In [1]:

```
!gdown --id 1OurDQUtbWQacvT32HMqFL7vIUrSMllOp
```

```
Downloading...
From: https://drive.google.com/uc?id=1OurDQUtbWQacvT32HMqFL7vIUrSMllOp
To: /content/preprocessed_data.csv
100% 300k/300k [00:00<00:00, 43.5MB/s]
```

In [2]:

```
#Importing the necessary packages
import pandas as pd
import numpy as np
import tensorflow as tf
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
```

In [3]:

```
df=pd.read_csv('preprocessed_data.csv')#reading the file preprocessed_data.csv
```

In [4]:

```
df.head(4)#visulazing the DataFrame
```

Out[4]:

	Unnamed: 0	source	target
0	0	U wan me to "chop" seat 4 u nt?\n	Do you want me to reserve seat for you or not?\n
1	1	Yup. U reaching. We order some durian pastry a...	Yeap. You reaching? We ordered some Durian pas...
2	2	They become more ex oredi... Mine is like 25.....	They become more expensive already. Mine is li...
3	3	I'm thai. what do u do?\n	I'm Thai. What do you do?\n

In [5]:

```
def preprocess(x):#for removingt the last character
  x=x[:-1]
  return x
```

In [6]:

```
df['source']=df['source'].apply(preprocess)
df['target']=df['target'].apply(preprocess)
```

In [7]:

```
df=df[['source','target']]
df.head()
```

Out[7]:

	source	target
0	U wan me to "chop" seat 4 u nt?	Do you want me to reserve seat for you or not?
1	Yup. U reaching. We order some durian pastry a...	Yeap. You reaching? We ordered some Durian pas...
2	They become more ex oredi... Mine is like 25.....	They become more expensive already. Mine is li...
3	I'm thai. what do u do?	I'm Thai. What do you do?
4	Hi! How did your week go? Haven heard from you...	Hi! How did your week go? Haven't heard from y...

In [8]:

```
df.shape
```

Out[8]:

```
(2000, 2)
```

In [9]:

```
df=df[df['source'].apply(len)<170]#removing sentences where source sentence is greater than 170
df=df[df['target'].apply(len)<200]#removing snetences where target sentence is greater than 200
```

In [10]:

```
df.shape#printing the shape
```

Out[10]:

```
(1990, 2)
```

In [11]:

```
from sklearn.model_selection import train_test_split
X=df['source']
y=df['target']
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.01)#splitting in the data in the ratio of
print(X_train.shape)
```

```
print(X_test.shape)
print(y_train.shape)
print(y_test.shape)
```

```
(1970,)
(20,)
(1970,)
(20,)
```

Target:

In [12]:

```
target_tokenizer= Tokenizer(filters=None,char_level=True,lower=False)#tokenzing the target in character l
target_tokenizer.fit_on_texts(y_train)#fitting on the target train
target_vocab_size= len(target_tokenizer.word_index) + 1
print(len(target_tokenizer.word_index))#printing the vocabulary size
```

```
90
```

In [13]:

```
target_encoded_docs_train = target_tokenizer.texts_to_sequences(y_train)#converting target train into sec
target_encoded_docs_test = target_tokenizer.texts_to_sequences(y_test)#converting target test into sequer

target_padded_docs_train = pad_sequences(target_encoded_docs_train,padding='post')#padding target train
target_padded_docs_test = pad_sequences(target_encoded_docs_test,maxlen=target_padded_docs_train.shape[1]
```

Source:

In [14]:

```
source_tokenizer= Tokenizer(char_level=True,lower=False)#tokenzing the source in character level
source_tokenizer.fit_on_texts(X_train)#fitting on the source train
source_vocab_size= len(source_tokenizer.word_index) + 1
print(len(source_tokenizer.word_index))#printing the vocabulary size
```

```
103
```

In [15]:

```
source_encoded_docs_train = source_tokenizer.texts_to_sequences(X_train)#converting source train into sec
source_encoded_docs_test = source_tokenizer.texts_to_sequences(X_test)#converting source train into seque

source_padded_docs_train = pad_sequences(source_encoded_docs_train,maxlen=target_padded_docs_train.shape[
source_padded_docs_test = pad_sequences(source_encoded_docs_test,maxlen=target_padded_docs_train.shape[1]
```

In [16]:

```
#we are reshaping because sparse_categorical_entropy expects 3dimensions
target_padded_docs_train=target_padded_docs_train.reshape((*target_padded_docs_train.shape,1))
target_padded_docs_test=target_padded_docs_test.reshape((*target_padded_docs_test.shape,1))
```

In [17]:

```
print(target_padded_docs_train.shape)
print(target_padded_docs_test.shape)
```

```
(1970, 199, 1)
(20, 199, 1)
```

In [18]:

```
#we are reshaping because sparse_categorical_entropy expects 3dimensions
source_padded_docs_train=source_padded_docs_train.reshape((*source_padded_docs_train.shape,1))
source_padded_docs_test=source_padded_docs_test.reshape((*source_padded_docs_test.shape,1))
```

In [19]:

```
print(source_padded_docs_train.shape)
print(source_padded_docs_test.shape)
```

```
(1970, 199, 1)
(20, 199, 1)
```

In [20]:

```
X_train.to_csv('X_train2.csv')
y_train.to_csv('y_train2.csv')
X_test.to_csv('X_test2.csv')
y_test.to_csv('y_test2.csv')
```

In [21]:

```
import pandas as pd
pd.DataFrame(source_encoded_docs_train).to_csv("source_encoded_docs_train2.csv")
pd.DataFrame(source_encoded_docs_test).to_csv("source_encoded_docs_test2.csv")
pd.DataFrame(target_encoded_docs_train).to_csv("target_encoded_docs_train2.csv")
pd.DataFrame(target_encoded_docs_test).to_csv("target_encoded_docs_test2.csv")
```

Model1:

In [22]:

```
input=tf.keras.layers.Input(shape=(199,))
embed=tf.keras.layers.Embedding(source_vocab_size,256, input_length=source_padded_docs_train.shape[1])(in
```

```python
lstm1=tf.keras.layers.LSTM(128, return_sequences=True)(embed)
dense=tf.keras.layers.TimeDistributed(tf.keras.layers.Dense(512, activation='relu'))(lstm1)
drop=tf.keras.layers.Dropout(0.5)(dense)
output=tf.keras.layers.TimeDistributed(tf.keras.layers.Dense(target_vocab_size, activation='softmax'))(dr
model=tf.keras.models.Model(inputs=input,outputs=output)
model.summary()
```

```
Model: "model"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
input_1 (InputLayer)         [(None, 199)]             0
_________________________________________________________________
embedding (Embedding)        (None, 199, 256)          26624
_________________________________________________________________
lstm (LSTM)                  (None, 199, 128)          197120
_________________________________________________________________
time_distributed (TimeDistri (None, 199, 512)          66048
_________________________________________________________________
dropout (Dropout)            (None, 199, 512)          0
_________________________________________________________________
time_distributed_1 (TimeDist (None, 199, 91)           46683
=================================================================
Total params: 336,475
Trainable params: 336,475
Non-trainable params: 0
_________________________________________________________________
```

In [23]:

```python
# Compile model
model.compile(optimizer=tf.keras.optimizers.Adam(0.01),
              loss='sparse_categorical_crossentropy',metrics=['accuracy'])
```

