

```
In [ ]: import numpy as np
import pandas as pd
```

```
In [ ]: df = pd.read_csv(open('spam.csv', encoding='ISO-8859-1'))
df.head()
```

```
Out[ ]:
```

	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

```
In [ ]: df.tail()
```

```
Out[ ]:
```

	v1	v2	Unnamed: 2	Unnamed: 3	Unnamed: 4
5567	spam	This is the 2nd time we have tried 2 contact u...	NaN	NaN	NaN
5568	ham	Will Ì_b going to esplanade fr home?	NaN	NaN	NaN
5569	ham	Pity, * was in mood for that. So...any other s...	NaN	NaN	NaN
5570	ham	The guy did some bitching but I acted like i'd...	NaN	NaN	NaN
5571	ham	Rofl. Its true to its name	NaN	NaN	NaN

```
In [ ]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5572 entries, 0 to 5571
Data columns (total 5 columns):
#   Column      Non-Null Count  Dtype
---  ---
0   v1           5572 non-null   object
1   v2           5572 non-null   object
2   Unnamed: 2   50 non-null     object
3   Unnamed: 3   12 non-null     object
4   Unnamed: 4   6 non-null      object
dtypes: object(5)
memory usage: 217.8+ KB
```

```
In [ ]: df.isnull().sum()
```

```
Out[ ]: v1           0
v2           0
Unnamed: 2    5522
Unnamed: 3    5560
Unnamed: 4    5566
dtype: int64
```

```
In [ ]: Sp = pd.get_dummies(df['v1'])
Sp
```

Out[]:

	ham	spam
0	1	0
1	1	0
2	0	1
3	1	0
4	1	0
...
5567	0	1
5568	1	0
5569	1	0
5570	1	0
5571	1	0

5572 rows × 2 columns

In []: `from sklearn.preprocessing import LabelEncoder`

`le = LabelEncoder()`

`label = le.fit_transform(df['v1'])`

`label`

Out[]: `array([0, 0, 1, ..., 0, 0, 0])`

In []: `df.drop("v1", axis=1, inplace=True)`

`df["v1"] = label`

printing Dataframe

`df`

Out[]:

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

5572 rows × 5 columns

In []: df.head()

Out[]:

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

In []: train_set = df.iloc[:,4:5].values
train_setOut[]: array([[0],
[0],
[1],
...,
[0],
[0],
[0]])

In []: from sklearn.preprocessing import MinMaxScaler

sc = MinMaxScaler()
scaled_tr = sc.fit_transform(train_set)
scaled_trOut[]: array([[0.],
[0.],
[1.],
...,
[0.],
[0.],
[0.]])

```
In [ ]: scaled_tr[60-60:60,0]
```

```
Out[ ]: array([0., 0., 1., 0., 0., 1., 0., 0., 1., 1., 0., 1., 1., 0., 0., 1., 0.,  
              0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,  
              1., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0.,  
              0., 0., 0., 1., 0., 1., 0., 0., 0.])
```

```
In [ ]: x_train = []  
        y_train = []  
  
        for i in range(60,1258):  
            x_train.append(scaled_tr[i-60:i,0])  
            y_train.append(scaled_tr[i,0])
```

```
In [ ]: x_train
```

[illegible]

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[illegible]

16/85

[illegible]

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25/85

26/85

27/85

28/85

29/85

30/85

31/85

[illegible]

33/85

[illegible]

[illegible]

36/85

37/85

38/85

39/85

40/85

41/85

42/85

43/85

44/85

45/85

46/85

47/85

48/85

49/85

50/85

51/85

52/85

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57/85

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60/85

[illegible]

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```

array([0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 1., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 1., 0., 0., 1., 0., 1., 0., 0.]),
array([0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 1., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 1., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       1., 0., 0., 1., 0., 1., 0., 0., 0.]),
array([0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 1., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1.,
       0., 0., 1., 0., 1., 0., 0., 0., 0.]),
array([0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 1., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0.,
       0., 1., 0., 1., 0., 0., 0., 0., 0.]),
array([0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0.,
       0., 0., 1., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 1.,
       0., 1., 0., 0., 0., 0., 0., 0., 0.]),
array([0., 0., 0., 1., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 1., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 1., 0.,
       1., 0., 0., 0., 0., 0., 0., 0., 0.]),
array([0., 0., 1., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       1., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 1., 0., 1.,
       0., 0., 0., 0., 0., 0., 0., 0., 0.]),
...]
```

In []: y_train

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[illegible]

