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

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

```
Mounted at /content/drive
```

```
df=pd.read_csv("/content/Bitext_Sample_Customer_Support_Training_Dataset_27K_responses-v11.csv")
```

```
df
```

	flags	instruction	category	intent	response
0	B	question about cancelling order {{Order Number}}	ORDER	cancel_order	I've understood you have a question regarding ...
1	BQZ	i have a question about cancelling oorder {{Or...	ORDER	cancel_order	I've been informed that you have a question ab...
2	BLQZ	i need help cancelling puchase {{Order Number}}	ORDER	cancel_order	I can sense that you're seeking assistance wit...
3	BL	I need to cancel purchase {{Order Number}}	ORDER	cancel_order	I understood that you need assistance with can...
4	BCELN	I cannot afford this order, cancel purchase {{...	ORDER	cancel_order	I'm sensitive to the fact that you're facing f...
...	...	...	...	...	...
26867	BL	I am waiting for a rebate of {{Refund Amount}}...	REFUND	track_refund	Thank you for sharing your situation regarding...
26868	BIL	how to see if there is anything wrong with my ...	REFUND	track_refund	Ensuring the accuracy of your restitution is o...
26869	BLQZ	I'm waiting for a reimbjrsement of {{Currency ...	REFUND	track_refund	Firstly, I genuinely understand the importance...
26870	BL	I don't know what to do to see my reimbursemen...	REFUND	track_refund	I've understood you're unsure about how to che...
26871	BL	I need to know if there is anything new on the...	REFUND	track_refund	It's completely understandable that you want t...

26872 rows × 5 columns

```
df.head()
```

	flags	instruction	category	intent	response
0	B	question about cancelling order {{Order Number}}	ORDER	cancel_order	I've understood you have a question regarding ...
1	BQZ	i have a question about cancelling oorder {{Or...	ORDER	cancel_order	I've been informed that you have a question ab...
2	BLQZ	i need help cancelling puchase {{Order Number}}	ORDER	cancel_order	I can sense that you're seeking assistance wit...
3	BL	I need to cancel purchase {{Order Number}}	ORDER	cancel_order	I understood that you need assistance with can...
4	BCELN	I cannot afford this order, cancel purchase {{...	ORDER	cancel_order	I'm sensitive to the fact that you're facing f...

```
df.describe()
```

	flags	instruction	category	intent	response
count	26872	26872	26872	26872	26872
unique	394	24635	11	27	26870
top	BL	shiping to {{Delivery City}}	ACCOUNT	contact_customer_service	Firstly, I truly understand how pivotal the {{...
freq	5212	8	5986	1000	2

```
df.duplicated().sum()
```

```
np.int64(0)
```

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

	0
flags	0
instruction	0
category	0
intent	0
response	0

dtype: int64

```
#feature scaling
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 26872 entries, 0 to 26871
Data columns (total 5 columns):
 #   Column       Non-Null Count  Dtype 
---  ------       --------------  ----- 
 0   flags        26872 non-null  object
 1   instruction  26872 non-null  object
 2   category     26872 non-null  object
 3   intent       26872 non-null  object
 4   response     26872 non-null  object
dtypes: object(5)
memory usage: 1.0+ MB
```

```
#dropdown
df['intent'].unique()
```

```
array(['cancel_order', 'change_order', 'change_shipping_address',
       'check_cancellation_fee', 'check_invoice', 'check_payment_methods',
       'check_refund_policy', 'complaint', 'contact_customer_service',
       'contact_human_agent', 'create_account', 'delete_account',
       'delivery_options', 'delivery_period', 'edit_account',
       'get_invoice', 'get_refund', 'newsletter_subscription',
       'payment_issue', 'place_order', 'recover_password',
       'registration_problems', 'review', 'set_up_shipping_address',
       'switch_account', 'track_order', 'track_refund'], dtype=object)
```

```
#drop columns
df.drop(['flags'],axis=1,inplace=True)
```

```
df.drop(["instruction"],axis=1,inplace=True)
```

```
df
```

	category	intent	response
0	ORDER	cancel_order	I've understood you have a question regarding ...
1	ORDER	cancel_order	I've been informed that you have a question ab...
2	ORDER	cancel_order	I can sense that you're seeking assistance wit...
3	ORDER	cancel_order	I understood that you need assistance with can...
4	ORDER	cancel_order	I'm sensitive to the fact that you're facing f...
...	...	...	...
26867	REFUND	track_refund	Thank you for sharing your situation regarding...
26868	REFUND	track_refund	Ensuring the accuracy of your restitution is o...
26869	REFUND	track_refund	Firstly, I genuinely understand the importance...
26870	REFUND	track_refund	I've understood you're unsure about how to che...
26871	REFUND	track_refund	It's completely understandable that you want t...