In [24]:

```python
model.fit(source_padded_docs_train,target_padded_docs_train,batch_size=1024,epochs=100,
          validation_data=(source_padded_docs_test,target_padded_docs_test))
```

```
Epoch 1/100
2/2 [==============================] - 9s 1s/step - loss: 4.1856 - accuracy: 0.3459 - val_loss: 2.7667 -
val_accuracy: 0.6420
Epoch 2/100
2/2 [==============================] - 1s 520ms/step - loss: 2.1551 - accuracy: 0.6701 - val_loss:
1.4970 - val_accuracy: 0.6907
Epoch 3/100
2/2 [==============================] - 1s 532ms/step - loss: 1.4772 - accuracy: 0.6788 - val_loss:
1.3300 - val_accuracy: 0.6593
Epoch 4/100
2/2 [==============================] - 1s 545ms/step - loss: 1.3352 - accuracy: 0.6729 - val_loss:
1.3038 - val_accuracy: 0.6965
Epoch 5/100
2/2 [==============================] - 1s 501ms/step - loss: 1.3312 - accuracy: 0.6997 - val_loss:
1.3129 - val_accuracy: 0.6965
Epoch 6/100
2/2 [==============================] - 1s 518ms/step - loss: 1.3253 - accuracy: 0.6968 - val_loss:
1.3014 - val_accuracy: 0.6965
Epoch 7/100
2/2 [==============================] - 1s 515ms/step - loss: 1.3145 - accuracy: 0.6953 - val_loss:
1.2833 - val_accuracy: 0.6965
Epoch 8/100
2/2 [==============================] - 1s 517ms/step - loss: 1.3080 - accuracy: 0.7002 - val_loss:
1.2783 - val_accuracy: 0.6965
Epoch 9/100
2/2 [==============================] - 1s 520ms/step - loss: 1.2955 - accuracy: 0.7001 - val_loss:
1.2808 - val_accuracy: 0.6965
Epoch 10/100
2/2 [==============================] - 1s 529ms/step - loss: 1.2924 - accuracy: 0.7000 - val_loss:
1.2741 - val_accuracy: 0.6965
Epoch 11/100
2/2 [==============================] - 1s 534ms/step - loss: 1.2838 - accuracy: 0.6999 - val_loss:
1.2633 - val_accuracy: 0.6950
Epoch 12/100
2/2 [==============================] - 1s 529ms/step - loss: 1.2738 - accuracy: 0.6996 - val_loss:
1.2536 - val_accuracy: 0.6950
Epoch 13/100
2/2 [==============================] - 1s 539ms/step - loss: 1.2589 - accuracy: 0.6995 - val_loss:
1.2441 - val_accuracy: 0.6962
Epoch 14/100
2/2 [==============================] - 1s 522ms/step - loss: 1.2412 - accuracy: 0.6999 - val_loss:
1.2363 - val_accuracy: 0.6960
```

```
Epoch 15/100
2/2 [==============================] - 1s 531ms/step - loss: 1.2297 - accuracy: 0.7002 - val_loss:
1.2348 - val_accuracy: 0.6965
Epoch 16/100
2/2 [==============================] - 1s 533ms/step - loss: 1.2226 - accuracy: 0.7008 - val_loss:
1.2262 - val_accuracy: 0.6970
Epoch 17/100
2/2 [==============================] - 1s 530ms/step - loss: 1.2173 - accuracy: 0.7013 - val_loss:
1.2253 - val_accuracy: 0.6987
Epoch 18/100
2/2 [==============================] - 1s 524ms/step - loss: 1.2148 - accuracy: 0.7018 - val_loss:
1.2243 - val_accuracy: 0.6992
Epoch 19/100
2/2 [==============================] - 1s 533ms/step - loss: 1.2106 - accuracy: 0.7019 - val_loss:
1.2291 - val_accuracy: 0.6992
Epoch 20/100
2/2 [==============================] - 1s 535ms/step - loss: 1.2080 - accuracy: 0.7019 - val_loss:
1.2227 - val_accuracy: 0.6992
Epoch 21/100
2/2 [==============================] - 1s 525ms/step - loss: 1.2045 - accuracy: 0.7020 - val_loss:
1.2185 - val_accuracy: 0.6990
Epoch 22/100
2/2 [==============================] - 1s 518ms/step - loss: 1.2008 - accuracy: 0.7021 - val_loss:
1.2257 - val_accuracy: 0.6992
Epoch 23/100
2/2 [==============================] - 1s 533ms/step - loss: 1.2082 - accuracy: 0.7020 - val_loss:
1.2150 - val_accuracy: 0.6990
Epoch 24/100
2/2 [==============================] - 1s 498ms/step - loss: 1.2034 - accuracy: 0.7023 - val_loss:
1.2149 - val_accuracy: 0.6995
Epoch 25/100
2/2 [==============================] - 1s 497ms/step - loss: 1.2005 - accuracy: 0.7024 - val_loss:
1.2112 - val_accuracy: 0.6992
Epoch 26/100
2/2 [==============================] - 1s 510ms/step - loss: 1.1942 - accuracy: 0.7027 - val_loss:
1.2096 - val_accuracy: 0.7003
Epoch 27/100
2/2 [==============================] - 1s 526ms/step - loss: 1.1917 - accuracy: 0.7029 - val_loss:
1.2017 - val_accuracy: 0.7005
Epoch 28/100
2/2 [==============================] - 1s 548ms/step - loss: 1.1871 - accuracy: 0.7032 - val_loss:
1.2008 - val_accuracy: 0.7000
Epoch 29/100
2/2 [==============================] - 1s 520ms/step - loss: 1.1816 - accuracy: 0.7032 - val_loss:
1.1972 - val_accuracy: 0.7003
Epoch 30/100
2/2 [==============================] - 1s 509ms/step - loss: 1.1772 - accuracy: 0.7034 - val_loss:
1.2440 - val_accuracy: 0.7013
Epoch 31/100
2/2 [==============================] - 1s 521ms/step - loss: 1.2147 - accuracy: 0.7034 - val_loss:
1.2044 - val_accuracy: 0.7005
Epoch 32/100
2/2 [==============================] - 1s 533ms/step - loss: 1.1946 - accuracy: 0.7036 - val_loss:
1.2172 - val_accuracy: 0.7003
Epoch 33/100
2/2 [==============================] - 1s 522ms/step - loss: 1.1996 - accuracy: 0.7040 - val_loss:
1.2092 - val_accuracy: 0.7018
Epoch 34/100
2/2 [==============================] - 1s 537ms/step - loss: 1.1859 - accuracy: 0.7043 - val_loss:
1.2110 - val_accuracy: 0.7003
Epoch 35/100
2/2 [==============================] - 1s 527ms/step - loss: 1.1862 - accuracy: 0.7041 - val_loss:
1.1951 - val_accuracy: 0.7015
Epoch 36/100
2/2 [==============================] - 1s 532ms/step - loss: 1.1761 - accuracy: 0.7048 - val_loss:
1.2010 - val_accuracy: 0.7028
Epoch 37/100
2/2 [==============================] - 1s 524ms/step - loss: 1.1781 - accuracy: 0.7052 - val_loss:
1.1944 - val_accuracy: 0.7043
Epoch 38/100
2/2 [==============================] - 1s 525ms/step - loss: 1.1702 - accuracy: 0.7062 - val_loss:
1.1933 - val_accuracy: 0.7033
Epoch 39/100
2/2 [==============================] - 1s 528ms/step - loss: 1.1704 - accuracy: 0.7062 - val_loss:
1.1935 - val_accuracy: 0.7050
Epoch 40/100
2/2 [==============================] - 1s 541ms/step - loss: 1.1640 - accuracy: 0.7071 - val_loss:
```

```
1.1910 - val_accuracy: 0.7050
Epoch 41/100
2/2 [==============================] - 1s 510ms/step - loss: 1.1611 - accuracy: 0.7075 - val_loss:
1.1822 - val_accuracy: 0.7048
Epoch 42/100
2/2 [==============================] - 1s 508ms/step - loss: 1.1574 - accuracy: 0.7079 - val_loss:
1.1742 - val_accuracy: 0.7053
Epoch 43/100
2/2 [==============================] - 1s 538ms/step - loss: 1.1548 - accuracy: 0.7080 - val_loss:
1.1724 - val_accuracy: 0.7048
Epoch 44/100
2/2 [==============================] - 1s 531ms/step - loss: 1.1513 - accuracy: 0.7088 - val_loss:
1.1705 - val_accuracy: 0.7060
Epoch 45/100
2/2 [==============================] - 1s 519ms/step - loss: 1.1471 - accuracy: 0.7091 - val_loss:
1.1688 - val_accuracy: 0.7068
Epoch 46/100
2/2 [==============================] - 1s 538ms/step - loss: 1.1442 - accuracy: 0.7095 - val_loss:
1.1669 - val_accuracy: 0.7068
Epoch 47/100
2/2 [==============================] - 1s 526ms/step - loss: 1.1402 - accuracy: 0.7100 - val_loss:
1.1589 - val_accuracy: 0.7078
Epoch 48/100
2/2 [==============================] - 1s 516ms/step - loss: 1.1368 - accuracy: 0.7109 - val_loss:
1.1562 - val_accuracy: 0.7085
Epoch 49/100
2/2 [==============================] - 1s 522ms/step - loss: 1.1391 - accuracy: 0.7111 - val_loss:
1.1613 - val_accuracy: 0.7088
Epoch 50/100
