Imports

```
import tensorflow as tf
from keras import preprocessing
from keras.preprocessing.text import Tokenizer
from keras.preprocessing.sequence import pad_sequences

from keras.models import Sequential
from keras.layers import Embedding
from keras.layers import Bidirectional
from keras.layers import LSTM
from keras.layers import Dropout
from keras.layers import Dense

from keras.callbacks import ModelCheckpoint
from keras.callbacks import Callback
from keras.regularizers import l2
from keras.utils import np_utils

import os
import time

import matplotlib.pyplot as plt
import numpy as np


artist_lyrics = ['eilish', 'beatles', 'bob-dylan', 'michael-jackson', 'zappa']
EPOCHS = 100
t = Tokenizer()


# Utility methods - plotting callback
class PlotCallback(Callback):
  """ This is a custom class to plot every few epochs. """
  losses = []
  accs = []

  def on_train_begin(self, logs=None):
    self.losses = []
    self.accs = []

  def on_epoch_end(self, epoch, logs=None):
    loss = logs['loss']
    acc = logs['accuracy']
    self.losses.append(loss)
    self.accs.append(acc)
    epoch_checkpoints = [10, 25, 50, 100, 150]
    if epoch+1 in epoch_checkpoints:
      print(f"Snapshot at epoch {epoch+1} (loss: {loss}):")
```

```
        plt.plot(self.losses)
        plt.ylabel('loss')
        plt.xlabel('epoch')
        plt.title(f"Training loss at {epoch+1} epoch{'s' if epoch > 1 else 's'}")
        plt.show()

        plt.plot(self.accs)
        plt.ylabel('accuracy')
        plt.xlabel('epoch')
        plt.title(f"Training accuracy at {epoch+1} epoch{'s' if epoch > 1 else 's'}")
        plt.show()

    def on_train_end(self, logs=None):
      print(f"Minimum loss: {min(self.losses)} (epoch {np.argmin(self.losses) + 1})")
      self.losses = []
      self.accs = []


  # Text generation
  def generate_text(model, max_sequence_length, seed_text="she", next_words=100, sequence_word_
    """ This method generates next_words words based on the seed text by
    repeatedly feeding the last sequence_length words into the LSTM to make the
    prediction. It keeps track of every word generated and prints the result."""
    # Seed and run predictions
    total_text = seed_text

    for i in range(next_words):
      token_list = t.texts_to_sequences([seed_text])[0]
      token_list = pad_sequences([token_list],
                                 maxlen=max_sequence_length - 1,
                                 padding='pre')
      predicted = np.argmax(model.predict(token_list), axis=-1)
      output_word = ""
      for word, index in t.word_index.items():
        if index == predicted:
          output_word = word
          break
      total_text += " " + output_word
      seed_text = seed_text + " " + output_word

      # if seed_text is n words or more, drop the first word in the sequence.
      seed_words = seed_text.split(' ')
      if len(seed_words) >= sequence_word_length:
        seed_text = ' '.join(seed_words[1:])

    out = ""
    for i, w in enumerate(total_text.split(' ')):
      out = out + " " + w
      if i % sequence_word_length == 0 and i > 0: # insert line breaks every 5 words
        out += "\r\n"

    print(out)
```

```
  print("-----------------------------------\r\n")
```

Method C: Bi-directional LSTM with Word Embeddings

This was the preferred method selected in the experimentation phase. This is the cleaned up version of the original notebook.

Based on: https://towardsdatascience.com/nlp-text-generation-through-bidirectional-lstm-model-9af29da4e520

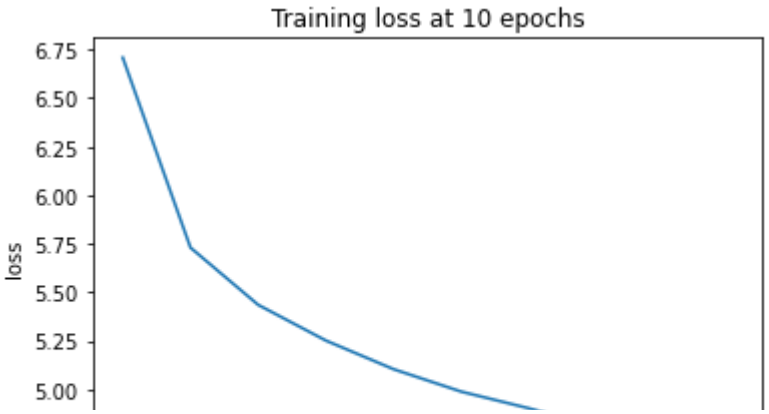
```
# https://towardsdatascience.com/nlp-text-generation-through-bidirectional-lstm-model-9af29da
# Tokenize input on words
def train_artist_lyrics(artist):
  print(f"\r\n*** Training {artist} ... ***")

  text = open(artist + ".txt", 'rb').read().decode(encoding='utf-8')

  # kill the newlines and lowercase everything
  sentences = text.lower().replace("\r\n", "\n").split("\n")

  # fit the tokenizer
  t.fit_on_texts(sentences)
  total_words = len(t.word_index) + 1

  print(f"There are {total_words} unique words in {artist}.txt")

  # Create input sequences, using list of tokens
  input_sequences = []
  for sentence in sentences:
    word_list = t.texts_to_sequences([sentence])[0]
    for i in range(1, len(word_list)):
      n_gram_sequence = word_list[:i+1] # include next
      input_sequences.append(n_gram_sequence)

  # Pad the sequences to fill in zeroes to maximum dimensionality
  max_sequence_length = max([len(x) for x in input_sequences])
  input_sequences = np.array(pad_sequences(input_sequences,
                                           maxlen=max_sequence_length,
                                           padding='pre'))

  # Get predictors and categorical label
  predictors, label = input_sequences[:, :-1], input_sequences[:, -1]
  label = tf.keras.utils.to_categorical(label, num_classes=total_words)

  # Build the bi-directional LSTM
  model = Sequential()
  model.add(Embedding(total_words, 100, input_length=max_sequence_length-1))
  model.add(Bidirectional(LSTM(150, return_sequences = True)))
  model.add(Dropout(0.2))
  model.add(LSTM(100))
```

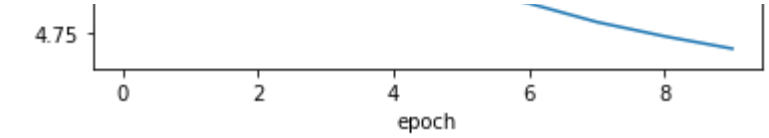
```
  model.add(Dense(total_words/2, activation='relu', kernel_regularizer=l2(0.01)))
  model.add(Dense(total_words, activation='softmax'))
  model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
  print(model.summary())

  # Configure checkpointing
  checkpoint_dir = f'./training_checkpoints/{artist}'
  checkpoint_prefix = os.path.join(checkpoint_dir, 'ckpt_{epoch}')
  checkpoint_callback = ModelCheckpoint(filepath=checkpoint_prefix,
                                        save_weights_only=True)

  # Fit the model
  history = model.fit(predictors, label, epochs=EPOCHS, verbose=1, callbacks=[checkpoint_cal]

  # SAVE THE FREAKING MODELS
  save_path = f'saved_models/{artist}_lyrics'
  model.save(save_path)
  print(f'Model saved to {save_path}.')

  # Print the results.
  print(f'Here are your new {artist.upper()} lyrics.\r\n*****\r\n')
  generate_text(model, max_sequence_length, seed_text="i")
```

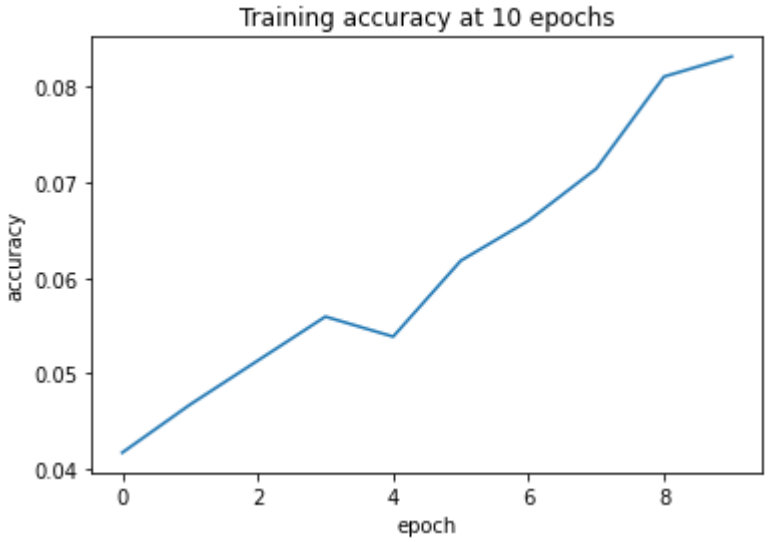
DO IT!

```
for artist in artist_lyrics:
  train_artist_lyrics(artist)
```

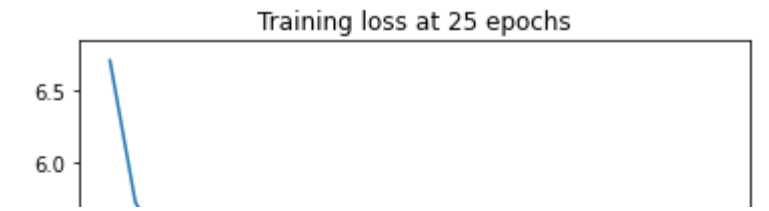
```
*** Training eilish ... ***
There are 641 unique words in eilish.txt
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding (Embedding)        (None, 16, 100)           64100
_________________________________________________________________
bidirectional (Bidirectional (None, 16, 300)           301200
_________________________________________________________________
dropout (Dropout)            (None, 16, 300)           0
_________________________________________________________________
lstm_1 (LSTM)                (None, 100)               160400
_________________________________________________________________
dense (Dense)                (None, 320)               32320
_________________________________________________________________
dense_1 (Dense)              (None, 641)               205761
=================================================================
Total params: 763,781
Trainable params: 763,781
Non-trainable params: 0
_________________________________________________________________
None
Epoch 1/100
75/75 [==============================] - 7s 12ms/step - loss: 7.1908 - accuracy: 0.0300
Epoch 2/100
75/75 [==============================] - 1s 12ms/step - loss: 5.8091 - accuracy: 0.0409
Epoch 3/100
75/75 [==============================] - 1s 12ms/step - loss: 5.4374 - accuracy: 0.0489
Epoch 4/100
75/75 [==============================] - 1s 12ms/step - loss: 5.2234 - accuracy: 0.0546
Epoch 5/100
75/75 [==============================] - 1s 12ms/step - loss: 5.0364 - accuracy: 0.0525
Epoch 6/100
75/75 [==============================] - 1s 12ms/step - loss: 4.9873 - accuracy: 0.0613
Epoch 7/100
75/75 [==============================] - 1s 12ms/step - loss: 4.9006 - accuracy: 0.0684
Epoch 8/100
75/75 [==============================] - 1s 12ms/step - loss: 4.8337 - accuracy: 0.0706
Epoch 9/100
75/75 [==============================] - 1s 11ms/step - loss: 4.7118 - accuracy: 0.0879
Epoch 10/100
75/75 [==============================] - 1s 12ms/step - loss: 4.6696 - accuracy: 0.0754
Snapshot at epoch 10 (loss: 4.668356418609619):
```

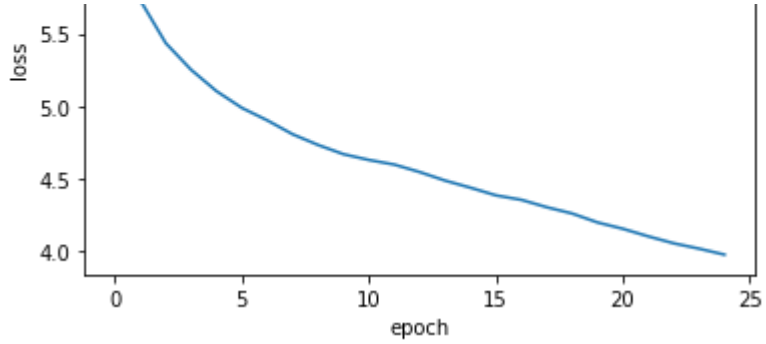


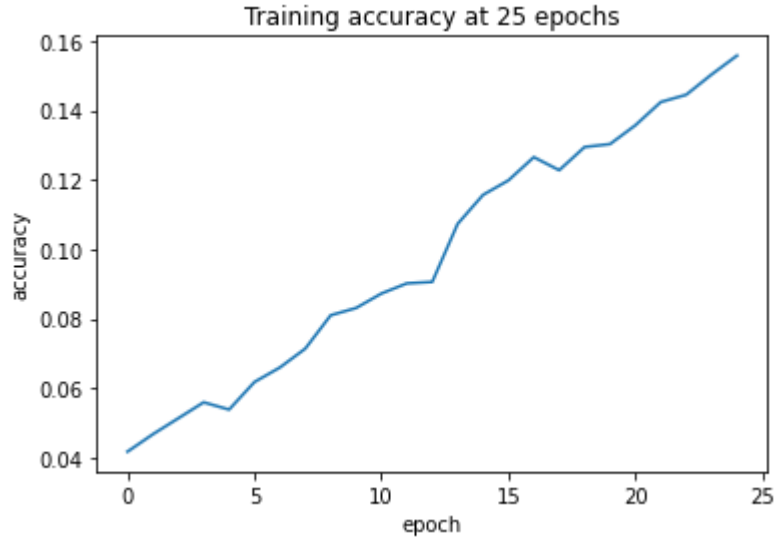





```
Epoch 11/100
75/75 [==============================] - 1s 12ms/step - loss: 4.5317 - accuracy: 0.0913
Epoch 12/100
75/75 [==============================] - 1s 12ms/step - loss: 4.5629 - accuracy: 0.0832
Epoch 13/100
75/75 [==============================] - 1s 12ms/step - loss: 4.5632 - accuracy: 0.0853
Epoch 14/100
75/75 [==============================] - 1s 12ms/step - loss: 4.4807 - accuracy: 0.0983
Epoch 15/100
75/75 [==============================] - 1s 12ms/step - loss: 4.3686 - accuracy: 0.1176
Epoch 16/100
75/75 [==============================] - 1s 12ms/step - loss: 4.4048 - accuracy: 0.1160
Epoch 17/100
75/75 [==============================] - 1s 12ms/step - loss: 4.3584 - accuracy: 0.1184
Epoch 18/100
75/75 [==============================] - 1s 12ms/step - loss: 4.2431 - accuracy: 0.1280
Epoch 19/100
75/75 [==============================] - 1s 12ms/step - loss: 4.2424 - accuracy: 0.1422
Epoch 20/100
75/75 [==============================] - 1s 12ms/step - loss: 4.1975 - accuracy: 0.1274
Epoch 21/100
75/75 [==============================] - 1s 12ms/step - loss: 4.1859 - accuracy: 0.1312
Epoch 22/100
75/75 [==============================] - 1s 12ms/step - loss: 4.0533 - accuracy: 0.1542
Epoch 23/100
75/75 [==============================] - 1s 12ms/step - loss: 4.0460 - accuracy: 0.1440
Epoch 24/100
75/75 [==============================] - 1s 12ms/step - loss: 3.9759 - accuracy: 0.1536
Epoch 25/100
75/75 [==============================] - 1s 12ms/step - loss: 3.9827 - accuracy: 0.1460
Snapshot at epoch 25 (loss: 3.975151777267456):
```

