

## ▼ Scenario 2

# Amazon Reviews For Sentiment Analysis

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## ▼ About Project:

This is a Sentiment Analysis Project in which I have used a Amazon customer review dataset from Kaggle. Link:

<https://www.kaggle.com/datasets/bittlingmayer/amazonreviews> . I have Used TensorFlow's LSTM and run my model using 2 epoches.

## ▼ Import Libraries

These are the following libraries this I'll be using for this project.

```
import bz2
from tqdm import tqdm
import re
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.metrics import confusion_matrix
from sklearn.metrics import classification_report
from wordcloud import WordCloud
from sklearn.metrics import confusion_matrix, classification_report
from nltk.sentiment.vader import SentimentIntensityAnalyzer
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, LSTM, SpatialDropout1D, Embedding
from keras.callbacks import ModelCheckpoint
import pickle
```

## ▼ Read Data

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

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

```
train, test, train_label, test_label = [], [], [], []
with open('/content/drive/MyDrive/sentiment/train.ft.txt', 'r', encoding='utf-8') as file:
    lines = file.readlines()
    for line in tqdm(lines):
        train.append(line.split('__label__')[1][1:])
        train_label.append(line.split('__label__')[1][0])
with open('/content/drive/MyDrive/sentiment/test.ft.txt', 'r', encoding='utf-8') as file:
    lines = file.readlines()
    for line in tqdm(lines):
```

```
test.append(line.split('__label__')[1][1:])
test_label.append(line.split('__label__')[1][0])

100%|██████████| 3600000/3600000 [00:07<00:00, 481035.09it/s]
100%|██████████| 4000000/4000000 [00:00<00:00, 414370.01it/s]
```

