Import Packages

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from plotly.subplots import make_subplots
import plotly.graph_objects as go
pd.set_option('display.max_columns', 300) #Setting column display limit
plt.style.use('ggplot') #Applying style to graphs
```

Load DataSet

Application Data

```
app = pd.read_csv('application_data.csv')
```

Previous Application Data

```
papp = pd.read_csv('previous_application.csv')
```

Top 5 Rows of the Dataset

```
app.head()
```

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	FLAG_OWN_CAR	FLAG_OWN_REALTY	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_A
0	100002	1	Cash loans	M	N	Y	0	202500.0	406597.5	2
1	100003	0	Cash loans	F	N	N	0	270000.0	1293502.5	3
2	100004	0	Revolving loans	M	Y	Y	0	67500.0	135000.0	
3	100006	0	Cash loans	F	N	Y	0	135000.0	312682.5	2
4	100007	0	Cash loans	M	N	Y	0	121500.0	513000.0	2

Dimension

```
app.shape
```

```
(307511, 122)
```

Checking Missing Values

```
app.isnull().sum()/app.shape[0] * 100
```

```
SK_ID_CURR                    0.000000
TARGET                        0.000000
NAME_CONTRACT_TYPE            0.000000
CODE_GENDER                   0.000000
FLAG_OWN_CAR                  0.000000
                               ...
AMT_REQ_CREDIT_BUREAU_DAY    13.501631
AMT_REQ_CREDIT_BUREAU_WEEK   13.501631
AMT_REQ_CREDIT_BUREAU_MON    13.501631
AMT_REQ_CREDIT_BUREAU_QRT    13.501631
AMT_REQ_CREDIT_BUREAU_YEAR   13.501631
Length: 122, dtype: float64
```

Names of the Columns where null values is greater than 40

```
removeCol = app.columns[app.isnull().sum()/app.shape[0]*100 > 40]
removeCol
```

```
Index(['OWN_CAR_AGE', 'EXT_SOURCE_1', 'APARTMENTS_AVG', 'BASEMENTAREA_AVG',
       'YEARS_BEGINEXPLUATATION_AVG', 'YEARS_BUILD_AVG', 'COMMONAREA_AVG',
       'ELEVATORS_AVG', 'ENTRANCES_AVG', 'FLOORSMAX_AVG', 'FLOORSMIN_AVG',
       'LANDAREA_AVG', 'LIVINGAPARTMENTS_AVG', 'LIVINGAREA_AVG',
       'NONLIVINGAPARTMENTS_AVG', 'NONLIVINGAREA_AVG', 'APARTMENTS_MODE',
       'BASEMENTAREA_MODE', 'YEARS_BEGINEXPLUATATION_MODE', 'YEARS_BUILD_MODE',
       'COMMONAREA_MODE', 'ELEVATORS_MODE', 'ENTRANCES_MODE', 'FLOORSMAX_MODE',
       'FLOORSMIN_MODE', 'LANDAREA_MODE', 'LIVINGAPARTMENTS_MODE',
       'LIVINGAREA_MODE', 'NONLIVINGAPARTMENTS_MODE', 'NONLIVINGAREA_MODE',
       'APARTMENTS_MEDI', 'BASEMENTAREA_MEDI', 'YEARS_BEGINEXPLUATATION_MEDI',
       'YEARS_BUILD_MEDI', 'COMMONAREA_MEDI', 'ELEVATORS_MEDI',
       'ENTRANCES_MEDI', 'FLOORSMAX_MEDI', 'FLOORSMIN_MEDI', 'LANDAREA_MEDI',
       'LIVINGAPARTMENTS_MEDI', 'LIVINGAREA_MEDI', 'NONLIVINGAPARTMENTS_MEDI',
       'NONLIVINGAREA_MEDI', 'FONDKAPREMONT_MODE', 'HOUSETYPE_MODE',
       'TOTALAREA_MODE', 'WALLSMATERIAL_MODE', 'EMERGENCYSTATE_MODE'],
      dtype='object')
```

Dropping the null values

```
app.drop(columns=removeCol,axis = 1, inplace= True)
```

Dimension of the Actual Dataset

```
app.shape
```

```
(307511, 73)
```

Statistical Analysis

```
app.describe()
```

	SK_ID_CURR	TARGET	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AMT_ANNUITY	AMT_GOODS_PRICE	REGION_POPULATION_RELA
count	307511.000000	307511.000000	307511.000000	3.075110e+05	3.075110e+05	307499.000000	3.072330e+05	307511.00
mean	278180.518577	0.080729	0.417052	1.687979e+05	5.990260e+05	27108.573909	5.383962e+05	0.02
std	102790.175348	0.272419	0.722121	2.371231e+05	4.024908e+05	14493.737315	3.694465e+05	0.01
min	100002.000000	0.000000	0.000000	2.565000e+04	4.500000e+04	1615.500000	4.050000e+04	0.00
25%	189145.500000	0.000000	0.000000	1.125000e+05	2.700000e+05	16524.000000	2.385000e+05	0.01
50%	278202.000000	0.000000	0.000000	1.471500e+05	5.135310e+05	24903.000000	4.500000e+05	0.01
75%	367142.500000	0.000000	1.000000	2.025000e+05	8.086500e+05	34596.000000	6.795000e+05	0.02
max	456255.000000	1.000000	19.000000	1.170000e+08	4.050000e+06	258025.500000	4.050000e+06	0.07

```
nullcol=app.isnull().sum()* 100/len(app)
nullcol[nullcol > 0].head(100)
```

```
AMT_ANNUITY                    0.003902
AMT_GOODS_PRICE                0.090403
NAME_TYPE_SUITE                0.420148
OCCUPATION_TYPE               31.345545
CNT_FAM_MEMBERS                0.000650
EXT_SOURCE_2                   0.214626
EXT_SOURCE_3                  19.825307
OBS_30_CNT_SOCIAL_CIRCLE       0.332021
DEF_30_CNT_SOCIAL_CIRCLE       0.332021
OBS_60_CNT_SOCIAL_CIRCLE       0.332021
DEF_60_CNT_SOCIAL_CIRCLE       0.332021
DAYS_LAST_PHONE_CHANGE         0.000325
AMT_REQ_CREDIT_BUREAU_HOUR    13.501631
AMT_REQ_CREDIT_BUREAU_DAY     13.501631
```

```
AMT_REQ_CREDIT_BUREAU_WEEK    13.501631
AMT_REQ_CREDIT_BUREAU_MON     13.501631
AMT_REQ_CREDIT_BUREAU_QRT     13.501631
AMT_REQ_CREDIT_BUREAU_YEAR    13.501631
dtype: float64
```

Checking DataTypes

```
app.dtypes.head(60)
```

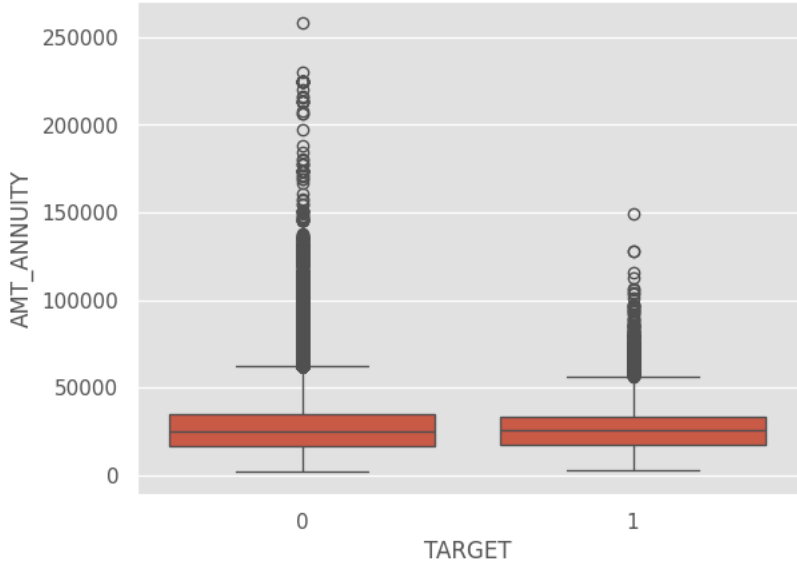
```
CODE_GENDER                    object
FLAG_OWN_CAR                   object
FLAG_OWN_REALTY                object
CNT_CHILDREN                    int64
AMT_INCOME_TOTAL              float64
AMT_CREDIT                    float64
AMT_ANNUITY                   float64
AMT_GOODS_PRICE               float64
NAME_TYPE_SUITE                object
NAME_INCOME_TYPE               object
NAME_EDUCATION_TYPE            object
NAME_FAMILY_STATUS             object
NAME_HOUSING_TYPE              object
REGION_POPULATION_RELATIVE    float64
DAYS_BIRTH                      int64
DAYS_EMPLOYED                   int64
DAYS_REGISTRATION             float64
DAYS_ID_PUBLISH                 int64
FLAG_MOBIL                      int64
FLAG_EMP_PHONE                  int64
FLAG_WORK_PHONE                 int64
FLAG_CONT_MOBILE                int64
FLAG_PHONE                      int64
FLAG_EMAIL                      int64
OCCUPATION_TYPE                object
CNT_FAM_MEMBERS               float64
REGION_RATING_CLIENT            int64
REGION_RATING_CLIENT_W_CITY     int64
WEEKDAY_APPR_PROCESS_START     object
HOUR_APPR_PROCESS_START         int64
REG_REGION_NOT_LIVE_REGION      int64
REG_REGION_NOT_WORK_REGION      int64
LIVE_REGION_NOT_WORK_REGION     int64
REG_CITY_NOT_LIVE_CITY          int64
REG_CITY_NOT_WORK_CITY          int64
LIVE_CITY_NOT_WORK_CITY         int64
ORGANIZATION_TYPE              object
EXT_SOURCE_2                  float64
EXT_SOURCE_3                  float64
OBS_30_CNT_SOCIAL_CIRCLE      float64
DEF_30_CNT_SOCIAL_CIRCLE      float64
OBS_60_CNT_SOCIAL_CIRCLE      float64
DEF_60_CNT_SOCIAL_CIRCLE      float64
DAYS_LAST_PHONE_CHANGE        float64
FLAG_DOCUMENT_2                 int64
FLAG_DOCUMENT_3                 int64
FLAG_DOCUMENT_4                 int64
FLAG_DOCUMENT_5                 int64
FLAG_DOCUMENT_6                 int64
FLAG_DOCUMENT_7                 int64
FLAG_DOCUMENT_8                 int64
FLAG_DOCUMENT_9                 int64
FLAG_DOCUMENT_10                int64
FLAG_DOCUMENT_11                int64
FLAG_DOCUMENT_12                int64
FLAG_DOCUMENT_13                int64
FLAG_DOCUMENT_14                int64
dtype: object
```

Data Visualization

Box Plot

```
sns.boxplot( x=app['TARGET'],y=app['AMT_ANNUITY'])
```

```
<Axes: xlabel='TARGET', ylabel='AMT_ANNUITY'>
```




```
print(app['TARGET'].value_counts())

```

```
TARGET
0    282686
1     24825
Name: count, dtype: int64
```

Bar plot of Target Count

```
import matplotlib.pyplot as plt
import seaborn as sns

# Assuming 'target' is your target variable
sns.countplot(x='TARGET', data=app)
plt.title(' Distribution')
plt.show()

```

Imputation

```
app.AMT_REQ_CREDIT_BUREAU_YEAR.fillna(app.AMT_REQ_CREDIT_BUREAU_YEAR.mode()[0],inplace = True) #AMT_REQ_CREDIT_BUREAU_YEAR

app.AMT_REQ_CREDIT_BUREAU_MON.fillna(app.AMT_REQ_CREDIT_BUREAU_MON.mode()[0],inplace = True)   #AMT_REQ_CREDIT_BUREAU_MON

app.AMT_REQ_CREDIT_BUREAU_WEEK.fillna(app.AMT_REQ_CREDIT_BUREAU_WEEK.mode()[0],inplace = True) #AMT_REQ_CREDIT_BUREAU_WEEK

app.AMT_REQ_CREDIT_BUREAU_DAY.fillna(app.AMT_REQ_CREDIT_BUREAU_DAY.mode()[0],inplace = True)   #AMT_REQ_CREDIT_BUREAU_DAY

app.AMT_REQ_CREDIT_BUREAU_HOUR.fillna(app.AMT_REQ_CREDIT_BUREAU_HOUR.mode()[0],inplace = True) #AMT_REQ_CREDIT_BUREAU_HOUR

app.AMT_REQ_CREDIT_BUREAU_QRT.fillna(app.AMT_REQ_CREDIT_BUREAU_QRT.mode()[0],inplace = True)   #AMT_REQ_CREDIT_BUREAU_QRT
```

```
(app.isnull().sum()/len(app)*100).sort_values(ascending=False)
```

```
OCCUPATION_TYPE                31.345545
EXT_SOURCE_3                   19.825307
NAME_TYPE_SUITE                 0.420148
OBS_30_CNT_SOCIAL_CIRCLE        0.332021
DEF_30_CNT_SOCIAL_CIRCLE        0.332021
                                  ...
REG_REGION_NOT_LIVE_REGION      0.000000
REG_REGION_NOT_WORK_REGION      0.000000
LIVE_REGION_NOT_WORK_REGION     0.000000
TARGET                          0.000000
AMT_REQ_CREDIT_BUREAU_YEAR      0.000000
Length: 73, dtype: float64
```

