(https://colab.research.google.com/github/reeniecd/DSC510-T301/blob/master/Assignement_11.ipynb)

In [3]:
```
import tensorflow as tf
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.layers import Embedding, LSTM, Dense
from tensorflow.keras.models import Sequential
from tensorflow.keras.utils import to_categorical
from tensorflow.keras.optimizers import Adam
import pickle
import numpy as np
import os
```

In [4]:
```
from google.colab import files
uploaded = files.upload()
```

Choose Files No file chosen

Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving Aab.txt to Aab.txt
```

In [5]:
```
file = open("Aab.txt", "r", encoding = "utf8")

# store file in list
lines = []
for i in file:
    lines.append(i)

# Convert list to string
data = ""
for i in lines:
  data = ' '. join(lines)

#replace unnecessary stuff with space
data = data.replace('\n', '').replace('\r', '').replace('\ufeff', '').repla

#remove unnecessary spaces
data = data.split()
data = ' '.join(data)
data[:500]
```

Out[5]:
```
'The Project Gutenberg eBook of The Aab, by Edward W. Ludwig This eBook i
s for the use of anyone anywhere in the United States and most other part
s of the world at no cost and with almost no restrictions whatsoever. You
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ws of the country where you are located before using this eBoo'
```

In [6]:
```
len(data)
```

Out[6]:
```
33740
```

In [7]:
```
tokenizer = Tokenizer()
tokenizer.fit_on_texts([data])

# saving the tokenizer for predict function
pickle.dump(tokenizer, open('token.pkl', 'wb'))

sequence_data = tokenizer.texts_to_sequences([data])[0]
sequence_data[:15]
```

Out[7]:
```
[1, 9, 7, 66, 2, 1, 24, 23, 272, 273, 274, 16, 66, 35, 20]
```

In [8]:
```
len(sequence_data)
```

Out[8]:
```
5831
```

In [9]:
```
vocab_size = len(tokenizer.word_index) + 1
print(vocab_size)
```

```
1484
```

In [10]:
```
sequences = []

for i in range(3, len(sequence_data)):
    words = sequence_data[i-3:i+1]
    sequences.append(words)

print("The Length of sequences are: ", len(sequences))
sequences = np.array(sequences)
sequences[:10]
```

```
The Length of sequences are:  5828
```

Out[10]:
```
array([[  1,   9,   7,  66],
       [  9,   7,  66,   2],
       [  7,  66,   2,   1],
       [ 66,   2,   1,  24],
       [  2,   1,  24,  23],
       [  1,  24,  23, 272],
       [ 24,  23, 272, 273],
       [ 23, 272, 273, 274],
       [272, 273, 274,  16],
       [273, 274,  16,  66]])
```

In [11]:
```
X = []
y = []

for i in sequences:
    X.append(i[0:3])
    y.append(i[3])

X = np.array(X)
y = np.array(y)
```

In [12]:
```
print("Data: ", X[:10])
print("Response: ", y[:10])
```

```
Data:  [[  1   9   7]
 [  9   7  66]
 [  7  66   2]
 [ 66   2   1]
 [  2   1  24]
 [  1  24  23]
 [ 24  23 272]
 [ 23 272 273]
 [272 273 274]
 [273 274  16]]
Response:  [ 66   2   1  24  23 272 273 274  16  66]
```

In [13]:
```
y = to_categorical(y, num_classes=vocab_size)
y[:5]
```

Out[13]:
```
array([[0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 1., ..., 0., 0., 0.],
       [0., 1., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.],
       [0., 0., 0., ..., 0., 0., 0.]], dtype=float32)
```

Creating the model

In [14]:
```
model = Sequential()
model.add(Embedding(vocab_size, 10, input_length=3))
model.add(LSTM(1000, return_sequences=True))
model.add(LSTM(1000))
model.add(Dense(1000, activation="relu"))
model.add(Dense(vocab_size, activation="softmax"))
```

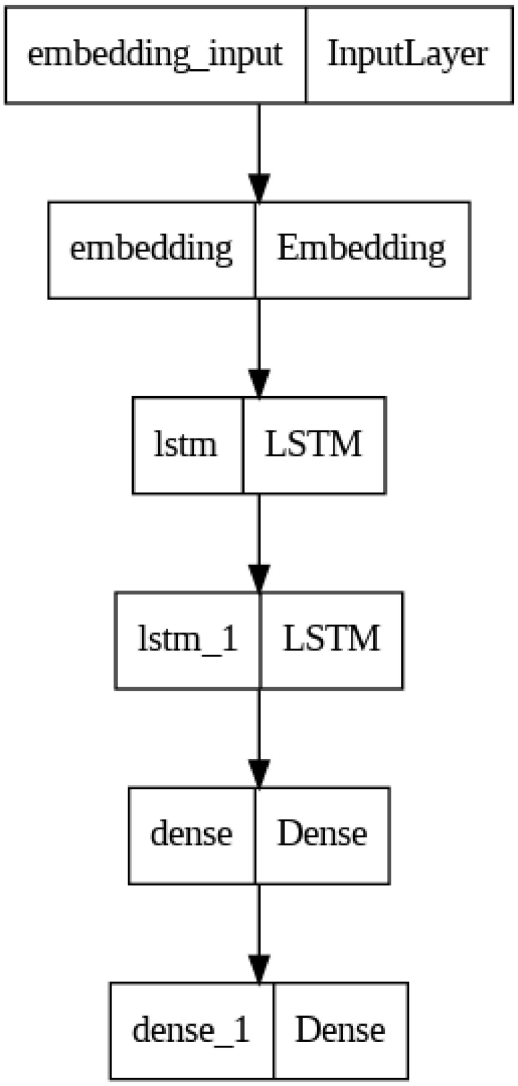
In [15]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding (Embedding)       (None, 3, 10)             14840

 lstm (LSTM)                 (None, 3, 1000)           4044000

 lstm_1 (LSTM)               (None, 1000)              8004000

 dense (Dense)               (None, 1000)              1001000

 dense_1 (Dense)             (None, 1484)              1485484

=================================================================
Total params: 14,549,324
Trainable params: 14,549,324
Non-trainable params: 0
_________________________________________________________________
```