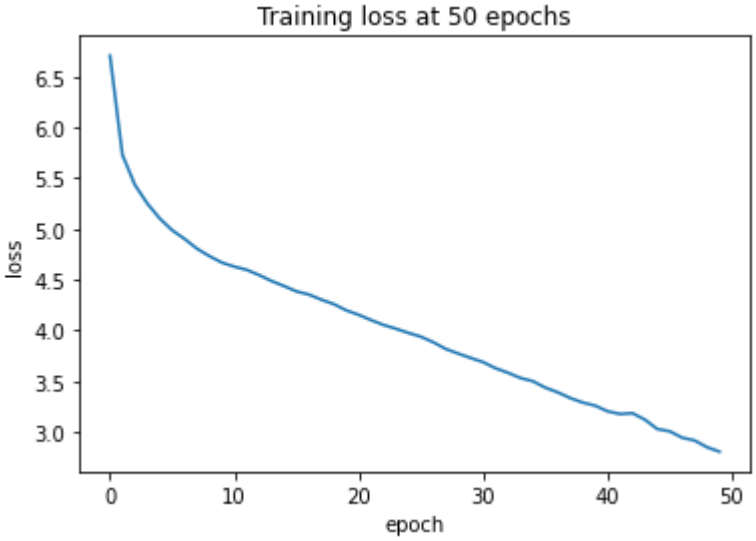


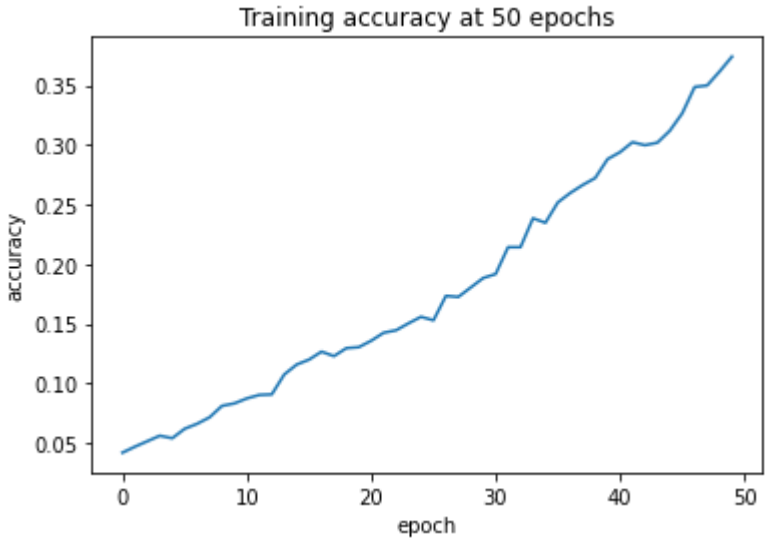





```
Epoch 26/100
75/75 [==============================] - 1s 12ms/step - loss: 3.8945 - accuracy: 0.1625
Epoch 27/100
75/75 [==============================] - 1s 12ms/step - loss: 3.8494 - accuracy: 0.1711
Epoch 28/100
75/75 [==============================] - 1s 12ms/step - loss: 3.7864 - accuracy: 0.1679
Epoch 29/100
75/75 [==============================] - 1s 12ms/step - loss: 3.7164 - accuracy: 0.1916
Epoch 30/100
75/75 [==============================] - 1s 12ms/step - loss: 3.6656 - accuracy: 0.1887
Epoch 31/100
75/75 [==============================] - 1s 12ms/step - loss: 3.6724 - accuracy: 0.1880
Epoch 32/100
75/75 [==============================] - 1s 12ms/step - loss: 3.5826 - accuracy: 0.2242
Epoch 33/100
75/75 [==============================] - 1s 12ms/step - loss: 3.5439 - accuracy: 0.2211
Epoch 34/100
75/75 [==============================] - 1s 11ms/step - loss: 3.4979 - accuracy: 0.2408
Epoch 35/100
75/75 [==============================] - 1s 11ms/step - loss: 3.4134 - accuracy: 0.2527
Epoch 36/100
75/75 [==============================] - 1s 12ms/step - loss: 3.3787 - accuracy: 0.2551
Epoch 37/100
75/75 [==============================] - 1s 12ms/step - loss: 3.3740 - accuracy: 0.2530
Epoch 38/100
75/75 [==============================] - 1s 12ms/step - loss: 3.3099 - accuracy: 0.2750
Epoch 39/100
75/75 [==============================] - 1s 12ms/step - loss: 3.2667 - accuracy: 0.2762
Epoch 40/100
75/75 [==============================] - 1s 12ms/step - loss: 3.1874 - accuracy: 0.3030
Epoch 41/100
```

```
75/75 [==============================] - 1s 12ms/step - loss: 3.1305 - accuracy: 0.2939
Epoch 42/100
75/75 [==============================] - 1s 12ms/step - loss: 3.1656 - accuracy: 0.3048
Epoch 43/100
75/75 [==============================] - 1s 12ms/step - loss: 3.1004 - accuracy: 0.3040
Epoch 44/100
75/75 [==============================] - 1s 12ms/step - loss: 3.1129 - accuracy: 0.3057
Epoch 45/100
75/75 [==============================] - 1s 12ms/step - loss: 2.9767 - accuracy: 0.3087
Epoch 46/100
75/75 [==============================] - 1s 12ms/step - loss: 2.9194 - accuracy: 0.3440
Epoch 47/100
75/75 [==============================] - 1s 12ms/step - loss: 2.8956 - accuracy: 0.3566
Epoch 48/100
75/75 [==============================] - 1s 12ms/step - loss: 2.8406 - accuracy: 0.3723
Epoch 49/100
75/75 [==============================] - 1s 12ms/step - loss: 2.8075 - accuracy: 0.3770
Epoch 50/100
75/75 [==============================] - 1s 12ms/step - loss: 2.7246 - accuracy: 0.3966
Snapshot at epoch 50 (loss: 2.8051583766937256):
```

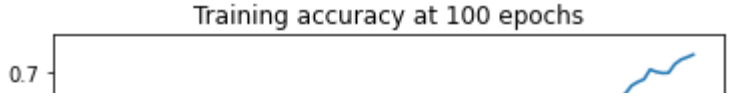


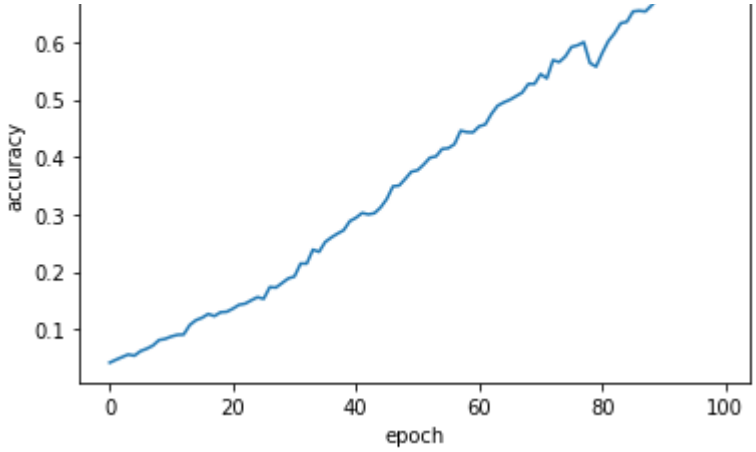



```
Epoch 51/100
75/75 [==============================] - 1s 12ms/step - loss: 2.7185 - accuracy: 0.3850
Epoch 52/100
75/75 [==============================] - 1s 11ms/step - loss: 2.6660 - accuracy: 0.3984
Epoch 53/100
```

```
75/75 [==============================] - 1s 12ms/step - loss: 2.6626 - accuracy: 0.4076
Epoch 54/100
75/75 [==============================] - 1s 12ms/step - loss: 2.6011 - accuracy: 0.4227
Epoch 55/100
75/75 [==============================] - 1s 12ms/step - loss: 2.5417 - accuracy: 0.4308
Epoch 56/100
75/75 [==============================] - 1s 12ms/step - loss: 2.5295 - accuracy: 0.4223
Epoch 57/100
75/75 [==============================] - 1s 12ms/step - loss: 2.5089 - accuracy: 0.4355
Epoch 58/100
75/75 [==============================] - 1s 12ms/step - loss: 2.4396 - accuracy: 0.4774
Epoch 59/100
75/75 [==============================] - 1s 12ms/step - loss: 2.3940 - accuracy: 0.4698
Epoch 60/100
75/75 [==============================] - 1s 12ms/step - loss: 2.4261 - accuracy: 0.4559
Epoch 61/100
75/75 [==============================] - 1s 11ms/step - loss: 2.3851 - accuracy: 0.4658
Epoch 62/100
75/75 [==============================] - 1s 11ms/step - loss: 2.3479 - accuracy: 0.4747
Epoch 63/100
75/75 [==============================] - 1s 11ms/step - loss: 2.3376 - accuracy: 0.4916
Epoch 64/100
75/75 [==============================] - 1s 12ms/step - loss: 2.2965 - accuracy: 0.5081
Epoch 65/100
75/75 [==============================] - 1s 11ms/step - loss: 2.2707 - accuracy: 0.4972
Epoch 66/100
75/75 [==============================] - 1s 12ms/step - loss: 2.1815 - accuracy: 0.5219
Epoch 67/100
75/75 [==============================] - 1s 11ms/step - loss: 2.1808 - accuracy: 0.5252
Epoch 68/100
75/75 [==============================] - 1s 11ms/step - loss: 2.1383 - accuracy: 0.5360
Epoch 69/100
75/75 [==============================] - 1s 11ms/step - loss: 2.1518 - accuracy: 0.5283
Epoch 70/100
75/75 [==============================] - 1s 12ms/step - loss: 2.0810 - accuracy: 0.5354
Epoch 71/100
75/75 [==============================] - 1s 12ms/step - loss: 2.0730 - accuracy: 0.5510
Epoch 72/100
75/75 [==============================] - 1s 12ms/step - loss: 2.0430 - accuracy: 0.5499
Epoch 73/100
75/75 [==============================] - 1s 11ms/step - loss: 1.9740 - accuracy: 0.5912
Epoch 74/100
75/75 [==============================] - 1s 11ms/step - loss: 1.9475 - accuracy: 0.5905
Epoch 75/100
75/75 [==============================] - 1s 11ms/step - loss: 1.9421 - accuracy: 0.5939
Epoch 76/100
75/75 [==============================] - 1s 12ms/step - loss: 1.9318 - accuracy: 0.6076
Epoch 77/100
75/75 [==============================] - 1s 12ms/step - loss: 1.8605 - accuracy: 0.6226
Epoch 78/100
75/75 [==============================] - 1s 12ms/step - loss: 1.8471 - accuracy: 0.6180
Epoch 79/100
75/75 [==============================] - 1s 11ms/step - loss: 1.9690 - accuracy: 0.6034
Epoch 80/100
75/75 [==============================] - 1s 12ms/step - loss: 2.0799 - accuracy: 0.5628
Epoch 81/100
75/75 [==============================] - 1s 11ms/step - loss: 1.9781 - accuracy: 0.5809
Epoch 82/100
```

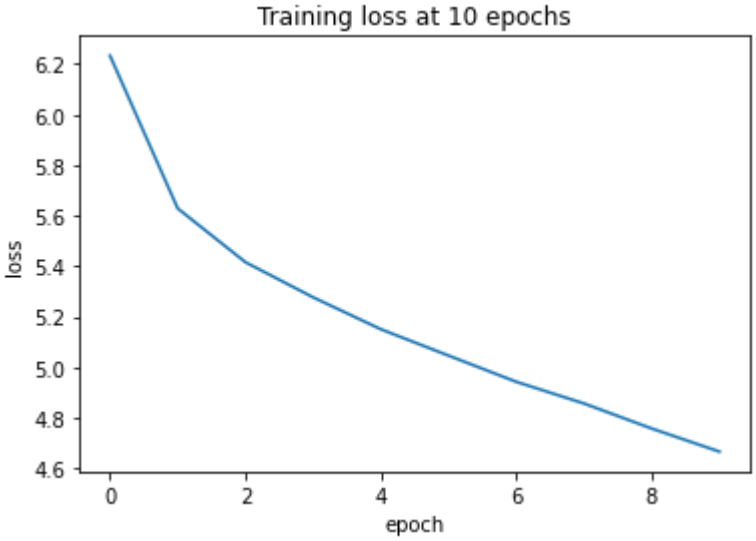
```
75/75 [==============================] - 1s 11ms/step - loss: 1.8217 - accuracy: 0.6155
Epoch 83/100
75/75 [==============================] - 1s 11ms/step - loss: 1.8272 - accuracy: 0.6183
Epoch 84/100
75/75 [==============================] - 1s 12ms/step - loss: 1.7757 - accuracy: 0.6426
Epoch 85/100
75/75 [==============================] - 1s 11ms/step - loss: 1.7337 - accuracy: 0.6488
Epoch 86/100
75/75 [==============================] - 1s 11ms/step - loss: 1.6430 - accuracy: 0.6756
Epoch 87/100
75/75 [==============================] - 1s 12ms/step - loss: 1.6882 - accuracy: 0.6611
Epoch 88/100
75/75 [==============================] - 1s 11ms/step - loss: 1.6824 - accuracy: 0.6646
Epoch 89/100
75/75 [==============================] - 1s 12ms/step - loss: 1.6519 - accuracy: 0.6632
Epoch 90/100
75/75 [==============================] - 1s 11ms/step - loss: 1.6104 - accuracy: 0.6875
Epoch 91/100
75/75 [==============================] - 1s 11ms/step - loss: 1.5684 - accuracy: 0.7021
Epoch 92/100
75/75 [==============================] - 1s 11ms/step - loss: 1.5577 - accuracy: 0.7017
Epoch 93/100
75/75 [==============================] - 1s 11ms/step - loss: 1.5024 - accuracy: 0.7302
Epoch 94/100
75/75 [==============================] - 1s 11ms/step - loss: 1.5144 - accuracy: 0.7061
Epoch 95/100
75/75 [==============================] - 1s 11ms/step - loss: 1.4534 - accuracy: 0.7276
Epoch 96/100
75/75 [==============================] - 1s 12ms/step - loss: 1.4727 - accuracy: 0.7184
Epoch 97/100
75/75 [==============================] - 1s 11ms/step - loss: 1.4855 - accuracy: 0.7139
Epoch 98/100
75/75 [==============================] - 1s 11ms/step - loss: 1.4355 - accuracy: 0.7407
Epoch 99/100
75/75 [==============================] - 1s 12ms/step - loss: 1.3784 - accuracy: 0.7510
Epoch 100/100
75/75 [==============================] - 1s 12ms/step - loss: 1.4255 - accuracy: 0.7393
Snapshot at epoch 100 (loss: 1.4481163024902344):
```