26872 rows × 3 columns


```
#label encoding
```

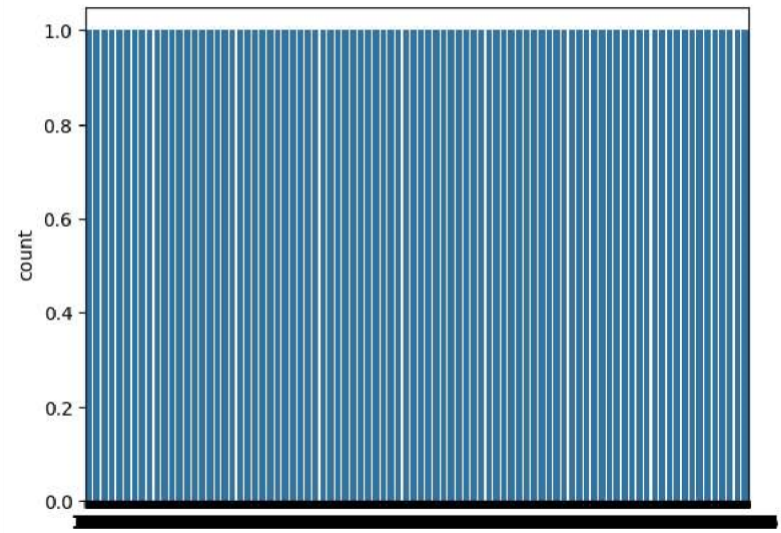
```
le=LabelEncoder()
df['intent']=le.fit_transform(df['intent'])
df['response']=le.fit_transform(df['response'])
df['category']=le.fit_transform(df['category'])


#scalar standardization
from sklearn.preprocessing import StandardScaler
ss=StandardScaler()
df
```

	category	intent	response
0	6	0	14922
1	6	0	13664
2	6	0	5945
3	6	0	8688
4	6	0	12398
...	...	...	...
26867	8	26	20621
26868	8	26	2306
26869	8	26	2397
26870	8	26	14978
26871	8	26	15513