```
app[['DAYS_BIRTH','DAYS_EMPLOYED','DAYS_REGISTRATION','DAYS_ID_PUBLISH','DAYS_LAST_PHONE_CHANGE']].info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 307511 entries, 0 to 307510
Data columns (total 5 columns):
 #   Column                  Non-Null Count   Dtype
---  ------                  --------------   -----
 0   DAYS_BIRTH              307511 non-null  int64
 1   DAYS_EMPLOYED           307511 non-null  int64
 2   DAYS_REGISTRATION       307511 non-null  float64
 3   DAYS_ID_PUBLISH         307511 non-null  int64
 4   DAYS_LAST_PHONE_CHANGE  307510 non-null  float64
dtypes: float64(2), int64(3)
memory usage: 11.7 MB
```

```
app['DAYS_BIRTH'] = app['DAYS_BIRTH'].abs()
```

```
app['DAYS_EMPLOYED'] = app['DAYS_EMPLOYED'].abs()
```

```
app['DAYS_REGISTRATION']= app['DAYS_ID_PUBLISH'].abs()
```

```
app['DAYS_LAST_PHONE_CHANGE']= app['DAYS_LAST_PHONE_CHANGE'].abs()
app['DAYS_ID_PUBLISH'] = app['DAYS_ID_PUBLISH'].abs()
```

```
app[['DAYS_BIRTH','DAYS_EMPLOYED','DAYS_REGISTRATION','DAYS_ID_PUBLISH','DAYS_LAST_PHONE_CHANGE']]
```

	DAYS_BIRTH	DAYS_EMPLOYED	DAYS_REGISTRATION	DAYS_ID_PUBLISH	DAYS_LAST_PHONE_CHANGE
0	9461	637	2120	2120	1134.0
1	16765	1188	291	291	828.0
2	19046	225	2531	2531	815.0
3	19005	3039	2437	2437	617.0
4	19932	3038	3458	3458	1106.0
...	...	...	...	...	...
307506	9327	236	1982	1982	273.0
307507	20775	365243	4090	4090	0.0
307508	14966	7921	5150	5150	1909.0
307509	11961	4786	931	931	322.0
307510	16856	1262	410	410	787.0

307511 rows × 5 columns

```
app[['DAYS_BIRTH','DAYS_EMPLOYED','DAYS_REGISTRATION','DAYS_ID_PUBLISH','DAYS_LAST_PHONE_CHANGE']].isnull().sum()/len(app) *100
```

```
DAYS_BIRTH                0.000000
DAYS_EMPLOYED             0.000000
DAYS_REGISTRATION         0.000000
DAYS_ID_PUBLISH           0.000000
DAYS_LAST_PHONE_CHANGE    0.000325
dtype: float64
```

```
app['FLAG_OWN_CAR'] = np.where(app['FLAG_OWN_CAR']=='Y', 1 , 0)
app['FLAG_OWN_REALTY'] = np.where(app['FLAG_OWN_REALTY']=='Y', 1 , 0)

```

```
app.head(50)
```

	SK_ID_CURR	TARGET	NAME_CONTRACT_TYPE	CODE_GENDER	FLAG_OWN_CAR	FLAG_OWN_REALTY	CNT_CHILDREN	AMT_INCOME_TOTAL	AMT_CREDIT	AM
0	100002	1	Cash loans	M	0	1	0	202500.000	406597.5	
1	100003	0	Cash loans	F	0	0	0	270000.000	1293502.5	
2	100004	0	Revolving loans	M	1	1	0	67500.000	135000.0	
3	100006	0	Cash loans	F	0	1	0	135000.000	312682.5	
4	100007	0	Cash loans	M	0	1	0	121500.000	513000.0	
5	100008	0	Cash loans	M	0	1	0	99000.000	490495.5	
6	100009	0	Cash loans	F	1	1	1	171000.000	1560726.0	
7	100010	0	Cash loans	M	1	1	0	360000.000	1530000.0	
8	100011	0	Cash loans	F	0	1	0	112500.000	1019610.0	
9	100012	0	Revolving loans	M	0	1	0	135000.000	405000.0	
10	100014	0	Cash loans	F	0	1	1	112500.000	652500.0	
11	100015	0	Cash loans	F	0	1	0	38419.155	148365.0	
12	100016	0	Cash loans	F	0	1	0	67500.000	80865.0	
13	100017	0	Cash loans	M	1	0	1	225000.000	918468.0	
14	100018	0	Cash loans	F	0	1	0	189000.000	773680.5	
15	100019	0	Cash loans	M	1	1	0	157500.000	299772.0	
16	100020	0	Cash loans	M	0	0	0	108000.000	509602.5	
17	100021	0	Revolving loans	F	0	1	1	81000.000	270000.0	
18	100022	0	Revolving loans	F	0	1	0	112500.000	157500.0	
19	100023	0	Cash loans	F	0	1	1	90000.000	544491.0	
20	100024	0	Revolving loans	M	1	1	0	135000.000	427500.0	
21	100025	0	Cash loans	F	1	1	1	202500.000	1132573.5	
22	100026	0	Cash loans	F	0	0	1	450000.000	497520.0	
23	100027	0	Cash loans	F	0	1	0	83250.000	239850.0	
24	100029	0	Cash loans	M	1	0	2	135000.000	247500.0	
25	100030	0	Cash loans	F	0	1	0	90000.000	225000.0	
26	100031	1	Cash loans	F	0	1	0	112500.000	979992.0	
27	100032	0	Cash loans	M	0	1	1	112500.000	327024.0	
28	100033	0	Cash loans	M	1	1	0	270000.000	790830.0	
29	100034	0	Revolving loans	M	0	1	0	90000.000	180000.0	
30	100035	0	Cash loans	F	0	1	0	292500.000	665892.0	

31	100036	0	Cash loans	F	0	1	0	112500.000	512064.0
32	100037	0	Cash loans	F	0	0	0	90000.000	199008.0
33	100039	0	Cash loans	M	1	0	1	360000.000	733315.5
34	100040	0	Cash loans	F	0	1	0	135000.000	1125000.0
35	100041	0	Cash loans	F	0	0	0	112500.000	450000.0
36	100043	0	Cash loans	F	0	1	2	198000.000	641173.5
37	100044	0	Cash loans	M	0	1	0	121500.000	454500.0
38	100045	0	Cash loans	F	0	1	0	99000.000	247275.0
39	100046	0	Revolving loans	M	1	1	0	180000.000	540000.0
40	100047	1	Cash loans	M	0	1	0	202500.000	1193580.0
41	100048	0	Cash loans	F	0	1	0	202500.000	604152.0
42	100049	1	Cash loans	F	0	0	0	135000.000	288873.0
43	100050	0	Cash loans	F	0	1	0	108000.000	746280.0
44	100051	0	Cash loans	M	0	1	0	202500.000	661702.5
45	100052	0	Revolving loans	F	0	1	1	90000.000	180000.0
46	100053	0	Cash loans	F	0	1	0	202500.000	305221.5
47	100054	0	Cash loans	F	0	1	0	99000.000	260640.0
48	100055	0	Cash loans	F	0	0	0	130500.000	1350000.0
49	100056	0	Cash loans	M	1	1	0	360000.000	1506816.0

```
(app.isnull().sum()/len(app) * 100).head(50)
```

```
SK_ID_CURR                     0.000000
TARGET                         0.000000
NAME_CONTRACT_TYPE             0.000000
CODE_GENDER                    0.000000
FLAG_OWN_CAR                   0.000000
FLAG_OWN_REALTY                0.000000
CNT_CHILDREN                   0.000000
AMT_INCOME_TOTAL               0.000000
AMT_CREDIT                     0.000000
AMT_ANNUITY                    0.003902
AMT_GOODS_PRICE                0.090403
NAME_TYPE_SUITE                0.420148
NAME_INCOME_TYPE               0.000000
NAME_EDUCATION_TYPE            0.000000
NAME_FAMILY_STATUS             0.000000
NAME_HOUSING_TYPE              0.000000
REGION_POPULATION_RELATIVE     0.000000
DAYS_BIRTH                     0.000000
DAYS_EMPLOYED                  0.000000
DAYS_REGISTRATION              0.000000
DAYS_ID_PUBLISH                0.000000
FLAG_MOBIL                     0.000000
FLAG_EMP_PHONE                 0.000000
FLAG_WORK_PHONE                0.000000
FLAG_CONT_MOBILE               0.000000
FLAG_PHONE                     0.000000
FLAG_EMAIL                     0.000000
OCCUPATION_TYPE               31.345545
CNT_FAM_MEMBERS                0.000650
```

```
REGION_RATING_CLIENT            0.000000
REGION_RATING_CLIENT_W_CITY     0.000000
WEEKDAY_APPR_PROCESS_START      0.000000
HOUR_APPR_PROCESS_START         0.000000
REG_REGION_NOT_LIVE_REGION      0.000000
REG_REGION_NOT_WORK_REGION      0.000000
LIVE_REGION_NOT_WORK_REGION     0.000000
REG_CITY_NOT_LIVE_CITY          0.000000
REG_CITY_NOT_WORK_CITY          0.000000
LIVE_CITY_NOT_WORK_CITY         0.000000
ORGANIZATION_TYPE               0.000000
EXT_SOURCE_2                    0.214626
EXT_SOURCE_3                   19.825307
OBS_30_CNT_SOCIAL_CIRCLE        0.332021
DEF_30_CNT_SOCIAL_CIRCLE        0.332021
OBS_60_CNT_SOCIAL_CIRCLE        0.332021
DEF_60_CNT_SOCIAL_CIRCLE        0.332021
DAYS_LAST_PHONE_CHANGE          0.000325
FLAG_DOCUMENT_2                 0.000000
FLAG_DOCUMENT_3                 0.000000
FLAG_DOCUMENT_4                 0.000000
dtype: float64
```

```
app['AMT_GOODS_PRICE'].fillna(app['AMT_GOODS_PRICE'].median(),inplace=True)
```

```
app['EXT_SOURCE_3'].fillna(app['EXT_SOURCE_3'].median(),inplace=True)
```

```
app['EXT_SOURCE_2'].fillna(app['EXT_SOURCE_2'].median(),inplace=True)
```

```
app['AMT_INCOME_TYPE'] = pd.qcut(app['AMT_INCOME_TOTAL'],q=[0,0.2,0.5,0.8,0.95,1] ,labels=['very low','low','medium','high','very high'])
app['AMT_INCOME_TYPE'].head(10)
```

```
0       medium
1         high
2     very low
3          low
4          low
5     very low
6       medium
7    very high
8          low
9          low
Name: AMT_INCOME_TYPE, dtype: category
Categories (5, object): ['very low' < 'low' < 'medium' < 'high' < 'very high']
```

Checking the Distributaion of the Categorical Values

```
app.CODE_GENDER.value_counts()
```

```
CODE_GENDER
F      202448
M      105059
XNA         4
Name: count, dtype: int64
```

Column Gender is having XNA V

```
app.loc[app.CODE_GENDER == 'XNA','CODE_GENDER'] = 'F'
app.CODE_GENDER.value_counts()
```

```
CODE_GENDER
F    202452
M    105059
Name: count, dtype: int64
```

```
app.OCCUPATION_TYPE.value_counts().head(25)
```

```
OCCUPATION_TYPE
Laborers                 55186
Sales staff              32102
Core staff               27570
Managers                 21371
Drivers                  18603
High skill tech staff    11380
Accountants               9813
```

```
Medicine staff            8537
Security staff            6721
Cooking staff             5946
Cleaning staff            4653
Private service staff     2652
Low-skill Laborers        2093
Waiters/barmen staff      1348
Secretaries               1305
Realty agents              751
HR staff                   563
IT staff                   526
Name: count, dtype: int64
```

```
app.ORGANIZATION_TYPE.value_counts()
```

```
XNA                       55374
Self-employed             38412
Other                     16683
Medicine                  11193
Business Entity Type 2    10553
Government                10404
School                     8893
Trade: type 7              7831
Kindergarten               6880
Construction               6721
Business Entity Type 1     5984
Transport: type 4          5398
Trade: type 3              3492
Industry: type 9           3368
Industry: type 3           3278
Security                   3247
Housing                    2958
Industry: type 11          2704
Military                   2634
Bank                       2507
Agriculture                2454
Police                     2341
Transport: type 2          2204
Postal                     2157
Security Ministries        1974
Trade: type 2              1900
Restaurant                 1811
Services                   1575
University                 1327
Industry: type 7           1307
Transport: type 3          1187
Industry: type 1           1039
Hotel                       966
Electricity                 950
Industry: type 4            877
Trade: type 6               631
Industry: type 5            599
Insurance                   597
Telecom                     577
Emergency                   560
Industry: type 2            458
Advertising                 429
Realtor                     396
Culture                     379
Industry: type 12           369
Trade: type 1               348
Mobile                      317
Legal Services              305
Cleaning                    260
Transport: type 1           201
Industry: type 6            112
Industry: type 10           109
Religion                     85
Industry: type 13            67
Trade: type 4                64
Trade: type 5                49
Industry: type 8             24
Name: count, dtype: int64
```

```
app.NAME_INCOME_TYPE.value_counts().head(19)
```

```
NAME_INCOME_TYPE
Working                 158774
Commercial associate     71617
Pensioner                55362
State servant            21703
Unemployed                  22
Student                     18
```

```
Businessman                 10
Maternity leave              5
Name: count, dtype: int64
```