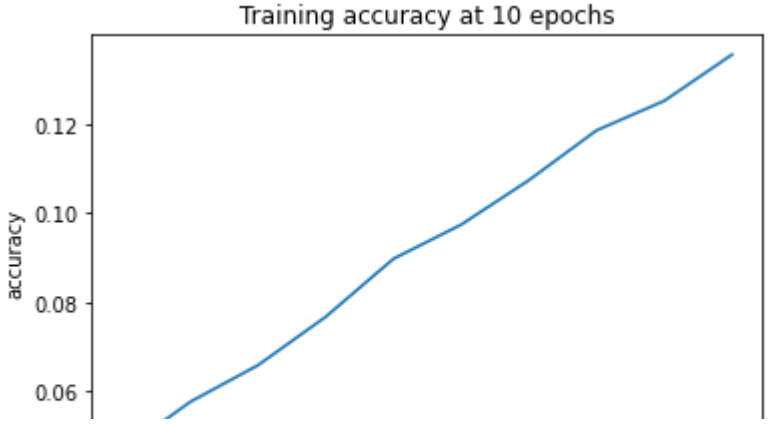


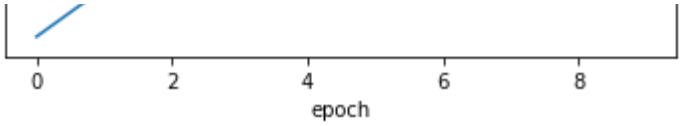



```
Minimum loss: 1.4481163024902344 (epoch 100)
WARNING:absl:Found untraced functions such as lstm_cell_3_layer_call_fn, lstm_cell_3_la
WARNING:absl:Found untraced functions such as lstm_cell_3_layer_call_fn, lstm_cell_3_la
INFO:tensorflow:Assets written to: saved_models/eilish_lyrics/assets
INFO:tensorflow:Assets written to: saved_models/eilish_lyrics/assets
Model saved to saved_models/eilish_lyrics.
Here are your new EILISH lyrics.
*****

 i just kinda wish you were gay
 out no invite me how you
 never know how you feel so
 scattered guy duh guy sidewalk guy
 glass hand smoke too long ago
 to enough guy duh guy crime
 guy crown guy duh guy duh
 guy glass hand smoke too long
 ago to enough guy duh guy
 crime guy crown guy duh guy
 duh guy glass hand smoke too
 long ago to enough guy duh
 guy crime guy crown guy duh
 guy duh guy glass hand smoke
 too long ago to enough guy
 duh guy crime guy crown guy
 duh guy duh guy
-------------------------------------


*** Training beatles ... ***
There are 1896 unique words in beatles.txt
Model: "sequential_1"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_1 (Embedding)      (None, 33, 100)           189600
_________________________________________________________________
bidirectional_1 (Bidirection (None, 33, 300)           301200
_________________________________________________________________
dropout_1 (Dropout)          (None, 33, 300)           0
_________________________________________________________________
lstm_3 (LSTM)                (None, 100)               160400
_________________________________________________________________
dense_2 (Dense)              (None, 948)               95748
```

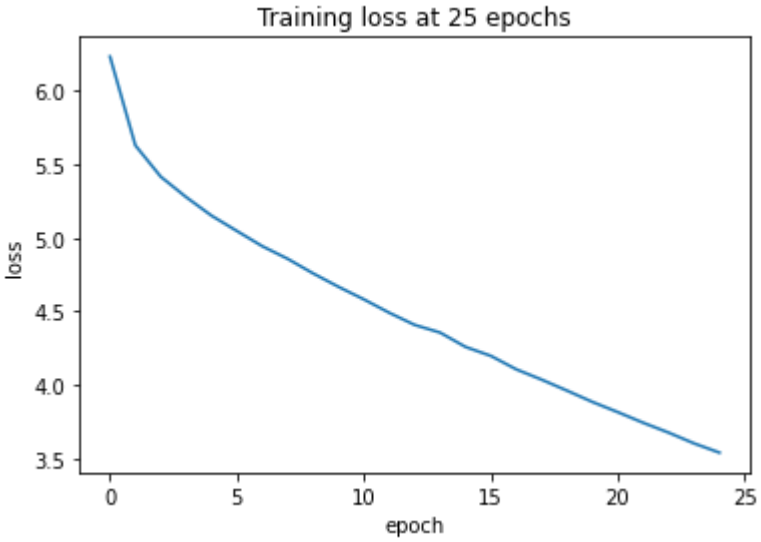
```
_________________________________________________________________
dense_3 (Dense)              (None, 1896)              1799304
=================================================================
Total params: 2,546,252
Trainable params: 2,546,252
Non-trainable params: 0
_________________________________________________________________
None
Epoch 1/100
392/392 [==============================] - 10s 16ms/step - loss: 6.7884 - accuracy: 0.0
Epoch 2/100
392/392 [==============================] - 6s 16ms/step - loss: 5.6558 - accuracy: 0.05
Epoch 3/100
392/392 [==============================] - 6s 16ms/step - loss: 5.4370 - accuracy: 0.06
Epoch 4/100
392/392 [==============================] - 6s 16ms/step - loss: 5.2728 - accuracy: 0.07
Epoch 5/100
392/392 [==============================] - 6s 16ms/step - loss: 5.1477 - accuracy: 0.08
Epoch 6/100
392/392 [==============================] - 6s 16ms/step - loss: 5.0141 - accuracy: 0.09
Epoch 7/100
392/392 [==============================] - 6s 16ms/step - loss: 4.9668 - accuracy: 0.10
Epoch 8/100
392/392 [==============================] - 6s 16ms/step - loss: 4.8468 - accuracy: 0.11
Epoch 9/100
392/392 [==============================] - 6s 16ms/step - loss: 4.7628 - accuracy: 0.12
Epoch 10/100
392/392 [==============================] - 6s 16ms/step - loss: 4.6604 - accuracy: 0.13
Snapshot at epoch 10 (loss: 4.666941165924072):
```

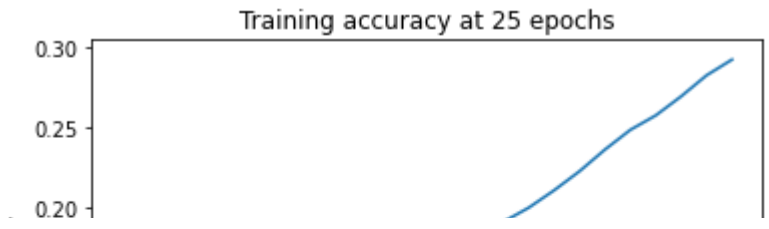


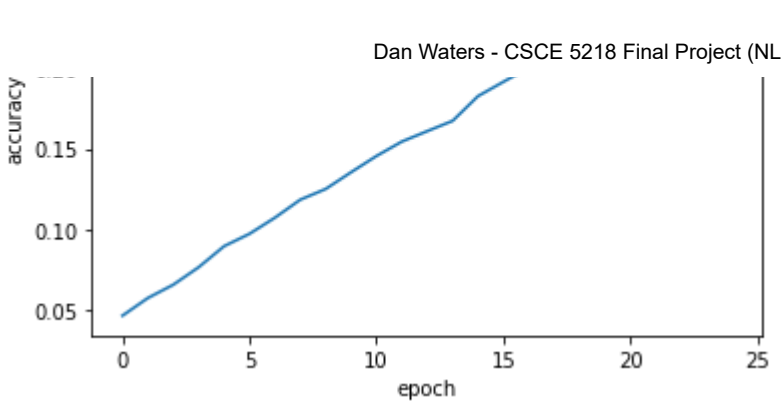





```
Epoch 11/100
392/392 [==============================] - 6s 16ms/step - loss: 4.5786 - accuracy: 0.14
Epoch 12/100
392/392 [==============================] - 6s 16ms/step - loss: 4.4663 - accuracy: 0.15
Epoch 13/100
392/392 [==============================] - 6s 16ms/step - loss: 4.3693 - accuracy: 0.16
Epoch 14/100
392/392 [==============================] - 6s 16ms/step - loss: 4.3670 - accuracy: 0.16
Epoch 15/100
392/392 [==============================] - 6s 16ms/step - loss: 4.2226 - accuracy: 0.18
Epoch 16/100
392/392 [==============================] - 7s 17ms/step - loss: 4.1709 - accuracy: 0.19
Epoch 17/100
392/392 [==============================] - 6s 16ms/step - loss: 4.0877 - accuracy: 0.20
Epoch 18/100
392/392 [==============================] - 6s 16ms/step - loss: 4.0370 - accuracy: 0.20
Epoch 19/100
392/392 [==============================] - 7s 17ms/step - loss: 3.9180 - accuracy: 0.22
Epoch 20/100
392/392 [==============================] - 7s 17ms/step - loss: 3.8753 - accuracy: 0.23
Epoch 21/100
392/392 [==============================] - 6s 16ms/step - loss: 3.7812 - accuracy: 0.25
Epoch 22/100
392/392 [==============================] - 7s 17ms/step - loss: 3.6904 - accuracy: 0.26
Epoch 23/100
392/392 [==============================] - 7s 17ms/step - loss: 3.6630 - accuracy: 0.26
Epoch 24/100
392/392 [==============================] - 7s 17ms/step - loss: 3.5748 - accuracy: 0.28
Epoch 25/100
392/392 [==============================] - 7s 17ms/step - loss: 3.5052 - accuracy: 0.29
Snapshot at epoch 25 (loss: 3.5387370586395264):
```

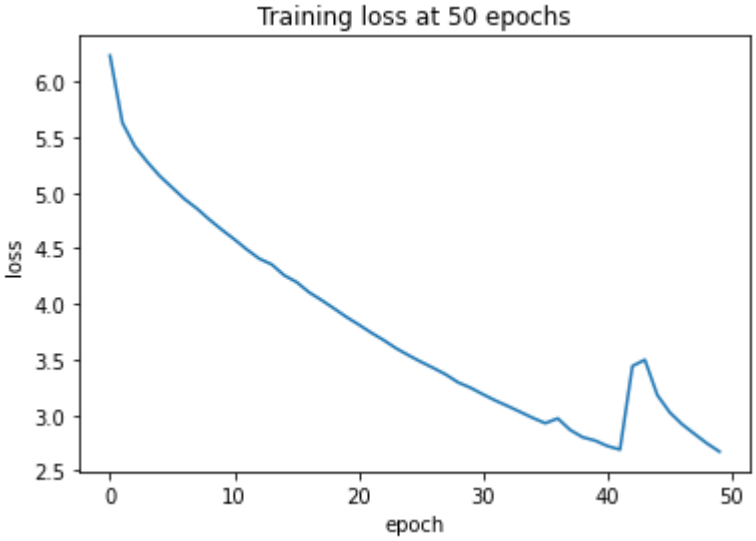


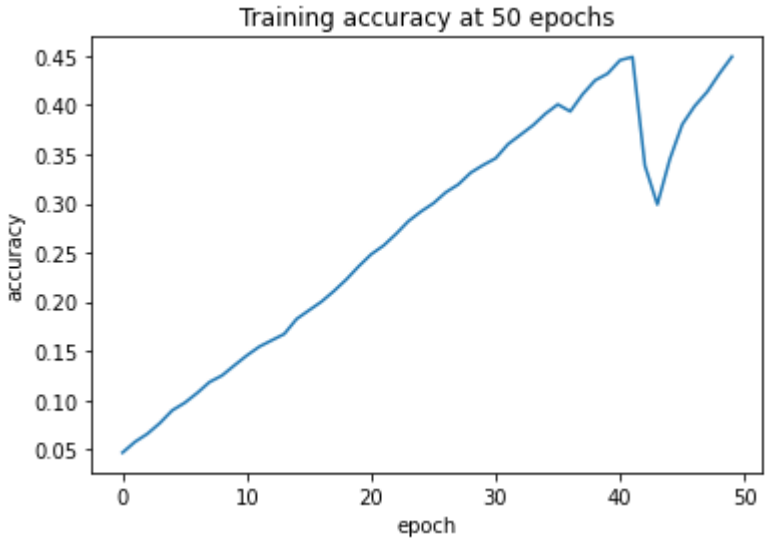





```
Epoch 26/100
392/392 [==============================] - 7s 17ms/step - loss: 3.4518 - accuracy: 0.30
Epoch 27/100
392/392 [==============================] - 7s 17ms/step - loss: 3.3514 - accuracy: 0.31
Epoch 28/100
392/392 [==============================] - 7s 17ms/step - loss: 3.3324 - accuracy: 0.32
Epoch 29/100
392/392 [==============================] - 7s 17ms/step - loss: 3.2674 - accuracy: 0.32
Epoch 30/100
392/392 [==============================] - 7s 17ms/step - loss: 3.1727 - accuracy: 0.34
Epoch 31/100
392/392 [==============================] - 7s 17ms/step - loss: 3.1511 - accuracy: 0.34
Epoch 32/100
392/392 [==============================] - 7s 18ms/step - loss: 3.1002 - accuracy: 0.36
Epoch 33/100
392/392 [==============================] - 7s 17ms/step - loss: 3.0810 - accuracy: 0.36
Epoch 34/100
392/392 [==============================] - 7s 17ms/step - loss: 2.9613 - accuracy: 0.39
Epoch 35/100
392/392 [==============================] - 7s 17ms/step - loss: 2.9492 - accuracy: 0.39
Epoch 36/100
392/392 [==============================] - 7s 17ms/step - loss: 2.9010 - accuracy: 0.40
Epoch 37/100
392/392 [==============================] - 7s 17ms/step - loss: 2.9233 - accuracy: 0.40
Epoch 38/100
392/392 [==============================] - 7s 17ms/step - loss: 2.8333 - accuracy: 0.41
Epoch 39/100
392/392 [==============================] - 7s 17ms/step - loss: 2.7526 - accuracy: 0.43
Epoch 40/100
392/392 [==============================] - 7s 17ms/step - loss: 2.7157 - accuracy: 0.44
Epoch 41/100
392/392 [==============================] - 7s 17ms/step - loss: 2.6752 - accuracy: 0.45
Epoch 42/100
392/392 [==============================] - 7s 17ms/step - loss: 2.6169 - accuracy: 0.46
Epoch 43/100
392/392 [==============================] - 7s 17ms/step - loss: 2.8684 - accuracy: 0.42
Epoch 44/100
392/392 [==============================] - 7s 17ms/step - loss: 3.5445 - accuracy: 0.29
Epoch 45/100
392/392 [==============================] - 7s 17ms/step - loss: 3.1916 - accuracy: 0.34
Epoch 46/100
392/392 [==============================] - 7s 17ms/step - loss: 3.0042 - accuracy: 0.37
Epoch 47/100
392/392 [==============================] - 7s 17ms/step - loss: 2.8979 - accuracy: 0.40
Epoch 48/100
392/392 [==============================] - 7s 17ms/step - loss: 2.7898 - accuracy: 0.41
Epoch 49/100
392/392 [==============================] - 7s 17ms/step - loss: 2.6966 - accuracy: 0.44
```

```
Epoch 50/100
392/392 [==============================] - 6s 17ms/step - loss: 2.6147 - accuracy: 0.46
Snapshot at epoch 50 (loss: 2.6719281673431396):
```

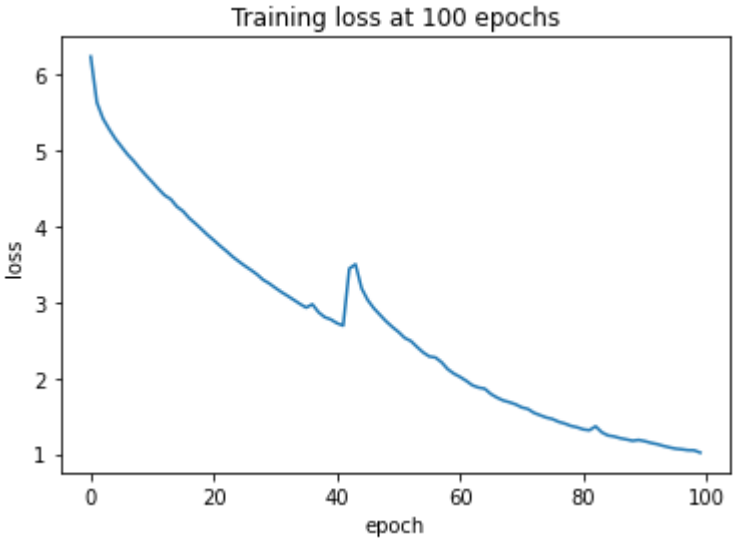


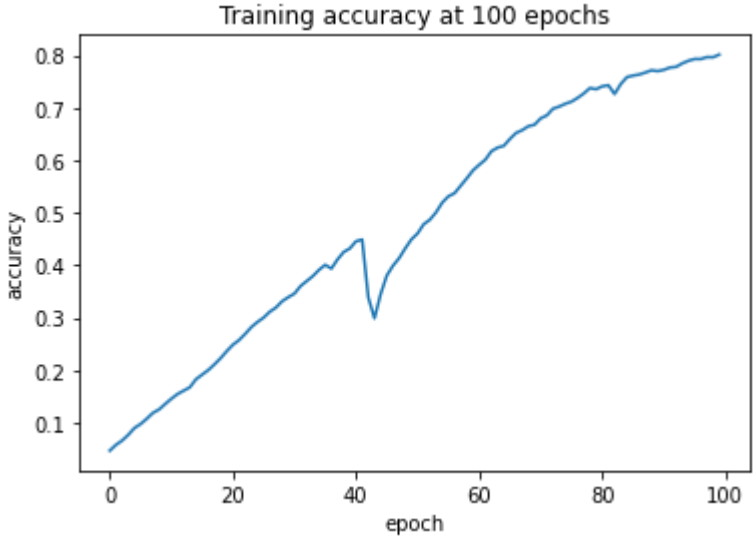



```
Epoch 51/100
392/392 [==============================] - 7s 17ms/step - loss: 2.5573 - accuracy: 0.47
Epoch 52/100
392/392 [==============================] - 7s 17ms/step - loss: 2.4763 - accuracy: 0.48
Epoch 53/100
392/392 [==============================] - 7s 17ms/step - loss: 2.4302 - accuracy: 0.50
Epoch 54/100
392/392 [==============================] - 7s 17ms/step - loss: 2.3741 - accuracy: 0.50
Epoch 55/100
392/392 [==============================] - 7s 18ms/step - loss: 2.2986 - accuracy: 0.52
Epoch 56/100
392/392 [==============================] - 7s 17ms/step - loss: 2.2387 - accuracy: 0.54
Epoch 57/100
392/392 [==============================] - 7s 19ms/step - loss: 2.1890 - accuracy: 0.55
Epoch 58/100
392/392 [==============================] - 7s 18ms/step - loss: 2.1909 - accuracy: 0.55
Epoch 59/100
392/392 [==============================] - 7s 18ms/step - loss: 2.0587 - accuracy: 0.57
Epoch 60/100
392/392 [==============================] - 7s 18ms/step - loss: 2.0261 - accuracy: 0.58
Epoch 61/100
392/392 [==============================] - 7s 17ms/step - loss: 1.9921 - accuracy: 0.59
```

```
Epoch 62/100
392/392 [==============================] - 7s 18ms/step - loss: 1.9125 - accuracy: 0.61
Epoch 63/100
392/392 [==============================] - 7s 17ms/step - loss: 1.8566 - accuracy: 0.63
Epoch 64/100
392/392 [==============================] - 7s 18ms/step - loss: 1.8228 - accuracy: 0.64
Epoch 65/100
392/392 [==============================] - 7s 17ms/step - loss: 1.7752 - accuracy: 0.65
Epoch 66/100
392/392 [==============================] - 7s 18ms/step - loss: 1.7319 - accuracy: 0.65
Epoch 67/100
392/392 [==============================] - 7s 18ms/step - loss: 1.6987 - accuracy: 0.66
Epoch 68/100
392/392 [==============================] - 7s 18ms/step - loss: 1.6533 - accuracy: 0.67
Epoch 69/100
392/392 [==============================] - 7s 17ms/step - loss: 1.6136 - accuracy: 0.68
Epoch 70/100
392/392 [==============================] - 7s 18ms/step - loss: 1.6172 - accuracy: 0.67
Epoch 71/100
392/392 [==============================] - 7s 18ms/step - loss: 1.5546 - accuracy: 0.69
Epoch 72/100
392/392 [==============================] - 7s 18ms/step - loss: 1.5473 - accuracy: 0.69
Epoch 73/100
392/392 [==============================] - 7s 18ms/step - loss: 1.5218 - accuracy: 0.70
Epoch 74/100
392/392 [==============================] - 7s 18ms/step - loss: 1.4513 - accuracy: 0.71
Epoch 75/100
392/392 [==============================] - 7s 18ms/step - loss: 1.4384 - accuracy: 0.71
Epoch 76/100
392/392 [==============================] - 7s 18ms/step - loss: 1.4073 - accuracy: 0.72
Epoch 77/100
392/392 [==============================] - 7s 18ms/step - loss: 1.3673 - accuracy: 0.73
Epoch 78/100
392/392 [==============================] - 7s 18ms/step - loss: 1.3688 - accuracy: 0.73
Epoch 79/100
392/392 [==============================] - 7s 18ms/step - loss: 1.3267 - accuracy: 0.74
Epoch 80/100
392/392 [==============================] - 7s 18ms/step - loss: 1.3284 - accuracy: 0.74
Epoch 81/100
392/392 [==============================] - 7s 18ms/step - loss: 1.2897 - accuracy: 0.75
Epoch 82/100
392/392 [==============================] - 7s 18ms/step - loss: 1.2937 - accuracy: 0.75
Epoch 83/100
392/392 [==============================] - 7s 18ms/step - loss: 1.3255 - accuracy: 0.73
Epoch 84/100
392/392 [==============================] - 7s 18ms/step - loss: 1.2778 - accuracy: 0.74
Epoch 85/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1966 - accuracy: 0.76
Epoch 86/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1883 - accuracy: 0.77
Epoch 87/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1560 - accuracy: 0.77
Epoch 88/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1558 - accuracy: 0.78
Epoch 89/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1078 - accuracy: 0.78
Epoch 90/100
```

```
392/392 [==============================] - 7s 18ms/step - loss: 1.1501 - accuracy: 0.78
Epoch 91/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1023 - accuracy: 0.79
Epoch 92/100
392/392 [==============================] - 7s 18ms/step - loss: 1.0859 - accuracy: 0.79
Epoch 93/100
392/392 [==============================] - 7s 18ms/step - loss: 1.1014 - accuracy: 0.78
Epoch 94/100
392/392 [==============================] - 7s 18ms/step - loss: 1.0603 - accuracy: 0.79
Epoch 95/100
392/392 [==============================] - 8s 19ms/step - loss: 1.0547 - accuracy: 0.79
Epoch 96/100
392/392 [==============================] - 7s 19ms/step - loss: 1.0385 - accuracy: 0.79
Epoch 97/100
392/392 [==============================] - 7s 18ms/step - loss: 1.0414 - accuracy: 0.79
Epoch 98/100
392/392 [==============================] - 7s 18ms/step - loss: 1.0116 - accuracy: 0.80
Epoch 99/100
392/392 [==============================] - 7s 18ms/step - loss: 1.0118 - accuracy: 0.80
Epoch 100/100
392/392 [==============================] - 7s 18ms/step - loss: 0.9811 - accuracy: 0.81
Snapshot at epoch 100 (loss: 1.016939640045166):
```

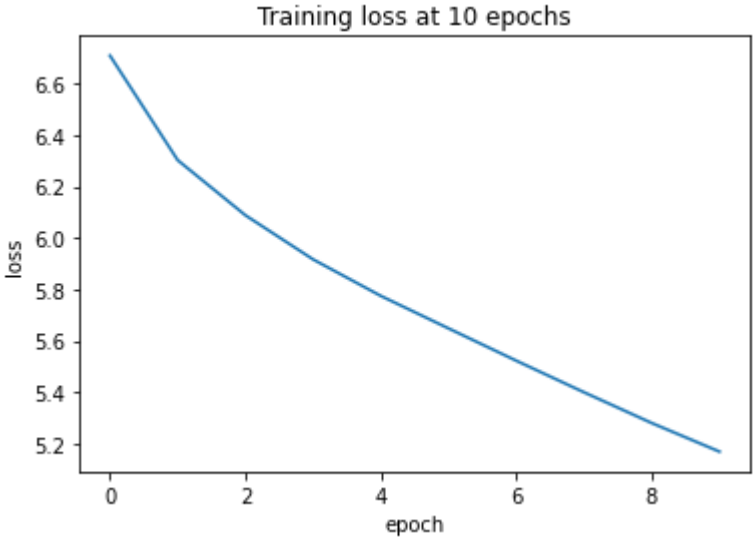


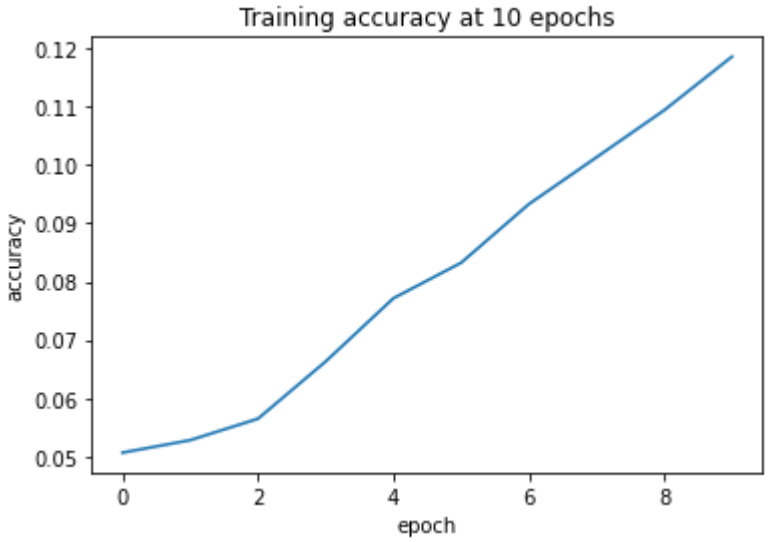



```
Minimum loss: 1.016939640045166 (epoch 100)
WARNING:absl:Found untraced functions such as lstm_cell_7_layer_call_fn, lstm_cell_7_la
WARNING:absl:Found untraced functions such as lstm_cell_7_layer_call_fn, lstm_cell_7_la
```

```
INFO:tensorflow:Assets written to: saved_models/beatles_lyrics/assets
INFO:tensorflow:Assets written to: saved_models/beatles_lyrics/assets
Model saved to saved_models/beatles_lyrics.
Here are your new BEATLES lyrics.
*****

 i don't know why you say goodbye
 i say hello hello hello hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello goodbye hello
 goodbye hello goodbye hello
-------------------------------------


*** Training bob-dylan ... ***
There are 5442 unique words in bob-dylan.txt
Model: "sequential_2"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_2 (Embedding)      (None, 18, 100)           544200
_________________________________________________________________
bidirectional_2 (Bidirection (None, 18, 300)           301200
_________________________________________________________________
dropout_2 (Dropout)          (None, 18, 300)           0
_________________________________________________________________
lstm_5 (LSTM)                (None, 100)               160400
_________________________________________________________________
dense_4 (Dense)              (None, 2721)              274821
_________________________________________________________________
dense_5 (Dense)              (None, 5442)              14813124
=================================================================
Total params: 16,093,745
Trainable params: 16,093,745
Non-trainable params: 0
_________________________________________________________________
None
Epoch 1/100
1038/1038 [==============================] - 24s 19ms/step - loss: 7.0387 - accuracy: 0
Epoch 2/100
1038/1038 [==============================] - 20s 20ms/step - loss: 6.3132 - accuracy: 0
Epoch 3/100
1038/1038 [==============================] - 20s 19ms/step - loss: 6.1120 - accuracy: 0
Epoch 4/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.9153 - accuracy: 0
Epoch 5/100
```

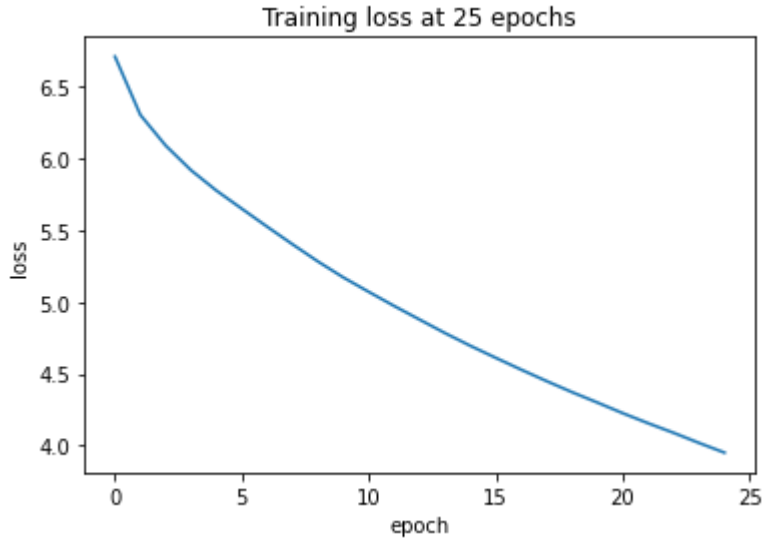
```
1038/1038 [==============================] - 20s 19ms/step - loss: 5.7721 - accuracy: 0
Epoch 6/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.6453 - accuracy: 0
Epoch 7/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.5040 - accuracy: 0
Epoch 8/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.3932 - accuracy: 0
Epoch 9/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.2399 - accuracy: 0
Epoch 10/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.1453 - accuracy: 0
Snapshot at epoch 10 (loss: 5.16956901550293):
```

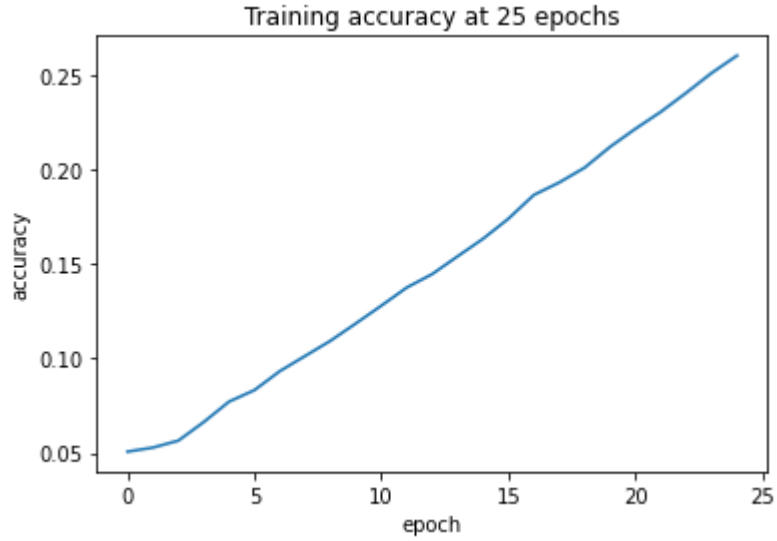





```
Epoch 11/100
1038/1038 [==============================] - 20s 19ms/step - loss: 5.0633 - accuracy: 0
Epoch 12/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.9578 - accuracy: 0
Epoch 13/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.8542 - accuracy: 0
Epoch 14/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.7630 - accuracy: 0
Epoch 15/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.6786 - accuracy: 0
Epoch 16/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.5971 - accuracy: 0
Epoch 17/100
```

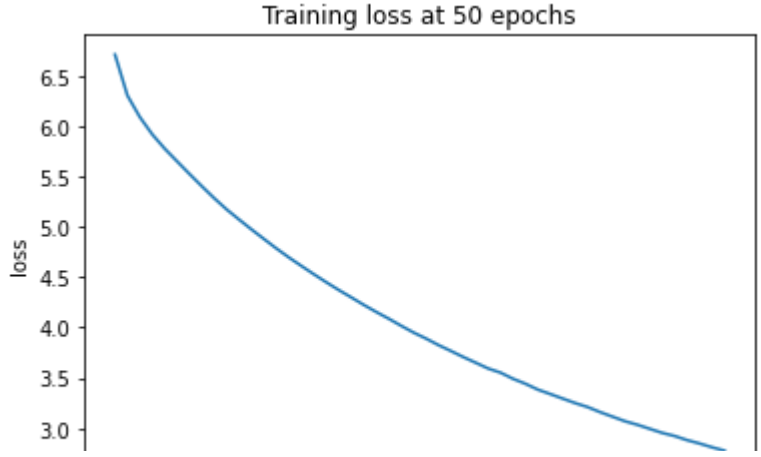
```
1038/1038 [==============================] - 20s 19ms/step - loss: 4.4948 - accuracy: 0
Epoch 18/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.4320 - accuracy: 0
Epoch 19/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.3482 - accuracy: 0
Epoch 20/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.2465 - accuracy: 0
Epoch 21/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.1959 - accuracy: 0
Epoch 22/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.1365 - accuracy: 0
Epoch 23/100
1038/1038 [==============================] - 20s 19ms/step - loss: 4.0438 - accuracy: 0
Epoch 24/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.9693 - accuracy: 0
Epoch 25/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.9137 - accuracy: 0
Snapshot at epoch 25 (loss: 3.9504435062408447):
```

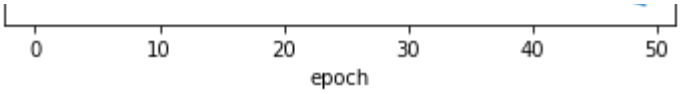


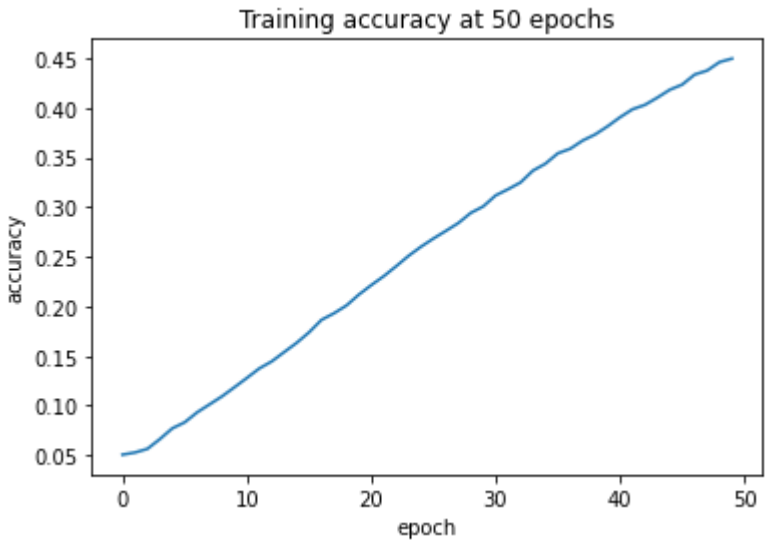



```
Epoch 26/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.8542 - accuracy: 0
Epoch 27/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.7972 - accuracy: 0
Epoch 28/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.7380 - accuracy: 0
Epoch 29/100
```

```
1038/1038 [==============================] - 20s 19ms/step - loss: 3.6722 - accuracy: 0
Epoch 30/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.6296 - accuracy: 0
Epoch 31/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.5533 - accuracy: 0
Epoch 32/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.5092 - accuracy: 0
Epoch 33/100
1038/1038 [==============================] - 20s 20ms/step - loss: 3.4512 - accuracy: 0
Epoch 34/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.3995 - accuracy: 0
Epoch 35/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.3590 - accuracy: 0
Epoch 36/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.2967 - accuracy: 0
Epoch 37/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.2484 - accuracy: 0
Epoch 38/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.2001 - accuracy: 0
Epoch 39/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.1468 - accuracy: 0
Epoch 40/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.1141 - accuracy: 0
Epoch 41/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.0740 - accuracy: 0
Epoch 42/100
1038/1038 [==============================] - 20s 19ms/step - loss: 3.0352 - accuracy: 0
Epoch 43/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.9792 - accuracy: 0
Epoch 44/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.9529 - accuracy: 0
Epoch 45/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.9080 - accuracy: 0
Epoch 46/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.8767 - accuracy: 0
Epoch 47/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.8298 - accuracy: 0
Epoch 48/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.8076 - accuracy: 0
Epoch 49/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.7779 - accuracy: 0
Epoch 50/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.7196 - accuracy: 0
Snapshot at epoch 50 (loss: 2.7785024642944336):
```



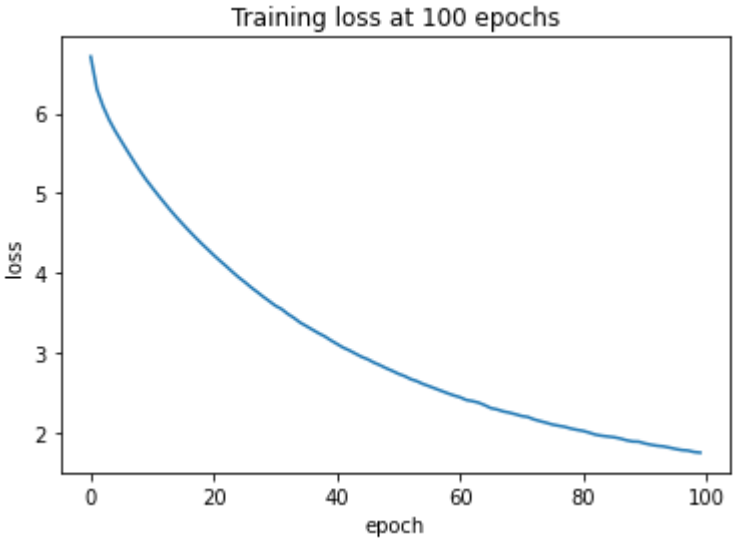


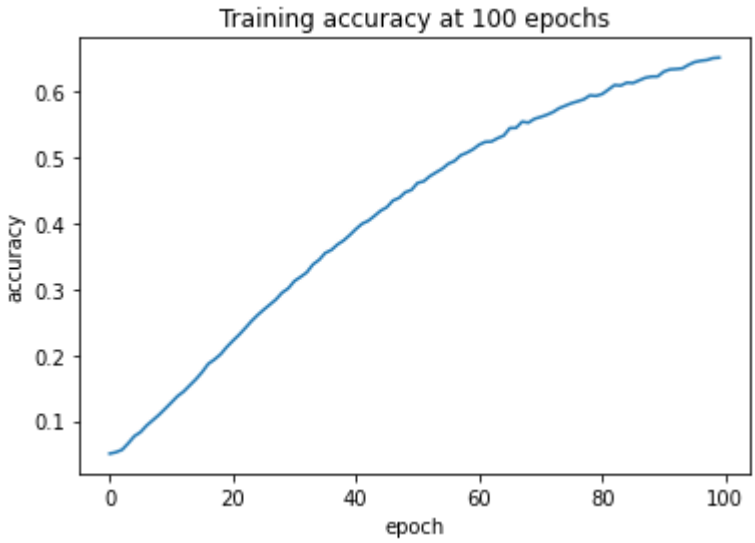



```
Epoch 51/100
1038/1038 [==============================] - 21s 20ms/step - loss: 2.7134 - accuracy: 0
Epoch 52/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.6600 - accuracy: 0
Epoch 53/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.6439 - accuracy: 0
Epoch 54/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.6131 - accuracy: 0
Epoch 55/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.5802 - accuracy: 0
Epoch 56/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.5127 - accuracy: 0
Epoch 57/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.5215 - accuracy: 0
Epoch 58/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.4917 - accuracy: 0
Epoch 59/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.4491 - accuracy: 0
Epoch 60/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.4240 - accuracy: 0
Epoch 61/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.3970 - accuracy: 0
Epoch 62/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.3882 - accuracy: 0
Epoch 63/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.3539 - accuracy: 0
Epoch 64/100
1038/1038 [==============================] - 20s 20ms/step - loss: 2.3263 - accuracy: 0
Epoch 65/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.3123 - accuracy: 0
Epoch 66/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.2640 - accuracy: 0
Epoch 67/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.2277 - accuracy: 0
Epoch 68/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.2264 - accuracy: 0
Epoch 69/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.1996 - accuracy: 0
Epoch 70/100
```

```
Epoch 70/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.1930 - accuracy: 0
Epoch 71/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.1559 - accuracy: 0
Epoch 72/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.1596 - accuracy: 0
Epoch 73/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.1219 - accuracy: 0
Epoch 74/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.1022 - accuracy: 0
Epoch 75/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.0831 - accuracy: 0
Epoch 76/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.0604 - accuracy: 0
Epoch 77/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.0563 - accuracy: 0
Epoch 78/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.0438 - accuracy: 0
Epoch 79/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.0034 - accuracy: 0
Epoch 80/100
1038/1038 [==============================] - 20s 19ms/step - loss: 2.0118 - accuracy: 0
Epoch 81/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.9848 - accuracy: 0
Epoch 82/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.9609 - accuracy: 0
Epoch 83/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.9322 - accuracy: 0
Epoch 84/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.9207 - accuracy: 0
Epoch 85/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.9090 - accuracy: 0
Epoch 86/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.9227 - accuracy: 0
Epoch 87/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8908 - accuracy: 0
Epoch 88/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8646 - accuracy: 0
Epoch 89/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8508 - accuracy: 0
Epoch 90/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8489 - accuracy: 0
Epoch 91/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8331 - accuracy: 0
Epoch 92/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8149 - accuracy: 0
Epoch 93/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.8054 - accuracy: 0
Epoch 94/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7924 - accuracy: 0
Epoch 95/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7882 - accuracy: 0
Epoch 96/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7553 - accuracy: 0
Epoch 97/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7290 - accuracy: 0
Epoch 98/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7313 - accuracy: 0
```

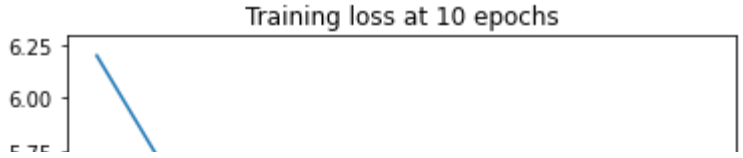
```
Epoch 99/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7209 - accuracy: 0
Epoch 100/100
1038/1038 [==============================] - 20s 19ms/step - loss: 1.7132 - accuracy: 0
Snapshot at epoch 100 (loss: 1.7565618753433228):
```

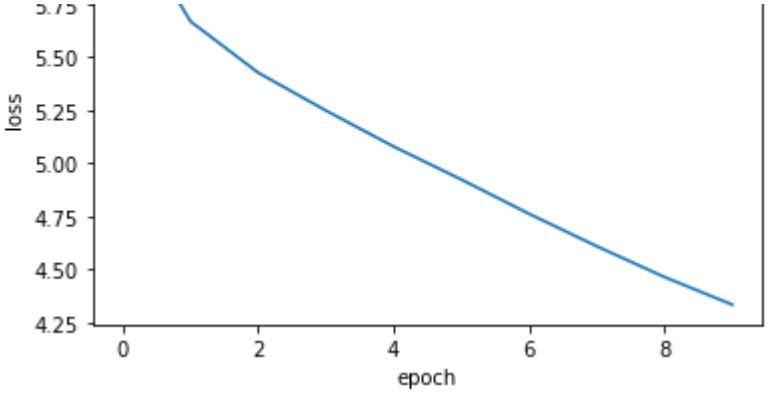


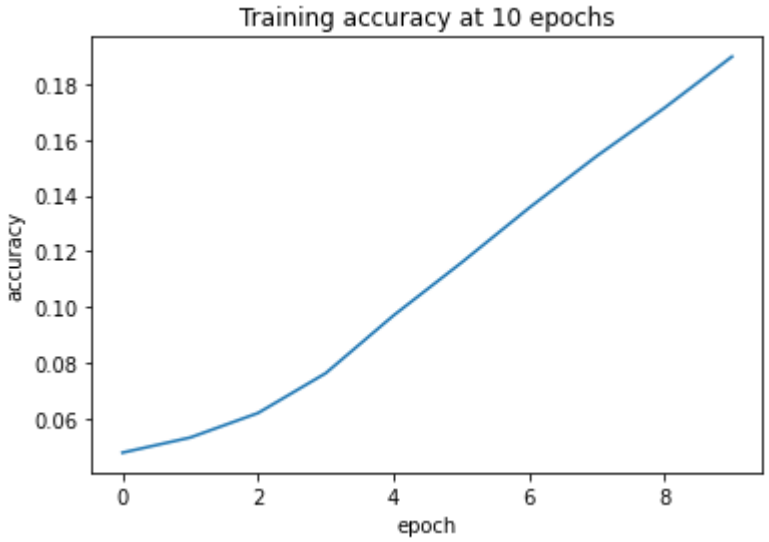



```
Minimum loss: 1.7565618753433228 (epoch 100)
WARNING:absl:Found untraced functions such as lstm_cell_11_layer_call_fn, lstm_cell_11_
WARNING:absl:Found untraced functions such as lstm_cell_11_layer_call_fn, lstm_cell_11_
INFO:tensorflow:Assets written to: saved_models/bob-dylan_lyrics/assets
INFO:tensorflow:Assets written to: saved_models/bob-dylan_lyrics/assets
Model saved to saved_models/bob-dylan_lyrics.
Here are your new BOB-DYLAN lyrics.
*****

 i was all right ’til i fell
 in love with you and i
 thought and i know that evenin’s
 empire has returned into sand the
 sun goes down graves drinking scott
 fitzgerald’s hard we eat with this
 attempts to set out of her
 at the wilderness a wildcat did
 growl a parade rolling out come
 down far from the mountain but
 it’s way from vain do you
```

```
 want abe then you know you’re
 a thousand one i was telling
 him about buddha you have oh
 to live inside my car wide
 heart blue disgrace and criticize all
 fears now “good many
------------------------------------


*** Training michael-jackson ... ***
There are 6884 unique words in michael-jackson.txt
Model: "sequential_3"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_3 (Embedding)      (None, 19, 100)           688400
_________________________________________________________________
bidirectional_3 (Bidirection (None, 19, 300)           301200
_________________________________________________________________
dropout_3 (Dropout)          (None, 19, 300)           0
_________________________________________________________________
lstm_7 (LSTM)                (None, 100)               160400
_________________________________________________________________
dense_6 (Dense)              (None, 3442)              347642
_________________________________________________________________
dense_7 (Dense)              (None, 6884)              23701612
=================================================================
Total params: 25,199,254
Trainable params: 25,199,254
Non-trainable params: 0
_________________________________________________________________
None
Epoch 1/100
1257/1257 [==============================] - 30s 21ms/step - loss: 6.5988 - accuracy: 0
Epoch 2/100
1257/1257 [==============================] - 26s 21ms/step - loss: 5.7193 - accuracy: 0
Epoch 3/100
1257/1257 [==============================] - 26s 21ms/step - loss: 5.4445 - accuracy: 0
Epoch 4/100
1257/1257 [==============================] - 26s 21ms/step - loss: 5.2556 - accuracy: 0
Epoch 5/100
1257/1257 [==============================] - 26s 21ms/step - loss: 5.0810 - accuracy: 0
Epoch 6/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.9356 - accuracy: 0
Epoch 7/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.7692 - accuracy: 0
Epoch 8/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.6063 - accuracy: 0
Epoch 9/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.4705 - accuracy: 0
Epoch 10/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.3307 - accuracy: 0
Snapshot at epoch 10 (loss: 4.334294319152832):
```

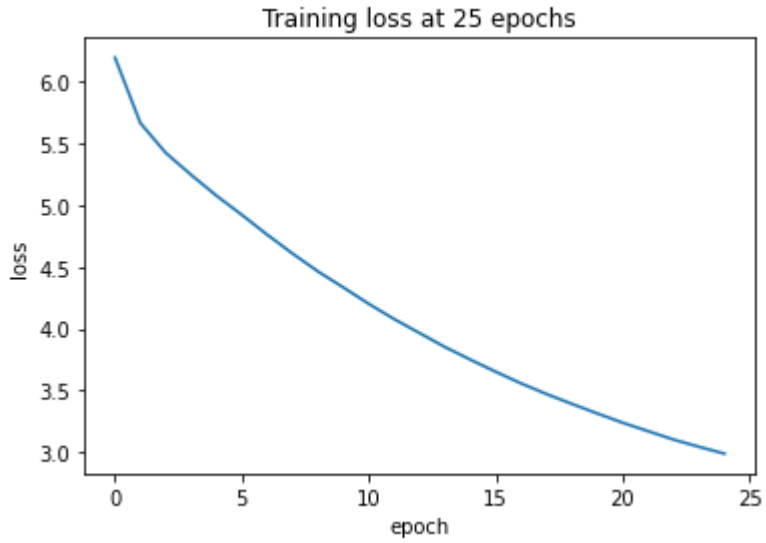


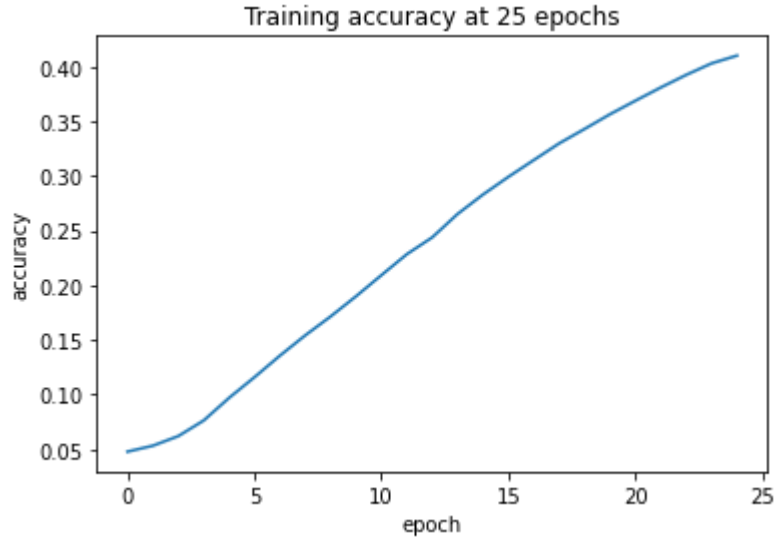





```
Epoch 11/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.2177 - accuracy: 0
Epoch 12/100
1257/1257 [==============================] - 26s 21ms/step - loss: 4.0591 - accuracy: 0
Epoch 13/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.9750 - accuracy: 0
Epoch 14/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.8332 - accuracy: 0
Epoch 15/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.7290 - accuracy: 0
Epoch 16/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.6482 - accuracy: 0
Epoch 17/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.5284 - accuracy: 0
Epoch 18/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.4514 - accuracy: 0
Epoch 19/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.3683 - accuracy: 0
Epoch 20/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.2962 - accuracy: 0
Epoch 21/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.2128 - accuracy: 0
Epoch 22/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.1454 - accuracy: 0
Epoch 23/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.0700 - accuracy: 0
Epoch 24/100
1257/1257 [==============================] - 26s 21ms/step - loss: 3.0162 - accuracy: 0
Epoch 25/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.9728 - accuracy: 0
```

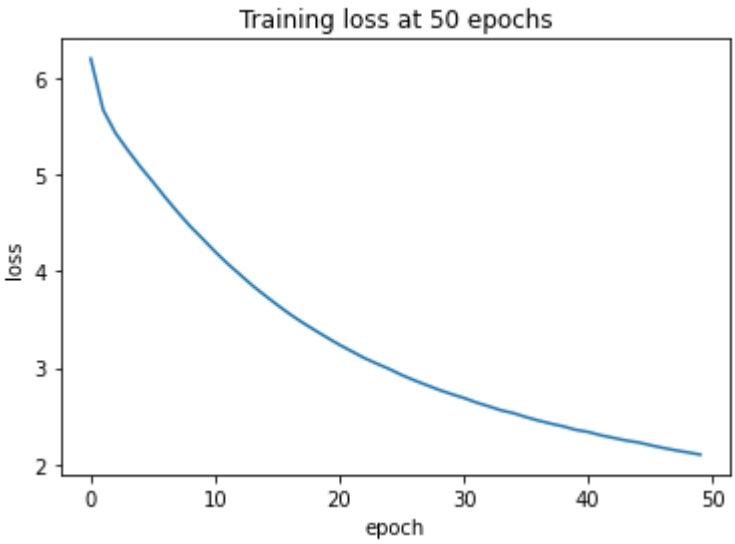
```
Snapshot at epoch 25 (loss: 2.9876394271850586):
```

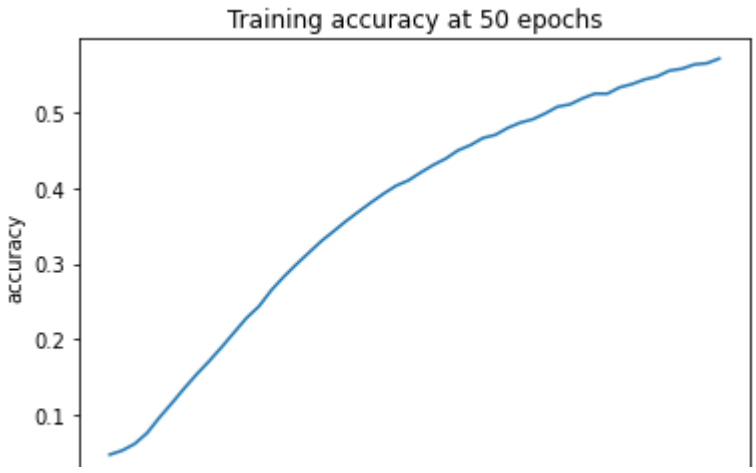


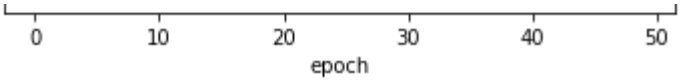



```
Epoch 26/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.9000 - accuracy: 0
Epoch 27/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.8461 - accuracy: 0
Epoch 28/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.7950 - accuracy: 0
Epoch 29/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.7273 - accuracy: 0
Epoch 30/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.6981 - accuracy: 0
Epoch 31/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.6467 - accuracy: 0
Epoch 32/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.6310 - accuracy: 0
Epoch 33/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.5775 - accuracy: 0
Epoch 34/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.5195 - accuracy: 0
Epoch 35/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.4911 - accuracy: 0
Epoch 36/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.4517 - accuracy: 0
Epoch 37/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.4224 - accuracy: 0
```

```
1257/1257 [==============================] - 26s 21ms/step - loss: 2.4224 - accuracy: 0
Epoch 38/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.3764 - accuracy: 0
Epoch 39/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.3396 - accuracy: 0
Epoch 40/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.3200 - accuracy: 0
Epoch 41/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.3092 - accuracy: 0
Epoch 42/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.2489 - accuracy: 0
Epoch 43/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.2325 - accuracy: 0
Epoch 44/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.1956 - accuracy: 0
Epoch 45/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.1778 - accuracy: 0
Epoch 46/100
1257/1257 [==============================] - 27s 21ms/step - loss: 2.1411 - accuracy: 0
Epoch 47/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.1340 - accuracy: 0
Epoch 48/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.1072 - accuracy: 0
Epoch 49/100
1257/1257 [==============================] - 27s 21ms/step - loss: 2.0896 - accuracy: 0
Epoch 50/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.0668 - accuracy: 0
Snapshot at epoch 50 (loss: 2.101902723312378):
```

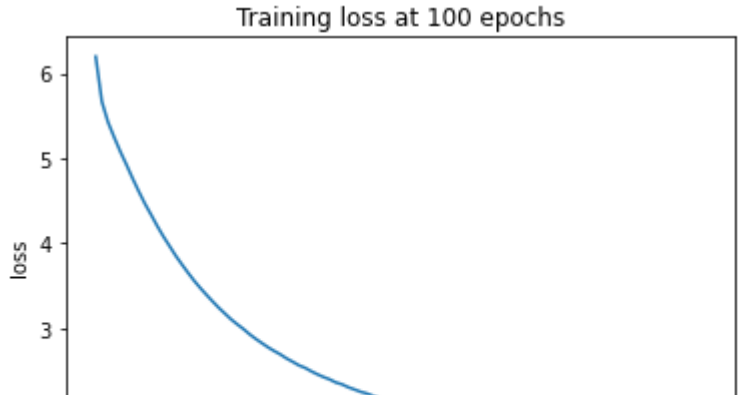


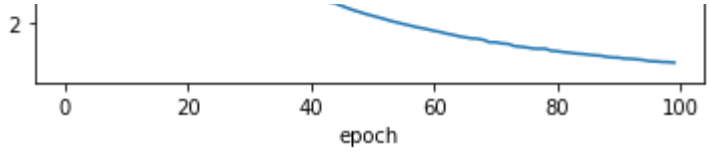


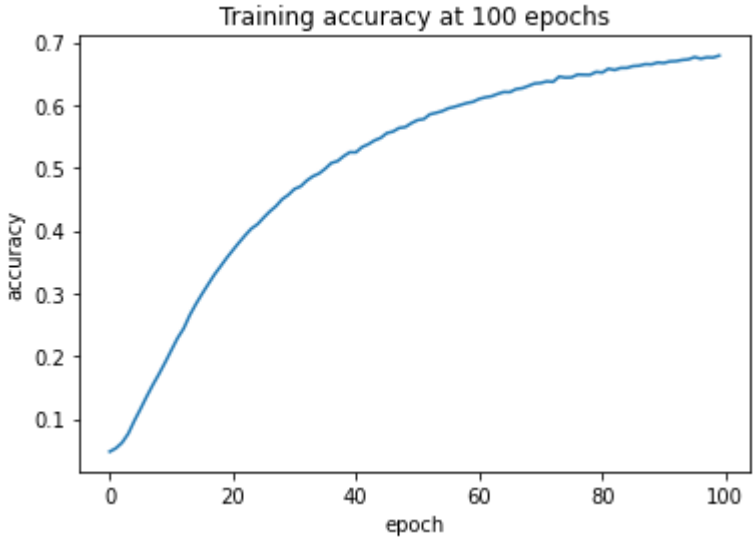



```
Epoch 51/100
1257/1257 [==============================] - 26s 21ms/step - loss: 2.0420 - accuracy: 0
Epoch 52/100
1257/1257 [==============================] - 27s 21ms/step - loss: 2.0341 - accuracy: 0
Epoch 53/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.9995 - accuracy: 0
Epoch 54/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.9949 - accuracy: 0
Epoch 55/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.9616 - accuracy: 0
Epoch 56/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.9337 - accuracy: 0
Epoch 57/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.9283 - accuracy: 0
Epoch 58/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.9017 - accuracy: 0
Epoch 59/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.9057 - accuracy: 0
Epoch 60/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.8756 - accuracy: 0
Epoch 61/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.8597 - accuracy: 0
Epoch 62/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.8572 - accuracy: 0
Epoch 63/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.8416 - accuracy: 0
Epoch 64/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.8389 - accuracy: 0
Epoch 65/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.7947 - accuracy: 0
Epoch 66/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.7990 - accuracy: 0
Epoch 67/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.7837 - accuracy: 0
Epoch 68/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.7801 - accuracy: 0
Epoch 69/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.7463 - accuracy: 0
Epoch 70/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.7271 - accuracy: 0
Epoch 71/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.7401 - accuracy: 0
Epoch 72/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.7053 - accuracy: 0
Epoch 73/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.7078 - accuracy: 0
Epoch 74/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6841 - accuracy: 0
Epoch 75/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.6855 - accuracy: 0
Epoch 76/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6665 - accuracy: 0
Epoch 77/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6593 - accuracy: 0
Epoch 78/100
```

```
1257/1257 [==============================] - 27s 21ms/step - loss: 1.6727 - accuracy: 0
Epoch 79/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.6522 - accuracy: 0
Epoch 80/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6458 - accuracy: 0
Epoch 81/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6233 - accuracy: 0
Epoch 82/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.6157 - accuracy: 0
Epoch 83/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6237 - accuracy: 0
Epoch 84/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.6122 - accuracy: 0
Epoch 85/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.5943 - accuracy: 0
Epoch 86/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5946 - accuracy: 0
Epoch 87/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5908 - accuracy: 0
Epoch 88/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.5836 - accuracy: 0
Epoch 89/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5595 - accuracy: 0
Epoch 90/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5589 - accuracy: 0
Epoch 91/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5508 - accuracy: 0
Epoch 92/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.5499 - accuracy: 0
Epoch 93/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5477 - accuracy: 0
Epoch 94/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5339 - accuracy: 0
Epoch 95/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.5286 - accuracy: 0
Epoch 96/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5220 - accuracy: 0
Epoch 97/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5241 - accuracy: 0
Epoch 98/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.5138 - accuracy: 0
Epoch 99/100
1257/1257 [==============================] - 27s 21ms/step - loss: 1.5058 - accuracy: 0
Epoch 100/100
1257/1257 [==============================] - 26s 21ms/step - loss: 1.5064 - accuracy: 0
Snapshot at epoch 100 (loss: 1.5310755968093872):
```

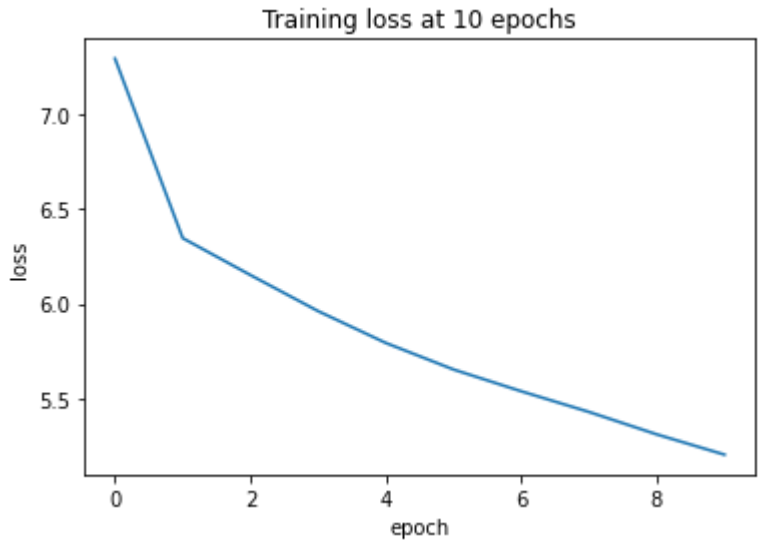


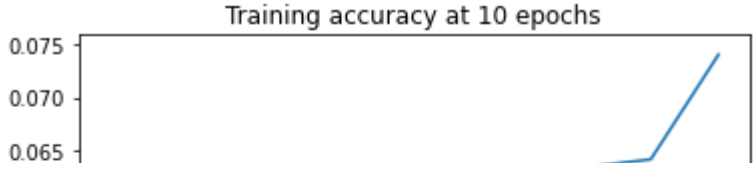


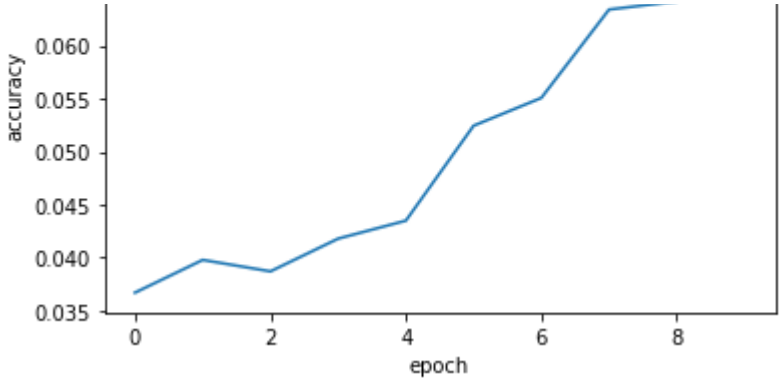



```
Minimum loss: 1.5310755968093872 (epoch 100)
WARNING:absl:Found untraced functions such as lstm_cell_15_layer_call_fn, lstm_cell_15_
WARNING:absl:Found untraced functions such as lstm_cell_15_layer_call_fn, lstm_cell_15_
INFO:tensorflow:Assets written to: saved_models/michael-jackson_lyrics/assets
INFO:tensorflow:Assets written to: saved_models/michael-jackson_lyrics/assets
Model saved to saved_models/michael-jackson_lyrics.
Here are your new MICHAEL-JACKSON lyrics.
*****

 i can't let her get away then
 they'll get to crippin’ its running
 in the early morn’ they say
 for you but i was the
 clown was dark and mj with
 the look that can't take her
 calling from the getto of the
 evening tops all the stars today
 you're my friends come on me
 stay so right whoa girl i
 can't take it much longer to
 me and when the birth winds
 blow on my heart is lonely
 stealin right before your apartment soul
 to kill too young to take
 off the mask so i can
 fly in your back
--------------------------------------


*** Training zappa ... ***
There are 7633 unique words in zappa.txt
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
embedding_4 (Embedding)      (None, 87, 100)           763300
```

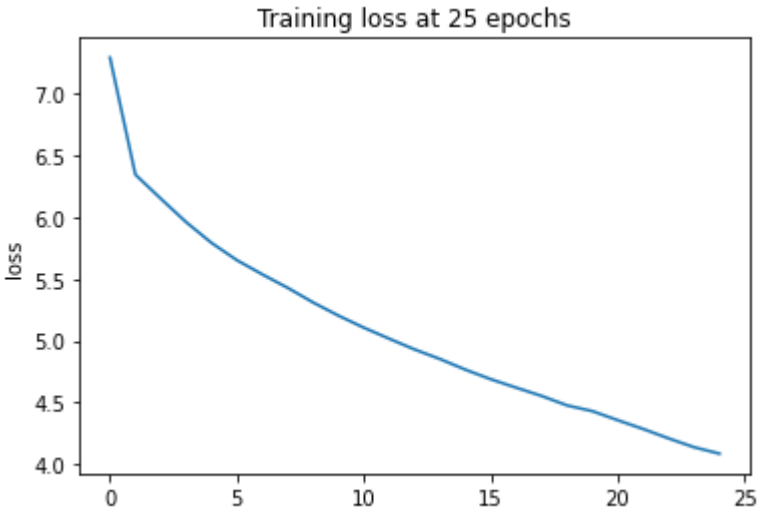
```
_________________________________________________________________
bidirectional_4 (Bidirection (None, 87, 300)           301200
_________________________________________________________________
dropout_4 (Dropout)          (None, 87, 300)           0
_________________________________________________________________
lstm_9 (LSTM)                (None, 100)               160400
_________________________________________________________________
dense_8 (Dense)              (None, 3816)              385416
_________________________________________________________________
dense_9 (Dense)              (None, 7633)              29135161
=================================================================
Total params: 30,745,477
Trainable params: 30,745,477
Non-trainable params: 0
_________________________________________________________________
None
Epoch 1/100
203/203 [==============================] - 11s 34ms/step - loss: 8.0321 - accuracy: 0.0
Epoch 2/100
203/203 [==============================] - 7s 35ms/step - loss: 6.3366 - accuracy: 0.04
Epoch 3/100
203/203 [==============================] - 7s 35ms/step - loss: 6.1445 - accuracy: 0.03
Epoch 4/100
203/203 [==============================] - 7s 35ms/step - loss: 5.9409 - accuracy: 0.04
Epoch 5/100
203/203 [==============================] - 7s 34ms/step - loss: 5.8079 - accuracy: 0.04
Epoch 6/100
203/203 [==============================] - 7s 35ms/step - loss: 5.6245 - accuracy: 0.04
Epoch 7/100
203/203 [==============================] - 7s 34ms/step - loss: 5.5375 - accuracy: 0.05
Epoch 8/100
203/203 [==============================] - 7s 34ms/step - loss: 5.3938 - accuracy: 0.06
Epoch 9/100
203/203 [==============================] - 7s 35ms/step - loss: 5.2860 - accuracy: 0.06
Epoch 10/100
203/203 [==============================] - 7s 34ms/step - loss: 5.1937 - accuracy: 0.06
Snapshot at epoch 10 (loss: 5.203057289123535):
```

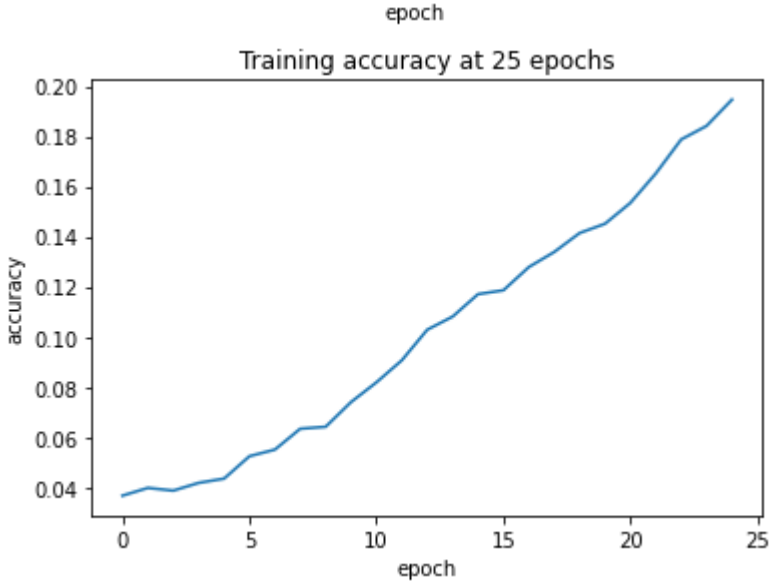






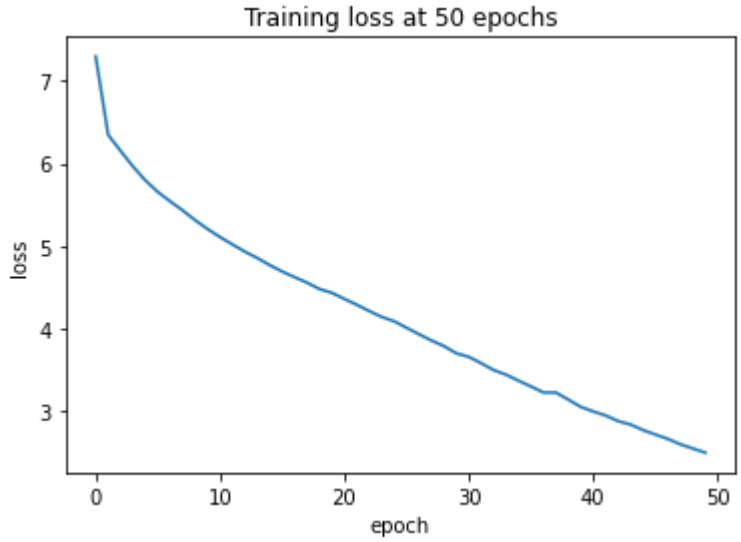

```
Epoch 11/100
203/203 [==============================] - 7s 35ms/step - loss: 5.0809 - accuracy: 0.07
Epoch 12/100
203/203 [==============================] - 7s 35ms/step - loss: 4.9801 - accuracy: 0.09
Epoch 13/100
203/203 [==============================] - 7s 35ms/step - loss: 4.8934 - accuracy: 0.10
Epoch 14/100
203/203 [==============================] - 7s 35ms/step - loss: 4.8030 - accuracy: 0.10
Epoch 15/100
203/203 [==============================] - 7s 35ms/step - loss: 4.7034 - accuracy: 0.12
Epoch 16/100
203/203 [==============================] - 7s 35ms/step - loss: 4.6342 - accuracy: 0.12
Epoch 17/100
203/203 [==============================] - 7s 34ms/step - loss: 4.5511 - accuracy: 0.12
Epoch 18/100
203/203 [==============================] - 7s 35ms/step - loss: 4.5087 - accuracy: 0.13
Epoch 19/100
203/203 [==============================] - 7s 35ms/step - loss: 4.4243 - accuracy: 0.14
Epoch 20/100
203/203 [==============================] - 7s 34ms/step - loss: 4.3499 - accuracy: 0.14
Epoch 21/100
203/203 [==============================] - 7s 35ms/step - loss: 4.2871 - accuracy: 0.15
Epoch 22/100
203/203 [==============================] - 7s 34ms/step - loss: 4.2210 - accuracy: 0.16
Epoch 23/100
203/203 [==============================] - 7s 34ms/step - loss: 4.1539 - accuracy: 0.17
Epoch 24/100
203/203 [==============================] - 7s 34ms/step - loss: 4.0848 - accuracy: 0.18
Epoch 25/100
203/203 [==============================] - 7s 35ms/step - loss: 4.0135 - accuracy: 0.19
Snapshot at epoch 25 (loss: 4.0845770835876465):
```

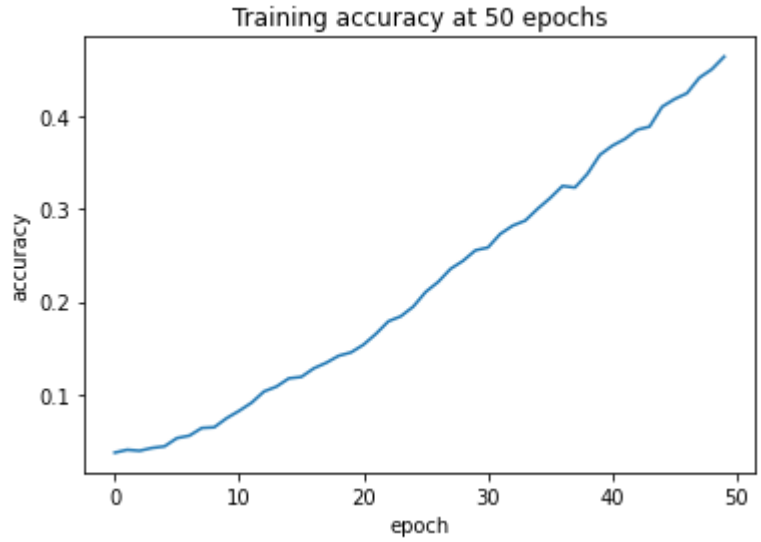





```
Epoch 26/100
203/203 [==============================] - 7s 35ms/step - loss: 3.9765 - accuracy: 0.20
Epoch 27/100
203/203 [==============================] - 7s 35ms/step - loss: 3.8759 - accuracy: 0.22
Epoch 28/100
203/203 [==============================] - 7s 35ms/step - loss: 3.7803 - accuracy: 0.24
Epoch 29/100
203/203 [==============================] - 7s 35ms/step - loss: 3.6937 - accuracy: 0.25
Epoch 30/100
203/203 [==============================] - 7s 35ms/step - loss: 3.6370 - accuracy: 0.26
Epoch 31/100
203/203 [==============================] - 7s 35ms/step - loss: 3.5837 - accuracy: 0.26
Epoch 32/100
203/203 [==============================] - 7s 35ms/step - loss: 3.4888 - accuracy: 0.28
Epoch 33/100
203/203 [==============================] - 7s 35ms/step - loss: 3.3850 - accuracy: 0.29
Epoch 34/100
203/203 [==============================] - 7s 35ms/step - loss: 3.3442 - accuracy: 0.30
Epoch 35/100
203/203 [==============================] - 7s 35ms/step - loss: 3.3231 - accuracy: 0.30
Epoch 36/100
203/203 [==============================] - 7s 35ms/step - loss: 3.1917 - accuracy: 0.31
Epoch 37/100
203/203 [==============================] - 7s 35ms/step - loss: 3.1781 - accuracy: 0.32
Epoch 38/100
203/203 [==============================] - 7s 35ms/step - loss: 3.1014 - accuracy: 0.34
Epoch 39/100
203/203 [==============================] - 7s 35ms/step - loss: 3.0906 - accuracy: 0.33
Epoch 40/100
203/203 [==============================] - 7s 35ms/step - loss: 2.9707 - accuracy: 0.37
Epoch 41/100
203/203 [==============================] - 7s 35ms/step - loss: 2.9126 - accuracy: 0.38
Epoch 42/100
203/203 [==============================] - 7s 35ms/step - loss: 2.8670 - accuracy: 0.38
Epoch 43/100
203/203 [==============================] - 7s 35ms/step - loss: 2.8348 - accuracy: 0.39
Epoch 44/100
203/203 [==============================] - 7s 35ms/step - loss: 2.8069 - accuracy: 0.39
Epoch 45/100
203/203 [==============================] - 7s 35ms/step - loss: 2.6716 - accuracy: 0.43
```

```
Epoch 46/100
203/203 [==============================] - 7s 35ms/step - loss: 2.6395 - accuracy: 0.43
Epoch 47/100
203/203 [==============================] - 7s 35ms/step - loss: 2.5883 - accuracy: 0.44
Epoch 48/100
203/203 [==============================] - 7s 35ms/step - loss: 2.5258 - accuracy: 0.46
Epoch 49/100
203/203 [==============================] - 7s 35ms/step - loss: 2.4692 - accuracy: 0.47
Epoch 50/100
203/203 [==============================] - 7s 35ms/step - loss: 2.4219 - accuracy: 0.49
Snapshot at epoch 50 (loss: 2.4915590286254883):
```

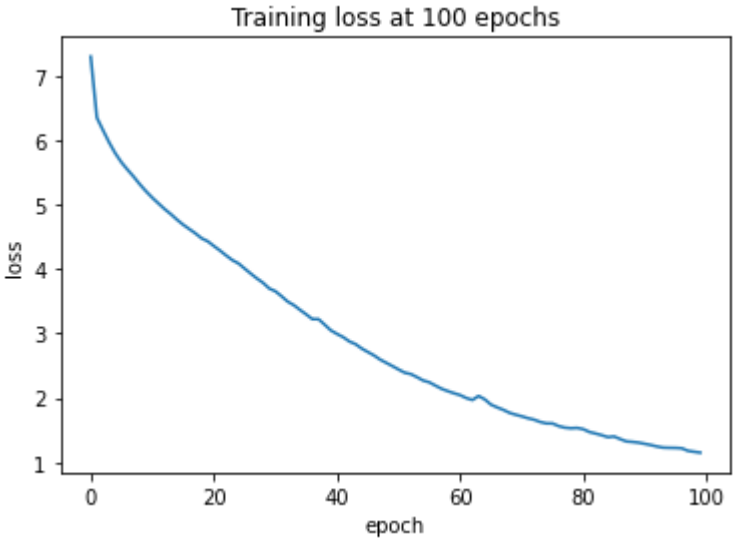


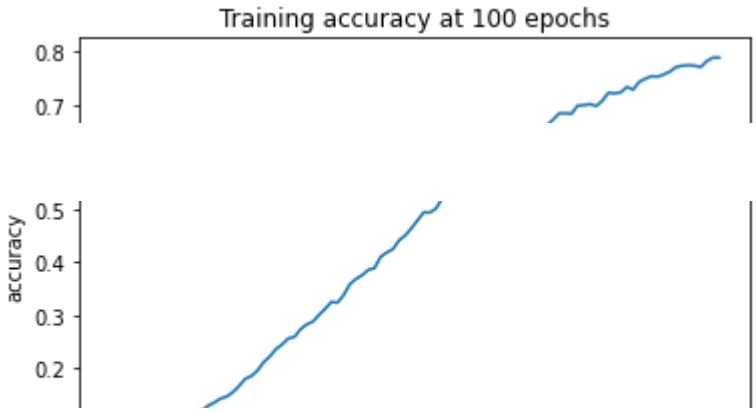


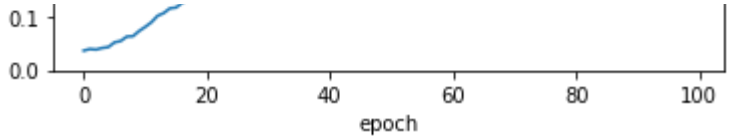

```
Epoch 51/100
203/203 [==============================] - 7s 35ms/step - loss: 2.3772 - accuracy: 0.49
Epoch 52/100
203/203 [==============================] - 7s 35ms/step - loss: 2.3168 - accuracy: 0.51
Epoch 53/100
203/203 [==============================] - 7s 35ms/step - loss: 2.3202 - accuracy: 0.51
Epoch 54/100
203/203 [==============================] - 7s 35ms/step - loss: 2.2915 - accuracy: 0.51
Epoch 55/100
203/203 [==============================] - 7s 35ms/step - loss: 2.1944 - accuracy: 0.55
Epoch 56/100
203/203 [==============================] - 7s 35ms/step - loss: 2.1467 - accuracy: 0.55
Epoch 57/100
203/203 [==============================] - 7s 35ms/step - loss: 2.1461 - accuracy: 0.54
```

```
Epoch 58/100
203/203 [==============================] - 7s 35ms/step - loss: 2.0622 - accuracy: 0.57
Epoch 59/100
203/203 [==============================] - 7s 35ms/step - loss: 2.0258 - accuracy: 0.59
Epoch 60/100
203/203 [==============================] - 7s 35ms/step - loss: 1.9952 - accuracy: 0.58
Epoch 61/100
203/203 [==============================] - 7s 35ms/step - loss: 1.9853 - accuracy: 0.59
Epoch 62/100
203/203 [==============================] - 7s 35ms/step - loss: 1.9841 - accuracy: 0.59
Epoch 63/100
203/203 [==============================] - 7s 35ms/step - loss: 1.8807 - accuracy: 0.61
Epoch 64/100
203/203 [==============================] - 7s 35ms/step - loss: 1.9210 - accuracy: 0.60
Epoch 65/100
203/203 [==============================] - 7s 35ms/step - loss: 1.8842 - accuracy: 0.62
Epoch 66/100
203/203 [==============================] - 7s 35ms/step - loss: 1.7924 - accuracy: 0.63
Epoch 67/100
203/203 [==============================] - 7s 35ms/step - loss: 1.7683 - accuracy: 0.64
Epoch 68/100
203/203 [==============================] - 7s 35ms/step - loss: 1.7711 - accuracy: 0.64
Epoch 69/100
203/203 [==============================] - 7s 35ms/step - loss: 1.6985 - accuracy: 0.65
Epoch 70/100
203/203 [==============================] - 7s 35ms/step - loss: 1.7039 - accuracy: 0.66
Epoch 71/100
203/203 [==============================] - 7s 35ms/step - loss: 1.6410 - accuracy: 0.67
Epoch 72/100
203/203 [==============================] - 7s 35ms/step - loss: 1.5937 - accuracy: 0.68
Epoch 73/100
203/203 [==============================] - 7s 35ms/step - loss: 1.6065 - accuracy: 0.68
Epoch 74/100
203/203 [==============================] - 7s 35ms/step - loss: 1.5576 - accuracy: 0.70
Epoch 75/100
203/203 [==============================] - 7s 35ms/step - loss: 1.5448 - accuracy: 0.69
Epoch 76/100
203/203 [==============================] - 7s 35ms/step - loss: 1.5453 - accuracy: 0.69
Epoch 77/100
203/203 [==============================] - 7s 35ms/step - loss: 1.4918 - accuracy: 0.72
Epoch 78/100
203/203 [==============================] - 7s 35ms/step - loss: 1.4667 - accuracy: 0.72
Epoch 79/100
203/203 [==============================] - 7s 35ms/step - loss: 1.4379 - accuracy: 0.73
Epoch 80/100
203/203 [==============================] - 7s 35ms/step - loss: 1.4362 - accuracy: 0.72
Epoch 81/100
203/203 [==============================] - 7s 35ms/step - loss: 1.4660 - accuracy: 0.71
Epoch 82/100
203/203 [==============================] - 7s 35ms/step - loss: 1.4205 - accuracy: 0.73
Epoch 83/100
203/203 [==============================] - 7s 35ms/step - loss: 1.3965 - accuracy: 0.74
Epoch 84/100
203/203 [==============================] - 7s 35ms/step - loss: 1.3601 - accuracy: 0.73
Epoch 85/100
203/203 [==============================] - 7s 35ms/step - loss: 1.3486 - accuracy: 0.74
Epoch 86/100
203/203 [==============================] - 7s 35ms/step - loss: 1.3545 - accuracy: 0.74
```

```
Epoch 87/100
203/203 [==============================] - 7s 35ms/step - loss: 1.3229 - accuracy: 0.75
Epoch 88/100
203/203 [==============================] - 7s 35ms/step - loss: 1.2758 - accuracy: 0.76
Epoch 89/100
203/203 [==============================] - 7s 35ms/step - loss: 1.2438 - accuracy: 0.77
Epoch 90/100
203/203 [==============================] - 7s 35ms/step - loss: 1.2870 - accuracy: 0.76
Epoch 91/100
203/203 [==============================] - 7s 35ms/step - loss: 1.2520 - accuracy: 0.76
Epoch 92/100
203/203 [==============================] - 7s 35ms/step - loss: 1.2140 - accuracy: 0.77
Epoch 93/100
203/203 [==============================] - 7s 35ms/step - loss: 1.2201 - accuracy: 0.77
Epoch 94/100
203/203 [==============================] - 7s 35ms/step - loss: 1.1770 - accuracy: 0.78
Epoch 95/100
203/203 [==============================] - 7s 35ms/step - loss: 1.1723 - accuracy: 0.79
Epoch 96/100
203/203 [==============================] - 7s 35ms/step - loss: 1.1938 - accuracy: 0.77
Epoch 97/100
203/203 [==============================] - 7s 35ms/step - loss: 1.1710 - accuracy: 0.78
Epoch 98/100
203/203 [==============================] - 7s 35ms/step - loss: 1.1131 - accuracy: 0.80
Epoch 99/100
203/203 [==============================] - 7s 35ms/step - loss: 1.0940 - accuracy: 0.80
Epoch 100/100
203/203 [==============================] - 7s 35ms/step - loss: 1.1134 - accuracy: 0.80
Snapshot at epoch 100 (loss: 1.1477164030075073):
```








```
Minimum loss: 1.1477164030075073 (epoch 100)
WARNING:absl:Found untraced functions such as lstm_cell_19_layer_call_fn, lstm_cell_19_
WARNING:absl:Found untraced functions such as lstm_cell_19_layer_call_fn, lstm_cell_19_
INFO:tensorflow:Assets written to: saved_models/zappa_lyrics/assets
INFO:tensorflow:Assets written to: saved_models/zappa_lyrics/assets
Model saved to saved_models/zappa_lyrics.
Here are your new ZAPPA lyrics.
*****
```

✓ 0s completed at 1:18 AM