In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:

```
import nltk
from nltk.sentiment.vader import SentimentIntensityAnalyzer

nltk.download('vader_lexicon')
sid = SentimentIntensityAnalyzer()
```

```
[nltk_data] Downloading package vader_lexicon to
[nltk_data]     C:\Users\MSI\AppData\Roaming\nltk_data...
[nltk_data]   Package vader_lexicon is already up-to-date!
```

VADER's SentimentIntensityAnalyzer() tokes in a string and returns a dictionary of scores in each of four categories:

- Negative
- Neutral
- Positive Compound (computed by normalizing the scores above)

In [3]:

```
a = 'This was a good movie'
b = 'The was the best, most awesome movie EVER MADE!!!'
c = 'This was the worst film to ever disgrace the screen.'

print(sid.polarity_scores(a))
print(sid.polarity_scores(b))
print(sid.polarity_scores(c))
```

```
{'neg': 0.0, 'neu': 0.508, 'pos': 0.492, 'compound': 0.4404}
{'neg': 0.0, 'neu': 0.425, 'pos': 0.575, 'compound': 0.8877}
{'neg': 0.477, 'neu': 0.523, 'pos': 0.0, 'compound': -0.8074}
```

Use VADER to analyze Amazon Reviews

In [4]:

```
data = pd.read_csv('IMDB Dataset.csv')
data.head()
```

Out[4]:

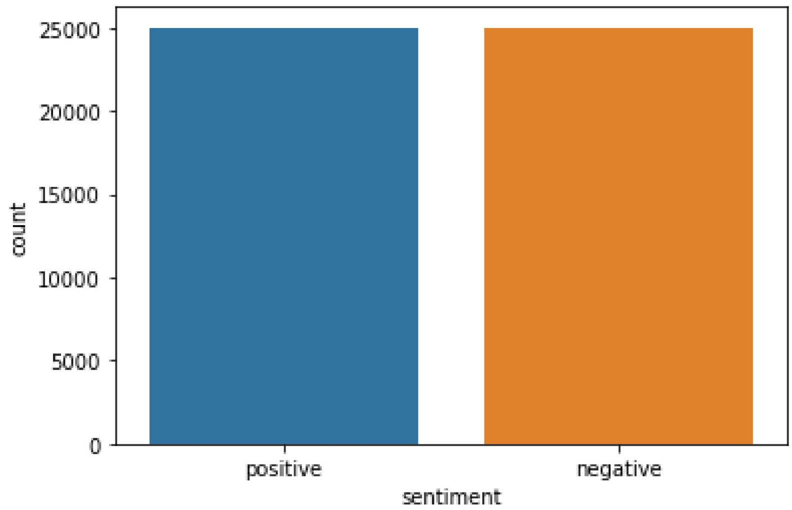
	review	sentiment
0	One of the other reviewers has mentioned that ...	positive
1	A wonderful little production. The...	positive
2	I thought this was a wonderful way to spend ti...	positive
3	Basically there's a family where a little boy ...	negative
4	Petter Mattei's "Love in the Time of Money" is...	positive

In [5]:

```
sns.countplot(x='sentiment', data=data)
```

Out[5]:

```
<AxesSubplot:xlabel='sentiment', ylabel='count'>
```



In [6]:

```
data['scores'] = data['review'].apply(lambda review: sid.polarity_scores(review))
```

In [7]:

```
data.head()
```

Out[7]:

	review	sentiment	scores
0	One of the other reviewers has mentioned that ...	positive	{'neg': 0.203, 'neu': 0.748, 'pos': 0.048, 'co...
1	A wonderful little production. The...	positive	{'neg': 0.053, 'neu': 0.776, 'pos': 0.172, 'co...
2	I thought this was a wonderful way to spend ti...	positive	{'neg': 0.094, 'neu': 0.714, 'pos': 0.192, 'co...
3	Basically there's a family where a little boy ...	negative	{'neg': 0.138, 'neu': 0.797, 'pos': 0.065, 'co...
4	Petter Mattei's "Love in the Time of Money" is...	positive	{'neg': 0.052, 'neu': 0.801, 'pos': 0.147, 'co...