```
app[['ORGANIZATION_TYPE','NAME_INCOME_TYPE']].head(30)

```

	ORGANIZATION_TYPE	NAME_INCOME_TYPE
0	Business Entity Type 3	Working
1	School	State servant
2	Government	Working
3	Business Entity Type 3	Working
4	Religion	Working
5	Other	State servant
6	Business Entity Type 3	Commercial associate
7	Other	State servant
8	XNA	Pensioner
9	Electricity	Working
10	Medicine	Working
11	XNA	Pensioner
12	Business Entity Type 2	Working
13	Self-employed	Working
14	Transport: type 2	Working
15	Business Entity Type 2	Working
16	Government	Working
17	Construction	Working
18	Housing	Working
19	Kindergarten	State servant
20	Self-employed	Working
21	Trade: type 7	Commercial associate
22	Self-employed	Working
23	XNA	Pensioner
24	Business Entity Type 3	Working
25	Business Entity Type 3	Working
26	Business Entity Type 3	Working
27	Industry: type 11	Working
28	Military	State servant
29	Business Entity Type 3	Working

```
app['ORGANIZATION_TYPE'] = app['ORGANIZATION_TYPE'].replace('XNA', 'Pensioner')
app['OCCUPATION_TYPE'].fillna('Pensioner' , inplace = True)

```

```
imputerSocial = ['OBS_30_CNT_SOCIAL_CIRCLE', 'DEF_30_CNT_SOCIAL_CIRCLE', 'OBS_60_CNT_SOCIAL_CIRCLE', 'DEF_60_CNT_SOCIAL_CIRCLE']
for i in imputerSocial:
  app[i].fillna(0,inplace=True)
```

```
imputeRest = ['AMT_ANNUITY','NAME_TYPE_SUITE','CNT_FAM_MEMBERS','DAYS_LAST_PHONE_CHANGE']

for rest in imputeRest:
  app[rest].fillna(app[rest].mode()[0],inplace=True)
```

```
app.isnull().sum().head(50)
```

```
SK_ID_CURR                    0
TARGET                        0
NAME_CONTRACT_TYPE            0
CODE_GENDER                   0
FLAG_OWN_CAR                  0
FLAG_OWN_REALTY               0
CNT_CHILDREN                  0
AMT_INCOME_TOTAL              0
AMT_CREDIT                    0
AMT_ANNUITY                   0
AMT_GOODS_PRICE               0
NAME_TYPE_SUITE               0
NAME_INCOME_TYPE              0
NAME_EDUCATION_TYPE           0
NAME_FAMILY_STATUS            0
NAME_HOUSING_TYPE             0
REGION_POPULATION_RELATIVE    0
DAYS_BIRTH                    0
DAYS_EMPLOYED                 0
DAYS_REGISTRATION             0
DAYS_ID_PUBLISH               0
FLAG_MOBIL                    0
FLAG_EMP_PHONE                0
FLAG_WORK_PHONE               0
FLAG_CONT_MOBILE              0
FLAG_PHONE                    0
FLAG_EMAIL                    0
OCCUPATION_TYPE               0
CNT_FAM_MEMBERS               0
REGION_RATING_CLIENT          0
REGION_RATING_CLIENT_W_CITY   0
WEEKDAY_APPR_PROCESS_START    0
HOUR_APPR_PROCESS_START       0
REG_REGION_NOT_LIVE_REGION    0
REG_REGION_NOT_WORK_REGION    0
LIVE_REGION_NOT_WORK_REGION   0
REG_CITY_NOT_LIVE_CITY        0
REG_CITY_NOT_WORK_CITY        0
LIVE_CITY_NOT_WORK_CITY       0
ORGANIZATION_TYPE             0
EXT_SOURCE_2                  0
EXT_SOURCE_3                  0
OBS_30_CNT_SOCIAL_CIRCLE      0
DEF_30_CNT_SOCIAL_CIRCLE      0
OBS_60_CNT_SOCIAL_CIRCLE      0
DEF_60_CNT_SOCIAL_CIRCLE      0
DAYS_LAST_PHONE_CHANGE        0
FLAG_DOCUMENT_2               0
FLAG_DOCUMENT_3               0
FLAG_DOCUMENT_4               0
dtype: int64
```

```
app.dtypes.head(50)
```

```
SK_ID_CURR                      int64
TARGET                          int64
NAME_CONTRACT_TYPE             object
CODE_GENDER                    object
FLAG_OWN_CAR                    int64
FLAG_OWN_REALTY                 int64
CNT_CHILDREN                    int64
AMT_INCOME_TOTAL              float64
AMT_CREDIT                    float64
AMT_ANNUITY                   float64
AMT_GOODS_PRICE               float64
NAME_TYPE_SUITE                object
NAME_INCOME_TYPE               object
NAME_EDUCATION_TYPE            object
NAME_FAMILY_STATUS             object
NAME_HOUSING_TYPE              object
REGION_POPULATION_RELATIVE    float64
DAYS_BIRTH                      int64
DAYS_EMPLOYED                   int64
DAYS_REGISTRATION               int64
DAYS_ID_PUBLISH                 int64
FLAG_MOBIL                      int64
FLAG_EMP_PHONE                  int64
FLAG_WORK_PHONE                 int64
FLAG_CONT_MOBILE                int64
FLAG_PHONE                      int64
FLAG_EMAIL                      int64
OCCUPATION_TYPE                object
CNT_FAM_MEMBERS               float64
```

```
REGION_RATING_CLIENT             int64
REGION_RATING_CLIENT_W_CITY      int64
WEEKDAY_APPR_PROCESS_START      object
HOUR_APPR_PROCESS_START          int64
REG_REGION_NOT_LIVE_REGION       int64
REG_REGION_NOT_WORK_REGION       int64
LIVE_REGION_NOT_WORK_REGION      int64
REG_CITY_NOT_LIVE_CITY           int64
REG_CITY_NOT_WORK_CITY           int64
LIVE_CITY_NOT_WORK_CITY          int64
ORGANIZATION_TYPE               object
EXT_SOURCE_2                   float64
EXT_SOURCE_3                   float64
OBS_30_CNT_SOCIAL_CIRCLE       float64
DEF_30_CNT_SOCIAL_CIRCLE       float64
OBS_60_CNT_SOCIAL_CIRCLE       float64
DEF_60_CNT_SOCIAL_CIRCLE       float64
DAYS_LAST_PHONE_CHANGE         float64
FLAG_DOCUMENT_2                  int64
FLAG_DOCUMENT_3                  int64
FLAG_DOCUMENT_4                  int64
dtype: object
```

```
Numeric_label= ['AMT_INCOME_TOTAL','AMT_CREDIT','AMT_ANNUITY','REGION_POPULATION_RELATIVE','HOUR_APPR_PROCESS_START','LIVE_REGION_NOT_WOR
       'REG_CITY_NOT_WORK_CITY', 'LIVE_CITY_NOT_WORK_CITY']
app[Numeric_label]=app[Numeric_label].apply(pd.to_numeric)
```

```
app.dtypes.head(50)
```

```
SK_ID_CURR                       int64
TARGET                           int64
NAME_CONTRACT_TYPE              object
CODE_GENDER                     object
FLAG_OWN_CAR                     int64
FLAG_OWN_REALTY                  int64
CNT_CHILDREN                     int64
AMT_INCOME_TOTAL               float64
AMT_CREDIT                     float64
AMT_ANNUITY                    float64
AMT_GOODS_PRICE                float64
NAME_TYPE_SUITE                 object
NAME_INCOME_TYPE                object
NAME_EDUCATION_TYPE             object
NAME_FAMILY_STATUS              object
NAME_HOUSING_TYPE               object
REGION_POPULATION_RELATIVE     float64
DAYS_BIRTH                       int64
DAYS_EMPLOYED                    int64
DAYS_REGISTRATION                int64
DAYS_ID_PUBLISH                  int64
FLAG_MOBIL                       int64
FLAG_EMP_PHONE                   int64
FLAG_WORK_PHONE                  int64
FLAG_CONT_MOBILE                 int64
FLAG_PHONE                       int64
FLAG_EMAIL                       int64
OCCUPATION_TYPE                 object
CNT_FAM_MEMBERS                float64
REGION_RATING_CLIENT             int64
REGION_RATING_CLIENT_W_CITY      int64
WEEKDAY_APPR_PROCESS_START      object
HOUR_APPR_PROCESS_START          int64
REG_REGION_NOT_LIVE_REGION       int64
REG_REGION_NOT_WORK_REGION       int64
LIVE_REGION_NOT_WORK_REGION      int64
REG_CITY_NOT_LIVE_CITY           int64
REG_CITY_NOT_WORK_CITY           int64
LIVE_CITY_NOT_WORK_CITY          int64
ORGANIZATION_TYPE               object
EXT_SOURCE_2                   float64
EXT_SOURCE_3                   float64
OBS_30_CNT_SOCIAL_CIRCLE       float64
DEF_30_CNT_SOCIAL_CIRCLE       float64
OBS_60_CNT_SOCIAL_CIRCLE       float64
DEF_60_CNT_SOCIAL_CIRCLE       float64
DAYS_LAST_PHONE_CHANGE         float64
FLAG_DOCUMENT_2                  int64
FLAG_DOCUMENT_3                  int64
FLAG_DOCUMENT_4                  int64
dtype: object
```

Binning

```
bins = [0,25000,50000,75000,100000,125000,150000,175000,200000,225000,250000,275000,300000,325000,350000,375000,400000,425000,450000,475000
Income_slot = ['0-25000', '25000-50000','50000-75000','75000,100000','100000-125000', '125000-150000', '150000-175000','175000-200000',
       '200000-225000','225000-250000','250000-275000','275000-300000','300000-325000','325000-350000','350000-375000',
       '375000-400000','400000-425000','425000-450000','450000-475000','475000-500000','500000 and above']

app['AMT_INCOME_RANGE']=pd.cut(app['AMT_INCOME_TOTAL'],bins,labels=Income_slot)
app['AMT_INCOME_RANGE']
```

```
0         200000-225000
1         250000-275000
2           50000-75000
3         125000-150000
4         100000-125000
                ...
307506    150000-175000
307507      50000-75000
307508    150000-175000
307509    150000-175000
307510    150000-175000
Name: AMT_INCOME_RANGE, Length: 307511, dtype: category
Categories (21, object): ['0-25000' < '25000-50000' < '50000-75000' < '75000,100000' < ... <
                          '425000-450000' < '450000-475000' < '475000-500000' < '500000 and above']
```

```
bins = [0,150000,200000,250000,300000,350000,400000,450000,500000,550000,600000,650000,700000,750000,800000,850000,900000,1000000000]
Credit_slots = ['0-150000', '150000-200000','200000-250000', '250000-300000', '300000-350000', '350000-400000','400000-450000',
        '450000-500000','500000-550000','550000-600000','600000-650000','650000-700000','700000-750000','750000-800000',
        '800000-850000','850000-900000','900000 and above']

app['AMT_CREDIT_RANGE']=pd.cut(app['AMT_CREDIT'],bins=bins,labels=Credit_slots)
app['AMT_CREDIT_RANGE']
```

```
0           400000-450000
1         900000 and above
2                0-150000
3           300000-350000
4           500000-550000
                   ...
307506      250000-300000
307507      250000-300000
307508      650000-700000
307509      350000-400000
307510      650000-700000
Name: AMT_CREDIT_RANGE, Length: 307511, dtype: category
Categories (17, object): ['0-150000' < '150000-200000' < '200000-250000' < '250000-300000' < ... <
                          '750000-800000' < '800000-850000' < '850000-900000' < '900000 and above']
```

```
app['AGE_GROUP']=pd.cut(app['DAYS_BIRTH'],bins=[19,25,35,60,100], labels=['Very_Young','Young', 'Middle_Age', 'Senior_Citizen'])
```

Dropping the Column

```
flagdrop=['FLAG_MOBIL', 'FLAG_EMP_PHONE', 'FLAG_WORK_PHONE', 'FLAG_CONT_MOBILE',
       'FLAG_PHONE', 'FLAG_EMAIL','REGION_RATING_CLIENT','REGION_RATING_CLIENT_W_CITY','FLAG_EMAIL', 'REGION_RATING_CLIENT',
       'REGION_RATING_CLIENT_W_CITY', 'FLAG_DOCUMENT_2', 'FLAG_DOCUMENT_3','FLAG_DOCUMENT_4', 'FLAG_DOCUMENT_5', 'FLAG_DOCUMENT_6',
       'FLAG_DOCUMENT_7', 'FLAG_DOCUMENT_8', 'FLAG_DOCUMENT_9','FLAG_DOCUMENT_10', 'FLAG_DOCUMENT_11', 'FLAG_DOCUMENT_12',
       'FLAG_DOCUMENT_13', 'FLAG_DOCUMENT_14', 'FLAG_DOCUMENT_15','FLAG_DOCUMENT_16', 'FLAG_DOCUMENT_17', 'FLAG_DOCUMENT_18',
       'FLAG_DOCUMENT_19', 'FLAG_DOCUMENT_20', 'FLAG_DOCUMENT_21']

app.drop(labels=flagdrop,axis=1,inplace=True)
```

```
app.info(verbose=True)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 307511 entries, 0 to 307510
Data columns (total 49 columns):
 #   Column                      Non-Null Count   Dtype
---  ------                      --------------   -----
 0   SK_ID_CURR                  307511 non-null  int64
 1   TARGET                      307511 non-null  int64
 2   NAME_CONTRACT_TYPE          307511 non-null  object
 3   CODE_GENDER                 307511 non-null  object
 4   FLAG_OWN_CAR                307511 non-null  int64
 5   FLAG_OWN_REALTY             307511 non-null  int64
 6   CNT_CHILDREN                307511 non-null  int64
```

