Language-Model-DL

Python · No attached data sources

Run
33.6s

Version 1 of 1

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DL Practical 6

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In [1]:
```
from tensorflow import keras
import numpy
from numpy import array
from keras.preprocessing.text import Tokenizer
from tensorflow.keras.utils import to_categorical
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import SimpleRNN
from keras.layers import Embedding
from keras.preprocessing.sequence import pad_sequences
```

In [2]:
```
data = """ Deep in the festering hold thy father lies,\n
               of his bones New England pews are made,\n
               those are altar lights that were his eyes.\n
               What port awaits us, Davy Jones'\n
               or home? I've heard of slavers drifting, drifting,\n
               playthings of wind and storm and chance, their crews\n"""
print("Data:", data, type(data))

data_splitted=data.split('\n') #returns a list of strings
print("Data_Splitted:", data_splitted, type(data_splitted))

tokenizer=Tokenizer(filters='!"#$%&()*+,-/:;<=>?@[\]^_`{|}~')

tokenizer.fit_on_texts(data_splitted) #learns a vocabulary
print("Word Indices:", tokenizer.word_index) #tokenizer.word_index is a dictionary
```

```
Data:  Deep in the festering hold thy father lies,

               of his bones New England pews are made,

               those are altar lights that were his eyes.

               What port awaits us, Davy Jones'

               or home? I've heard of slavers drifting, drifting,

               playthings of wind and storm and chance, their crews
 <class 'str'>
Data_Splitted: [' Deep in the festering hold thy father lies,', '    ', '
of his bones New England pews are made,', '    ', '               those are altar light
```

```
s that were his eyes. ',   ',                  What port awaits us, Davy Jones  ',   ',
or home? I've heard of slavers drifting, drifting,', '   ', '               playthings
of wind and storm and chance, their crews', ''] <class 'list'>
Word Indices: {'of': 1, 'his': 2, 'are': 3, 'drifting': 4, 'and': 5, 'deep': 6, 'in':
7, 'the': 8, 'festering': 9, 'hold': 10, 'thy': 11, 'father': 12, 'lies': 13, 'bones':
14, 'new': 15, 'england': 16, 'pews': 17, 'made': 18, 'those': 19, 'altar': 20, 'light
s': 21, 'that': 22, 'were': 23, 'eyes.': 24, 'what': 25, 'port': 26, 'awaits': 27, 'u
s': 28, 'davy': 29, 'jones'': 30, 'or': 31, 'home': 32, 'i've': 33, 'heard': 34, 'slav
ers': 35, 'playthings': 36, 'wind': 37, 'storm': 38, 'chance': 39, 'their': 40, 'crew
s': 41}
```

In [3]:

```
vocab_size = len(tokenizer.word_index) + 1
print("Vocab Size:", vocab_size)

sequences=tokenizer.texts_to_sequences(data_splitted) #list of list
l=len(sequences)
print("Sequences:",sequences, type(sequences), l)
```

```
Vocab Size: 42
Sequences: [[6, 7, 8, 9, 10, 11, 12, 13], [], [1, 2, 14, 15, 16, 17, 3, 18], [], [19,
3, 20, 21, 22, 23, 2, 24], [], [25, 26, 27, 28, 29, 30], [], [31, 32, 33, 34, 1, 35,
4, 4], [], [36, 1, 37, 5, 38, 5, 39, 40, 41], []] <class 'list'> 12
```

In [4]:

```
X=list()
y=list()

for i in range(len(sequences)):
    X.insert(i,sequences[i][:-1])
    y.insert(i,sequences[i])

print("X=", X, "y=",y, type(X), type(y))

maxlen = max([len(sequence) for sequence in X])
print("Maxlen:",maxlen)
```

```
X= [[6, 7, 8, 9, 10, 11, 12], [], [1, 2, 14, 15, 16, 17, 3], [], [19, 3, 20, 21, 22, 2
3, 2], [], [25, 26, 27, 28, 29], [], [31, 32, 33, 34, 1, 35, 4], [], [36, 1, 37, 5, 3
8, 5, 39, 40], []] y= [[6, 7, 8, 9, 10, 11, 12, 13], [], [1, 2, 14, 15, 16, 17, 3, 1
8], [], [19, 3, 20, 21, 22, 23, 2, 24], [], [25, 26, 27, 28, 29, 30], [], [31, 32, 33,
34, 1, 35, 4, 4], [], [36, 1, 37, 5, 38, 5, 39, 40, 41], []] <class 'list'> <class 'li
st'>
Maxlen: 8
```

In [5]:

```
X=pad_sequences(X,maxlen=maxlen+1,padding='pre') # +1 to have 0 as the first input
print("X:",X, type(X), X.shape)
y=pad_sequences(y,maxlen=maxlen+1,padding='pre')
print("y:",y, type(y), y.shape)
```

```
X: [[ 0  0  6  7  8  9 10 11 12]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0  1  2 14 15 16 17  3]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0 19  3 20 21 22 23  2]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0  0  0 25 26 27 28 29]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0 31 32 33 34  1 35  4]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0 36  1 37  5 38  5 39 40]
 [ 0  0  0  0  0  0  0  0  0]] <class 'numpy.ndarray'> (12, 9)
y: [[ 0  6  7  8  9 10 11 12 13]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  1  2 14 15 16 17  3 18]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0 19  3 20 21 22 23  2 24]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0  0 25 26 27 28 29 30]
```

```
 [ 0  0  0  0  0  0  0  0  0]
 [ 0 31 32 33 34  1 35  4  4]
 [ 0  0  0  0  0  0  0  0  0]
 [36  1 37  5 38  5 39 40 41]
 [ 0  0  0  0  0  0  0  0  0]] <class 'numpy.ndarray'> (12, 9)
```

In [6]:

```
y=to_categorical(y,num_classes=vocab_size)

print("X=", X, "y=",y, type(X), type(y), X.shape, y.shape)
```

```
X= [[ 0  0  6  7  8  9 10 11 12]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0  1  2 14 15 16 17  3]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0 19  3 20 21 22 23  2]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0  0  0 25 26 27 28 29]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0  0 31 32 33 34  1 35  4]
 [ 0  0  0  0  0  0  0  0  0]
 [ 0 36  1 37  5 38  5 39 40]
 [ 0  0  0  0  0  0  0  0  0]] y= [[[1. 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.]]

 [[1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  ...
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]]

 [[1. 0. 0. ... 0. 0. 0.]
  [0. 1. 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. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  ...
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]]

 [[0. 0. 0. ... 0. 0. 0.]
  [0. 1. 0. ... 0. 0. 0.]
  [0. 0. 0. ... 0. 0. 0.]
  ...
  [0. 0. 0. ... 1. 0. 0.]
  [0. 0. 0. ... 0. 1. 0.]
  [0. 0. 0. ... 0. 0. 1.]]

 [[1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  ...
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]
  [1. 0. 0. ... 0. 0. 0.]]] <class 'numpy.ndarray'> <class 'numpy.ndarray'> (12, 9) (1
```

```
2, 9, 42)
```

In [7]:

```
model=Sequential()
model.add(Embedding(input_dim=vocab_size, output_dim=10))
print(model.output_shape)
model.add(SimpleRNN(units=50, return_sequences=True))
print(model.output_shape)
model.add(Dense(units=vocab_size,activation='softmax'))
model.summary()


print("Input Shape of all Layers:",model.layers[0].input_shape,model.layers[1].input_shap
e,model.layers[2].input_shape)
print("Input Dim:",model.layers[0].input_dim)
```

```
(None, None, 10)

2022-05-06 14:36:29.939570: I tensorflow/core/common_runtime/process_util.cc:146] Crea
ting new thread pool with default inter op setting: 2. Tune using inter_op_parallelism
_threads for best performance.


(None, None, 50)
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding (Embedding)        (None, None, 10)          420
_________________________________________________________________
simple_rnn (SimpleRNN)       (None, None, 50)          3050
_________________________________________________________________
dense (Dense)                (None, None, 42)          2142
=================================================================
Total params: 5,612
Trainable params: 5,612
Non-trainable params: 0
_________________________________________________________________
Input Shape of all Layers: (None, None) (None, None, 10) (None, None, 50)
Input Dim: 42
```

In [8]:

```
model.compile(optimizer="rmsprop", loss="categorical_crossentropy", metrics=['accuracy'])

model.fit(X, y, epochs=200, verbose=0)
```

```
2022-05-06 14:36:30.277642: I tensorflow/compiler/mlir/mlir_graph_optimization_pass.c
c:185] None of the MLIR Optimization Passes are enabled (registered 2)
```

Out[8]:

```
<keras.callbacks.History at 0x7f8b984fb490>
```

In [9]:

```
def sample_all_seq_wo_seed(model, tokenizer, n_words, vocab_size): #all the words are samp
led
    encoded=list()
    in_text = ''
    # generate a fixed number of words = n_words
    for i in range(n_words):
        # encode the text as integer
        encoded = tokenizer.texts_to_sequences([in_text])[0] # for words not in the vocab
it returns []
        print("i:", i, "Encoded:",encoded)
        # pre-pad sequences to a fixed length
        #encoded = pad_sequences([encoded], maxlen=max_length, padding='pre')
        encoded.insert(0,0)
        encoded=array(encoded)
        encoded=numpy.reshape(encoded,newshape=(1,-1))
        print("i:", i, "Encoded:",encoded, encoded.shape)
        # predict probability and sample a word from vocab
        if i == 0:
```

```
            prob = model.predict(encoded, verbose=0)
            print("i=", i, "Prob:", prob, type(prob), prob.shape)
            yhat=0
            while yhat == 0:
                yhat=numpy.random.choice(range(vocab_size),p=prob.ravel())
            yhat=[yhat]
            yhat=array(yhat)
            yhat=numpy.reshape(yhat,newshape=(1,-1))
            print("i:", i, "If yhat:", yhat, yhat.shape)
        else:
            prob = model.predict(encoded, verbose=0)
            print("i=", i, "Prob:", prob, type(prob), prob.shape)
            yhat=numpy.append(yhat,0)  #just creating space for the next yhat
            yhat=numpy.reshape(yhat,newshape=(1,-1))
            while yhat[0,i] == 0:
                yhat[0,i]=numpy.random.choice(range(vocab_size),p=prob[0,i].ravel())
            print("i:", i, "Else yhat:", yhat, yhat.shape)


        # map predicted word index to word
        out_word = ''
        for word, index in tokenizer.word_index.items():
            if index == yhat[0,i]:
                out_word = word
                #print("index:", index, "out_word:", out_word)
                break

        # append to input
        in_text = in_text + out_word + ' '
    return in_text
```

In [10]:

```
print("-----------------------sample all seq without seed-----------------------------")
print(sample_all_seq_wo_seed(model, tokenizer, 8, vocab_size))
print("-------------------------------------------------------------------------------")
```

```
-----------------------sample all seq without seed-----------------------------
i: 0 Encoded: []
i: 0 Encoded: [[0]] (1, 1)
i= 0 Prob: [[[8.0643690e-01 9.2318133e-03 4.1410034e-03 5.7523265e-03 4.2269784e-03
   6.0244865e-04 2.6597133e-02 2.4160494e-03 3.7575632e-04 1.7523196e-03
   1.2282119e-03 8.0484524e-04 6.1323895e-04 2.4282699e-03 1.1037427e-03
   1.3115929e-03 1.6214408e-03 2.4087643e-03 1.1511584e-03 1.6596120e-02
   1.4385926e-03 3.0712576e-03 2.8903806e-03 9.3258191e-03 1.4952599e-03
   8.7563479e-03 2.7778975e-03 2.3075461e-03 2.0957375e-03 2.1558350e-03
   8.2405342e-04 1.7763002e-02 5.5762017e-03 2.0091517e-03 3.4940555e-03
   7.4961683e-04 3.1205000e-02 2.7203362e-04 1.1279900e-03 3.4603304e-03
   4.8816497e-03 1.5223001e-03]]] <class 'numpy.ndarray'> (1, 1, 42)
i: 0 If yhat: [[36]] (1, 1)
i: 1 Encoded: [36]
i: 1 Encoded: [[ 0 36]] (1, 2)
i= 1 Prob: [[[8.0643678e-01 9.2318160e-03 4.1410048e-03 5.7523283e-03 4.2269798e-03
   6.0244859e-04 2.6597140e-02 2.4160501e-03 3.7575662e-04 1.7523194e-03
   1.2282130e-03 8.0484588e-04 6.1323884e-04 2.4282709e-03 1.1037436e-03
   1.3115932e-03 1.6214420e-03 2.4087650e-03 1.1511587e-03 1.6596125e-02
   1.4385930e-03 3.0712588e-03 2.8903815e-03 9.3258219e-03 1.4952604e-03
   8.7563517e-03 2.7778985e-03 2.3075468e-03 2.0957382e-03 2.1558357e-03
   8.2405371e-04 1.7763007e-02 5.5762036e-03 2.0091534e-03 3.4940564e-03
   7.4961712e-04 3.1205017e-02 2.7203356e-04 1.1279910e-03 3.4603334e-03
   4.8816488e-03 1.5223013e-03]
  [3.0724229e-02 6.2386900e-01 5.0431300e-02 3.2761887e-02 2.0980542e-03
   1.7563843e-04 3.4837265e-02 1.8947573e-02 6.0873484e-04 2.3745111e-04
   2.7961252e-04 6.9109793e-04 2.0058271e-04 2.9279146e-04 6.7168439e-04
   7.6756626e-04 5.0471112e-04 3.8410185e-04 2.5728964e-03 6.8614677e-02
   2.3894756e-04 1.0389154e-03 6.0270759e-03 2.6492379e-03 1.7561935e-03
   2.7362769e-03 8.0515193e-03 1.5984568e-03 2.8098037e-03 4.4831582e-03
   4.6031210e-03 3.9584376e-02 3.4400262e-02 1.3941317e-03 3.6536928e-03
   1.1170601e-03 2.7861621e-03 2.5436683e-03 3.5596563e-04 3.1262438e-03
   1.3163376e-03 4.0585184e-03]]] <class 'numpy.ndarray'> (1, 2, 42)
i: 1 Else yhat: [[36  1]] (1, 2)
i: 2 Encoded: [36, 1]
```

```
i: 2 Encoded: [[ 0 36  1]] (1, 3)
i= 2 Prob: [[[8.0643678e-01 9.2318160e-03 4.1410048e-03 5.7523283e-03 4.2269798e-03
   6.0244830e-04 2.6597140e-02 2.4160501e-03 3.7575662e-04 1.7523194e-03
   1.2282124e-03 8.0484588e-04 6.1323884e-04 2.4282709e-03 1.1037436e-03
   1.3115932e-03 1.6214420e-03 2.4087650e-03 1.1511587e-03 1.6596122e-02
   1.4385930e-03 3.0712588e-03 2.8903815e-03 9.3258219e-03 1.4952604e-03
   8.7563517e-03 2.7778985e-03 2.3075468e-03 2.0957382e-03 2.1558357e-03
   8.2405371e-04 1.7763007e-02 5.5762036e-03 2.0091534e-03 3.4940564e-03
   7.4961712e-04 3.1205017e-02 2.7203356e-04 1.1279910e-03 3.4603334e-03
   4.8816511e-03 1.5223013e-03]
  [3.0724237e-02 6.2386900e-01 5.0431300e-02 3.2761887e-02 2.0980542e-03
   1.7563860e-04 3.4837265e-02 1.8947573e-02 6.0873484e-04 2.3745111e-04
   2.7961252e-04 6.9109793e-04 2.0058251e-04 2.9279146e-04 6.7168468e-04
   7.6756626e-04 5.0471112e-04 3.8410185e-04 2.5728964e-03 6.8614677e-02
   2.3894756e-04 1.0389154e-03 6.0270759e-03 2.6492379e-03 1.7561943e-03
   2.7362769e-03 8.0515193e-03 1.5984568e-03 2.8098037e-03 4.4831582e-03
   4.6031210e-03 3.9584376e-02 3.4400262e-02 1.3941317e-03 3.6536912e-03
   1.1170601e-03 2.7861621e-03 2.5436697e-03 3.5596563e-04 3.1262438e-03
   1.3163377e-03 4.0585184e-03]
  [5.1142363e-04 6.9430174e-04 3.5088759e-02 9.3203140e-03 2.6129995e-04
   1.8035783e-03 2.1997681e-04 3.7029099e-02 6.3388422e-02 1.5909588e-03
   2.9826281e-04 6.1737781e-04 6.0305097e-03 2.7009388e-04 6.3228078e-02
   9.4905408e-04 4.0518850e-04 2.7288622e-04 4.2777322e-03 3.4107300e-04
   2.6816577e-02 3.6492173e-04 2.9435856e-04 3.1724852e-04 1.5823742e-02
   1.4746758e-03 9.9506683e-04 6.3123545e-03 1.9482251e-03 1.1739590e-03
   3.9653666e-03 4.8599025e-04 9.3343686e-03 1.6728930e-02 5.2865018e-04
   1.8401952e-02 1.1362118e-04 6.6589594e-01 5.1664043e-05 1.7920353e-04
   7.5470499e-04 1.4400973e-03]]] <class 'numpy.ndarray'> (1, 3, 42)
i: 2 Else yhat: [[36  1 37]] (1, 3)
i: 3 Encoded: [36, 1, 37]
i: 3 Encoded: [[ 0 36  1 37]] (1, 4)
i= 3 Prob: [[[8.06436896e-01 9.23181325e-03 4.14100336e-03 5.75232645e-03
   4.22697840e-03 6.02448650e-04 2.65971329e-02 2.41604936e-03
   3.75756325e-04 1.75231963e-03 1.22821191e-03 8.04845244e-04
   6.13238954e-04 2.42826995e-03 1.10374275e-03 1.31159287e-03
   1.62144075e-03 2.40876433e-03 1.15115836e-03 1.65961199e-02
   1.43859256e-03 3.07125761e-03 2.89038057e-03 9.32581909e-03
   1.49525993e-03 8.75634793e-03 2.77789752e-03 2.30754609e-03
   2.09573749e-03 2.15583504e-03 8.24053423e-04 1.77630018e-02
   5.57620171e-03 2.00915174e-03 3.49405548e-03 7.49616825e-04
   3.12050004e-02 2.72033620e-04 1.12798996e-03 3.46033042e-03
   4.88164974e-03 1.52230007e-03]
  [3.07242200e-02 6.23869061e-01 5.04312813e-02 3.27618644e-02
   2.09805346e-03 1.75638459e-04 3.48372534e-02 1.89475659e-02
   6.08734612e-04 2.37451022e-04 2.79612548e-04 6.91097346e-04
   2.00582523e-04 2.92791199e-04 6.71684451e-04 7.67565973e-04
   5.04710944e-04 3.84101906e-04 2.57289549e-03 6.86146468e-02
   2.38947337e-04 1.03891490e-03 6.02707360e-03 2.64923670e-03
   1.75619288e-03 2.73627462e-03 8.05151742e-03 1.59845618e-03
   2.80980254e-03 4.48315637e-03 4.60311677e-03 3.95843610e-02
   3.44002657e-02 1.39413110e-03 3.65369138e-03 1.11705961e-03
   2.78616091e-03 2.54366733e-03 3.55965662e-04 3.12624266e-03
   1.31633657e-03 4.05851705e-03]
  [5.11423394e-04 6.94301154e-04 3.50887291e-02 9.32030566e-03
   2.61299865e-04 1.80357764e-03 2.19976617e-04 3.70290689e-02
   6.33884296e-02 1.59095810e-03 2.98262836e-04 6.17377576e-04
   6.03051065e-03 2.70093646e-04 6.32280558e-02 9.49053734e-04
   4.05188359e-04 2.72886129e-04 4.27773269e-03 3.41072853e-04
   2.68165600e-02 3.64921434e-04 2.94358440e-04 3.17248225e-04
   1.58237256e-02 1.47467456e-03 9.95066483e-04 6.31234888e-03
   1.94822438e-03 1.17395795e-03 3.96536710e-03 4.85990051e-04
   9.33436956e-03 1.67289246e-02 5.28650009e-04 1.84019394e-02
   1.13621085e-04 6.65895998e-01 5.16640539e-05 1.79203373e-04
   7.54704699e-04 1.44009688e-03]
  [7.07615618e-05 6.38565762e-05 7.25072983e-04 2.27908589e-04
   2.23205541e-03 5.23867190e-01 9.18404185e-05 1.35036395e-03
   7.02589899e-02 9.18377489e-02 1.40853068e-02 1.21038512e-03
   3.09339073e-03 4.90004290e-03 3.43544595e-02 3.74101028e-02
   4.81214887e-03 2.23266217e-03 3.66886053e-03 7.53072673e-05
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 1.94822438e-03 1.17395795e-03 3.96536710e-03 4.85990051e-04
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 2.45970450e-02 3.85652073e-02 3.56969307e-03 8.17511522e-04
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 5.83594181e-02 3.03815189e-03 5.41781628e-05 4.29261490e-05
 3.61542887e-04 9.88217629e-03 1.39295319e-02 1.20714447e-03
 3.32929194e-04 1.36936374e-04 1.47032598e-03 3.81623511e-03
 2.52610608e-03 3.04945814e-03 1.43549556e-03 1.26390005e-04
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 9.73825954e-05 2.18257221e-04]
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 8.94680343e-05 1.21899345e-03 5.12769520e-02 8.75080228e-02
 2.65857467e-04 1.28897125e-04 2.80384003e-04 7.09172990e-03
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 7.74952467e-04 1.38447955e-04 4.69026039e-04 1.27209574e-02
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 1.20002602e-03 6.19826824e-05]
[6.05631713e-03 5.19092940e-03 4.60400991e-02 9.06712189e-02
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 9.25577333e-05 5.55423467e-05 1.26540510e-03 4.15739566e-02
 1.81093104e-02 1.19786784e-02 9.58668534e-05 7.87645695e-05
 9.17222176e-04 3.39736044e-02 8.04338139e-03 1.00374417e-02
 3.00292595e-04 2.71346726e-05 4.99613292e-04 1.41564524e-02
 4.10936819e-03 4.81573021e-04 6.27785703e-05 1.94355540e-04
 1.11293327e-03 5.09254774e-03 1.67969638e-03 1.00599630e-02
 2.38156412e-03 7.34787827e-05 3.79309568e-05 4.64777974e-03
 4.93217260e-03 5.67593786e-04 8.05355550e-04 5.84865510e-01
 4.89777178e-02 8.07916396e-04]
```

```
  [1.19738644e-02 6.38872909e-04 5.67116216e-02 4.70225923e-02
   1.16800768e-02 1.79553084e-04 1.52022270e-02 9.73381568e-03
   7.30279833e-04 8.57947525e-05 6.42124651e-05 5.90692041e-04
   1.06328176e-02 4.04948220e-02 3.13265179e-03 5.07552686e-05
   4.75213710e-05 1.08910631e-03 6.83091432e-02 1.16440924e-02
   6.22343598e-03 2.66792369e-04 1.72863238e-05 5.15237800e-04
   4.42083217e-02 5.82293747e-03 2.28514735e-04 8.25698007e-05
   1.75540161e-04 1.46203896e-03 1.72152871e-03 6.10637385e-03
   2.15599053e-02 3.06207058e-03 8.49661810e-05 5.10680256e-04
   3.56666185e-03 3.03237792e-03 1.02418715e-04 8.71410500e-03
   5.68859458e-01 3.36622559e-02]]] <class 'numpy.ndarray'> (1, 8, 42)
i: 7 Else yhat: [[36  1 37 15 16 23 12 40]] (1, 8)
playthings of wind new england were father their
--------------------------------------------------------------------------------
```

In [11]:

```
def prob_of_input_sentence(model, tokenizer, sentence):
    print("Input Sentence:", sentence)
    encoded=tokenizer.texts_to_sequences([sentence])[0]
    print("encoded before insert:", encoded)
    encoded.insert(0,0)
    encoded=array(encoded)
    encoded=numpy.reshape(encoded,newshape=(1,-1))
    print("Encoded:", encoded, encoded.shape)
    prob=model.predict(encoded, verbose=0)
    print("Prob:", prob, prob.shape)
    probability=1
    for i in range(prob.shape[1]-1):
        probability = probability * prob[0,i,encoded[0,i+1]]
    print("Probability of Sentence", "\"", sentence, "\"", "is:", probability)
```

In [12]:

```
print("-------------------Probability of Input Sentence-----------------------------")
prob_of_input_sentence(model, tokenizer, "Deep in the festering")
prob_of_input_sentence(model, tokenizer, "lights that were his nose")
prob_of_input_sentence(model, tokenizer, "lights that were his")
prob_of_input_sentence(model, tokenizer, "gone blind, the")
print("--------------------------------------------------------------------------------")
```

```
-------------------Probability of Input Sentence-----------------------------
Input Sentence: Deep in the festering
encoded before insert: [6, 7, 8, 9]
Encoded: [[0 6 7 8 9]] (1, 5)
Prob: [[[8.06436896e-01 9.23181325e-03 4.14100336e-03 5.75232645e-03
   4.22697840e-03 6.02448650e-04 2.65971329e-02 2.41604936e-03
   3.75756325e-04 1.75231963e-03 1.22821191e-03 8.04845244e-04
   6.13238954e-04 2.42826995e-03 1.10374275e-03 1.31159287e-03
   1.62144075e-03 2.40876433e-03 1.15115836e-03 1.65961199e-02
   1.43859256e-03 3.07125761e-03 2.89038057e-03 9.32581909e-03
   1.49525993e-03 8.75634793e-03 2.77789752e-03 2.30754609e-03
   2.09573749e-03 2.15583504e-03 8.24053423e-04 1.77630018e-02
   5.57620171e-03 2.00915174e-03 3.49405548e-03 7.49616825e-04
   3.12050004e-02 2.72033620e-04 1.12798996e-03 3.46033042e-03
   4.88164974e-03 1.52230007e-03]
  [1.99159831e-02 5.91844022e-01 6.50484487e-02 4.46971171e-02
   2.05279351e-03 2.66148127e-04 3.10377534e-02 2.88281012e-02
   1.06187863e-03 2.70434743e-04 3.45018430e-04 9.26242617e-04
   3.39274615e-04 3.32561438e-04 9.37690085e-04 8.82612250e-04
   7.14649388e-04 4.09875676e-04 3.95648973e-03 6.29631728e-02
   3.84483516e-04 1.01583451e-03 6.68669911e-03 2.57956167e-03
   2.29599606e-03 2.83175311e-03 8.76348652e-03 1.92918826e-03
   3.23168072e-03 4.95884987e-03 6.49278052e-03 3.70260216e-02
   3.96564081e-02 2.00313143e-03 3.80887999e-03 1.60093419e-03
   2.46472238e-03 4.14284365e-03 4.12510883e-04 3.53289908e-03
   1.51987956e-03 5.83129982e-03]
  [2.17630775e-04 2.99288280e-04 1.76759567e-02 4.95440885e-03
   1.89130500e-04 2.48640892e-03 1.11469890e-04 2.57821120e-02
   8.85599479e-02 2.40826746e-03 3.42196348e-04 6.30609342e-04
   4.73301765e-03 3.09828523e-04 8.31888244e-02 1.34398544e-03
   4.35164024e-04 3.19434679e-04 3.20885726e-03 1.48588893e-04
   3.12610194e-02 4.61595802e-04 2.46306765e-04 2.71995290e-04
```

```
  1.26049332e-02 9.57661308e-04 8.79588421e-04 7.41650024e-03
  2.10472615e-03 1.33745885e-03 3.49841733e-03 2.43381626e-04
  5.24067460e-03 1.58446860e-02 6.09244627e-04 2.05645692e-02
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  5.40613371e-04 1.17068819e-03]
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  7.72571843e-03 2.49076076e-03 2.27306900e-03 4.42872406e-05
  1.01398490e-02 4.19295542e-02 3.98056442e-03 6.41376944e-04
  4.02907468e-03 5.53611666e-04 3.09101515e-03 4.51761717e-03
  6.16939738e-03 4.58055502e-03 6.05432689e-03 6.57997807e-05
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  1.43456185e-04 5.59333572e-03]
 [1.49035859e-05 5.92439435e-04 3.11599470e-05 4.80210329e-05
  1.88180187e-03 3.44151370e-02 6.82035679e-05 2.19980266e-05
  4.91290994e-04 2.82339901e-02 2.11748958e-01 1.69667229e-02
  1.94593554e-03 1.89746474e-03 2.62870832e-04 2.00860202e-02
  7.09415600e-02 5.54735446e-03 1.01373480e-04 3.66669265e-05
  2.14373737e-04 6.42532436e-03 1.59267038e-02 1.81355025e-03
  1.98890048e-04 5.06729884e-05 7.25266465e-04 1.77510164e-03
  2.68463674e-03 3.44472309e-03 2.47622188e-03 7.85346201e-05
  2.36722772e-05 7.25818973e-05 3.26284976e-03 7.17237068e-04
  1.31106924e-03 2.03209012e-04 5.62112331e-01 9.28712951e-04
  8.47226765e-05 1.35751834e-04]]] (1, 5, 42)
Probability of Sentence " Deep in the festering " is: 6.796489420620258e-06
Input Sentence: lights that were his nose
encoded before insert: [21, 22, 23, 2]
Encoded: [[ 0 21 22 23  2]] (1, 5)
Prob: [[[8.06436896e-01 9.23181325e-03 4.14100336e-03 5.75232645e-03
  4.22697840e-03 6.02448650e-04 2.65971329e-02 2.41604936e-03
  3.75756325e-04 1.75231963e-03 1.22821191e-03 8.04845244e-04
  6.13238954e-04 2.42826995e-03 1.10374275e-03 1.31159287e-03
  1.62144075e-03 2.40876433e-03 1.15115836e-03 1.65961199e-02
  1.43859256e-03 3.07125761e-03 2.89038057e-03 9.32581909e-03
  1.49525993e-03 8.75634793e-03 2.77789752e-03 2.30754609e-03
  2.09573749e-03 2.15583504e-03 8.24053423e-04 1.77630018e-02
  5.57620171e-03 2.00915174e-03 3.49405548e-03 7.49616825e-04
  3.12050004e-02 2.72033620e-04 1.12798996e-03 3.46033042e-03
  4.88164974e-03 1.52230007e-03]
 [3.67812991e-01 2.83590287e-01 1.69791952e-02 1.50476480e-02
  1.64826610e-03 2.06046916e-05 7.41471946e-02 7.77414208e-03
  1.27421648e-04 1.12309404e-04 7.62326745e-05 2.18767906e-04
  6.09017479e-05 2.48102035e-04 2.09251579e-04 3.08818620e-04
  1.71905427e-04 1.67249105e-04 9.92882415e-04 1.00805894e-01
  1.78274960e-04 6.75670453e-04 2.36221449e-03 2.52092979e-03
  7.78728048e-04 6.51728734e-03 5.03064971e-03 6.89095759e-04
  1.25692319e-03 1.44328654e-03 6.93259703e-04 7.55538940e-02
  1.65251344e-02 6.81777194e-04 2.62526609e-03 2.11172592e-04
  5.44085307e-03 3.04232410e-04 1.80107745e-04 2.31166673e-03
  1.54391048e-03 1.95556856e-03]
 [8.19219172e-01 6.23445725e-03 2.99371537e-02 2.66940612e-02
  1.28637010e-04 1.88166468e-05 9.00676288e-03 2.54242104e-02
  4.47288243e-04 1.36239236e-04 2.00819541e-05 2.70119635e-05
  1.67044200e-04 1.29298103e-04 2.37588235e-03 6.74478142e-05
  5.23731505e-05 5.41157933e-05 9.39199992e-04 9.98128857e-03
  1.10020000e-03 1.13967275e-04 1.60971031e-04 7.74344313e-04
  2.12983391e-03 6.71164365e-03 2.35220557e-03 1.24940835e-03
  2.34134190e-04 2.37443499e-04 1.94929744e-04 9.13114380e-03
  3.12881544e-02 4.05424926e-03 3.46708373e-04 4.43674362e-04
  2.25455919e-03 3.14217177e-03 3.12624479e-06 2.61212001e-04
  2.03409139e-03 7.21301360e-04]
 [1.40994787e-01 4.22911625e-03 1.71666611e-02 3.69546632e-03
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  1.04732433e-04 1.03932573e-03 6.57258183e-02 2.51753209e-03
  2.39555651e-04 2.03321615e-04 1.89880212e-03 6.07925327e-03
  5.87095022e-02 8.56904685e-03 7.81862589e-04 5.72845573e-04
  4.94261459e-03 2.57285029e-01 5.62146418e-02 7.14291213e-03
  4.69049532e-03 1.35879987e-03 1.05646066e-03 1.04013635e-02
```

```
   2.67473888e-02 1.89602911e-01 1.22751603e-02 1.12927100e-03
   2.88283685e-03 9.28348023e-03 2.47163378e-04 5.61672241e-05
   1.27838936e-03 1.94853880e-02]
  [4.19334732e-02 1.93321407e-02 7.28620798e-04 6.02060871e-04
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   5.69960382e-03 6.14782348e-02 2.94134044e-03 2.71457306e-04
   4.45240876e-05 8.39205022e-05 1.38930678e-02 6.19941950e-02
   6.21361611e-03 2.65002163e-04 8.93675024e-05 1.47679099e-03
   3.14056710e-03 6.51234835e-02 1.79496054e-02 1.05438987e-03
   9.71605128e-04 8.25236272e-03 2.83660859e-01 9.71214697e-02
   1.50744673e-02 6.05964614e-03 2.66061537e-03 3.02460627e-03
   2.90070334e-03 1.33791808e-02 2.38314942e-01 1.15324638e-03
   2.47083395e-03 1.50868809e-03 6.29566796e-03 2.45901774e-05
   1.14774877e-04 5.28930407e-03]]] (1, 5, 42)
Probability of Sentence " lights that were his nose " is: 9.643962709010138e-11
Input Sentence: lights that were his
encoded before insert: [21, 22, 23, 2]
Encoded: [[ 0 21 22 23  2]] (1, 5)
Prob: [[[8.06436896e-01 9.23181325e-03 4.14100336e-03 5.75232645e-03
   4.22697840e-03 6.02448650e-04 2.65971329e-02 2.41604936e-03
   3.75756325e-04 1.75231963e-03 1.22821191e-03 8.04845244e-04
   6.13238954e-04 2.42826995e-03 1.10374275e-03 1.31159287e-03
   1.62144075e-03 2.40876433e-03 1.15115836e-03 1.65961199e-02
   1.43859256e-03 3.07125761e-03 2.89038057e-03 9.32581909e-03
   1.49525993e-03 8.75634793e-03 2.77789752e-03 2.30754609e-03
   2.09573749e-03 2.15583504e-03 8.24053423e-04 1.77630018e-02
   5.57620171e-03 2.00915174e-03 3.49405548e-03 7.49616825e-04
   3.12050004e-02 2.72033620e-04 1.12798996e-03 3.46033042e-03
   4.88164974e-03 1.52230007e-03]
  [3.67812991e-01 2.83590287e-01 1.69791952e-02 1.50476480e-02
   1.64826610e-03 2.06046916e-05 7.41471946e-02 7.77414208e-03
   1.27421648e-04 1.12309404e-04 7.62326745e-05 2.18767906e-04
   6.09017479e-05 2.48102035e-04 2.09251579e-04 3.08818620e-04
   1.71905427e-04 1.67249105e-04 9.92882415e-04 1.00805894e-01
   1.78274960e-04 6.75670453e-04 2.36221449e-03 2.52092979e-03
   7.78728048e-04 6.51728734e-03 5.03064971e-03 6.89095759e-04
   1.25692319e-03 1.44328654e-03 6.93259703e-04 7.55538940e-02
   1.65251344e-02 6.81777194e-04 2.62526609e-03 2.11172592e-04
   5.44085307e-03 3.04232410e-04 1.80107745e-04 2.31166673e-03
   1.54391048e-03 1.95556856e-03]
  [8.19219172e-01 6.23445725e-03 2.99371537e-02 2.66940612e-02
   1.28637010e-04 1.88166468e-05 9.00676288e-03 2.54242104e-02
   4.47288243e-04 1.36239236e-04 2.00819541e-05 2.70119635e-05
   1.67044200e-04 1.29298103e-04 2.37588235e-03 6.74478142e-05
   5.23731505e-05 5.41157933e-05 9.39199992e-04 9.98128857e-03
   1.10020000e-03 1.13967275e-04 1.60971031e-04 7.74344313e-04
   2.12983391e-03 6.71164365e-03 2.35220557e-03 1.24940835e-03
   2.34134190e-04 2.37443499e-04 1.94929744e-04 9.13114380e-03
   3.12881544e-02 4.05424926e-03 3.46708373e-04 4.43674362e-04
   2.25455919e-03 3.14217177e-03 3.12624479e-06 2.61212001e-04
   2.03409139e-03 7.21301360e-04]
  [1.40994787e-01 4.22911625e-03 1.71666611e-02 3.69546632e-03
   4.54614288e-04 1.19753438e-03 7.35038705e-03 2.57705990e-02
   4.36872691e-02 2.70271883e-03 1.67617531e-04 6.11307478e-05
   1.04732433e-04 1.03932573e-03 6.57258183e-02 2.51753209e-03
   2.39555651e-04 2.03321615e-04 1.89880212e-03 6.07925327e-03
   5.87095022e-02 8.56904685e-03 7.81862589e-04 5.72845573e-04
   4.94261459e-03 2.57285029e-01 5.62146418e-02 7.14291213e-03
   4.69049532e-03 1.35879987e-03 1.05646066e-03 1.04013635e-02
   2.67473888e-02 1.89602911e-01 1.22751603e-02 1.12927100e-03
   2.88283685e-03 9.28348023e-03 2.47163378e-04 5.61672241e-05
   1.27838936e-03 1.94853880e-02]
  [4.19334732e-02 1.93321407e-02 7.28620798e-04 6.02060871e-04
   3.19712155e-04 2.23861868e-03 1.32385630e-03 3.52481520e-03
   5.69960382e-03 6.14782348e-02 2.94134044e-03 2.71457306e-04
   4.45240876e-05 8.39205022e-05 1.38930678e-02 6.19941950e-02
   6.21361611e-03 2.65002163e-04 8.93675024e-05 1.47679099e-03
   3.14056710e-03 6.51234835e-02 1.79496054e-02 1.05438987e-03
   9.71605128e-04 8.25236272e-03 2.83660859e-01 9.71214697e-02
   1.50744673e-02 6.05964614e-03 2.66061537e-03 3.02460627e-03
   2.90070334e-03 1.33791808e-02 2.38314942e-01 1.15324638e-03
   2.47083395e-03 1.50868809e-03 6.29566796e-03 2.45901774e-05
```

```
   1.14774877e-04 5.28930407e-03]]] (1, 5, 42)
Probability of Sentence " lights that were his " is: 9.643962709010138e-11
Input Sentence: gone blind, the
encoded before insert: [8]
Encoded: [[0 8]] (1, 2)
Prob: [[[8.0643678e-01 9.2318160e-03 4.1410048e-03 5.7523283e-03 4.2269798e-03
   6.0244859e-04 2.6597140e-02 2.4160501e-03 3.7575662e-04 1.7523194e-03
   1.2282130e-03 8.0484588e-04 6.1323884e-04 2.4282709e-03 1.1037436e-03
   1.3115932e-03 1.6214420e-03 2.4087650e-03 1.1511587e-03 1.6596125e-02
   1.4385930e-03 3.0712588e-03 2.8903815e-03 9.3258219e-03 1.4952604e-03
   8.7563517e-03 2.7778985e-03 2.3075468e-03 2.0957382e-03 2.1558357e-03
   8.2405371e-04 1.7763007e-02 5.5762036e-03 2.0091534e-03 3.4940564e-03
   7.4961712e-04 3.1205017e-02 2.7203356e-04 1.1279910e-03 3.4603334e-03
   4.8816488e-03 1.5223013e-03]
  [1.6558632e-02 6.1582530e-01 6.3434035e-02 4.6618205e-02 2.1181889e-03
   2.5349323e-04 2.6881404e-02 2.6221110e-02 9.4957568e-04 2.6177414e-04
   3.5565597e-04 9.3011849e-04 3.4284976e-04 2.8783953e-04 8.8174461e-04
   8.9860905e-04 7.0746429e-04 4.1835997e-04 3.6409029e-03 6.0329691e-02
   3.3248332e-04 9.8213775e-04 6.2249880e-03 2.4235041e-03 2.1862194e-03
   2.4091376e-03 8.1160776e-03 1.8504328e-03 3.1422111e-03 4.9041156e-03
   6.5623187e-03 3.2256927e-02 3.6527235e-02 1.6745111e-03 3.4292806e-03
   1.5908590e-03 2.3734765e-03 4.5370664e-03 4.0625167e-04 3.3252772e-03
   1.4994681e-03 5.3310306e-03]]] (1, 2, 42)
Probability of Sentence " gone blind, the " is: 0.0003757566155400127
--------------------------------------------------------------------------------
```

Continue exploring

Data
1 input and 0 output →

Logs
33.6 second run - successful →

Comments
0 comments →