In [8]:

```
data['compound'] = data['scores'].apply(lambda score_dict: score_dict['compound'])
data['comp_score'] = data['compound'].apply(lambda c: 'positive' if c >= 0 else 'negati
```

In [9]:

```
data.head()
```

Out[9]:

	review	sentiment	scores	compound	comp_score
0	One of the other reviewers has mentioned that ...	positive	{'neg': 0.203, 'neu': 0.748, 'pos': 0.048, 'co...	-0.9951	negative
1	A wonderful little production. The...	positive	{'neg': 0.053, 'neu': 0.776, 'pos': 0.172, 'co...	0.9641	positive
2	I thought this was a wonderful way to spend ti...	positive	{'neg': 0.094, 'neu': 0.714, 'pos': 0.192, 'co...	0.9605	positive
3	Basically there's a family where a little boy ...	negative	{'neg': 0.138, 'neu': 0.797, 'pos': 0.065, 'co...	-0.9213	negative
4	Petter Mattei's "Love in the Time of Money" is...	positive	{'neg': 0.052, 'neu': 0.801, 'pos': 0.147, 'co...	0.9744	positive

In [10]:

```
from sklearn.metrics import accuracy_score, classification_report, confusion_matrix

accuracy_score(data['sentiment'], data['comp_score'])
```

Out[10]:

```
0.69556
```

In [11]:

```
confusion_matrix(data['sentiment'], data['comp_score'])
```

Out[11]:

```
array([[13364, 11636],
       [ 3586, 21414]], dtype=int64)
```

In [12]:

```
pd.DataFrame(classification_report(data['sentiment'], data['comp_score'], output_dict=T
```

Out[12]:

	negative	positive	accuracy	macro avg	weighted avg
precision	0.788437	0.647927	0.69556	0.718182	0.718182
recall	0.534560	0.856560	0.69556	0.695560	0.695560
f1-score	0.637139	0.737778	0.69556	0.687459	0.687459
support	25000.000000	25000.000000	0.69556	50000.000000	50000.000000

In [13]:

```
data = pd.read_csv('train.csv')
```

In [14]:

```
print(data.target)
```

```
0       1
1       1
2       1
3       1
4       1
       ..
7608    1
7609    1
7610    1
7611    1
7612    1
Name: target, Length: 7613, dtype: int64
```

Classic Machine Learning Models

In [15]:

```
import spacy
import pandas as pd
import numpy as np

from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer

from sklearn.linear_model import LogisticRegression
from sklearn.svm import LinearSVC
from sklearn.naive_bayes import MultinomialNB

from sklearn.metrics import accuracy_score, classification_report

def train_model(model_name, model, X_train, X_test, y_train, y_test):
    print(f'BEGIN. {model_name.upper()}......')
    model.fit(X_train, y_train)
    y_pred = model.predict(X_test)
    y_train_pred = model.predict(X_train)
    print(f'TESTING DATA----> {model_name.upper()}: \t\t{accuracy_score(y_test, y_pred)
    print(f'TRAINING DATA---> {model_name.upper()}: \t\t{accuracy_score(y_train, y_trai
    print(classification_report(y_test, y_pred))
    print(f'END. {model_name.upper()}')
    print('=======================================================')
    return y_pred

data = pd.read_csv('train.csv')
```

In [16]:

```
print('=============Splitting the data=============')
X = data.text
y = data.target
print(f'Data shape: {data.shape}')

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=4
print(f'X_Train shape: {X_train.shape}, y_train shape: {y_train.shape}')
print(f'X_Test shape: {X_test.shape}, y_test shape: {y_test.shape}')

print('\n============Message Preprocessing============')
vectorizer = TfidfVectorizer(ngram_range=(1, 2), max_df=0.9, min_df=2, stop_words='engl
X_train_vect = vectorizer.fit_transform(X_train.astype('U'))
X_test_vect = vectorizer.transform(X_test)

print('Training and testing data shape after pre-processing:')
print(f'X_Train shape: {X_train_vect.shape}, y_train shape: {y_train.shape}')
print(f'X_Test shape: {X_test_vect.shape}, y_test shape: {y_test.shape}')

print('\n=============Model Building==================')
lr_model = LogisticRegression()
lr_y_pred = train_model('Logistic Regression', lr_model, X_train_vect, X_test_vect, y_t

svm_model = LinearSVC()
svm_y_pred = train_model('Support Vector Machine', svm_model, X_train_vect, X_test_vect

nb_model = MultinomialNB()
nb_y_pred = train_model('Naive Bayes', nb_model, X_train_vect, X_test_vect, y_train, y_

