NLP Assignment.ipynb

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Importing Libraries and Packages

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

    import nltk
    import re
    from nltk.stem import PorterStemmer
    from nltk.corpus import stopwords

    import tensorflow as tf
    from tensorflow import keras
    from keras.preprocessing import sequence
    from tensorflow.keras.preprocessing.text import Tokenizer
    from tensorflow.keras.preprocessing.sequence import pad_sequences
    from sklearn.preprocessing import LabelEncoder
    le = LabelEncoder()

    from sklearn.model_selection import train_test_split
    from tensorflow.keras import layers, models
    from tensorflow.keras.models import Sequential
    from tensorflow.keras.layers import Embedding, SpatialDropout1D, Dense, Dropout, LSTM
    from sklearn.metrics import accuracy_score, confusion_matrix, classification_report
    from tensorflow.keras.callbacks import EarlyStopping, ReduceLROnPlateau
```

```
[ ] nltk.download('punkt_tab')
    nltk.download('wordnet')
    nltk.download('stopwords')
```

```
[nltk_data] Downloading package punkt_tab to /root/nltk_data...
[nltk_data]   Unzipping tokenizers/punkt_tab.zip.
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Unzipping corpora/stopwords.zip.
True
```

Loading the Dataset

```
[ ] tweets = pd.read_csv('Tweets.csv')
```

```
[ ] tweets.head()
```

	textID	text	selected_text	sentiment
0	cb774db0d1	I`d have responded, if I were going	I`d have responded, if I were going	neutral
1	549e992a42	Sooo SAD I will miss you here in San Diego!!!	Sooo SAD	negative
2	088c60f138	my boss is bullying me...	bullying me	negative
3	9642c003ef	what interview! leave me alone	leave me alone	negative
4	358bd9e861	Sons of ****, why couldn`t they put them on t...	Sons of ****,	negative

Basic EDA

```
[ ] tweets.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 27481 entries, 0 to 27480
Data columns (total 4 columns):
 #   Column         Non-Null Count  Dtype
---  ------         --------------  -----
 0   textID         27481 non-null  object
 1   text           27480 non-null  object
 2   selected_text  27480 non-null  object
 3   sentiment      27481 non-null  object
dtypes: object(4)
memory usage: 858.9+ KB
```

```
[ ] tweets.isnull().sum()
```

	0
textID	0
text	1
selected_text	1
sentiment	0

dtype: int64

```
[ ] tweets.dropna(inplace=True)
    tweets.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 27480 entries, 0 to 27480
Data columns (total 4 columns):
 #   Column         Non-Null Count  Dtype
```

```
 0   textID         27480 non-null  object
 1   text           27480 non-null  object
 2   selected_text  27480 non-null  object
 3   sentiment      27480 non-null  object
dtypes: object(4)
memory usage: 1.0+ MB
```

- null values have been removed

Text Preprocessing

Regular expression and creating words tokens

```
[ ] text_tokenized = []
    for i,sentence in enumerate(tweets['text']):
      tokens = re.sub('[^a-zA-Z]',' ',sentence)           # using regular expression
      tokens = tokens.lower()
      tokens = tokens.split()
      text_tokenized.append(tokens)
```

```
[ ] text_tokenized[0:2]
```

Show hidden output

Stemming

```
[ ] porter = PorterStemmer()
```

```
[ ] stemmed_text = []
    for i,stems in enumerate(text_tokenized):
        stemming = [porter.stem(j) for j in stems]
        stemmed_text.append(stemming)
```

```
[ ] stemmed_text[:2]
```

Show hidden output

StopWords removal from the stemmed text

```
[ ] stop_words = set(stopwords.words('english'))
    cleaned = []
    for i,words in enumerate(stemmed_text):
        clean = [j for j in words if j.lower() not in stop_words]
        cleaned.append(clean)
```

```
[ ] cleaned[:2]
```

```
[['respond', 'go'], ['sooo', 'sad', 'miss', 'san', 'diego']]
```

Now Creating Embeddings of the clean text

```
[ ] tokenizer = Tokenizer()
    tokenizer.fit_on_texts(cleaned)
```

```
[ ] cleaned[:2]
```

```
[['respond', 'go'], ['sooo', 'sad', 'miss', 'san', 'diego']]
```

```
[ ] sequences = tokenizer.texts_to_sequences(cleaned)
```

```
[ ] sequences[:2]
```

```
[[1303, 2], [325, 55, 21, 1167, 1988]]
```

creating padded_Embeddings

```
[ ] pad_len = len(max(sequences))
    print(f"Padding width : {pad_len}")
```

```
Padding Width : 10
```

```
[ ] padded_sequences = sequence.pad_sequences(sequences, maxlen = pad_len)
    padded_sequences[:2]
```

```
array([[   0,    0,    0,    0,    0,    0,    0,    0, 1303,    2],
       [   0,    0,    0,    0,    0,    0,  325,   55,   21, 1167, 1988]],
      dtype=int32)
```

- as now we have created padded_embedding let's create a feature in dataset (tweets)

```
[ ] # converting the sentiments into the numerical format
    Labels = le.fit_transform(tweets['sentiment'])
```

```
[ ] tweets.head()
```

	textID	text	selected_text	sentiment
0	cb774db0d1	I`d have responded, if I were going	I`d have responded, if I were going	neutral
1	549e992a42	Sooo SAD I will miss you here in San Diego!!!	Sooo SAD	negative
2	088c60f138	my boss is bullying me...	bullying me	negative
3	9642c003ef	what interview! leave me alone	leave me alone	negative
4	358bd9e861	Sons of ****, why couldn`t they put them on t...	Sons of ****,	negative

Independent and dependent

```
[ ] X = padded_sequences
    Y = Labels

    X.shape, Y.shape
```

```
((27480, 10), (27480,))
```

Splitting into Training and Testing Set

```
[ ] x_train, x_test, y_train, y_test = train_test_split(X,Y, test_size=0.25, random_state=42)

    x_train.shape, y_train.shape, x_test.shape, y_test.shape
```

```
((20610, 10), (20610,), (6870, 10), (6870,))
```

Double-click (or enter) to edit

Model Development

```
[ ] model = Sequential()
    model.add(layers.Embedding(input_dim=x_train.shape[0],output_dim=64))
    model.add(SpatialDropout1D(rate=0.40))
    model.add(LSTM(128))
    model.add(Dense(3,activation='softmax'))
```

```
[ ] model.compile(optimizer='adam',
                  loss = 'sparse_categorical_crossentropy',
                  metrics = ['accuracy'])
```

```
[ ] early_stopping = keras.callbacks.EarlyStopping(patience=10,
                                                   restore_best_weights=True)

    learning_rate = keras.callbacks.ReduceLROnPlateau(factor=0.01,
                                                      patience=10)
```

```
[ ] history = model.fit(x_train,y_train,
                        batch_size=64,
                        validation_split=0.20,
                        epochs = 30,
                        verbose= 1,callbacks=[early_stopping,learning_rate] )
```

```
Epoch 1/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 9s 10ms/step - accuracy: 0.4861 - loss: 0.9907 - val_accuracy: 0.6591 - val_loss: 0.7905 - learning_rate: 0.0010
Epoch 2/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 6s 7ms/step - accuracy: 0.7287 - loss: 0.6558 - val_accuracy: 0.6761 - val_loss: 0.7736 - learning_rate: 0.0010
Epoch 3/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 2s 8ms/step - accuracy: 0.8041 - loss: 0.5081 - val_accuracy: 0.6691 - val_loss: 0.8213 - learning_rate: 0.0010
Epoch 4/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 1s 6ms/step - accuracy: 0.8436 - loss: 0.4152 - val_accuracy: 0.6611 - val_loss: 0.8794 - learning_rate: 0.0010
Epoch 5/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 3s 6ms/step - accuracy: 0.8767 - loss: 0.3479 - val_accuracy: 0.6497 - val_loss: 0.9613 - learning_rate: 0.0010
Epoch 6/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 3s 6ms/step - accuracy: 0.8914 - loss: 0.3114 - val_accuracy: 0.6604 - val_loss: 1.0529 - learning_rate: 0.0010
Epoch 7/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step - accuracy: 0.9114 - loss: 0.2530 - val_accuracy: 0.6448 - val_loss: 1.0419 - learning_rate: 0.0010
Epoch 8/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 2s 8ms/step - accuracy: 0.9202 - loss: 0.2344 - val_accuracy: 0.6487 - val_loss: 1.1442 - learning_rate: 0.0010
Epoch 9/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step - accuracy: 0.9289 - loss: 0.2092 - val_accuracy: 0.6426 - val_loss: 1.2045 - learning_rate: 0.0010
Epoch 10/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step - accuracy: 0.9341 - loss: 0.1897 - val_accuracy: 0.6366 - val_loss: 1.3186 - learning_rate: 0.0010
Epoch 11/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 3s 6ms/step - accuracy: 0.9430 - loss: 0.1615 - val_accuracy: 0.6405 - val_loss: 1.3679 - learning_rate: 0.0010
Epoch 12/30
258/258 ━━━━━━━━━━━━━━━━━━━━ 3s 6ms/step - accuracy: 0.9497 - loss: 0.1460 - val_accuracy: 0.6356 - val_loss: 1.4233 - learning_rate: 0.0010
```

```
[ ] model.summary()
```

```
Model: "sequential"
```

Layer (type)	Output Shape	Param #
embedding (Embedding)	(None, 10, 64)	1,319,040
spatial_dropout1d (SpatialDropout1D)	(None, 10, 64)	0
lstm (LSTM)	(None, 128)	98,816
dense (Dense)	(None, 3)	387

```
Total params: 4,254,731 (16.23 MB)
Trainable params: 1,418,243 (5.41 MB)
```

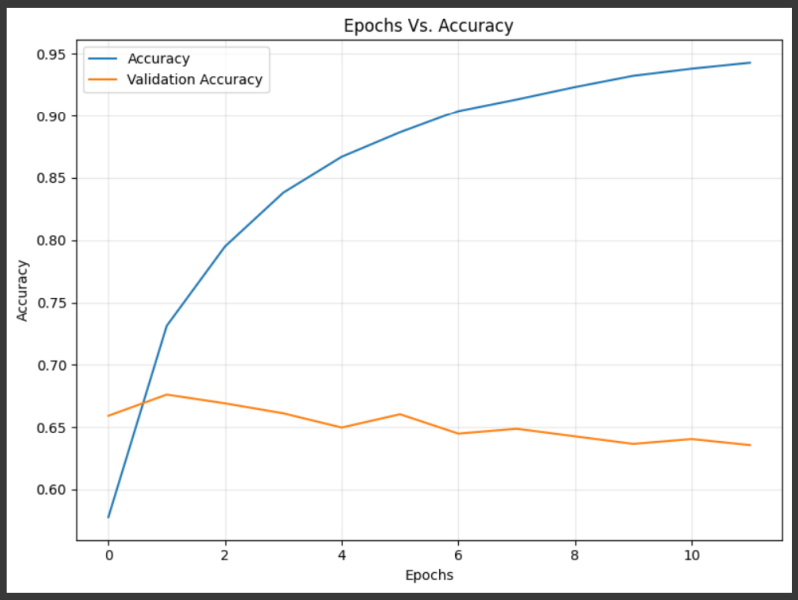
```
Non-trainable params: 0 (0.00 B)
Optimizer params: 2,836,488 (10.82 MB)
```

```
[ ] loss , accuracy = model.evaluate(x_test,y_test)
    print(f"\nAccuracy : {accuracy:.4f}")
```

```
215/215 ━━━━━━━━━━━━━━━━━━━━ 1s 3ms/step - accuracy: 0.6831 - loss: 0.7469

Accuracy : 0.6834
```

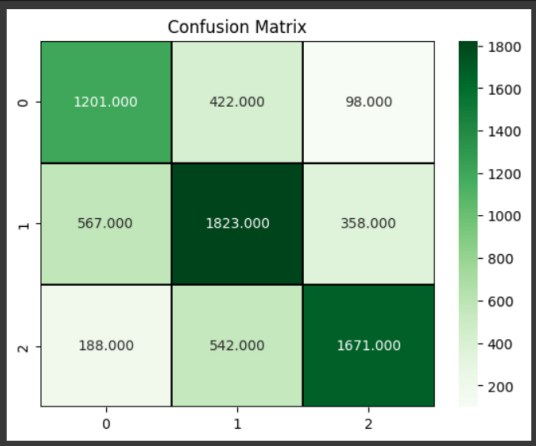
```
[ ] plt.figure(figsize=(8,6))
    plt.plot(history.history['accuracy'], label="Accuracy")
    plt.plot(history.history['val_accuracy'], label="Validation Accuracy")
    plt.xlabel("Epochs")
    plt.ylabel("Accuracy")
    plt.title("Epochs Vs. Accuracy")
    plt.tight_layout()
    plt.legend()
    plt.grid(alpha=0.30)
    plt.show()
```



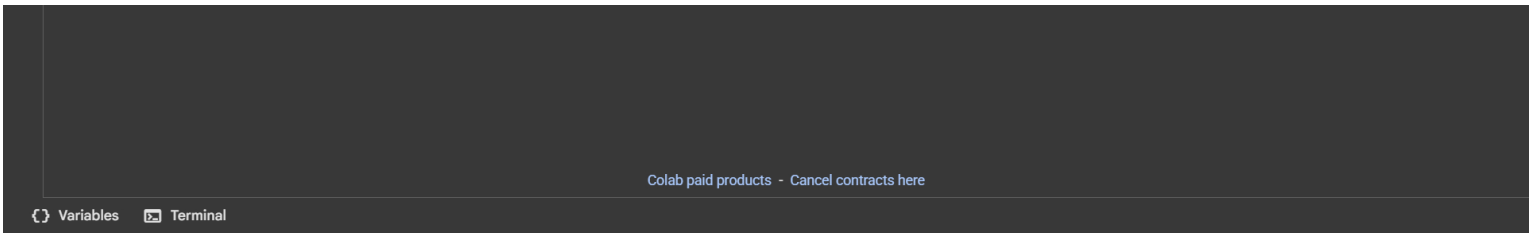

```
predictions  = model.predict(x_test)
y_pred = [predicted.argmax() for predicted in predictions]
y_pred[:2]
```

Show hidden output

```
[ ] cm = confusion_matrix(y_pred,y_test)
    sns.heatmap(cm, cmap='Greens', annot=True, fmt='.3f', linecolor='black', linewidths=0.03)
    plt.title("Confusion Matrix")
    plt.show()
```




```
[ ] Start coding or generate with AI.
```


Colab paid products - Cancel contracts here
Variables
Terminal