```
 7   AMT_INCOME_TOTAL             307511 non-null  float64
 8   AMT_CREDIT                   307511 non-null  float64
 9   AMT_ANNUITY                  307511 non-null  float64
 10  AMT_GOODS_PRICE              307511 non-null  float64
 11  NAME_TYPE_SUITE              307511 non-null  object
 12  NAME_INCOME_TYPE             307511 non-null  object
 13  NAME_EDUCATION_TYPE          307511 non-null  object
 14  NAME_FAMILY_STATUS           307511 non-null  object
 15  NAME_HOUSING_TYPE            307511 non-null  object
 16  REGION_POPULATION_RELATIVE   307511 non-null  float64
 17  DAYS_BIRTH                   307511 non-null  int64
 18  DAYS_EMPLOYED                307511 non-null  int64
 19  DAYS_REGISTRATION            307511 non-null  int64
 20  DAYS_ID_PUBLISH              307511 non-null  int64
 21  OCCUPATION_TYPE              307511 non-null  object
 22  CNT_FAM_MEMBERS              307511 non-null  float64
 23  WEEKDAY_APPR_PROCESS_START   307511 non-null  object
 24  HOUR_APPR_PROCESS_START      307511 non-null  int64
 25  REG_REGION_NOT_LIVE_REGION   307511 non-null  int64
 26  REG_REGION_NOT_WORK_REGION   307511 non-null  int64
 27  LIVE_REGION_NOT_WORK_REGION  307511 non-null  int64
 28  REG_CITY_NOT_LIVE_CITY       307511 non-null  int64
 29  REG_CITY_NOT_WORK_CITY       307511 non-null  int64
 30  LIVE_CITY_NOT_WORK_CITY      307511 non-null  int64
 31  ORGANIZATION_TYPE            307511 non-null  object
 32  EXT_SOURCE_2                 307511 non-null  float64
 33  EXT_SOURCE_3                 307511 non-null  float64
 34  OBS_30_CNT_SOCIAL_CIRCLE     307511 non-null  float64
 35  DEF_30_CNT_SOCIAL_CIRCLE     307511 non-null  float64
 36  OBS_60_CNT_SOCIAL_CIRCLE     307511 non-null  float64
 37  DEF_60_CNT_SOCIAL_CIRCLE     307511 non-null  float64
 38  DAYS_LAST_PHONE_CHANGE       307511 non-null  float64
 39  AMT_REQ_CREDIT_BUREAU_HOUR   307511 non-null  float64
 40  AMT_REQ_CREDIT_BUREAU_DAY    307511 non-null  float64
 41  AMT_REQ_CREDIT_BUREAU_WEEK   307511 non-null  float64
 42  AMT_REQ_CREDIT_BUREAU_MON    307511 non-null  float64
 43  AMT_REQ_CREDIT_BUREAU_QRT    307511 non-null  float64
 44  AMT_REQ_CREDIT_BUREAU_YEAR   307511 non-null  float64
 45  AMT_INCOME_TYPE              307511 non-null  category
 46  AMT_INCOME_RANGE             307511 non-null  category
 47  AMT_CREDIT_RANGE             307511 non-null  category
 48  AGE_GROUP                    0 non-null       category
dtypes: category(4), float64(19), int64(16), object(10)
memory usage: 106.8+ MB
```

```
numerical_col = app.select_dtypes(include='number').columns
len(numerical_col)
```

```
35
```

```
#The datatype of categorical columns below will be changed to category to suit univariate analysis
app['NAME_CONTRACT_TYPE'] = app['NAME_CONTRACT_TYPE'].astype('category')
app['CODE_GENDER'] = app['CODE_GENDER'].astype('category')
app['NAME_TYPE_SUITE'] = app['NAME_TYPE_SUITE'].astype('category')
app['NAME_INCOME_TYPE'] = app['NAME_INCOME_TYPE'].astype('category')
app['NAME_EDUCATION_TYPE'] = app['NAME_EDUCATION_TYPE'].astype('category')
app['NAME_FAMILY_STATUS'] = app['NAME_FAMILY_STATUS'].astype('category')
app['NAME_HOUSING_TYPE'] = app['NAME_HOUSING_TYPE'].astype('category')
app['OCCUPATION_TYPE'] = app['OCCUPATION_TYPE'].astype('category')
app['WEEKDAY_APPR_PROCESS_START'] = app['WEEKDAY_APPR_PROCESS_START'].astype('category')
app['ORGANIZATION_TYPE'] = app['ORGANIZATION_TYPE'].astype('category')
```

```
app['DAYS_BIRTH'] = (app['DAYS_BIRTH'] / 365).astype(int)
app['DAYS_BIRTH']
```

```
0         25
1         45
2         52
3         52
4         54
          ..
307506    25
307507    56
307508    41
307509    32
307510    46
Name: DAYS_BIRTH, Length: 307511, dtype: int64
```

```
app['DAYS_BIRTH']
```

```
0         25
1         45
2         52
3         52
4         54
          ..
307506    25
307507    56
307508    41
307509    32
307510    46
Name: DAYS_BIRTH, Length: 307511, dtype: int64
```

```
app['AGE_GROUP'] = pd.cut(app['DAYS_BIRTH'],bins=[19,25,35,60,100],labels=['very_young','young','middle age','senior citizen'])
```

```
app[['DAYS_BIRTH','AGE_GROUP']].head()
```

	DAYS_BIRTH	AGE_GROUP
0	25	very_young
1	45	middle age
2	52	middle age
3	52	middle age
4	54	middle age

```
Target0=app.loc[app["TARGET"]==0]
Target1=app.loc[app["TARGET"]==1]
```

Imbalanced Percentage of the data

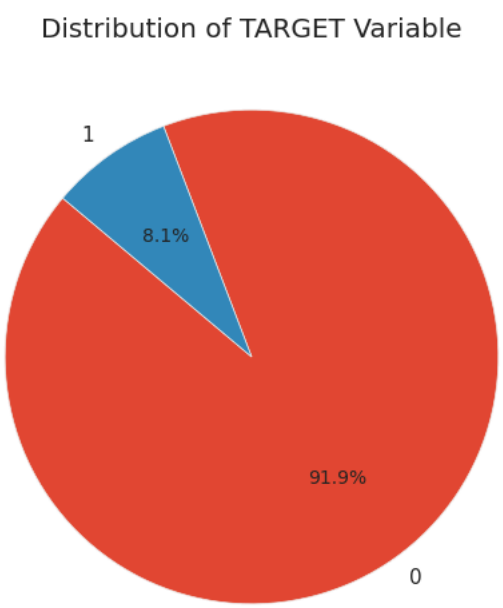
```
round(len(Target0)/len(Target1),2)

```

```
11.39
```

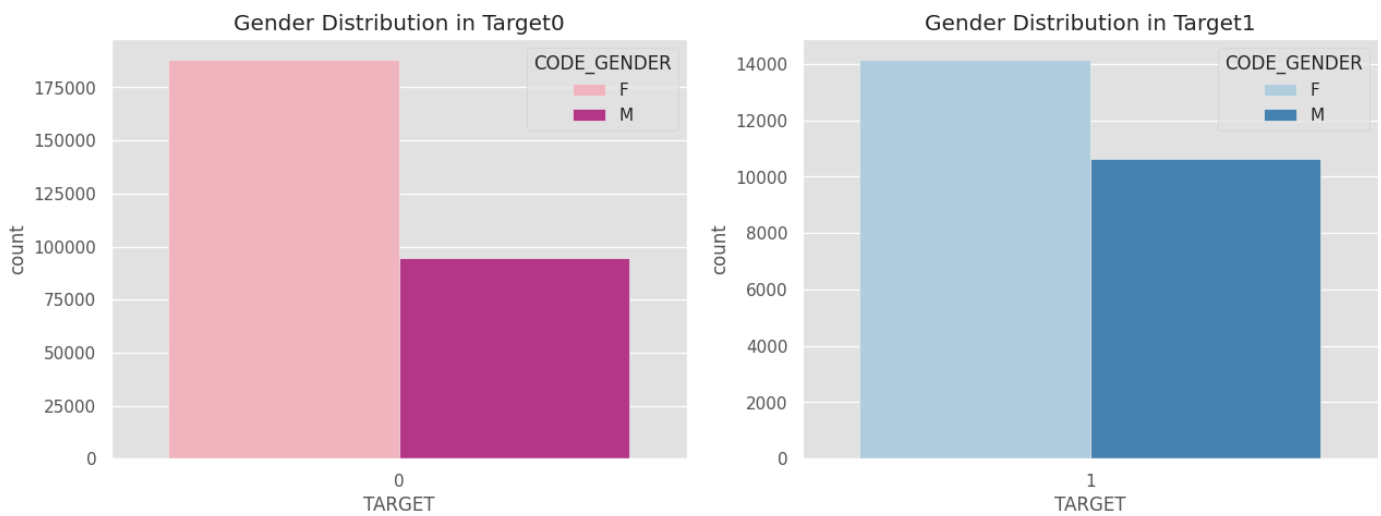
```
target_counts = app['TARGET'].value_counts()

# Create a pie chart
plt.figure(figsize=(6, 6))
plt.pie(target_counts, labels=target_counts.index, autopct='%1.1f%%', startangle=140)
plt.title('Distribution of TARGET Variable')
plt.show()
```



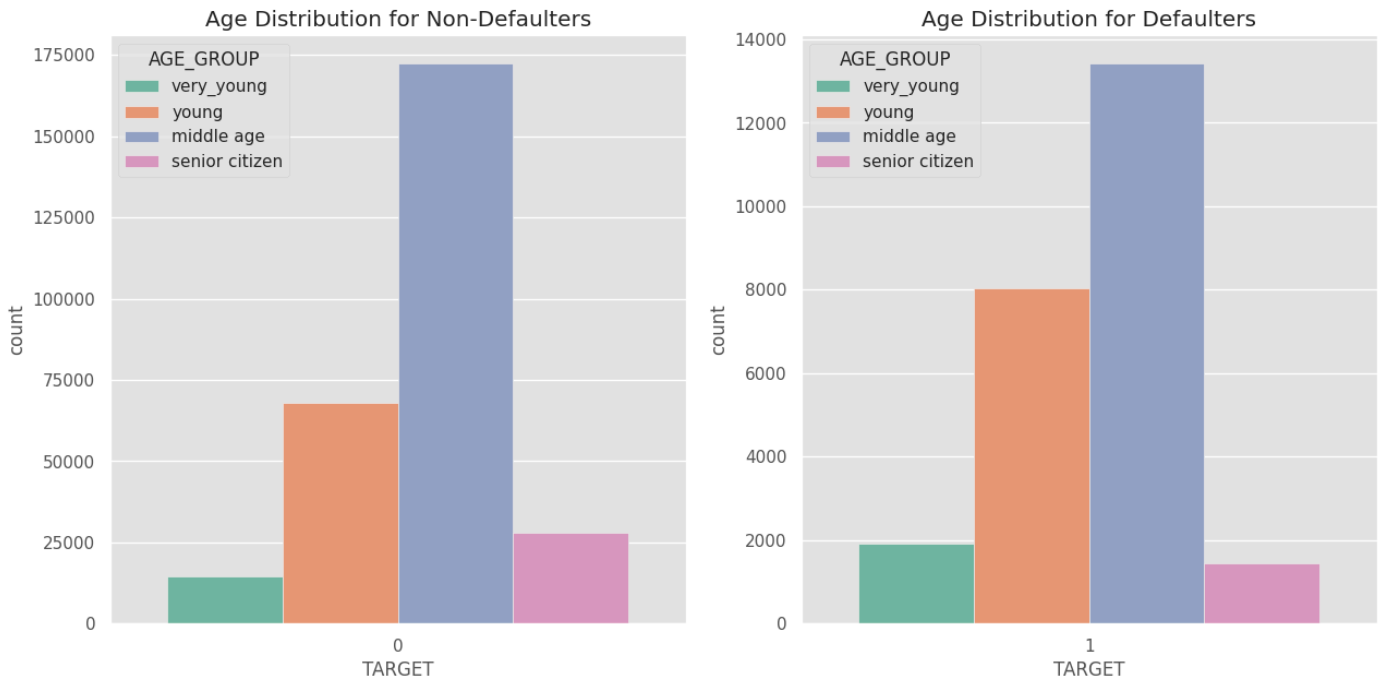
```
plt.figure(figsize=(15,5))
plt.subplot(121)
sns.countplot(x='TARGET',hue='CODE_GENDER',data=Target0, palette ='RdPu')
plt.title("Gender Distribution in Target0")
plt.subplot(122)
sns.countplot(x='TARGET',hue='CODE_GENDER',data=Target1, palette = 'Blues')
plt.title("Gender Distribution in Target1")

plt.show()
```




```
#AGE DISTRIBUTION FOR NON-DEFAULTERS AND DEFAULTERS

plt.figure(figsize=(15,7))
plt.subplot(121)
sns.countplot(x='TARGET',hue='AGE_GROUP',data=Target0,palette='Set2')
plt.title("Age Distribution for Non-Defaulters")
plt.subplot(122)
sns.countplot(x='TARGET',hue='AGE_GROUP',data=Target1,palette='Set2')
plt.title("Age Distribution for Defaulters")
plt.show()
```




```
categorical_col = list(app.select_dtypes(include= 'category').columns)


