

# lstm\_with\_unique\_5

December 12, 2018

```
In [1]: # LSTM WITH UNIQUE DATASET IMPLEMENTATION 5
        # Depression Analysis in Bangla
        # copyright (c) ABDUL HASIB UDDIN <abdulhasibuddin@gmail.com>
        # LICENSE: GNU General Public License v3.0
        # Courtesy: https://github.com/mchablani/deep-learning/blob/master/sentiment-rnn/Senti
```

```
In [0]: import numpy as np
        import tensorflow as tf
        from timeit import default_timer as timer
        from collections import Counter
        from string import punctuation
        from google.colab import files
```

```
In [0]: # Build the graph::
```

```
lstm_size = 1024
lstm_layers = 5
batch_size = 10
learning_rate = 0.0001
epochs = 5
```

```
In [4]: fileName = "lstm_with_unique_5"
        checkpointName = "checkpoints/"+fileName+".ckpt"
        print(checkpointName)
        print(type(checkpointName))
```

```
checkpoints/lstm_with_unique_5.ckpt
<class 'str'>
```

```
In [5]: files.upload()
        files.upload()

        with open('data_all_unique_dnd_stratified_text.txt', 'r', encoding="utf8") as f:
            tweets = f.read()
        with open('data_all_unique_dnd_stratified_labels.txt', 'r', encoding="utf8") as f:
            labels_org = f.read()
```

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

```
In [0]: # Data preprocessing::
        #all_text = ''.join([c for c in tweets if c not in punctuation])
        all_text = ''.join([c for c in tweets])
        tweets = all_text.split('\n')

        all_text = ' '.join(tweets)
        words = all_text.split()

In [0]: counts = Counter(words)
        vocab = sorted(counts, key=counts.get, reverse=True)
        vocab_to_int = {word: ii for ii, word in enumerate(vocab, 1)}

        tweets_ints = []
        for each in tweets:
            tweets_ints.append([vocab_to_int[word] for word in each.split()])

In [8]: # Encoding the labels::
        list_labels = []

        for l in labels_org.split():
            if l == "depressive":
                list_labels.append(1)
            else:
                list_labels.append(0)

        labels = np.array(list_labels)
        print(len(labels))
```

1176

```
In [9]: tweets_lens = Counter([len(x) for x in tweets_ints])
        print("Zero-length tweets: {}".format(tweets_lens[0]))
        print("Maximum tweets length: {}".format(max(tweets_lens)))
```

Zero-length tweets: 1

Maximum tweets length: 63

```
In [0]: # Filter out that tweets with 0 length
        tweets_ints = [r[0:200] for r in tweets_ints if len(r) > 0]
```

```
In [11]: from collections import Counter
        tweets_lens = Counter([len(x) for x in tweets_ints])
        print("Zero-length tweets: {}".format(tweets_lens[0]))
        print("Maximum tweet length: {}".format(max(tweets_lens)))
```

Zero-length tweets: 0  
Maximum tweet length: 63

```
In [0]: seq_len = 200
        features = np.zeros((len(tweets_ints), seq_len), dtype=int)
        # print(features[:10,:100])
        for i, row in enumerate(tweets_ints):
            features[i, -len(row):] = np.array(row)[:seq_len]
        #features[:10,:100]
```

```
In [13]: split_frac = 0.8
```

```
split_index = int(split_frac * len(features))

train_x, val_x = features[:split_index], features[split_index:]
train_y, val_y = labels[:split_index], labels[split_index:]

split_frac = 0.5
split_index = int(split_frac * len(val_x))

val_x, test_x = val_x[:split_index], val_x[split_index:]
val_y, test_y = val_y[:split_index], val_y[split_index:]

print("\t\t\tFeature Shapes:")
print("Train set: \t\t{}".format(train_x.shape),
      "\nValidation set: \t{}".format(val_x.shape),
      "\nTest set: \t\t{}".format(test_x.shape))
print("label set: \t\t{}".format(train_y.shape),
      "\nValidation label set: \t{}".format(val_y.shape),
      "\nTest label set: \t\t{}".format(test_y.shape))
```

```

                        Feature Shapes:
Train set:              (940, 200)
Validation set:         (118, 200)
Test set:               (118, 200)
label set:              (940,)
Validation label set:   (118,)
Test label set:        (118,)
```

```
In [0]: n_words = len(vocab_to_int) + 1 # Add 1 for 0 added to vocab
```

```
# Create the graph object
tf.reset_default_graph()
with tf.name_scope('inputs'):
    inputs_ = tf.placeholder(tf.int32, [None, None], name="inputs")
    labels_ = tf.placeholder(tf.int32, [None, None], name="labels")
    keep_prob = tf.placeholder(tf.float32, name="keep_prob")
```

```
In [0]: # Size of the embedding vectors (number of units in the embedding layer)
        embed_size = 300
```

```
        with tf.name_scope("Embeddings"):
            embedding = tf.Variable(tf.random_uniform((n_words, embed_size), -1, 1))
            embed = tf.nn.embedding_lookup(embedding, inputs_)
```

```
In [16]: def lstm_cell():
```

```
    # Your basic LSTM cell
```

```
    lstm = tf.contrib.rnn.BasicLSTMCell(lstm_size, reuse=tf.get_variable_scope().reuse)
```

```
    # Add dropout to the cell
```

```
    return tf.contrib.rnn.DropoutWrapper(lstm, output_keep_prob=keep_prob)
```

```
        with tf.name_scope("RNN_layers"):
```

```
            # Stack up multiple LSTM layers, for deep learning
```

```
            cell = tf.contrib.rnn.MultiRNNCell([lstm_cell() for _ in range(lstm_layers)])
```

```
            # Getting an initial state of all zeros
```

```
            initial_state = cell.zero_state(batch_size, tf.float32)
```

WARNING:tensorflow:From <ipython-input-16-678741cf60df>:3: BasicLSTMCell.\_\_init\_\_ (from tensorflow.nn.rnn\_cell) is deprecated and will be removed in a future version. Instructions for updating:

This class is deprecated, please use tf.nn.rnn\_cell.LSTMCell, which supports all the feature t

```
In [0]: with tf.name_scope("RNN_forward"):
```

```
    outputs, final_state = tf.nn.dynamic_rnn(cell, embed, initial_state=initial_state)
```

```
In [0]: # Output::
```

```
        with tf.name_scope('predictions'):
```

```
            predictions = tf.contrib.layers.fully_connected(outputs[:, -1], 1, activation_fn=t
```

```
            tf.summary.histogram('predictions', predictions)
```

```
        with tf.name_scope('cost'):
```

```
            cost = tf.losses.mean_squared_error(labels_, predictions)
```

```
            tf.summary.scalar('cost', cost)
```

```
        with tf.name_scope('train'):
```

```
            optimizer = tf.train.AdamOptimizer(learning_rate).minimize(cost)
```

```
        merged = tf.summary.merge_all()
```

```
In [0]: # Validation accuracy::
```

```
        with tf.name_scope('validation'):
```

```
            correct_pred = tf.equal(tf.cast(tf.round(predictions), tf.int32), labels_)
```

```
            accuracy = tf.reduce_mean(tf.cast(correct_pred, tf.float32))
```

```
In [0]: # Batching::
```

```
def get_batches(x, y, batch_size=100):
```

```
    n_batches = len(x)//batch_size
    x, y = x[:n_batches*batch_size], y[:n_batches*batch_size]
    for ii in range(0, len(x), batch_size):
        yield x[ii:ii+batch_size], y[ii:ii+batch_size]
```

```
In [21]: # Training::
```

```
    #epochs = 5
```

```
    saver = tf.train.Saver()
```

```
    start = timer()
```

```
    with tf.Session() as sess:
```

```
        sess.run(tf.global_variables_initializer())
```

```
        train_writer = tf.summary.FileWriter('./logs/tb/train', sess.graph)
```

```
        test_writer = tf.summary.FileWriter('./logs/tb/test', sess.graph)
```

```
        iteration = 1
```

```
        for e in range(1, epochs+1):
```

```
            state = sess.run(initial_state)
```

```
            for ii, (x, y) in enumerate(get_batches(train_x, train_y, batch_size), 1):
```

```
                feed = {inputs_: x,
                        labels_: y[:, None],
                        keep_prob: 1,
                        initial_state: state}
```

```
                summary, loss, state, _ = sess.run([merged, cost, final_state, optimizer]
```

```
#                loss, state, _ = sess.run([cost, final_state, optimizer], feed_dict=feed)
```

```
                train_writer.add_summary(summary, iteration)
```

```
            if iteration%5==0:
```

```
                print("Epoch: {}/{}".format(e, epochs),
                      "Iteration: {}".format(iteration),
                      "Train loss: {:.3f}".format(loss))
```

```
            if iteration%25==0:
```

```
                val_acc = []
```

```
                val_state = sess.run(cell.zero_state(batch_size, tf.float32))
```

```
                for x, y in get_batches(val_x, val_y, batch_size):
```

```
                    feed = {inputs_: x,
                            labels_: y[:, None],
                            keep_prob: 1,
                            initial_state: val_state}
```

```
#                    batch_acc, val_state = sess.run([accuracy, final_state], feed_dict=feed)
```

```
                    summary, batch_acc, val_state = sess.run([merged, accuracy, final_state], feed_dict=feed)
```

```
                    val_acc.append(batch_acc)
```

```
                print("Val acc: {:.3f}".format(np.mean(val_acc)))
```

```

        iteration +=1
        test_writer.add_summary(summary, iteration)
        saver.save(sess, checkpointName)
#         tensorboard = TensorBoard(log_dir="logs/tweet_5000_all_sentiments_six_cl
        saver.save(sess, checkpointName)

    duration = timer() - start
    print('Time elapsed =',duration,'sec(s)')

```

```

Epoch: 1/5 Iteration: 5 Train loss: 0.244
Epoch: 1/5 Iteration: 10 Train loss: 0.260
Epoch: 1/5 Iteration: 15 Train loss: 0.248
Epoch: 1/5 Iteration: 20 Train loss: 0.248
Epoch: 1/5 Iteration: 25 Train loss: 0.218
Val acc: 0.291
Epoch: 1/5 Iteration: 30 Train loss: 0.253
Epoch: 1/5 Iteration: 35 Train loss: 0.235
Epoch: 1/5 Iteration: 40 Train loss: 0.252
Epoch: 1/5 Iteration: 45 Train loss: 0.220
Epoch: 1/5 Iteration: 50 Train loss: 0.236
Val acc: 0.382
Epoch: 1/5 Iteration: 55 Train loss: 0.271
Epoch: 1/5 Iteration: 60 Train loss: 0.227
Epoch: 1/5 Iteration: 65 Train loss: 0.255
Epoch: 1/5 Iteration: 70 Train loss: 0.262
Epoch: 1/5 Iteration: 75 Train loss: 0.245
Val acc: 0.473
Epoch: 1/5 Iteration: 80 Train loss: 0.263
Epoch: 1/5 Iteration: 85 Train loss: 0.201
Epoch: 1/5 Iteration: 90 Train loss: 0.264
Epoch: 2/5 Iteration: 95 Train loss: 0.264
Epoch: 2/5 Iteration: 100 Train loss: 0.273
Val acc: 0.500
Epoch: 2/5 Iteration: 105 Train loss: 0.260
Epoch: 2/5 Iteration: 110 Train loss: 0.245
Epoch: 2/5 Iteration: 115 Train loss: 0.234
Epoch: 2/5 Iteration: 120 Train loss: 0.259
Epoch: 2/5 Iteration: 125 Train loss: 0.212
Val acc: 0.382
Epoch: 2/5 Iteration: 130 Train loss: 0.237
Epoch: 2/5 Iteration: 135 Train loss: 0.238
Epoch: 2/5 Iteration: 140 Train loss: 0.254
Epoch: 2/5 Iteration: 145 Train loss: 0.152
Epoch: 2/5 Iteration: 150 Train loss: 0.163
Val acc: 0.355
Epoch: 2/5 Iteration: 155 Train loss: 0.185
Epoch: 2/5 Iteration: 160 Train loss: 0.222
Epoch: 2/5 Iteration: 165 Train loss: 0.192

```

Epoch: 2/5 Iteration: 170 Train loss: 0.275  
Epoch: 2/5 Iteration: 175 Train loss: 0.205  
Val acc: 0.618  
Epoch: 2/5 Iteration: 180 Train loss: 0.108  
Epoch: 2/5 Iteration: 185 Train loss: 0.224  
Epoch: 3/5 Iteration: 190 Train loss: 0.311  
Epoch: 3/5 Iteration: 195 Train loss: 0.266  
Epoch: 3/5 Iteration: 200 Train loss: 0.253  
Val acc: 0.445  
Epoch: 3/5 Iteration: 205 Train loss: 0.238  
Epoch: 3/5 Iteration: 210 Train loss: 0.244  
Epoch: 3/5 Iteration: 215 Train loss: 0.243  
Epoch: 3/5 Iteration: 220 Train loss: 0.234  
Epoch: 3/5 Iteration: 225 Train loss: 0.231  
Val acc: 0.482  
Epoch: 3/5 Iteration: 230 Train loss: 0.199  
Epoch: 3/5 Iteration: 235 Train loss: 0.184  
Epoch: 3/5 Iteration: 240 Train loss: 0.086  
Epoch: 3/5 Iteration: 245 Train loss: 0.429  
Epoch: 3/5 Iteration: 250 Train loss: 0.115  
Val acc: 0.318  
Epoch: 3/5 Iteration: 255 Train loss: 0.167  
Epoch: 3/5 Iteration: 260 Train loss: 0.169  
Epoch: 3/5 Iteration: 265 Train loss: 0.241  
Epoch: 3/5 Iteration: 270 Train loss: 0.064  
Epoch: 3/5 Iteration: 275 Train loss: 0.188  
Val acc: 0.682  
Epoch: 3/5 Iteration: 280 Train loss: 0.149  
Epoch: 4/5 Iteration: 285 Train loss: 0.209  
Epoch: 4/5 Iteration: 290 Train loss: 0.286  
Epoch: 4/5 Iteration: 295 Train loss: 0.275  
Epoch: 4/5 Iteration: 300 Train loss: 0.216  
Val acc: 0.445  
Epoch: 4/5 Iteration: 305 Train loss: 0.269  
Epoch: 4/5 Iteration: 310 Train loss: 0.163  
Epoch: 4/5 Iteration: 315 Train loss: 0.187  
Epoch: 4/5 Iteration: 320 Train loss: 0.173  
Epoch: 4/5 Iteration: 325 Train loss: 0.084  
Val acc: 0.391  
Epoch: 4/5 Iteration: 330 Train loss: 0.119  
Epoch: 4/5 Iteration: 335 Train loss: 0.071  
Epoch: 4/5 Iteration: 340 Train loss: 0.080  
Epoch: 4/5 Iteration: 345 Train loss: 0.118  
Epoch: 4/5 Iteration: 350 Train loss: 0.125  
Val acc: 0.436  
Epoch: 4/5 Iteration: 355 Train loss: 0.133  
Epoch: 4/5 Iteration: 360 Train loss: 0.237  
Epoch: 4/5 Iteration: 365 Train loss: 0.222

```

Epoch: 4/5 Iteration: 370 Train loss: 0.255
Epoch: 4/5 Iteration: 375 Train loss: 0.181
Val acc: 0.600
Epoch: 5/5 Iteration: 380 Train loss: 0.206
Epoch: 5/5 Iteration: 385 Train loss: 0.237
Epoch: 5/5 Iteration: 390 Train loss: 0.296
Epoch: 5/5 Iteration: 395 Train loss: 0.194
Epoch: 5/5 Iteration: 400 Train loss: 0.256
Val acc: 0.400
Epoch: 5/5 Iteration: 405 Train loss: 0.186
Epoch: 5/5 Iteration: 410 Train loss: 0.141
Epoch: 5/5 Iteration: 415 Train loss: 0.053
Epoch: 5/5 Iteration: 420 Train loss: 0.062
Epoch: 5/5 Iteration: 425 Train loss: 0.123
Val acc: 0.391
Epoch: 5/5 Iteration: 430 Train loss: 0.168
Epoch: 5/5 Iteration: 435 Train loss: 0.176
Epoch: 5/5 Iteration: 440 Train loss: 0.073
Epoch: 5/5 Iteration: 445 Train loss: 0.190
Epoch: 5/5 Iteration: 450 Train loss: 0.195
Val acc: 0.400
Epoch: 5/5 Iteration: 455 Train loss: 0.120
Epoch: 5/5 Iteration: 460 Train loss: 0.174
Epoch: 5/5 Iteration: 465 Train loss: 0.121
Epoch: 5/5 Iteration: 470 Train loss: 0.220
Time elapsed = 5354.586688152 sec(s)

```

In [22]: # *Testing::*

```

test_acc = []
with tf.Session() as sess:
    saver.restore(sess, checkpointName)
    test_state = sess.run(cell.zero_state(batch_size, tf.float32))
    for ii, (x, y) in enumerate(get_batches(test_x, test_y, batch_size), 1):
        feed = {inputs_: x,
                labels_: y[:, None],
                keep_prob: 1,
                initial_state: test_state}
        batch_acc, test_state = sess.run([accuracy, final_state], feed_dict=feed)
        test_acc.append(batch_acc)
    print("Test accuracy: {:.3f}".format(np.mean(test_acc)))

```

```

INFO:tensorflow:Restoring parameters from checkpoints/lstm_with_unique_5.ckpt
Test accuracy: 0.709

```

In [0]: