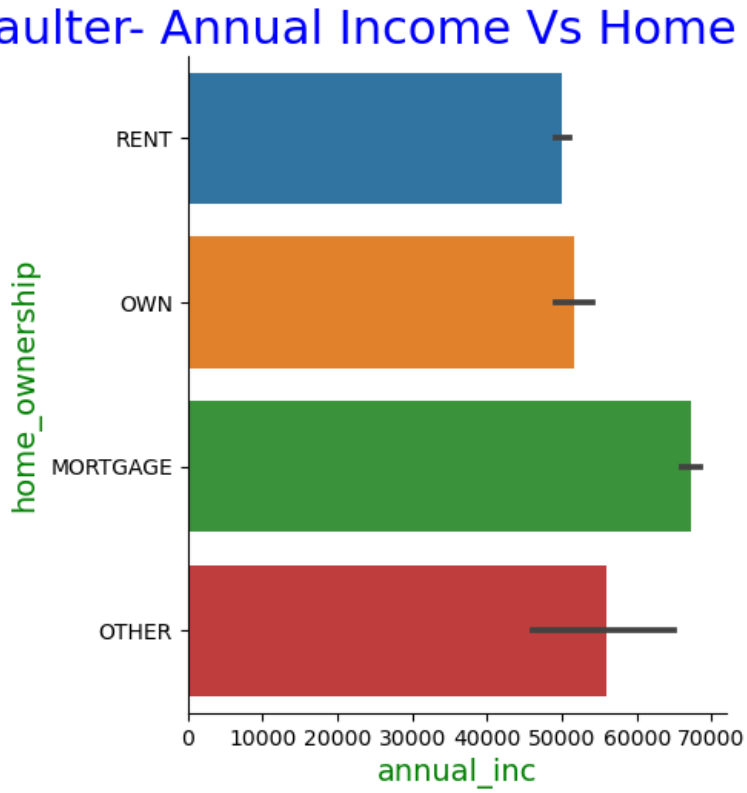

```
#Observation
#There is not specific pattern found in interest rate and Loan amount
#Applicants who receive interest at the rate of 21-24% and have an
income of 70k-80k
```

```
plt.figure(figsize=(10,10))
fig, ax = plt.subplots()
plt.scatter(valid_charge.loan_amnt,valid_charge.annual_inc, alpha=
0.7)
ax.axline((0, 0), slope=2,color='r')
# Adding and formatting title
plt.title("Loan Amount vs Annual Income- Defaulted Loans",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
# Labeling Axes
plt.xlabel("Loan Amount", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Annual Income", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.show()
```

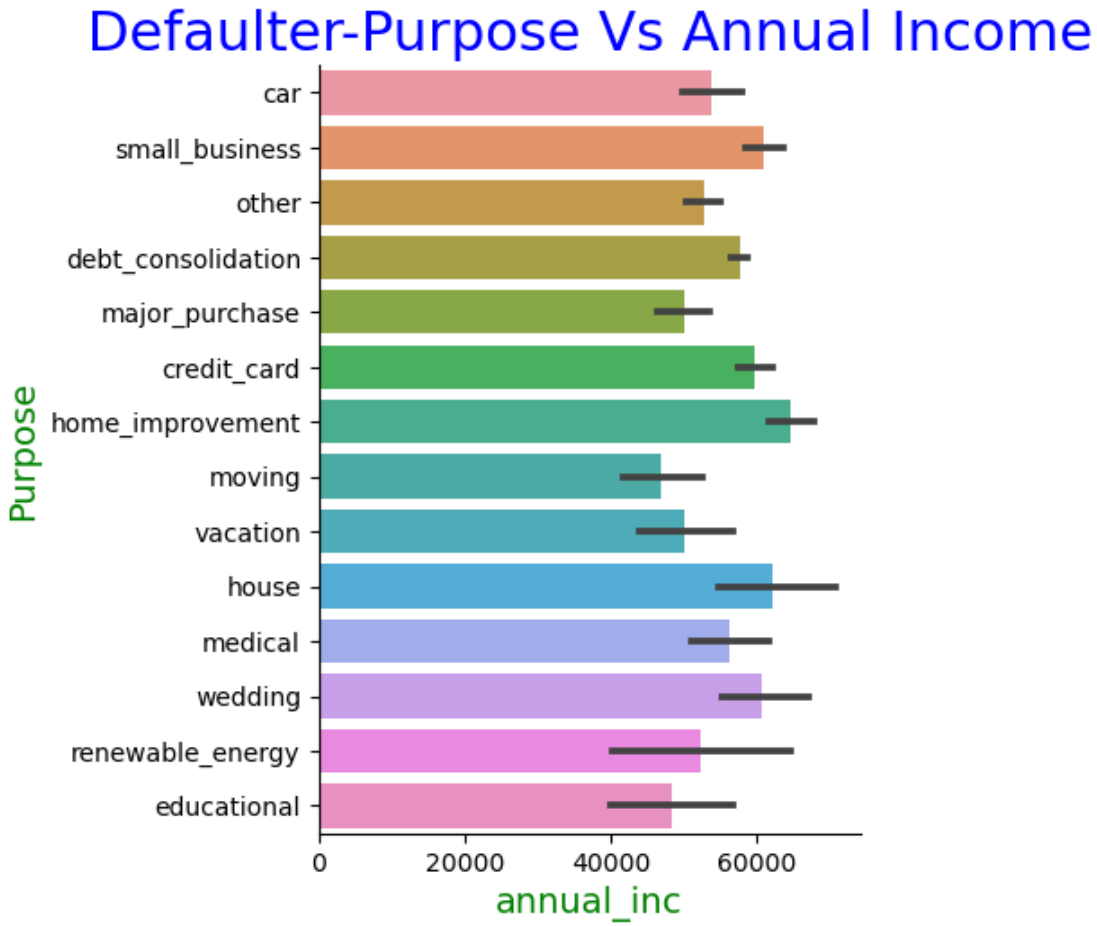
```
<Figure size 1000x1000 with 0 Axes>
```



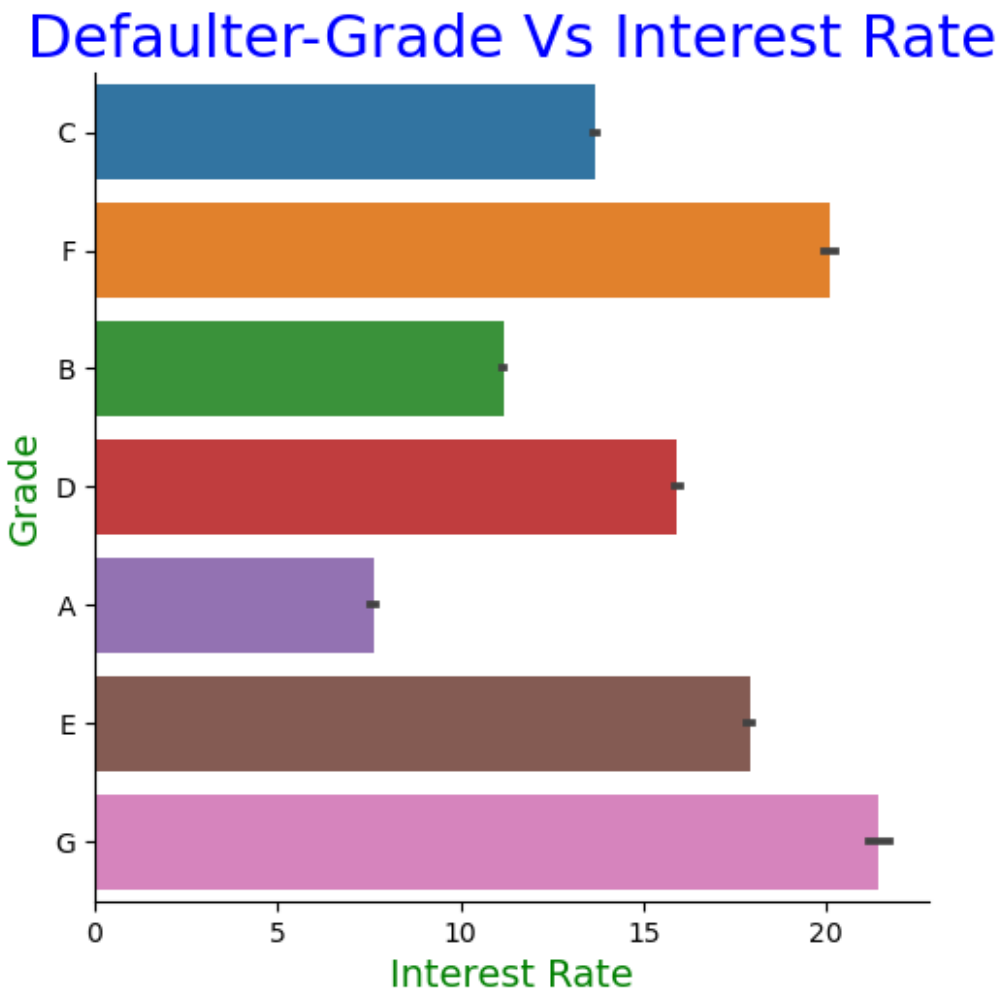

```
## Observation
## There is linear relationship between annual income and loan amount
## For loan amount between 0-15000 , more people took out loan.
## Only high income people with salary higher than 23500 took more
than 30000 loan amount.
## Once income crosses the median annual income of 57000 ,less likely
people are to go for loans exceeding 25000
## People crossing 100000 rarely took loans of less than 5000
## People within income range 120000-140000 seldomly took loans
crossing 25000"

sns.catplot(y = 'home_ownership', x = 'annual_inc', data =
valid_charge, kind = 'bar')
# Labeling Axes
plt.title("Defaulter- Annual Income Vs Home Ownership",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("home_ownership", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.xlabel("annual_inc", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



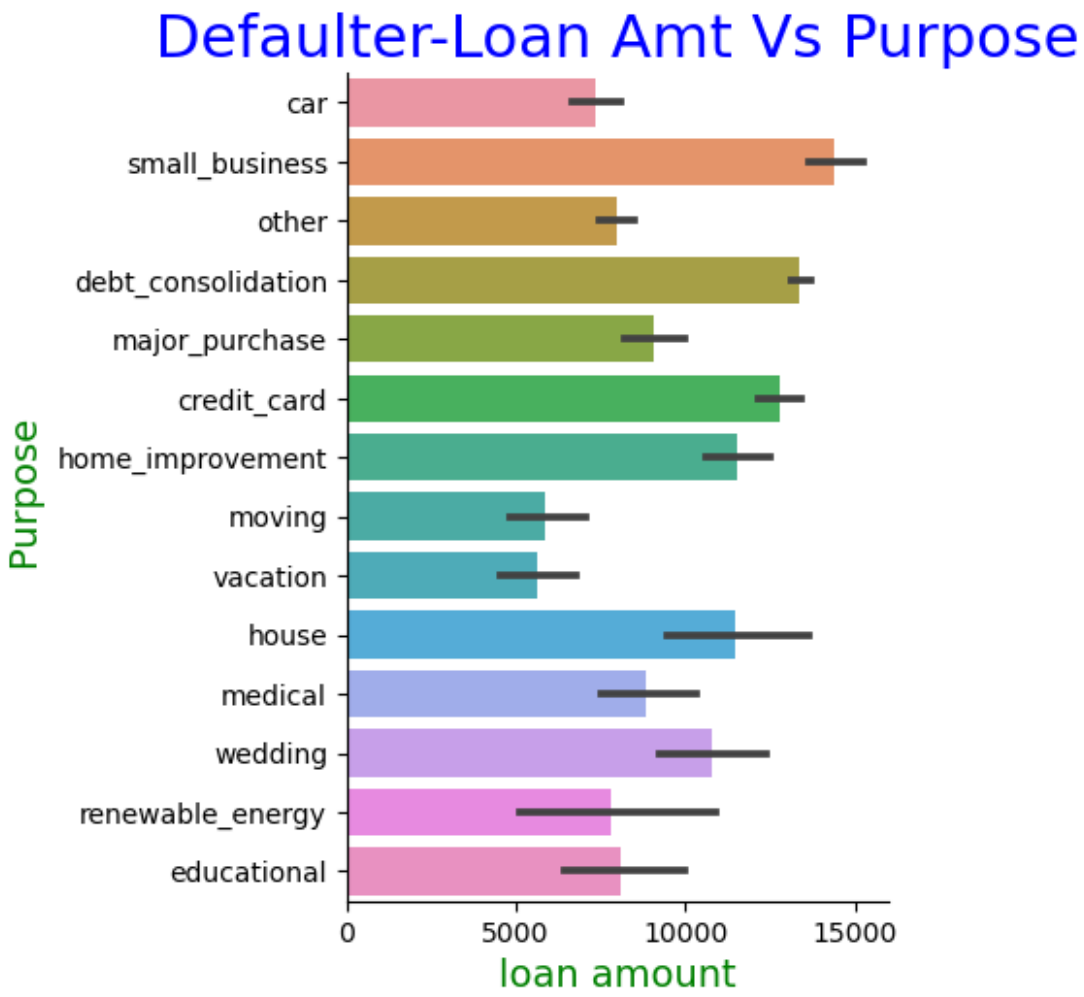

