## Importing Libraries

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

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

## Importing & Loading the dataset

```
df = pd.read_csv('/content/drive/MyDrive/dataset_ads/train.csv')
df.head()
```

| | Loan_ID | Gender | Married | Dependents | Education | Self_Employed | ApplicantIncome |
|---|---|---|---|---|---|---|---|
| **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 |

Next steps: View recommended plots

## Dataset Info:

```
df.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
```

```
df.describe()
```

| | ApplicantIncome | CoapplicantIncome | LoanAmount | Loan_Amount_Term | Credit_Histo |
|---|---|---|---|---|---|
| **count** | 614.000000 | 614.000000 | 592.000000 | 600.00000 | 564.0000 |
| **mean** | 5403.459283 | 1621.245798 | 146.412162 | 342.00000 | 0.8421 |
| **std** | 6109.041673 | 2926.248369 | 85.587325 | 65.12041 | 0.3648 |
| **min** | 150.000000 | 0.000000 | 9.000000 | 12.00000 | 0.0000 |
| **25%** | 2877.500000 | 0.000000 | 100.000000 | 360.00000 | 1.0000 |
| **50%** | 3812.500000 | 1188.500000 | 128.000000 | 360.00000 | 1.0000 |
| **75%** | 5795.000000 | 2297.250000 | 168.000000 | 360.00000 | 1.0000 |
| **max** | 81000.000000 | 41667.000000 | 700.000000 | 480.00000 | 1.0000 |

### Dataset Shape:

```
df.shape
```

```
(614, 13)
```

## Data Cleaning

### Checking the Missing Values

```
df.isnull().sum()
```

```
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
```

```
from sklearn.impute import SimpleImputer
imputer=SimpleImputer(missing_values=np.NaN,strategy='mean')
df.LoanAmount=imputer.fit_transform(df['LoanAmount'].values.reshape(-1,1))[:,0]
df.LoanAmount
```

```
0      146.412162
1      128.000000
2       66.000000
3      120.000000
4      141.000000
          ...
609     71.000000
610     40.000000
611    253.000000
612    187.000000
613    133.000000
Name: LoanAmount, Length: 614, dtype: float64
```

```
imputer=SimpleImputer(missing_values=np.NaN,strategy='median')
df.Credit_History=imputer.fit_transform(df['Credit_History'].values.reshape(-1,1))[:,0]
df.Credit_History
```

```
0      1.0
1      1.0
2      1.0
3      1.0
4      1.0
      ...
609    1.0
610    1.0
611    1.0
612    1.0
613    0.0
Name: Credit_History, Length: 614, dtype: float64
```

```
imputer=SimpleImputer(missing_values=np.NaN,strategy='most_frequent')
df.Gender=imputer.fit_transform(df['Gender'].values.reshape(-1,1))[:,0]
df.Gender
```

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

```
imputer=SimpleImputer(missing_values=np.NaN,strategy='most_frequent')
df.Self_Employed=imputer.fit_transform(df['Self_Employed'].values.reshape(-1,1))[:,0]
df.Self_Employed
```

```
0       No
1       No
2      Yes
3       No
4       No
      ...
609     No
610     No
611     No
612     No
613    Yes
Name: Self_Employed, Length: 614, dtype: object
```

```
df.isnull().sum()
```