# Removing 'ORGANIZATION_TYPE','CODE_GENDER','AGE_GROUP' because we have already taken up the isights from  above plots

categorical_col.remove('ORGANIZATION_TYPE')
categorical_col.remove('CODE_GENDER')
categorical_col.remove('AGE_GROUP')

categorical_col #Checking after removing columns
```

```
['NAME_CONTRACT_TYPE',
 'NAME_TYPE_SUITE',
 'NAME_INCOME_TYPE',
 'NAME_EDUCATION_TYPE',
 'NAME_FAMILY_STATUS',
 'NAME_HOUSING_TYPE',
 'OCCUPATION_TYPE',
 'WEEKDAY_APPR_PROCESS_START',
 'AMT_INCOME_TYPE',
 'AMT_INCOME_RANGE',
 'AMT_CREDIT_RANGE']
```

```
def uni(col):
    sns.set(style="darkgrid")
    plt.figure(figsize=(40,20))


    plt.subplot(1,2,1)
    sns.distplot(Target0[col], color="g" )
    plt.yscale('linear')
    plt.xlabel(col, fontsize= 30, fontweight="bold")
    plt.ylabel('Non Payment Difficulties', fontsize= 30, fontweight="bold")                    #Target 0
    plt.xticks(rotation=90, fontsize=30)
    plt.yticks(rotation=360, fontsize=30)




    plt.subplot(1,2,2)
    sns.distplot(Target1[col], color="r")
    plt.yscale('linear')
    plt.xlabel(col, fontsize= 30, fontweight="bold")
    plt.ylabel('Payment Difficulties', fontsize= 30, fontweight="bold")                       # Target 1
    plt.xticks(rotation=90, fontsize=30)
    plt.yticks(rotation=360, fontsize=30)

    plt.show();
```

```
uni(col='AMT_ANNUITY')
```

```
<ipython-input-148-46950d9ac816>:7: UserWarning:


`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

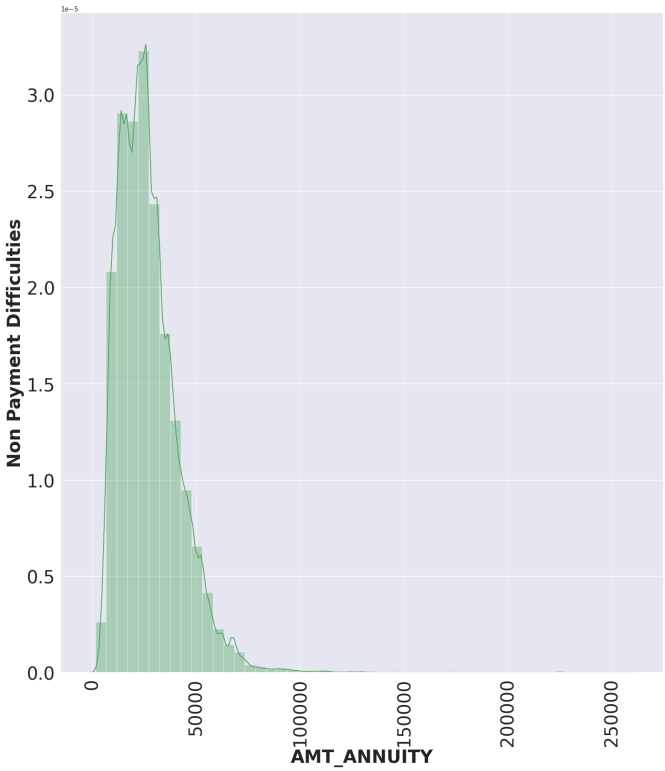
For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

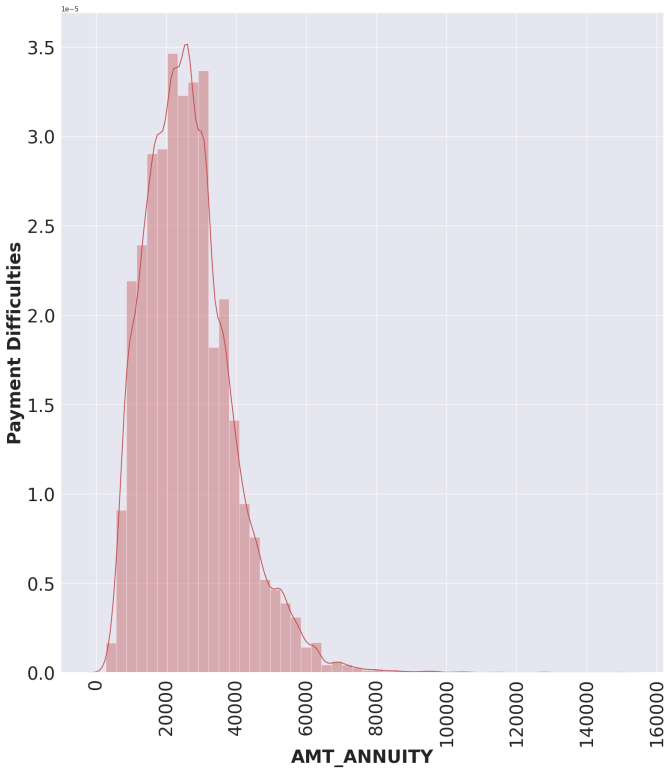

<ipython-input-148-46950d9ac816>:18: UserWarning:


`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751
```






```
uni(col='AMT_CREDIT')
```

```
<ipython-input-148-46950d9ac816>:7: UserWarning:


`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751


<ipython-input-148-46950d9ac816>:18: UserWarning:


`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

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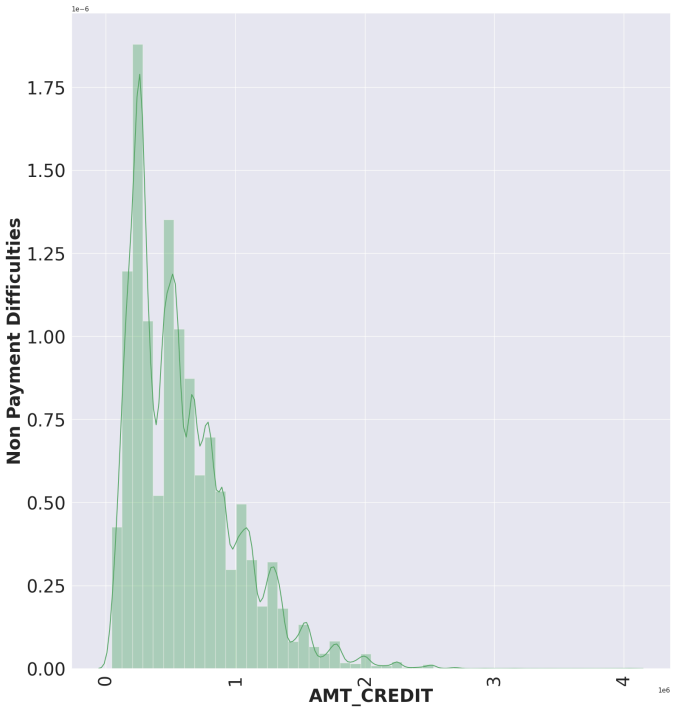
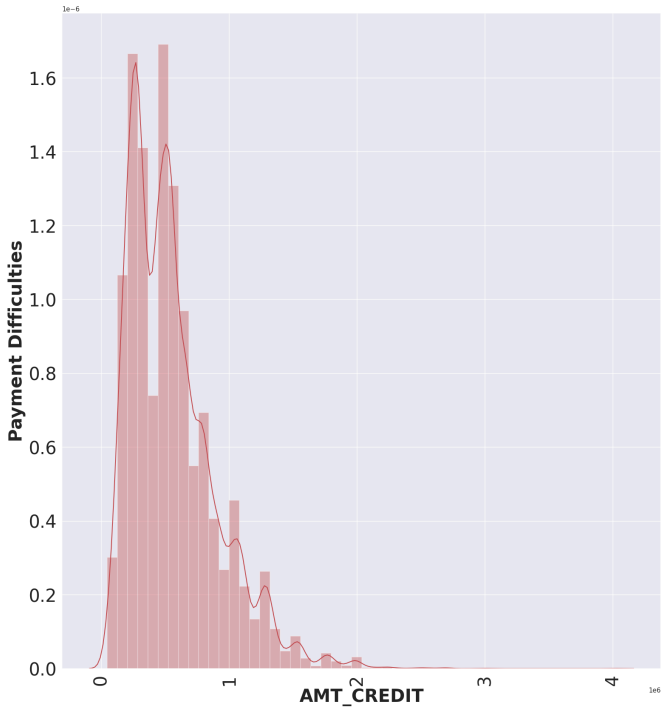
```






```
uni(col='AMT_GOODS_PRICE')

```

```
<ipython-input-148-46950d9ac816>:7: UserWarning: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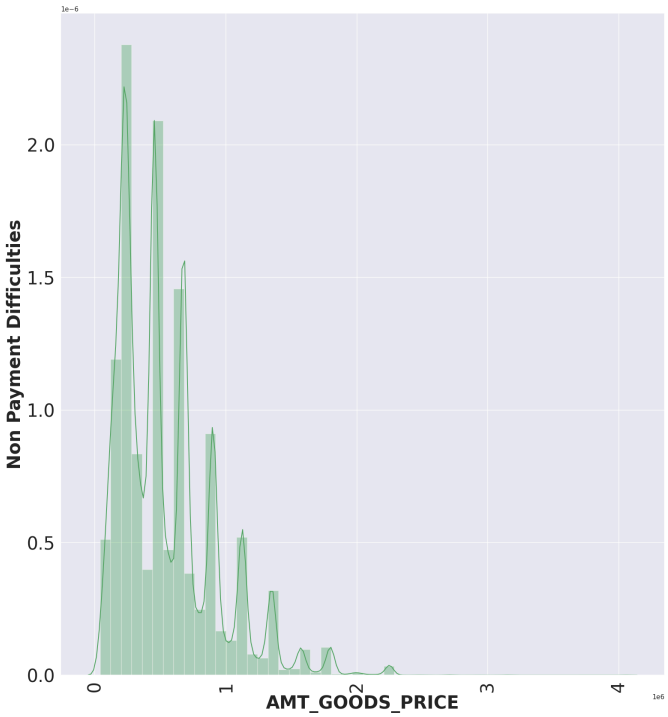

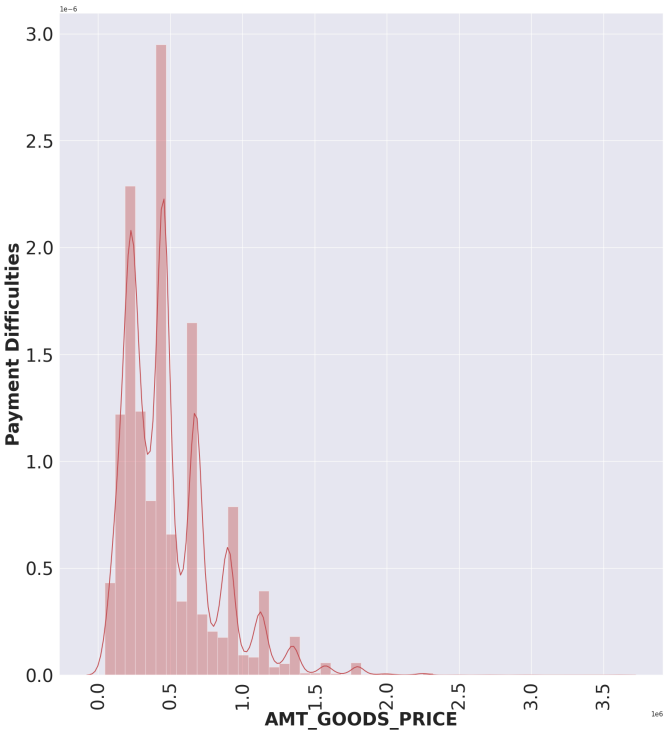


```
uni(col='AMT_INCOME_TOTAL')