```

```
=============Splitting the data=============
Data shape: (7613, 5)
X_Train shape: (5329,), y_train shape: (5329,)
X_Test shape: (2284,), y_test shape: (2284,)

============Message Preprocessing============
Training and testing data shape after pre-processing:
X_Train shape: (5329, 8557), y_train shape: (5329,)
X_Test shape: (2284, 8557), y_test shape: (2284,)

=============Model Building==================
BEGIN. LOGISTIC REGRESSION......
TESTING DATA----> LOGISTIC REGRESSION:          80.12%
TRAINING DATA---> LOGISTIC REGRESSION:          88.40%
              precision    recall  f1-score   support

           0       0.80      0.88      0.84      1318
           1       0.81      0.69      0.75       966

    accuracy                           0.80      2284
   macro avg       0.80      0.79      0.79      2284
weighted avg       0.80      0.80      0.80      2284

END. LOGISTIC REGRESSION
======================================================
BEGIN. SUPPORT VECTOR MACHINE......
TESTING DATA----> SUPPORT VECTOR MACHINE:               77.76%
TRAINING DATA---> SUPPORT VECTOR MACHINE:               95.91%
              precision    recall  f1-score   support
```

```
           0       0.80      0.82      0.81      1318
           1       0.75      0.72      0.73       966

    accuracy                           0.78      2284
   macro avg       0.77      0.77      0.77      2284
weighted avg       0.78      0.78      0.78      2284

END. SUPPORT VECTOR MACHINE
======================================================
BEGIN. NAIVE BAYES......
TESTING DATA----> NAIVE BAYES:          80.47%
TRAINING DATA---> NAIVE BAYES:          87.15%
              precision    recall  f1-score   support

           0       0.78      0.91      0.84      1318
           1       0.85      0.66      0.74       966

    accuracy                           0.80      2284
   macro avg       0.82      0.79      0.79      2284
weighted avg       0.81      0.80      0.80      2284

END. NAIVE BAYES
======================================================
```