## ▼ Text Cleaning

```
def clean_text(text):
    # Remove non-alphanumeric characters and extra whitespace
    text = re.sub(r'^a-zA-Z\s', '', text)
    # Convert multiple whitespace characters to a single space
    text = re.sub(r'\s+', ' ', text)
    # Convert the text to lowercase
    text = text.lower()
    return text

print('Train Length',len(train))
print('Train Label Length',len(train_label))
print('Test Length',len(test))
print('Test Label Length',len(test_label))

Train Length 3600000
Train Label Length 3600000
Test Length 4000000
Test Label Length 4000000

train_label[0],train[0]

('2',
 ' Stuning even for the non-gamer: This sound track was beautiful! It paints the senery in your mind so well I would recomed it even to people who hate vid. game music! I have played the game Chrono Cross but out of all of the games I have ever played it has the best music! It backs away from crude keyboarding and takes a fresher step with grate guitars and soulful orchestras. It would impress anyone who cares to listen! ^_\n')

train_label[0],clean_text(train[0])

('2',
 ' stuning even for the nongamer this sound track was beautiful it paints the senery in your mind so well i would recomed it even to people who hate vid game music i have played the game chrono cross but out of all of the games i have ever played it has the best music it backs away from crude keyboarding and takes a fresher step with grate guitars and soulful orchestras it would impress anyone who cares to listen ')

test_label[0],test[0]

('2',
 ' Great CD: My lovely Pat has one of the GREAT voices of her generation. I have listened to this CD for YEARS and I still LOVE IT. When I\'m in a good mood it makes me feel better. A bad mood just evaporates like sugar in the rain. This CD just oozes LIFE. Vocals are jusat STUUNNING and lyrics just kill. One of life\'s hidden gems. This is a desert isle CD in my book. Why she never made it big is just beyond me. Everytime I play this, no matter black, white, young, old, male, female EVERYBODY says one thing "Who was that singing ?"\n')

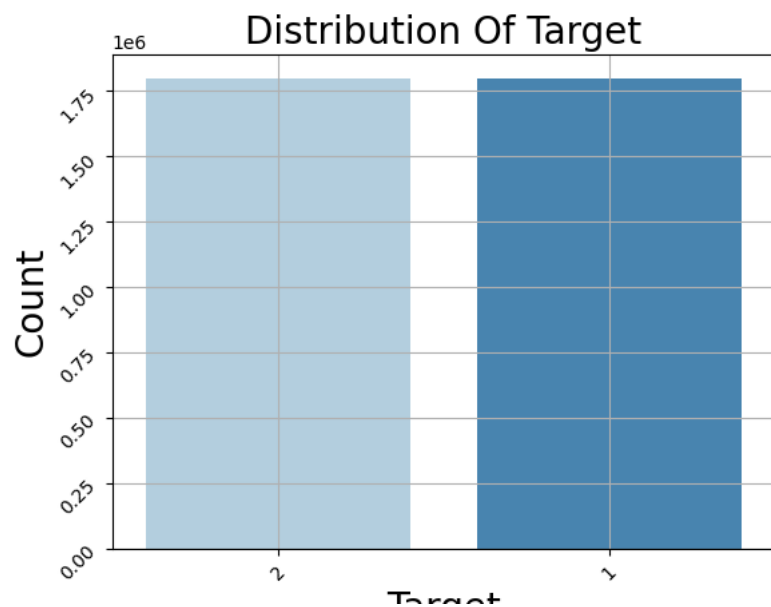
test_label[0],clean_text(test[0])

('2',
 ' great cd my lovely pat has one of the great voices of her generation i have listened to this cd for years and i still love it when im in a good mood it makes me feel better a bad mood just evaporates like sugar in the rain this cd just oozes life vocals are jusat stuunning and lyrics just kill one of lifes hidden gems this is a desert isle cd in my book why she never made it big is just beyond me everytime i play this no matter black white young old male female everybody says one thing who was that singing ')

#train label
pd.DataFrame(train_label).value_counts()

1    1800000
2    1800000
dtype: int64

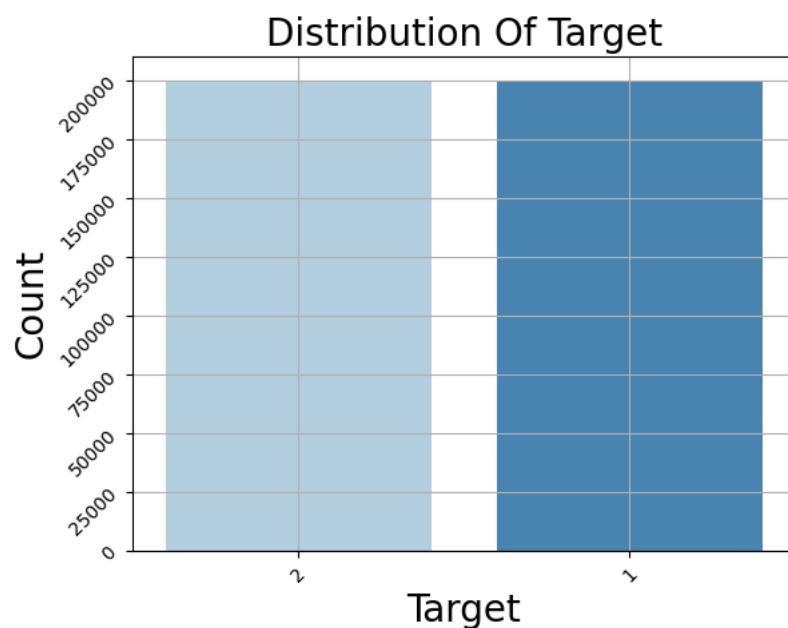
sns.countplot(x=pd.DataFrame(train_label)[0],palette='Blues')
plt.title('Distribution Of Target',fontsize=20)
plt.xlabel('Target',fontsize=20)
plt.ylabel('Count',fontsize=20)
plt.grid(True)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()
```



```
#test label
pd.DataFrame(test_label).value_counts()
```

```
1    200000
2    200000
dtype: int64
```

```
sns.countplot(x=pd.DataFrame(test_label)[0],palette='Blues')
plt.title('Distribution Of Target',fontsize=20)
plt.xlabel('Target',fontsize=20)
plt.ylabel('Count',fontsize=20)
plt.grid(True)
plt.xticks(rotation=45)
plt.yticks(rotation=45)
plt.show()
```



```
train=pd.DataFrame(train)[0].apply(clean_text)
test=pd.DataFrame(test)[0].apply(clean_text)
train.head()
```

```
0    stuning even for the nongamer this sound trac...
1    the best soundtrack ever to anything im readi...
2    amazing this soundtrack is my favorite music ...
3    excellent soundtrack i truly like this soundt...
4    remember pull your jaw off the floor after he...
Name: 0, dtype: object
```