```
#Observations
#Most Defaulters whose home ownership is 'MORTGAGE and have income of
65-70k

sns.catplot(y = 'purpose', x = 'annual_inc', data = valid_charge, kind
= 'bar')
# Labeling Axes
plt.title("Defaulter-Purpose Vs Annual Income", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Purpose", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.xlabel("annual_inc", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



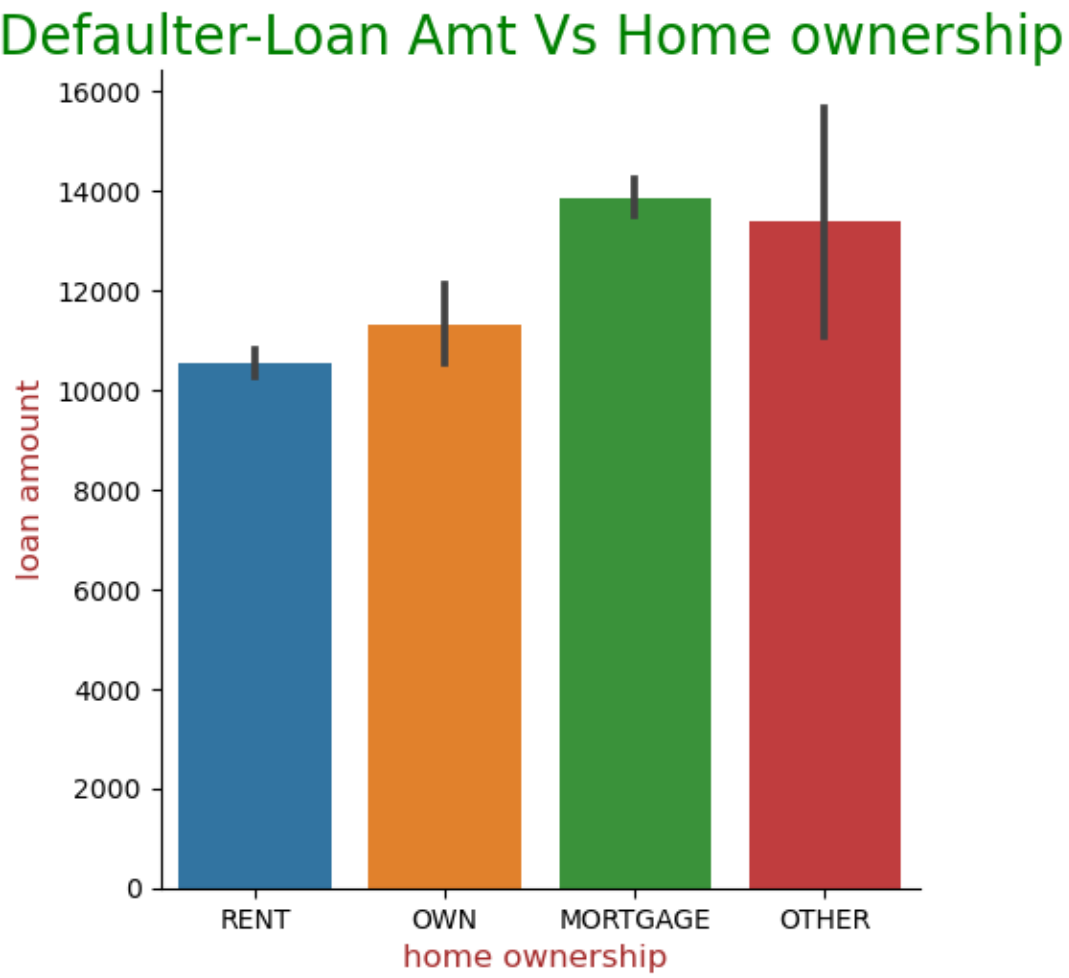

```
#Observation
#Most defaulters are taking loan for 'home improvement' and have
income of 60k -70k

sns.catplot(y = 'grade', x = 'int_rate', data = valid_charge, kind =
'bar')
# Labeling Axes
plt.title("Defaulter-Grade Vs Interest Rate", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Grade", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.xlabel("Interest Rate", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.show()
```