Plot the model

In [16]:
```
from tensorflow import keras
from keras.utils.vis_utils import plot_model

keras.utils.plot_model(model, to_file='plot.png', show_layer_names=True)
```

Out[16]:



Train the model

In [17]:
```
from tensorflow.keras.callbacks import ModelCheckpoint

checkpoint = ModelCheckpoint("next_words.h5", monitor='loss', verbose=1, sa
model.compile(loss="categorical_crossentropy", optimizer=Adam(learning_rate
model.fit(X, y, epochs=70, batch_size=64, callbacks=[checkpoint])
```

```
Epoch 1/70
92/92 [==============================] - ETA: 0s - loss: 6.5470
Epoch 1: loss improved from inf to 6.54700, saving model to next_words.
h5
92/92 [==============================] - 64s 637ms/step - loss: 6.5470
Epoch 2/70
92/92 [==============================] - ETA: 0s - loss: 6.1198
Epoch 2: loss improved from 6.54700 to 6.11977, saving model to next_wo
rds.h5
92/92 [==============================] - 58s 635ms/step - loss: 6.1198
Epoch 3/70
92/92 [==============================] - ETA: 0s - loss: 6.0440
Epoch 3: loss improved from 6.11977 to 6.04403, saving model to next_wo
rds.h5
92/92 [==============================] - 62s 671ms/step - loss: 6.0440
Epoch 4/70
92/92 [==============================] - ETA: 0s - loss: 5.9609
Epoch 4: loss improved from 6.04403 to 5.96089, saving model to next_wo
rds.h5
```

Predict

In [18]:
```
from tensorflow.keras.models import load_model
import numpy as np
import pickle

# Load the model and tokenizer
model = load_model('next_words.h5')
tokenizer = pickle.load(open('token.pkl', 'rb'))

def Predict_Next_Words(model, tokenizer, text):

  sequence = tokenizer.texts_to_sequences([text])
  sequence = np.array(sequence)
  preds = np.argmax(model.predict(sequence))
  predicted_word = ""

  for key, value in tokenizer.word_index.items():
      if value == preds:
          predicted_word = key
          break

  print(predicted_word)
  return predicted_word
```

In [ ]:

```
# Load the model and tokenizer
model = load_model('next_words.h5')
tokenizer = pickle.load(open('token.pkl', 'rb'))

results_dir = 'dsc650/assignments/assignment11/results'

for _ in range(20):
    text = input("Enter your line: ")

    try:
        text = text.split(" ")
        text = text[-3:]
        print(text)

        predicted_word = Predict_Next_Words(model, tokenizer, text)

        # Append the predicted word to the results directory
        with open(os.path.join(results_dir, 'predictions.txt'), 'a') as f:
            f.write(predicted_word + '\n')

    except Exception as e:
        print("Error occurred:", e)
        continue
```

```
['from', 'the', 'melting']
1/1 [==============================] - 1s 890ms/step
polar
['bad', 'about', 'the']
1/1 [==============================] - 0s 60ms/step
old
['could', 'feel', 'the']
1/1 [==============================] - 0s 62ms/step
blood
['morning', "he'd", 'gone']
1/1 [==============================] - 0s 62ms/step
to
["Monk's", 'smile']
1/1 [==============================] - 1s 1s/step
seemed
['about', 'the', 'punctual']
1/1 [==============================] - 0s 38ms/step
arrival
['deed', 'of', 'Stardust']
1/1 [==============================] - 0s 38ms/step
luke's
['in', 'wandering', 'over']
1/1 [==============================] - 0s 40ms/step
unexplored
['sweat-matted', 'mop', 'of']
1/1 [==============================] - 0s 33ms/step
the
['matted', 'mop', 'of']
1/1 [==============================] - 0s 53ms/step
hair
['shiny', 'pin-heads', 'of']
1/1 [==============================] - 0s 35ms/step
by
['pin-heads', 'of']
1/1 [==============================] - 0s 43ms/step
you
['in', 'his', 'mind']
1/1 [==============================] - 0s 36ms/step
knowing
['his', 'mind,', 'rising']
1/1 [==============================] - 0s 52ms/step
as
Enter your line: arrival of Stardust
['arrival', 'of', 'Stardust']
1/1 [==============================] - 0s 82ms/step
and
```