```
import pandas as pd


import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt


from sklearn.model_selection import train_test_split
from sklearn.preprocessing import OneHotEncoder
from sklearn.impute import SimpleImputer
from sklearn.linear_model import LinearRegression
from sklearn.discriminant_analysis import LinearDiscriminantAnalysis as LDA
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score, confusion_matrix, classification_report


from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to

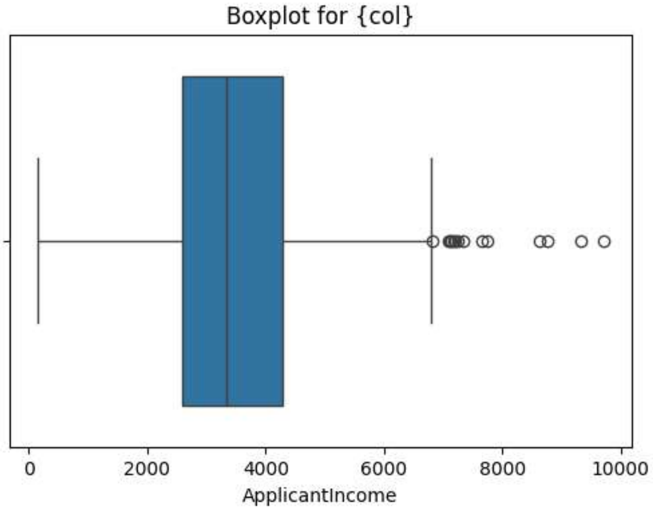
```
data= pd.read_excel('Loan.xlsx')


data.head()
```

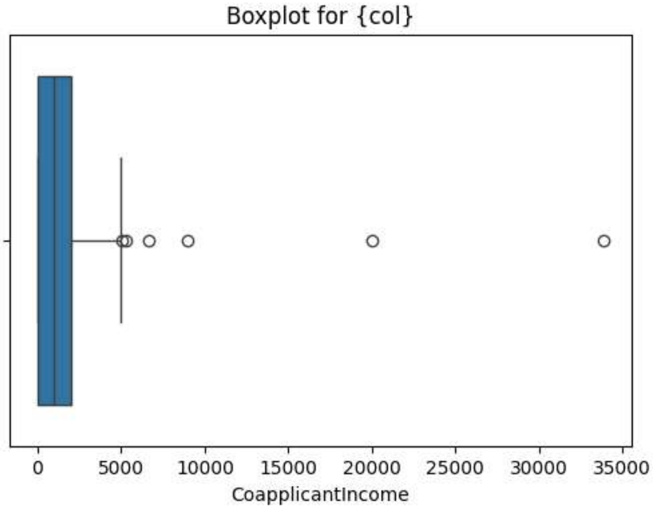
	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_H
0	Male	Yes	1	Graduate	No	4583	1508.0	128	360.0	
1	Male	Yes	0	Graduate	Yes	3000	0.0	66	360.0	
2	Male	Yes	0	Not Graduate	No	2583	2358.0	120	360.0	
3	Male	No	0	Graduate	No	6000	0.0	141	360.0	

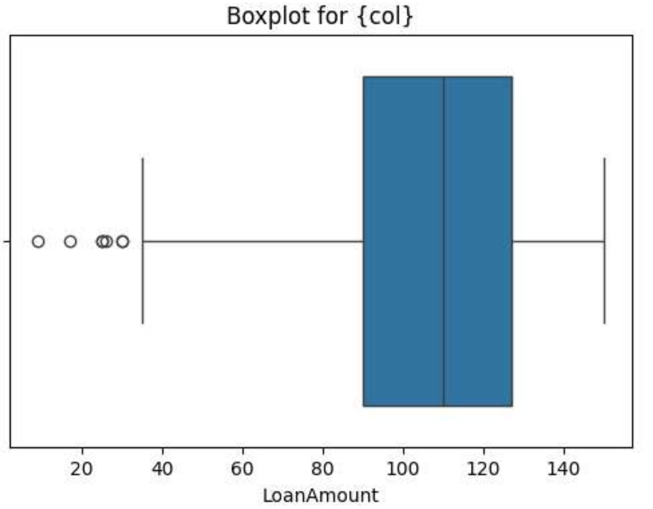
```
categorical_cols = data.select_dtypes(include=['object']).columns