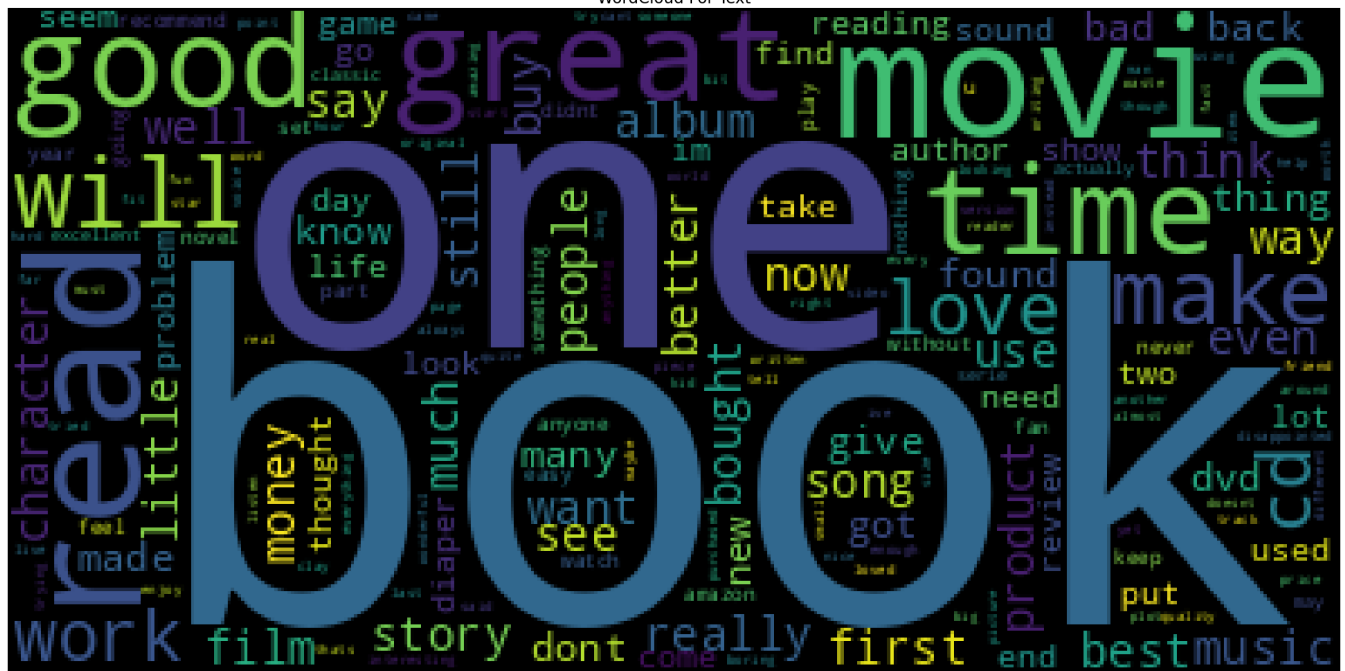
```
test.head()
```

```
0 great cd my lovely pat has one of the great v...
1 one of the best game music soundtracks for a ...
2 batteries died within a year i bought this ch...
3 works fine but maha energy is better check ou...
4 great for the nonaudiophile reviewed quite a ...
Name: 0, dtype: object
```

- ▼ Word Cloud

```
plt.figure(figsize=(30,20))
plt.imshow(WordCloud().generate(" ".join(train.iloc[:20000])))
plt.axis("off")
plt.title("WordCloud For Text",fontsize=20)
plt.show()
```

## WordCloud For Text



- ▼ Tokeniztion & pad\_sequences

```
voc_size = 20000
max_length = 100
tokenizer = Tokenizer(num_words=voc_size)
tokenizer.fit_on_texts(train)
word_index = tokenizer.word_index
with open('tokenizer.pkl', 'wb') as f:
    pickle.dump(tokenizer, f)

train = tokenizer.texts_to_sequences(train)
train = pad_sequences(train, maxlen=max_length)
test = tokenizer.texts_to_sequences(test)
test = pad_sequences(test, maxlen=max_length)
```

```
train_lab=np.array([1 if i=='2' else 0 for i in train_label])
test_lab=np.array([1 if i=='2' else 0 for i in test_label])
```

▼ Model

```
model = Sequential()
model.add(Embedding(input_dim=voc_size, output_dim=64, input_length=max_length))
model.add(LSTM(units=32, return_sequences=True))
model.add(SpatialDropout1D(rate=0.2))
model.add(LSTM(units=32))
model.add(Dense(1,activation='sigmoid'))
model.summary()
```

Model: "sequential"