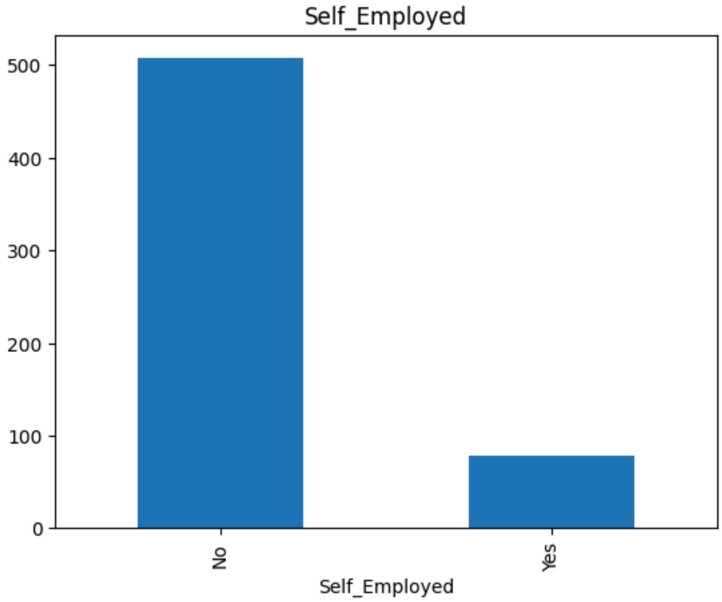
```
Loan_ID               0
Gender                0
Married               3
Dependents           15
Education             0
Self_Employed         0
ApplicantIncome       0
CoapplicantIncome     0
LoanAmount            0
Loan_Amount_Term     14
Credit_History        0
Property_Area         0
Loan_Status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

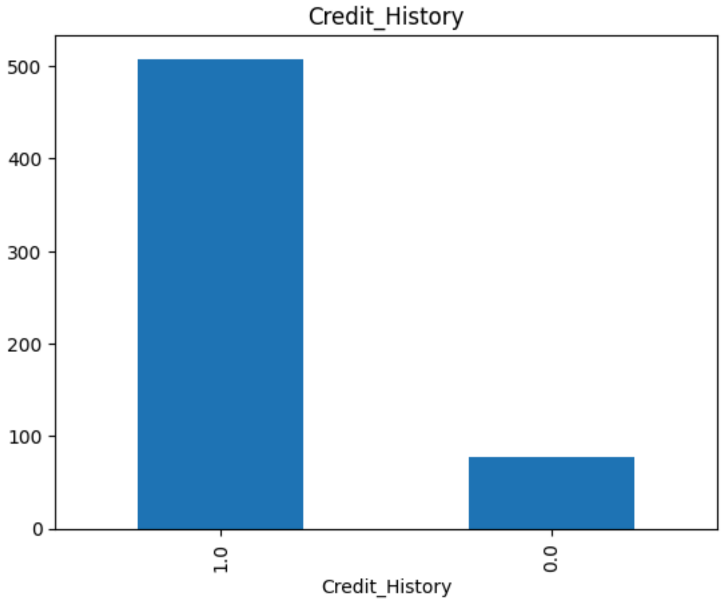
```
df.dropna(inplace=True)
```

```
df.isnull().sum()
```

```
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
```

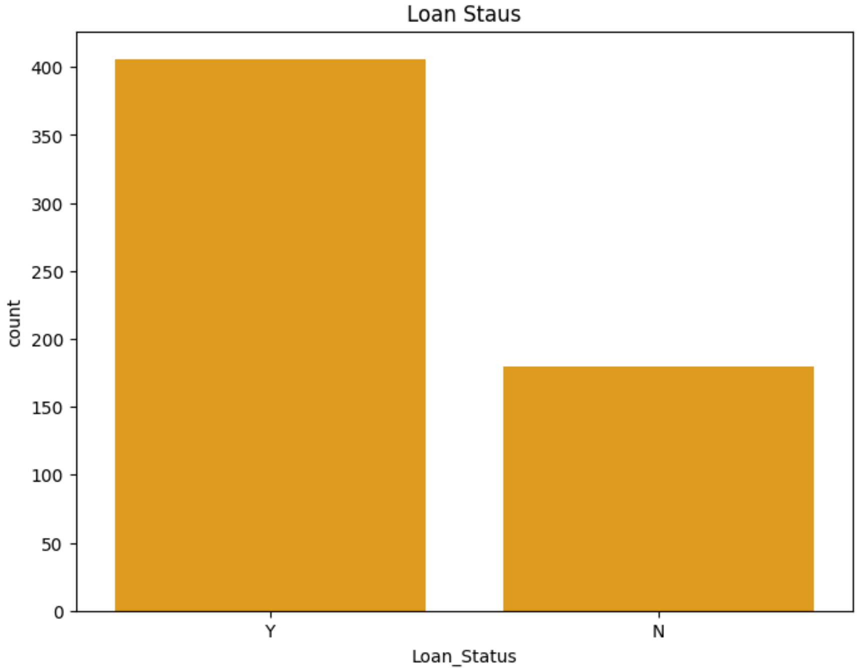
```
df['Gender'].value_counts().plot.bar(title= 'Gender')
plt.show()
df['Married'].value_counts().plot.bar(title= 'Married')
plt.show()
df['Self_Employed'].value_counts().plot.bar(title= 'Self_Employed')
plt.show()
df['Credit_History'].value_counts().plot.bar(title= 'Credit_History')
plt.show()
```


Self_Employed


Credit_History

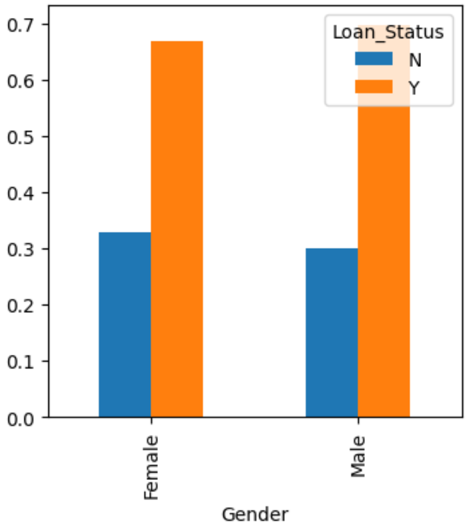
```
plt.figure(figsize=(8,6))
plt.title("Loan Staus")
sns.countplot(x=df['Loan_Status'],color='orange')
```

```
<Axes: title={'center': 'Loan Staus'}, xlabel='Loan_Status', ylabel='count'>
```



```
Gender=pd.crosstab(df['Gender'],df['Loan_Status'])
Gender.div(Gender.sum(1).astype(float), axis=0).plot(kind="bar", figsize=(4,4))
```

```
<Axes: xlabel='Gender'>
```



```
df=df.drop(['Loan_ID'],axis=1)
```

```
df.shape
```

```
(586, 12)
```

```
from sklearn.preprocessing import LabelEncoder
labelencoder=LabelEncoder()
df['Loan_Status']=labelencoder.fit_transform(df['Loan_Status'])
print(df['Loan_Status'])
```

```
0      1
1      0
2      1
3      1
4      1
      ..
609    1
610    1
611    1
612    1
613    0
Name: Loan_Status, Length: 586, dtype: int64
```

```
df['Loan_Status'].value_counts()
```

```
Loan_Status
1    406
0    180
Name: count, dtype: int64
```

```
labelencoder=LabelEncoder()
df['Gender']=labelencoder.fit_transform(df['Gender'])
print(df['Gender'])
df['Gender'].value_counts()
```

```
0      1
1      1
2      1
3      1
4      1
      ..
609    0
610    1
611    1
612    1
613    0
Name: Gender, Length: 586, dtype: int64
Gender
1    480
0    106
Name: count, dtype: int64
```

```
labelencoder=LabelEncoder()
df['Married']=labelencoder.fit_transform(df['Married'])
print(df['Married'].unique())
df['Married'].value_counts()
```

```
[0 1]
Married
1    382
0    204
Name: count, dtype: int64
```

```
labelencoder=LabelEncoder()
df['Dependents']=labelencoder.fit_transform(df['Dependents'])
print(df['Dependents'].unique())
df['Dependents'].value_counts()
```

```
[0 1 2 3]
Dependents
0    334
1    101
2    101
3     50
Name: count, dtype: int64
```

```
labelencoder=LabelEncoder()
df['Education']=labelencoder.fit_transform(df['Education'])
print(df['Education'].unique())
df['Education'].value_counts()
```

```
[0 1]
```

```
Education
0    462
1    124
Name: count, dtype: int64
```

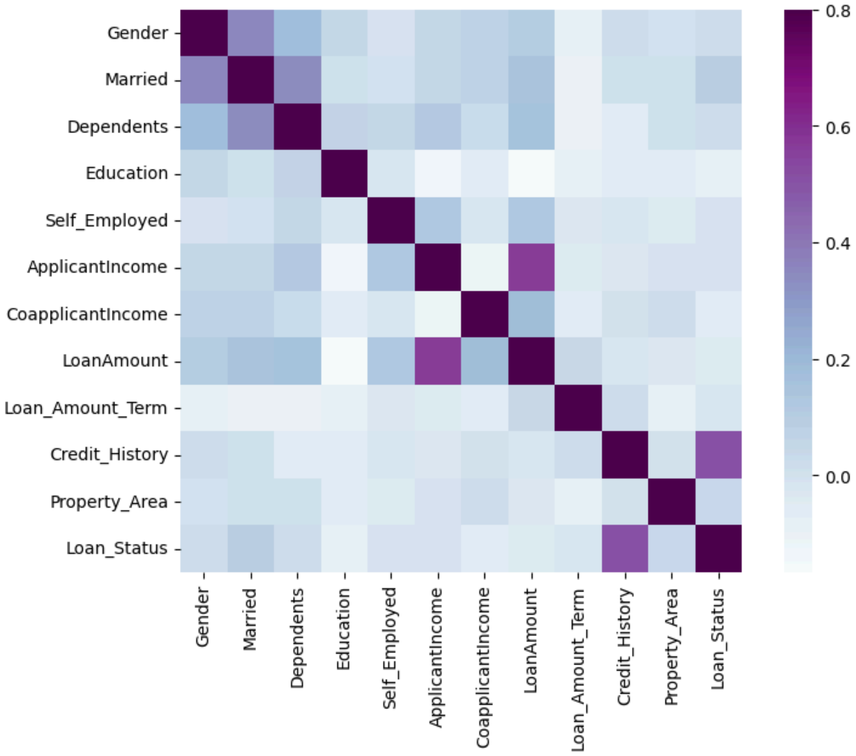
```
labelencoder=LabelEncoder()
df['Self_Employed']=labelencoder.fit_transform(df['Self_Employed'])
print(df['Self_Employed'].unique())
df['Self_Employed'].value_counts()
```

```
[0 1]
Self_Employed
0    507
1     79
Name: count, dtype: int64
```

```
labelencoder=LabelEncoder()
df['Property_Area']=labelencoder.fit_transform(df['Property_Area'])
print(df['Property_Area'].unique())
df['Property_Area'].value_counts()
```

```
[2 0 1]
Property_Area
1    225
2    188
0    173
Name: count, dtype: int64
```

```
matrix = df.corr()
ax = plt.subplots(figsize=(9, 6))
sns.heatmap(matrix, vmax=.8, square=True, cmap="BuPu");
```



```
df['LoanAmount'].value_counts()
```

```
LoanAmount
146.412162    20
120.000000    18
110.000000    16
100.000000    14
187.000000    12
              ..
72.000000      1
240.000000     1
214.000000     1
59.000000      1
253.000000     1
Name: count, Length: 204, dtype: int64
```

```
df['Loan_Amount_Term'].value_counts()
```

```
Loan_Amount_Term
360.0    502
180.0     43
300.0     13
480.0     13
84.0       4
120.0      3
240.0      3
60.0       2
36.0       2
12.0       1
Name: count, dtype: int64
```

```
df['Credit_History'].value_counts()
```

```
Credit_History
1.0    508
0.0     78
Name: count, dtype: int64
```

```
df.head()
```

| | Gender | Married | Dependents | Education | Self_Employed | ApplicantIncome | Coapplican |
|---|---|---|---|---|---|---|---|
| **0** | 1 | 0 | 0 | 0 | 0 | 5849 | |
| **1** | 1 | 1 | 1 | 0 | 0 | 4583 | |
| **2** | 1 | 1 | 0 | 0 | 1 | 3000 | |
| **3** | 1 | 1 | 0 | 1 | 0 | 2583 | |
| **4** | 1 | 0 | 0 | 0 | 0 | 6000 | |

Next steps: View recommended plots

## Importing Packages for Classification algorithms

```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn import metrics
```

## Splitting the data into Train and Test set

```
X = df.iloc[1:542,1:11].values
y = df.iloc[1:542,11].values
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3,random_state=0)
```

## Logistic Regression (LR)

```
model = LogisticRegression()
model.fit(X_train,y_train)

lr_prediction = model.predict(X_test)
print('Logistic Regression accuracy = ', metrics.accuracy_score(lr_prediction,y_test))
```

```
Logistic Regression accuracy =  0.7730061349693251
```

```
print("y_predicted",lr_prediction)
print("y_test",y_test)
```

```
y_predicted [1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 1 1 1 1 0 0 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 0 1 1 1 0 1 1 1 1 1 1 1
 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 0 1 1 0 1
 1 1 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 0 1 1 0 1 1 1 0 0 0 1 1 1 1
 1 0 1 1 1 0 1 1 1 1 1 1 1 1 1]
y_test [0 1 0 1 0 1 1 0 0 0 1 1 1 1 1 1 1 1 0 1 0 1 1 1 1 1 0 0 0 1 1 1 1 1 1 1 0
 0 1 1 0 0 0 0 1 0 1 1 1 1 1 1 1 1 1 1 0 1 1 0 0 1 1 1 1 1 1 0 1 1 1 1 1 1
 0 1 0 1 0 1 1 0 0 1 1 1 0 1 1 0 1 1 1 1 0 1 0 0 0 0 0 1 1 1 1 0 0 1 1 0 1
 1 1 1 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 1 1 0 1 0 1 1 0 1 0 0 0 0 0 1 0 1 1
 0 0 0 0 0 0 1 1 1 1 1 0 1 1 1]
```