2/2 [==============================] - 1s 534ms/step - loss: 1.1412 - accuracy: 0.7105 - val_loss:
1.1588 - val_accuracy: 0.7085
Epoch 51/100
2/2 [==============================] - 1s 507ms/step - loss: 1.1358 - accuracy: 0.7111 - val_loss:
1.1534 - val_accuracy: 0.7095
Epoch 52/100
2/2 [==============================] - 1s 505ms/step - loss: 1.1301 - accuracy: 0.7115 - val_loss:
1.1408 - val_accuracy: 0.7108
Epoch 53/100
2/2 [==============================] - 1s 523ms/step - loss: 1.1262 - accuracy: 0.7127 - val_loss:
1.1561 - val_accuracy: 0.7111
Epoch 54/100
2/2 [==============================] - 1s 529ms/step - loss: 1.1395 - accuracy: 0.7119 - val_loss:
1.1544 - val_accuracy: 0.7128
Epoch 55/100
2/2 [==============================] - 1s 514ms/step - loss: 1.1348 - accuracy: 0.7127 - val_loss:
1.1467 - val_accuracy: 0.7123
Epoch 56/100
2/2 [==============================] - 1s 510ms/step - loss: 1.1230 - accuracy: 0.7138 - val_loss:
1.1445 - val_accuracy: 0.7151
Epoch 57/100
2/2 [==============================] - 1s 514ms/step - loss: 1.1207 - accuracy: 0.7148 - val_loss:
1.1324 - val_accuracy: 0.7161
Epoch 58/100
2/2 [==============================] - 1s 520ms/step - loss: 1.1154 - accuracy: 0.7150 - val_loss:
1.1299 - val_accuracy: 0.7156
Epoch 59/100
2/2 [==============================] - 1s 524ms/step - loss: 1.1111 - accuracy: 0.7150 - val_loss:
1.1221 - val_accuracy: 0.7148
Epoch 60/100
2/2 [==============================] - 1s 538ms/step - loss: 1.1089 - accuracy: 0.7159 - val_loss:
1.1962 - val_accuracy: 0.7103
Epoch 61/100
2/2 [==============================] - 1s 523ms/step - loss: 1.1592 - accuracy: 0.7129 - val_loss:
1.1504 - val_accuracy: 0.7095
Epoch 62/100
2/2 [==============================] - 1s 515ms/step - loss: 1.1424 - accuracy: 0.7111 - val_loss:
1.1665 - val_accuracy: 0.7088
Epoch 63/100
2/2 [==============================] - 1s 526ms/step - loss: 1.1507 - accuracy: 0.7107 - val_loss:
1.1584 - val_accuracy: 0.7095
Epoch 64/100
2/2 [==============================] - 1s 527ms/step - loss: 1.1358 - accuracy: 0.7113 - val_loss:
1.1567 - val_accuracy: 0.7106
Epoch 65/100
2/2 [==============================] - 1s 517ms/step - loss: 1.1334 - accuracy: 0.7113 - val_loss:
1.1583 - val_accuracy: 0.7111
Epoch 66/100
```

```
Epoch 66/100
2/2 [==============================] - 1s 523ms/step - loss: 1.1294 - accuracy: 0.7115 - val_loss:
1.1582 - val_accuracy: 0.7085
Epoch 67/100
2/2 [==============================] - 1s 521ms/step - loss: 1.1237 - accuracy: 0.7125 - val_loss:
1.1463 - val_accuracy: 0.7098
Epoch 68/100
2/2 [==============================] - 1s 536ms/step - loss: 1.1179 - accuracy: 0.7128 - val_loss:
1.1357 - val_accuracy: 0.7106
Epoch 69/100
2/2 [==============================] - 1s 520ms/step - loss: 1.1146 - accuracy: 0.7135 - val_loss:
1.1309 - val_accuracy: 0.7108
Epoch 70/100
2/2 [==============================] - 1s 530ms/step - loss: 1.1109 - accuracy: 0.7141 - val_loss:
1.1264 - val_accuracy: 0.7133
Epoch 71/100
2/2 [==============================] - 1s 523ms/step - loss: 1.1043 - accuracy: 0.7149 - val_loss:
1.1223 - val_accuracy: 0.7141
Epoch 72/100
2/2 [==============================] - 1s 535ms/step - loss: 1.1000 - accuracy: 0.7159 - val_loss:
1.1154 - val_accuracy: 0.7161
Epoch 73/100
2/2 [==============================] - 1s 521ms/step - loss: 1.0958 - accuracy: 0.7165 - val_loss:
1.1061 - val_accuracy: 0.7163
Epoch 74/100
2/2 [==============================] - 1s 517ms/step - loss: 1.0912 - accuracy: 0.7175 - val_loss:
1.0990 - val_accuracy: 0.7166
Epoch 75/100
2/2 [==============================] - 1s 531ms/step - loss: 1.0868 - accuracy: 0.7179 - val_loss:
1.0958 - val_accuracy: 0.7176
Epoch 76/100
2/2 [==============================] - 1s 534ms/step - loss: 1.0840 - accuracy: 0.7185 - val_loss:
1.0942 - val_accuracy: 0.7188
Epoch 77/100
2/2 [==============================] - 1s 529ms/step - loss: 1.0807 - accuracy: 0.7187 - val_loss:
1.0966 - val_accuracy: 0.7196
Epoch 78/100
2/2 [==============================] - 1s 522ms/step - loss: 1.0800 - accuracy: 0.7190 - val_loss:
1.0965 - val_accuracy: 0.7204
Epoch 79/100
2/2 [==============================] - 1s 510ms/step - loss: 1.0751 - accuracy: 0.7196 - val_loss:
1.0854 - val_accuracy: 0.7211
Epoch 80/100
2/2 [==============================] - 1s 526ms/step - loss: 1.0770 - accuracy: 0.7197 - val_loss:
1.0805 - val_accuracy: 0.7224
Epoch 81/100
2/2 [==============================] - 1s 528ms/step - loss: 1.0700 - accuracy: 0.7205 - val_loss:
1.0762 - val_accuracy: 0.7214
Epoch 82/100
2/2 [==============================] - 1s 516ms/step - loss: 1.0692 - accuracy: 0.7207 - val_loss:
1.0738 - val_accuracy: 0.7214
Epoch 83/100
2/2 [==============================] - 1s 520ms/step - loss: 1.0663 - accuracy: 0.7210 - val_loss:
1.0813 - val_accuracy: 0.7224
Epoch 84/100
2/2 [==============================] - 1s 531ms/step - loss: 1.0648 - accuracy: 0.7208 - val_loss:
1.0679 - val_accuracy: 0.7219
Epoch 85/100
2/2 [==============================] - 1s 526ms/step - loss: 1.0623 - accuracy: 0.7214 - val_loss:
1.0720 - val_accuracy: 0.7216
Epoch 86/100
2/2 [==============================] - 1s 498ms/step - loss: 1.0605 - accuracy: 0.7218 - val_loss:
1.0614 - val_accuracy: 0.7231
Epoch 87/100
2/2 [==============================] - 1s 523ms/step - loss: 1.0569 - accuracy: 0.7218 - val_loss:
1.0646 - val_accuracy: 0.7229
Epoch 88/100
2/2 [==============================] - 1s 544ms/step - loss: 1.0554 - accuracy: 0.7222 - val_loss:
1.0564 - val_accuracy: 0.7236
Epoch 89/100
2/2 [==============================] - 1s 530ms/step - loss: 1.0518 - accuracy: 0.7224 - val_loss:
1.0524 - val_accuracy: 0.7234
Epoch 90/100
2/2 [==============================] - 1s 509ms/step - loss: 1.0496 - accuracy: 0.7227 - val_loss:
1.0523 - val_accuracy: 0.7241
Epoch 91/100
2/2 [==============================] - 1s 508ms/step - loss: 1.0486 - accuracy: 0.7230 - val_loss:
1.0538 - val_accuracy: 0.7226
```

```
Epoch 92/100
2/2 [==============================] - 1s 529ms/step - loss: 1.0483 - accuracy: 0.7229 - val_loss: 1.0508 - val_accuracy: 0.7236
Epoch 93/100
2/2 [==============================] - 1s 523ms/step - loss: 1.0464 - accuracy: 0.7229 - val_loss: 1.0504 - val_accuracy: 0.7234
Epoch 94/100
2/2 [==============================] - 1s 518ms/step - loss: 1.0475 - accuracy: 0.7234 - val_loss: 1.0502 - val_accuracy: 0.7231
Epoch 95/100
2/2 [==============================] - 1s 515ms/step - loss: 1.0435 - accuracy: 0.7237 - val_loss: 1.0497 - val_accuracy: 0.7229
Epoch 96/100
2/2 [==============================] - 1s 531ms/step - loss: 1.0415 - accuracy: 0.7238 - val_loss: 1.0574 - val_accuracy: 0.7246
Epoch 97/100
2/2 [==============================] - 1s 525ms/step - loss: 1.0480 - accuracy: 0.7223 - val_loss: 1.0707 - val_accuracy: 0.7231
Epoch 98/100
2/2 [==============================] - 1s 519ms/step - loss: 1.0442 - accuracy: 0.7230 - val_loss: 1.0528 - val_accuracy: 0.7216
Epoch 99/100
2/2 [==============================] - 1s 529ms/step - loss: 1.0434 - accuracy: 0.7229 - val_loss: 1.0457 - val_accuracy: 0.7244
Epoch 100/100
2/2 [==============================] - 1s 530ms/step - loss: 1.0381 - accuracy: 0.7235 - val_loss: 1.0492 - val_accuracy: 0.7256
```