```
In [ ]: x_train,y_train = np.array(x_train),np.array(y_train)
```

```
In [ ]: x_train
```

```
Out[ ]: array([[0., 0., 1., ..., 0., 0., 0.],
               [0., 1., 0., ..., 0., 0., 0.],
               [1., 0., 0., ..., 0., 0., 0.],
               ...,
               [1., 0., 0., ..., 0., 0., 0.],
               [0., 0., 0., ..., 0., 0., 0.],
               [0., 0., 0., ..., 0., 0., 0.]])
```

```
In [ ]: x_train.shape
```

```
Out[ ]: (1198, 60)
```

```
In [ ]: x_train = np.reshape(x_train,(1198, 60, 1))
        x_train.shape
```

Out[]: (1198, 60, 1)

```
In [ ]: from tensorflow.keras.models import Sequential
        from tensorflow.keras.layers import Dense, LSTM
```

```
In [ ]: model = Sequential()
        model.add(LSTM(50, input_shape = (60,1),return_sequences=True))
        model.add(LSTM(50,return_sequences=True))
        model.add(LSTM(50,return_sequences=True))
        model.add(LSTM(50,return_sequences=True))
        model.add(Dense(1))
```

```
In [ ]: model.compile(optimizer='adam',loss='mse')
```

```
In [ ]: model.fit(x_train,y_train,epochs=24,batch_size=32)
```

```
Epoch 1/24
38/38 [=====] - 4s 115ms/step - loss: 0.1265
Epoch 2/24
38/38 [=====] - 4s 116ms/step - loss: 0.1264
Epoch 3/24
38/38 [=====] - 4s 117ms/step - loss: 0.1265
Epoch 4/24
38/38 [=====] - 4s 116ms/step - loss: 0.1263
Epoch 5/24
38/38 [=====] - 4s 116ms/step - loss: 0.1261
Epoch 6/24
38/38 [=====] - 4s 117ms/step - loss: 0.1264
Epoch 7/24
38/38 [=====] - 4s 116ms/step - loss: 0.1263
Epoch 8/24
38/38 [=====] - 5s 119ms/step - loss: 0.1261
Epoch 9/24
38/38 [=====] - 4s 116ms/step - loss: 0.1263
Epoch 10/24
38/38 [=====] - 4s 117ms/step - loss: 0.1265
Epoch 11/24
38/38 [=====] - 4s 116ms/step - loss: 0.1262
Epoch 12/24
38/38 [=====] - 4s 117ms/step - loss: 0.1261
Epoch 13/24
38/38 [=====] - 4s 117ms/step - loss: 0.1269
Epoch 14/24
38/38 [=====] - 4s 116ms/step - loss: 0.1266
Epoch 15/24
38/38 [=====] - 4s 117ms/step - loss: 0.1267
Epoch 16/24
38/38 [=====] - 4s 117ms/step - loss: 0.1263
Epoch 17/24
38/38 [=====] - 4s 117ms/step - loss: 0.1261
Epoch 18/24
38/38 [=====] - 4s 118ms/step - loss: 0.1262
Epoch 19/24
38/38 [=====] - 4s 116ms/step - loss: 0.1261
Epoch 20/24
38/38 [=====] - 4s 117ms/step - loss: 0.1264
Epoch 21/24
38/38 [=====] - 4s 116ms/step - loss: 0.1263
Epoch 22/24
38/38 [=====] - 4s 117ms/step - loss: 0.1261
Epoch 23/24
38/38 [=====] - 4s 117ms/step - loss: 0.1260
Epoch 24/24
38/38 [=====] - 4s 116ms/step - loss: 0.1261
```

Out[]: <keras.callbacks.History at 0x7efcaea5f610>



In []: `model.save('ARK.h5')`