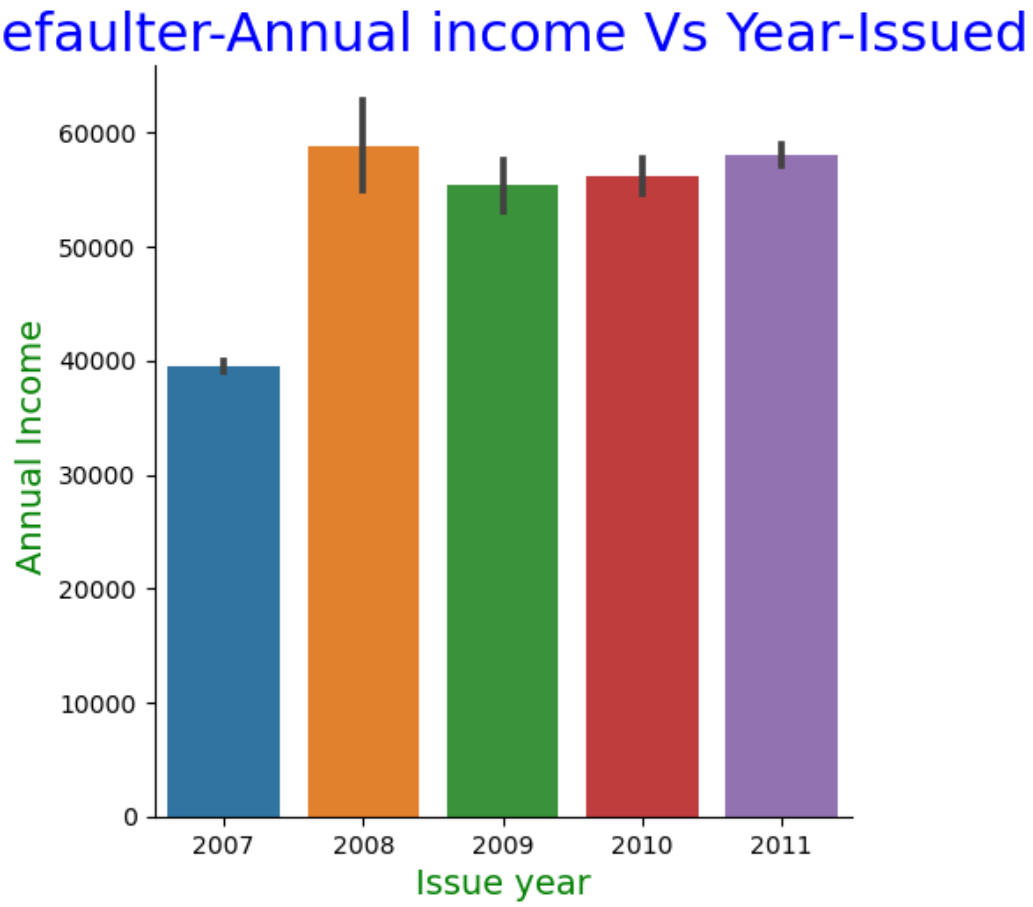

```
#Observation
#Most defaulters are grade G employees and have loans at interest rate
above 20%

sns.catplot(y = 'purpose', x = 'loan_amnt', data = valid_charge, kind
= 'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Purpose", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Purpose ", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.xlabel("loan amount", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



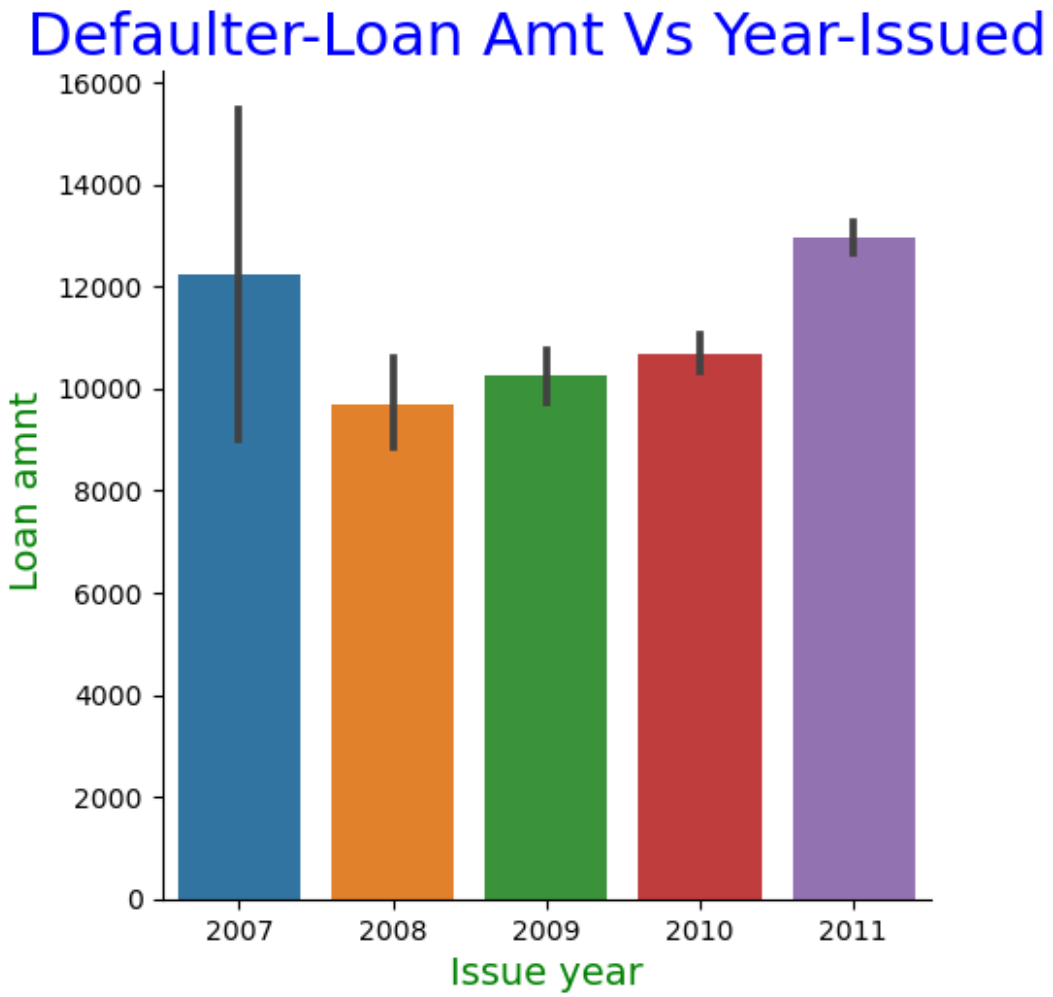

