

MAHENDRA ENGINEERING COLLEGE FOR WOMEN

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Import the Dataset

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

Saving spam.csv to spam.csv

Import required libraries

```
import csv
import tensorflow as tf
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
import nltk
nltk.download('stopwords')
from nltk.corpus import stopwords
STOPWORDS = set(stopwords.words('english'))

[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data] Unzipping corpora/stopwords.zip.

[nltk_data] Unzipping corpora/stopwords.zip.
```

Import dataset

```
import io
dataset = pd.read_csv(io.BytesIO(uploaded['spam.csv']), encoding = "ISO-8859-1")
```

dataset

	v1	v2	Unnamed: 2	\
0	ham	Go until jurong point, crazy.. Available only ...		NaN
1	ham	Ok lar... Joking wif u oni...		NaN
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...		NaN
3	ham	U dun say so early hor... U c already then say...		NaN
4	ham	Nah I don't think he goes to usf, he lives aro...		NaN
...
5567	spam	This is the 2nd time we have tried 2 contact u...		NaN
5568	ham	Will i_b going to esplanade fr home?		NaN
5569	ham	Pity, * was in mood for that. So...any other s...		NaN
5570	ham	The guy did some bitching but I acted like i'd...		NaN
5571	ham	Rofl. Its true to its name		NaN

Unnamed:

3

Unnamed:

4

0	NaN	NaN
1	NaN	NaN
2	NaN	NaN
3	NaN	NaN
4	NaN	NaN
...
5567	NaN	NaN
5568	NaN	NaN
5569	NaN	NaN
5570	NaN	NaN
5571	NaN	NaN

[5572 rows x 5 columns]

vocab_size	=	5000
embedding_dim	=	64
max_length	=	200
trunc_type	=	'post'
padding_type	=	'post'
oov_tok	=	''
training_portion	=	.8

Read the dataset and do pre-processing.

To remove the stop words.

```

articles = []
labels = []

with open("spam.csv", 'r', encoding = "ISO-8859-1") as dataset:
    reader = csv.reader(dataset, delimiter=',')
    next(reader)
    for row in reader:
        labels.append(row[0])
        article = row[1]
        for word in STOPWORDS:
            token = ' ' + word + ' '
            article = article.replace(token, '')
            article = article.replace(',', '')
        articles.append(article)
print(len(labels))
print(len(articles))

5572
5572

```

Train the model

```

train_size = int(len(articles) * training_portion)
train_articles = articles[0:train_size]
train_labels = labels[0:train_size]
validation_articles = articles[train_size:]
validation_labels = labels[train_size:]
print(train_size)
print(len(train_articles))
print(len(train_labels))

```



```

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 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 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 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 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 0 0 0 0
0 0 0 0]

```

```

validation_sequences = tokenizer.texts_to_sequences(validation_articles)
validation_padded = pad_sequences(validation_sequences, maxlen=max_length,
padding=padding_type, truncating=trunc_type)

```

```

print(len(validation_sequences))
print(validation_padded.shape)

```

```

1115
(1115, 200)

```

```

label_tokenizer = Tokenizer()
label_tokenizer.fit_on_texts(labels)

```

```

training_label_seq = np.array(label_tokenizer.texts_to_sequences(train_labels))
validation_label_seq = np.array(label_tokenizer.texts_to_sequences(validation_labels))
print(training_label_seq[0])
print(training_label_seq[1])
print(training_label_seq[2])
print(training_label_seq.shape)

```

```

print(validation_label_seq[0])
print(validation_label_seq[1])
print(validation_label_seq[2])
print(validation_label_seq.shape)

```

```

[1]
[1]
[2]
(4457, 1)
[1]
[2]
[1]
(1115, 1)

```

```

reverse_word_index = dict([(value, key) for (key, value) in word_index.items()])

```

```

def decode_article(text):
    return ' '.join([reverse_word_index.get(i, '?') for i in text])
print(decode_article(train_padded[10]))
print('---')
print(train_articles[10])

```

I'm gonna home soon want talk stuff anymore tonight, k? I've cried enough today.

To implement LSTM

```
model = tf.keras.Sequential([
    tf.keras.layers.Embedding(vocab_size, embedding_dim),
    tf.keras.layers.Bidirectional(tf.keras.layers.LSTM(embedding_dim)),
    tf.keras.layers.Dense(embedding_dim, activation='relu'),
    tf.keras.layers.Dense(6, activation='softmax')
])
model.summary()
```

```
Model: "sequential"
```

Layer (type)	Output Shape	Param #
embedding (Embedding)	(None, None, 64)	320000
bidirectional (Bidirectional 1)	(None, 128)	66048
dense (Dense)	(None, 64)	8256
dense_1 (Dense)	(None, 6)	390
Total		394,694
Trainable		394,694
Non-trainable		0

```
print(set(labels))
```

```
{ 'spam', 'ham' }
```

```
model.compile(loss='sparse_categorical_crossentropy', optimizer='adam',
metrics=['accuracy'])
num_epochs = 10
history = model.fit(train_padded, training_label_seq, epochs=num_epochs,
validation_data=(validation_padded, validation_label_seq), verbose=2)
```

```
Epoch 1/10
140/140 - 37s - loss: 0.3177 - accuracy: 0.9251 - val_loss: 0.0387 - val_accuracy: 0.9830 - 37s/epoch - 265ms/step
Epoch 2/10
140/140 - 35s - loss: 0.0310 - accuracy: 0.9915 - val_loss: 0.0318 - val_accuracy: 0.9901 - 35s/epoch - 252ms/step
Epoch 3/10
```

```

140/140 - 32s - loss: 0.0130 - accuracy: 0.9975 - val_loss: 0.0627 -
val_accuracy: 0.9857 - 32s/epoch - 230ms/step
Epoch 4/10
140/140 - 31s - loss: 0.0060 - accuracy: 0.9987 - val_loss: 0.0478 -
val_accuracy: 0.9901 - 31s/epoch - 220ms/step
Epoch 5/10
140/140 - 30s - loss: 0.0042 - accuracy: 0.9989 - val_loss: 0.0613 -
val_accuracy: 0.9883 - 30s/epoch - 215ms/step
Epoch 6/10
140/140 - 29s - loss: 0.0033 - accuracy: 0.9991 - val_loss: 0.0728 -
val_accuracy: 0.9883 - 29s/epoch - 210ms/step
Epoch 7/10
140/140 - 29s - loss: 0.0020 - accuracy: 0.9996 - val_loss: 0.0540 -
val_accuracy: 0.9865 - 29s/epoch - 208ms/step
Epoch 8/10
140/140 - 31s - loss: 7.6466e-04 - accuracy: 0.9998 - val_loss: 0.0644 -
val_accuracy: 0.9901 - 31s/epoch - 219ms/step
Epoch 9/10
140/140 - 30s - loss: 3.9159e-04 - accuracy: 1.0000 - val_loss: 0.0678 -
val_accuracy: 0.9883 - 30s/epoch - 211ms/step
Epoch 10/10
140/140 - 29s - loss: 1.7514e-04 - accuracy: 1.0000 - val_loss: 0.0726 -
val_accuracy: 0.9883 - 29s/epoch - 208ms/step

```

```

def plot_graphs(history, string):
    plt.plot(history.history[string])
    plt.plot(history.history['val_'+string])
    plt.xlabel("Epochs")
    plt.ylabel(string)
    plt.legend([string, 'val_'+string])
    plt.show()

plot_graphs(history, "accuracy")
plot_graphs(history, "loss")

```

