In [1]:

```
!python --version
```

```
Python 3.7.6
```

In [5]:

```
import sklearn
sklearn.__version__
```

Out[5]:

```
'0.22.1'
```

In [6]:

```
import pandas
pandas.__version__
```

Out[6]:

```
'1.0.1'
```

In [1]:

```
import pandas as pd
import numpy as np
```

In [21]:

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

In [92]:

```
train_loan = pd.read_csv('loan-train.csv')
```

In [4]:

```
train_loan.head()
```

Out[4]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001002	Male	No	0	Graduate	No	5849	
1	LP001003	Male	Yes	1	Graduate	No	4583	
2	LP001005	Male	Yes	0	Graduate	Yes	3000	
3	LP001006	Male	Yes	0	Not Graduate	No	2583	
4	LP001008	Male	No	0	Graduate	No	6000	

In [5]:

```
test_loan = pd.read_csv('loan-test.csv')
```

In [6]:

```
test_loan.head()
```

Out[6]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001015	Male	Yes	0	Graduate	No	5720	
1	LP001022	Male	Yes	1	Graduate	No	3076	
2	LP001031	Male	Yes	2	Graduate	No	5000	
3	LP001035	Male	Yes	2	Graduate	No	2340	
4	LP001051	Male	No	0	Not Graduate	No	3276	

In [8]:

```
train_loan.shape
```

Out[8]:

```
(614, 13)
```

In [9]:

```
test_loan.shape
```

Out[9]:

```
(367, 12)
```

In [10]:

```
train_loan.columns
```

Out[10]:

```
Index(['Loan_ID', 'Gender', 'Married', 'Dependents', 'Education',
       'Self_Employed', 'ApplicantIncome', 'CoapplicantIncome', 'LoanAmoun
t',
       'Loan_Amount_Term', 'Credit_History', 'Property_Area', 'Loan_Statu
s'],
      dtype='object')
```

In [11]:

```
train_loan.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 614 entries, 0 to 613
Data columns (total 13 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Loan_ID            614 non-null    object 
 1   Gender             601 non-null    object 
 2   Married            611 non-null    object 
 3   Dependents         599 non-null    object 
 4   Education          614 non-null    object 
 5   Self_Employed      582 non-null    object 
 6   ApplicantIncome    614 non-null    int64  
 7   CoapplicantIncome  614 non-null    float64
 8   LoanAmount         592 non-null    float64
 9   Loan_Amount_Term   600 non-null    float64
 10  Credit_History     564 non-null    float64
 11  Property_Area      614 non-null    object 
 12  Loan_Status        614 non-null    object 
dtypes: float64(4), int64(1), object(8)
memory usage: 62.5+ KB
```

In [12]:

```
train_loan.describe()
```

Out[12]:

	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_History
count	614.000000	614.000000	592.000000	600.00000	564.000000
mean	5403.459283	1621.245798	146.412162	342.00000	0.842199
std	6109.041673	2926.248369	85.587325	65.12041	0.364878
min	150.000000	0.000000	9.000000	12.00000	0.000000
25%	2877.500000	0.000000	100.000000	360.00000	1.000000
50%	3812.500000	1188.500000	128.000000	360.00000	1.000000
75%	5795.000000	2297.250000	168.000000	360.00000	1.000000
max	81000.000000	41667.000000	700.000000	480.00000	1.000000

In [13]:

```
test_loan.describe()
```

Out[13]:

	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_History
count	367.000000	367.000000	362.000000	361.000000	338.000000
mean	4805.599455	1569.577657	136.132597	342.537396	0.825444
std	4910.685399	2334.232099	61.366652	65.156643	0.380150
min	0.000000	0.000000	28.000000	6.000000	0.000000
25%	2864.000000	0.000000	100.250000	360.000000	1.000000
50%	3786.000000	1025.000000	125.000000	360.000000	1.000000
75%	5060.000000	2430.500000	158.000000	360.000000	1.000000
max	72529.000000	24000.000000	550.000000	480.000000	1.000000

In [14]:

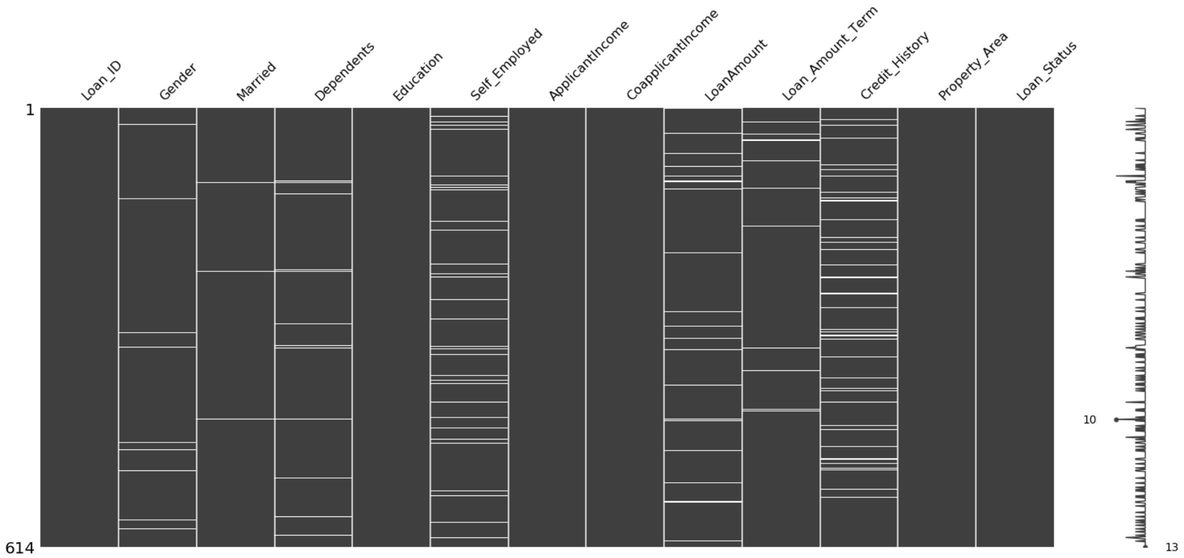
```
import missingno as msno
```

In [15]:

```
msno.matrix(train_loan)
```

Out[15]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4a1ecb88>
```

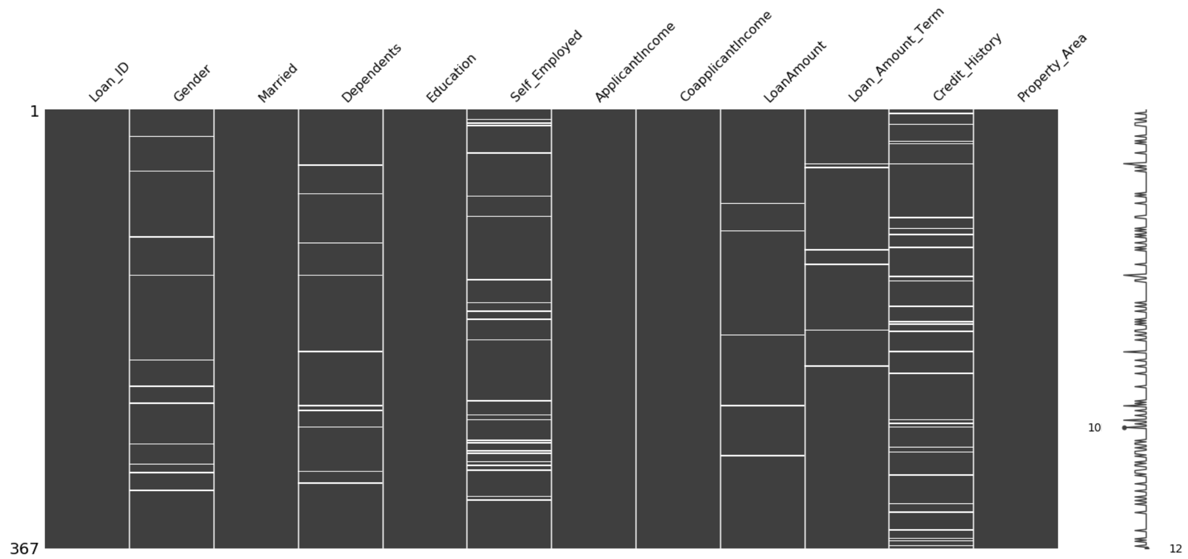


In [16]:

```
msno.matrix(test_loan)
```

Out[16]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4a30df08>
```



In [17]:

```
train_loan.corr()
```

Out[17]:

	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Cre
ApplicantIncome	1.000000	-0.116605	0.570909	-0.045306	
CoapplicantIncome	-0.116605	1.000000	0.188619	-0.059878	
LoanAmount	0.570909	0.188619	1.000000	0.039447	
Loan_Amount_Term	-0.045306	-0.059878	0.039447	1.000000	
Credit_History	-0.014715	-0.002056	-0.008433	0.001470	

In [19]:

```
corr_train = train_loan.corr()
```

In [18]:

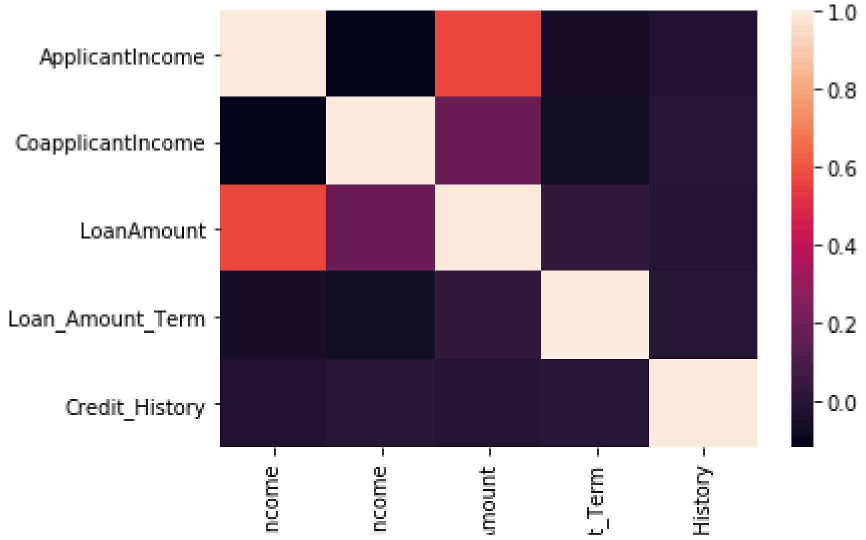
```
import seaborn as sns
```

In [20]:

```
sns.heatmap(corr_train)
```

Out[20]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4abf8848>
```



In [27]:

```
col_names = train_loan.columns
```

In [41]:

```
count = 0 # categorial features count
for i in col_names:
    if train_loan[i].dtype == 'object' :
        count = count + 1
print(count)
```

```
8
```

In [36]:

```
print(train_loan['Loan_ID'].dtype)
```

```
object
```

In [39]:

```
print(train_loan['ApplicantIncome'].dtype)
```

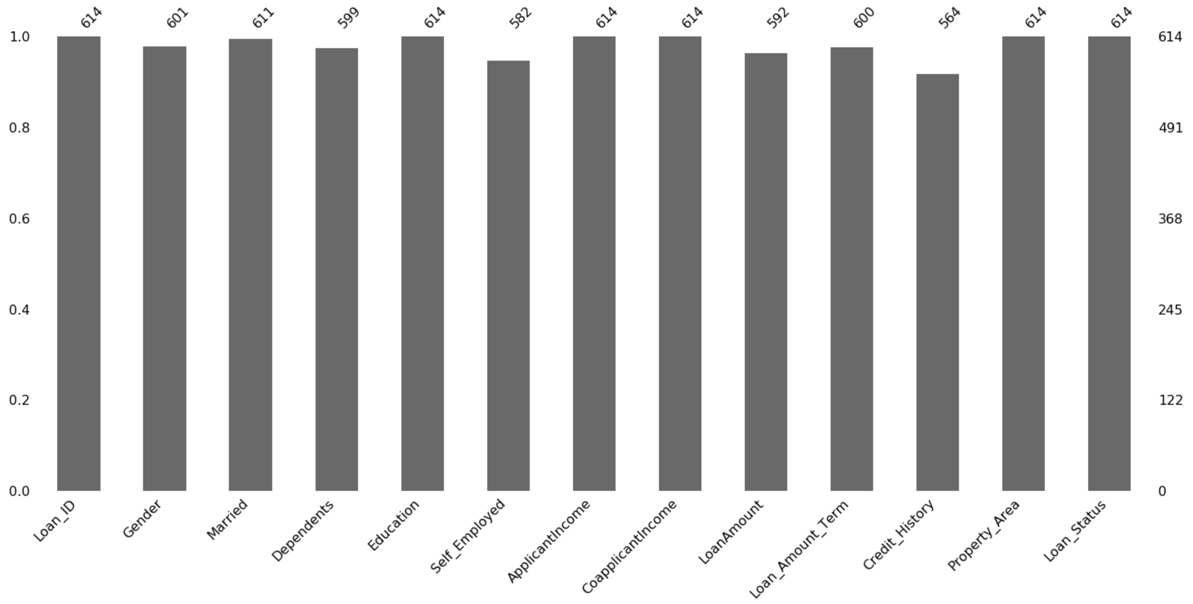
```
int64
```

In [40]:

```
msno.bar(train_loan)
```

Out[40]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4acc9c08>
```



In [38]:

```
train_loan.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 614 entries, 0 to 613
Data columns (total 13 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Loan_ID            614 non-null    object 
 1   Gender             601 non-null    object 
 2   Married            611 non-null    object 
 3   Dependents         599 non-null    object 
 4   Education          614 non-null    object 
 5   Self_Employed      582 non-null    object 
 6   ApplicantIncome    614 non-null    int64  
 7   CoapplicantIncome  614 non-null    float64
 8   LoanAmount         592 non-null    float64
 9   Loan_Amount_Term   600 non-null    float64
 10  Credit_History     564 non-null    float64
 11  Property_Area      614 non-null    object 
 12  Loan_Status        614 non-null    object 
dtypes: float64(4), int64(1), object(8)
memory usage: 62.5+ KB
```