Out[24]:

```
<tensorflow.python.keras.callbacks.History at 0x7f38504b6e90>
```

In [25]:

```python
#https://machinelearningmastery.com/beam-search-decoder-natural-language-processing/
from math import log
from numpy import array
from numpy import argmax
import numpy as np
def beam_search_decoder(data, k):
 sequences = [[list(), 0.0]]
 # walk over each step in sequence
 #print(sequences)
 for row in data:
  all_candidates = list()
  # expand each current candidate
  for i in range(len(sequences)):
   seq, score = sequences[i]
   for j in range(len(row)):
    candidate = [seq + [j], score - np.log(row[j])]
    all_candidates.append(candidate)
  # order all candidates by score
  ordered = sorted(all_candidates, key=lambda tup:tup[1])
  sequences = ordered[:k]
 return sequences
```

In [29]:

```python
def prediction(x):

  index_to_words = {id: word for word, id in target_tokenizer.word_index.items()}
  index_to_words[0] = '<PAD>'

  y=''.join([index_to_words[prediction] for prediction in x])
  return y
for i in range(20):
  print("Input text: ")
  a=list(X_test[i:i+1])
  print(a[0])

  print("Actual Output: ")
  b=list(y_test[i:i+1])
  print(b[0])

  print("Predicted Output for beam==3 : ")
  x=model.predict(source_padded_docs_test[i:i+1])

  res=beam_search_decoder(x[0],3)

  y1=prediction(res[0][0])
```

```
    y1=y1.split(' ')
    y_lst1=[]
    for i in y1:
        y_lst1.append(i)
    print(' '.join(y_lst1))


    y2=prediction(res[1][0])
    y2=y2.split(' ')
    y_lst2=[]
    for i in y2:
        y_lst2.append(i)
    print(' '.join(y_lst2))

    y3=prediction(res[2][0])
    y3=y3.split(' ')
    y_lst3=[]
    for i in y3:
        y_lst3.append(i)
    print(' '.join(y_lst3))
    print('>'*180)
```

```
Input text:
He's going thru tutorial today? Is today the last lecture?
Actual Output:
He's going through tutorial today? Is today the last lecture?
Predicted Output for beam==3 :
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Input text:
Nope... I wan to use com la...
Actual Output:
No. I want to use computer.
Predicted Output for beam==3 :
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Input text:
Er... Yeah i think not. Cøz we dun know which one we got assigned. Ü not sleeping yet? Haha... My hair s
till wet that's why...
Actual Output:
Yes, I don't think so. Cause we don't know which one we will be assigned. Are you not going to sleep
yet? Haha. My hair is still wet, that's why.
Predicted Output for beam==3 :
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Input text:
Well... Izzit true for u?
Actual Output:
Well. Is it true for you?
Predicted Output for beam==3 :
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Input text:
mohd sultan's double o.my og goin.but i not close to em.i wana ask fion along lei-if ü on.
Actual Output:
Mohd sultan's double o. My Og going. But I'm not close to them. I want to ask Fion along, if you on.
Predicted Output for beam==3 :
Mohd sultan's doubbe o        o                                                              <PAD><PAD>
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Input text:
Hi! devin,I am ric.Where u from?
Actual Output:
Hi! Devin, I am Ric. Where are you from?
Predicted Output for beam==3 :
Hi! 'evin,           ere        <PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PA
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Input text:
Save 5 seats can? Try try
Actual Output:
Save 5 seats, can you? Try try.
Predicted Output for beam==3 :
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Input text:
Shall i buy tis mambo watch tt cost 80 bucks...
Actual Output:
Shall I buy this Mambo watch that costs 80 bucks?
Predicted Output for beam==3 :
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Input text:
MY NEW YEARS EVE WAS OK. I WENT TO A PARTY WITH MY BOYFRIEND. WHO IS THIS SI THEN HEY
Actual Output:
My new year evening was ok. I went to a party with my boyfriend. Who is this?
Predicted Output for beam==3 :
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Input text:
Haha..Cause supervisor go oversea lo.Then no one look after me lo..Hehe.But i still got find thing do lo.
Actual Output:
Haha. Because supervisor went overseas. Then no one looks after me. Hehe. But I still find thing to do.
Predicted Output for beam==3 :
Haha.  aase s  e eis r    o ereee   <PAD>  ee                         <PAD>   e<PAD>
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Input text:
hi gal, can ask daddy 2 call me, i can't get thru his handphone, thks
Actual Output:
Hi girl, can you ask dad to call me, I can't get through his handphone, thanks.
Predicted Output for beam==3 :
Hi gal   an aa     d                                                   <PAD><PAD><PAD><PAD><PAD><PAD><PAD
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Hi gal   an aa                                                         <PAD><PAD><PAD><PAD><PAD><PAD><PAD
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Hi gal,  an aa     d                                                   <PAD><PAD><PAD><PAD><PAD><PAD><PAD
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Input text:
Didnt check but mi not studyin uni..mi gt a place in nanyang poly 4physiotherapy...so u happy wif dat
choice?so u plan 2take chem izzit?
Actual Output:
Didn't check, but I'm not studying university. I got a place in Nanyang Polytechnic for Physiotherapy. S
o are you happy with that choice? So you are planning to take chemistry, is it?
Predicted Output for beam==3 :
Didnt  heck
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Input text:
Eh. I'm still at the bus stop... Missed the bus. So i might be later than you
Actual Output:
I'm still at the bus stop. I missed the bus. So I might be later than you.
Predicted Output for beam==3 :
Eh.   m  ti l    tte                sss   e                                   <PAD><PAD><PAD><PAD><PAD><P
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Input text:
pj.ur a malay/ chinese,rin?
Actual Output:
PJ. You're a Malay or Chinese, Rin?
Predicted Output for beam==3 :
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Input text:
Yar then can say hi... Then later can go for dinner... He like doing project...
Actual Output:
Yes. Can say hi and then go for dinner later. He likes doing project.
Predicted Output for beam==3 :
Yer then can  aa                                     <PAD>                          <PAD><PAD><PAD><PAD><PAD
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Input text:
Oh dat...hehe.Why r u so interested?
Actual Output:
Oh that. Hehe. Why are you so interested?
Predicted Output for beam==3 :
Oh dat    e e<PAD>                e  ee<PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><
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Input text:
Then wat time ü coming home...
Actual Output:
Then what time are you coming home?
Predicted Output for beam==3 :
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Input text:
Tmr i can only mt u durin my lunch break...Wed la...
Actual Output:
Tomorrow I can only meet you during my lunch break. Wednesday.
Predicted Output for beam==3 :
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Input text:
Hey yun ask you ah... where did you the answers for the past year exam papers from?
Actual Output:
Hey Yun, can I ask you? Where did you get the answers for the past year exam papers from?
Predicted Output for beam==3 :
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Input text:
Happy Valentine's Day... May this day of yours be blessed with happiness n laughter... Good day ahead.
Actual Output:
Happy Valentine's Day. May this day of yours be blessed with happiness and laughter. Good day ahead.
Predicted Output for beam==3 :
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In [30]:

```
import nltk.translate.bleu_score as bleu
bleu_score1=[]
bleu_score2=[]
bleu_score3=[]

for i in range(20):
  b=list(y_test[i:i+1])
  x=model.predict(source_padded_docs_test[i:i+1])

  res=beam_search_decoder(x[0],3)

  y1=prediction(res[0][0])
  y1=y1.split(' ')
  y_lst1=[]
  for i in y1:
    if '<'in i:
      continue
    else:
      y_lst1.append(i)
  bleu_score1.append(bleu.sentence_bleu([b[0].split(),],y_lst1))

  y2=prediction(res[1][0])
  y2=y2.split(' ')
  y_lst2=[]
  for i in y2:
    if i=='<PAD>':
      continue
    else:
      y_lst2.append(i)
  bleu_score2.append(bleu.sentence_bleu([b[0].split(),],y_lst2))

  y3=prediction(res[2][0])
  y3=y3.split(' ')
  y_lst3=[]
  for i in y3:
    if i=='<PAD>':
      continue
    else:
      y_lst3.append(i)
  bleu_score3.append(bleu.sentence_bleu([b[0].split(),],y_lst3))

print("The Average Bleu Score1 is: ",sum(bleu_score1)/20)
print('>'*180)
print("The Average Bleu Score2 is: ",sum(bleu_score2)/20)
print('>'*180)
print("The Average Bleu Score3 is: ",sum(bleu_score3)/20)
print('>'*180)
```

```
/usr/local/lib/python3.7/dist-packages/nltk/translate/bleu_score.py:490: UserWarning:
Corpus/Sentence contains 0 counts of 3-gram overlaps.
BLEU scores might be undesirable; use SmoothingFunction().
  warnings.warn(_msg)
/usr/local/lib/python3.7/dist-packages/nltk/translate/bleu_score.py:490: UserWarning:
Corpus/Sentence contains 0 counts of 2-gram overlaps.
BLEU scores might be undesirable; use SmoothingFunction().
  warnings.warn(_msg)
The Average Bleu Score1 is:  0.2746536825395667
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The Average Bleu Score2 is:  0.2718117637320006
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The Average Bleu Score3 is:  0.273708969340681
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```

Model2:

In [35]:

```
input=tf.keras.layers.Input(shape=(199,))
embed=tf.keras.layers.Embedding(source_vocab_size,256, input_length=source_padded_docs_train.shape[1])(in
lstm1=tf.keras.layers.Bidirectional(tf.keras.layers.LSTM(128, return_sequences=True))(embed)
dense=tf.keras.layers.TimeDistributed(tf.keras.layers.Dense(512,activation='relu'))(lstm1)
drop=tf.keras.layers.Dropout(0.5)(dense)
```

```
output=tf.keras.layers.TimeDistributed(tf.keras.layers.Dense(target_vocab_size, activation='softmax'))(dr
model=tf.keras.models.Model(inputs=input,outputs=output)
model.summary()
```

```
Model: "model_2"
_________________________________________________________________
Layer (type)                 Output Shape              Param #   
=================================================================
input_3 (InputLayer)         [(None, 199)]             0         
_________________________________________________________________
embedding_2 (Embedding)      (None, 199, 256)          26624     
_________________________________________________________________
bidirectional_1 (Bidirection (None, 199, 256)          394240    
_________________________________________________________________
time_distributed_4 (TimeDist (None, 199, 512)          131584    
_________________________________________________________________
dropout_2 (Dropout)          (None, 199, 512)          0         
_________________________________________________________________
time_distributed_5 (TimeDist (None, 199, 91)           46683     
=================================================================
Total params: 599,131
Trainable params: 599,131
Non-trainable params: 0
_________________________________________________________________
```

In [36]:

```
# Compile model
model.compile(optimizer=tf.keras.optimizers.Adam(0.01),
              loss='sparse_categorical_crossentropy',metrics=['accuracy'])
```

