

**Assignment -4**  
**SMS Spam Classification**

|                     |   |
|---------------------|---|
| Assignment Date     | 14 November 2022                                      |
| Team ID             | PNT2022TMID12745                                      |
| Project Name        | AI-powered Nutrition Analyzer for Fitness Enthusiasts |
| Student Name        | R.Soundaryaa  |
| Student Roll Number | 718019L136  |
| Maximum Marks       | 2 Marks   |

### 1.Download the dataset

### 2.Import required library

```
[ ] import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from keras.models import Model
from keras.layers import LSTM, Activation, Dense, Dropout, Input, Embedding
from keras.optimizers import RMSprop
from keras.preprocessing.text import Tokenizer
from keras_preprocessing import sequence
from keras.utils import to_categorical
from keras.models import load_model
```

### 3.Read Dataset and do preprocessing

```
df = pd.read_csv('/content/spam (1).csv',delimiter=',',encoding='latin-1')
df.head()
```

|   | v1   | v2  | Unnamed: 2 | Unnamed: 3 | Unnamed: 4 |
|---|------|---|------------|------------|------------|
| 0 | ham  | Go until jurong point, crazy.. Available only ... | NaN        | NaN        | NaN        |
| 1 | ham  | Ok lar... Joking wif u oni...                     | NaN        | NaN        | NaN        |
| 2 | spam | Free entry in 2 a wkly comp to win FA Cup fina... | NaN        | NaN        | NaN        |
| 3 | ham  | U dun say so early hor... U c already then say... | NaN        | NaN        | NaN        |
| 4 | ham  | Nah I don't think he goes to usf, he lives aro... | NaN        | NaN        | NaN        |

```
df.drop(['Unnamed: 2', 'Unnamed: 3', 'Unnamed: 4'],axis=1,inplace=True) #dropping
unwanted columns
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 2 columns):
#   Column  Non-Null Count  Dtype
---  -
0    v1      5572 non-null    object
1    v2      5572 non-null    object
dtypes: object(2)
memory usage: 87.2+ KB
```

```
# Count of Spam and Ham values
df.groupby(['v1']).size()
```

```
[ ] v1
    ham    4825
    spam    747
dtype: int64
```

```
# Test and train split
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)
```

```
# Label Encoding target column
X = df.v2
Y = df.v1
le = LabelEncoder()
Y = le.fit_transform(Y)
Y = Y.reshape(-1,1)
```

```
# Tokenisation function
max_words = 1000
max_len = 150
tok = Tokenizer(num_words=max_words)
tok.fit_on_texts(X_train)
sequences = tok.texts_to_sequences(X_train)
sequences_matrix = sequence.pad_sequences(sequences,maxlen=max_len)
```

#### 4. Create Model and 5. Add Layers (LSTM, Dense-(Hidden Layers), Output)

```
# Creating LSTM model
inputs = Input(name='InputLayer', shape=[max_len])
layer = Embedding(max_words, 50, input_length=max_len)(inputs)
layer = LSTM(64)(layer)
layer = Dense(256, name='FullyConnectedLayer1')(layer)
layer = Activation('relu')(layer)
layer = Dropout(0.5)(layer)
layer = Dense(1, name='OutputLayer')(layer)
layer = Activation('sigmoid')(layer)
```

#### 6. Compile the model

```
model = Model(inputs=inputs, outputs=layer)
model.summary()
model.compile(loss='binary_crossentropy', optimizer=RMSprop(), metrics=['accuracy'])
```

Model: "model"

| Layer (type)                 | Output Shape    | Param # |
|------------------------------|-----------------|---------|
| InputLayer (InputLayer)      | [(None, 150)]   | 0       |
| embedding (Embedding)        | (None, 150, 50) | 50000   |
| lstm (LSTM)                  | (None, 64)      | 29440   |
| FullyConnectedLayer1 (Dense) | (None, 256)     | 16640   |
| activation (Activation)      | (None, 256)     | 0       |
| dropout (Dropout)            | (None, 256)     | 0       |
| OutputLayer (Dense)          | (None, 1)       | 257     |
| activation_1 (Activation)    | (None, 1)       | 0       |
| Total params: 96,337         |                 |         |
| Trainable params: 96,337     |                 |         |
| Non-trainable params: 0      |                 |         |

## 7. Fit the Model

```
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,
validation_split=0.2)
```

```
Epoch 1/10
30/30 [=====] - 12s 288ms/step - loss: 0.3478 - accuracy: 0.8704 - val_loss: 0.1900 - val_accuracy: 0.9262
Epoch 2/10
30/30 [=====] - 8s 267ms/step - loss: 0.0927 - accuracy: 0.9770 - val_loss: 0.0929 - val_accuracy: 0.9747
Epoch 3/10
30/30 [=====] - 8s 268ms/step - loss: 0.0432 - accuracy: 0.9876 - val_loss: 0.0740 - val_accuracy: 0.9800
Epoch 4/10
30/30 [=====] - 8s 269ms/step - loss: 0.0309 - accuracy: 0.9918 - val_loss: 0.0648 - val_accuracy: 0.9810
Epoch 5/10
30/30 [=====] - 8s 264ms/step - loss: 0.0255 - accuracy: 0.9931 - val_loss: 0.0674 - val_accuracy: 0.9810
Epoch 6/10
30/30 [=====] - 8s 269ms/step - loss: 0.0178 - accuracy: 0.9952 - val_loss: 0.0605 - val_accuracy: 0.9852
Epoch 7/10
30/30 [=====] - 8s 269ms/step - loss: 0.0162 - accuracy: 0.9960 - val_loss: 0.0633 - val_accuracy: 0.9852
Epoch 8/10
30/30 [=====] - 8s 266ms/step - loss: 0.0129 - accuracy: 0.9958 - val_loss: 0.0723 - val_accuracy: 0.9863
Epoch 9/10
30/30 [=====] - 8s 266ms/step - loss: 0.0097 - accuracy: 0.9976 - val_loss: 0.0704 - val_accuracy: 0.9884
Epoch 10/10
30/30 [=====] - 8s 269ms/step - loss: 0.0070 - accuracy: 0.9976 - val_loss: 0.0700 - val_accuracy: 0.9863
<keras.callbacks.History at 0x7f6077793ad0>
```

## 8. Save the Model

```
model.save("model_1")
```

```
WARNING:absl:Function `_wrapped_model` contains input name(s) InputLayer with unsupported characters which will be renamed to inputlayer in the SavedModel.
WARNING:absl:Found untraced functions such as lstm_cell_layer_call_fn, lstm_cell_layer_call_and_return_conditional_losses while saving (showing 2 of 2). These functions will not be traced.
```

## 9. Test the model

```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = sequence.pad_sequences(test_sequences,maxlen=max_len)
accuracy = model.evaluate(test_sequences_matrix,Y_test)
print('Accuracy: {:.3f}'.format(accuracy[1]))
```

```
27/27 [=====] - 1s 22ms/step - loss: 0.0945 - accuracy: 0.9797
Accuracy: 0.980
```

```
y_pred = model.predict(test_sequences_matrix)
print(y_pred[25:40].round(3))
```

---

```
27/27 [=====] - 1s 21ms/step
```

```
[[0.  ]
 [1.  ]
 [1.  ]
 [0.  ]
 [1.  ]
 [0.  ]
 [0.  ]
 [0.  ]
 [0.  ]
 [0.  ]
 [1.  ]
 [0.002]
 [0.  ]
 [1.  ]
 [0.  ]
 [0.  ]]
```

```
print(Y_test[25:40])
```

```
[[0]
 [1]
 [1]
 [0]
 [1]
 [0]
 [0]
 [0]
 [0]
 [0]
 [1]
 [0]
 [0]
 [1]
 [0]
 [0]]
```