Recurrent Neural Networks

In [17]:

```
import pandas as pd
import numpy as np

from sklearn.model_selection import train_test_split
from sklearn.feature_extraction.text import TfidfVectorizer

from sklearn.linear_model import LogisticRegression
from sklearn.svm import LinearSVC
from sklearn.naive_bayes import MultinomialNB

from sklearn.metrics import accuracy_score, classification_report

def train_model(model_name, model, X_train, X_test, y_train, y_test):
    print(f'BEGIN. {model_name.upper()}......')
    model.fit(X_train, y_train)
    y_pred = model.predict(X_test)
    y_train_pred = model.predict(X_train)
    print(f'TESTING DATA----> {model_name.upper()}: \t\t{accuracy_score(y_test, y_pred)
    print(f'TRAINING DATA---> {model_name.upper()}: \t\t{accuracy_score(y_train, y_trai
    print(classification_report(y_test, y_pred))
    print(f'END. {model_name.upper()}')
    print('======================================================')
    return y_pred

data = pd.read_csv('train.csv')

print('=============Splitting the data=============')
X = data.text
y = data.target
print(f'Data shape: {data.shape}')

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=4
print(f'X_Train shape: {X_train.shape}, y_train shape: {y_train.shape}')
print(f'X_Test shape: {X_test.shape}, y_test shape: {y_test.shape}')

print('\n============Message Preprocessing============')
vectorizer = TfidfVectorizer(ngram_range=(1, 2), max_df=0.9, min_df=2, stop_words='engl
X_train_vect = vectorizer.fit_transform(X_train)
X_test_vect = vectorizer.transform(X_test)

print('Training and testing data shape after pre-processing:')
print(f'X_Train shape: {X_train_vect.shape}, y_train shape: {y_train.shape}')
print(f'X_Test shape: {X_test_vect.shape}, y_test shape: {y_test.shape}')

print('\n=============Model Building==================')
lr_model = LogisticRegression()
lr_y_pred = train_model('Logistic Regression', lr_model, X_train_vect, X_test_vect, y_t

svm_model = LinearSVC()
svm_y_pred = train_model('Support Vector Machine', svm_model, X_train_vect, X_test_vect

nb_model = MultinomialNB()
nb_y_pred = train_model('Naive Bayes', nb_model, X_train_vect, X_test_vect, y_train, y_
```

```
=============Splitting the data=============
Data shape: (7613, 5)
X_Train shape: (5329,), y_train shape: (5329,)
X_Test shape: (2284,), y_test shape: (2284,)
```

```
============Message Preprocessing============
Training and testing data shape after pre-processing:
X_Train shape: (5329, 8557), y_train shape: (5329,)
X_Test shape: (2284, 8557), y_test shape: (2284,)

=============Model Building==================
BEGIN. LOGISTIC REGRESSION......
TESTING DATA----> LOGISTIC REGRESSION:          80.12%
TRAINING DATA---> LOGISTIC REGRESSION:          88.40%
              precision    recall  f1-score   support

           0       0.80      0.88      0.84      1318
           1       0.81      0.69      0.75       966

    accuracy                           0.80      2284
   macro avg       0.80      0.79      0.79      2284
weighted avg       0.80      0.80      0.80      2284

END. LOGISTIC REGRESSION
======================================================
BEGIN. SUPPORT VECTOR MACHINE......
TESTING DATA----> SUPPORT VECTOR MACHINE:               77.76%
TRAINING DATA---> SUPPORT VECTOR MACHINE:               95.91%
              precision    recall  f1-score   support

           0       0.80      0.82      0.81      1318
           1       0.75      0.72      0.73       966

    accuracy                           0.78      2284
   macro avg       0.77      0.77      0.77      2284
weighted avg       0.78      0.78      0.78      2284

END. SUPPORT VECTOR MACHINE
======================================================
BEGIN. NAIVE BAYES......
TESTING DATA----> NAIVE BAYES:          80.47%
TRAINING DATA---> NAIVE BAYES:          87.15%
              precision    recall  f1-score   support

           0       0.78      0.91      0.84      1318
           1       0.85      0.66      0.74       966

    accuracy                           0.80      2284
   macro avg       0.82      0.79      0.79      2284
weighted avg       0.81      0.80      0.80      2284

END. NAIVE BAYES
======================================================
```

Recurrent Neural Networks

In [18]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split

from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.layers import Dense, Input, GlobalAveragePooling1D, Dropout, Spa
from tensorflow.keras.layers import LSTM, Embedding
from tensorflow.keras.models import Model
from tensorflow.keras.optimizers import Adam

from sklearn.metrics import confusion_matrix, classification_report, accuracy_score


def plot_loss_evaluation(r):
    plt.figure(figsize=(12, 8))

    plt.subplot(2, 2, 1)
    plt.plot(r.history['loss'], label='loss')
    plt.plot(r.history['val_loss'], label='val_loss')
    plt.legend()

    plt.subplot(2, 2, 2)
    plt.plot(r.history['accuracy'], label='accuracy')
    plt.plot(r.history['val_accuracy'], label='val_acc')
    plt.legend()

    plt.title('Training and Loss fuction evolution')

def evaluate(model, X_train, X_test, y_train, y_test):
    y_pred_train = np.round(model.predict(X_train))
    y_pred_test = np.round(model.predict(X_test))

    print("=============Training Data===============")
    print(confusion_matrix(y_train, y_pred_train))
    print(classification_report(y_train, y_pred_train))
    print(f"Accuracy score: {accuracy_score(y_train, y_pred_train) * 100:.2f}%")

    print("=============Testing Data===============")
    print(confusion_matrix(y_test, y_pred_test))
    print(classification_report(y_test, y_pred_test))
    print(f"Accuracy score: {accuracy_score(y_test, y_pred_test) * 100:.2f}%")

data = pd.read_csv("train.csv")

print('=============Splitting the data=============')
X = data.text
y = data.target
print(f'Data shape: {data.shape}')

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=
print(f'X_Train shape: {X_train.shape}, y_train shape: {y_train.shape}')
print(f'X_Test shape: {X_test.shape}, y_test shape: {y_test.shape}')

print('==============Convert Sentences to Sequences================')
MAX_VOCAB_SIZE = 20000
tokenizer = Tokenizer(num_words=MAX_VOCAB_SIZE, char_level=False)
tokenizer.fit_on_texts(X_train)
```

```
sequences_train = tokenizer.texts_to_sequences(X_train)
sequences_test = tokenizer.texts_to_sequences(X_test)

# pad sequence do that we get a NxT matrix
data_train = pad_sequences(sequences_train)
data_test = pad_sequences(sequences_test, maxlen=data_train.shape[1])
print(f"Found {len(tokenizer.word_index)} unique tokens.")
print(f"Training Data shape: {data_train.shape}")
print(f"Testing Data shape: {data_test.shape}")

print('===============Create The Model==========================')
# We get to choose embedding dimensionality
D = 100
# Hidden state dimentionality
M = 64
V = len(tokenizer.word_index)
T = data_train.shape[1]

# model.add(embedding)
# model.add(SpatialDropout1D(0.2))
# model.add(LSTM(64, dropout=0.2, recurrent_dropout=0.2))
# model.add(Dense(1, activation='sigmoid'))

i = Input(shape=(T,))
x = Embedding(V + 1, D)(i)
x = SpatialDropout1D(0.2)(x)
x = LSTM(M, return_sequences=True, activation='relu')(x)
x = GlobalAveragePooling1D()(x)
# x = Dropout(0.2)(x)
x = Dense(1, activation='sigmoid')(x)

model = Model(i, x)
optimizer = Adam(learning_rate=1e-5)
# Compile and fit
model.compile(optimizer=optimizer, loss='binary_crossentropy', metrics=['accuracy'])
print('Training model..........')
r = model.fit(data_train, y_train, epochs=50,
              validation_data=(data_test, y_test),
              batch_size=16)

print('===============Model Evaluation====================')
evaluate(model, data_train, data_test, y_train, y_test)
plot_loss_evaluation(r)

```

```
=============Splitting the data=============
Data shape: (7613, 5)
X_Train shape: (5329,), y_train shape: (5329,)
X_Test shape: (2284,), y_test shape: (2284,)
==============Convert Sentences to Sequences================
Found 17762 unique tokens.
Training Data shape: (5329, 33)
Testing Data shape: (2284, 33)
===============Create The Model==========================
Training model..........
Epoch 1/50
334/334 [==============================] - 18s 44ms/step - loss: 0.6939 -
accuracy: 0.4495 - val_loss: 0.6920 - val_accuracy: 0.5771
Epoch 2/50
334/334 [==============================] - 10s 29ms/step - loss: 0.6917 -
```

```
accuracy: 0.5701 - val_loss: 0.6896 - val_accuracy: 0.5771
Epoch 3/50
334/334 [==============================] - 10s 31ms/step - loss: 0.6899 -
accuracy: 0.5596 - val_loss: 0.6869 - val_accuracy: 0.5771
```

In [19]:

```
data.text.str.len()
```

Out[19]:

```
0        69
1        38
2       133
3        65
4        88
       ... 
7608     83
7609    125
7610     65
7611    137
7612     94
Name: text, Length: 7613, dtype: int64
```

Convolutional Neural Networks

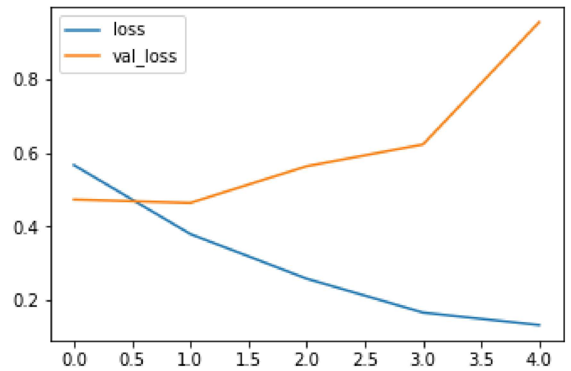
In [20]:

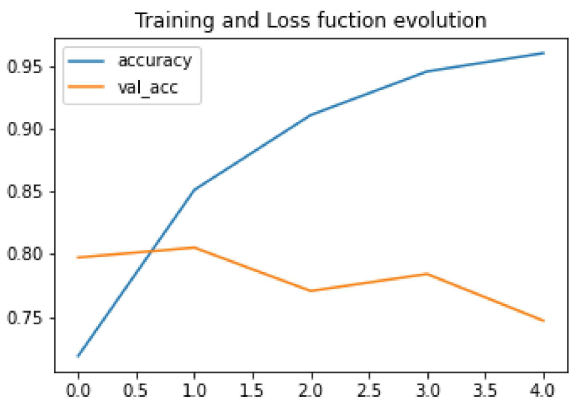
```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split

from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.layers import Dense, Input, GlobalMaxPooling1D, MaxPooling1D
from tensorflow.keras.layers import Conv1D, Embedding, Dropout
from tensorflow.keras.models import Model

from sklearn.metrics import confusion_matrix, classification_report, accuracy_score


def plot_loss_evaluation(r):
    plt.figure(figsize=(12, 8))

    plt.subplot(2, 2, 1)
    plt.plot(r.history['loss'], label='loss')
    plt.plot(r.history['val_loss'], label='val_loss')
    plt.legend()

    plt.subplot(2, 2, 2)
    plt.plot(r.history['accuracy'], label='accuracy')
    plt.plot(r.history['val_accuracy'], label='val_acc')
    plt.legend()

    plt.title('Training and Loss fuction evolution')

def evaluate(model, X_train, X_test, y_train, y_test):
    y_pred_train = np.round(model.predict(X_train))
    y_pred_test = np.round(model.predict(X_test))

    print("=============Training Data===============")
    print(confusion_matrix(y_train, y_pred_train))
    print(classification_report(y_train, y_pred_train))
    print(f"Accuracy score: {accuracy_score(y_train, y_pred_train) * 100:.2f}%")

    print("=============Testing Data===============")
    print(confusion_matrix(y_test, y_pred_test))
    print(classification_report(y_test, y_pred_test))
    print(f"Accuracy score: {accuracy_score(y_test, y_pred_test) * 100:.2f}%")

data = pd.read_csv("train.csv")

print('=============Splitting the data=============')
X = data.text
y = data.target
print(f'Data shape: {data.shape}')

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=
print(f'X_Train shape: {X_train.shape}, y_train shape: {y_train.shape}')
print(f'X_Test shape: {X_test.shape}, y_test shape: {y_test.shape}')

print('==============Convert Sentences to Sequences================')
MAX_VOCAB_SIZE = 20000
tokenizer = Tokenizer(num_words=MAX_VOCAB_SIZE)
tokenizer.fit_on_texts(X_train)
sequences_train = tokenizer.texts_to_sequences(X_train)
```

```python
sequences_test = tokenizer.texts_to_sequences(X_test)

# pad sequence do that we get a NxT matrix
data_train = pad_sequences(sequences_train)
data_test = pad_sequences(sequences_test, maxlen=data_train.shape[1])
print(f"Found {len(tokenizer.word_index)} unique tokens.")
print(f"Training Data shape: {data_train.shape}")
print(f"Testing Data shape: {data_test.shape}")

print('===============Create The Model==========================')
# We get to choose embedding dimensionality
D = 100

V = len(tokenizer.word_index)
T = data_train.shape[1]

i = Input(shape=(T,))
x = Embedding(V + 1, D)(i)

x = Conv1D(32, 2, activation='relu')(x)
x = MaxPooling1D()(x)
x = Dropout(0.1)(x)

x = Conv1D(64, 2, activation='relu')(x)
x = MaxPooling1D()(x)
x = Dropout(0.2)(x)

x = Conv1D(128, 2, activation='relu')(x)
x = MaxPooling1D()(x)
x = Dropout(0.3)(x)

x = Conv1D(264, 2, activation='relu')(x)
x = GlobalMaxPooling1D()(x)

x = Dropout(0.5)(x)

x = Dense(1, activation='sigmoid')(x)

model = Model(i, x)