```

```
<ipython-input-148-46950d9ac816>:7: UserWarning:


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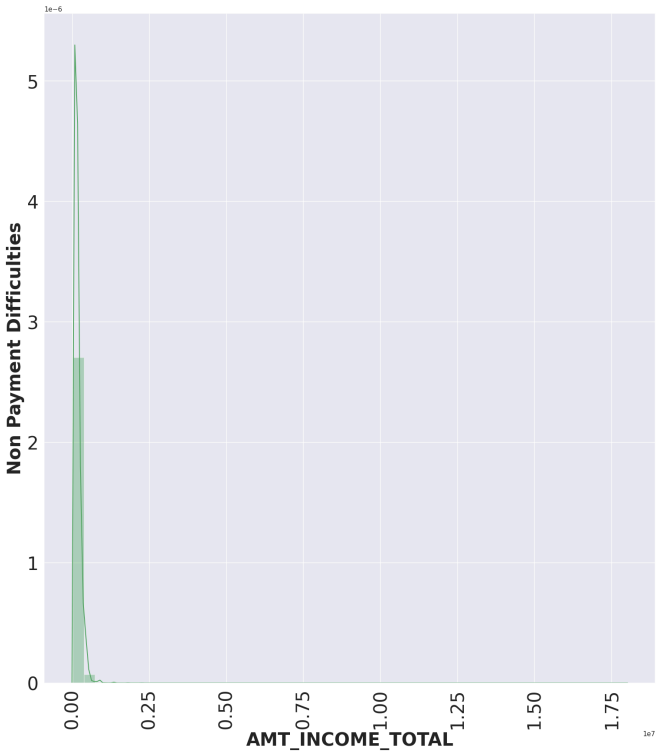
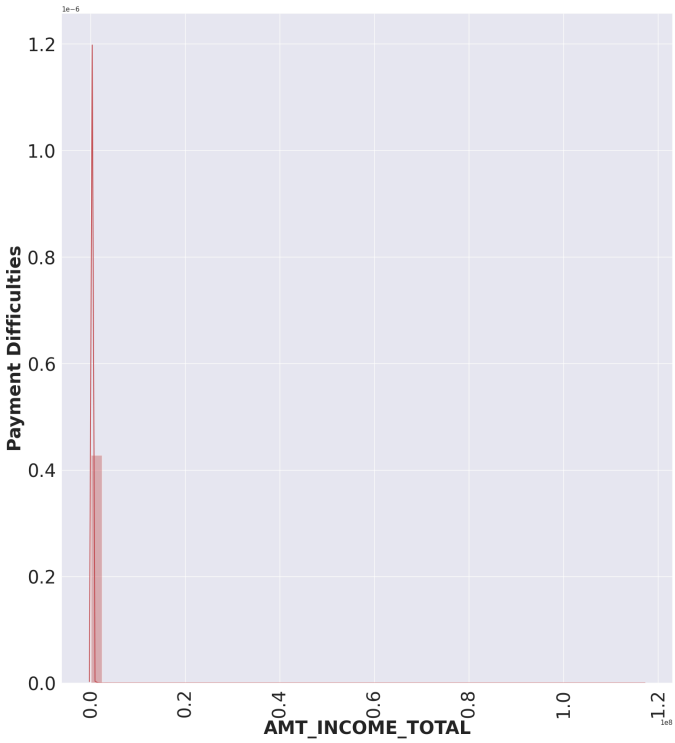
```






```
app[["TARGET","AMT_INCOME_TOTAL","NAME_EDUCATION_TYPE","NAME_FAMILY_STATUS"]]
```

	TARGET	AMT_INCOME_TOTAL	NAME_EDUCATION_TYPE	NAME_FAMILY_STATUS
0	1	202500.0	Secondary / secondary special	Single / not married
1	0	270000.0	Higher education	Married
2	0	67500.0	Secondary / secondary special	Single / not married
3	0	135000.0	Secondary / secondary special	Civil marriage
4	0	121500.0	Secondary / secondary special	Single / not married
...	...	...	...	...
307506	0	157500.0	Secondary / secondary special	Separated
307507	0	72000.0	Secondary / secondary special	Widow
307508	0	153000.0	Higher education	Separated
307509	1	171000.0	Secondary / secondary special	Married
307510	0	157500.0	Higher education	Married

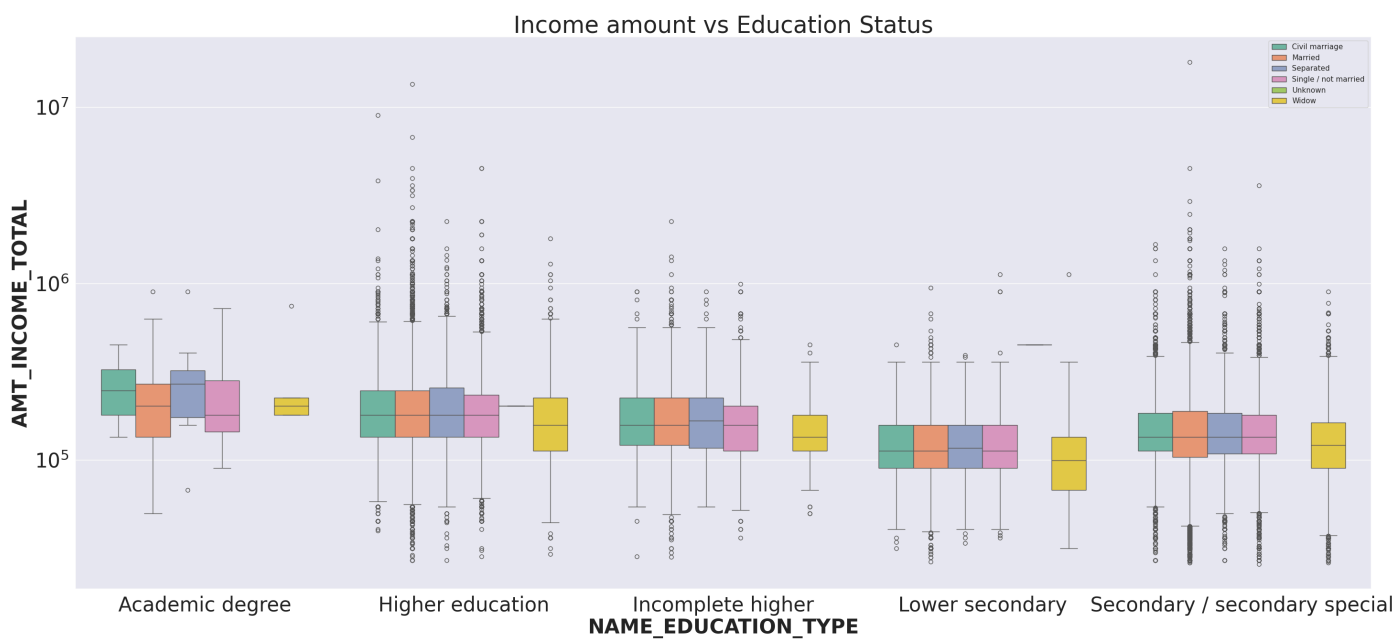
307511 rows × 4 columns

```
plt.figure(figsize=(35,15))
plt.yscale('log')                      #As the values are too large, it is convinient to use log for better analysis
plt.xticks(rotation = 45)


sns.boxplot(data =Target0, x='NAME_EDUCATION_TYPE',y='AMT_INCOME_TOTAL',   #Boxplot w.r.t Data Target 0
            hue ='NAME_FAMILY_STATUS',orient='v',palette='Set2')


plt.legend( loc = 'upper right')                                          #Adjusting legend position
plt.title('Income amount vs Education Status',fontsize=35 )
plt.xlabel("NAME_EDUCATION_TYPE",fontsize= 30, fontweight="bold")
plt.ylabel("AMT_INCOME_TOTAL",fontsize= 30, fontweight="bold")
plt.xticks(rotation=0, fontsize=30)
plt.yticks(rotation=360, fontsize=30)

plt.show()
```



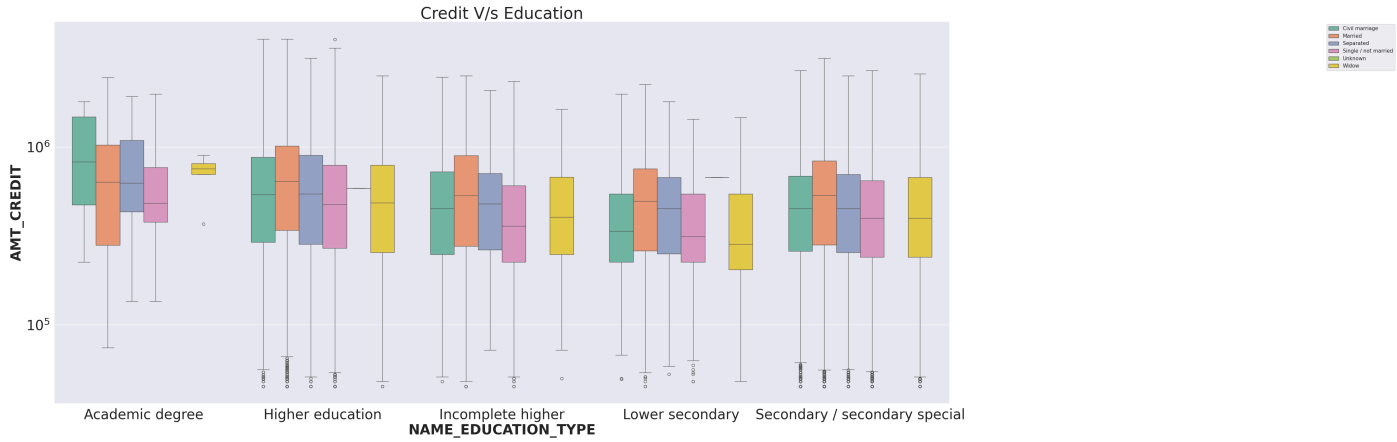

```
plt.figure(figsize=(35,15))
```

```
plt.figure(figsize=(35,15))
plt.yscale('log')                    #As the values are too large, it is convinient to use log for better analysis
plt.xticks(rotation = 90)


sns.boxplot(data =Target0, x='NAME_EDUCATION_TYPE',y='AMT_CREDIT',           #Boxplot w.r.t Data Target 0
            hue ='NAME_FAMILY_STATUS',orient='v',palette='Set2')


plt.legend( bbox_to_anchor=(1.5, 1),loc = 'upper right')            #Adjusting legend position
plt.title('Credit V/s Education',fontsize=35 )
plt.xlabel("NAME_EDUCATION_TYPE",fontsize= 30, fontweight="bold")
plt.ylabel("AMT_CREDIT",fontsize= 30, fontweight="bold")
plt.xticks(rotation=0, fontsize=30)
plt.yticks(rotation=360, fontsize=30)

plt.show()
```

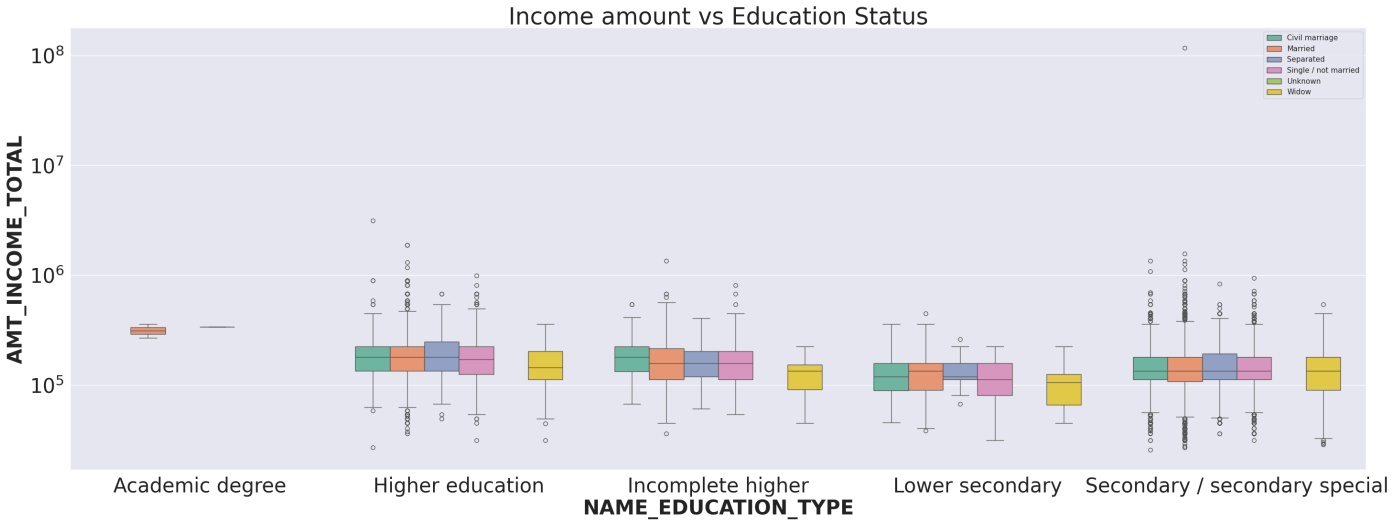



```
plt.figure(figsize=(35,12))
plt.yscale('log')                    #As the values are too large, it is convinient to use log for better analysis
plt.xticks(rotation = 90)


sns.boxplot(data =Target1, x='NAME_EDUCATION_TYPE',y='AMT_INCOME_TOTAL',   #Boxplot w.r.t Data Target 1
            hue ='NAME_FAMILY_STATUS',orient='v',palette='Set2')


plt.legend( loc = 'upper right')                                            #Adjusting legend position
plt.title('Income amount vs Education Status',fontsize= 35)
plt.xlabel("NAME_EDUCATION_TYPE",fontsize= 30, fontweight="bold")
plt.ylabel("AMT_INCOME_TOTAL",fontsize= 30, fontweight="bold")
plt.xticks(rotation=0, fontsize=30)
plt.yticks(rotation=360, fontsize=30)

plt.show()
```