In [37]:

```
model.fit(source_padded_docs_train,target_padded_docs_train,batch_size=1024,epochs=100,
          validation_data=(source_padded_docs_test,target_padded_docs_test))
```

```
Epoch 1/100
2/2 [==============================] - 6s 2s/step - loss: 3.5634 - accuracy: 0.3871 - val_loss: 5.6043 -
val_accuracy: 0.6420
Epoch 2/100
2/2 [==============================] - 2s 795ms/step - loss: 4.6147 - accuracy: 0.6449 - val_loss:
1.5023 - val_accuracy: 0.6681
Epoch 3/100
2/2 [==============================] - 2s 846ms/step - loss: 1.5370 - accuracy: 0.6425 - val_loss:
1.6905 - val_accuracy: 0.6917
Epoch 4/100
2/2 [==============================] - 2s 814ms/step - loss: 1.7233 - accuracy: 0.6717 - val_loss:
1.5941 - val_accuracy: 0.6683
Epoch 5/100
2/2 [==============================] - 2s 814ms/step - loss: 1.5887 - accuracy: 0.6811 - val_loss:
1.5098 - val_accuracy: 0.6922
Epoch 6/100
2/2 [==============================] - 2s 809ms/step - loss: 1.5349 - accuracy: 0.6805 - val_loss:
1.4723 - val_accuracy: 0.6578
Epoch 7/100
2/2 [==============================] - 2s 815ms/step - loss: 1.4904 - accuracy: 0.6627 - val_loss:
1.4265 - val_accuracy: 0.6714
Epoch 8/100
2/2 [==============================] - 2s 827ms/step - loss: 1.4400 - accuracy: 0.6833 - val_loss:
1.3469 - val_accuracy: 0.6907
Epoch 9/100
2/2 [==============================] - 2s 808ms/step - loss: 1.3753 - accuracy: 0.6936 - val_loss:
1.3098 - val_accuracy: 0.6950
Epoch 10/100
2/2 [==============================] - 2s 808ms/step - loss: 1.2997 - accuracy: 0.6980 - val_loss:
1.2679 - val_accuracy: 0.6995
Epoch 11/100
2/2 [==============================] - 2s 804ms/step - loss: 1.2868 - accuracy: 0.6919 - val_loss:
1.2738 - val_accuracy: 0.6972
Epoch 12/100
2/2 [==============================] - 2s 846ms/step - loss: 1.2676 - accuracy: 0.6973 - val_loss:
1.2560 - val_accuracy: 0.6965
Epoch 13/100
2/2 [==============================] - 2s 791ms/step - loss: 1.2517 - accuracy: 0.6989 - val_loss:
1.2668 - val_accuracy: 0.6965
Epoch 14/100
2/2 [==============================] - 2s 824ms/step - loss: 1.2433 - accuracy: 0.7001 - val_loss:
1.2634 - val_accuracy: 0.6980
Epoch 15/100
2/2 [==============================] - 2s 790ms/step - loss: 1.2346 - accuracy: 0.7009 - val_loss:
1.2386 - val_accuracy: 0.6980
```

```
Epoch 16/100
2/2 [==============================] - 2s 799ms/step - loss: 1.2265 - accuracy: 0.7012 - val_loss:
1.2164 - val_accuracy: 0.6982
Epoch 17/100
2/2 [==============================] - 2s 804ms/step - loss: 1.2222 - accuracy: 0.7021 - val_loss:
1.2137 - val_accuracy: 0.6997
Epoch 18/100
2/2 [==============================] - 2s 808ms/step - loss: 1.2208 - accuracy: 0.7020 - val_loss:
1.2102 - val_accuracy: 0.6990
Epoch 19/100
2/2 [==============================] - 2s 821ms/step - loss: 1.2168 - accuracy: 0.7020 - val_loss:
1.2107 - val_accuracy: 0.7000
Epoch 20/100
2/2 [==============================] - 2s 798ms/step - loss: 1.2131 - accuracy: 0.7021 - val_loss:
1.2113 - val_accuracy: 0.7000
Epoch 21/100
2/2 [==============================] - 2s 806ms/step - loss: 1.2103 - accuracy: 0.7022 - val_loss:
1.2118 - val_accuracy: 0.6997
Epoch 22/100
2/2 [==============================] - 2s 782ms/step - loss: 1.2084 - accuracy: 0.7022 - val_loss:
1.2085 - val_accuracy: 0.7000
Epoch 23/100
2/2 [==============================] - 2s 814ms/step - loss: 1.2070 - accuracy: 0.7023 - val_loss:
1.2047 - val_accuracy: 0.6997
Epoch 24/100
2/2 [==============================] - 2s 812ms/step - loss: 1.2046 - accuracy: 0.7023 - val_loss:
1.2054 - val_accuracy: 0.7000
Epoch 25/100
2/2 [==============================] - 2s 792ms/step - loss: 1.2022 - accuracy: 0.7025 - val_loss:
1.2049 - val_accuracy: 0.7005
Epoch 26/100
2/2 [==============================] - 2s 810ms/step - loss: 1.2005 - accuracy: 0.7025 - val_loss:
1.2027 - val_accuracy: 0.7005
Epoch 27/100
2/2 [==============================] - 2s 801ms/step - loss: 1.1985 - accuracy: 0.7025 - val_loss:
1.1986 - val_accuracy: 0.7003
Epoch 28/100
2/2 [==============================] - 2s 803ms/step - loss: 1.1968 - accuracy: 0.7026 - val_loss:
1.1960 - val_accuracy: 0.7010
Epoch 29/100
2/2 [==============================] - 2s 809ms/step - loss: 1.1951 - accuracy: 0.7027 - val_loss:
1.1953 - val_accuracy: 0.7010
Epoch 30/100
2/2 [==============================] - 2s 803ms/step - loss: 1.1934 - accuracy: 0.7028 - val_loss:
1.1932 - val_accuracy: 0.7010
Epoch 31/100
2/2 [==============================] - 2s 792ms/step - loss: 1.1919 - accuracy: 0.7029 - val_loss:
1.1916 - val_accuracy: 0.7010
Epoch 32/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1906 - accuracy: 0.7029 - val_loss:
1.1919 - val_accuracy: 0.7010
Epoch 33/100
2/2 [==============================] - 2s 799ms/step - loss: 1.1905 - accuracy: 0.7030 - val_loss:
1.1916 - val_accuracy: 0.7010
Epoch 34/100
2/2 [==============================] - 2s 818ms/step - loss: 1.1895 - accuracy: 0.7030 - val_loss:
1.1867 - val_accuracy: 0.7008
Epoch 35/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1933 - accuracy: 0.7031 - val_loss:
1.1998 - val_accuracy: 0.7018
Epoch 36/100
2/2 [==============================] - 2s 803ms/step - loss: 1.1950 - accuracy: 0.7032 - val_loss:
1.1964 - val_accuracy: 0.7015
Epoch 37/100
2/2 [==============================] - 2s 799ms/step - loss: 1.1955 - accuracy: 0.7031 - val_loss:
1.1936 - val_accuracy: 0.7008
Epoch 38/100
2/2 [==============================] - 2s 795ms/step - loss: 1.1905 - accuracy: 0.7034 - val_loss:
1.1893 - val_accuracy: 0.7010
Epoch 39/100
2/2 [==============================] - 2s 809ms/step - loss: 1.1872 - accuracy: 0.7035 - val_loss:
1.1875 - val_accuracy: 0.7013
Epoch 40/100
2/2 [==============================] - 2s 819ms/step - loss: 1.1856 - accuracy: 0.7037 - val_loss:
1.1873 - val_accuracy: 0.7018
Epoch 41/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1836 - accuracy: 0.7038 - val_loss:
```

```
1.1944 - val_accuracy: 0.7020
Epoch 42/100
2/2 [==============================] - 2s 822ms/step - loss: 1.1844 - accuracy: 0.7040 - val_loss:
1.1823 - val_accuracy: 0.7023
Epoch 43/100
2/2 [==============================] - 2s 793ms/step - loss: 1.1821 - accuracy: 0.7042 - val_loss:
1.1813 - val_accuracy: 0.7025
Epoch 44/100
2/2 [==============================] - 2s 821ms/step - loss: 1.1797 - accuracy: 0.7045 - val_loss:
1.1855 - val_accuracy: 0.7030
Epoch 45/100
2/2 [==============================] - 2s 799ms/step - loss: 1.1834 - accuracy: 0.7047 - val_loss:
1.1832 - val_accuracy: 0.7020
Epoch 46/100
2/2 [==============================] - 2s 817ms/step - loss: 1.1771 - accuracy: 0.7049 - val_loss:
1.1794 - val_accuracy: 0.7025
Epoch 47/100
2/2 [==============================] - 2s 811ms/step - loss: 1.1768 - accuracy: 0.7050 - val_loss:
1.1791 - val_accuracy: 0.7023
Epoch 48/100
2/2 [==============================] - 2s 803ms/step - loss: 1.1751 - accuracy: 0.7051 - val_loss:
1.1778 - val_accuracy: 0.7023
Epoch 49/100
2/2 [==============================] - 2s 804ms/step - loss: 1.1731 - accuracy: 0.7052 - val_loss:
1.1776 - val_accuracy: 0.7015
Epoch 50/100
2/2 [==============================] - 2s 798ms/step - loss: 1.1713 - accuracy: 0.7054 - val_loss:
1.1806 - val_accuracy: 0.7025
Epoch 51/100
2/2 [==============================] - 2s 809ms/step - loss: 1.1691 - accuracy: 0.7058 - val_loss:
1.1726 - val_accuracy: 0.7023
Epoch 52/100
2/2 [==============================] - 2s 813ms/step - loss: 1.1677 - accuracy: 0.7058 - val_loss:
1.1676 - val_accuracy: 0.7023
Epoch 53/100
2/2 [==============================] - 2s 806ms/step - loss: 1.1630 - accuracy: 0.7060 - val_loss:
1.1713 - val_accuracy: 0.7033
Epoch 54/100
2/2 [==============================] - 2s 811ms/step - loss: 1.1619 - accuracy: 0.7060 - val_loss:
1.1691 - val_accuracy: 0.7028
Epoch 55/100
2/2 [==============================] - 2s 809ms/step - loss: 1.1592 - accuracy: 0.7062 - val_loss:
1.1632 - val_accuracy: 0.7028
Epoch 56/100
2/2 [==============================] - 2s 810ms/step - loss: 1.1735 - accuracy: 0.7062 - val_loss:
1.2816 - val_accuracy: 0.6997
Epoch 57/100
2/2 [==============================] - 2s 790ms/step - loss: 1.2281 - accuracy: 0.7028 - val_loss:
1.1937 - val_accuracy: 0.7045
Epoch 58/100
2/2 [==============================] - 2s 804ms/step - loss: 1.2109 - accuracy: 0.7060 - val_loss:
1.2041 - val_accuracy: 0.7043
Epoch 59/100
2/2 [==============================] - 2s 798ms/step - loss: 1.1891 - accuracy: 0.7063 - val_loss:
1.1819 - val_accuracy: 0.7033
Epoch 60/100
2/2 [==============================] - 2s 789ms/step - loss: 1.1886 - accuracy: 0.7060 - val_loss:
1.1933 - val_accuracy: 0.7033
Epoch 61/100
2/2 [==============================] - 2s 810ms/step - loss: 1.1780 - accuracy: 0.7063 - val_loss:
1.2038 - val_accuracy: 0.7043
Epoch 62/100
2/2 [==============================] - 2s 803ms/step - loss: 1.1799 - accuracy: 0.7068 - val_loss:
1.2012 - val_accuracy: 0.7048
Epoch 63/100
2/2 [==============================] - 2s 820ms/step - loss: 1.1737 - accuracy: 0.7072 - val_loss:
1.1672 - val_accuracy: 0.7053
Epoch 64/100
2/2 [==============================] - 2s 801ms/step - loss: 1.1673 - accuracy: 0.7072 - val_loss:
1.1689 - val_accuracy: 0.7055
Epoch 65/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1679 - accuracy: 0.7070 - val_loss:
1.1591 - val_accuracy: 0.7065
Epoch 66/100
2/2 [==============================] - 2s 812ms/step - loss: 1.1598 - accuracy: 0.7077 - val_loss:
1.1642 - val_accuracy: 0.7060
Epoch 67/100
```

```
Epoch 67/100
2/2 [==============================] - 2s 811ms/step - loss: 1.1596 - accuracy: 0.7080 - val_loss:
1.1607 - val_accuracy: 0.7063
Epoch 68/100
2/2 [==============================] - 2s 798ms/step - loss: 1.1550 - accuracy: 0.7082 - val_loss:
1.1600 - val_accuracy: 0.7058
Epoch 69/100
2/2 [==============================] - 2s 799ms/step - loss: 1.1548 - accuracy: 0.7087 - val_loss:
1.1552 - val_accuracy: 0.7075
Epoch 70/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1515 - accuracy: 0.7088 - val_loss:
1.1543 - val_accuracy: 0.7075
Epoch 71/100
2/2 [==============================] - 2s 818ms/step - loss: 1.1514 - accuracy: 0.7087 - val_loss:
1.1511 - val_accuracy: 0.7070
Epoch 72/100
2/2 [==============================] - 2s 776ms/step - loss: 1.1483 - accuracy: 0.7091 - val_loss:
1.1502 - val_accuracy: 0.7075
Epoch 73/100
2/2 [==============================] - 2s 815ms/step - loss: 1.1465 - accuracy: 0.7095 - val_loss:
1.1488 - val_accuracy: 0.7068
Epoch 74/100
2/2 [==============================] - 2s 809ms/step - loss: 1.1448 - accuracy: 0.7099 - val_loss:
1.1465 - val_accuracy: 0.7093
Epoch 75/100
2/2 [==============================] - 2s 812ms/step - loss: 1.1438 - accuracy: 0.7100 - val_loss:
1.1481 - val_accuracy: 0.7068
Epoch 76/100
2/2 [==============================] - 2s 816ms/step - loss: 1.1435 - accuracy: 0.7099 - val_loss:
1.1458 - val_accuracy: 0.7078
Epoch 77/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1413 - accuracy: 0.7102 - val_loss:
1.1429 - val_accuracy: 0.7090
Epoch 78/100
2/2 [==============================] - 2s 815ms/step - loss: 1.1403 - accuracy: 0.7106 - val_loss:
1.1432 - val_accuracy: 0.7080
Epoch 79/100
2/2 [==============================] - 2s 814ms/step - loss: 1.1381 - accuracy: 0.7107 - val_loss:
1.1424 - val_accuracy: 0.7088
Epoch 80/100
2/2 [==============================] - 2s 814ms/step - loss: 1.1360 - accuracy: 0.7108 - val_loss:
1.1391 - val_accuracy: 0.7093
Epoch 81/100
2/2 [==============================] - 2s 815ms/step - loss: 1.1341 - accuracy: 0.7114 - val_loss:
1.1369 - val_accuracy: 0.7093
Epoch 82/100
2/2 [==============================] - 2s 817ms/step - loss: 1.1324 - accuracy: 0.7114 - val_loss:
1.1346 - val_accuracy: 0.7098
Epoch 83/100
2/2 [==============================] - 2s 813ms/step - loss: 1.1307 - accuracy: 0.7121 - val_loss:
1.1330 - val_accuracy: 0.7101
Epoch 84/100
2/2 [==============================] - 2s 803ms/step - loss: 1.1290 - accuracy: 0.7122 - val_loss:
1.1306 - val_accuracy: 0.7103
Epoch 85/100
2/2 [==============================] - 2s 813ms/step - loss: 1.1276 - accuracy: 0.7126 - val_loss:
1.1286 - val_accuracy: 0.7113
Epoch 86/100
2/2 [==============================] - 2s 812ms/step - loss: 1.1259 - accuracy: 0.7129 - val_loss:
1.1354 - val_accuracy: 0.7095
Epoch 87/100
2/2 [==============================] - 2s 819ms/step - loss: 1.1286 - accuracy: 0.7127 - val_loss:
1.1227 - val_accuracy: 0.7123
Epoch 88/100
2/2 [==============================] - 2s 810ms/step - loss: 1.1265 - accuracy: 0.7133 - val_loss:
1.1204 - val_accuracy: 0.7108
Epoch 89/100
2/2 [==============================] - 2s 805ms/step - loss: 1.1231 - accuracy: 0.7133 - val_loss:
1.1194 - val_accuracy: 0.7123
Epoch 90/100
2/2 [==============================] - 2s 815ms/step - loss: 1.1217 - accuracy: 0.7138 - val_loss:
1.1196 - val_accuracy: 0.7126
Epoch 91/100
2/2 [==============================] - 2s 807ms/step - loss: 1.1194 - accuracy: 0.7137 - val_loss:
1.1165 - val_accuracy: 0.7133
Epoch 92/100
2/2 [==============================] - 2s 834ms/step - loss: 1.1208 - accuracy: 0.7139 - val_loss:
1.1387 - val_accuracy: 0.7070
```

```
1.1307 - val_accuracy: 0.7070
Epoch 93/100
2/2 [==============================] - 2s 802ms/step - loss: 1.1285 - accuracy: 0.7117 - val_loss:
1.1253 - val_accuracy: 0.7108
Epoch 94/100
2/2 [==============================] - 2s 808ms/step - loss: 1.1232 - accuracy: 0.7134 - val_loss:
1.1156 - val_accuracy: 0.7143
Epoch 95/100
2/2 [==============================] - 2s 823ms/step - loss: 1.1211 - accuracy: 0.7146 - val_loss:
1.1146 - val_accuracy: 0.7141
Epoch 96/100
2/2 [==============================] - 2s 800ms/step - loss: 1.1158 - accuracy: 0.7148 - val_loss:
1.1170 - val_accuracy: 0.7136
Epoch 97/100
2/2 [==============================] - 2s 798ms/step - loss: 1.1153 - accuracy: 0.7153 - val_loss:
1.1118 - val_accuracy: 0.7138
Epoch 98/100
2/2 [==============================] - 2s 814ms/step - loss: 1.1125 - accuracy: 0.7158 - val_loss:
1.1088 - val_accuracy: 0.7148
Epoch 99/100
2/2 [==============================] - 2s 809ms/step - loss: 1.1100 - accuracy: 0.7156 - val_loss:
1.1064 - val_accuracy: 0.7151
Epoch 100/100
2/2 [==============================] - 2s 799ms/step - loss: 1.1086 - accuracy: 0.7160 - val_loss:
1.1010 - val_accuracy: 0.7161
```