```
#Observations
##Most defaulters took loan had small business' and loan was upwards
of 12500

sns.catplot(x = 'home_ownership', y = 'loan_amnt', data =
valid_data_charged, kind = 'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Home ownership ",
fontdict={'fontsize': 20, 'fontweight' : 5, 'color' : 'Green'})
plt.xlabel("home ownership ", fontdict={'fontsize': 12, 'fontweight' :
5, 'color' : 'Brown'})
plt.ylabel("loan amount", fontdict={'fontsize': 12, 'fontweight' : 5,
'color' : 'Brown'})
plt.show()
```



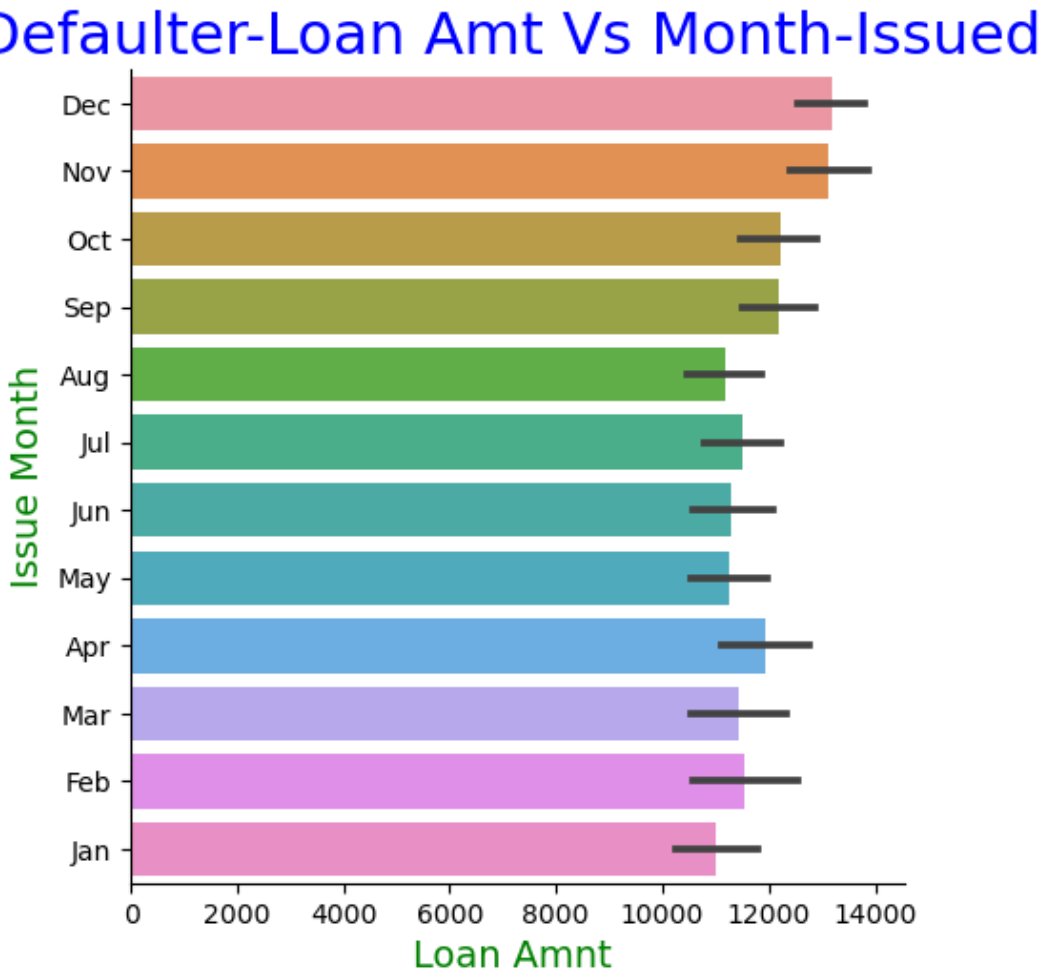

```
#Most of the defaulters whose home ownership is 'MORTGAGE and have
Loan amount of 14000

sns.catplot(x = 'issue_d_yr', y = 'annual_inc', data = valid_charge,
kind = 'bar')
# Labeling Axes
plt.title("Defaulter-Annual income Vs Year-Issued ",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Annual Income ", fontdict={'fontsize': 14, 'fontweight' :
5, 'color' : 'green'})
plt.xlabel("Issue year", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



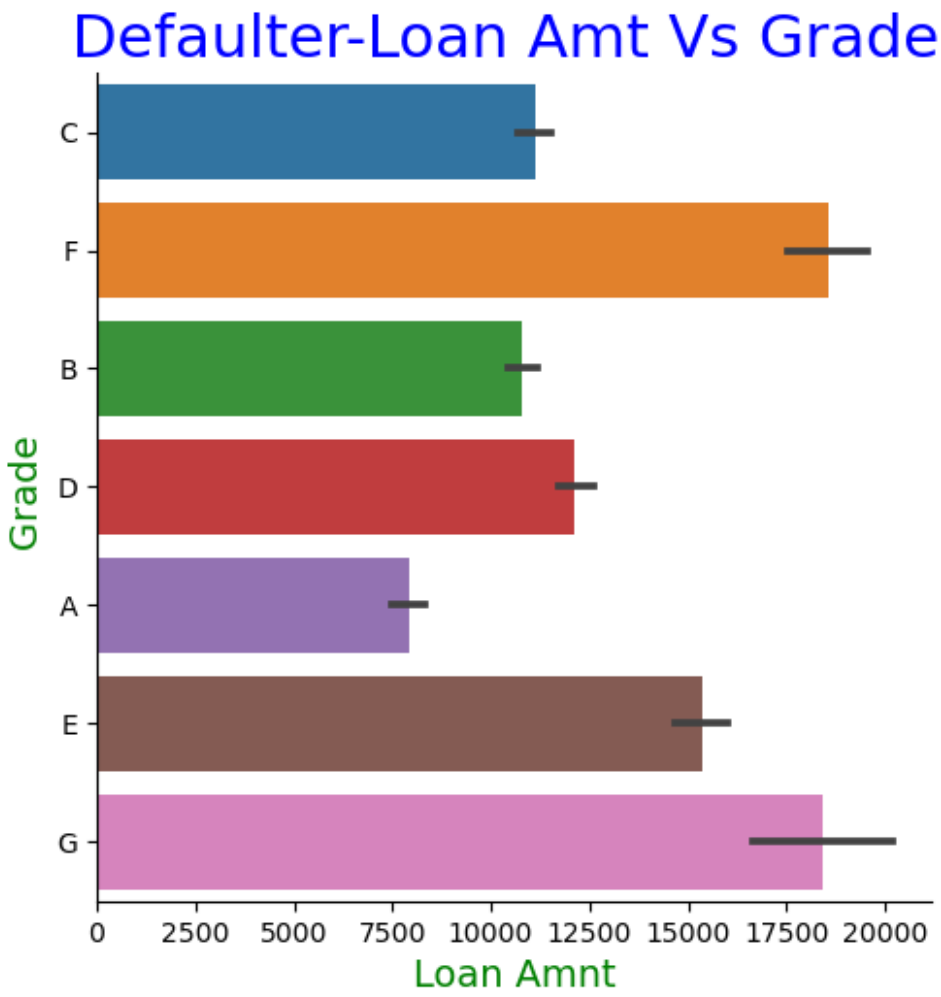

```
sns.catplot(x = 'issue_d_yr', y = 'loan_amnt', data = valid_charge,
kind = 'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Year-Issued ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Loan amnt ", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.xlabel("Issue year", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



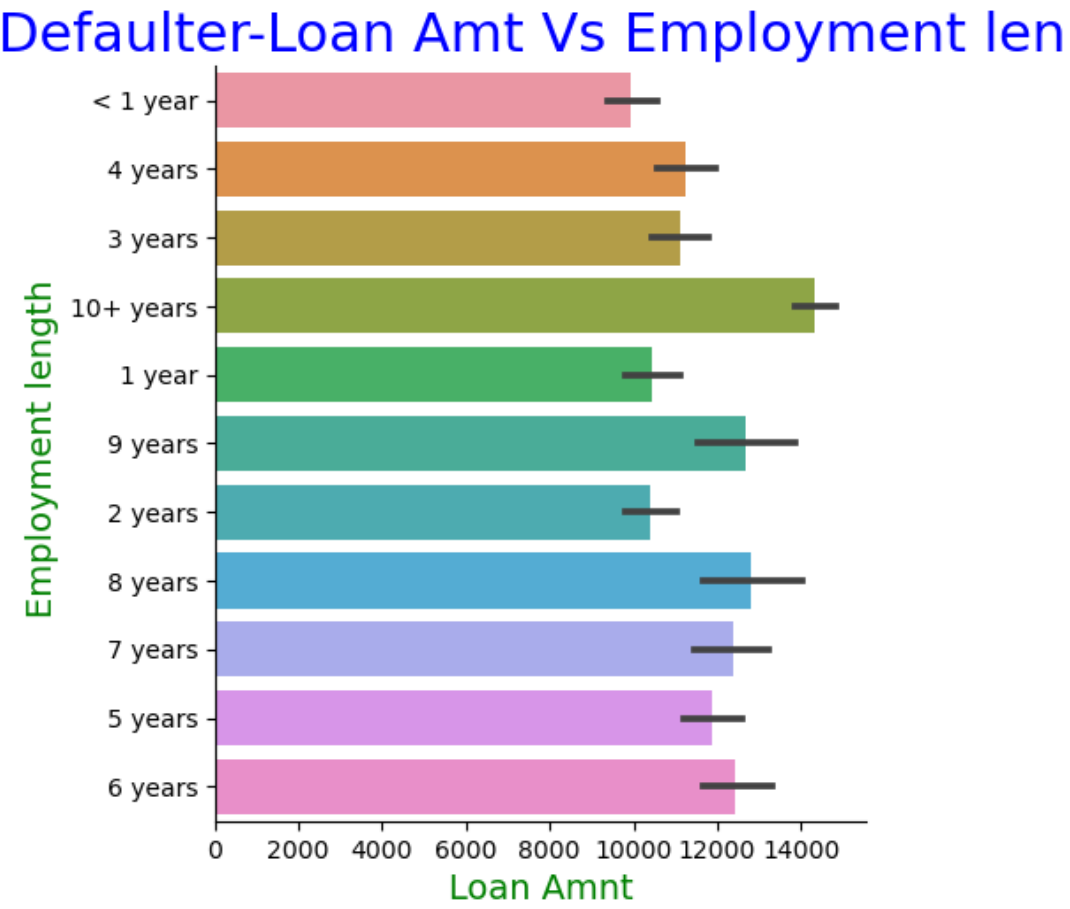

```
sns.catplot(y = 'issue_d_mth', x = 'loan_amnt', data = valid_charge,
kind = 'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Month-Issued ", fontdict={'fontsize':
22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Loan Amnt ", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.ylabel("Issue Month", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



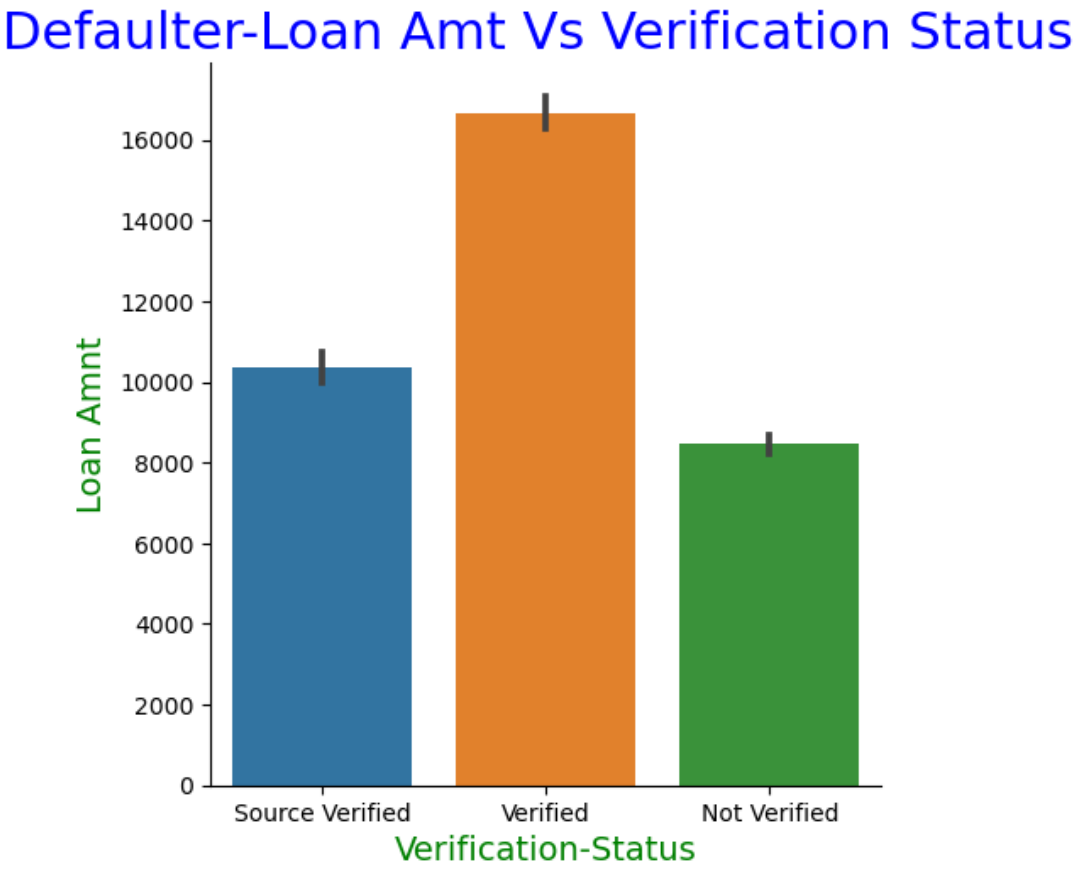

```
#Observations
#Most of the defaulted loans are in Month of Dec'2011.

sns.catplot(y = 'grade', x = 'loan_amnt', data = valid_charge, kind =
'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Grade ", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Grade ", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.xlabel("Loan Amnt", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```



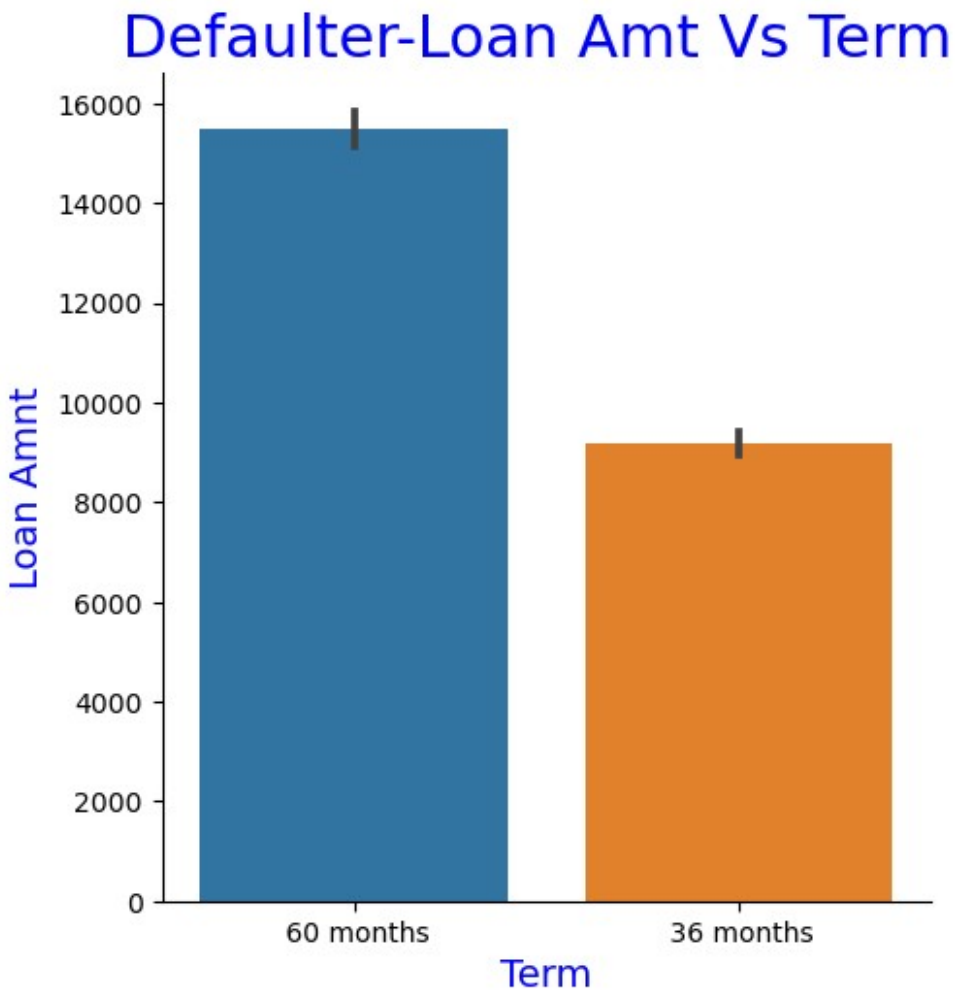

```
#Observation
#When grade is F and loan amount is between 17k-20k

sns.catplot(y = 'emp_length', x = 'loan_amnt', data = valid_charge,
kind = 'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Employment len ",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
plt.ylabel("Employment length ", fontdict={'fontsize': 14,
'fontweight' : 5, 'color' : 'green'})