Fill null values

In [63]:

```
train_loan.notnull().sum()
```

Out[63]:

```
Loan_ID              614
Gender               601
Married              611
Dependents           599
Education            614
Self_Employed        582
ApplicantIncome      614
CoapplicantIncome    614
LoanAmount           592
Loan_Amount_Term     600
Credit_History       564
Property_Area        614
Loan_Status          614
dtype: int64
```

In [61]:

```
train_loan['Gender'].isna().sum()
```

Out[61]:

```
13
```

In [47]:

```
test_loan.notnull().count()
```

Out[47]:

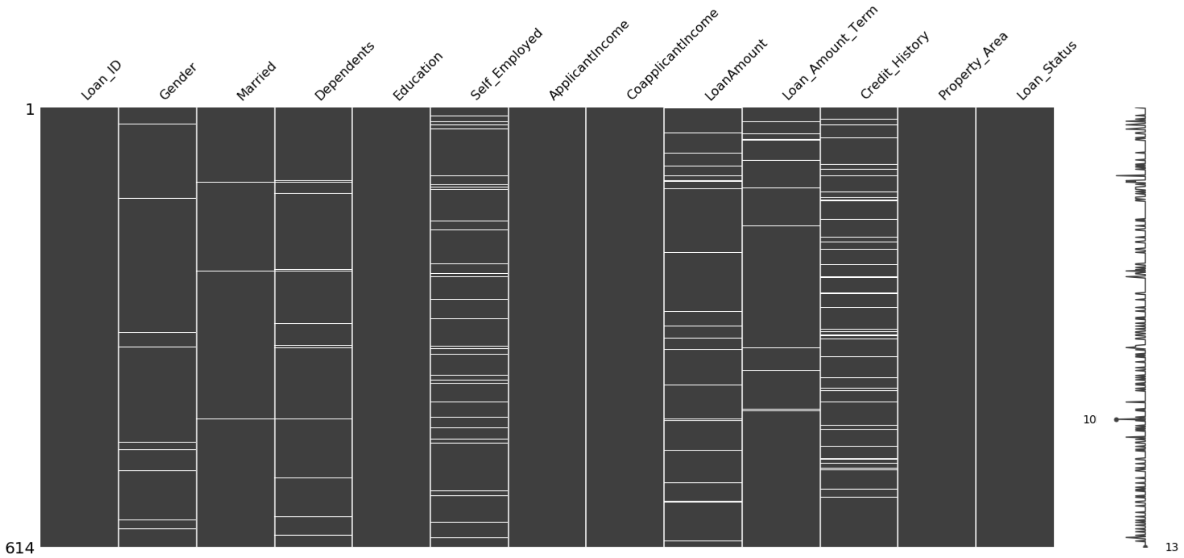
```
Loan_ID              367
Gender               367
Married              367
Dependents           367
Education            367
Self_Employed        367
ApplicantIncome      367
CoapplicantIncome    367
LoanAmount           367
Loan_Amount_Term     367
Credit_History       367
Property_Area        367
dtype: int64
```

In [52]:

```
msno.matrix(train_loan)
```

Out[52]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4ae8ad08>
```



In [56]:

```
train_loan.isnull().any()
```

Out[56]:

```
Loan_ID              False
Gender                True
Married               True
Dependents            True
Education            False
Self_Employed         True
ApplicantIncome      False
CoapplicantIncome    False
LoanAmount            True
Loan_Amount_Term      True
Credit_History        True
Property_Area        False
Loan_Status          False
dtype: bool
```

In [57]:

```
train_loan['Gender'].isnull().any()
```

Out[57]:

```
True
```

In [59]:

```
train_loan['Gender'].isnull().sum()
```

Out[59]:

```
13
```

In [60]:

```
train_loan.isnull().sum()
```

Out[60]:

```
Loan_ID               0
Gender               13
Married               3
Dependents           15
Education             0
Self_Employed        32
ApplicantIncome       0
CoapplicantIncome     0
LoanAmount           22
Loan_Amount_Term     14
Credit_History       50
Property_Area         0
Loan_Status           0
dtype: int64
```

In [64]:

```
test_loan.isnull().sum()
```

Out[64]:

```
Loan_ID               0
Gender               11
Married               0
Dependents           10
Education             0
Self_Employed        23
ApplicantIncome       0
CoapplicantIncome     0
LoanAmount            5
Loan_Amount_Term      6
Credit_History       29
Property_Area         0
dtype: int64
```

In [69]:

```
count = 0 # Null columns count
for i in col_names:
    if train_loan[i].isnull().any() == True :
        count = count + 1
print(count)
```

```
7
```

In [71]:

```
def null_feature(data):
    count= 0
    col_names = data.columns
    for i in col_names:
        if data[i].isnull().any() == True :
            count = count + 1
    print(count)
data = train_loan
null_feature(data)
```

```
7
```

In [73]:

```
null_feature(test_loan)
```

```
6
```

In [96]:

```
def fill_null(data):
    col_names = data.columns
    for i in col_names:
        if data[i].isnull().any() == True :
            data[i] = data[i].fillna(method = 'ffill')
    print(data.isnull().sum())
```

In [97]:

```
fill_null(train_loan)
```

```
Loan_ID              0
Gender               0
Married              0
Dependents           0
Education            0
Self_Employed        0
ApplicantIncome      0
CoapplicantIncome    0
LoanAmount           1
Loan_Amount_Term     0
Credit_History       0
Property_Area        0
Loan_Status          0
dtype: int64
```

In [98]:

```
train_loan.isnull().sum()
```

Out[98]:

```
Loan_ID              0
Gender               0
Married              0
Dependents           0
Education            0
Self_Employed        0
ApplicantIncome      0
CoapplicantIncome    0
LoanAmount           1
Loan_Amount_Term     0
Credit_History       0
Property_Area        0
Loan_Status          0
dtype: int64
```

In [99]:

```
train_loan['LoanAmount'].fillna(train_loan['LoanAmount'].mean(),inplace =True)
```

In [100]:

```
train_loan.isnull().sum()
```

Out[100]:

```
Loan_ID              0
Gender               0
Married              0
Dependents           0
Education            0
Self_Employed        0
ApplicantIncome      0
CoapplicantIncome    0
LoanAmount           0
Loan_Amount_Term     0
Credit_History       0
Property_Area        0
Loan_Status          0
dtype: int64
```

In [94]:

```
null_feature(train_loan)
```

```
7
```

In [93]:

```
train_loan.isnull().sum()
```

Out[93]:

```
Loan_ID               0
Gender               13
Married               3
Dependents           15
Education             0
Self_Employed        32
ApplicantIncome       0
CoapplicantIncome     0
LoanAmount           22
Loan_Amount_Term     14
Credit_History       50
Property_Area         0
Loan_Status           0
dtype: int64
```

In [86]:

```
fill_null(test_loan)
```

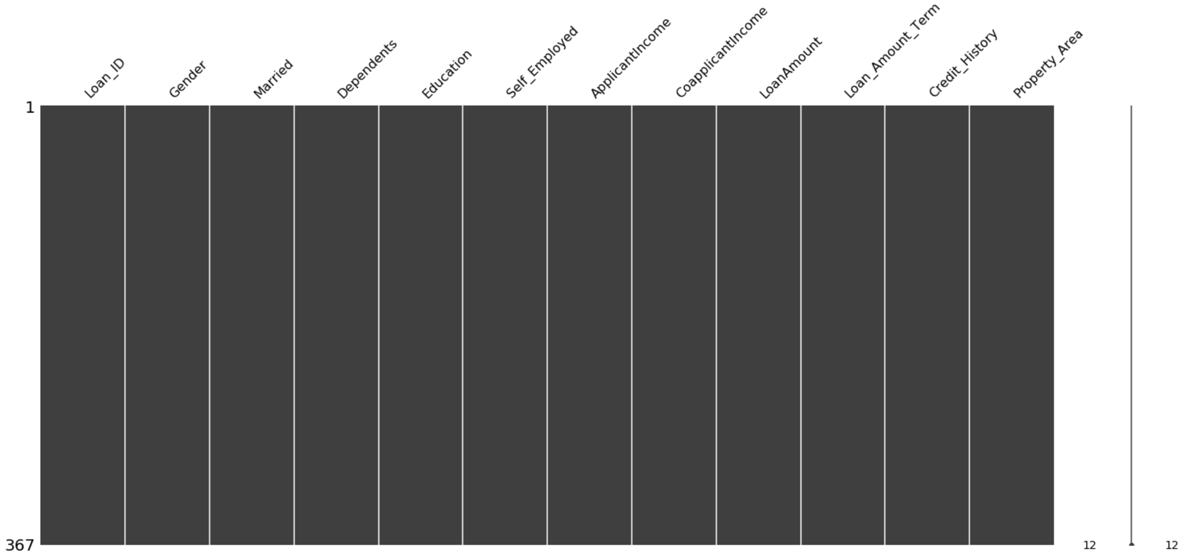
```
Loan_ID              0
Gender               0
Married              0
Dependents           0
Education            0
Self_Employed        0
ApplicantIncome      0
CoapplicantIncome    0
LoanAmount           0
Loan_Amount_Term     0
Credit_History       0
Property_Area        0
dtype: int64
```

In [87]:

```
msno.matrix(test_loan)
```

Out[87]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4c2c8048>
```

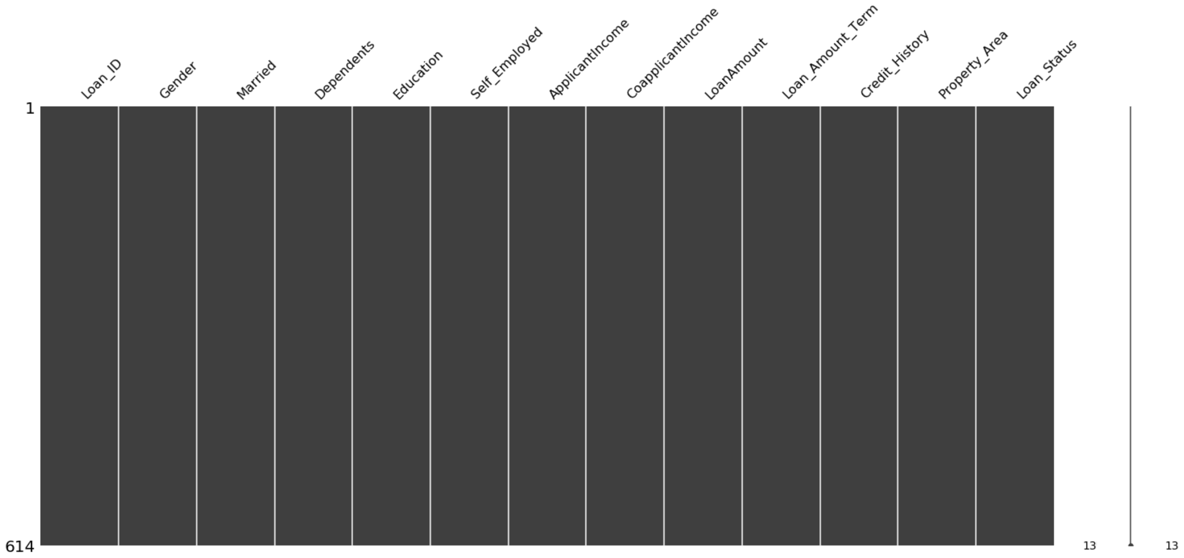


In [101]:

```
msno.matrix(train_loan)
```

Out[101]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4cc77048>
```

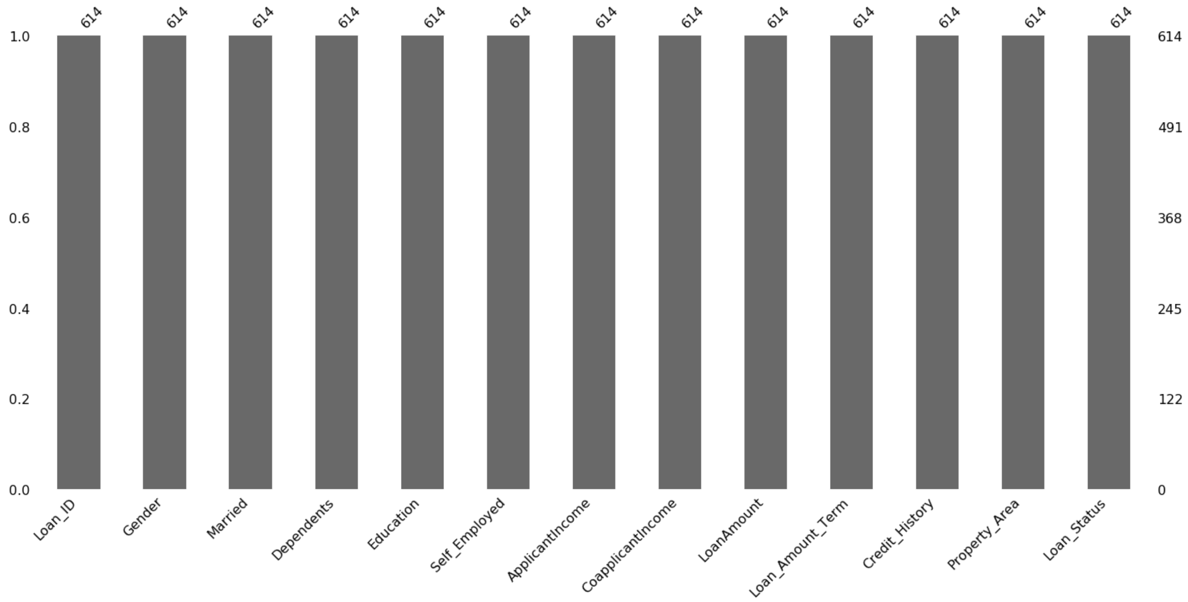


In [102]:

```
msno.bar(train_loan)
```

Out[102]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4ccecd48>
```

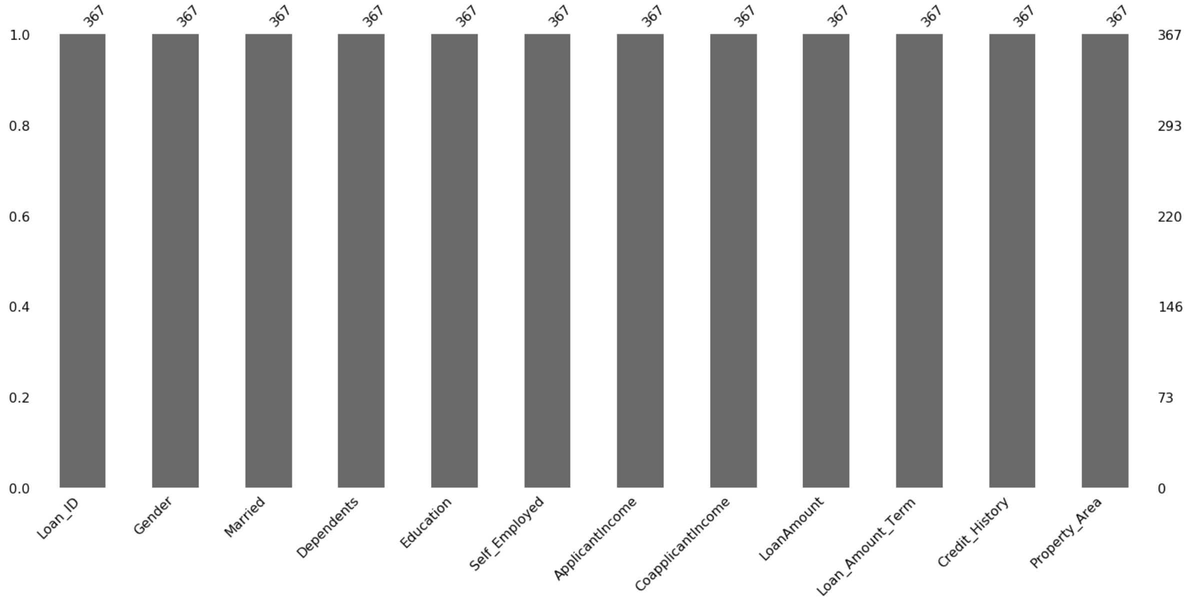


In [103]:

```
msno.bar(test_loan)
```

Out[103]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4ccecb08>
```



In [104]:

```
train_loan['Loan_Status'].unique
```

Out[104]:

```
<bound method Series.unique of 0      Y
1      N
2      Y
3      Y
4      Y
      ..
609    Y
610    Y
611    Y
612    Y
613    N
Name: Loan_Status, Length: 614, dtype: object>
```

In [105]:

```
train_loan['Loan_Status'] = np.where(train_loan['Loan_Status']=='Y',1,0)
```

In [106]:

```
train_loan['Loan_Status']
```

Out[106]:

```
0      1
1      0
2      1
3      1
4      1
      ..
609    1
610    1
611    1
612    1
613    0
Name: Loan_Status, Length: 614, dtype: int32
```

In [113]:

```
test_loan['Loan_Status'] = np.where(test_loan['Loan_Status']=='Y',1,0)
test_loan['Loan_Status']
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
~\anaconda3\lib\site-packages\pandas\core\indexes\base.py in get_loc(self, k
ey, method, tolerance)
   2645             try:
-> 2646                 return self._engine.get_loc(key)
   2647             except KeyError:

pandas\_libs\index.pyx in pandas._libs.index.IndexEngine.get_loc()

pandas\_libs\index.pyx in pandas._libs.index.IndexEngine.get_loc()

pandas\_libs\hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHa
shTable.get_item()

pandas\_libs\hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHa
shTable.get_item()

KeyError: 'Loan_Status'

During handling of the above exception, another exception occurred:

KeyError                                  Traceback (most recent call last)
<ipython-input-113-fdfff870b8fe> in <module>
----> 1 test_loan['Loan_Status'] = np.where(test_loan['Loan_Status']=='Y',1,
0)
      2 test_loan['Loan_Status']

~\anaconda3\lib\site-packages\pandas\core\frame.py in __getitem__(self, key)
   2798             if self.columns.nlevels > 1:
   2799                 return self._getitem_multilevel(key)
-> 2800             indexer = self.columns.get_loc(key)
   2801             if is_integer(indexer):
   2802                 indexer = [indexer]

~\anaconda3\lib\site-packages\pandas\core\indexes\base.py in get_loc(self, k
ey, method, tolerance)
   2646                 return self._engine.get_loc(key)
   2647             except KeyError:
-> 2648                 return self._engine.get_loc(self._maybe_cast_indexer
(key))
   2649         indexer = self.get_indexer([key], method=method, tolerance=t
olerance)
   2650         if indexer.ndim > 1 or indexer.size > 1:

pandas\_libs\index.pyx in pandas._libs.index.IndexEngine.get_loc()

pandas\_libs\index.pyx in pandas._libs.index.IndexEngine.get_loc()

pandas\_libs\hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHa
shTable.get_item()

pandas\_libs\hashtable_class_helper.pxi in pandas._libs.hashtable.PyObjectHa
shTable.get_item()
```

```
KeyError: 'Loan_Status'
```

In [107]:

```
train_loan.Gender = train_loan.Gender.replace({"Male":1,"Female":0})
```

In [108]:

```
train_loan.Gender
```

Out[108]:

```
0      1
1      1
2      1
3      1
4      1
      ..
609    0
610    1
611    1
612    1
613    0
Name: Gender, Length: 614, dtype: int64
```

In [112]:

```
train_loan.Married = train_loan.Married.replace({"Yes": 1, "No" : 0})
test_loan.Married = test_loan.Married.replace({"Yes": 1, "No" : 0})

train_loan.Self_Employed = train_loan.Self_Employed.replace({"Yes": 1, "No" : 0})
test_loan.Self_Employed = test_loan.Self_Employed.replace({"Yes": 1, "No" : 0})

test_loan.Gender = test_loan.Gender.replace({"Male":1,"Female":0})
```

```
~\anaconda3\lib\site-packages\pandas\core\internals\managers.py in replace
_list(self, src_list, dest_list, inplace, regex)
    611                 return _compare_or_regex_search(values, s, regex)
    612 
--> 613         masks = [comp(s, regex) for i, s in enumerate(src_list)]
    614 
    615         result_blocks = []

~\anaconda3\lib\site-packages\pandas\core\internals\managers.py in <listco
mp>(.0)
    611                 return _compare_or_regex_search(values, s, regex)
    612 
--> 613         masks = [comp(s, regex) for i, s in enumerate(src_list)]
    614 
    615         result_blocks = []

~\anaconda3\lib\site-packages\pandas\core\internals\managers.py in comp(s,
regex)
    609                     maybe_convert_objects(values), s.asm8, regex
```

In [114]:

```
test_loan.head()
```

Out[114]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001015	1	1	0	Graduate	0	5720	
1	LP001022	1	1	1	Graduate	0	3076	
2	LP001031	1	1	2	Graduate	0	5000	
3	LP001035	1	1	2	Graduate	0	2340	
4	LP001051	1	0	0	Not Graduate	0	3276	

In [115]:

```
train_loan.head()
```

Out[115]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001002	1	0	0	Graduate	0	5849	
1	LP001003	1	1	1	Graduate	0	4583	
2	LP001005	1	1	0	Graduate	1	3000	
3	LP001006	1	1	0	Not Graduate	0	2583	
4	LP001008	1	0	0	Graduate	0	6000	

In [118]:

```
test_loan["Gender"].unique()
```

Out[118]:

```
array([1, 0], dtype=int64)
```

In [119]:

```
train_loan["Gender"].unique()
```

Out[119]:

```
array([1, 0], dtype=int64)
```

In [116]:

```
train_loan.shape,test_loan.shape
```

Out[116]:

```
((614, 13), (367, 12))
```

In [121]:

```
from sklearn.preprocessing import LabelEncoder
col_feature = ['Property_Area','Education', 'Dependents']
le = LabelEncoder()
for col in col_feature:
    train_loan[col] = le.fit_transform(train_loan[col])
    test_loan[col] = le.fit_transform(test_loan[col])
```

In [122]:

```
train_loan.head()
```

Out[122]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001002	1	0	0	0	0	5849	
1	LP001003	1	1	1	0	0	4583	
2	LP001005	1	1	0	0	1	3000	
3	LP001006	1	1	0	1	0	2583	
4	LP001008	1	0	0	0	0	6000	

In [123]:

```
test_loan.head()
```

Out[123]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001015	1	1	0	0	0	5720	
1	LP001022	1	1	1	0	0	3076	
2	LP001031	1	1	2	0	0	5000	
3	LP001035	1	1	2	0	0	2340	
4	LP001051	1	0	0	1	0	3276	

In [125]:

```
new_train_corr = train_loan.corr()
new_train_corr
```

Out[125]:

	Gender	Married	Dependents	Education	Self_Employed	ApplicantInco
Gender	1.000000	0.371532	0.164475	0.049480	0.011676	0.046
Married	0.371532	1.000000	0.333841	0.014097	-0.000257	0.049
Dependents	0.164475	0.333841	1.000000	0.054909	0.044505	0.115
Education	0.049480	0.014097	0.054909	1.000000	-0.008734	-0.140
Self_Employed	0.011676	-0.000257	0.044505	-0.008734	1.000000	0.122
ApplicantIncome	0.046230	0.049052	0.115036	-0.140760	0.122728	1.000
CoapplicantIncome	0.086991	0.077760	0.026683	-0.062290	-0.021807	-0.116
LoanAmount	0.100652	0.132982	0.141705	-0.151960	0.099377	0.533
Loan_Amount_Term	-0.080085	-0.099170	-0.085453	-0.080674	-0.035485	-0.042
Credit_History	-0.008501	0.007358	-0.070299	-0.084637	-0.010803	-0.020
Property_Area	-0.019854	0.004415	0.005131	-0.065243	-0.037106	-0.009
Loan_Status	0.012213	0.089072	-0.003361	-0.085884	0.009035	-0.004

In [126]:

```
new_test_corr = test_loan.corr()
new_test_corr
```

Out[126]:

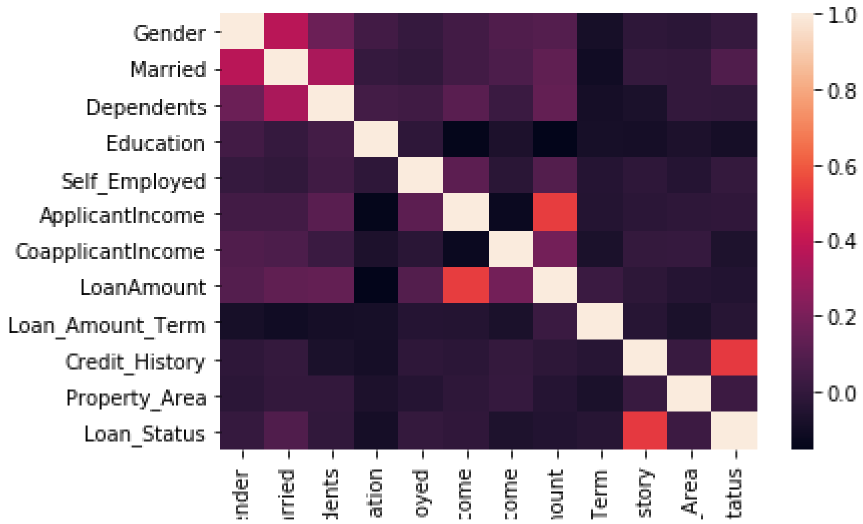
	Gender	Married	Dependents	Education	Self_Employed	ApplicantInco
Gender	1.000000	0.282828	0.114665	0.022330	0.063326	0.0767
Married	0.282828	1.000000	0.349000	0.049443	0.034823	0.0512
Dependents	0.114665	0.349000	1.000000	0.107078	-0.026532	0.1361
Education	0.022330	0.049443	0.107078	1.000000	-0.014850	-0.1363
Self_Employed	0.063326	0.034823	-0.026532	-0.014850	1.000000	0.0748
ApplicantIncome	0.076782	0.051265	0.136139	-0.136369	0.074877	1.0000
CoapplicantIncome	0.075561	0.032548	-0.055212	-0.057318	-0.032769	-0.1103
LoanAmount	0.090628	0.180853	0.112094	-0.144555	0.073917	0.4965
Loan_Amount_Term	-0.054391	0.034637	-0.082404	0.049807	-0.021512	0.0254
Credit_History	0.042770	0.026262	-0.035999	-0.035509	0.055642	0.0537
Property_Area	-0.008124	0.010921	0.062643	-0.028660	-0.097807	0.0394

In [127]:

```
sns.heatmap(new_train_corr)
```

Out[127]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4d9c2c08>
```

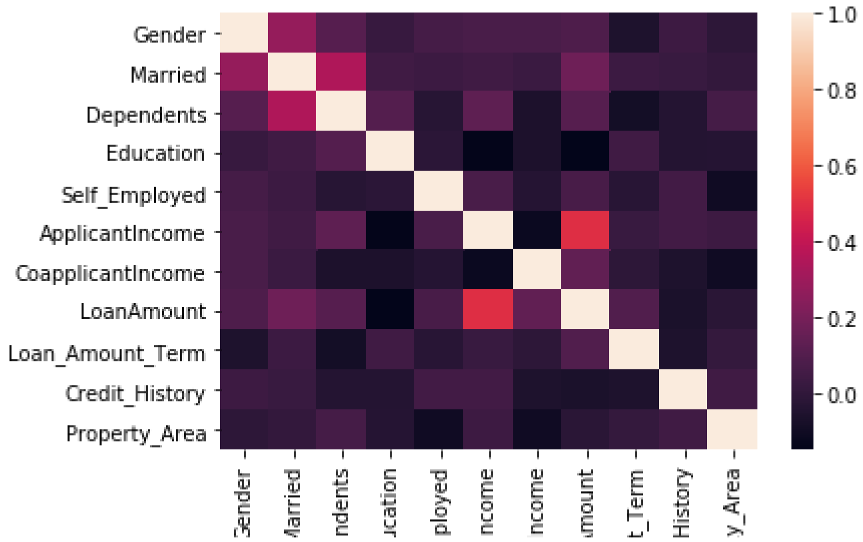


In [128]:

```
sns.heatmap(new_test_corr)
```

Out[128]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x24c4d61b6c8>
```

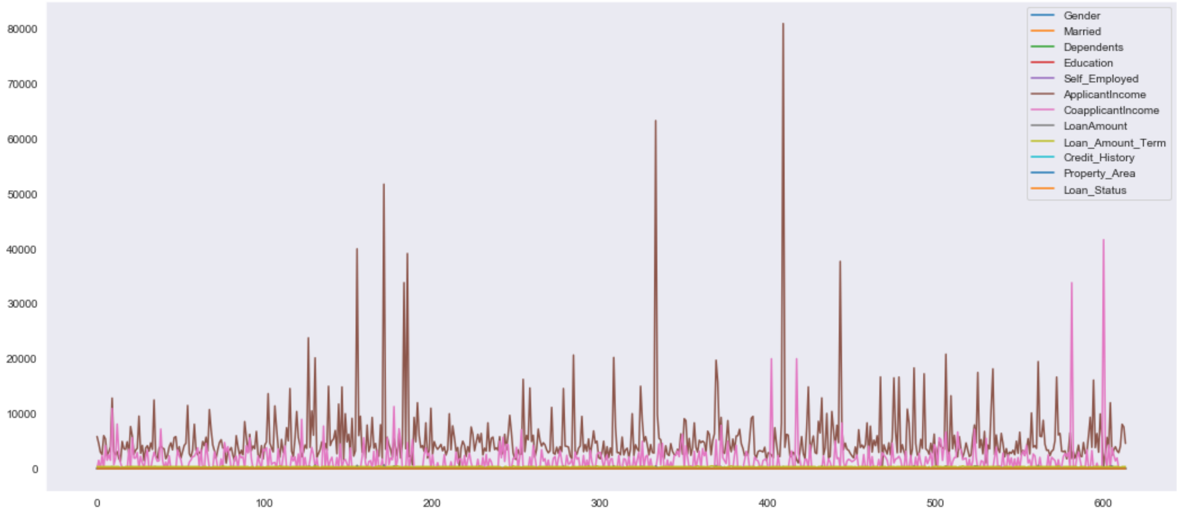


In [129]:

```
import matplotlib.pyplot as plt
%matplotlib inline
```

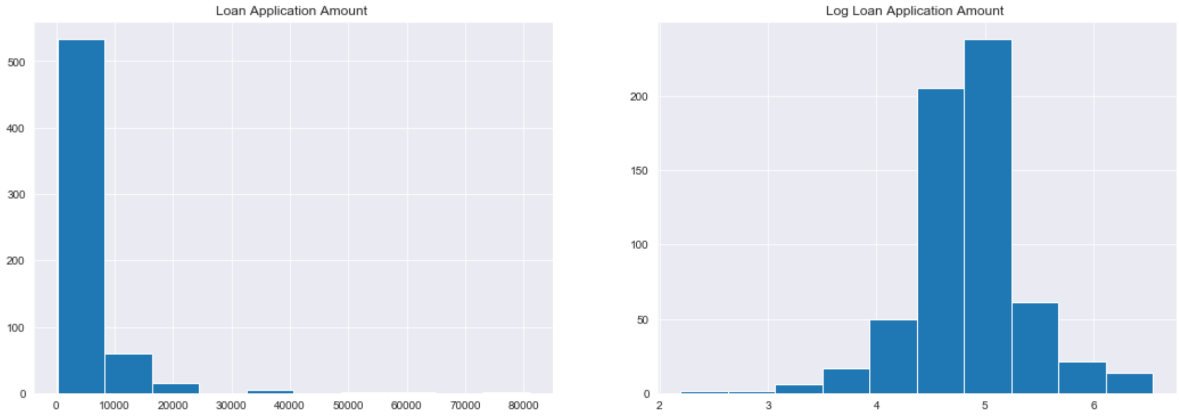
In [130]:

```
sns.set_style('dark')
train_loan.plot(figsize= (18,8))
plt.show()
```



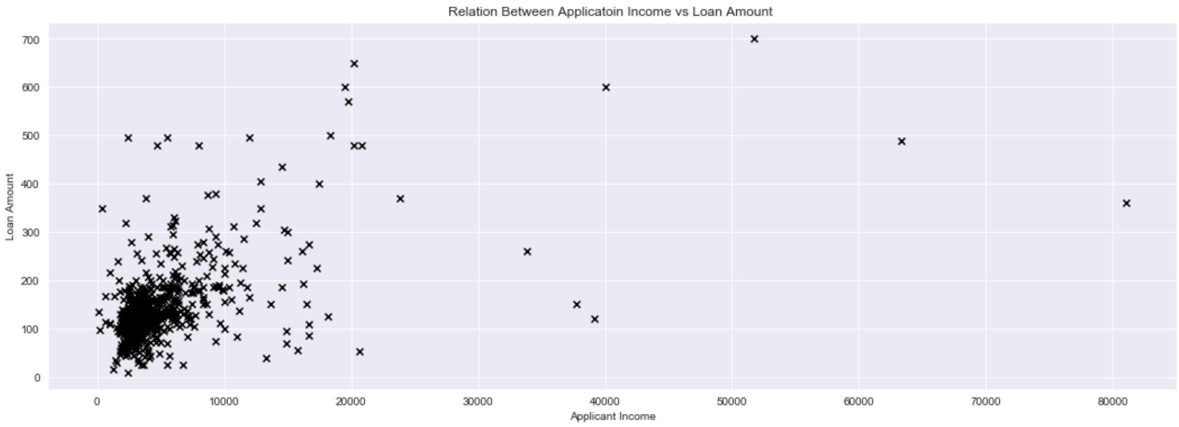
In [131]:

```
plt.figure(figsize=(18, 6))
plt.subplot(1, 2, 1)


train_loan['ApplicantIncome'].hist(bins=10)
plt.title("Loan Application Amount ")

plt.subplot(1, 2, 2)
plt.grid()
plt.hist(np.log(train_loan['LoanAmount']))
plt.title("Log Loan Application Amount ")

plt.show()
```



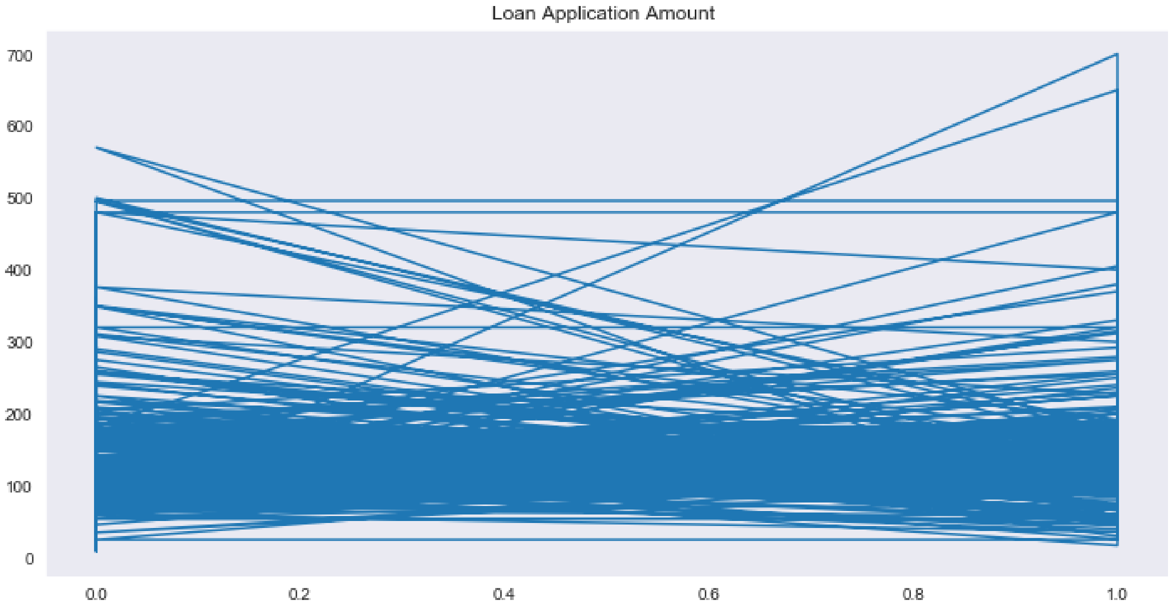
In [132]:

```
plt.figure(figsize=(18, 6))
plt.title("Relation Between Applicatoin Income vs Loan Amount ")

plt.grid()
plt.scatter(train_loan['ApplicantIncome'] , train_loan['LoanAmount'], c='k', marker='x')
plt.xlabel("Applicant Income")
plt.ylabel("Loan Amount")
plt.show()
```



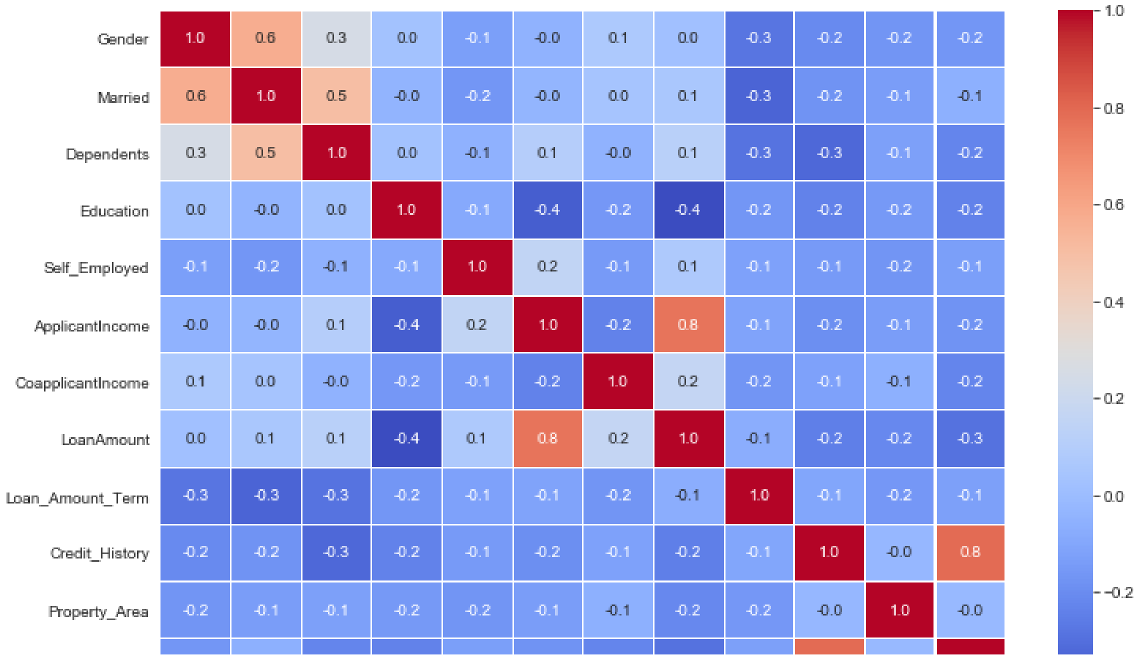
In [133]:

```
plt.figure(figsize=(12, 6))
plt.plot(train_loan['Loan_Status'], train_loan['LoanAmount'])
plt.title("Loan Application Amount ")
plt.show()
```



In [135]:

```
plt.figure(figsize=(12,8))
sns.heatmap(new_train_corr.corr(), cmap='coolwarm', annot=True, fmt='.1f', linewidths=.1)
plt.show()
```



In [136]:

```
from sklearn.linear_model import LogisticRegression
```

In [138]:

```
from sklearn.metrics import accuracy_score,classification_report
```

In [154]:

```
logistic_model = LogisticRegression()
```

In [146]:

```
train_features = ['Credit_History', 'Education', 'Gender']

x_train = train_loan[train_features].values
y_train = train_loan['Loan_Status'].values

x_test = test_loan[train_features].values
```

In [150]:

```
x_train.shape
```

Out[150]:

```
(614, 3)
```

In [151]:

```
y_train.shape,x_test.shape
```

Out[151]:

```
((614,), (367, 3))
```

In [155]:

```
logistic_model.fit(x_train,y_train)
```

Out[155]:

```
LogisticRegression(C=1.0, class_weight=None, dual=False, fit_intercept=True,
                   intercept_scaling=1, l1_ratio=None, max_iter=100,
                   multi_class='auto', n_jobs=None, penalty='l2',
                   random_state=None, solver='lbfgs', tol=0.0001, verbose=0,
                   warm_start=False)
```

In [156]:

```
predicted = logistic_model.predict(x_test)
```

In [157]:

```
score = logistic_model.score(x_train,y_train)
score
```

Out[157]:

```
0.8061889250814332
```

In [162]:

```
logistic_model.coef_
```

Out[162]:

```
array([[ 2.91106078, -0.28742646,  0.12535932]])
```

In [165]:

```
logistic_model.intercept_
```

Out[165]:

```
array([-1.62744319])
```

In [166]:

```
score = logistic_model.score(x_train, y_train)
print('accuracy_score overall :', score)
print('accuracy_score percent :', round(score*100,2))
```

```
accuracy_score overall : 0.8061889250814332
accuracy_score percent : 80.62
```

In [171]:

```
x1_train = train_loan.drop(['Loan_Status'],axis = 1)
```

In [172]:

```
x1_train.shape
```

Out[172]:

```
(614, 12)
```

In [173]:

```
x1_train.head()
```

Out[173]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coapp
0	LP001002	1	0	0	0	0	5849	
1	LP001003	1	1	1	0	0	4583	
2	LP001005	1	1	0	0	1	3000	
3	LP001006	1	1	0	1	0	2583	
4	LP001008	1	0	0	0	0	6000	

In [175]:

```
y1_train = train_loan['Loan_Status']
```

In [177]:

```
y1_train.shape
```

Out[177]:

```
(614,)
```

In [179]:

```
test_loan.shape
```

Out[179]:

```
(367, 12)
```

In [185]:

```
from sklearn.ensemble import RandomForestRegressor
```

In [186]:

```
rfc = RandomForestRegressor()
```

In [188]:

```
rfc.fit(x_train,y_train)
```

Out[188]:

```
RandomForestRegressor(bootstrap=True, ccp_alpha=0.0, criterion='mse',
                      max_depth=None, max_features='auto', max_leaf_nodes=No
ne,
                      max_samples=None, min_impurity_decrease=0.0,
                      min_impurity_split=None, min_samples_leaf=1,
                      min_samples_split=2, min_weight_fraction_leaf=0.0,
                      n_estimators=100, n_jobs=None, oob_score=False,
                      random_state=None, verbose=0, warm_start=False)
```

In [189]:

```
rfc.score(x_train,y_train)
```

Out[189]:

```
0.2799027116322771
```