26872 rows × 3 columns

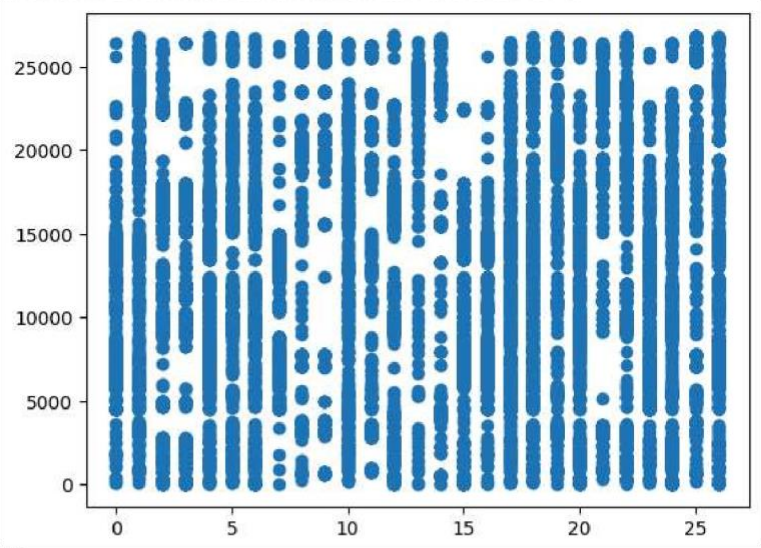
```
#univariate analysis
sns.countplot(df['intent'])
```

```
<Axes: ylabel='count'>
```




```
#bivariate analysis
plt.scatter(df['intent'],df['response'])
```

```
<matplotlib.collections.PathCollection at 0x784efa367310>
```




```
#model building
from sklearn.model_selection import train_test_split
x=df.drop(['intent'],axis=1)
y=df['intent']
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.2,random_state=42)


#importing model
from sklearn.linear_model import LogisticRegression
lr=LogisticRegression()
lr.fit(x_train,y_train)
```

```
▾ LogisticRegression
LogisticRegression()
```

```
#prediction
y_pred=lr.predict(x_test)
print("y_pred",y_pred)
```

```
y_pred [13 17 23 ...  2 18 21]
```

```
#decision classifier
from sklearn.tree import DecisionTreeClassifier
dt=DecisionTreeClassifier()
dt.fit(x_train,y_train)
```

```
▾ DecisionTreeClassifier
DecisionTreeClassifier()
```

```
#prediction
y_pred_dt=dt.predict(x_test)
print("y_pred_dt",y_pred_dt)
```

```
y_pred_dt [ 9 15 18 ... 23  0 20]
```

```
#Evaluation on two models
from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
print("accuracy_score",accuracy_score(y_test,y_pred))
print("confusion_matrix",confusion_matrix(y_test,y_pred))
print("classification_report",classification_report(y_test,y_pred))
```

```
accuracy_score 0.14790697674418604
confusion_matrix [[  0  10  32   0   0   0   0   0   0   0   0   0   0   0   0   0  26
   59   0   0   0   0  60   0   0   0]
 [  0  17  11   0   0   0   0   0   0   0   0   0   0   0   0   0   8
    9 100   0   0   9  33   0   0   0]
```

```
[  0  32  47   0   0   0   0   0   0   0   0   0   0   0   0   0  56
   1   0   0   0   0  80   0   0   0]
[ 14   0   0   0   4   0   0   0   0   0   0   0   0 156   0   0  11   0
   0   0   0   0   4   8   0   0   2]
[  0  20  54   0   0   0   0   0   0   0   0   0   0   0   0   0   0  19
  25  24   0   0   9  41   0   0   0]
[  0  48  47   0   0   0   0   0   0   0   0   0   0   0   0   0   0   6
  35  11   0   0   0  59   0   0   0]
[  0  12  53   0   0   0   0   0   0   0   0   0   0   0   0   0   0  40
  15   2   0   0   0  78   0   0   0]
[  0  54  42   0   0   0   0   0   0   0   0   0   0   0   0   0   0  13
  16  65   0   0   2  11   0   0   0]
[  0   2   0   0   0  19   0   0   0   0   0   0   0 137   0   0   0   0
   0  14   0   0   0  11   0   0  25]
[  0   0   0   0   0   4   0   0   0   0   0   0   0 157   0   0   0   0
   1  16   0   0   0  10   0   0  13]
[  0   0   0   0   0   0   0   0   0   0   0   7   0   0   1   0   0   0
   0   0   0 199   0   0  10   0   0]
[  0   0   0   0   0   0   0   0   0   0   0  12   0   0   0   0   0   0
   0   0   0 151   0   0  15   0   0]
[  0  19   9   0   0   1   0   0   0   0   0   0   0  32   0   0   1   0
   0  34   0   0  33  88   0   0   1]
[  0   1   1   0   0   0   0   0   0   0   0   0   0 164   0   0   0   0
   0   0   0   0   2   2   0   0   1]
[  0   0   0   0   0   0   0   0   0   0   0   1   0   0   9   0   0   0
   0   0   0 175   0   0   1   0   0]
[  0  24  60   0   0   0   0   0   0   0   0   0   0   0   0   0   0  20
  43  24   0   0   6  38   0   0   0]
[  0   1  40   0   0   0   0   0   0   0   0   0   0   0   0   0   0  65
   1   0   0   0   0  89   0   0   0]
[  0   6  34   0   0   0   0   0   0   0   0   0   0   0   0   0   0  28
  12   0   0   0   0  86   0   0   0]
[  0  24  28   0   0   0   0   0   0   0   0   0   0   0   0   0   0  46
  18  27   0   0   0  61   0   0   0]
[  0  32   4   0   0   0   0   0   0   0   0   0   0   0   0   0   0   8
   4  96   0   0   8  39   0   0   0]
[  0   0   0   0   0   0   0   0   0   0   0  10   4   0   4   0   0   0
   0   0   0 141   0   0  32   0   0]
[  0   0   0   0   0   0   0   0   0   0   0   8   0   0   0   0   0   0
   0   0   0 185   0   0  11   0   0]
[  0  26   3   0   0   0   0   0   0   0   0   0   0  58   0   0   0   1
  12  17   0   0  80  27   0   0   0]
[  0   2  91   0   0   0   0   0   0   0   0   0   0   0   0   0   0  19
   1   0   0   0   0 115   0   0   0]
[  0   0   0   0   0   0   0   0   0   0   0  12   2   0   6   0   0   0
   0   0   0 140   0   0  24   0   0]
[  0  24   8   0   0   0   0   0   0   0   0   0   0   0   0   0   0   4
   1  88   0   0  32  41   0   0   0]
[  0  20  30   0   0   0   0   0   0   0   0   0   0   0   0   0   0  30
  12   2   0   0   0 111   0   0   0]]
classification_report              precision    recall  f1-score   support

           0       0.00      0.00      0.00       187
```

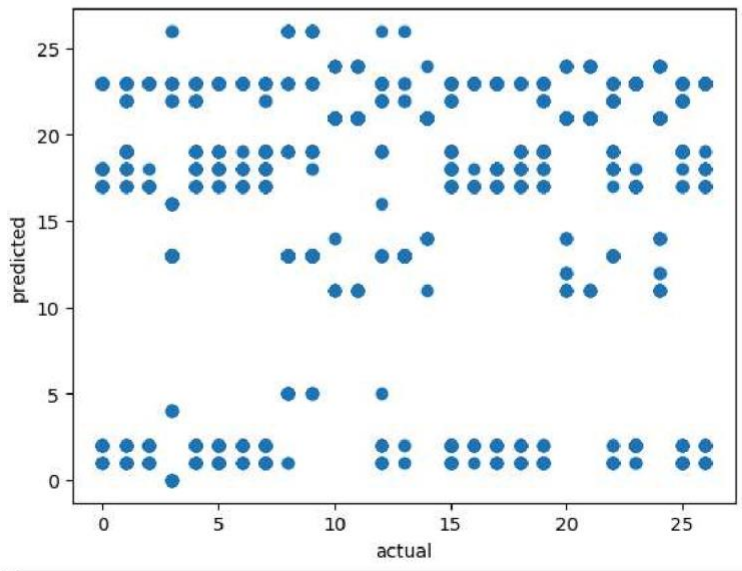
```
#Evaluation on two models
from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
print("accuracy_score_dt",accuracy_score(y_test,y_pred_dt))
print("confusion_matrix_dt",confusion_matrix(y_test,y_pred_dt))
print("classification_report_dt",classification_report(y_test,y_pred_dt))
```

```
accuracy_score_dt 0.7949767441860465
confusion_matrix_dt [[153  26   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   4   0   0   0   0   0   4   0]
 [ 27 132   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0  14   0   0   0   0   0  14   0]
 [  0   0 187   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0  29   0   0   0]
 [  0   0   0 199   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0]
 [  0   0   0   0 124   0   0   0   0   0   0   0   0   0   0  68   0   0   0   0   0
   0   0   0   0   0   0   0   0   0]
 [  0   0   0   0   0 167   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
  39   0   0   0   0   0   0   0   0]
 [  0   0   0   0   0   0 154   0   0   0   0   0   0   0   0   0  14   0   0   0   0
   0   0   0   0   0   0   0   0  32]
 [  0   0   0   0   0   0   0 200   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   3   0   0   0   0]
 [  0   0   0   0   0   0   0   0 138  70   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0]
 [  0   0   0   0   0   0   0   0  61 140   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0   0   0   0   0]
 [  0   0   0   0   0   0   0   0   0   0 144  15   0   0  15   0   0   0   0   0   0
   0   0   6   6   0   0  31   0   0]
```

```
[  0   0   0   0   0   0   0   0   0   0   6 140   0   0   1   0   0   0
   0   0  11  14   0   0   6   0   0]
[  0   0   0   0   0   0   0   0   0   0   0   0 209   9   0   0   0   0
   0   0   0   0   0   0   0   0   0]
[  0   0   0   0   0   0   0   0   0   0   0   0   5 166   0   0   0   0
   0   0   0   0   0   0   0   0   0]
[  0   0   0   0   0   0   0   0   0   0   5   0   0   0 173   0   0   0
   0   0   1   2   0   0   5   0   0]
[  0   0   0   0  86   0   0   0   0   0   0   0   0   0   0 129   0   0
   0   0   0   0   0   0   0   0   0]
[  0   0   0   0   0   0  15   0   0   0   0   0   0   0   0   0 136   0
   0   0   0   0   0   0   0   0  45]
[  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0 166
   0   0   0   0   0   0   0   0   0]
[  0   0   0   0   0  42   0   0   0   0   0   0   0   0   0   0   0   0
 162   0   0   0   0   0   0   0   0]
[ 16  10   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0 147   0   0   0   0   0  18   0]
[  0   0   0   0   0   0   0   0   0   0   5  12   0   0   0   0   0   0
   0   0 136   6   0   0  32   0   0]
[  0   0   0   0   0   0   0   0   0   0   4  31   0   0   4   0   0   0
   0   0   2 156   0   0   7   0   0]
[  0   0   0   0   0   0   0   8   0   0   0   0   0   0   0   0   0   0
   0   0   0   0 216   0   0   0   0]
[  0   0  32   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0   0   0   0   0 196   0   0   0]
[  0   0   0   0   0   0   0   0   0   0  20   5   0   0   4   0   0   0
   0   0  39   5   0   0 111   0   0]
[  2  17   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
   0  16   0   0   0   0   0 163   0]
[  0   0   0   0   0   0  36   0   0   0   0   0   0   0   0   0  40   0
   0   0   0   0   0   0   0   0 129]]
classification_report_dt              precision    recall  f1-score   support

           0       0.77      0.82      0.79       187
```

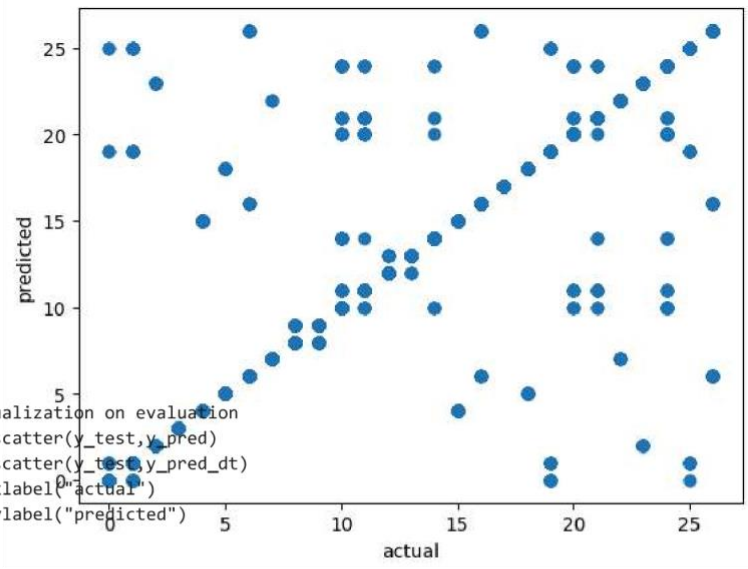
```
#visualization chart prediction and actual value
import matplotlib.pyplot as plt
plt.scatter(y_test,y_pred)
plt.xlabel("actual")
plt.ylabel("predicted")
```

```
Text(0, 0.5, 'predicted')
```



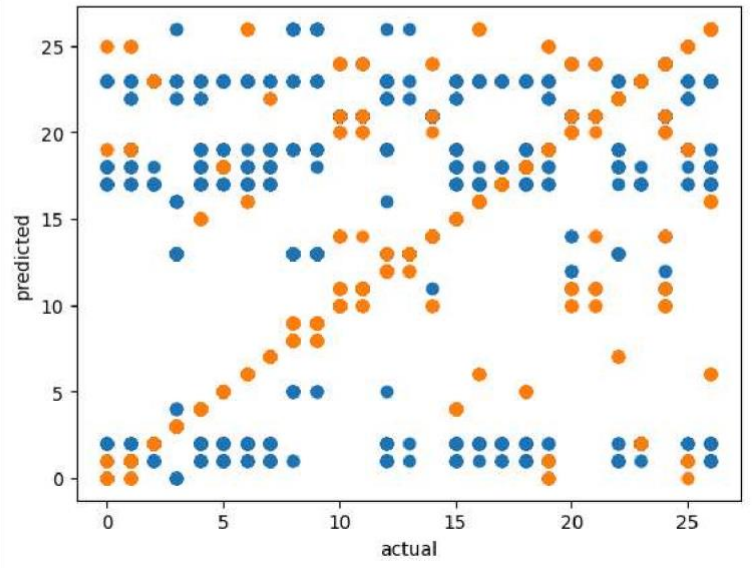

```
#visualization on prediction
plt.scatter(y_test,y_pred_dt)
plt.xlabel("actual")
plt.ylabel("predicted")
```

```
Text(0, 0.5, 'predicted')
```




```
#visualization on evaluation
plt.scatter(y_test,y_pred)
plt.scatter(y_test,y_pred_dt)
plt.xlabel("actual")
plt.ylabel("predicted")
```

```
Text(0, 0.5, 'predicted')
```



Start coding or generate with AI.