plt.xlabel("Loan Amnt", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```




```
#Observation
#Mostof the defaults have happened when the employees have 10+yrs
experience and loan amount is 14k+

sns.catplot(x = 'verification_status', y = 'loan_amnt', data =
valid_charge, kind = 'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Verification Status ",
fontdict={'fontsize': 22, 'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Verification-Status", fontdict={'fontsize': 14,
'fontweight' : 5, 'color' : 'green'})
plt.ylabel("Loan Amnt", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'green'})
plt.show()
```




```
#Observation
#Most of the defaulters had been verified and loan amount is above 16k

sns.catplot(x = 'term', y = 'loan_amnt', data = valid_charge, kind =
'bar')
# Labeling Axes
plt.title("Defaulter-Loan Amt Vs Term ", fontdict={'fontsize': 22,
'fontweight' : 5, 'color' : 'blue'})
plt.xlabel("Term", fontdict={'fontsize': 14, 'fontweight' : 5, 'color'
: 'blue'})
plt.ylabel("Loan Amnt", fontdict={'fontsize': 14, 'fontweight' : 5,
'color' : 'blue'})
plt.show()

#Observation
#Higher amount loans have tenure of  60 months.
```


Defaulter-Loan Amt Vs Term
16000
14000
12000
10000
8000
6000
4000
2000
0
Loan Amnt
60 months
36 months
Term