```python
import pandas as pd import numpy as np import
matplotlib.pyplot as plt import seaborn as sns 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
pad_sequences from keras.utils import to_categorical
from keras.callbacks import EarlyStopping
```

READING DATASET

```python
df = pd.read_csv('spam.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

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

```
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
```

```python
df.groupby(['v1']).size()
```

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

```python
df.groupby(['v2']).size()
```

```
v2
 <#>  in mca. But not conform.                                                  1
<#>  mins but i had to stop somewhere first.
1
 <DECIMAL> m but its not a common car here so its better to buy from china or asia. Or if i find
it less expensive. I.ll holla    1
 and  picking them up from various points
1
 came to look at the flat, seems ok, in his 50s? * Is away alot wiv work. Got woman coming at
6.30 too.                          1
                                                                                      ..
```

Ïˍ still got lessons? Ïˍ in sch?   1
Ïˍ takin linear algebra today?
1
Ïˍ thk of wat to eat tonight.   1
Ïˍ v ma fan...   1 Ïˍ
wait 4 me in sch i finish ard 5..
1
Length: 5169, dtype: int64
X = df.v2 Y = df.v1 le = LabelEncoder() Y =
   le.fit_transform(Y)
Y = Y.reshape(-1,1)
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.15)
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 = pad_sequences(sequences,maxlen=max_len)
CREATE MODEL AND ADD LAYERS

inputs = Input(name='inputs',shape=[max_len])
layer = Embedding(max_words,50,input_length=max_len)(inputs) layer
= LSTM(64)(layer)
layer = Dense(256,name='FC1')(layer)
layer = Activation('relu')(layer) layer =
Dropout(0.5)(layer)
layer = Dense(1,name='out_layer')(layer) layer
= Activation('sigmoid')(layer)
model = Model(inputs=inputs,outputs=layer)
COMPILE AND FIT THE MODEL

model.summary()
model.compile(loss='binary_crossentropy',optimizer=RMSprop(),metrics=['accuracy'])
model.fit(sequences_matrix,Y_train,batch_size=128,epochs=10,   validation_split=0.2)
Model: "model"

_____

Layer (type)	Output Shape	Param #
inputs (InputLayer)	[(None, 150)]	0
embedding (Embedding)	(None, 150, 50)	50000
lstm (LSTM)	(None, 64)	29440
FC1 (Dense)	(None, 256)	16640

activation (Activation)	(None, 256)	0
dropout (Dropout)	(None, 256)	0
out_layer (Dense)	(None, 1)	257
activation_1 (Activation)	(None, 1)	0

```
=================================================================
Total params: 96,337
Trainable params: 96,337
Non-trainable params: 0
_____
Epoch 1/10
30/30 [==============================] - 11s 286ms/step - loss: 0.3204 - accuracy:
0.8820 - val_loss: 0.1487 - val_accuracy: 0.9726
Epoch 2/10
30/30 [==============================] - 8s 260ms/step - loss: 0.0889 - accuracy:
0.9791 - val_loss: 0.0641 - val_accuracy: 0.9831
Epoch 3/10
30/30 [==============================] - 8s 263ms/step - loss: 0.0482 - accuracy:
0.9863 - val_loss: 0.0461 - val_accuracy: 0.9895
Epoch 4/10
30/30 [==============================] - 8s 261ms/step - loss: 0.0361 - accuracy:
0.9894 - val_loss: 0.0363 - val_accuracy: 0.9895
Epoch 5/10
30/30 [==============================] - 8s 258ms/step - loss: 0.0312 - accuracy:
0.9897 - val_loss: 0.0365 - val_accuracy: 0.9895 Epoch
6/10
30/30 [==============================] - 10s 328ms/step - loss: 0.0223 - accuracy:
0.9923 - val_loss: 0.0418 - val_accuracy: 0.9863
Epoch 7/10
30/30 [==============================] - 9s 284ms/step - loss: 0.0179 - accuracy:
0.9945 - val_loss: 0.0473 - val_accuracy: 0.9852
Epoch 8/10
30/30 [==============================] - 10s 344ms/step - loss: 0.0123 - accuracy:
0.9950 - val_loss: 0.0599 - val_accuracy: 0.9895
Epoch 9/10
30/30 [==============================] - 8s 271ms/step - loss: 0.0087 - accuracy:
0.9974 - val_loss: 0.0592 - val_accuracy: 0.9905
Epoch 10/10
30/30 [==============================] - 8s 262ms/step - loss: 0.0082 - accuracy:
0.9971 - val_loss: 0.0490 - val_accuracy: 0.9884
```

SAVING THE MODEL

```
model.save('sms_classifier.h5')
```
TEST THE MODEL

```
test_sequences = tok.texts_to_sequences(X_test)
test_sequences_matrix = pad_sequences(test_sequences,maxlen=max_len)
accr = model.evaluate(test_sequences_matrix,Y_test)
27/27 [==============================] - 1s 24ms/step - loss: 0.0512 - accuracy: 0.9856
print('Test set\n  Loss: {:0.3f}\n  Accuracy: {:0.3f}'.format(accr[0],accr[1])) Test set
  Loss: 0.051
  Accuracy: 0.986
```

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