In [1]:

```
!pip install transformers
```

```
Collecting transformers
  Downloading https://files.pythonhosted.org/packages/19/22/aff234f4a841f899
9e68a7a94bdd4b60b4cebcfeca5d67d61cd08c9179de/transformers-3.3.1-py3-none-an
y.whl (https://files.pythonhosted.org/packages/19/22/aff234f4a841f8999e68a7a
94bdd4b60b4cebcfeca5d67d61cd08c9179de/transformers-3.3.1-py3-none-any.whl)
 (1.1MB)
     |████████████████████████████████| 1.1MB 2.7MB/s
Collecting sacremoses
  Downloading https://files.pythonhosted.org/packages/7d/34/09d19aff26edcc8e
b2a01bed8e98f13a1537005d31e95233fd48216eed10/sacremoses-0.0.43.tar.gz (http
s://files.pythonhosted.org/packages/7d/34/09d19aff26edcc8eb2a01bed8e98f13a15
37005d31e95233fd48216eed10/sacremoses-0.0.43.tar.gz) (883kB)
     |████████████████████████████████| 890kB 10.2MB/s
Requirement already satisfied: filelock in /usr/local/lib/python3.6/dist-pac
kages (from transformers) (3.0.12)
Requirement already satisfied: dataclasses; python_version < "3.7" in /usr/l
ocal/lib/python3.6/dist-packages (from transformers) (0.7)
Requirement already satisfied: numpy in /usr/local/lib/python3.6/dist-packag
es (from transformers) (1.18.5)
Collecting tokenizers==0.8.1.rc2
  Downloading https://files.pythonhosted.org/packages/80/83/8b9fccb9e48eeb57
5ee19179e2bdde0ee9a1904f97de5f02d19016b8804f/tokenizers-0.8.1rc2-cp36-cp36m-
manylinux1_x86_64.whl (https://files.pythonhosted.org/packages/80/83/8b9fccb
9e48eeb575ee19179e2bdde0ee9a1904f97de5f02d19016b8804f/tokenizers-0.8.1rc2-cp
36-cp36m-manylinux1_x86_64.whl) (3.0MB)
     |████████████████████████████████| 3.0MB 21.8MB/s
Requirement already satisfied: tqdm>=4.27 in /usr/local/lib/python3.6/dist-p
ackages (from transformers) (4.41.1)
Requirement already satisfied: packaging in /usr/local/lib/python3.6/dist-pa
ckages (from transformers) (20.4)
Requirement already satisfied: requests in /usr/local/lib/python3.6/dist-pac
kages (from transformers) (2.23.0)
Requirement already satisfied: regex!=2019.12.17 in /usr/local/lib/python3.
6/dist-packages (from transformers) (2019.12.20)
Collecting sentencepiece!=0.1.92
  Downloading https://files.pythonhosted.org/packages/d4/a4/d0a884c4300004a7
8cca907a6ff9a5e9fe4f090f5d95ab341c53d28cbc58/sentencepiece-0.1.91-cp36-cp36m
-manylinux1_x86_64.whl (https://files.pythonhosted.org/packages/d4/a4/d0a884
c4300004a78cca907a6ff9a5e9fe4f090f5d95ab341c53d28cbc58/sentencepiece-0.1.91-
cp36-cp36m-manylinux1_x86_64.whl) (1.1MB)
     |████████████████████████████████| 1.1MB 32.6MB/s
Requirement already satisfied: six in /usr/local/lib/python3.6/dist-packages
(from sacremoses->transformers) (1.15.0)
Requirement already satisfied: click in /usr/local/lib/python3.6/dist-packag
es (from sacremoses->transformers) (7.1.2)
Requirement already satisfied: joblib in /usr/local/lib/python3.6/dist-packa
ges (from sacremoses->transformers) (0.16.0)
Requirement already satisfied: pyparsing>=2.0.2 in /usr/local/lib/python3.6/
dist-packages (from packaging->transformers) (2.4.7)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.
6/dist-packages (from requests->transformers) (2020.6.20)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.
6/dist-packages (from requests->transformers) (3.0.4)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /u
sr/local/lib/python3.6/dist-packages (from requests->transformers) (1.24.3)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.6/dist
-packages (from requests->transformers) (2.10)
```

```
Building wheels for collected packages: sacremoses
  Building wheel for sacremoses (setup.py) ... done
  Created wheel for sacremoses: filename=sacremoses-0.0.43-cp36-none-any.whl
size=893257 sha256=1c0f23baa2839e8fa0a50fc6c7fcaabb2c1f3eab45ffdebfac4ec3ecc
d974ba3
  Stored in directory: /root/.cache/pip/wheels/29/3c/fd/7ce5c3f0666dab31a501
23635e6fb5e19ceb42ce38d4e58f45
Successfully built sacremoses
Installing collected packages: sacremoses, tokenizers, sentencepiece, transf
ormers
Successfully installed sacremoses-0.0.43 sentencepiece-0.1.91 tokenizers-0.
8.1rc2 transformers-3.3.1
```

In [1]:

```

```

In [2]:

```
from transformers import DistilBertTokenizer,DistilBertConfig, RobertaConfig, RobertaTokeni
#from transformers import *
import tensorflow as tf
import pandas as pd
import numpy as np
from tqdm import tqdm
import math
from sklearn.model_selection import train_test_split
import tensorflow.keras.backend as K
from sklearn.model_selection import StratifiedKFold
from transformers import *
import tokenizers
from keras import regularizers
from keras.layers import Dense, Input , Dropout
from keras.layers import Flatten
from keras.layers import concatenate
from keras.layers.embeddings import Embedding
from keras.models import Model
from keras.layers import LSTM, Dense, Dropout, Masking, Embedding, TimeDistributed,Bidirect
from keras.preprocessing.sequence import pad_sequences

print('TF version',tf.__version__)
```

```
TF version 2.3.0
```

In [3]:

```
tokenizer = RobertaTokenizer.from_pretrained("roberta-base")
```

```
HBox(children=(FloatProgress(value=0.0, description='Downloading', max=89882
3.0, style=ProgressStyle(descripti…


HBox(children=(FloatProgress(value=0.0, description='Downloading', max=45631
8.0, style=ProgressStyle(descripti…
```

In [4]:

```
train_data=pd.read_csv('train_twitter.csv').fillna('')
train_data.head(3)
```

Out[4]:

	textID	text	selected_text	sentiment
0	cb774db0d1	I`d have responded, if I were going	I`d have responded, if I were going	neutral
1	549e992a42	Sooo SAD I will miss you here in San Diego!!!	Sooo SAD	negative
2	088c60f138	my boss is bullying me...	bullying me	negative

In [5]:

```
# We are trying to remove whitespace because it may produce different encodings for same wo
def spaces_text(df):
  sent=df['text'].strip()
  return sent

def spaces_st(df):
  sent1=df['selected_text'].strip()
  return sent1
```

In [6]:

```
train_data['text']=train_data.apply(spaces_text,axis=1)
train_data['selected_text']=train_data.apply(spaces_st,axis=1)
```

In [7]:

```
from sklearn.model_selection import train_test_split
train,test=train_test_split(train_data,test_size=0.2,stratify=train_data['sentiment'])
print(train.shape)
print(test.shape)
```

```
(21984, 4)
(5497, 4)
```

In [8]:

```
train_copy=train.copy()
train_copy=train_copy.reset_index(drop=True)
train_copy.head(2)
```

Out[8]:

	textID	text	selected_text	sentiment
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral

In [9]:

```
test_copy=test.copy()
test_copy=test_copy.reset_index(drop=True)
test_copy.head(2)
```

Out[9]:

	textID	text	selected_text	sentiment
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative
1	ee5b92dd36	TWEEEEEET! good morning twitterland! going to ...	good mo	positive

In [10]:

```
def token(text,tokenizer):
  inputs=[]
  masks=[]

  for i in range(text.shape[0]):
    tok=tokenizer(text[i])
    inputs.append(tok['input_ids'])
    masks.append(tok['attention_mask'])

  return np.array(inputs),np.array(masks)
```

In [11]:

```
tr_feat=token(train_copy.text,tokenizer)
```

In [12]:

```
ts_feat=token(test_copy.text,tokenizer)
inputs_ts=ts_feat[0]
masks_ts=ts_feat[1]
```

In [13]:

```
inputs_ts
```

Out[13]:

```
array([list([0, 1215, 417, 38, 64, 12905, 90, 1217, 932, 6, 14651, 4, 1491,
129, 524, 38, 4968, 6, 38, 64, 12905, 90, 190, 1166, 5, 31095, 317, 4, 2]),
       list([0, 29334, 9993, 47146, 3935, 328, 205, 662, 7409, 1245, 328, 16
4, 7, 173, 23, 112, 98, 240, 7, 489, 16404, 8, 8143, 42, 3269, 328, 517, 66,
11, 326, 10877, 65, 183, 2]),
       list([0, 1638, 857, 939, 240, 7, 465, 277, 169, 172, 29784, 329, 2]),
       ...,
       list([0, 18, 658, 338, 1720, 108, 3795, 19, 10, 8492, 8, 10, 1455, 6,
142, 24, 12905, 29, 985, 12905, 29, 183, 328, 1437, 4252, 56, 2162, 7716, 4,
4832, 8061, 2]),
       list([0, 2362, 6, 21958, 6, 51, 222, 45, 328, 939, 21, 22431, 77, 93
9, 13356, 62, 42, 662, 4, 2]),
       list([0, 734, 8, 24, 29667, 4056, 9470, 14989, 29, 274, 5944, 1009, 3
4727, 30986, 3226, 53, 38, 29667, 4056, 9470, 14989, 119, 98, 3610, 23, 173,
452, 38, 351, 29667, 4056, 9470, 14989, 90, 120, 932, 626, 2])],
      dtype=object)
```

In [14]:

```
inputs=tr_feat[0]
masks=tr_feat[1]
inputs
```

Out[14]:

```
array([list([0, 7333, 18698, 127, 865, 15, 5, 35572, 6, 24, 15774, 2]),
       list([0, 100, 12905, 119, 164, 7, 860, 359, 120, 103, 3581, 4, 38, 30
0, 173, 2260, 70, 183, 359, 38, 12905, 119, 1058, 13, 22428, 67, 4, 272, 511
2, 4783, 33175, 11398, 8956, 15, 9124, 4, 226, 1916, 139, 4, 14159, 50, 486,
2]),
       list([0, 100, 794, 110, 3545, 10, 891, 9, 688, 536, 14, 56, 14, 1549
3, 6, 98, 770, 7, 5042, 187, 38, 524, 10, 1307, 8703, 2378, 2]),
       ...,
       list([0, 10926, 419, 98, 15158, 8, 19957, 196, 5, 512, 4, 38, 12905,
119, 686, 5, 10689, 206, 38, 12905, 119, 7758, 6, 38, 10397, 24, 823, 358, 1
86, 4, 2]),
       list([0, 771, 32708, 31, 2941, 4932, 13848, 7, 20804, 21457, 1437, 14
37, 2054, 640, 17137, 405, 19017, 4, 175, 73, 306, 267, 506, 306, 330, 2]),
       list([0, 21136, 35666, 1053, 7, 70, 35666, 358, 147, 2])],
      dtype=object)
```

In [15]:

```
tr_feat[0].shape
```

Out[15]:

```
(21984,)
```

In [16]:

```
tr_feat[0]
```

Out[16]:

```
array([list([0, 7333, 18698, 127, 865, 15, 5, 35572, 6, 24, 15774, 2]),
       list([0, 100, 12905, 119, 164, 7, 860, 359, 120, 103, 3581, 4, 38, 30
0, 173, 2260, 70, 183, 359, 38, 12905, 119, 1058, 13, 22428, 67, 4, 272, 511
2, 4783, 33175, 11398, 8956, 15, 9124, 4, 226, 1916, 139, 4, 14159, 50, 486,
2]),
       list([0, 100, 794, 110, 3545, 10, 891, 9, 688, 536, 14, 56, 14, 1549
3, 6, 98, 770, 7, 5042, 187, 38, 524, 10, 1307, 8703, 2378, 2]),
       ...,
       list([0, 10926, 419, 98, 15158, 8, 19957, 196, 5, 512, 4, 38, 12905,
119, 686, 5, 10689, 206, 38, 12905, 119, 7758, 6, 38, 10397, 24, 823, 358, 1
86, 4, 2]),
       list([0, 771, 32708, 31, 2941, 4932, 13848, 7, 20804, 21457, 1437, 14
37, 2054, 640, 17137, 405, 19017, 4, 175, 73, 306, 267, 506, 306, 330, 2]),
       list([0, 21136, 35666, 1053, 7, 70, 35666, 358, 147, 2])],
      dtype=object)
```

In [18]:

```
print(tokenizer.decode(2))
tokenizer.decode(0)
```

```
</s>
```

Out[18]:

```
'<s>'
```

In [19]:

```
print(tokenizer.encode(' positive'))
print(tokenizer.encode(' negative'))
print(tokenizer.encode(' neutral'))
```

```
[0, 1313, 2]
[0, 2430, 2]
[0, 7974, 2]
```

Ids for sentiments

Positive ----> 1313

Negative ----> 2430

Neutral ----> 7974

RoBERTa doesn’t have token_type_ids, you don’t need to indicate which token belongs to which segment. Just separate your segments with the separation token tokenizer.sep_token

In [20]:

```
# Adding these ids to the input_ids
sentiment_id = {'positive': 1313, 'negative': 2430, 'neutral': 7974}
```

In [21]:

```
type(sentiment_id['positive'])
```

Out[21]:

```
int
```

In [22]:

```
'''
for i in range(train_copy.shape[0]):
  masks[i]=masks[i] + [1]*3
  inputs[i]=inputs[i]+[2]+[sentiment_id[train_copy['sentiment'][i]]]+[2]
'''
```

Out[22]:

```
"\nfor i in range(train_copy.shape[0]):\n  masks[i]=masks[i] + [1]*3\n  inpu
ts[i]=inputs[i]+[2]+[sentiment_id[train_copy['sentiment'][i]]]+[2]\n"
```

In [23]:

```
len(inputs[3])
```

Out[23]:

```
19
```

In [24]:

```
len(masks[3])
```

Out[24]:

```
19
```

In [25]:

```
'''
for i in range(test_copy.shape[0]):
  inputs_ts[i]=inputs_ts[i]+[2]+[sentiment_id[train_copy['sentiment'][i]]]+[2]
  masks_ts[i]=masks_ts[i] + [1]*3
'''
```

Out[25]:

```
"\nfor i in range(test_copy.shape[0]):\n  inputs_ts[i]=inputs_ts[i]+[2]+[sen
timent_id[train_copy['sentiment'][i]]]+[2]\n  masks_ts[i]=masks_ts[i] + [1]*
3\n"
```

In [26]:

```
inputs_ts
```

Out[26]:

```
array([list([0, 1215, 417, 38, 64, 12905, 90, 1217, 932, 6, 14651, 4, 1491,
129, 524, 38, 4968, 6, 38, 64, 12905, 90, 190, 1166, 5, 31095, 317, 4, 2]),
       list([0, 29334, 9993, 47146, 3935, 328, 205, 662, 7409, 1245, 328, 16
4, 7, 173, 23, 112, 98, 240, 7, 489, 16404, 8, 8143, 42, 3269, 328, 517, 66,
11, 326, 10877, 65, 183, 2]),
       list([0, 1638, 857, 939, 240, 7, 465, 277, 169, 172, 29784, 329, 2]),
       ...,
       list([0, 18, 658, 338, 1720, 108, 3795, 19, 10, 8492, 8, 10, 1455, 6,
142, 24, 12905, 29, 985, 12905, 29, 183, 328, 1437, 4252, 56, 2162, 7716, 4,
4832, 8061, 2]),
       list([0, 2362, 6, 21958, 6, 51, 222, 45, 328, 939, 21, 22431, 77, 93
9, 13356, 62, 42, 662, 4, 2]),
       list([0, 734, 8, 24, 29667, 4056, 9470, 14989, 29, 274, 5944, 1009, 3
4727, 30986, 3226, 53, 38, 29667, 4056, 9470, 14989, 119, 98, 3610, 23, 173,
452, 38, 351, 29667, 4056, 9470, 14989, 90, 120, 932, 626, 2])],
      dtype=object)
```

In [27]:

```
# Paddig them to a fixed size
input_ids_tr=pad_sequences(inputs,padding='post',maxlen=96,value=1)
print(input_ids_tr.shape)
input_ids_tr
```

```
(21984, 96)
```

Out[27]:

```
array([[    0,  7333, 18698, ...,     1,     1,     1],
       [    0,   100, 12905, ...,     1,     1,     1],
       [    0,   100,   794, ...,     1,     1,     1],
       ...,
       [    0, 10926,   419, ...,     1,     1,     1],
       [    0,   771, 32708, ...,     1,     1,     1],
       [    0, 21136, 35666, ...,     1,     1,     1]], dtype=int32)
```

In [28]:

```
# Paddig them to a fixed size
input_ids_ts=pad_sequences(inputs_ts,padding='post',maxlen=96,value=1)
print(input_ids_ts.shape)
input_ids_ts
```

```
(5497, 96)
```

Out[28]:

```
array([[    0,  1215,   417, ...,     1,     1,     1],
       [    0, 29334,  9993, ...,     1,     1,     1],
       [    0,  1638,   857, ...,     1,     1,     1],
       ...,
       [    0,    18,   658, ...,     1,     1,     1],
       [    0,  2362,     6, ...,     1,     1,     1],
       [    0,   734,     8, ...,     1,     1,     1]], dtype=int32)
```

In [29]:

```
attention_masks_tr=pad_sequences(masks,padding='post',maxlen=96)
print(attention_masks_tr.shape)
attention_masks_tr
```

```
(21984, 96)
```

Out[29]:

```
array([[1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0],
       ...,
       [1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0]], dtype=int32)
```

In [30]:

```
attention_masks_ts=pad_sequences(masks_ts,padding='post',maxlen=96)
print(attention_masks_ts.shape)
attention_masks_ts
```

```
(5497, 96)
```

Out[30]:

```
array([[1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0],
       ...,
       [1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0],
       [1, 1, 1, ..., 0, 0, 0]], dtype=int32)
```

In [31]:

```
train_copy.head()
```

Out[31]:

	textID	text	selected_text	sentiment
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive
3	f782648201	I am the queen of losing things. Important thi...	losing	neutral
4	dd1b429fc1	i`m not ready for tomorrow`s competition!	i`m not ready for tomorrow`s competition!	neutral

In [32]:

```
def labels(df):
  string=df['text']
  words=list(string.split())
  l=len(words)
  label=np.zeros(l)
  label.astype(np.bool)
  target=df['selected_text']
  st_words=list(target.split())
  for i in st_words:
    try:
      num=words.index(i)
      label[num]=1
    except ValueError:
      pass
  return label
train_copy['labels']=train_copy.apply(labels,axis=1)
test_copy['labels']=test_copy.apply(labels,axis=1)
train_copy.head(2)
```

Out[32]:

	textID	text	selected_text	sentiment	labels
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...

In [33]:

```
test_copy.head()
```

Out[33]:

	textID	text	selected_text	sentiment	labels
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...
1	ee5b92dd36	TWEEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]
4	1fcc024ec4	LMOA! i just quit one of mine, too much stress	too much stress	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...

In [34]:

```
test_copy['labels'][0]
```

Out[34]:

```
array([0., 1., 0., 0., 0., 0., 1., 1., 1., 0., 1., 0., 0., 0., 0., 0., 0.,
       0.])
```

In [35]:

```
from keras.preprocessing.sequence import pad_sequences
y_pad_ts=pad_sequences(test_copy['labels'],maxlen=96, padding='post',value=2)
#y_ts_pad=pad_sequences(Y_test,maxlen=50, padding='post')
print(y_pad_ts.shape)
print(type(y_pad_ts))
print(y_pad_ts)
```

```
(5497, 96)
<class 'numpy.ndarray'>
[[0 1 0 ... 2 2 2]
 [0 1 0 ... 2 2 2]
 [1 1 1 ... 2 2 2]
 ...
 [1 1 1 ... 2 2 2]
 [1 1 1 ... 2 2 2]
 [0 0 0 ... 2 2 2]]
```

In [36]:

```
y_pad_tr=pad_sequences(train_copy['labels'],maxlen=96, padding='post',value=2)
#y_ts_pad=pad_sequences(Y_test,maxlen=50, padding='post')
print(y_pad_tr.shape)
print(type(y_pad_tr))
print(y_pad_tr)
```

```
(21984, 96)
<class 'numpy.ndarray'>
[[0 0 0 ... 2 2 2]
 [1 1 1 ... 2 2 2]
 [1 0 0 ... 2 2 2]
 ...
 [1 1 1 ... 2 2 2]
 [1 1 1 ... 2 2 2]
 [1 0 0 ... 2 2 2]]
```

In [37]:

```
start_tr=np.zeros((len(y_pad_tr),96))
for i in range(y_pad_tr.shape[0]):
  for j in range(96):
    if(y_pad_tr[i][j]==1):
      start_tr[i][j]=1
      break
```

In [38]:

```
start_ts=np.zeros((len(y_pad_ts),96))
for i in range(y_pad_ts.shape[0]):
  for j in range(96):
    if(y_pad_ts[i][j]==1):
      start_ts[i][j]=1
      break
```

In [39]:

```
end_tr=np.zeros((len(y_pad_tr),96))
for i in range(y_pad_tr.shape[0]):
  for j in range(95,-1,-1):
    if(y_pad_tr[i][j]==1):
      end_tr[i][j]=1
      break
```

In [40]:

```
end_ts=np.zeros((len(y_pad_ts),96))
for i in range(y_pad_ts.shape[0]):
  for j in range(95,-1,-1):
    if(y_pad_ts[i][j]==1):
      end_ts[i][j]=1
      break
```

In [41]:

```
train_copy.labels[1]
```

Out[41]:

```
array([1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 0., 0., 1.,
       1., 1., 1., 1., 1., 1., 1., 1., 1., 1., 1.])
```

In [42]:

```
start_tr[1]
```

Out[42]:

```
array([1., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

In [43]:

```
end_tr[1]
```

Out[43]:

```
array([0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 1., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.,
       0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.])
```

In [44]:

```
model = TFRobertaModel.from_pretrained('roberta-base')
```

```
HBox(children=(FloatProgress(value=0.0, description='Downloading', max=481.
0, style=ProgressStyle(description_…



HBox(children=(FloatProgress(value=0.0, description='Downloading', max=65743
4796.0, style=ProgressStyle(descri…



Some weights of the model checkpoint at roberta-base were not used when init
ializing TFRobertaModel: ['lm_head']
- This IS expected if you are initializing TFRobertaModel from the checkpoin
t of a model trained on another task or with another architecture (e.g. init
ializing a BertForSequenceClassification model from a BertForPretraining mod
el).
- This IS NOT expected if you are initializing TFRobertaModel from the check
point of a model that you expect to be exactly identical (initializing a Ber
tForSequenceClassification model from a BertForSequenceClassification mode
l).
All the weights of TFRobertaModel were initialized from the model checkpoint
at roberta-base.
If your task is similar to the task the model of the checkpoint was trained
on, you can already use TFRobertaModel for predictions without further train
ing.
```

In [45]:

```
start_tr.shape
```

Out[45]:

```
(21984, 96)
```

In [46]:

```
y_pad_tr.shape
```

Out[46]:

```
(21984, 96)
```

In [47]:

```
Y_tr=np.reshape(y_pad_tr,(-1,96,1))
print(Y_tr.shape)
Y_ts=np.reshape(y_pad_ts,(-1,96,1))
print(Y_ts.shape)
```

```
(21984, 96, 1)
(5497, 96, 1)
```

In [48]:

```
def maskedLoss(y_true, y_pred):
  loss_function = tf.keras.losses.BinaryCrossentropy(from_logits=False, reduction='none')
 #getting mask value
  mask = tf.math.logical_not(tf.math.equal(y_true, 2))

 #calculating the loss
  loss_ = loss_function(y_true, y_pred)
  loss_=tf.reshape(loss_,(-1,96,1))
 #print(loss_)
 #print(loss_.shape)

 #converting mask dtype to loss_ dtype
  mask = tf.cast(mask, dtype='int32')

 #applying the mask to loss
  loss_ = loss_*mask
 #print(loss_)

 #getting mean over all the values
  loss_ = tf.reduce_sum(loss_)/tf.reduce_sum(mask)
  return loss_
```

In [49]:

```
def build_model():
    MAX_LEN=96
    ids = tf.keras.layers.Input((MAX_LEN,), dtype=tf.int32)
    att = tf.keras.layers.Input((MAX_LEN,), dtype=tf.int32)

    bert_model = TFRobertaModel.from_pretrained('roberta-base')
    roberta = bert_model(ids,attention_mask=att)

    drop1 = tf.keras.layers.Dropout(0.1)(roberta[0])
    conv1 = tf.keras.layers.Conv1D(1,1)(drop1)
    flat1 = tf.keras.layers.Flatten()(conv1)
    out1 = tf.keras.layers.Activation('softmax')(flat1)

    drop2 = tf.keras.layers.Dropout(0.1)(roberta[0])
    conv2 = tf.keras.layers.Conv1D(1,1)(drop2)
    flat2 = tf.keras.layers.Flatten()(conv2)
    out2 = tf.keras.layers.Activation('softmax')(flat2)

    model = tf.keras.models.Model(inputs=[ids, att,], outputs=[out1,out2])
    optimizer = tf.keras.optimizers.Adam(learning_rate=3e-5)
    model.compile(loss='categorical_crossentropy', optimizer=optimizer, metrics=['accuracy'

    return model
```

In [51]:

```
model=build_model()
model.summary()
```

```
Some weights of the model checkpoint at roberta-base were not used when init
ializing TFRobertaModel: ['lm_head']
- This IS expected if you are initializing TFRobertaModel from the checkpoin
t of a model trained on another task or with another architecture (e.g. init
ializing a BertForSequenceClassification model from a BertForPretraining mod
el).
- This IS NOT expected if you are initializing TFRobertaModel from the check
point of a model that you expect to be exactly identical (initializing a Ber
tForSequenceClassification model from a BertForSequenceClassification mode
l).
All the weights of TFRobertaModel were initialized from the model checkpoint
at roberta-base.
If your task is similar to the task the model of the checkpoint was trained
on, you can already use TFRobertaModel for predictions without further train
ing.

Model: "functional_1"
____________________________________________________________________________
______________________
Layer (type)                    Output Shape         Param #     Connected t
o
============================================================================
======================
input_1 (InputLayer)            [(None, 96)]         0
____________________________________________________________________________
______________________
input_2 (InputLayer)            [(None, 96)]         0
____________________________________________________________________________
______________________
tf_roberta_model_1 (TFRobertaMo ((None, 96, 768), (N 124645632   input_1[0]
[0]
                                                                 input_2[0]
[0]
____________________________________________________________________________
______________________
dropout_74 (Dropout)            (None, 96, 768)      0           tf_roberta_
model_1[0][0]
____________________________________________________________________________
______________________
dropout_75 (Dropout)            (None, 96, 768)      0           tf_roberta_
model_1[0][0]
____________________________________________________________________________
______________________
conv1d (Conv1D)                 (None, 96, 1)        769         dropout_74
[0][0]
____________________________________________________________________________
______________________
conv1d_1 (Conv1D)               (None, 96, 1)        769         dropout_75
[0][0]
____________________________________________________________________________
______________________
flatten (Flatten)               (None, 96)           0           conv1d[0]
[0]
____________________________________________________________________________
______________________
```

```
flatten_1 (Flatten)            (None, 96)           0           conv1d_1[0]
[0]
____________________________________________________________________________
______________________
activation_4 (Activation)      (None, 96)           0           flatten[0]
[0]
____________________________________________________________________________
______________________
activation_5 (Activation)      (None, 96)           0           flatten_1
[0][0]
============================================================================
======================
Total params: 124,647,170
Trainable params: 124,647,170
Non-trainable params: 0
____________________________________________________________________________
______________________
```

In [52]:

```
#model=build_model1()
#model.summary()
```

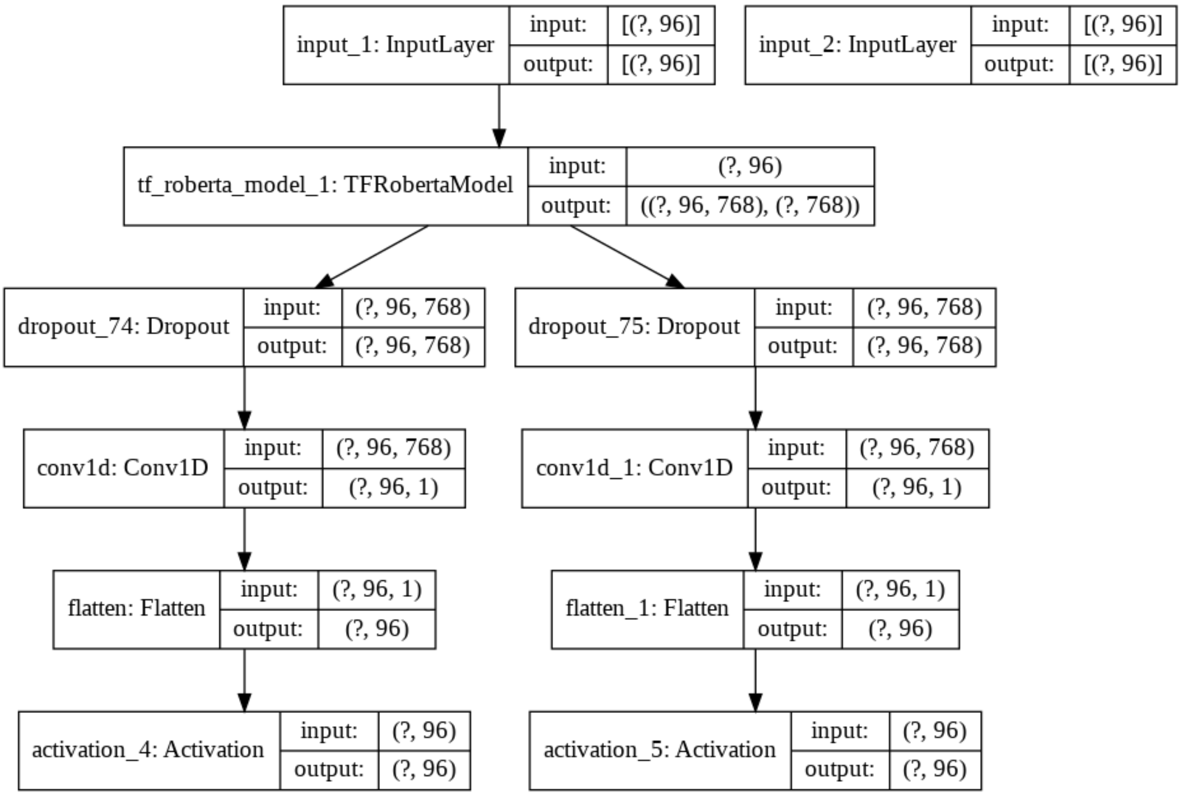
In [53]:

```
#from keras.utils import plot_model
#plot_model(model, show_shapes=True,show_layer_names=True, to_file='model1.png')
```

In [54]:

```
from keras.utils import plot_model
plot_model(model, show_shapes=True,show_layer_names=True, to_file='model1.png')
```

Out[54]:



In [55]:

```
input_ids_tr
```

Out[55]:

```
array([[    0,  7333, 18698, ...,     1,     1,     1],
       [    0,   100, 12905, ...,     1,     1,     1],
       [    0,   100,   794, ...,     1,     1,     1],
       ...,
       [    0, 10926,   419, ...,     1,     1,     1],
       [    0,   771, 32708, ...,     1,     1,     1],
       [    0, 21136, 35666, ...,     1,     1,     1]], dtype=int32)
```

In [56]:

```
from keras.callbacks import ModelCheckpoint,TensorBoard,ReduceLROnPlateau, EarlyStopping
import os
import datetime
es = EarlyStopping(monitor='val_accuracy', mode='max', patience=3, verbose=1)
mc = ModelCheckpoint('model.h5', monitor='val_accuracy', mode='max', save_best_only=True, v
logdir = os.path.join("model", datetime.datetime.now().strftime("%Y%m%d-%H%M%S"))
tb1 = TensorBoard(log_dir=logdir)
```

In [57]:

```
y_pad_tr
```

Out[57]:

```
array([[0, 0, 0, ..., 2, 2, 2],
       [1, 1, 1, ..., 2, 2, 2],
       [1, 0, 0, ..., 2, 2, 2],
       ...,
       [1, 1, 1, ..., 2, 2, 2],
       [1, 1, 1, ..., 2, 2, 2],
       [1, 0, 0, ..., 2, 2, 2]], dtype=int32)
```

In [58]:

```
hist = model.fit([input_ids_tr,attention_masks_tr,],[start_tr,end_tr],
                validation_data = ([input_ids_ts, attention_masks_ts], [start_ts,end_ts]),
                epochs=3, batch_size=32,verbose=1,callbacks=[es,mc,tb1])
```

```
WARNING:tensorflow:Model failed to serialize as JSON. Ignoring...
Epoch 1/3
WARNING:tensorflow:Gradients do not exist for variables ['tf_roberta_model_
1/roberta/pooler/dense/kernel:0', 'tf_roberta_model_1/roberta/pooler/dense/b
ias:0'] when minimizing the loss.
WARNING:tensorflow:Gradients do not exist for variables ['tf_roberta_model_
1/roberta/pooler/dense/kernel:0', 'tf_roberta_model_1/roberta/pooler/dense/b
ias:0'] when minimizing the loss.
WARNING:tensorflow:Gradients do not exist for variables ['tf_roberta_model_
1/roberta/pooler/dense/kernel:0', 'tf_roberta_model_1/roberta/pooler/dense/b
ias:0'] when minimizing the loss.
WARNING:tensorflow:Gradients do not exist for variables ['tf_roberta_model_
1/roberta/pooler/dense/kernel:0', 'tf_roberta_model_1/roberta/pooler/dense/b
ias:0'] when minimizing the loss.
  1/687 [..............................] - ETA: 0s - loss: 8.9690 - activati
on_4_loss: 4.5196 - activation_5_loss: 4.4494 - activation_4_accuracy: 0.000
0e+00 - activation_5_accuracy: 0.0938WARNING:tensorflow:From /usr/local/lib/
python3.6/dist-packages/tensorflow/python/ops/summary_ops_v2.py:1277: stop
(from tensorflow.python.eager.profiler) is deprecated and will be removed af
ter 2020-07-01.
Instructions for updating:
use `tf.profiler.experimental.stop` instead.
687/687 [==============================] - ETA: 0s - loss: 3.5753 - activati
on_4_loss: 1.4912 - activation_5_loss: 2.0841 - activation_4_accuracy: 0.584
9 - activation_5_accuracy: 0.2870WARNING:tensorflow:Early stopping condition
ed on metric `val_accuracy` which is not available. Available metrics are: l
oss,activation_4_loss,activation_5_loss,activation_4_accuracy,activation_5_a
ccuracy,val_loss,val_activation_4_loss,val_activation_5_loss,val_activation_
4_accuracy,val_activation_5_accuracy
WARNING:tensorflow:Can save best model only with val_accuracy available, ski
pping.
687/687 [==============================] - 1056s 2s/step - loss: 3.5753 - ac
tivation_4_loss: 1.4912 - activation_5_loss: 2.0841 - activation_4_accuracy:
0.5849 - activation_5_accuracy: 0.2870 - val_loss: 2.6575 - val_activation_4
_loss: 1.1787 - val_activation_5_loss: 1.4788 - val_activation_4_accuracy:
0.6263 - val_activation_5_accuracy: 0.4903
Epoch 2/3
687/687 [==============================] - ETA: 0s - loss: 2.6662 - activati
on_4_loss: 1.2036 - activation_5_loss: 1.4626 - activation_4_accuracy: 0.614
6 - activation_5_accuracy: 0.4773WARNING:tensorflow:Early stopping condition
ed on metric `val_accuracy` which is not available. Available metrics are: l
oss,activation_4_loss,activation_5_loss,activation_4_accuracy,activation_5_a
ccuracy,val_loss,val_activation_4_loss,val_activation_5_loss,val_activation_
4_accuracy,val_activation_5_accuracy
WARNING:tensorflow:Can save best model only with val_accuracy available, ski
pping.
687/687 [==============================] - 1052s 2s/step - loss: 2.6662 - ac
tivation_4_loss: 1.2036 - activation_5_loss: 1.4626 - activation_4_accuracy:
0.6146 - activation_5_accuracy: 0.4773 - val_loss: 2.3431 - val_activation_4
_loss: 1.1034 - val_activation_5_loss: 1.2397 - val_activation_4_accuracy:
0.6402 - val_activation_5_accuracy: 0.5499
Epoch 3/3
687/687 [==============================] - ETA: 0s - loss: 2.3847 - activati
on_4_loss: 1.1138 - activation_5_loss: 1.2709 - activation_4_accuracy: 0.632
3 - activation_5_accuracy: 0.5479WARNING:tensorflow:Early stopping condition
```

```
ed on metric `val_accuracy` which is not available. Available metrics are: l
oss,activation_4_loss,activation_5_loss,activation_4_accuracy,activation_5_a
ccuracy,val_loss,val_activation_4_loss,val_activation_5_loss,val_activation_
4_accuracy,val_activation_5_accuracy
WARNING:tensorflow:Can save best model only with val_accuracy available, ski
pping.
687/687 [==============================] - 1052s 2s/step - loss: 2.3847 - ac
tivation_4_loss: 1.1138 - activation_5_loss: 1.2709 - activation_4_accuracy:
0.6323 - activation_5_accuracy: 0.5479 - val_loss: 2.3638 - val_activation_4
_loss: 1.1033 - val_activation_5_loss: 1.2605 - val_activation_4_accuracy:
0.6383 - val_activation_5_accuracy: 0.5458
```

In [59]:

```
#hist = model.fit([input_ids_tr,attention_masks_tr,],y_pad_tr,
#                  validation_data = ([input_ids_ts, attention_masks_ts], y_pad_ts),
#                  epochs=3, batch_size=96,verbose=1,callbacks=[es])
```

In [60]:

```
pred=model.predict([input_ids_ts,attention_masks_ts])
```

In [61]:

```
print(len(pred))
start=pred[0]
end=pred[1]
print(start.shape)
print(end.shape)
```

```
2
(5497, 96)
(5497, 96)
```

In [62]:

```
start
```

Out[62]:

```
array([[3.36584926e-01, 5.27576745e-01, 2.39785872e-02, ...,
        5.88283801e-05, 5.88283801e-05, 5.88283801e-05],
       [8.56858194e-02, 8.12800169e-01, 8.81342217e-02, ...,
        8.27553085e-05, 8.27553085e-05, 8.27553085e-05],
       [9.18052137e-01, 2.20491309e-02, 9.17786825e-03, ...,
        8.67988128e-05, 8.67988128e-05, 8.67988128e-05],
       ...,
       [9.42715764e-01, 6.08177297e-03, 2.25715758e-03, ...,
        2.03135642e-04, 2.03135642e-04, 2.03135642e-04],
       [9.48756337e-02, 1.03285285e-02, 4.90075955e-03, ...,
        5.06428405e-05, 5.06428405e-05, 5.06428405e-05],
       [5.16543269e-01, 2.19097301e-01, 1.95728801e-02, ...,
        5.03522169e-04, 5.03522169e-04, 5.03522169e-04]], dtype=float32)
```

In [63]:

```
test_copy.head()
```

Out[63]:

	textID	text	selected_text	sentiment	labels
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...
1	ee5b92dd36	TWEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]
4	1fcc024ec4	LMOA! i just quit one of mine, too much stress	too much stress	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...

In [64]:

```
print(np.argmax(start[0]))
print(np.argmax(end[0]))
```

```
1
17
```

In [65]:

```
print(np.argmax(start_ts[0]))
np.argmax(end_ts[0])
```

```
1
```

Out[65]:

```
10
```

In [66]:

```
test_copy['first']=np.nan
test_copy['last']=np.nan
for i in range(test_copy.shape[0]):
  test_copy['first'][i]=np.argmax(start[i])
  test_copy['last'][i]=np.argmax(end[i])
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:4: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  after removing the cwd from sys.path.
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:5: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  """
```

In [67]:

```
test_copy.head()
```

Out[67]:

	textID	text	selected_text	sentiment	labels	first	last
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0
1	ee5b92dd36	TWEEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	8.0
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]	0.0	2.0
4	1fcc024ec4	LMOA! i just quit one of mine, too much stress	too much stress	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	8.0	9.0

In [68]:

```
def dec(df):
  sent=df['text']
  sentence=list(sent.split())
  length=len(sentence)
  a=int(df['first'])
  b=int(df['last'])
  s=''
  if (a>b):
    s+=df['text']
  elif (b>=length):
    b=min(b,length)
    for i in range(a,b):
      s+=str(sentence[i])+' '
  else:
    for i in range(a,b+1):
      s+=str(sentence[i])+' '
  return s.strip()
```

In [69]:

```
test_copy['pred']=test_copy.apply(dec,axis=1)
test_copy.head(2)
```

Out[69]:

	textID	text	selected_text	sentiment	labels	first	last	pred
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0	I can`t view anything, Gerald. Not only am I b...
1	ee5b92dd36	TWEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0	good

In [70]:

```
def jaccard1(df):
  str1=df['selected_text']
  str2=df['pred']
  a = set(str1.lower().split())
  b = set(str2.lower().split())
  c = a.intersection(b)
  try:
    return float(len(c)) / (len(a) + len(b) - len(c))
  except ZeroDivisionError:
    return 0
```

In [71]:

```
test_copy['jaccard']=test_copy.apply(jaccard1,axis=1)
test_copy.head()
```

Out[71]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0	I can`t view anything, Gerald. Not only am I b...	0.357143
1	ee5b92dd36	TWEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0	good	0.500000
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	8.0	okay i need to find another way then lolz	1.000000
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]	0.0	2.0	Not any more.	1.000000
4	1fcc024ec4	LMOA! i just quit one of mine, too much stress	too much stress	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	8.0	9.0	much stress	0.666667

In [73]:

```
test_copy['jaccard'].mean()
```

Out[73]:

```
0.6293622648247365
```

In [74]:

```
test_copy[test_copy['sentiment']=='positive']['jaccard'].mean()
```

Out[74]:

```
0.4643797080880787
```

In [75]:

```
test_copy[test_copy['sentiment']=='negative']['jaccard'].mean()
```

Out[75]:

```
0.4539203793163219
```

In [76]:

```
test_copy[test_copy['sentiment']=='neutral']['jaccard'].mean()
```

Out[76]:

```
0.8794803510513257
```

In [76]:

```

```

In [77]:

```
pred_tr=model.predict([input_ids_tr,attention_masks_tr])
```

In [78]:

```
print(len(pred_tr))
tr_start=pred_tr[0]
tr_end=pred_tr[1]
print(tr_start.shape)
print(tr_end.shape)
```

```
2
(21984, 96)
(21984, 96)
```

In [79]:

```
tr_start
```

Out[79]:

```
array([[7.7901065e-02, 2.1383144e-01, 6.2772175e-03, ..., 2.3481021e-05,
        2.3481021e-05, 2.3481021e-05],
       [9.3961918e-01, 1.3350357e-03, 1.4051842e-03, ..., 8.6866916e-05,
        8.6866916e-05, 8.6866916e-05],
       [4.5456865e-01, 3.7968787e-03, 6.0447892e-03, ..., 4.1230094e-05,
        4.1230094e-05, 4.1230094e-05],
       ...,
       [5.6921345e-01, 9.6778739e-03, 1.6330332e-02, ..., 1.2857599e-04,
        1.2857599e-04, 1.2857599e-04],
       [9.8492199e-01, 4.8326206e-04, 6.4137811e-04, ..., 9.0566493e-05,
        9.0566493e-05, 9.0566493e-05],
       [9.8284042e-01, 2.6277865e-03, 6.8077347e-03, ..., 2.4923764e-05,
        2.4923764e-05, 2.4923764e-05]], dtype=float32)
```

In [80]:

```
train_copy.head()
```

Out[80]:

	textID	text	selected_text	sentiment	labels
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive	[1.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...
3	f782648201	I am the queen of losing things. Important thi...	losing	neutral	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, ...
4	dd1b429fc1	i`m not ready for tomorrow`s competition!	i`m not ready for tomorrow`s competition!	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0]

In [81]:

```
print(np.argmax(tr_start[0]))
print(np.argmax(tr_end[0]))
```

```
8
8
```

In [82]:

```
print(np.argmax(start_tr[0]))
np.argmax(end_tr[0])
```

```
8
```

Out[82]:

```
8
```

In [83]:

```
train_copy['first']=np.nan
train_copy['last']=np.nan
for i in range(train_copy.shape[0]):
  train_copy['first'][i]=np.argmax(tr_start[i])
  train_copy['last'][i]=np.argmax(tr_end[i])
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:4: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  after removing the cwd from sys.path.
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:5: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  """
```

In [84]:

```
train_copy.head(3)
```

Out[84]:

	textID	text	selected_text	sentiment	labels	first	last
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	8.0	8.0
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	26.0
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive	[1.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	23.0

In [85]:

```
train_copy['pred']=train_copy.apply(dec,axis=1)
train_copy.head(2)
```

Out[85]:

	textID	text	selected_text	sentiment	labels	first	last	pred
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	8.0	8.0	hurts
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	26.0	I`m going to try & get some sleep. I got work ...

In [86]:

```
train_copy['jaccard']=train_copy.apply(jaccard1,axis=1)
train_copy.head()
```

Out[86]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	8.0	8.0	hurts	1.000000
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	26.0	I`m going to try & get some sleep. I got work ...	0.961538
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive	[1.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	23.0	I saw your tweet a couple of weeks ago that ha...	0.285714
3	f782648201	I am the queen of losing things. Important thi...	losing	neutral	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	losing	1.000000
4	dd1b429fc1	i`m not ready for tomorrow`s competition!	i`m not ready for tomorrow`s competition!	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	5.0	i`m not ready for tomorrow`s competition!	1.000000

In [87]:

```
train_copy['jaccard'].mean()
```

Out[87]:

```
0.6876059058275397
```

In [88]:

```
train_copy[train_copy['sentiment']=='positive']['jaccard'].mean()
```

Out[88]:

```
0.5357638955364429
```

In [89]:

```
train_copy[train_copy['sentiment']=='negative']['jaccard'].mean()
```

Out[89]:

```
0.535831473456868
```

In [90]:

```
train_copy[train_copy['sentiment']=='neutral']['jaccard'].mean() # Train score for neutral
```

Out[90]:

```
0.9110364480082893
```

In [91]:

```
test_copy[test_copy['sentiment']=='neutral']['jaccard'].mean() # Test score for neutral
```

Out[91]:

```
0.8794803510513257
```

In [91]:

```

```

Analyzing positive texts

In [92]:

```
train_positive=train_copy[train_copy.sentiment=='positive']
train_positive.head()
```

Out[92]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jacc
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive	[1.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	23.0	I saw your tweet a couple of weeks ago that ha...	0.285
9	adbe4d8676	Nothing exciting from me tonight....got some n...	Happy	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	12.0	12.0	Happy	1.000
10	60da5f7f30	ROFLMFAO!!!! You love us better, don`t you!	love	positive	[0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0]	2.0	2.0	love	1.000
15	74e92f4188	sounds like you all had a great night . i`m gl...	i`m glad	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	6.0	14.0	great night . i`m glad it was successful	0.250
16	fa60196831	#3wordsaftersex goodbye innocence!!!	goodbye innocence!!	positive	[0.0, 1.0, 0.0]	1.0	2.0	goodbye innocence!!!	0.333

In [93]:

```
train_positive.shape
```

Out[93]:

```
(6865, 9)
```

In [94]:

```
#train_positive.drop(columns=['encoded_text'],inplace=True)
```

In [95]:

```
test_positive=test_copy[test_copy.sentiment=='positive']
test_positive.head()
```

Out[95]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccai
1	ee5b92dd36	TWEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0	good	0.50000
8	1f14f8f9f8	just got back from my grandparents suprise 60t...	it was sooooo much fun!!!	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	13.0	13.0	fun!!!	0.20000
18	d9c047c4de	Happy Mother`s Day, Moms!!! You are wonderful!...	Happy Mother`s Day, Moms!!! You are wonderful!...	positive	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	11.0	Happy Mother`s Day, Moms!!! You are wonderful!...	1.00000
23	b37664cb2a	goodnight everyone.	goodnight everyone.	positive	[1.0, 1.0]	0.0	1.0	goodnight everyone.	1.00000
28	d153e50085	__buckley Good for you mate, sadly I couldnt g...	Good for you mate, sadly I couldnt get pissed ...	positive	[0.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	14.0	__buckley Good for you mate, sadly I couldnt g...	0.93333

In [96]:

```
test_positive.shape
```

Out[96]:

```
(1717, 9)
```

In [97]:

```
#test_positive.drop(columns=['encoded_text',],inplace=True)
```

In [98]:

```
test_positive.head(2)
```

Out[98]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
1	ee5b92dd36	TWEEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0	good	0.5
8	1f14f8f9f8	just got back from my grandparents suprise 60t...	it was sooooo much fun!!!	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	13.0	13.0	fun!!!	0.2

In [99]:

```
def text_len(df):
 l1=len(df['text'].strip())
 return l1
def text_len1(df):
 l2=len(df['selected_text'].strip())
 return l2
```

In [100]:

```python
train_positive['text_len']=train_positive.apply(text_len,axis=1)
train_positive['st_len']=train_positive.apply(text_len1,axis=1)
test_positive['text_len']=test_positive.apply(text_len,axis=1)
test_positive['st_len']=test_positive.apply(text_len1,axis=1)
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:1: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  """Entry point for launching an IPython kernel.
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:2: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)

/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:3: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  This is separate from the ipykernel package so we can avoid doing imports
 until
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:4: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  after removing the cwd from sys.path.
```

In [101]:

```
train_positive.head(2)
```

Out[101]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive	[1.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	23.0	I saw your tweet a couple of weeks ago that ha...	0.285714	
9	adbe4d8676	Nothing exciting from me tonight....got some n...	Happy	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	12.0	12.0	Happy	1.000000	

In [102]:

```
print(train_positive['text_len'].mean())
print(train_positive['st_len'].mean())
```

```
70.01937363437727
18.085360524399125
```

In [103]:

```
test_positive.head(2)
```

Out[103]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_l
1	ee5b92dd36	TWEEEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0	good	0.5	1
8	1f14f8f9f8	just got back from my grandparents suprise 60t...	it was sooooo much fun!!!	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	13.0	13.0	fun!!!	0.2	

In [103]:

```

```

In [104]:

```
tr_low_pos=train_positive[train_positive.jaccard<=0.4]
tr_low_pos.head()
```

Out[104]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jacc
2	2426b87d1a	I saw your tweet a couple of weeks ago that ha...	I am a huge Mitch fan	positive	[1.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	23.0	I saw your tweet a couple of weeks ago that ha...	0.285
15	74e92f4188	sounds like you all had a great night . i`m gl...	i`m glad	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	6.0	14.0	great night . i`m glad it was successful	0.250
16	fa60196831	#3wordsaftersex goodbye innocence!!!	goodbye innocence!!	positive	[0.0, 1.0, 0.0]	1.0	2.0	goodbye innocence!!!	0.333
23	579f45f637	Thank you! I appreciate that.	I appreciate	positive	[0.0, 0.0, 1.0, 1.0, 0.0]	3.0	4.0	appreciate that.	0.333
32	a948d1231e	Cherry Italian Ice is my fave. I want to get t...	Cherry Italian Ice is my fave.	positive	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	fave.	0.166

In [105]:

```
len(tr_low_pos)
```

Out[105]:

```
3150
```

In [106]:

```
print(tr_low_pos['text_len'].mean())
print(tr_low_pos['st_len'].mean())
```

```
76.82571428571428
20.186349206349206
```

In [107]:

```
ts_low_pos=test_positive[test_positive.jaccard<=0.4]
print(len(ts_low_pos))
ts_low_pos.head()
```

```
951
```

Out[107]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	t
8	1f14f8f9f8	just got back from my grandparents suprise 60t...	it was sooooo much fun!!!	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	13.0	13.0	fun!!!	0.200000	
34	fc53d120e4	no phone call yet.. 20 minutes until I pluck u...	WISH	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	12.0	18.0	I WISH MY PHONE WOULD RING	0.166667	
45	993aff3b0c	Woo hoo party over here. Its gonna be fun	Its gonna be fun	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, 1.0]	8.0	8.0	fun	0.250000	
51	a60a993e5d	I like it!	I like	positive	[1.0, 1.0, 0.0]	1.0	2.0	like it!	0.333333	
53	2898a9f7d5	I have to start eating healthy	healthy	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	0.0	5.0	I have to start eating healthy	0.166667	

In [108]:

```
print(ts_low_pos['text_len'].mean())
print(ts_low_pos['st_len'].mean())
```

```
75.13459516298633
18.43217665615142
```

In [109]:

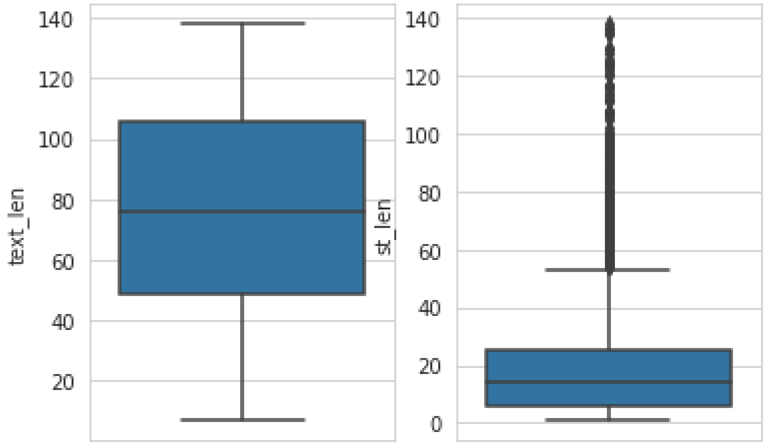
```
print('Difference between text length and selected text length is ',end='')
print(ts_low_pos['text_len'].mean()-ts_low_pos['st_len'].mean())
```

```
Difference between text length and selected text length is 56.70241850683491
```

In [110]:

```
#Objective: To see the range of text length individually for all the sentiments
import seaborn as sns
import matplotlib.pyplot as plt

sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_low_pos)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_low_pos)
plt.show()
```

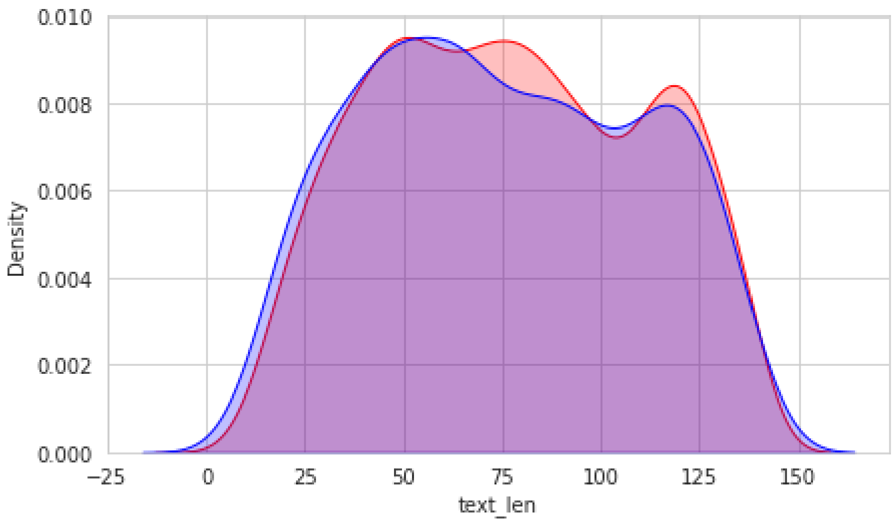


In [111]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_low_pos['text_len'], color='r', shade=True, Label='Train text length with lo
sns.kdeplot(ts_low_pos['text_len'], color='b', shade=True, Label='Test text length with low
```

Out[111]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e740c198>
```

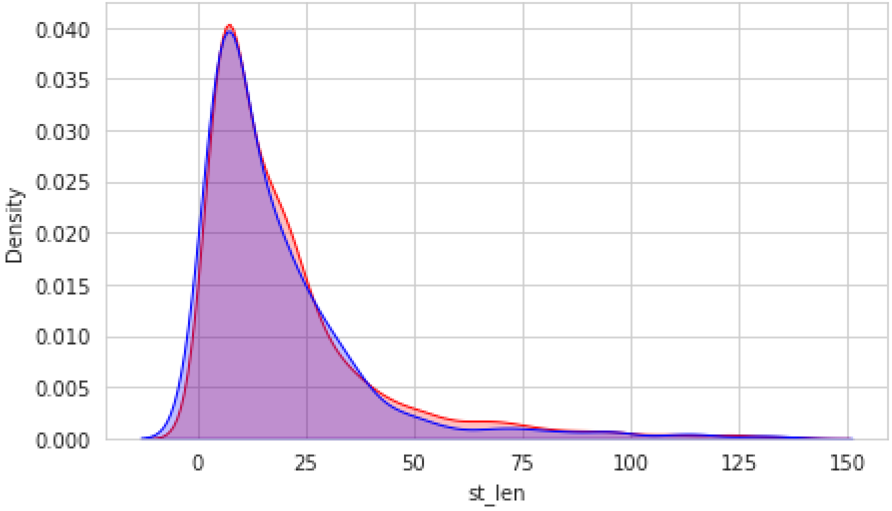


In [112]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_low_pos['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_low_pos['st_len'], color='b', shade=True, Label='Test text length with low j
```

Out[112]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e70dd898>
```



In [113]:

```
tr_med_pos = train_positive[(train_positive['jaccard'] > 0.4) & (train_positive['jaccard']
print(len(tr_med_pos))
tr_med_pos.head()
```

```
1198
```

Out[113]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
25	d98f04843f	I know! I`m totally excited	y excited	positive	[0.0, 0.0, 0.0, 0.0, 1.0]	4.0	4.0	excited	0.50
48	388c6acb71	fireworks @ KBOOM concert... second best I`ve ...	second best	positive	[0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	best	0.50
79	f0ca2549ca	lol, my current mp3 player is a brick. It woul...	It would be nice	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, ...	10.0	11.0	be nice	0.50
84	b64034dd8e	everyone loves u sarah not just the tweeters! ...	everyone loves u sarah	positive	[1.0, 1.0, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	1.0	everyone loves	0.50
93	11370b4eed	its my birthday.....happy birthday to me!!!!	happy birthday to me!!!!	positive	[0.0, 0.0, 0.0, 1.0, 1.0, 1.0]	3.0	5.0	birthday to me!!!!	0.75

In [114]:

```
print(tr_med_pos['text_len'].mean())
print(tr_med_pos['st_len'].mean())
```

```
69.7220367278798
17.146076794657763
```

In [115]:

```
ts_med_pos = test_positive[(test_positive['jaccard'] > 0.4) & (test_positive['jaccard'] <=
print(len(ts_med_pos))
ts_med_pos.head()
```

```
259
```

Out[115]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
1	ee5b92dd36	TWEEEEEET! good morning twitterland! going to ...	good mo	positive	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	1.0	good	0.5
46	14d8e92a3e	_Attack thanks dude!	thanks	positive	[0.0, 1.0, 0.0]	1.0	2.0	thanks dude!	0.5
60	cfc0dd0401	oh that was good cake	good	positive	[0.0, 0.0, 0.0, 1.0, 0.0]	3.0	4.0	good cake	0.5
77	c021952637	right on! i`m 29 myself... i turn 30 in octob...	s awesome	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	17.0	18.0	awesome	0.5
79	ddbc804570	i KNOW! AHH! so fun!	so fun!	positive	[0.0, 0.0, 0.0, 1.0, 1.0]	4.0	4.0	fun!	0.5

In [116]:

```
print(ts_med_pos['text_len'].mean())
print(ts_med_pos['st_len'].mean())
```

```
70.51351351351352
16.07335907335907
```

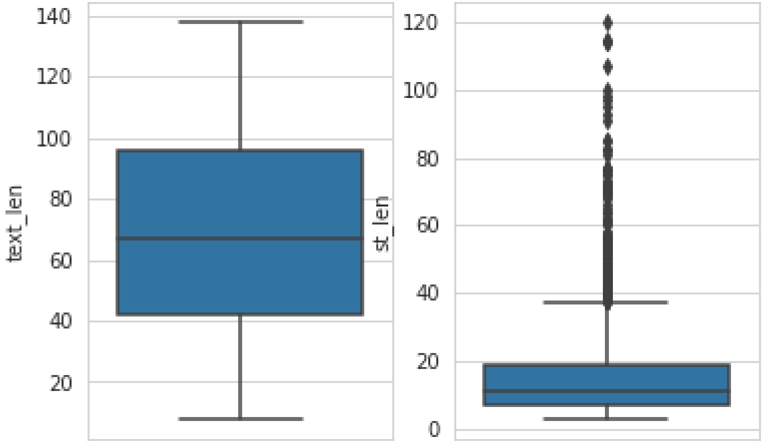
In [117]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_med_pos['text_len'].mean()-ts_med_pos['st_len'].mean())
```

```
Difference between text length and selected text length is 54.44015444015444
4
```

In [118]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_med_pos)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_med_pos)
plt.show()
```

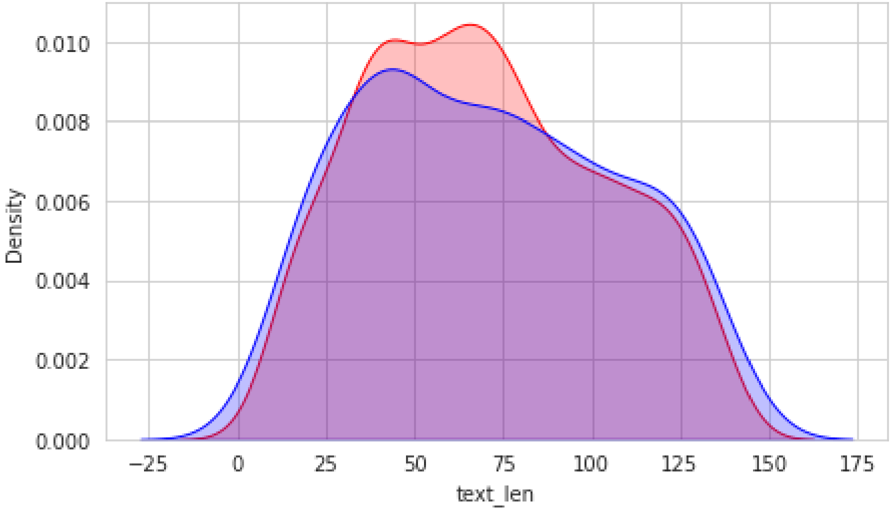


In [119]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_med_pos['text_len'], color='r', shade=True, Label='Train text length with lo
sns.kdeplot(ts_med_pos['text_len'], color='b', shade=True, Label='Test text length with low
```

Out[119]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e6f64cf8>
```

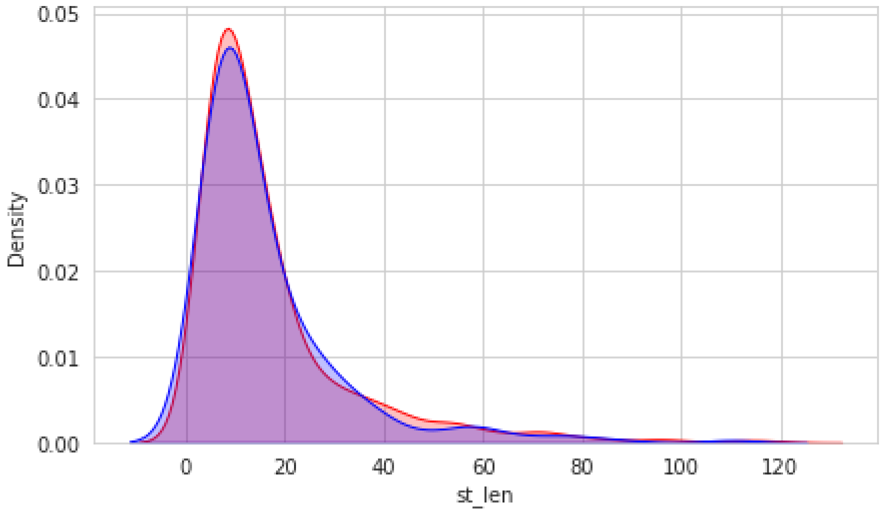


In [120]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_med_pos['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_med_pos['st_len'], color='b', shade=True, Label='Test text length with low j
```

Out[120]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e6f35198>
```



In [121]:

```
tr_high_pos = train_positive[(train_positive['jaccard'] > 0.75)]
print(len(tr_high_pos))
tr_high_pos.head()
```

```
2517
```

Out[121]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	te
9	adbe4d8676	Nothing exciting from me tonight....got some n...	Happy	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	12.0	12.0	Happy	1.0	
10	60da5f7f30	ROFLMFAO!!!! You love us better, don`t you!	love	positive	[0.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0]	2.0	2.0	love	1.0	
27	30ea165391	great thanks hun, i did thr family thing this ...	great	positive	[1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	0.0	great	1.0	
28	657d37972a	Thanks to my assignment im off to work today!	Thanks	positive	[1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	0.0	Thanks	1.0	
41	734ab2cf0d	Bottle of reisling this time... My favorite!	favorite!	positive	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	6.0	6.0	favorite!	1.0	

In [122]:

```
print(tr_high_pos['text_len'].mean())
print(tr_high_pos['st_len'].mean())
```

```
61.64282876440207
15.90305919745729
```

In [123]:

```
ts_high_pos = test_positive[(test_positive['jaccard'] > 0.75)]
print(len(ts_high_pos))
ts_high_pos.head()
```

```
507
```

Out[123]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
18	d9c047c4de	Happy Mother`s Day, Moms!!! You are wonderful!...	Happy Mother`s Day, Moms!!! You are wonderful!...	positive	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	11.0	Happy Mother`s Day, Moms!!! You are wonderful!...	1.000000
23	b37664cb2a	goodnight everyone.	goodnight everyone.	positive	[1.0, 1.0]	0.0	1.0	goodnight everyone.	1.000000
28	d153e50085	__buckley Good for you mate, sadly I couldnt g...	Good for you mate, sadly I couldnt get pissed ...	positive	[0.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	14.0	__buckley Good for you mate, sadly I couldnt g...	0.933333
37	ad12342c25	recovering from being sick ... anyone want to ...	recovering from being sick	positive	[1.0, 1.0, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	3.0	recovering from being sick	1.000000
66	f60cc81508	relaxing fragrances are SOO IN! my latest love...	relaxing	positive	[1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	0.0	relaxing	1.000000

In [124]:

```
print(ts_high_pos['text_len'].mean())
print(ts_high_pos['st_len'].mean())
```

```
58.400394477317555
18.24852071005917
```

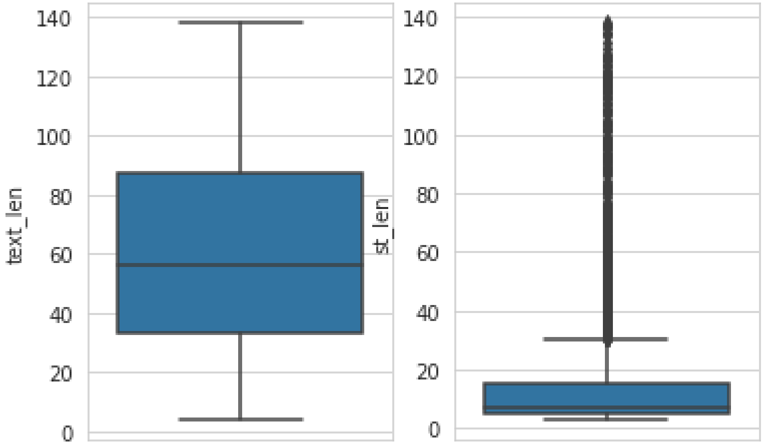
In [125]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_high_pos['text_len'].mean()-ts_high_pos['st_len'].mean())
```

```
Difference between text length and selected text length is 40.15187376725838
```

In [126]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_high_pos)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_high_pos)
plt.show()
```

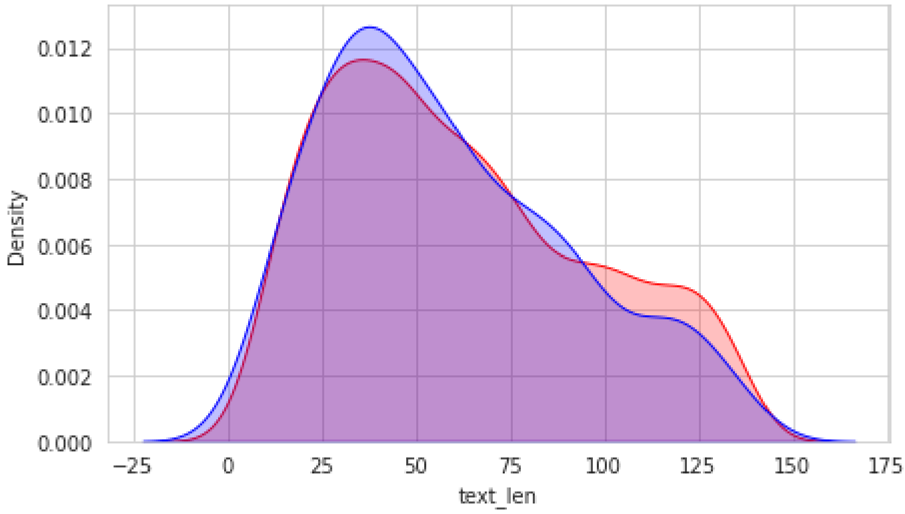


In [127]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_high_pos['text_len'], color='r', shade=True, Label='Train text length with l
sns.kdeplot(ts_high_pos['text_len'], color='b', shade=True, Label='Test text length with lo
```

Out[127]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e500c9b0>
```

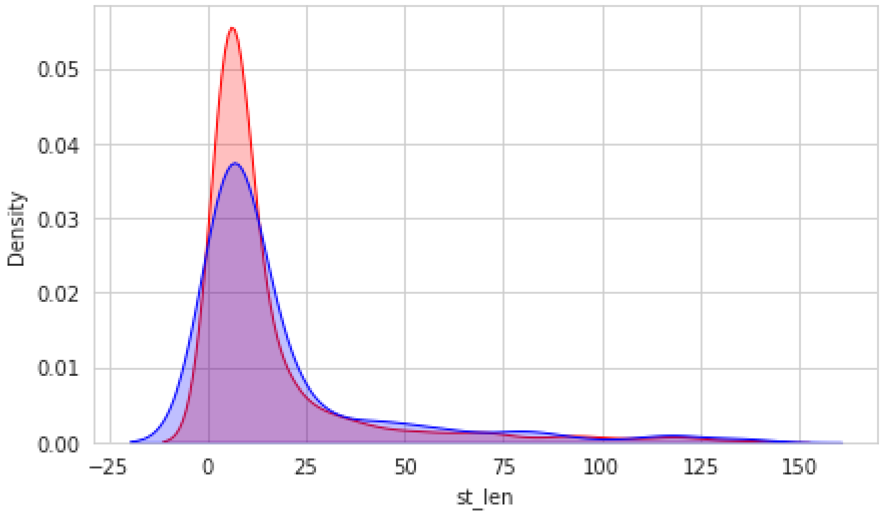


In [128]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_high_pos['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_high_pos['st_len'], color='b', shade=True, Label='Test text length with low
```

Out[128]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e503b240>
```



Analyzing negative texts

In [129]:

```
train_negative=train_copy[train_copy.sentiment=='negative']
train_negative.head()
```

Out[129]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	8.0	8.0	hurts	1.000000
6	61e225fbd7	my new dress looks sort of...horrible http:/...	horrible	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	6.0	my new dress looks sort of...horrible http://t...	0.000000
7	4c2b096989	half my class just called me retarded it hurt ...	it hurt for real	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	8.0	8.0	hurt	0.250000
12	9928207c77	Wide awake. Wishing I wasn`t. **** nightshift ...	Wide awake. Wishing I wasn`t. **** nightshift ...	negative	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	18.0	Wide awake. Wishing I wasn`t. **** nightshift ...	0.947368
13	73a6c8c55e	My knee is killing me	My knee is killing me	negative	[1.0, 1.0, 1.0, 1.0, 1.0]	3.0	4.0	killing me	0.400000

In [130]:

```
train_negative.shape
```

Out[130]:

```
(6225, 9)
```

In [131]:

```
#train_negative.drop(columns=['encoded_text',],inplace=True)
```

In [132]:

```
test_negative=test_copy[test_copy.sentiment=='negative']
test_negative.head()
```

Out[132]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0	I can`t view anything, Gerald. Not only am I b...	0.357143
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]	0.0	2.0	Not any more.	1.000000
4	1fcc024ec4	LMOA! i just quit one of mine, too much stress	too much stress	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	8.0	9.0	much stress	0.666667
5	1b9afa81bf	Waiting for 5:00 & having cramps	cramps	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	5.0	5.0	cramps	1.000000
10	ac58a7a9d5	cuz airlines are super lame.	lame.	negative	[0.0, 0.0, 0.0, 0.0, 1.0]	4.0	4.0	lame.	1.000000

In [133]:

```
test_negative.shape
```

Out[133]:

```
(1556, 9)
```

In [134]:

```
#test_negative.drop(columns=['encoded_text',],inplace=True)
```

In [135]:

```
test_negative.head(2)
```

Out[135]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0	I can`t view anything, Gerald. Not only am I b...	0.357143
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]	0.0	2.0	Not any more.	1.000000

In [136]:

```
train_negative['text_len']=train_negative.apply(text_len,axis=1)
train_negative['st_len']=train_negative.apply(text_len1,axis=1)
test_negative['text_len']=test_negative.apply(text_len,axis=1)
test_negative['st_len']=test_negative.apply(text_len1,axis=1)
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:1: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  """Entry point for launching an IPython kernel.
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:2: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)

/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:3: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  This is separate from the ipykernel package so we can avoid doing imports
 until
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:4: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  after removing the cwd from sys.path.
```

In [137]:

```
train_negative.head(2)
```

Out[137]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	8.0	8.0	hurts	1.0	
6	61e225fbd7	my new dress looks sort of...horrible http:/...	horrible	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	6.0	my new dress looks sort of...horrible http://t...	0.0	

In [138]:

```
print(train_negative['text_len'].mean())
print(train_negative['st_len'].mean())
```

```
70.3463453815261
19.927550200803214
```

In [139]:

```
test_negative.head(2)
```

Out[139]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_l
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0	I can`t view anything, Gerald. Not only am I b...	0.357143	
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]	0.0	2.0	Not any more.	1.000000	

In [139]:

```

```

In [140]:

```
tr_low_neg=train_negative[train_negative.jaccard<=0.4]
tr_low_neg.head()
```

Out[140]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jacca
6	61e225fbd7	my new dress looks sort of...horrible http:/...	horrible	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	6.0	my new dress looks sort of...horrible http://t...	0.0000
7	4c2b096989	half my class just called me retarded it hurt ...	it hurt for real	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	8.0	8.0	hurt	0.2500
13	73a6c8c55e	My knee is killing me	My knee is killing me	negative	[1.0, 1.0, 1.0, 1.0, 1.0]	3.0	4.0	killing me	0.4000
17	bba7fc173b	crashing from my WI high...missing mayfield	missing	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	5.0	crashing from my WI high...missing mayfield	0.0000
18	08a6d8a0da	_mejer I couldn`t remember what all the differ...	couldn`t remember wh	negative	[0.0, 0.0, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	1.0	19.0	I couldn`t remember what all the different cor...	0.1176

In [141]:

```
len(tr_low_neg[tr_low_neg.jaccard==0])
```

Out[141]:

```
401
```

In [142]:

```
len(tr_low_neg)
```

Out[142]:

```
2886
```

In [143]:

```
print(tr_low_neg['text_len'].mean())
print(tr_low_neg['st_len'].mean())
```

```
78.011088011088
19.441787941787943
```

In [144]:

```
ts_low_neg=test_negative[test_negative.jaccard<=0.4]
print(len(ts_low_neg))
ts_low_neg.head()
```

```
867
```

Out[144]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
0	9f7dbce69d	_d I can`t view anything, Gerald. Not only am ...	Not only am I banned,	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, ...	1.0	17.0	I can`t view anything, Gerald. Not only am I b...	0.357143
14	dfd17c5926	Whooops... wrong smiley... it`s supposed to be...	wrong	negative	[0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	7.0	Whooops... wrong smiley... it`s supposed to be...	0.125000
17	39b286912b	not a lot!! im bored! My names Crissy BTW lol ...	not a lot!! im bored!	negative	[1.0, 1.0, 1.0, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	4.0	4.0	bored!	0.200000
22	ec66683c9f	Flap-a-taco was nice until the plebs came in.	Flap-a-taco was nice until the plebs came in.	negative	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	2.0	2.0	nice	0.125000
25	c48674bca0	thers not many peole tweeting tonight... well ...	skint	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	18.0	thers not many peole tweeting tonight... well ...	0.055556

In [145]:

```
print(ts_low_neg['text_len'].mean())
print(ts_low_neg['st_len'].mean())
```

```
77.53748558246828
18.71280276816609
```

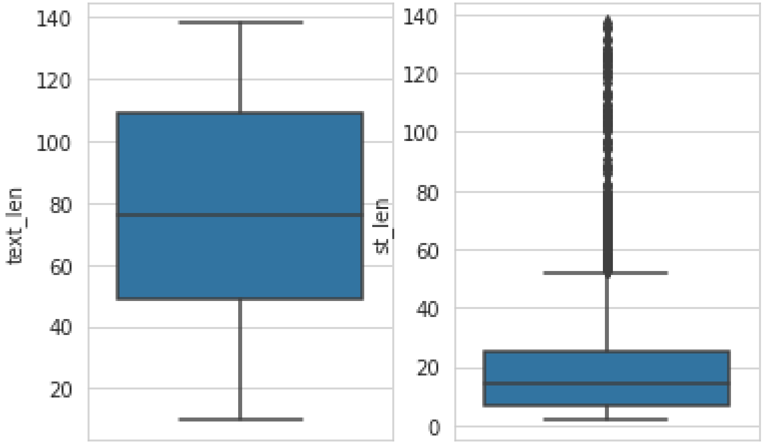
In [146]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_low_neg['text_len'].mean()-ts_low_neg['st_len'].mean())
```

```
Difference between text length and selected text length is 58.82468281430219
```

In [147]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_low_neg)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_low_neg)
plt.show()
```

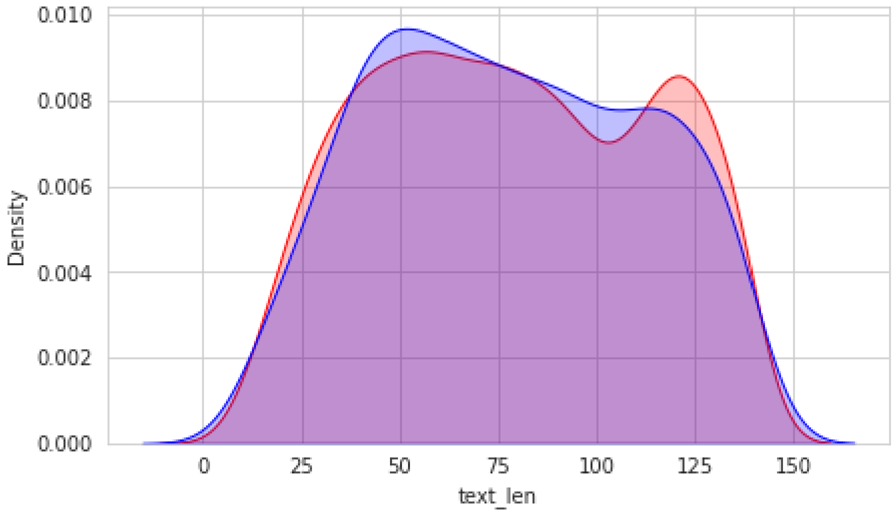


In [148]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_low_neg['text_len'], color='r', shade=True, Label='Train text length with lo
sns.kdeplot(ts_low_neg['text_len'], color='b', shade=True, Label='Test text length with low
```

Out[148]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4ef07b8>
```

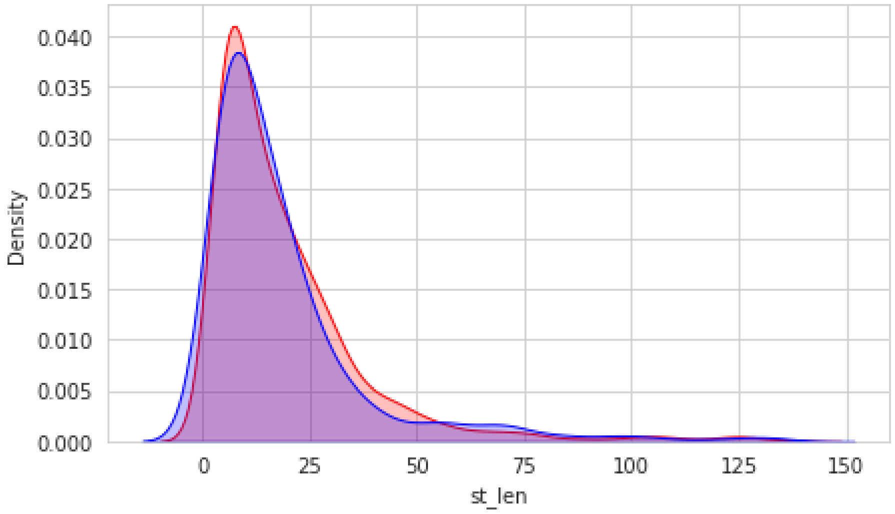


In [149]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_low_neg['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_low_neg['st_len'], color='b', shade=True, Label='Test text length with low j
```

Out[149]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4e12ac8>
```



In [150]:

```
tr_med_neg = train_negative[(train_negative['jaccard'] > 0.4) & (train_negative['jaccard']
print(len(tr_med_neg))
tr_med_neg.head()
```

```
1089
```

Out[150]:

	textID	text	selected_text	sentiment	labels	first	last	pred	
14	00248197c5	Im in so deep its disgusting. I would even tak...	s disgusting.	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	disgusting.	(
33	0e28857f4b	http://twitpic.com/675t7 - Square B - she is s...	she is sad	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, 0.0, ...	6.0	7.0	is sad	(
43	d4c4ea2da8	Where`s poss i miss him	i miss	negative	[0.0, 0.0, 1.0, 1.0, 0.0]	3.0	3.0	miss	(
47	d3344f58a6	Trying to figure out this thing...it`s not goi...	it`s not going well	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0]	6.0	8.0	not going well	(
51	c9ed90d81c	_A_R_A I was wondering where you were, how com...	not nice	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	22.0	22.0	nice	(

In [151]:

```
print(tr_med_neg['text_len'].mean())
print(tr_med_neg['st_len'].mean())
```

```
68.21763085399449
20.882460973370065
```

In [152]:

```
ts_med_neg = test_negative[(test_negative['jaccard'] > 0.4) & (test_negative['jaccard'] <=
print(len(ts_med_neg))
ts_med_neg.head()
```

```
261
```

Out[152]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_
4	1fcc024ec4	LMOA! i just quit one of mine, too much stress	too much stress	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	8.0	9.0	much stress	0.666667	
12	3ac5c17dda	This class is really long and I`m really getti...	This class is really long	negative	[1.0, 1.0, 1.0, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0, ...	0.0	9.0	This class is really long and I`m really getti...	0.555556	
87	5250e0d4ba	Having a hectic day travelling from PJ to UNIT...	hectic day	negative	[0.0, 0.0, 1.0, 1.0, 0.0, 0.0, 0.0, 0.0, 0.0, ...	2.0	2.0	hectic	0.500000	
104	77c8d92adb	listens to MSI and bakes banana bread. How wei...	How weird is she? Remarkably not so much anymore.	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, ...	0.0	16.0	listens to MSI and bakes banana bread. How wei...	0.562500	
124	4e1fc4b289	`erocka the ruler` i called you, but i see i g...	i see i gets the no love whats up with that	negative	[0.0, 1.0, 0.0, 1.0, 0.0, 0.0, 0.0, 0.0, 1.0, ...	0.0	17.0	`erocka the ruler` i called you, but i see i g...	0.562500	

In [153]:

```
print(ts_med_neg['text_len'].mean())
print(ts_med_neg['st_len'].mean())
```

```
62.440613026819925
20.436781609195403
```

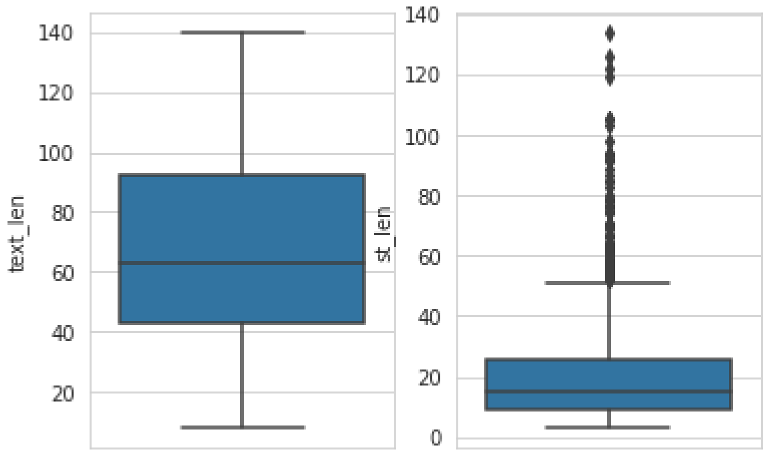
In [154]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_med_neg['text_len'].mean()-ts_med_neg['st_len'].mean())
```

```
Difference between text length and selected text length is 42.00383141762452
5
```

In [155]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_med_neg)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_med_neg)
plt.show()
```

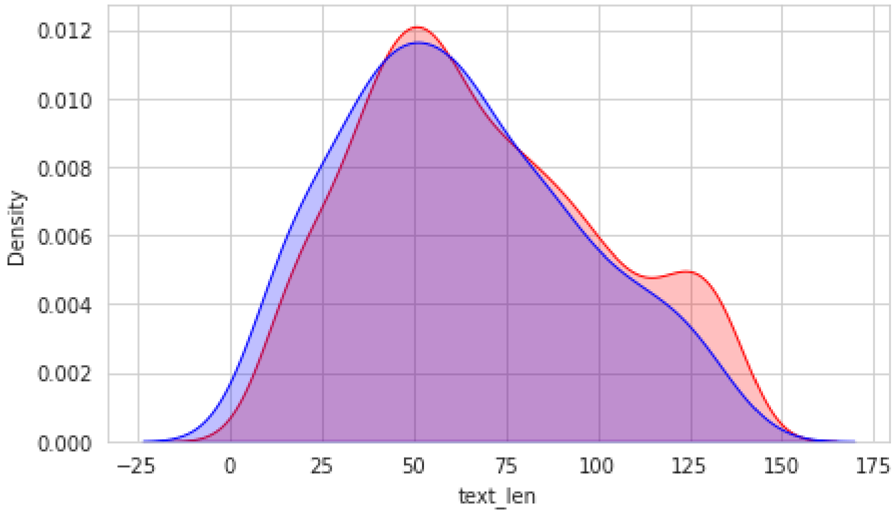


In [156]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_med_neg['text_len'], color='r', shade=True, Label='Train text length with lo
sns.kdeplot(ts_med_neg['text_len'], color='b', shade=True, Label='Test text length with low
```

Out[156]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4d19320>
```

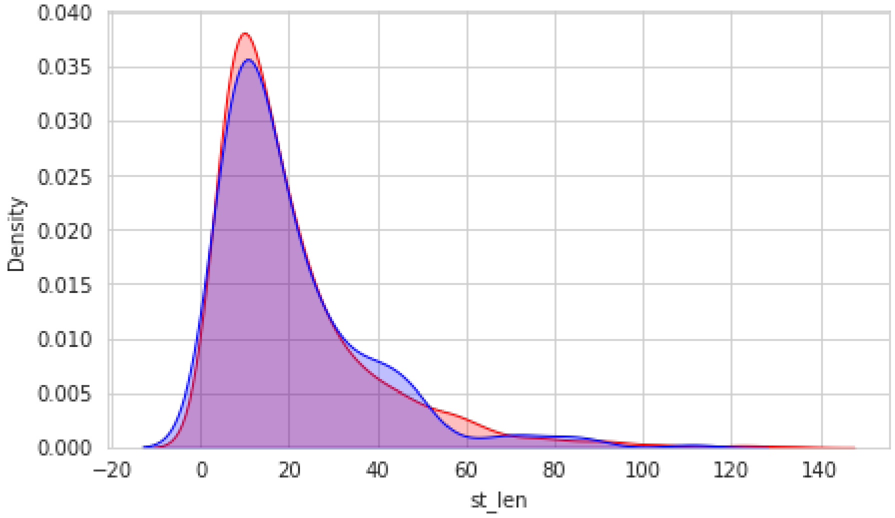


In [157]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_med_neg['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_med_neg['st_len'], color='b', shade=True, Label='Test text length with low j
```

Out[157]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4dca6a0>
```



In [158]:

```
tr_high_neg = train_negative[(train_negative['jaccard'] > 0.75)]
print(len(tr_high_neg))
tr_high_neg.head()
```

```
2250
```

Out[158]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_
0	bc4f254bdd	has burnt my hand on the cooker, it hurts	hurts	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	8.0	8.0	hurts	1.000000	
12	9928207c77	Wide awake. Wishing I wasn`t. **** nightshift ...	Wide awake. Wishing I wasn`t. **** nightshift ...	negative	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	18.0	Wide awake. Wishing I wasn`t. **** nightshift ...	0.947368	
26	5399d6cddd	Where art thou ? I miss you!	I miss you!	negative	[0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0]	4.0	6.0	I miss you!	1.000000	
40	29a9e34b8f	Will miss my baby for 2 days	Will miss my baby for 2 days	negative	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	1.0	6.0	miss my baby for 2 days	0.857143	
42	050721252d	Doubtful! It`s going to be on 24/2!	Doubtful!	negative	[1.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]	0.0	0.0	Doubtful!	1.000000	

In [159]:

```
print(tr_high_neg['text_len'].mean())
print(tr_high_neg['st_len'].mean())
```

```
61.54533333333333
20.088444444444445
```

In [160]:

```
ts_high_neg = test_negative[(test_negative['jaccard'] > 0.75)]
print(len(ts_high_neg))
ts_high_neg.head()
```

```
428
```

Out[160]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_len
3	4c8908e55c	Not any more.	Not any more.	negative	[1.0, 1.0, 1.0]	0.0	2.0	Not any more.	1.0	13
5	1b9afa81bf	Waiting for 5:00 & having cramps	cramps	negative	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0]	5.0	5.0	cramps	1.0	32
10	ac58a7a9d5	cuz airlines are super lame.	lame.	negative	[0.0, 0.0, 0.0, 0.0, 1.0]	4.0	4.0	lame.	1.0	28
19	e591a91118	it wont work for me	it wont work for me	negative	[1.0, 1.0, 1.0, 1.0, 1.0]	0.0	4.0	it wont work for me	1.0	19
43	ac4bbd801f	yeah, it`s gonna be rubbish!	rubbish!	negative	[0.0, 0.0, 0.0, 0.0, 1.0]	4.0	4.0	rubbish!	1.0	28

In [161]:

```
print(ts_high_neg['text_len'].mean())
print(ts_high_neg['st_len'].mean())
```

```
56.808411214953274
22.712616822429908
```

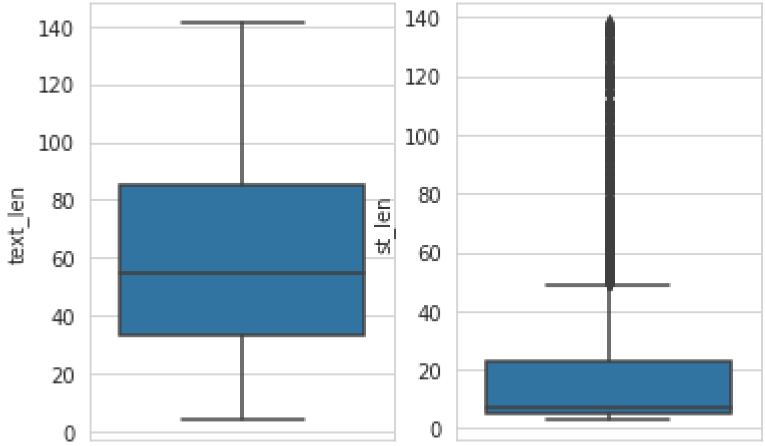
In [162]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_high_neg['text_len'].mean()-ts_high_neg['st_len'].mean())
```

```
Difference between text length and selected text length is 34.09579439252336
6
```

In [163]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_high_neg)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_high_neg)
plt.show()
```

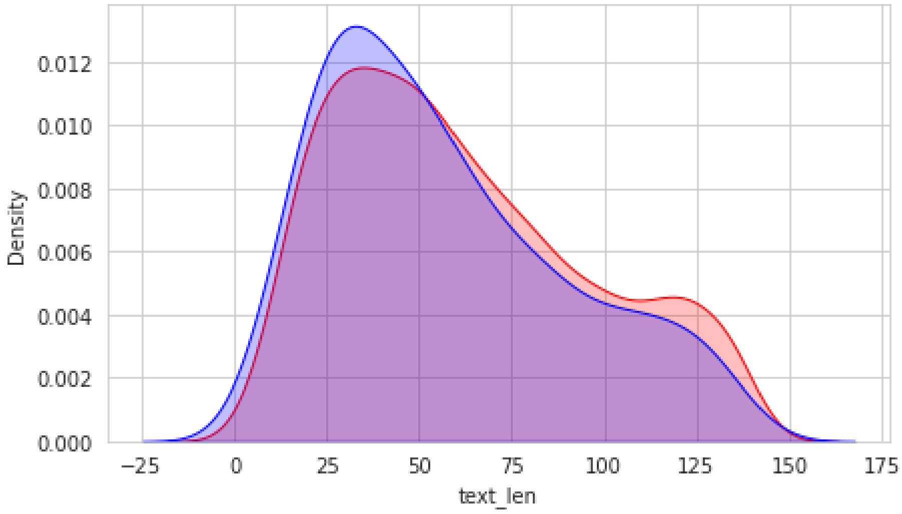


In [164]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_high_neg['text_len'], color='r', shade=True, Label='Train text length with l
sns.kdeplot(ts_high_neg['text_len'], color='b', shade=True, Label='Test text length with lo
```

Out[164]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4bd7b70>
```

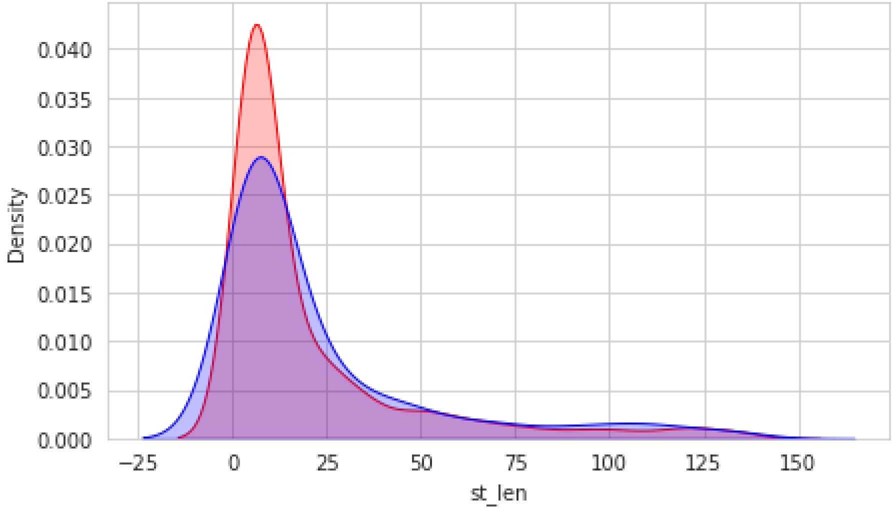


In [165]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_high_neg['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_high_neg['st_len'], color='b', shade=True, Label='Test text length with low
```

Out[165]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4c0f3c8>
```



Analyzing neutral texts

In [166]:

```
train_neutral=train_copy[train_copy.sentiment=='neutral']
train_neutral.head()
```

Out[166]:

	textID	text	selected_text	sentiment	labels	first	last	pred	ja
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	26.0	I`m going to try & get some sleep. I got work ...	0.9
3	f782648201	I am the queen of losing things. Important thi...	losing	neutral	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	losing	1.0
4	dd1b429fc1	i`m not ready for tomorrow`s competition!	i`m not ready for tomorrow`s competition!	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	5.0	i`m not ready for tomorrow`s competition!	1.0
5	18910017a3	Josette....where are you?? I looked across t...	Josette....where are you?? I looked across t...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	14.0	Josette....where are you?? I looked across the...	1.0
8	d45ad63346	YoYo door nazis refused me entry on account of...	YoYo door nazis refused me entry on account of...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	23.0	YoYo door nazis refused me entry on account of...	1.0

In [167]:

```
train_neutral.shape
```

Out[167]:

```
(8894, 9)
```

In [168]:

```
#train_neutral.drop(columns=['encoded_text'],inplace=True)
```

In [169]:

```
test_neutral=test_copy[test_copy.sentiment=='neutral']
test_neutral.head()
```

Out[169]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	8.0	okay i need to find another way then lolz	1.0000
6	f19b2cd94a	Ugh, I feel like ****-- gonna call out of my c...	Ugh, I feel like ****-- gonna call out of my c...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	17.0	Ugh, I feel like ****-- gonna call out of my c...	1.0000
7	bbd9c7c9c5	I`m so sorry to hear your bad news. I will se...	I`m so sorry to hear your bad news. I will se...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	22.0	I`m so sorry to hear your bad news. I will sen...	1.0000
9	6ccec768e2	definitely, or even just 'i`ll call you', they...	definitely, or even just 'i`ll call you', they...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	15.0	definitely, or even just 'i`ll call you', they...	0.8125
11	317e271cf3	Guitar lessons tomorrow. (I have to wake up e...	Guitar lessons tomorrow. (I have to wake up e...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	10.0	Guitar lessons tomorrow. (I have to wake up e...	1.0000

In [170]:

```
test_neutral.shape
```

Out[170]:

```
(2224, 9)
```

In [170]:

```

```

In [171]:

```
#test_neutral.drop(columns=['encoded_text',],inplace=True)
```

In [172]:

```
test_neutral.head(2)
```

Out[172]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	8.0	okay i need to find another way then lolz	1.0
6	f19b2cd94a	Ugh, I feel like ****-- gonna call out of my c...	Ugh, I feel like ****-- gonna call out of my c...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	17.0	Ugh, I feel like ****-- gonna call out of my c...	1.0

In [173]:

```
train_neutral['text_len']=train_neutral.apply(text_len,axis=1)
train_neutral['st_len']=train_neutral.apply(text_len1,axis=1)
test_neutral['text_len']=test_neutral.apply(text_len,axis=1)
test_neutral['st_len']=test_neutral.apply(text_len1,axis=1)
```

```
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:1: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  """Entry point for launching an IPython kernel.
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:2: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)

/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:3: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  This is separate from the ipykernel package so we can avoid doing imports
 until
/usr/local/lib/python3.6/dist-packages/ipykernel_launcher.py:4: SettingWithC
opyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/
stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pand
as.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-v
ersus-a-copy)
  after removing the cwd from sys.path.
```

In [174]:

```
train_neutral.head(2)
```

Out[174]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_len
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	26.0	I`m going to try & get some sleep. I got work ...	0.961538	137
3	f782648201	I am the queen of losing things. Important thi...	losing	neutral	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	losing	1.000000	79

In [175]:

```
print(train_neutral['text_len'].mean())
print(train_neutral['st_len'].mean())
```

```
64.86979986507758
62.86215426129975
```

In [176]:

```
test_neutral.head(2)
```

Out[176]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_len
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	8.0	okay i need to find another way then lolz	1.0	41
6	f19b2cd94a	Ugh, I feel like ****-- gonna call out of my c...	Ugh, I feel like ****-- gonna call out of my c...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	17.0	Ugh, I feel like ****-- gonna call out of my c...	1.0	90

In [176]:

```

```

In [177]:

```
tr_low_neu=train_neutral[train_neutral.jaccard<=0.4]
tr_low_neu.head()
```

Out[177]:

	textID	text	selected_text	sentiment	labels	first	last	pred
34	ca9df3b99e	There is a sadness in the air at school but I...	There is a sadness in the air at school but I...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	3.0	There is a sadness
45	1848ee74fe	-- yeahhh u wasnt thereeeeeeeeeee	#NAME?	neutral	[0.0, 0.0, 0.0, 0.0, 0.0]	0.0	4.0	-- yeahhh u wasnt thereeeeeeeeeee
87	dd2b941fef	[stapler haiku] Whar a Night! Woo Hoo! Yeah! /...	Whar a Night! Woo Hoo! Yeah! / A beautiful nig...	neutral	[0.0, 0.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	8.0	9.0	/ A
124	8658e3fed2	_GreenWizard ah ha! Cool, will look into that ...	_GreenWizard ah ha! Cool, will look into that ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	18.0	18.0	Thanks
130	7b1cba35d6	i wud do but im at work srry ****	i wud do but im at work srry	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 0.0]	7.0	8.0	srry ****

In [178]:

```
len(tr_low_neu[tr_low_neu.jaccard==0])
```

Out[178]:

```
23
```

In [179]:

```
len(tr_low_neu)
```

Out[179]:

```
723
```

In [180]:

```
print(tr_low_neu['text_len'].mean())
print(tr_low_neu['st_len'].mean())
```

```
78.09958506224066
70.18395573997233
```

In [181]:

```
ts_low_neu=test_neutral[test_neutral.jaccard<=0.4]
print(len(ts_low_neu))
ts_low_neu.head()
```

```
255
```

Out[181]:

	textID	text	selec
42	aa984895f6	Oh man, that`s rough. Sounded like the weeken...	that`s rough. Sounded like the week
96	adede39756	you look smashing darling is trent reznor rea...	you look smashing darling is trent rez
110	9bb6a384bd	had a good day but im now skint again	had a good day but im now sl
111	188d3cea0c	to cold for the beach sucky.	to cold for the bea
112	aa120f1755	http://naturalismo.files.wordpress.com/2008/01...	http://naturalismo.files.wordpress.com/2

In [182]:

```
print(ts_low_neu['text_len'].mean())
print(ts_low_neu['st_len'].mean())
```

```
73.70980392156862
66.26666666666667
```

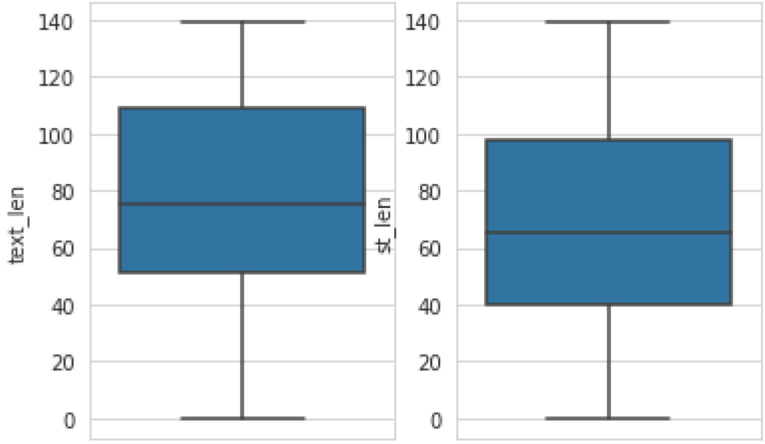
In [183]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_low_neu['text_len'].mean()-ts_low_neu['st_len'].mean())
```

```
Difference between text length and selected text length is 7.443137254901956
```

In [184]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_low_neu)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_low_neu)
plt.show()
```

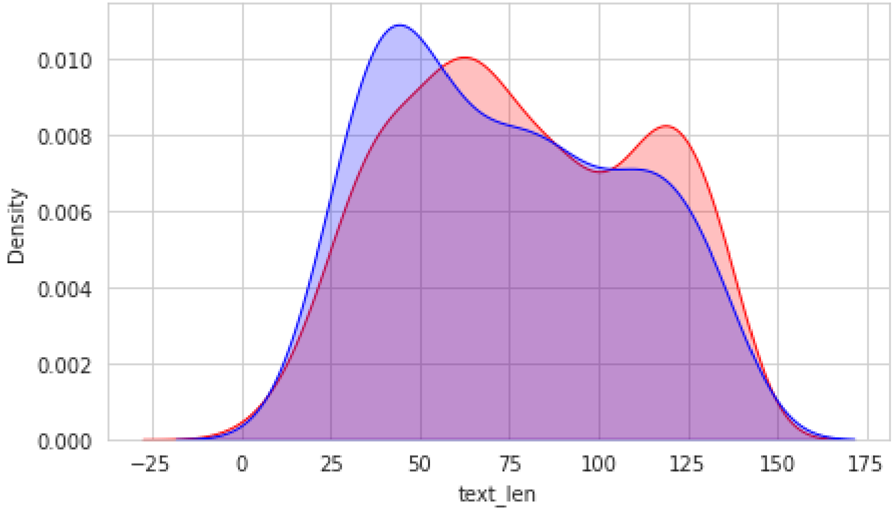


In [185]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_low_neu['text_len'], color='r', shade=True, Label='Train text length with lo
sns.kdeplot(ts_low_neu['text_len'], color='b', shade=True, Label='Test text length with low
```

Out[185]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e49c0dd8>
```

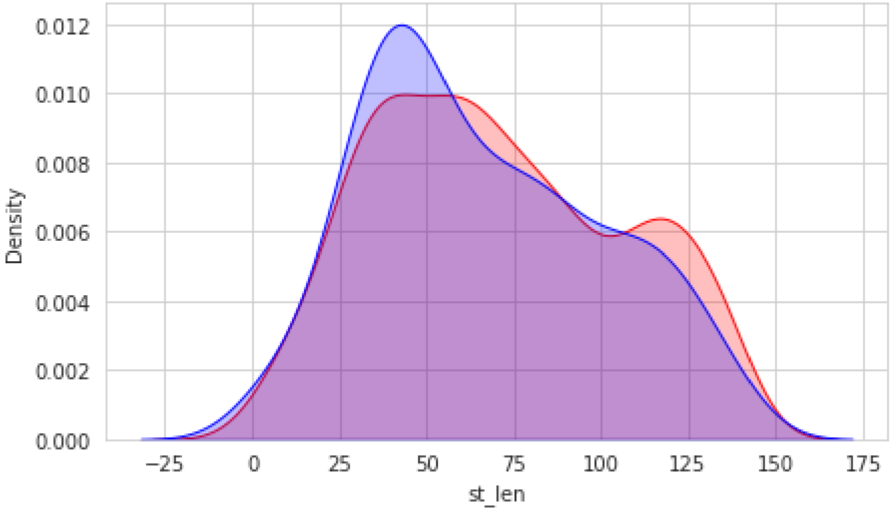


In [186]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_low_neu['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_low_neu['st_len'], color='b', shade=True, Label='Test text length with low j
```

Out[186]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4aaaeb8>
```



In [187]:

```
tr_med_neu = train_neutral[(train_neutral['jaccard'] > 0.4) & (train_neutral['jaccard'] <=
print(len(tr_med_neu))
tr_med_neu.head()
```

```
274
```

Out[187]:

	textID	text	selected_text	sentiment	labels	first	last	
140	f87ffde1b0	_mueller yes i love it its just a little bit ...	yes i love it its just a little bit complicated,	neutral	[0.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	1.0	21.0	yes i love little bit cc
252	a39a139223	just joined Twitter... Hiya world!	just joined Twitter... Hiya world	neutral	[1.0, 1.0, 1.0, 1.0, 0.0]	0.0	4.0	just joine
255	511eff412b	Crazy Legs is peepin _parks at the pool hahaha...	at the pool hahaha She likes graf writers, not...	neutral	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	16.0	Crazy Leg _parks
285	7a3f00a1fe	Tapit:E446WWHLLYAR TK3H6694PRMP 9R46TAHXEFKT p...	please @ reply me if you win! Thanks!	neutral	[0.0, 0.0, 0.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	12.0	Tapit:E446W TK3H6 9R46TAH
468	f98db090f7	This is a status update to twitter from ICE T...	This is a status update to twitter from ICE T...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	15.0	This is a sta to twitter frc

In [188]:

```
print(tr_med_neu['text_len'].mean())
print(tr_med_neu['st_len'].mean())
```

```
70.52189781021897
54.083941605839414
```

In [189]:

```
ts_med_neu = test_neutral[(test_neutral['jaccard'] > 0.4) & (test_neutral['jaccard'] <= 0.7
print(len(ts_med_neu))
ts_med_neu.head()
```

```
80
```

Out[189]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard
80	3c79a762ad	Going to Hong Kong tonight. Hope I can sleep i...	Going to Hong Kong tonight. Hope I can sleep i...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	5.0	20.0	Hope I can sleep in the airplane. Worth case I...	0.736842
216	e13be6452c	the #liesgirlstell and #liesboystell threads s...	the #liesgirlstell and #liesboystell threads s...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 0.0, ...	11.0	22.0	are screwed up and struggle to have real, hone...	0.526316
374	2224270b7e	watching 'slice of life' (laughing at the song...	watching 'slice of life' (laughing at the song...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	4.0	12.0	(laughing at the songgg) and then going to sleep	0.692308
555	7fc2b79810	Hope you get your car today Hate anything th...	Hope you get your car today Hate anything th...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	6.0	14.0	Hate anything that stops me from my work ;)	0.533333
645	8891f2aaa6	I`m going to be doing the FAFSA form today. I...	I`m going to be doing the FAFSA form today. I...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	10.0	26.0	hope to help out in the Ann Arbor / Detroit Me...	0.680000

In [190]:

```
print(ts_med_neu['text_len'].mean())
print(ts_med_neu['st_len'].mean())
```

```
73.9375
55.45
```

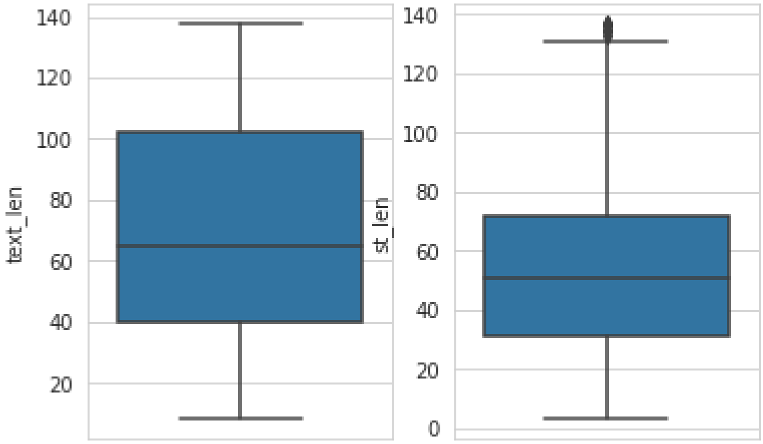
In [191]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_med_neu['text_len'].mean()-ts_med_neu['st_len'].mean())
```

```
Difference between text length and selected text length is 18.48749999999999
7
```

In [192]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_med_neu)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_med_neu)
plt.show()
```

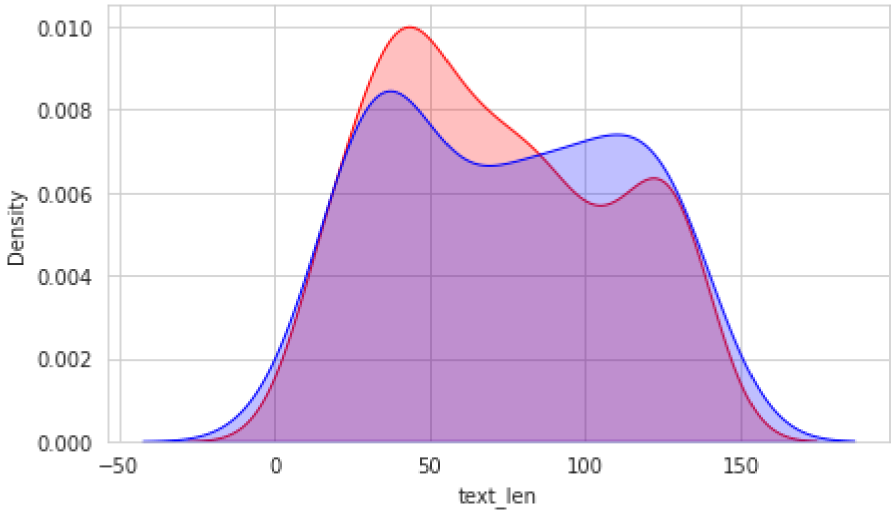


In [193]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_med_neu['text_len'], color='r', shade=True, Label='Train text length with lo
sns.kdeplot(ts_med_neu['text_len'], color='b', shade=True, Label='Test text length with low
```

Out[193]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4862cc0>
```

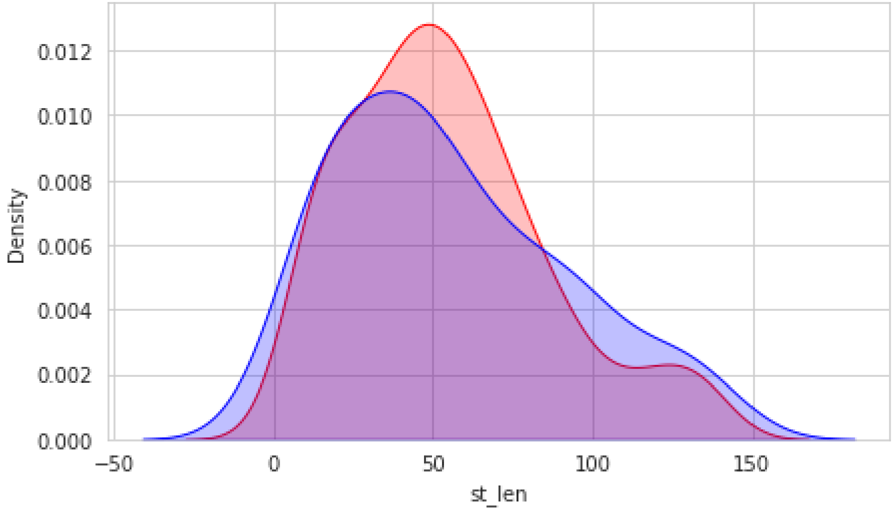


In [194]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_med_neu['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_med_neu['st_len'], color='b', shade=True, Label='Test text length with low j
```

Out[194]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e4837048>
```



In [195]:

```
tr_high_neu = train_neutral[(train_neutral['jaccard'] > 0.75)]
print(len(tr_high_neu))
tr_high_neu.head()
```

```
7897
```

Out[195]:

	textID	text	selected_text	sentiment	labels	first	last	pred	ja
1	8537872198	I`m going to try & get some sleep. I got work ...	I`m going to try & get some sleep. I got work ...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	26.0	I`m going to try & get some sleep. I got work ...	0.9
3	f782648201	I am the queen of losing things. Important thi...	losing	neutral	[0.0, 0.0, 0.0, 0.0, 0.0, 1.0, 0.0, 0.0, 0.0, ...	5.0	5.0	losing	1.0
4	dd1b429fc1	i`m not ready for tomorrow`s competition!	i`m not ready for tomorrow`s competition!	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	5.0	i`m not ready for tomorrow`s competition!	1.0
5	18910017a3	Josette....where are you?? I looked across t...	Josette....where are you?? I looked across t...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	14.0	Josette....where are you?? I looked across the...	1.0
8	d45ad63346	YoYo door nazis refused me entry on account of...	YoYo door nazis refused me entry on account of...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	23.0	YoYo door nazis refused me entry on account of...	1.0

In [196]:

```
print(tr_high_neu['text_len'].mean())
print(tr_high_neu['st_len'].mean())
```

```
63.46245409649234
62.49639103457009
```

In [197]:

```
ts_high_neu = test_neutral[(test_neutral['jaccard'] > 0.75)]
print(len(ts_high_neu))
ts_high_neu.head()
```

```
1889
```

Out[197]:

	textID	text	selected_text	sentiment	labels	first	last	pred	jaccard	text_
2	c8f88c6bc2	okay i need to find another way then lolz	okay i need to find another way then lolz	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0]	0.0	8.0	okay i need to find another way then lolz	1.0000	
6	f19b2cd94a	Ugh, I feel like ****-- gonna call out of my c...	Ugh, I feel like ****-- gonna call out of my c...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	17.0	Ugh, I feel like ****-- gonna call out of my c...	1.0000	
7	bbd9c7c9c5	I`m so sorry to hear your bad news. I will se...	I`m so sorry to hear your bad news. I will se...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	22.0	I`m so sorry to hear your bad news. I will sen...	1.0000	
9	6ccec768e2	definitely, or even just 'i`ll call you', they...	definitely, or even just 'i`ll call you', they...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	15.0	definitely, or even just 'i`ll call you', they...	0.8125	
11	317e271cf3	Guitar lessons tomorrow. (I have to wake up e...	Guitar lessons tomorrow. (I have to wake up e...	neutral	[1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, ...	0.0	10.0	Guitar lessons tomorrow. (I have to wake up e...	1.0000	

In [198]:

```
print(ts_high_neu['text_len'].mean())
print(ts_high_neu['st_len'].mean())
```

```
62.603493912122815
61.844891476971945
```

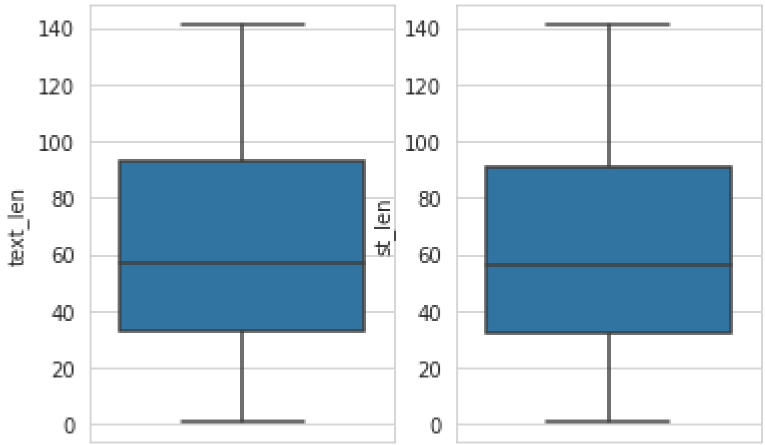
In [199]:

```
print('Difference between text length and selected text length is ',end='')
print(ts_high_neu['text_len'].mean()-ts_high_neu['st_len'].mean())
```

```
Difference between text length and selected text length is 0.758602435150869
8
```

In [200]:

```
#Objective: To see the range of text length individually for all the sentiments
sns.set_style(style="whitegrid")
plt.subplot(121)
sns.boxplot(y='text_len', data=tr_high_neu)
plt.subplot(122)
sns.boxplot(y='st_len',data=tr_high_neu)
plt.show()
```

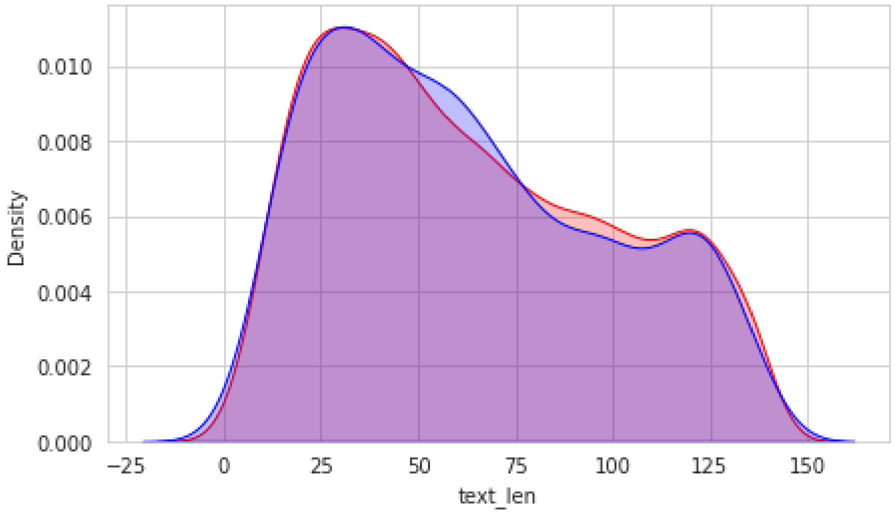


In [201]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_high_neu['text_len'], color='r', shade=True, Label='Train text length with l
sns.kdeplot(ts_high_neu['text_len'], color='b', shade=True, Label='Test text length with lo
```

Out[201]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e46d5b70>
```

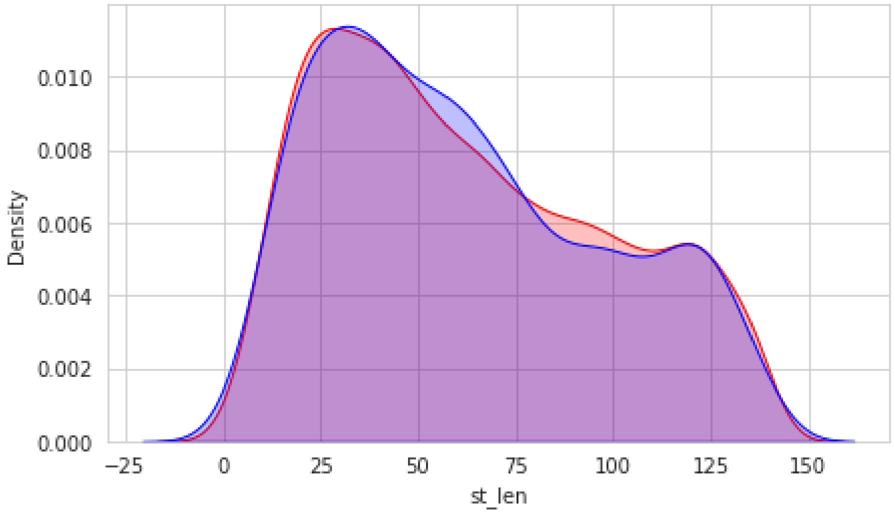


In [202]:

```
#Objective: To see the distribution of length of the texts
plt.figure(figsize=(7,4))
sns.kdeplot(tr_high_neu['st_len'], color='r', shade=True, Label='Train text length with low
sns.kdeplot(ts_high_neu['st_len'], color='b', shade=True, Label='Test text length with low
```

Out[202]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fc4e466e160>
```



Clearly, the model is struggling for tweets where the length of the text is long and the selected text is small.