# Compile and fit
model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
print('Training model...........')
r = model.fit(data_train, y_train, epochs=5,
              validation_data=(data_test, y_test),
              batch_size=1)

print('===============Model Evaluation====================')
evaluate(model, data_train, data_test, y_train, y_test)
plot_loss_evaluation(r)
```

```
=============Splitting the data=============
Data shape: (7613, 5)
X_Train shape: (5329,), y_train shape: (5329,)
X_Test shape: (2284,), y_test shape: (2284,)
==============Convert Sentences to Sequences===============
Found 17762 unique tokens.
Training Data shape: (5329, 33)
Testing Data shape: (2284, 33)
===============Create The Model==========================
```

```
Training model...........
Epoch 1/5
5329/5329 [==============================] - 134s 25ms/step - loss: 0.6245 -
accuracy: 0.6507 - val_loss: 0.4736 - val_accuracy: 0.7973
Epoch 2/5
5329/5329 [==============================] - 133s 25ms/step - loss: 0.3623 -
accuracy: 0.8628 - val_loss: 0.4646 - val_accuracy: 0.8052
Epoch 3/5
5329/5329 [==============================] - 124s 23ms/step - loss: 0.2426 -
accuracy: 0.9193 - val_loss: 0.5639 - val_accuracy: 0.7706
Epoch 4/5
5329/5329 [==============================] - 131s 25ms/step - loss: 0.1615 -
accuracy: 0.9457 - val_loss: 0.6227 - val_accuracy: 0.7842
Epoch 5/5
5329/5329 [==============================] - 127s 24ms/step - loss: 0.1178 -
accuracy: 0.9615 - val_loss: 0.9541 - val_accuracy: 0.7469
================Model Evaluation====================
=============Training Data===============
[[2972   52]
 [  55 2250]]
              precision    recall  f1-score   support

           0       0.98      0.98      0.98      3024
           1       0.98      0.98      0.98      2305

    accuracy                           0.98      5329
   macro avg       0.98      0.98      0.98      5329
weighted avg       0.98      0.98      0.98      5329

Accuracy score: 97.99%
=============Testing Data===============
[[981 337]
 [241 725]]
              precision    recall  f1-score   support

           0       0.80      0.74      0.77      1318
           1       0.68      0.75      0.71       966

    accuracy                           0.75      2284
   macro avg       0.74      0.75      0.74      2284
weighted avg       0.75      0.75      0.75      2284

Accuracy score: 74.69%
```





NLTK Sentiment VADER

In [21]:

```
from nltk.sentiment.vader import SentimentIntensityAnalyzer
sid = SentimentIntensityAnalyzer()
data['scores'] = data['text'].apply(lambda text: sid.polarity_scores(text))
data['compound'] = data['scores'].apply(lambda score_dict: score_dict['compound'])
data['comp_score'] = data['compound'].apply(lambda c: 0 if c >= 0 else 1)
```

In [22]:

```
accuracy_score(data['target'], data['comp_score'])
```

Out[22]:

```
0.5724418757388677
```

Making submission

In [23]:

```
# /kaggle/input/nlp-getting-started/test.csv
# /kaggle/input/nlp-getting-started/sample_submission.csv
test = pd.read_csv('test.csv')

print('==============Convert Sentences to Sequences================')
sequences_test = tokenizer.texts_to_sequences(test.text)

# pad sequence do that we get a NxT matrix
data_test = pad_sequences(sequences_test, maxlen=data_train.shape[1])
print(f"Found {len(tokenizer.word_index)} unique tokens.")
print(f"Testing Data shape: {data_test.shape}")
```

```
==============Convert Sentences to Sequences================
Found 17762 unique tokens.
Testing Data shape: (3263, 33)
```

In [24]:

```
sample_sub=pd.read_csv('sample_submission.csv')
y_pre = model.predict(data_test)
y_pre = np.round(y_pre).astype(int).reshape(3263)
sub = pd.DataFrame({'id':sample_sub['id'].values.tolist(), 'target':y_pre})
sub.to_csv('submission.csv', index=False)
```

In [25]:

```
sub.head()
```

Out[25]:

	id	target
0	0	0
1	2	1
2	3	1
3	9	0
4	11	1

In [ ]:

```

```