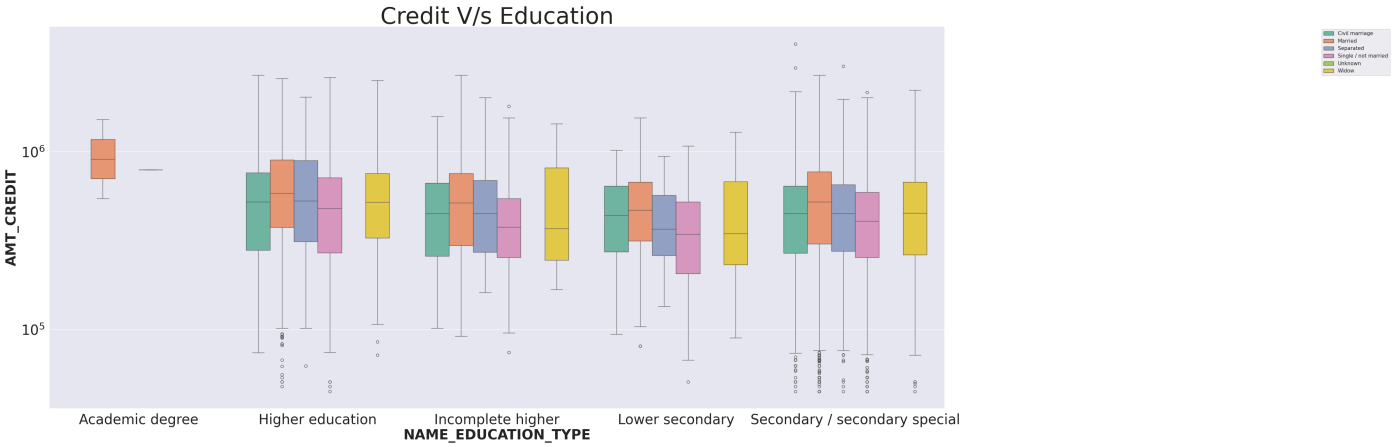

```
plt.figure(figsize=(35,15))              #As the values are too large, it is convinient to use log for better analysis
plt.yscale('log')
plt.xticks(rotation = 90)


sns.boxplot(data =Target1, x='NAME_EDUCATION_TYPE',y='AMT_CREDIT',      #Boxplot w.r.t Data Target 1
            hue ='NAME_FAMILY_STATUS',orient='v',palette='Set2')



plt.legend( bbox_to_anchor=(1.5, 1),loc = 'upper right')              #Adjusting legend position
plt.title('Credit V/s Education',fontsize=50 )
plt.xlabel("NAME_EDUCATION_TYPE",fontsize= 30, fontweight="bold")
plt.ylabel("AMT_CREDIT",fontsize= 30, fontweight="bold")
plt.xticks(rotation=0, fontsize=30)
plt.yticks(rotation=360, fontsize=30)

plt.show()
```

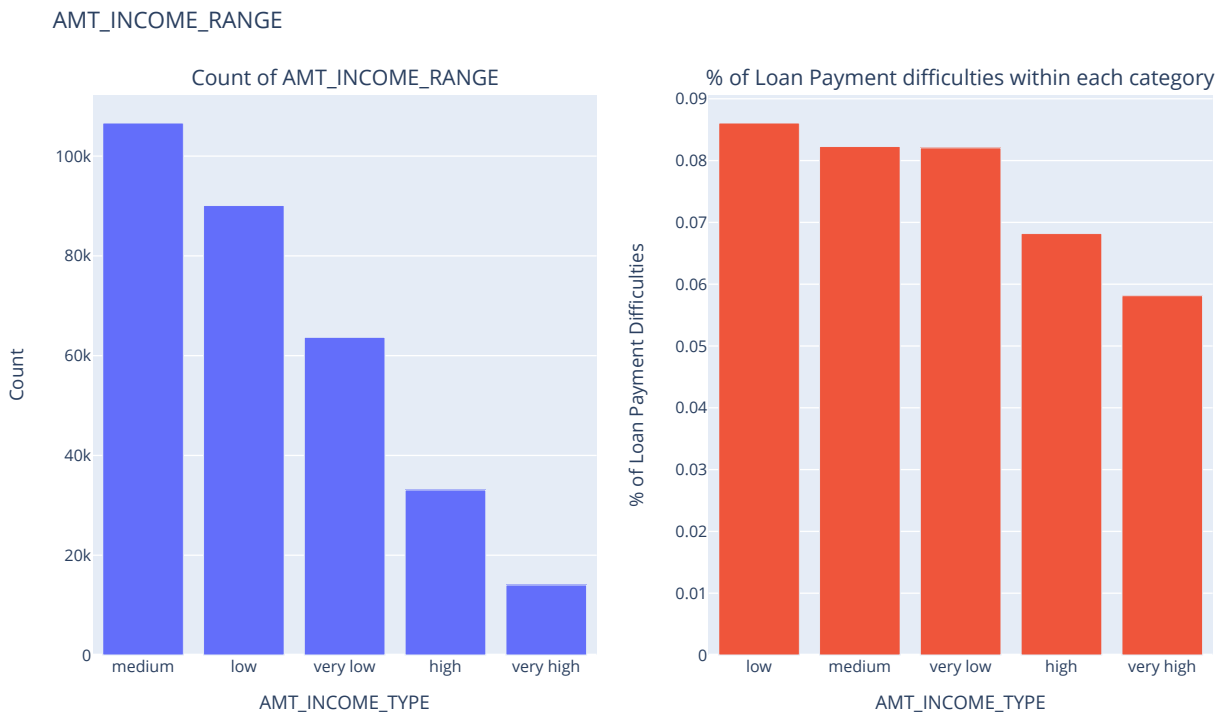


```
def biplot(df,feature,title):
    temp = df[feature].value_counts()

# Calculate the percentage of target=1 per category value

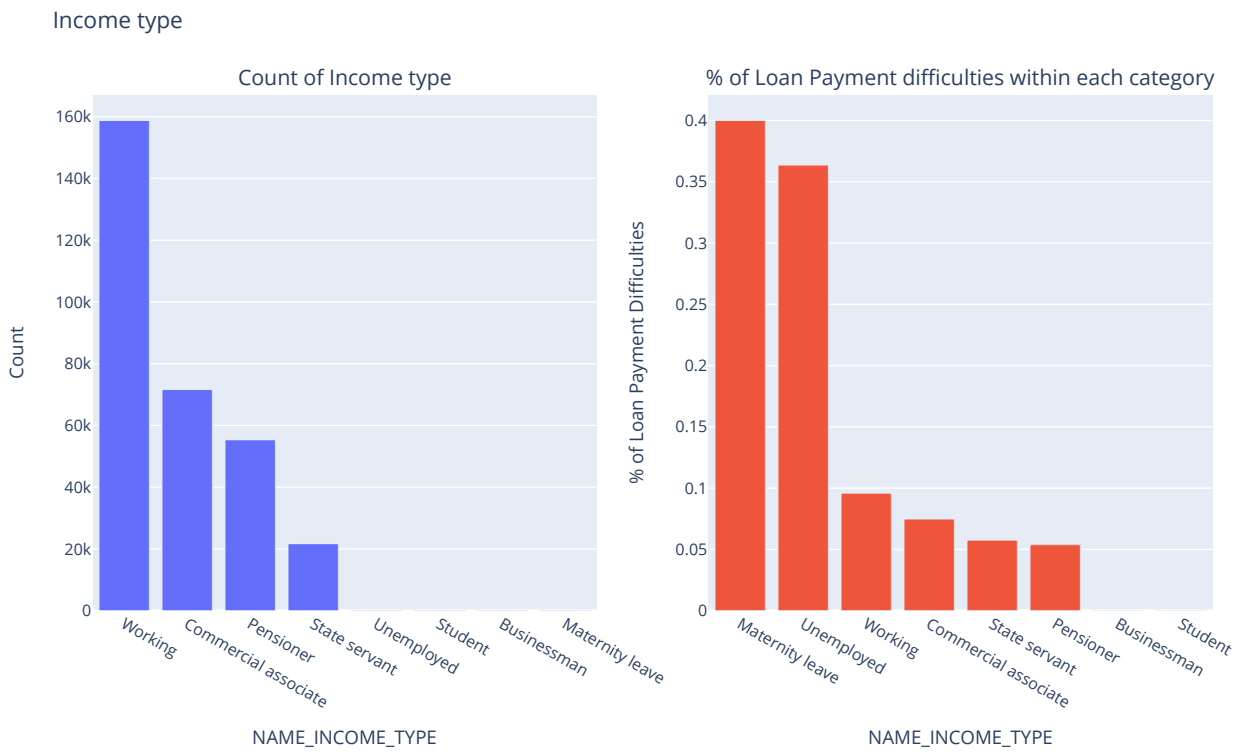
    perc = df[[feature, 'TARGET']].groupby([feature],as_index=False).mean()
    perc.sort_values(by='TARGET', ascending=False, inplace=True)
    fig = make_subplots(rows=1, cols=2,
                        subplot_titles=("Count of "+ title,"% of Loan Payment difficulties within each category"))
    fig.add_trace(go.Bar(x=temp.index, y=temp.values),row=1, col=1)
    fig.add_trace(go.Bar(x=perc[feature].to_list(), y=perc['TARGET'].to_list()),row=1, col=2)
    fig['layout']['xaxis']['title']=feature
    fig['layout']['xaxis2']['title']=feature
    fig['layout']['yaxis']['title']='Count'
    fig['layout']['yaxis2']['title']='% of Loan Payment Difficulties'
    fig.update_layout(height=600, width=1000, title_text=title, showlegend=False)
    fig.show()
```

```
biplot(app ,'AMT_INCOME_TYPE','AMT_INCOME_RANGE')
```

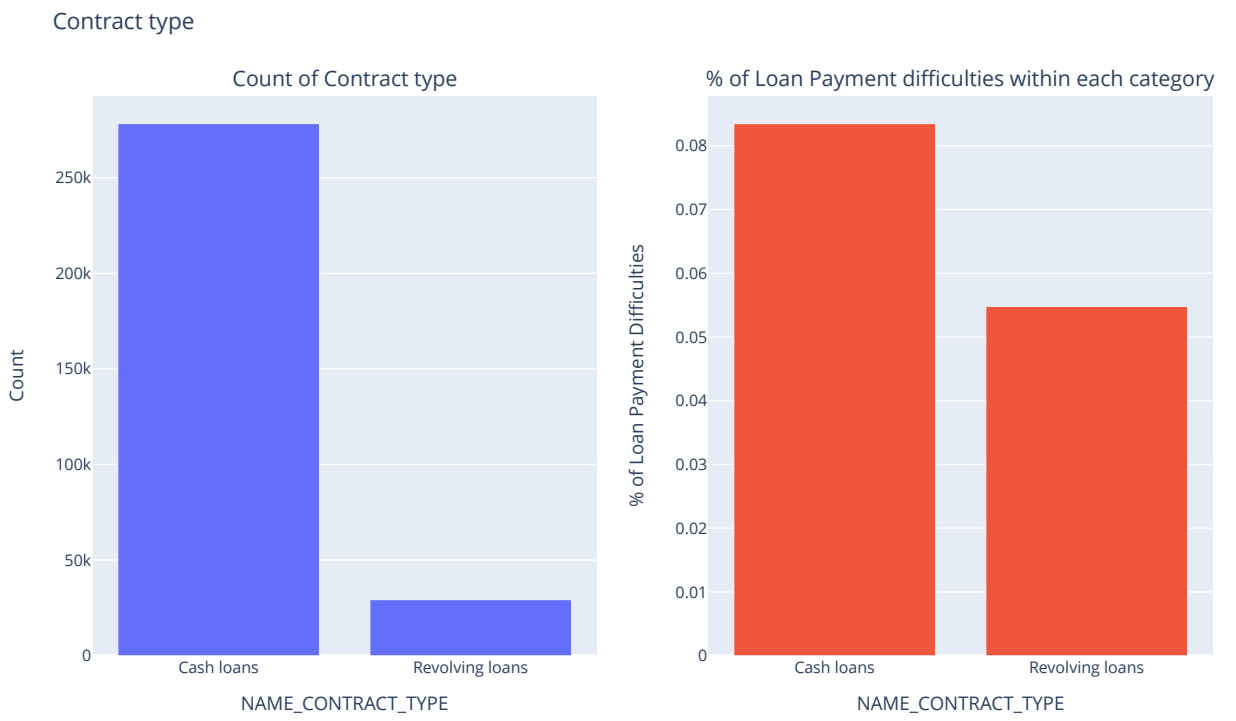



```
Start coding or generate with AI.
```

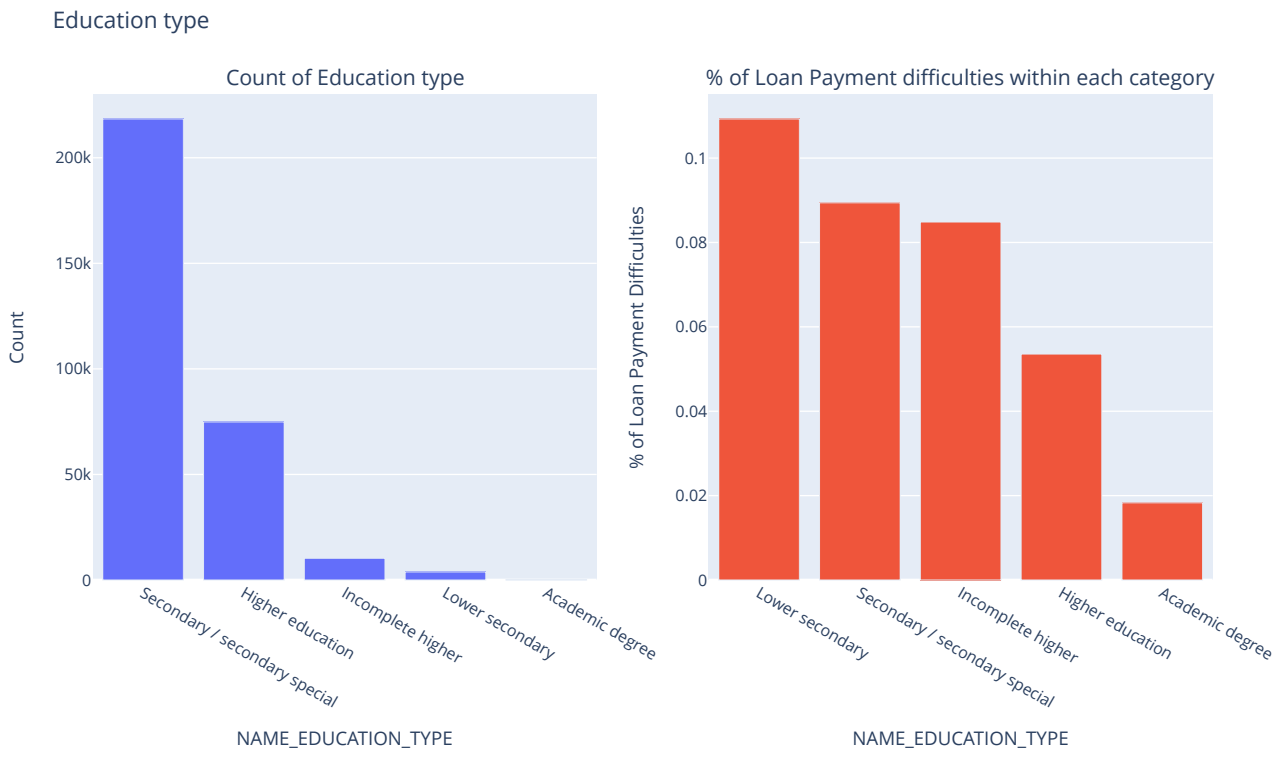
```
biplot(app ,'NAME_INCOME_TYPE','Income type')
```