Layer (type)	Output Shape	Param #
=====		
embedding (Embedding)	(None, 100, 64)	1280000
lstm (LSTM)	(None, 100, 32)	12416
spatial_dropout1d (Spatial Dropout1D)	(None, 100, 32)	0
lstm_1 (LSTM)	(None, 32)	8320
dense (Dense)	(None, 1)	33
=====		
Total params: 1300769 (4.96 MB)		
Trainable params: 1300769 (4.96 MB)		
Non-trainable params: 0 (0.00 Byte)		



```
checkpoint_cb =ModelCheckpoint("amazon_model.h5", save_best_only=True)
model.compile(loss='binary_crossentropy',optimizer='adam',metrics=['accuracy'])
history = model.fit(train, train_lab, epochs=2,
                    validation_split=.1,
                    callbacks=[checkpoint_cb])
```

```
Epoch 1/2
101250/101250 [=====] - 1260s 12ms/step - loss: 0.1781 - accuracy: 0.9309 - val_loss: 0.1518 - val_accurac
Epoch 2/2
12/101250 [.....] - ETA: 17:47 - loss: 0.1685 - accuracy: 0.9401/usr/local/lib/python3.10/dist-package
saving_api.save_model(
101250/101250 [=====] - 1183s 12ms/step - loss: 0.1455 - accuracy: 0.9454 - val_loss: 0.1455 - val_accurac
```

```
loss,accuracy = model.evaluate(test, test_lab)
print("Loss:", loss)
print("Accuracy:", accuracy)
```

```
12500/12500 [=====] - 67s 5ms/step - loss: 0.1485 - accuracy: 0.9439
Loss: 0.1484723836183548
Accuracy: 0.9438974857330322
```

```
pd.DataFrame(history.history)
```

	loss	accuracy	val_loss	val_accuracy	
0	0.178121	0.930931	0.151841	0.942453	
1	0.145466	0.945415	0.145505	0.945150	

```
prediction=model.predict(test)
y_pred=np.where(prediction>=.5,1,0)
df=pd.DataFrame()
df['actual'],df['pred']=test_lab,y_pred
```

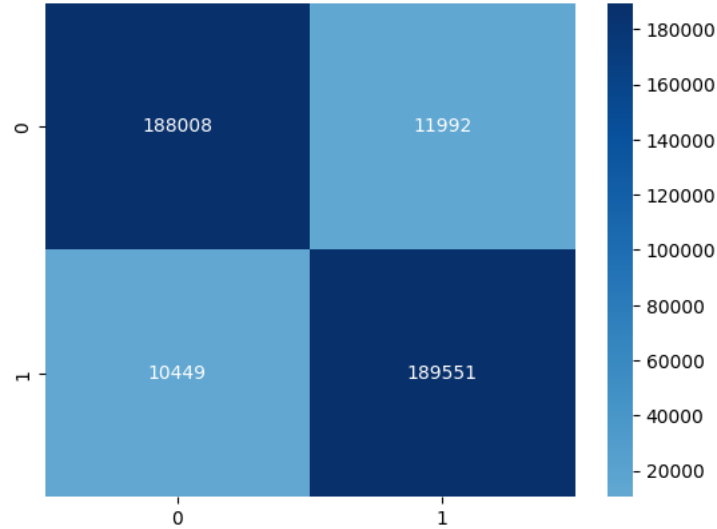
```
12500/12500 [=====] - 59s 5ms/step
```

```
df
```

	actual	pred
0	1	1
1	1	1
2	0	0
3	1	1
4	1	1
...	...	...
399995	0	0
399996	0	0
399997	0	0

Model Check

```
CM = confusion_matrix(test_lab, y_pred)
sns.heatmap(CM,annot=True,center = True,fmt='g',cmap='Blues')
CM
array([[188008, 11992],
       [10449, 189551]])
```



```
ClassificationReport = classification_report(test_lab,y_pred)
print('Classification Report is : ', ClassificationReport)
```

Classification Report is :		precision	recall	f1-score	support
0	0.95	0.94	0.94	0.94	200000
1	0.94	0.95	0.94	0.94	200000
accuracy			0.94	0.94	400000
macro avg	0.94	0.94	0.94	0.94	400000
weighted avg	0.94	0.94	0.94	0.94	400000

Prediction using User Input

User input part is left

```
# predictor = ktrain.get_predictor(amazon_model.model)
# predictor.get_classes()

# import time

# message = 'It was a worst product which I have buied from amazon'

# start_time = time.time()
# prediction = predictor.predict(message)
```

```
# print('predicted: {} {:.2f}'.format(prediction, (time.time() - start_time)))

# import ktrain

# # Load the saved predictor
# predictor = ktrain.load_predictor("models")

# # Input loop for making predictions
# while True:
#     user_input = input("Enter a text to predict emotion (or type 'exit' to quit): ")
#     if user_input.lower() == 'exit':
#         break

#     # Make prediction
#     prediction = predictor.predict(user_input)

#     print("Predicted Emotion:", prediction)
```