numerical_cols = data.select_dtypes(include=['int64', 'float64']).columns


imputer_num=SimpleImputer(strategy='mean')
data[numerical_cols]=imputer_num.fit_transform(data[numerical_cols])


imputer_cat=SimpleImputer(strategy='most_frequent')
data[categorical_cols]=imputer_cat.fit_transform(data[categorical_cols])


data_encoded=pd.get_dummies(data, columns=categorical_cols, drop_first=True)


data_encoded.head()
```

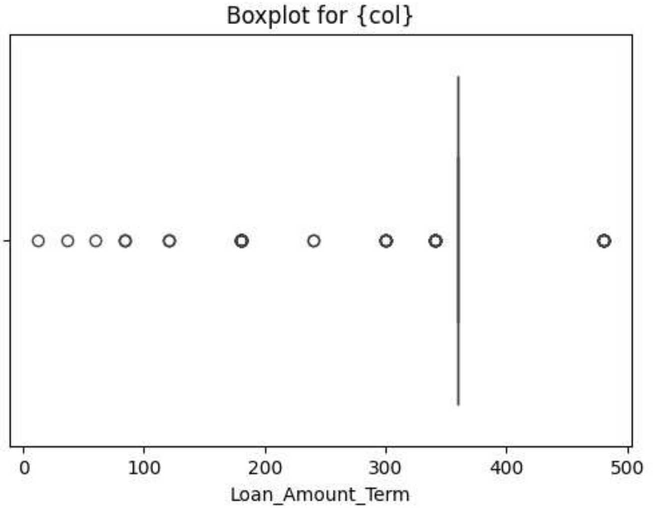
	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_History	Gender_Male	Married_Yes	Dependents_1	Depende
0	4583.0	1508.0	128.0	360.0	1.0	True	True	True	
1	3000.0	0.0	66.0	360.0	1.0	True	True	False	
2	2583.0	2358.0	120.0	360.0	1.0	True	True	False	
3	6000.0	0.0	141.0	360.0	1.0	True	False	False	
4	2333.0	1516.0	95.0	360.0	1.0	True	True	False	

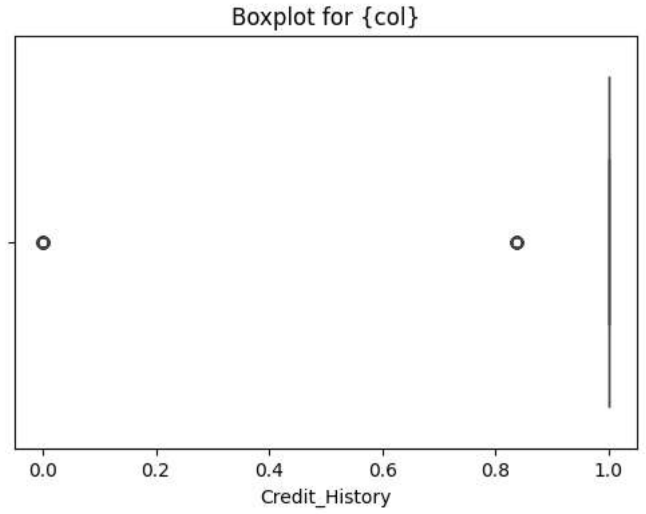
```
for columns in numerical_cols:
  plt.figure(figsize=(6,4))
  sns.boxplot(data=data_encoded, x=columns)
  plt.title('Boxplot for {col}')
  plt.show()
```


Boxplot for {col}
0
2000
4000
6000
8000
10000
ApplicantIncome


Boxplot for {col}
0
5000
10000
15000
20000
25000
30000
35000
CoapplicantIncome


Boxplot for {col}
20
40
60
80
100
120
140
LoanAmount


Boxplot for {col}
0
100
200
300
400
500
Loan_Amount_Term



```
  q1= data_encoded[numerical_cols].quantile(0.25)
  q3= data_encoded[numerical_cols].quantile(0.75)
  iqr= q3-q1
```

```
outliers= ((data_encoded[numerical_cols]<(q1-1.5*iqr))|(data_encoded[numerical_cols]>(q3+1.5*iqr))).any(axis=1)
```

```
outliers.sum()
```

```
149
```

```
X = data_encoded.drop(columns=['Loan_Status_Y'])
y = data_encoded['Loan_Status_Y']
```

```
x_train, x_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)
```

```
x_train.shape, x_test.shape
```

```
((266, 14), (115, 14))
```

Logistic Regression

```
from sklearn.linear_model import LogisticRegression
log_reg = LogisticRegression(max_iter=1000)
log_reg.fit(x_train, y_train)
```

```
▾       LogisticRegression
LogisticRegression(max_iter=1000)
```

```
y_pred = log_reg.predict(x_test)
```

```
print("Logistic Regression Accuracy:",accuracy_score(y_test, y_pred))
print(confusion_matrix(y_test, y_pred))
print(classification_report(y_test, y_pred))
```

```
Logistic Regression Accuracy: 0.8173913043478261
[[14 21]
 [ 0 80]]
              precision    recall  f1-score   support

       False       1.00      0.40      0.57        35
        True       0.79      1.00      0.88        80

    accuracy                           0.82       115
   macro avg       0.90      0.70      0.73       115
weighted avg       0.86      0.82      0.79       115
```

Linear Discriminant Analysis (LDA)

```
lda=LDA()
```

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

```
▾ LinearDiscriminantAnalysis
LinearDiscriminantAnalysis()
```

```
y_pred_lda=lda.predict(x_test)
```

```
print("LDA Accuracy:",accuracy_score(y_test, y_pred_lda))
print(confusion_matrix(y_test, y_pred_lda))
print(classification_report(y_test, y_pred_lda))
```

```
LDA Accuracy: 0.808695652173913
[[14 21]
 [ 1 79]]
              precision    recall  f1-score   support

       False       0.93      0.40      0.56        35
        True       0.79      0.99      0.88        80

    accuracy                           0.81       115
   macro avg       0.86      0.69      0.72       115
weighted avg       0.83      0.81      0.78       115
```

Start coding or generate with AI.

K-Nearest Neighbours KNN

```
knn=KNeighborsClassifier(n_neighbors=5)
knn.fit(x_train, y_train)
```

```
▾ KNeighborsClassifier
KNeighborsClassifier()
```

```
y_pred_knn=knn.predict(x_test)
```

```
print("KNN Accuracy:",accuracy_score(y_test, y_pred_knn))
print(confusion_matrix(y_test, y_pred_knn))
print(classification_report(y_test, y_pred_knn))
```

```
KNN Accuracy: 0.6869565217391305
[[10 25]
 [11 69]]
              precision    recall  f1-score   support

       False       0.48      0.29      0.36        35
        True       0.73      0.86      0.79        80

    accuracy                           0.69       115
   macro avg       0.61      0.57      0.58       115
weighted avg       0.66      0.69      0.66       115
```

Decision Tree Classifier

```
tree=DecisionTreeClassifier()
tree.fit(x_train, y_train)
```

```
▾ DecisionTreeClassifier
DecisionTreeClassifier()
```

```
y_pred_tree=tree.predict(x_test)
```

```
print("Decision Tree Accuracy:",accuracy_score(y_test, y_pred_tree))
print(confusion_matrix(y_test, y_pred_tree))
print(classification_report(y_test, y_pred_tree))
```

```
Decision Tree Accuracy: 0.7565217391304347
[[19 16]
 [12 68]]
              precision    recall  f1-score   support

       False       0.61      0.54      0.58        35
        True       0.81      0.85      0.83        80
```