```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sb
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn import metrics
from sklearn.svm import SVC
from imblearn.over_sampling import RandomOverSampler

import warnings
warnings.filterwarnings('ignore')
```

```
df = pd.read_csv('/content/loan_data.csv')
df.head()
```

	Gender	Married	ApplicantIncome	LoanAmount	Loan_Status
0	Male	Yes	4583	128000.0	N
1	Male	Yes	3000	66000.0	Y
2	Male	Yes	2583	120000.0	Y
3	Male	No	6000	141000.0	Y
4	Male	Yes	5417	267000.0	Y

```
df.shape
```

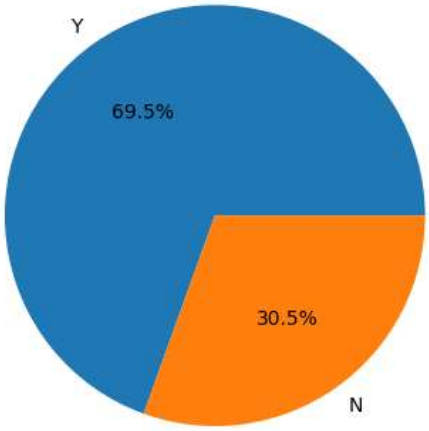
```
(577, 5)
```

```
df.info()
```

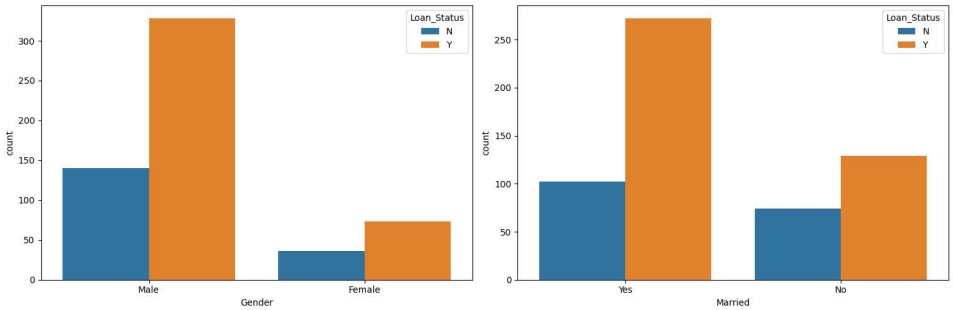
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 577 entries, 0 to 576
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Gender           577 non-null    object
 1   Married          577 non-null    object
 2   ApplicantIncome  577 non-null    int64
 3   LoanAmount       577 non-null    float64
 4   Loan_Status      577 non-null    object
dtypes: float64(1), int64(1), object(3)
memory usage: 22.7+ KB
```

```
df.describe()
```

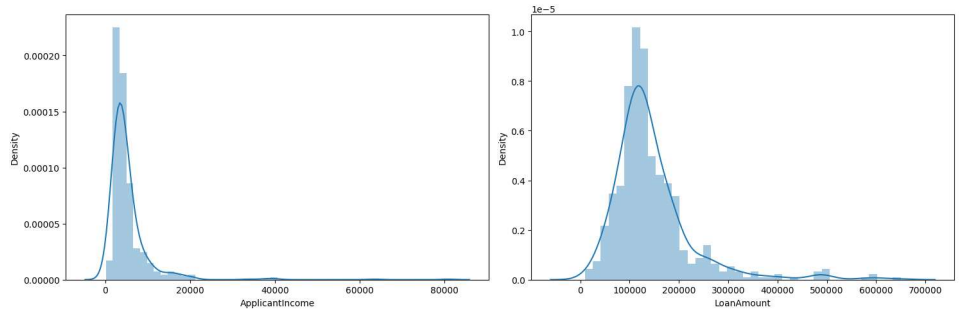
```
temp = df['Loan_Status'].value_counts()
plt.pie(temp.values,
        labels=temp.index,
        autopct='%1.1f%%')
plt.show()
```



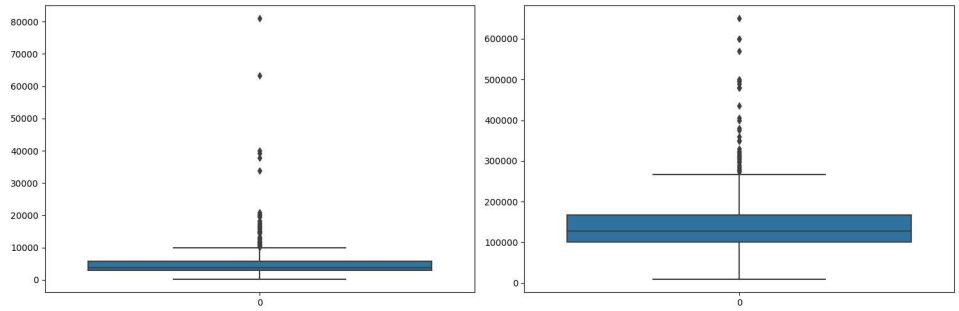

```
plt.subplots(figsize=(15, 5))
for i, col in enumerate(['Gender', 'Married']):
    plt.subplot(1, 2, i+1)
    sb.countplot(data=df, x=col, hue='Loan_Status')
plt.tight_layout()
plt.show()
```




```
plt.subplots(figsize=(15, 5))
for i, col in enumerate(['ApplicantIncome', 'LoanAmount']):
    plt.subplot(1, 2, i+1)
    sb.distplot(df[col])
plt.tight_layout()
plt.show()
```




```
plt.subplots(figsize=(15, 5))
for i, col in enumerate(['ApplicantIncome', 'LoanAmount']):
    plt.subplot(1, 2, i+1)
    sb.boxplot(df[col])
plt.tight_layout()
plt.show()
```



```
df = df[df['ApplicantIncome'] < 25000]
df = df[df['LoanAmount'] < 400000]
```

```
df.groupby('Gender').mean()['LoanAmount']
```

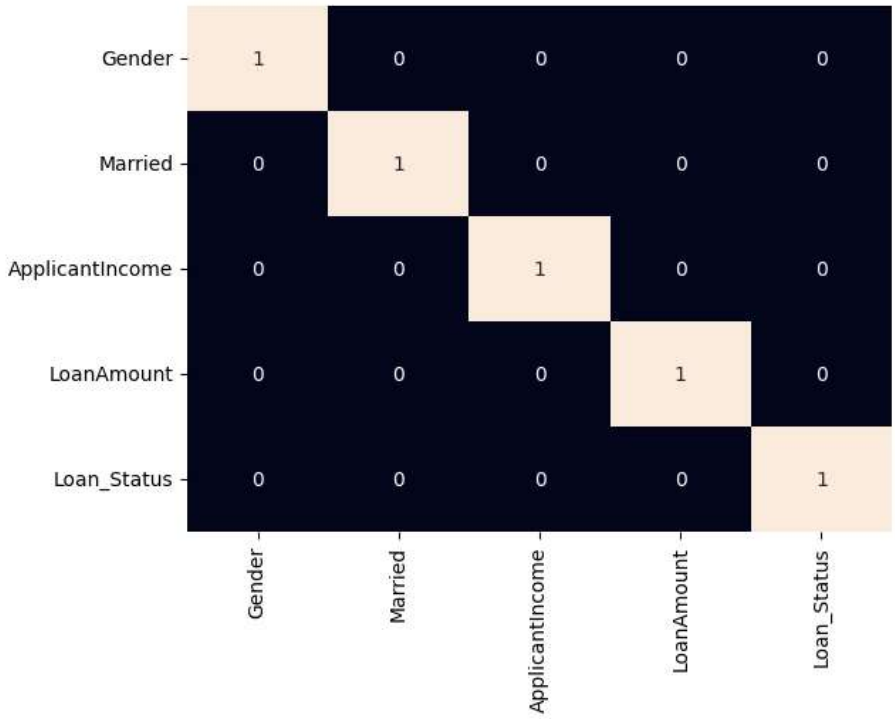
```
Gender
Female    118822.429907
Male      139289.823009
Name: LoanAmount, dtype: float64
```

```
df.groupby(['Married', 'Gender']).mean()['LoanAmount']
```

```
Married  Gender
No       Female    116115.384615
         Male      126644.628099
Yes      Female    126103.448276
         Male      143912.386707
Name: LoanAmount, dtype: float64
```

```
# Function to apply label encoding
def encode_labels(data):
    for col in data.columns:
        if data[col].dtype == 'object':
            le = LabelEncoder()
            data[col] = le.fit_transform(data[col])

    return data
```

```
# Applying function in whole column
df = encode_labels(df)

# Generating Heatmap
sb.heatmap(df.corr() > 0.8, annot=True, cbar=False)
plt.show()
```




```
features = df.drop('Loan_Status', axis=1)
target = df['Loan_Status'].values

X_train, X_val,\
    Y_train, Y_val = train_test_split(features, target,
                                      test_size=0.2,
                                      random_state=10)

# As the data was highly imbalanced we will balance
# it by adding repetitive rows of minority class.
ros = RandomOverSampler(sampling_strategy='minority',
                        random_state=0)
X, Y = ros.fit_resample(X_train, Y_train)

X_train.shape, X.shape
```

```
((447, 4), (616, 4))
```

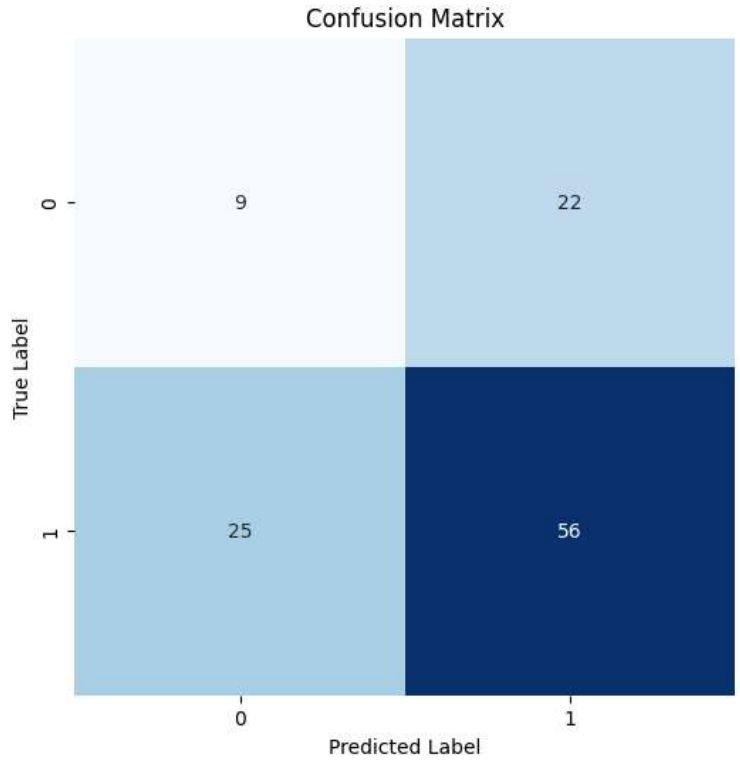
```
# Normalizing the features for stable and fast training.
scaler = StandardScaler()
X = scaler.fit_transform(X)
X_val = scaler.transform(X_val)



from sklearn.metrics import roc_auc_score
model = SVC(kernel='rbf')
model.fit(X, Y)

print('Training Accuracy : ', metrics.roc_auc_score(Y, model.predict(X)))
print('Validation Accuracy : ', metrics.roc_auc_score(Y_val, model.predict(X_val)))
print()
```

```
Training Accuracy :  0.6136363636363635
Validation Accuracy :  0.4908403026682596
```

```
from sklearn.svm import SVC
from sklearn.metrics import confusion_matrix
training_roc_auc = roc_auc_score(Y, model.predict(X))
validation_roc_auc = roc_auc_score(Y_val, model.predict(X_val))
print('Training ROC AUC Score:', training_roc_auc)
print('Validation ROC AUC Score:', validation_roc_auc)
print()
cm = confusion_matrix(Y_val, model.predict(X_val))
```

```
Training ROC AUC Score: 0.6136363636363635
Validation ROC AUC Score: 0.4908403026682596
```

```
plt.figure(figsize=(6, 6))
sb.heatmap(cm, annot=True, fmt='d', cmap='Blues', cbar=False)
plt.title('Confusion Matrix')
plt.xlabel('Predicted Label')
plt.ylabel('True Label')
plt.show()
```




```
from sklearn.metrics import classification_report
print(classification_report(Y_val, model.predict(X_val)))
```

```
              precision    recall  f1-score   support

           0       0.26      0.29      0.28        31
           1       0.72      0.69      0.70        81

    accuracy                           0.58       112
   macro avg       0.49      0.49      0.49       112
weighted avg       0.59      0.58      0.59       112
```