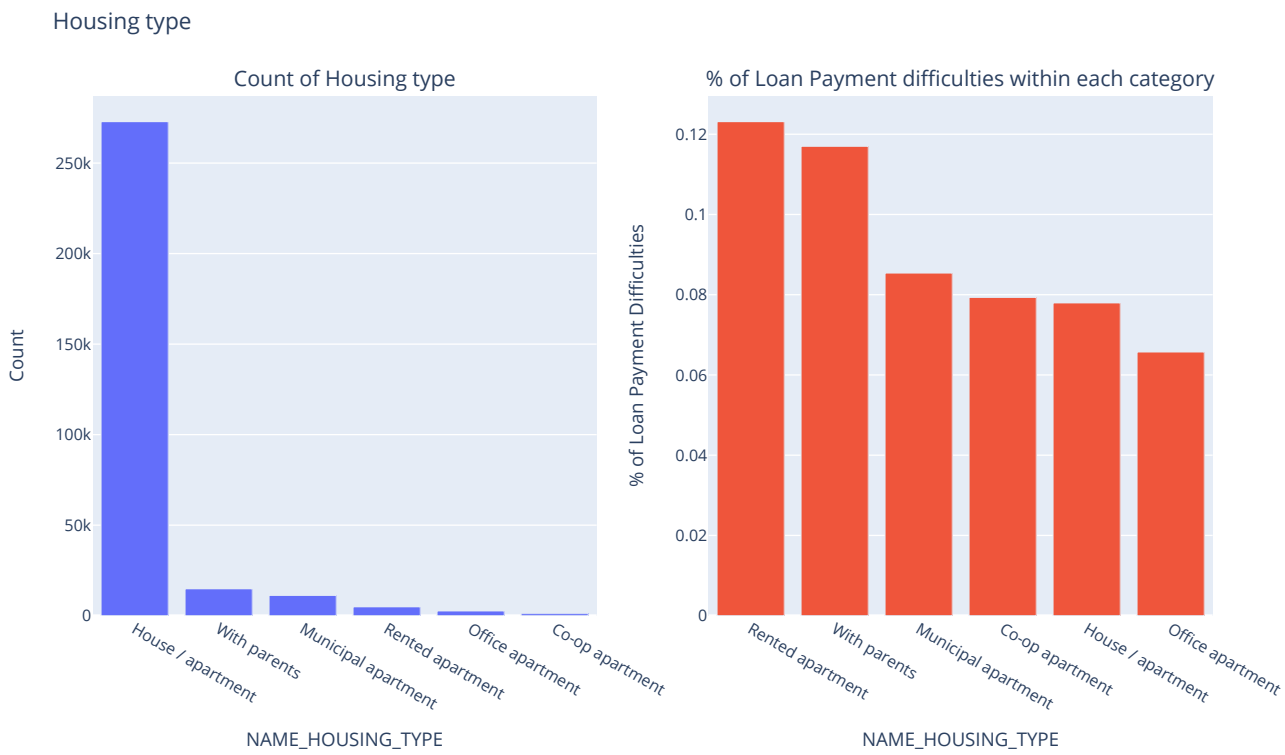

```
biplot(app ,'NAME_CONTRACT_TYPE','Contract type')
```



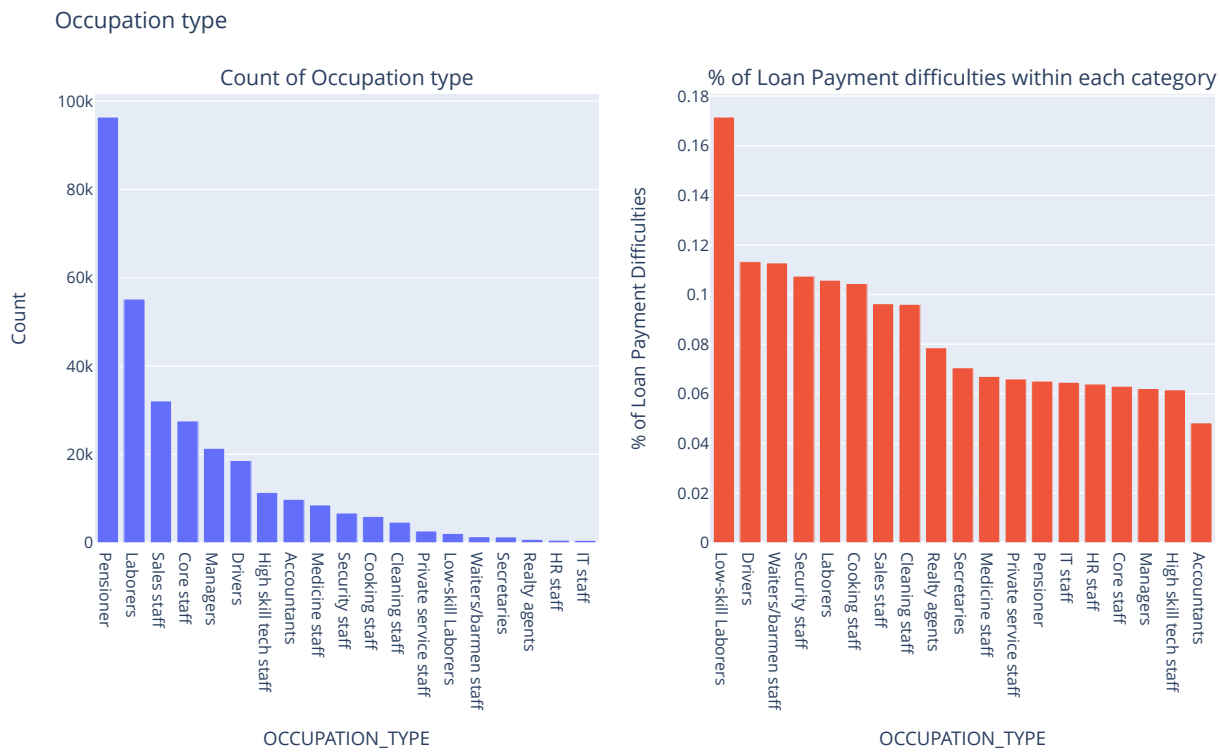

```
biplot(app,'NAME_EDUCATION_TYPE','Education type')
```




```
biplot(app,'NAME_HOUSING_TYPE','Housing type')
```




```
biplot(app,'OCCUPATION_TYPE','Occupation type')
```



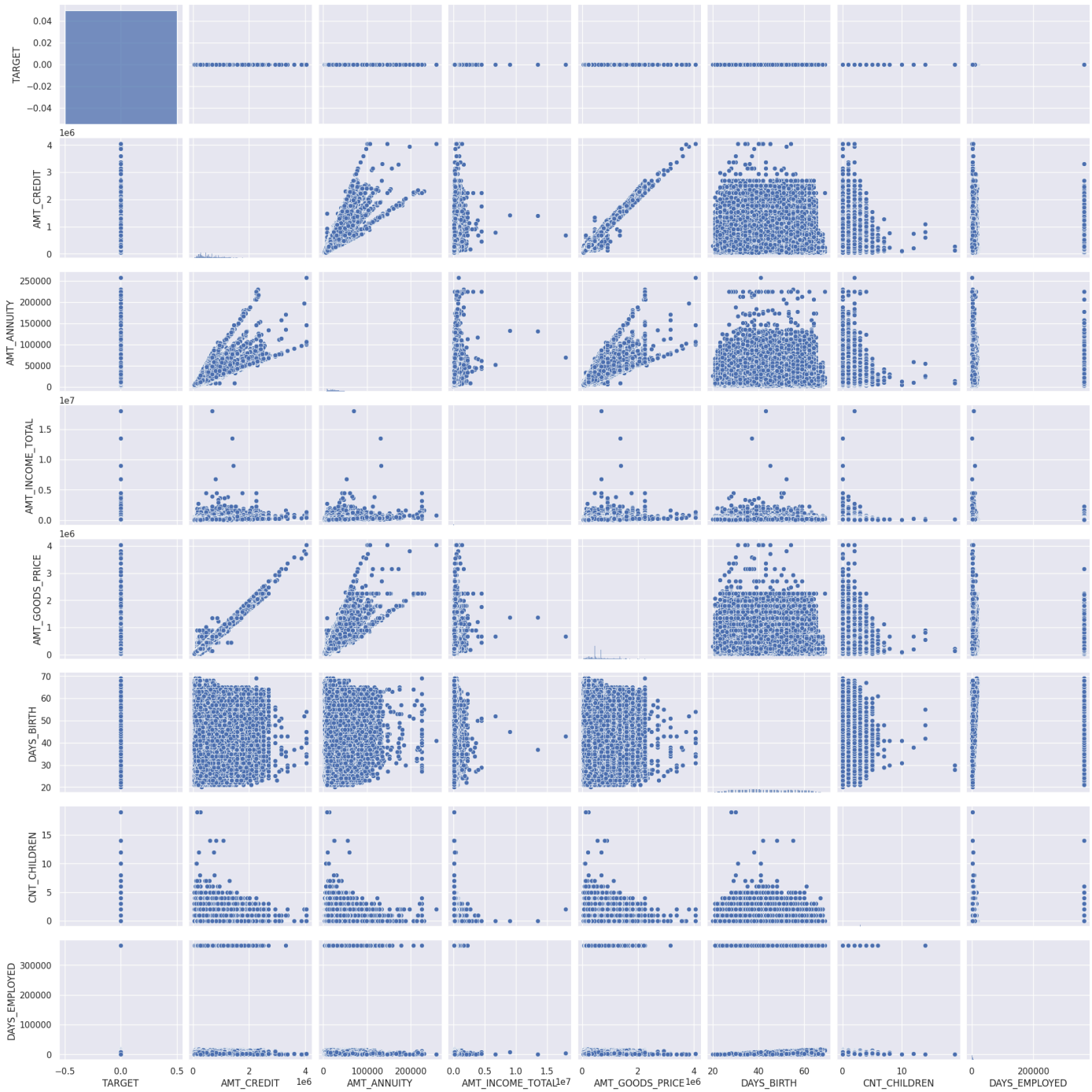

```
table= pd.pivot_table(app, values='TARGET', index=['CODE_GENDER','AMT_INCOME_TYPE'],columns=['NAME_EDUCATION_TYPE'], aggfunc=np.mean)
table
```

	NAME_EDUCATION_TYPE	Academic degree	Higher education	Incomplete higher	Lower secondary	Secondary / secondary special
CODE_GENDER	AMT_INCOME_TYPE					
F	very low	0.000000	0.056068	0.086399	0.080193	0.076778
	low	0.000000	0.049022	0.080075	0.113889	0.079523
	medium	0.000000	0.050254	0.078431	0.096983	0.075692
	high	0.105263	0.041516	0.074313	0.038961	0.070736
	very high	0.076923	0.037289	0.082251	0.066667	0.065930
M	very low	0.000000	0.080411	0.123967	0.125000	0.118066
	low	0.000000	0.073305	0.097778	0.142857	0.123693
	medium	0.000000	0.070086	0.095130	0.150515	0.113466
	high	0.000000	0.055911	0.074627	0.081633	0.093484
	very high	0.000000	0.044080	0.077586	0.064516	0.089939

Next steps: Generate code with table View recommended plots

```
pair = Target0[['TARGET','AMT_CREDIT', 'AMT_ANNUITY', 'AMT_INCOME_TOTAL', 'AMT_GOODS_PRICE', 'DAYS_BIRTH','CNT_CHILDREN','DAYS_EMPLOYED']
sns.pairplot(pair)

plt.show()
```


TARGET
AMT_CREDIT
AMT_ANNUITY
AMT_INCOME_TOTAL
AMT_GOODS_PRICE
DAYS_BIRTH
CNT_CHILDREN
DAYS_EMPLOYED
1e6
1e7

```
pair = Target1[['TARGET','AMT_CREDIT', 'AMT_ANNUITY', 'AMT_INCOME_TOTAL', 'AMT_GOODS_PRICE', 'DAYS_BIRTH','CNT_CHILDREN','DAYS_EMPLOYED']
sns.pairplot(pair)

plt.show()
```