Out[37]:

```
<tensorflow.python.keras.callbacks.History at 0x7f37e7afbe50>
```

In [38]:

```
model.fit(source_padded_docs_train,target_padded_docs_train,batch_size=1024,epochs=20,
          validation_data=(source_padded_docs_test,target_padded_docs_test))
```

```
Epoch 1/20
2/2 [==============================] - 2s 824ms/step - loss: 1.1064 - accuracy: 0.7168 - val_loss: 
1.1013 - val_accuracy: 0.7168
Epoch 2/20
2/2 [==============================] - 2s 811ms/step - loss: 1.1049 - accuracy: 0.7171 - val_loss: 
1.1004 - val_accuracy: 0.7166
Epoch 3/20
2/2 [==============================] - 2s 811ms/step - loss: 1.1036 - accuracy: 0.7175 - val_loss: 
1.0921 - val_accuracy: 0.7173
Epoch 4/20
2/2 [==============================] - 2s 810ms/step - loss: 1.1025 - accuracy: 0.7183 - val_loss: 
1.0914 - val_accuracy: 0.7173
Epoch 5/20
2/2 [==============================] - 2s 814ms/step - loss: 1.0998 - accuracy: 0.7179 - val_loss: 
1.0927 - val_accuracy: 0.7163
Epoch 6/20
2/2 [==============================] - 2s 824ms/step - loss: 1.0994 - accuracy: 0.7181 - val_loss: 
1.0879 - val_accuracy: 0.7186
Epoch 7/20
2/2 [==============================] - 2s 811ms/step - loss: 1.0962 - accuracy: 0.7191 - val_loss: 
1.0864 - val_accuracy: 0.7168
Epoch 8/20
2/2 [==============================] - 2s 816ms/step - loss: 1.0962 - accuracy: 0.7187 - val_loss: 
1.0852 - val_accuracy: 0.7188
Epoch 9/20
2/2 [==============================] - 2s 776ms/step - loss: 1.0934 - accuracy: 0.7193 - val_loss: 
1.0815 - val_accuracy: 0.7183
Epoch 10/20
2/2 [==============================] - 2s 810ms/step - loss: 1.0914 - accuracy: 0.7202 - val_loss: 
1.0808 - val_accuracy: 0.7186
Epoch 11/20
2/2 [==============================] - 2s 799ms/step - loss: 1.0919 - accuracy: 0.7193 - val_loss: 
1.0788 - val_accuracy: 0.7188
Epoch 12/20
2/2 [==============================] - 2s 825ms/step - loss: 1.0906 - accuracy: 0.7202 - val_loss: 
1.0778 - val_accuracy: 0.7204
Epoch 13/20
2/2 [==============================] - 2s 822ms/step - loss: 1.0877 - accuracy: 0.7209 - val_loss: 
1.0755 - val_accuracy: 0.7183
Epoch 14/20
2/2 [==============================] - 2s 806ms/step - loss: 1.0915 - accuracy: 0.7198 - val_loss: 
1.0748 - val_accuracy: 0.7206
Epoch 15/20
2/2 [==============================] - 2s 811ms/step - loss: 1.0898 - accuracy: 0.7201 - val_loss: 
1.0748 - val_accuracy: 0.7211
Epoch 16/20
2/2 [==============================] - 2s 798ms/step - loss: 1.0848 - accuracy: 0.7210 - val_loss: 
1.0745 - val_accuracy: 0.7221
Epoch 17/20
2/2 [==============================] - 2s 800ms/step - loss: 1.0831 - accuracy: 0.7210 - val_loss: 
1.0731 - val_accuracy: 0.7219
Epoch 18/20
2/2 [==============================] - 2s 801ms/step - loss: 1.0810 - accuracy: 0.7216 - val_loss: 
1.0750 - val_accuracy: 0.7221
Epoch 19/20
2/2 [==============================] - 2s 816ms/step - loss: 1.0800 - accuracy: 0.7219 - val_loss: 
1.0666 - val_accuracy: 0.7219
Epoch 20/20
2/2 [==============================] - 2s 800ms/step - loss: 1.0786 - accuracy: 0.7225 - val_loss: 
1.0725 - val_accuracy: 0.7198
```

Out[38]:

```
<tensorflow.python.keras.callbacks.History at 0x7f37e5149e90>
```

In [39]:

```
model.fit(source_padded_docs_train,target_padded_docs_train,batch_size=1024,epochs=50,
          validation_data=(source_padded_docs_test,target_padded_docs_test))
```

```
Epoch 1/50
2/2 [==============================] - 2s 835ms/step - loss: 1.0831 - accuracy: 0.7205 - val_loss: 
1.0790 - val_accuracy: 0.7206
Epoch 2/50
2/2 [==============================] - 2s 829ms/step - loss: 1.0825 - accuracy: 0.7215 - val_loss: 
1.0709 - val_accuracy: 0.7206
Epoch 3/50
2/2 [==============================] - 2s 823ms/step - loss: 1.0784 - accuracy: 0.7212 - val_loss: 
1.0703 - val_accuracy: 0.7209
Epoch 4/50
2/2 [==============================] - 2s 822ms/step - loss: 1.0772 - accuracy: 0.7223 - val_loss: 
```

```
1.0614 - val_accuracy: 0.7239
Epoch 5/50
2/2 [==============================] - 2s 819ms/step - loss: 1.0742 - accuracy: 0.7226 - val_loss:
1.0633 - val_accuracy: 0.7229
Epoch 6/50
2/2 [==============================] - 2s 789ms/step - loss: 1.0724 - accuracy: 0.7229 - val_loss:
1.0633 - val_accuracy: 0.7231
Epoch 7/50
2/2 [==============================] - 2s 799ms/step - loss: 1.0703 - accuracy: 0.7237 - val_loss:
1.0605 - val_accuracy: 0.7254
Epoch 8/50
2/2 [==============================] - 2s 804ms/step - loss: 1.0694 - accuracy: 0.7236 - val_loss:
1.0563 - val_accuracy: 0.7239
Epoch 9/50
2/2 [==============================] - 2s 829ms/step - loss: 1.0704 - accuracy: 0.7226 - val_loss:
1.0687 - val_accuracy: 0.7231
Epoch 10/50
2/2 [==============================] - 2s 820ms/step - loss: 1.0709 - accuracy: 0.7230 - val_loss:
1.0562 - val_accuracy: 0.7241
Epoch 11/50
2/2 [==============================] - 2s 806ms/step - loss: 1.0674 - accuracy: 0.7241 - val_loss:
1.0584 - val_accuracy: 0.7234
Epoch 12/50
2/2 [==============================] - 2s 813ms/step - loss: 1.0647 - accuracy: 0.7239 - val_loss:
1.0529 - val_accuracy: 0.7264
Epoch 13/50
2/2 [==============================] - 2s 784ms/step - loss: 1.0625 - accuracy: 0.7247 - val_loss:
1.0489 - val_accuracy: 0.7256
Epoch 14/50
2/2 [==============================] - 2s 827ms/step - loss: 1.0604 - accuracy: 0.7243 - val_loss:
1.0504 - val_accuracy: 0.7246
Epoch 15/50
2/2 [==============================] - 2s 806ms/step - loss: 1.0592 - accuracy: 0.7248 - val_loss:
1.0488 - val_accuracy: 0.7246
Epoch 16/50
2/2 [==============================] - 2s 811ms/step - loss: 1.0598 - accuracy: 0.7250 - val_loss:
1.0497 - val_accuracy: 0.7251
Epoch 17/50
2/2 [==============================] - 2s 810ms/step - loss: 1.0564 - accuracy: 0.7254 - val_loss:
1.0455 - val_accuracy: 0.7261
Epoch 18/50
2/2 [==============================] - 2s 812ms/step - loss: 1.0589 - accuracy: 0.7254 - val_loss:
1.0728 - val_accuracy: 0.7176
Epoch 19/50
2/2 [==============================] - 2s 806ms/step - loss: 1.0853 - accuracy: 0.7180 - val_loss:
1.0778 - val_accuracy: 0.7163
Epoch 20/50
2/2 [==============================] - 2s 817ms/step - loss: 1.0781 - accuracy: 0.7178 - val_loss:
1.0760 - val_accuracy: 0.7153
Epoch 21/50
2/2 [==============================] - 2s 812ms/step - loss: 1.0746 - accuracy: 0.7191 - val_loss:
1.0707 - val_accuracy: 0.7171
Epoch 22/50
2/2 [==============================] - 2s 815ms/step - loss: 1.0699 - accuracy: 0.7209 - val_loss:
1.0686 - val_accuracy: 0.7209
Epoch 23/50
2/2 [==============================] - 2s 798ms/step - loss: 1.0667 - accuracy: 0.7217 - val_loss:
1.0574 - val_accuracy: 0.7171
Epoch 24/50
2/2 [==============================] - 2s 808ms/step - loss: 1.0621 - accuracy: 0.7229 - val_loss:
1.0517 - val_accuracy: 0.7206
Epoch 25/50
2/2 [==============================] - 2s 816ms/step - loss: 1.0588 - accuracy: 0.7233 - val_loss:
1.0496 - val_accuracy: 0.7219
Epoch 26/50
2/2 [==============================] - 2s 822ms/step - loss: 1.0572 - accuracy: 0.7233 - val_loss:
1.0487 - val_accuracy: 0.7216
Epoch 27/50
2/2 [==============================] - 2s 781ms/step - loss: 1.0556 - accuracy: 0.7240 - val_loss:
1.0426 - val_accuracy: 0.7211
Epoch 28/50
2/2 [==============================] - 2s 811ms/step - loss: 1.0529 - accuracy: 0.7243 - val_loss:
1.0413 - val_accuracy: 0.7214
Epoch 29/50
2/2 [==============================] - 2s 803ms/step - loss: 1.0517 - accuracy: 0.7245 - val_loss:
1.0376 - val_accuracy: 0.7236
Epoch 30/50
```

```
2/2 [==============================] - 2s 807ms/step - loss: 1.0489 - accuracy: 0.7248 - val_loss:
1.0374 - val_accuracy: 0.7244
Epoch 31/50
2/2 [==============================] - 2s 791ms/step - loss: 1.0473 - accuracy: 0.7254 - val_loss:
1.0330 - val_accuracy: 0.7246
Epoch 32/50
2/2 [==============================] - 2s 823ms/step - loss: 1.0449 - accuracy: 0.7256 - val_loss:
1.0330 - val_accuracy: 0.7241
Epoch 33/50
2/2 [==============================] - 2s 806ms/step - loss: 1.0454 - accuracy: 0.7256 - val_loss:
1.0298 - val_accuracy: 0.7231
Epoch 34/50
2/2 [==============================] - 2s 811ms/step - loss: 1.0421 - accuracy: 0.7259 - val_loss:
1.0304 - val_accuracy: 0.7259
Epoch 35/50
2/2 [==============================] - 2s 802ms/step - loss: 1.0404 - accuracy: 0.7257 - val_loss:
1.0317 - val_accuracy: 0.7231
Epoch 36/50
2/2 [==============================] - 2s 806ms/step - loss: 1.0410 - accuracy: 0.7257 - val_loss:
1.0283 - val_accuracy: 0.7244
Epoch 37/50
2/2 [==============================] - 2s 801ms/step - loss: 1.0385 - accuracy: 0.7262 - val_loss:
1.0249 - val_accuracy: 0.7249
Epoch 38/50
2/2 [==============================] - 2s 809ms/step - loss: 1.0387 - accuracy: 0.7263 - val_loss:
1.0281 - val_accuracy: 0.7241
Epoch 39/50
2/2 [==============================] - 2s 814ms/step - loss: 1.0374 - accuracy: 0.7264 - val_loss:
1.0308 - val_accuracy: 0.7244
Epoch 40/50
2/2 [==============================] - 2s 793ms/step - loss: 1.0378 - accuracy: 0.7267 - val_loss:
1.0231 - val_accuracy: 0.7259
Epoch 41/50
2/2 [==============================] - 2s 816ms/step - loss: 1.0334 - accuracy: 0.7268 - val_loss:
1.0213 - val_accuracy: 0.7264
Epoch 42/50
2/2 [==============================] - 2s 805ms/step - loss: 1.0320 - accuracy: 0.7269 - val_loss:
1.0216 - val_accuracy: 0.7254
Epoch 43/50
2/2 [==============================] - 2s 798ms/step - loss: 1.0303 - accuracy: 0.7270 - val_loss:
1.0194 - val_accuracy: 0.7259
Epoch 44/50
2/2 [==============================] - 2s 819ms/step - loss: 1.0289 - accuracy: 0.7275 - val_loss:
1.0232 - val_accuracy: 0.7269
Epoch 45/50
2/2 [==============================] - 2s 816ms/step - loss: 1.0278 - accuracy: 0.7275 - val_loss:
1.0191 - val_accuracy: 0.7246
Epoch 46/50
2/2 [==============================] - 2s 829ms/step - loss: 1.0256 - accuracy: 0.7280 - val_loss:
1.0181 - val_accuracy: 0.7249
Epoch 47/50
2/2 [==============================] - 2s 804ms/step - loss: 1.0240 - accuracy: 0.7281 - val_loss:
1.0209 - val_accuracy: 0.7266
Epoch 48/50
2/2 [==============================] - 2s 838ms/step - loss: 1.0249 - accuracy: 0.7280 - val_loss:
1.0239 - val_accuracy: 0.7259
Epoch 49/50
2/2 [==============================] - 2s 824ms/step - loss: 1.0248 - accuracy: 0.7272 - val_loss:
1.0176 - val_accuracy: 0.7249
Epoch 50/50
2/2 [==============================] - 2s 802ms/step - loss: 1.0299 - accuracy: 0.7271 - val_loss:
1.0192 - val_accuracy: 0.7264
```

Out[39]:

```
<tensorflow.python.keras.callbacks.History at 0x7f37e5133f10>
```

In [40]:

```python
def prediction(x):

  index_to_words = {id: word for word, id in target_tokenizer.word_index.items()}
  index_to_words[0] = '<PAD>'

  y=''.join([index_to_words[prediction] for prediction in x])
  return y
for i in range(20):
  print("Input text: ")
  a=list(X_test[i:i+1])
  print(a[0])
```

```python
    print("Actual Output: ")
    b=list(y_test[i:i+1])
    print(b[0])

    print("Predicted Output for beam==3 : ")
    x=model.predict(source_padded_docs_test[i:i+1])

    res=beam_search_decoder(x[0],3)

    y1=prediction(res[0][0])
    y1=y1.split(' ')
    y_lst1=[]
    for i in y1:
        y_lst1.append(i)
    print(' '.join(y_lst1))


    y2=prediction(res[1][0])
    y2=y2.split(' ')
    y_lst2=[]
    for i in y2:
        y_lst2.append(i)
    print(' '.join(y_lst2))

    y3=prediction(res[2][0])
    y3=y3.split(' ')
    y_lst3=[]
    for i in y3:
        y_lst3.append(i)
    print(' '.join(y_lst3))
    print('>'*180)
```

```
Input text:
He's going thru tutorial today? Is today the last lecture?
Actual Output:
He's going through tutorial today? Is today the last lecture?
Predicted Output for beam==3 :
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:16: RuntimeWarning: divide by zero
encountered in log
  app.launch_new_instance()
He's going thru t tor al    a            the la t lect re<PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PA
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Input text:
Nope... I wan to use com la...
Actual Output:
No. I want to use computer.
Predicted Output for beam==3 :
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Input text:
Er... Yeah i think not. Cøz we dun know which one we got assigned. Ü not sleeping yet? Haha... My hair s
till wet that's why...
Actual Output:
Yes, I don't think so. Cause we don't know which one we will be assigned. Are you not going to sleep
yet? Haha. My hair is still wet, that's why.
Predicted Output for beam==3 :
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Input text:
Well... Izzit true for u?
Actual Output:
Well. Is it true for you?
Predicted Output for beam==3 :
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Input text:
mohd sultan's double o.my og goin.but i not close to em.i wana ask fion along lei-if ü on.
Actual Output:
Mohd sultan's double o. My Og going. But I'm not close to them. I want to ask Fion along, if you on.
Predicted Output for beam==3 :
Sohd sul an s  o bl       o                                                                <PAD><PAD><PAD
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Input text:
Hi! devin,I am ric.Where u from?
Actual Output:
Hi! Devin, I am Ric. Where are you from?
Predicted Output for beam==3 :
Hi! Devin,  am ric. here    roo<PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD>
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Input text:
Save 5 seats can? Try try
Actual Output:
Save 5 seats, can you? Try try.
Predicted Output for beam==3 :
Save 5  eat   an        rrr<PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PAD><PA
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Input text:
Shall i buy tis mambo watch tt cost 80 bucks...
Actual Output:
Shall I buy this Mambo watch that costs 80 bucks?
Predicted Output for beam==3 :
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Input text:
MY NEW YEARS EVE WAS OK. I WENT TO A PARTY WITH MY BOYFRIEND. WHO IS THIS SI THEN HEY
Actual Output:
My new year evening was ok. I went to a party with my boyfriend. Who is this?
Predicted Output for beam==3 :
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Input text:
Haha..Cause supervisor go oversea lo.Then no one look after me lo..Hehe.But i still got find thing do lo.
Actual Output:
Haha. Because supervisor went overseas. Then no one looks after me. Hehe. But I still find thing to do.
Predicted Output for beam==3 :
Haha.   uss sss rri or o o eree   l   nn <PAD>
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Input text:
hi gal, can ask daddy 2 call me, i can't get thru his handphone, thks
Actual Output:
Hi girl, can you ask dad to call me, I can't get through his handphone, thanks.
Predicted Output for beam==3 :
Hi gil, can   k   y   <PAD><PAD><PAD><PAD><PAD><PAD><P
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Input text:
Didnt check but mi not studyin uni..mi gt a place in nanyang poly 4physiotherapy...so u happy wif dat choice?so u plan 2take chem izzit?
Actual Output:
Didn't check, but I'm not studying university. I got a place in Nanyang Polytechnic for Physiotherapy. So are you happy with that choice? So you are planning to take chemistry, is it?
Predicted Output for beam==3 :
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Input text:
Eh. I'm still at the bus stop... Missed the bus. So i might be later than you
Actual Output:
I'm still at the bus stop. I missed the bus. So I might be later than you.
Predicted Output for beam==3 :
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Input text:
pj.ur a malay/ chinese,rin?
Actual Output:
PJ. You're a Malay or Chinese, Rin?
Predicted Output for beam==3 :
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Input text:
Yar then can say hi... Then later can go for dinner... He like doing project...
Actual Output:
Yes. Can say hi and then go for dinner later. He likes doing project.
Predicted Output for beam==3 :
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Input text:
Oh dat...hehe.Why r u so interested?
Actual Output:
Oh that. Hehe. Why are you so interested?
Predicted Output for beam==3 :
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Input text:
Then wat time ü coming home...
Actual Output:
Then what time are you coming home?
Predicted Output for beam==3 :
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Input text:
Tmr i can only mt u durin my lunch break...Wed la...
Actual Output:
Tomorrow I can only meet you during my lunch break. Wednesday.
Predicted Output for beam==3 :
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Input text:
Hey yun ask you ah... where did you the answers for the past year exam papers from?
Actual Output:
Hey Yun, can I ask you? Where did you get the answers for the past year exam papers from?
Predicted Output for beam==3 :
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Input text:
Happy Valentine's Day... May this day of yours be blessed with happiness n laughter... Good day ahead.
Actual Output:
Happy Valentine's Day. May this day of yours be blessed with happiness and laughter. Good day ahead.
Predicted Output for beam==3 :
Happy Valentine s  ay.                    ou         ss           p   ss                           <PAD>
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In [41]:

```python
import nltk.translate.bleu_score as bleu
bleu_score1=[]
bleu_score2=[]
bleu_score3=[]

for i in range(20):
  b=list(y_test[i:i+1])
  x=model.predict(source_padded_docs_test[i:i+1])

  res=beam_search_decoder(x[0],3)

  y1=prediction(res[0][0])
  y1=y1.split(' ')
  y_lst1=[]
  for i in y1:
    if '<'in i:
      continue
    else:
      y_lst1.append(i)
  bleu_score1.append(bleu.sentence_bleu([b[0].split(),],y_lst1))

  y2=prediction(res[1][0])
  y2=y2.split(' ')
  y_lst2=[]
  for i in y2:
    if i=='<PAD>':
      continue
    else:
      y_lst2.append(i)
  bleu_score2.append(bleu.sentence_bleu([b[0].split(),],y_lst2))

  y3=prediction(res[2][0])
  y3=y3.split(' ')
  y_lst3=[]
  for i in y3:
    if i=='<PAD>':
      continue
    else:
      y_lst3.append(i)
  bleu_score3.append(bleu.sentence_bleu([b[0].split(),],y_lst3))

print("The Average Bleu Score1 is: ",sum(bleu_score1)/20)
print('>'*180)
print("The Average Bleu Score2 is: ",sum(bleu_score2)/20)
print('>'*180)
print("The Average Bleu Score3 is: ",sum(bleu_score3)/20)
print('>'*180)
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:16: RuntimeWarning: divide by zero
encountered in log
  app.launch_new_instance()
/usr/local/lib/python3.7/dist-packages/nltk/translate/bleu_score.py:490: UserWarning:
Corpus/Sentence contains 0 counts of 3-gram overlaps.
BLEU scores might be undesirable; use SmoothingFunction().
  warnings.warn(_msg)
/usr/local/lib/python3.7/dist-packages/nltk/translate/bleu_score.py:490: UserWarning:
Corpus/Sentence contains 0 counts of 2-gram overlaps.
BLEU scores might be undesirable; use SmoothingFunction().
  warnings.warn(_msg)
The Average Bleu Score1 is:  0.2598517965282279
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The Average Bleu Score2 is:  0.2600204569601833
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The Average Bleu Score3 is:  0.2662145469430429
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In [ ]: