

Transfer_Learning_binary_classification_new_data

May 14, 2019

1 Getting Started

This section sets up the environment for access to the Universal Sentence Encoder on TF Hub and provides examples of applying the encoder to words, sentences, and paragraphs. Tutorial followed: <https://www.dlology.com/blog/keras-meets-universal-sentence-encoder-transfer-learning-for-text-data/>

More detailed information about installing Tensorflow can be found at <https://www.tensorflow.org/install/>.

```
In [0]: # Install the latest Tensorflow version.
!pip3 install --quiet "tensorflow>=1.7"
# Install TF-Hub.
!pip3 install --quiet tensorflow-hub
!pip3 install seaborn
```

```
Requirement already satisfied: seaborn in /usr/local/lib/python3.6/dist-packages (0.9.0)
Requirement already satisfied: pandas>=0.15.2 in /usr/local/lib/python3.6/dist-packages (from s
Requirement already satisfied: numpy>=1.9.3 in /usr/local/lib/python3.6/dist-packages (from se
Requirement already satisfied: matplotlib>=1.4.3 in /usr/local/lib/python3.6/dist-packages (fr
Requirement already satisfied: scipy>=0.14.0 in /usr/local/lib/python3.6/dist-packages (from s
Requirement already satisfied: python-dateutil>=2.5.0 in /usr/local/lib/python3.6/dist-packages
Requirement already satisfied: pytz>=2011k in /usr/local/lib/python3.6/dist-packages (from pan
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/pytho
Requirement already satisfied: cycycler>=0.10 in /usr/local/lib/python3.6/dist-packages (from ma
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.6/dist-packages (fr
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.6/dist-packages (from python
Requirement already satisfied: setuptools in /usr/local/lib/python3.6/dist-packages (from kiwi
```

```
In [0]: import tensorflow as tf
import tensorflow_hub as hub
import matplotlib.pyplot as plt
import numpy as np
import os
import pandas as pd
import re
import seaborn as sns
```

```
WARNING: Logging before flag parsing goes to stderr.
W0514 09:15:35.634165 140515327711104 __init__.py:56] Some hub symbols are not available because
Using TensorFlow backend.
```

```
In [0]: # Import the Universal Sentence Encoder's TF Hub module
embed = hub.Module(module_url)
```

```
W0514 09:15:46.538287 140515327711104 deprecation.py:323] From /usr/local/lib/python3.6/dist-packages/tensorflow/python/training/training_util.py:110: create_session (from tensorflow.python.training.training_util) is deprecated and will be removed in a future version.
Instructions for updating:
Colocations handled automatically by placer.
```

```
In [0]: df.head()
```

	class
0	1
1	1
2	1
3	1
4	0

2

```
In [0]: df_test.columns = ["label", "text"]
```

```
In [0]: df_test.head()
```

```
Out[0]:
```

	label	text
0	1	As of March 13th , 2014 , the booklet had been...
1	1	Thank you in advance. :) Download the youtube...
2	1	In order to help increase the booklets downloa...
3	1	(Simply copy and paste the following text int...
4	0	Click below for a FREE download of a colorfull...

```
In [0]: df_test.label = df_test.label.astype('category')
```

```
/usr/local/lib/python3.6/dist-packages/pandas/core/generic.py:5096: SettingWithCopyWarning:
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: http://pandas.pydata.org/pandas-docs/stable/indexing.html
self[name] = value
```

```
In [0]: category_counts = len(df_test.label.cat.categories)
category_counts
```

```
Out[0]: 2
```

```
In [0]: def UniversalEmbedding(x):
        return embed(tf.squeeze(tf.cast(x, tf.string)), signature="default", as_dict=True)
```

```
In [0]: input_text = layers.Input(shape=(1,), dtype=tf.string)
embedding = layers.Lambda(UniversalEmbedding, output_shape=(embed_size,))(input_text)
dense = layers.Dense(256, activation='relu')(embedding)
pred = layers.Dense(category_counts, activation='softmax')(dense)
model = Model(inputs=[input_text], outputs=pred)
model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
model.summary()
```

```
INFO:tensorflow:Saver not created because there are no variables in the graph to restore
```

```
I0514 09:17:29.306929 140515327711104 saver.py:1483] Saver not created because there are no variables to save
```

Layer (type)	Output Shape	Param #
input_1 (InputLayer)	(None, 1)	0
lambda_1 (Lambda)	(None, 512)	0

```
dense_1 (Dense)                (None, 256)                131328
-----
dense_2 (Dense)                (None, 2)                  514
=====
Total params: 131,842
Trainable params: 131,842
Non-trainable params: 0
-----
```

```
In [0]: df_train=pd.read_csv("labeled_data.csv")
```

```
In [0]: df_train.head()
```

```
Out[0]:
```

	Unnamed: 0	count	hate_speech	offensive_language	neither	class	\
0	0	3	0	0	3	2	
1	1	3	0	3	0	1	
2	2	3	0	3	0	1	
3	3	3	0	2	1	1	
4	4	6	0	6	0	1	

```

                                tweet
0  !!! RT @mayasolovely: As a woman you shouldn't...
1  !!!!! RT @mleew17: boy dats cold...tyga dwn ba...
2  !!!!!!! RT @UrKindOfBrand Dawg!!!! RT @80sbaby...
3  !!!!!!!! RT @C_G_Anderson: @viva_based she lo...
4  !!!!!!!!!!!!!!! RT @ShenikaRoberts: The shit you...
```

```
In [0]: df_train=df_train[["class", "tweet"]]
df_train.columns=["label", "text"]
```

```
In [0]: hate=df_train[df_train.label==0]
offensive=df_train[df_train.label==1]
```

```
In [0]: print(len(hate), len(offensive))
```

```
1430 19190
```

```
In [0]: hate=hate.sample(frac=1)
offensive=offensive.sample(frac=1)
```

```
In [0]: new_hate=hate[:min(len(hate), len(offensive))]
new_off=offensive[:min(len(hate), len(offensive))]
```

```
In [0]: new_hate = new_hate.append(new_off)
df_train=new_hate
```

```
In [0]: train_text = df_train['text'].tolist()
train_text = np.array(train_text, dtype=object)[: , np.newaxis]

train_label = np.asarray(pd.get_dummies(df_train.label), dtype = np.int8)
```

```
In [0]: train_text.shape
```

```
Out[0]: (2860, 1)
```

```
In [0]: train_label.shape
```

```
Out[0]: (2860, 2)
```

1.1 Train Keras model and save weights

This only train and save our Keras layers not the embed module' weights.

```
In [0]: with tf.Session() as session:
        K.set_session(session)
        session.run(tf.global_variables_initializer())
        session.run(tf.tables_initializer())
        history = model.fit(train_text,
                            train_label,
                            validation_split=0.2,
                            epochs=15,
                            batch_size=32)
        model.save_weights('./model.h5')
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/tensorflow/python/ops/math_ops.py:
Instructions for updating:
Use tf.cast instead.
```

```
W0514 09:17:37.663952 140515327711104 deprecation.py:323] From /usr/local/lib/python3.6/dist-p
Instructions for updating:
Use tf.cast instead.
```

Train on 2288 samples, validate on 572 samples

Epoch 1/15

2288/2288 [=====] - 5s 2ms/step - loss: 0.4777 - acc: 0.7614 - val_loss: 0.3996

Epoch 2/15

2288/2288 [=====] - 2s 909us/step - loss: 0.3996 - acc: 0.8169 - val_loss: 0.3844

Epoch 3/15

2288/2288 [=====] - 2s 919us/step - loss: 0.3844 - acc: 0.8252 - val_loss: 0.3716

Epoch 4/15

2288/2288 [=====] - 2s 913us/step - loss: 0.3716 - acc: 0.8387 - val_loss: 0.3621

Epoch 5/15

2288/2288 [=====] - 2s 921us/step - loss: 0.3621 - acc: 0.8352 - val_loss: 0.3581

Epoch 6/15

2288/2288 [=====] - 2s 910us/step - loss: 0.3581 - acc: 0.8435 - val_loss: 0.3379

Epoch 7/15

2288/2288 [=====] - 2s 917us/step - loss: 0.3379 - acc: 0.8514 - val_loss: 0.3379

Epoch 8/15

```

2288/2288 [=====] - 2s 910us/step - loss: 0.3204 - acc: 0.8615 - val_
Epoch 9/15
2288/2288 [=====] - 2s 911us/step - loss: 0.3058 - acc: 0.8776 - val_
Epoch 10/15
2288/2288 [=====] - 2s 920us/step - loss: 0.2913 - acc: 0.8754 - val_
Epoch 11/15
2288/2288 [=====] - 2s 929us/step - loss: 0.2736 - acc: 0.8829 - val_
Epoch 12/15
2288/2288 [=====] - 2s 921us/step - loss: 0.2597 - acc: 0.8955 - val_
Epoch 13/15
2288/2288 [=====] - 2s 918us/step - loss: 0.2472 - acc: 0.8977 - val_
Epoch 14/15
2288/2288 [=====] - 2s 918us/step - loss: 0.2328 - acc: 0.9126 - val_
Epoch 15/15
2288/2288 [=====] - 2s 922us/step - loss: 0.2178 - acc: 0.9200 - val_

```

1.2 Make predictions

```
In [0]: sentences=df_test.text
```

```
In [0]: df_test.head()
```

```

Out[0]:   label      text
0      1  As of March 13th , 2014 , the booklet had been...
1      1  Thank you in advance. : ) Download the youtube...
2      1  In order to help increase the booklets downloa...
3      1  ( Simply copy and paste the following text int...
4      0  Click below for a FREE download of a colorfull...

```

```

In [0]: s=[]
        labels_test=[]
        for i in range(len(sentences)):
            if len(sentences[i].split())>2:
                s.append(sentences[i])
                labels_test.append(df_test.label[i])

In [0]: test_text = s
        # df_test['text'].tolist()
        new_text = np.array(test_text, dtype=object)[: , np.newaxis]
        # new_text=df_test.text
        with tf.Session() as session:
            K.set_session(session)
            session.run(tf.global_variables_initializer())
            session.run(tf.tables_initializer())
            model.load_weights('./model.h5')
            predicts = model.predict(new_text, batch_size=32)

```

```

Exception ignored in: <bound method BaseSession._Callable.__del__ of <tensorflow.python.client
Traceback (most recent call last):

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```
In [0]: df_test.label
```

```
In [0]: tf.confusion_matrix(labels_test, predict_labels)
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/tensorflow/python/ops/confusion_matrix_ops.py:126:
Instructions for updating:
Use tf.cast instead.
```

```
W0514 09:25:44.563770 140515327711104 deprecation.py:323] From /usr/local/lib/python3.6/dist-packages/tensorflow/python/ops/confusion_matrix_ops.py:126:
Instructions for updating:
Use tf.cast instead.
```

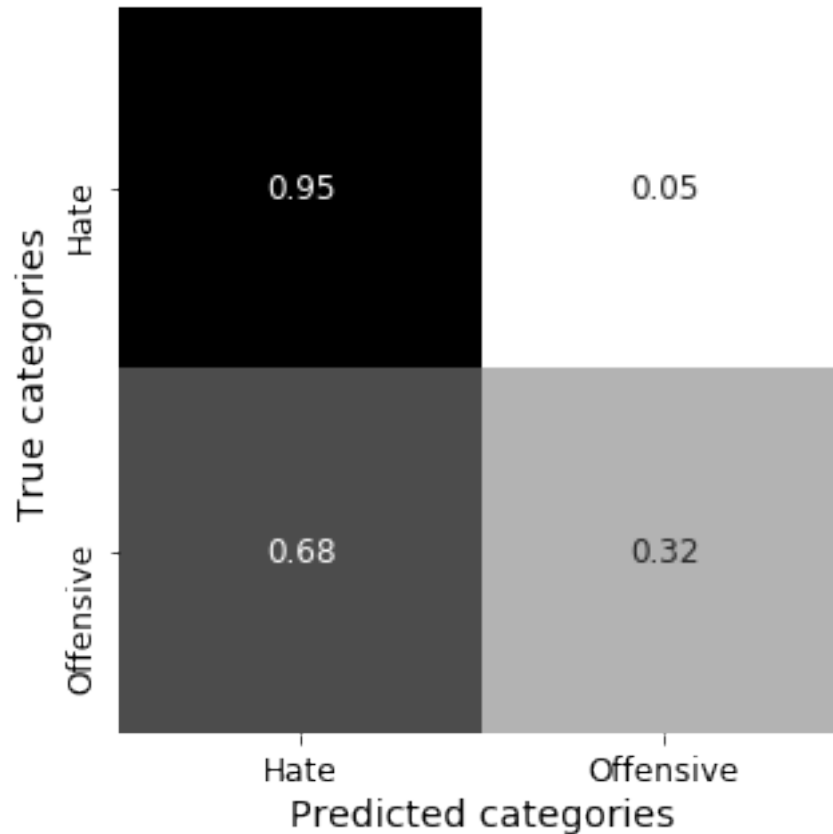
```
Out[0]: <tf.Tensor 'confusion_matrix/SparseTensorDenseAdd:0' shape=(2, 2) dtype=int32>
```

```
In [0]: from sklearn.metrics import classification_report
report = classification_report(labels_test, predict_labels)
```

```
In [0]: print(report)
```

	precision	recall	f1-score	support
0	0.15	0.95	0.26	1196
1	0.98	0.32	0.48	9288
micro avg	0.39	0.39	0.39	10484
macro avg	0.57	0.64	0.37	10484
weighted avg	0.89	0.39	0.46	10484

```
In [0]: import seaborn
from sklearn.metrics import confusion_matrix
confusion_matrix = confusion_matrix(labels_test, predict_labels)
matrix_proportions = np.zeros((2,2))
for i in range(0,2):
    matrix_proportions[i,:] = confusion_matrix[i,:]/float(confusion_matrix[i,:].sum())
names=['Hate','Offensive']
confusion_df = pd.DataFrame(matrix_proportions, index=names, columns=names)
plt.figure(figsize=(5,5))
seaborn.heatmap(confusion_df,annot=True,annot_kws={"size": 12},cmap='gist_gray_r',cbar=
plt.ylabel(r'True categories',fontsize=14)
plt.xlabel(r'Predicted categories',fontsize=14)
plt.tick_params(labelsize=12)
```



1.3 Insample predictions

```
In [0]: new_text = list(df_train.text)
        new_text = np.array(new_text, dtype=object)[: , np.newaxis]
        with tf.Session() as session:
            K.set_session(session)
            session.run(tf.global_variables_initializer())
            session.run(tf.tables_initializer())
            model.load_weights('./model.h5')
            predicts = model.predict(new_text, batch_size=32)
```

Exception ignored in: <bound method BaseSession._Callable.__del__ of <tensorflow.python.client

Traceback (most recent call last):

File "/usr/local/lib/python3.6/dist-packages/tensorflow/python/client/session.py", line 1455

self._session._session, self._handle, status)

File "/usr/local/lib/python3.6/dist-packages/tensorflow/python/framework/errors_impl.py", line

c_api.TF_GetCode(self.status.status))

tensorflow.python.framework.errors_impl.CancelledError: Session has been closed.

```

In [0]: categories = df_test.label.cat.categories.tolist()
        predict_logits = predicts.argmax(axis=1)
        predict_labels = [categories[logit] for logit in predict_logits]
        predict_labels

In [0]: tf.confusion_matrix(df_train.label, predict_labels)

Out[0]: <tf.Tensor 'confusion_matrix_1/SparseTensorDenseAdd:0' shape=(2, 2) dtype=int32>

In [0]: from sklearn.metrics import classification_report
        report = classification_report(df_train.label, predict_labels)

In [0]: print(report)

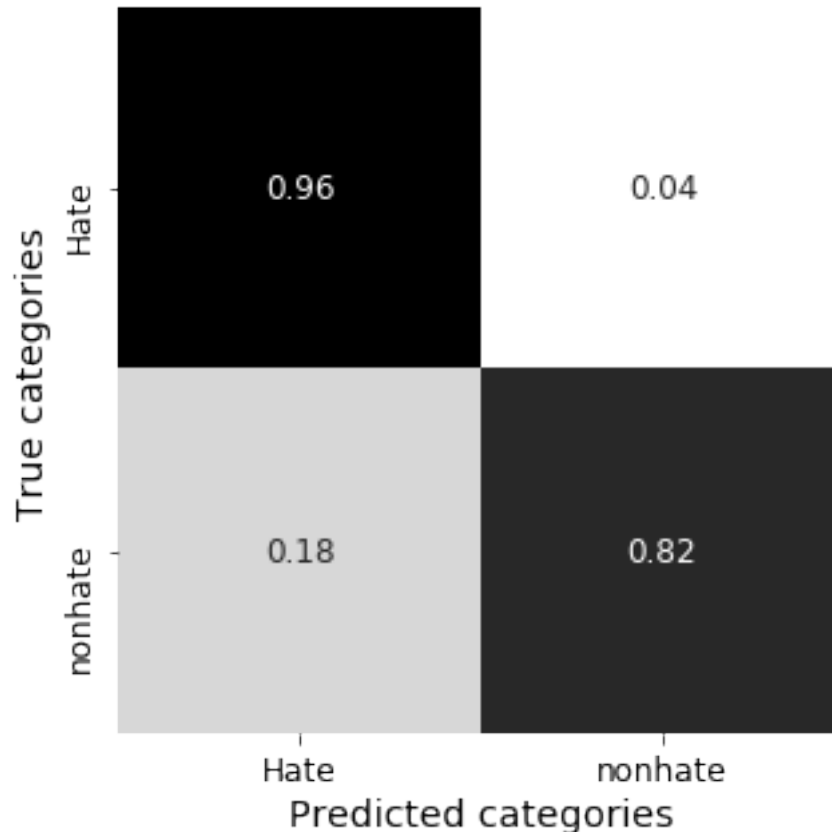
```

	precision	recall	f1-score	support
0	0.84	0.96	0.90	1430
1	0.96	0.82	0.88	1430
micro avg	0.89	0.89	0.89	2860
macro avg	0.90	0.89	0.89	2860
weighted avg	0.90	0.89	0.89	2860

```

In [0]: import seaborn
        from sklearn.metrics import confusion_matrix
        confusion_matrix = confusion_matrix(df_train.label, predict_labels)
        matrix_proportions = np.zeros((2,2))
        for i in range(0,2):
            matrix_proportions[i,:] = confusion_matrix[i,:]/float(confusion_matrix[i,:].sum())
        names=['Hate','nonhate']
        confusion_df = pd.DataFrame(matrix_proportions, index=names,columns=names)
        plt.figure(figsize=(5,5))
        seaborn.heatmap(confusion_df,annot=True,annot_kws={"size": 12},cmap='gist_gray_r',cbar=
        plt.ylabel(r'True categories',fontsize=14)
        plt.xlabel(r'Predicted categories',fontsize=14)
        plt.tick_params(labelsize=12)

```



We see that while the out of sample recall is low, the model gives high precision. Apart from that, in sample metrics are pretty good. This is probably because the model is overfitting (we can also see this from fluctuating validation accuracies in the training step). To tackle this we need to either increase the dataset size(make it more diverse) or reduce the complexity of the model or include dropout. In our opinion, it would be a good idea to make the dataset more diverse by including small datasets of various types of hate,

```
In [0]: misclassified=df_train[df_train.label!=predict_labels]
```

```
In [0]: said_nonhate=misclassified[misclassified.label==0]
```

```
In [0]: said_hate=misclassified[misclassified.label==1]
```

```
In [0]: #labelled as hate
        list(said_hate.text)
```

```
Out[0]: ['RT @Basedomg: im fukin yo bitch u mad as shit',
        '@whoelsebutkey you just a dark ie my nig.. It's ok..',
        '@Im_Thirst Shin's a faggot. I'm glad your chipped him.',
        '@DrMalvo \nI likes it back dare. It's free fo me cause whitey pay da fee",
        'RT @TacoPablo_: Rich dollaz always tryinna snatch a bitch. Like he a bitch &#128514;',
        '@max_dashevsky u and taber the shit coon',
```

'RT @KingCedd_: Hit the bitch nd forget the bitch, but i left my kids on her fuckin f
 "Can't stand ghetto ratchet ass mofos 👎😒",
 'Luke Bryan is such a faggot tool',
 "RT @__nijel: Niggas be out here loving ALL they hoes...that's a no no.",
 '@TomcatStraight Come over queer',
 'niggas stay with insides over some hoe shit',
 'RT @hiagokoury: Lmao what my nigga just told me 😂😂😂hoes theses
 "RT @bebalizz123: Bagging thot bitches & giving 'em head? Ew nigga you nasty &
 'RT @willyroast2: Ratchet hoes wear flip flops that curl up and turned black like soul
 'RT @ChaseMyChucks: "@viva_based: @CallME__Jetson hoe ass nigga. 😑"Hoe Ass Nig
 'darf retarded lol',
 'RT @HeIsMe_IAMHim: Cause lord know if another bitch call yo nigga handsome and he en
 'RT @lildurk_: How you wife dat bitch 2many niggas fucked from my clique 2many niggas
 'If a nigga is watching Love and HipHop instead of the playoffs he gay denna bitch',
 "Slut I ain't playin' go find a white crayon and color a fuckin zebra.",
 "“@badnradbrad: @whattheflocka @MorbidMermaid sydney's my favorite” she's a
 'RT @Queen_Quita_: 🎤😩I just touchdown on pussy nigga!',
 '@dantoomey2 forgot someone niglet',
 'RT @thecoreyholcomb: People who r mentally stable know when to beat their kids &
 '"@A7XDemery: I\'m a fucking fag they said"',
 '🚼🚼- you a little genius man i need you for a class so u can help a n
 'Thanks to my nigga coco I smell good then a hoe haha finna pull alllllllll the hoes, c
 '"Get your ass back to Detroit ya fuckin\' wigger!'",
 'Nigga fuck hoe , ion want fuck yo hoe , she a fat chick & she bad built 👐
 "RT @roach_nigga: “@XiaoBiniiMessy: Can't believe I actually killed a cockroach
 "I'm a wigger",
 "RT @ChrissiBaxter: If my man ain't appreciating me this pussy DEFINITELY IS gonna en
 "I'm not the type to fight no bitch over a nigga im the type to say fucc that & ta
 'RT @irieleee12: @drrrrruuu @Victoria_Finae ayyy what fags',
 'RT @chillvitooo: “@_KillSwitch: Nigga damn 😬😳 https://t.co/m7
 '@DrewHelms21 I know right so much retard',
 '“@DJZeeti: RT @DJZeeti: Black bitches turn 60 buy a hat and act like Jesus for
 'Smh ma niggah',
 'RT @DrummerKid0328: But if I run into that niggah imma let you know 💥㈝
 'Fruit 2 O? Who tf does WOHS think they are Trynna serv a nigguh dat lame shit',
 'Ya bitches dumb as fuck for the felon.',
 "FUCK YOU, you're a fucking a lowlife piece of trash.",
 "@BrendanSchaub @TimTebow ugh your with Tebow? You're officially a fag now and in fol
 'RT @savethesehos: Your bitch when my Skechers light up . http://t.co/vqLUSPYqm0',
 'RT @uncle_palacios: “@SheeeRatchet: "bitch ass nigga square up" 😂€
 'They some bitch ass niggas',
 'RT @hspiotta_21: c is for cunt\nu is for ur a cunt\nnn is for not sure u know this bu
 '@ThatAssholeAlan nick background my nigger',
 '@JacobBBacker faggot',
 "RT @scaffoldjocky: I'll never smoke weed with Willy again. He invited that hick, Tob
 'RT @haztv: Stop forcing ya kids to take these pictures u trying to trap niggas online
 'RT @WorldStarFunny: when you see a bitch nigga subtweet you http://t.co/ec10joVwg7',
 "RT @LizzardJurado: @b10oreo YESSS it's that one! Ooze! This nigguh! 😂😂

"Am sorry I can't stand some black females especially the full breasted Africans
 '24_rozay_idgt mad cuz Twan fuck his bitch😂 http://t.co/GoyZf0U46I',
 "This Uncle Tom mother fucking wants to invoke 3/5 a man in his speech? Dude you ain't
 'I l8v3 fuckin wit this nigga he getting all emotional he remind me of my bitch is tha
 'Niggas cant stand me cuz they bitches be feelin a nigga . Get mad at yo so called "g
 "How da fucc we gone believe that you out here selling bricks wit some Dirty ass kick
 '@JNunchuckfuck u can just ask him to suck his dick not that hard white trash',
 "you lil dumb ass bitch, i ain't fuckin wit chu!.. i got a million, trillion things i
 'Jon Stewart takes a crack at stupid teabagger moron Rick Perry and his gay/alcoholism
 'RT @andresdavid: Saying, "Who cares?" comes from a privileged position. May you never
 'RT @Milesss_: If u say #blessed u r hashtag lying and r probably unhappy w/ ur life :
 'RT @alec_tiano: @Vinnyrants Happy birthday fag boy',
 'I dont give a single shit who you are, if you wear a suit and white cotton socks I an
 'Code of slience pussy! HM nigga free my nigga ceddy. d ridah. quan. dollah. Dre n my
 'And them niggas pussies...cameltoes 😂',
 "RT @trvpgxdx: Jen: Bitch Daquan dropped your kids off today\n\nKeisha: Bitch I don't
 'RT @Now_Thats_Fresh: The club Promoter tweet "fucked another niggas bitch last night
 '@m_gast faggot',
 'RT @LoveLifeEst13: @West305 u look like an all black persian rug. . with no designs o
 "If u expect me to stop playin with niggas But u playin widd bitches I can't deal",
 'I wish I would argue with a nigga or a bitch imma just laugh at ya ass',
 'RT @CoryLafon: I just wanna b a side nigga to a thick pretty faced cuffed hoe that d
 'Stop hatin niggah , I got ya girlfriend callin you a hater niggah 😂😂,
 '@KodyMark1 hahahh thank you fag boy! #represent',
 'If u bad niggas a really play nice to get to the pussy then... that ass gone 😂
 'Missouri got them swag fags lmao',
 'RT if you fucked a bitch that fucked EVERY nigga in your state',
 'stupid ass hoe',
 "@Scottt3130 @Brantality @hunterxsfob I think he's retarded or somethin http://t.co/E
 "Fat bitches need love too I'll fuck em 💯💯",
 "@MrMooncricket @AtBlackface @UncleUnco @BobbyBotsods @FuckTheMallcops @RacistNegro69
 'RT @Tylar____: @1stBlocJeremiah lol why you tryna be raw doe bitch',
 '@TheRevAl you are not a cat.you are a pussy! black bored kid kills a cop by starting
 'Let a nigguh try me , fuck around fuck around fuck around meet his daddy',
 '@ItsmeKyleWayne Yeaa black bitches actin like they too good for an average nigga lik
 '@1SonofYahweh he aint a real nigger, oh my bad a real nigga, but praise the sonsof s
 '@seductiveally @sunstylesshinex oh now your bitch ass wants to reply back after 3 day
 '😂😂😂😂😂😂😂😂😂"@AlisaRenee
 "Or get they nails done RT @Che_TheYello1: Same hoes brag about niggas they fw got mor
 'RT @Faceyspace: Dorks are fucking bitch-magnets. Sorry.',
 'RT @SariyaDaniellee: “@JayJuice22: The nigga who got slept is a faggot if he s
 "RT @PinkDuckTwist: LMFAO WTF “@MakeMeSpazz: “@TheKingSimp: Niggas on her
 'Lmaooooo RT @savvgrace: bitches be like “relationship goals”…. Duml
 'I wonder who wrote that blog... Either a hoe dat let a few of them niggas beat to no
 '@Tamorite @The_Greatest_10 The truth hurts nigguh.',
 'If the world was free of sucka free it would be just me and my nigs left',
 "Going out with bad intension... Keep yo girlfriends inside, and I'm not just saying :
 'RT @Doestaxxx: Stop fuckin jail birds. RT"@_BRAT_: Niggas that\'s that serious about

'@jboii2: ima keep on giving these pussy ass niggas ah reason to hate !'',
 'I hate the f-ing bus, I hate the f-ing bus, high ho the dairy-0 I hate the f-ing bus'
 'I definitely cant FW a nigga that associates himself wit bitches I DONT fw 😂',
 'RT @semper_fiibitch: Farra from teen mom has 2 sex tapes on pornhub lmao hoe ass',
 'RT @PETTYfcknANN: gimmmmmie a hoodrat bitch',
 'Lmaoooo RT @Hand2DaHairline: His sister probably got the pussy that night RT @No_Cut',
 'Haley was called a raghead & accused of adultery and she skyrocketed in the poll',
 '@RFam2550 shut up faggot',
 'That ho went from darkskinned to mulatto RT @FunnyJulius: This fucked me up http://t',
 '@Shmalec13 chad reeds a fag he's a 5th kinda guy",
 '@dannycatsteve because it's fucking retarded?',
 'I name my niggas after nba playersmy nigga larry bird is a strait fuckin#shooter',
 'Happy Birthday nigguh keep your blunts fat and your cups filled :) @BigDaddySniper',
 "“@_BeautifulKeezy: these hoes be playing w/ me like I won't send baby Cain at t",
 "@QuantRyse @HairyPotterZ @Hockeypuck55 if I get blocked I'll be on that bitches porcl",
 '@ThatTallCashier lol youre retarded 😂',
 "Know why birds don't wear pants?\nCause their pecker's in the way",
 '"@trutherbot: does he look like a bitch?" @el_capacitor',
 '“@Chrissy_Cindy: "WAKA TAMMY JUST GOT HER ASS BEAT"... http://t.co/9in5IysnpI&',
 'RT @BlackRichyRich: Every nigga\nNew hoe is \nDa next niggas old hoe',
 'Raaaayciss bitch “@Sky_Max: Michelle Obama: African-Americans Should Vote for M',
 'RT @TooRacist: What type of eye make-up do redneck women use?\n\n NASCARA.',
 'swat to the twat',
 'If you LIKE #chocolate or #sodapop and you tweet bad about #HappyColumbusDay...YOU AL',
 "You still that nigga b don't trip. They just hatin cause they got no bitches RT @THEE",
 'I love Asian bitches',
 'Salute a real nicca http://t.co/3fOYAYwLWS',
 'RT @theHIGHESTpeak_: Ya lil dumb ass bitch ian fwy',
 "@tcthegreat1 it's yo fault taking a nig out everyday",
 'RT @LILBTHEBASEDGOD: That nerdy fat bitch yes sir she fucked " The BasedGod" - Lil B',
 '@JayKollsKSTP please tell those fuming cops that they are a bunch of coward little b',
 '@mistaturk5 @DaUnfuqwitabl1 nigga chill throw me in the jungle watch me come out wi',
 'A hoe nigga will not be tolerated,',
 'Why yes, functioning tho RT @blaaksuedepumps: Are you retarded?',
 '@Huntermoore fuck my wet pussy with ur huge cock',
 'What the fuck kind of redneck commercial was that???? #indycar',
 'Im a south side niggah fuck around fuck around',
 '“@_chrisbrazell: Fuck The Girls , Peep How He Change When A Nigga Squared Up A',
 "@TryHardAlby looks like you're gonna blow someone fag",
 'RT @kg4hunnid: Bruh you trash take yo ass back to college @GenoSmith7',
 '@SammySkinner hey nig',
 '@kieffer_jason wtf r u talking about I was in Plano tx what r u talking about pussy l',
 "@snoopaintlion @TreyzUpZay @DattBoiIraq @Eaaaazzzz Lmao nigga yo avi so trash my pho",
 '@sorryimalex slay his ass alex, lil bitch needs to tighten the fuck and needs to stop',
 "RT @Ivan_splash: If a guy flirts with ya girl that's just niggas being niggas. If she",
 'U on the hit list to bitch kill yo self',
 "RT @eemoneee: I wish a bitch would tell me something that I don't know about MY nigg",
 'Whats wrong w/ this marie hibben bitch..',

'@t__amil i tell it how it is if yu ain uh bitch or uh hoe i call yu by yo name',
 '“@OsmanMasabah: Spitting on people just shows you weren't raised right. In ano
 'RT @BitchNiggaAlexx: Bitches be talking about they ride or die with every nigga they
 'Niggas be bitches hoes be bitches ion see no difference',
 '“@LongMoneyTonyy: @vintage_monroe_ DONT Say Shit Else ! Just Stfu !”bitch
 'RT @khloewithoutheC: @TypicalMinions: when ur with ur friend and a bitch u both hate
 'RT @JaredLambert21: Brandon's a dumb fat chunky whore",
 'It\'s not "unique" it\'s ghetto as hell.',
 '@That1guyJeff Low blow, cuntface. How many times the Yanks beat us in the playoffs t
 'Fuk u bitch <http://t.co/YezHxQVy02>',
 'RT @DezDLT: "I play soccer, cheat on girls, and wear khaki coloured cargos" haircut l
 '"Stop looking us and go eat some pussy, you yuppie fucks."',
 '@WyattNuckels fuck you bitch smd',
 'Nigga pee wee is a bitch',
 '"@ChandlerParsons: How bout them Cowboys!!!!" Shutup pussy',
 '@maddieevaans @felicity182 "us english" it\'s our go learn grammar u dick sucking ho
 "I've been tryin to tell niggas RT @_nicarrag Lesbian porn have the finest bitches",
 '"I KNOW my shoes dirty as fuck, whatever, bitch. You don\'t have to call!"\n\nLike, r
 'RT !! @6oysLoveKeena: I will never EVER EVER give a nigga my all unless I know for a
 'RT @SunFlowerTrue13 @ThoughtsOfRandy Im speaking on Ho niggas + hoe niggaz probably c
 "I'm from #SouthChicago so I know it's bad but...bitch, it ain't like you live in Eng
 "@justeezzzee nigga what bitch I'm talking bout boxing can u read?",
 'See... he already know he a faggot lmao',
 "@justeezzzee your so fucking ignorant u talk a lot shit for someone who don't wanna f
 'RT @Taylor_1017: Thanks for ignoring me faggots. I'm locked outside @A_Mitchell1113
 "I can't stand a snobby stuck up bitch",
 'Driving the fucktardmobile - tranny slips and all. 😒 <http://t.co/8e3kXEgMjo>'
 'RT @DamonIWantYou: #TVD and #Theoriginals is the shows bad ass Vampires turn into sp
 '@Orangeone4 @SteveWorks4You..biggest liars ever ...republican teabagger asshats like
 "Still can't see what niggers see in them white hoes...",
 'What a fucking retard',
 '"@Gotti_LTF: Happy Bday Bitch Ass Nigga @JetsAndASwisher"preciate that bitch roll up
 '@thecoreyholcomb "s/o the fat bitches who ride dick with a t-shirt on" 😂€
 'RT @WORLDSTARH1PHOP: If a Nigga try to slide in my bitch DMs.. <http://t.co/Mr2FjYUGT>
 '@RoyallyKate So says the one who fills an empty hole inside herself by worshiping a
 'RT @xtruthseekerx_: @NotoriousBeep blaxican',
 '@BrotherDiabeats take your queer ass dubstep out of here',
 'RT @RakwonOGOD: Rare pic of trash posing with trash <http://t.co/usGIAZSDWv>',
 'Every Psychology class has that annoying cunt who relates everything to herself just
 '@SoTrippyWhit remember that African bitch we used to work with at CMI?!',
 'I hope you realize that your both retarded',
 'RT @omfgmeezy: maybe \n\nnobody \n\nlikes \n\nyou \n\nbecause \n\nyou're \n\nna \n\nnb
 'sprayed da vee wit peppermint oil hopefully dat fuckin spider leaves or dies.. I hop
 'RT @josephdburns34: Damn girl u is a straight hoe!😂😂😂',
 '@DoubleAIV just watch bitch nigga u gonna want the whole team dead',
 'It wus yo fat ass that filled out the application to work there, not me bitch...',
 '@Pretty_WarZone shouldve caught it the first time nigger',
 'RT @djevilone: stupid ignorant bitch “@SarahPalinUSA: Stopped by Chick-fil-A in

'RT @gabellini: @LifeNewsHQ not surprised stupid bitch@Jane Fonda #American troops Viet
 'Pic so confusing.. Looks like a dyke, but has a hoe pooci.. «@Datjollygirl “
 'Dez is caked up with some bitch or something cause hes not playing like Dez Bryant',
 'RT @NoelleonFOX7: Protestors rally to support teen facing life sentence in pot brown.
 'Red bitch with me dark skin friend callin talkin bout come and get me',
 'RT @ItsSonGoku: Don't Get Spirit Bombed Lil Nigga RT @LeanandCuisine: Dragonball z tr
 'RT @___TheFuckery: "@187X0_: \' You messin with broke niggahs you gon be broke niggah
 'Pisses me off so much when Brett screams fag or whore out the window at people',
 'RT @makenzies_mask: Yo bitch, what cho name bitch? I wanna fuck ya bitch. -Jacey (the
 'My mom told me never use the word cunt... ITS MY FAVORITE WORD!!! Cunt cunt cunt cunt
 'Choate Chokes On Twinkies> All the damn time I bet. #lol #Cardinals',
 'RT @thirlrection: I will fight a bitch for Austin that's my gringo right there ain't
 'That nigga john ain't ah Real older nigga Forreal.. He let Vick brotha bitch out on r
 '@kieffer_jason bitch u describe both of those terms',
 '@LaneBelgarde shut up bitch',
 '@RavenPeltier_ @Jesuslovinj @_B_R_Y_C_E_ still a bitch though',
 "#DegenerateArtist Isn't a bitch walks back his words> Isn't a WITCH who questions
 'Lol faggot team pipe "beef"',
 'I hope you all accidentally get a fat black bitch pregnant',
 '@ajam never happen. Too much republican redneck oil money. Sad butt true. #corruptAm
 'This hoe car smell like nigga let off a sweet potato bomb in her shit!',
 'I be seein you bitches in the whip wit your boyfriend but he be lookin like your dad
 '@BloggerBoxing @Studhardt22 the Jacob and Joshua picks have been very similar. As the
 'I love faggots!!! Absolutely love them, especially the ones that can dress to the tee
 'Face only yo bitch could love <http://t.co/OckXAYthAK>',
 '@marcostc_ you're right momma ain't raise no faggot",
 'OMG> I was throwing beer bottles on street and yelling at drunk homeless people to
 '@alammus @wesideconnect @ArbitraryDesign @Damn_Jehu @michaelsayeth fellow anarchists
 'Smack these hoes on they ass like we birthed these bitches',
 '@VAKILL shut up faggot, you and Ras need to make an album together, we'll Ras fell o
 'RT @FreeLaddin: This is what happens when niggas gas up ugly bitches <http://t.co/dfK>
 "You can ask if I fucked a bitch but can't ask how my Father's Day was?!! ... These h
 "Haha a private industry birthday is needed to all who have celebrated our bday the p
 'quote this with your best racist comment i need them for this white bitch comin at m
 'RT @_xMaiya_xMonike: What's the difference between a main & a side bitch ?? Shit
 'What a Dirty Girl! Haha  #cat #pussy #pets <http://t>.
 '@jayswaggkillah is a fag',
 "I just don't get why none of you people talk back to me..i guess you follow me for t
 '@JunDishes block or mute the cunt',
 'RT @SEMAJ_HOEE_: “@tiffanyluxride: Damn so many fake niggas & bitches“
 'Flag bitch 🚩GHAT DAMN... WE NIGHT AS WELL BE PLAYING AGAINST THE FLAG, SHIT!
 "“@sc_waters: “@what_evaittakes: Ya niggas play to fuck my niggas play fo
 "You're irrelevant, bitch",
 "@aschops absolutely agree with that statement. It's just so amusing how angry it mak
 '@mynamesahmed @tonyrOckyhorror I rather go choke on your moms bomb pussy',
 '#TheMostAnnoyingThingsInLife people who are NEVER happy and bitch-n-moan 100% of the
 'RT @NikoWavy: If you know yo pussy smells like death why tf would you sit there an l
 "@ChrisHeben you motherfuckin' bullshit slingin' son of a whore! you disgraced all ve

"@Jobbe03 @PandaEnchilada You're such a bitch Carlton. You're lucky your fathers a ju
 "RT @Ra_Shia: Quotable RT @ChrissiBaxter: If my man ain't appreciating me this pussy l
 "RT @BeYouTiful_Pris: Recognize that I'm a star player & leave them hoe fans of y
 'Who da fuck is yo? Idk niggah',
 '"@_rapdreams: bitches hold they nigga down when he get locked up... but if a nigga g
 'It aint nun to cut dat bitch off 💇🔫✌️',
 'RT @CzarofSwag: To the retards chanting USA at the FC Dallas game, Kansas is in the U
 "RT @KingCurtisJayy: Ugly hoes love to fight lmao . They ain't got none to lose €
 "If your parents let you drink underage, they're fucking retarded and so are you.",
 '“@_BunnyCocaine_: Oomf a hoe hopper 😂😂😂” ㇬
 'Butler Unchained Review <http://t.co/HXyYUjmOrm> Short version, whitey sucks and a pote
 "' You messin with broke niggahs you gon be broke niggah 󾭻󾭻󾭻
 '@sorryimnicki that would be a joint then retard',
 'RT @LouieVRee: If that nigga Santa come to the hood niggas gonna rob him for his sle

```
In [0]: #is hate but didnt get classified as one
        list(said_nonhate.text)
```

```
Out[0]: ["RT @jezzzzz_: &#8220;@Ginga_Snaps13: @jezzzzz_ @ShitPussiesSay Jessica I'm not afraid t
'RT @Fit4LifeMike: @Whitecholo23 @chanelisabeth true i need to sleep to make them Gain
"@TheErnie You're a little bitch.",
'RT @_ChickenGeorge: DEAD!!&#128128;&#8220;@Takeme2CHINA: &#128553; RT @PEagles14: Wh
'First thing I do when I hit the lotto is buying @moniqueeedavis two fat bitches and v
'"@jgabssss: Stacey Dash won &#128166; http://t.co/PDLG46rjOL" baddest bitch evaaaa',
"&#8220;@TP_Three: @WestSideFlee @KekePalmer damn they got wifey &#128561;&#128561;&#
'I like taking niggas hoes but I stop doing that &#9995;',
'RT @SAMMI_boyden: Fucking James tried to tell me Jawga Boys sucked. I went ape shit o
'RT @kiddsmypyt: You have a new boyfriend every week.. Tf you doin hoe?',
'@NOT_UR_BRO @niccol3_xo lmao nigga shoulda said I would be balless bc dat cold bitch
"@_cblaze @Barbod6FCB @ODDBEAST Man bitch am not gonna do a damn thang, if u don't lil
"RT @GMB_Ace: I'm a Get Money nigga So da hoes Love me",
'@KingHov1313 i got a dyke wit a child as whse mgr, and she jus hired another girlboy
"Lmao! You niggas regionally picky about hoes now. Just say anything on Twitter. Makes
'Smh hate that hoe',
'"We\'re out here, and we\'re queer!"\n" 2, 4, 6, hut! We like it in our butt!"',
"You can't owe me shit ion trust niccas",
"Omg!!! You won't say it to my face! Stupid ass hoes talkin shit!!! Imma whoop her ass
"@GlitteredInPink hoe don't tweet me",
'RT @dirtyimage: @Tronkitty not just cause of hoes, go to jail cause of fucking up hoe
"@Montea_Rollin @kayysavage I wasn't serious bitch &#128514; bitch them niggas i namee
"RT @DRNRDX: @BrandonFxrdr you're not safe pussy boy loooooool http://t.co/TocJ1WxRYK",
'RT @jaymesshaylan: fuuck jalens a slow bitch!',
"It's so shady when you bitches talk to guys w/ girlfriends that's so disrespectful to
'RT @dxpperjay: You assholes know that referring to a girl as "bitch" doesn\'t make yo
'Yo bitch on my dick she come to my crib she get passed around no love',
'RT @Lady_BlahBlah: furrybah *in my PayPay voice* RT @80sbaby4life: The hoes are for l
'Dumb bitch https://t.co/We46w015nI',
'@McwilliamsBrett shut your legs hoe',
```

"Lmao let these hoes be hoes ain't no Savin nem",
 'You’re a little bitch RT @FuckingCashBro: RT @Thotcho: my team got blown out in
 "@Fit4LifeMike @chanelisabeth hoe don't make me put up screenshots of your texts to me"
 'Stuck up serious bitches are possibly the worst type of girls. Ever.',
 'I be waking up on some new shit like fuck that bitch shit',
 "@passIt2Liv Hit a bitch it's not like you can see the bruises",
 'I need to chat with @SpaceJam_Teeg . Where dat nicca at? Lol',
 'Some lying ass hoes lol',
 'This nigga over here telling me he dont fuck with this bitch . When he do 😩😂
 "It's levels to my bitch you can't fuck her nigga cause she like red bottom you can't
 "Lol RT @JayFucknHarris: Youuuuu got niggas but I don't got bitches",
 'Look at this little faggot.\n"@Kellz622: Tell her she\'s beautiful as much as you can
 '@PrayForJack new york niggas quick to take off on a bitch in public boy lol!!!!',
 "RT @YoShortyMa: I'll kill this bitch no hesitation <http://t.co/UxePa9LVi5>",
 'So many bitches in one sentence #fixitjesus',
 'Raunchy ass hoe.',
 "😂😂😂 i just said that RT @BoyThats_ARYAH: My TL gotta chill w
 '"These sour apple bitter bitches, I\'m not fuckin wit em"',
 '@RylannWilliams whooooo? Chelsey? Fuck her lol. She juss a bitch',
 'You a lame ass nigga still cuffin these hoes my bitch got a bitch with er',
 "I can't fuck a scary hoe.",
 "RT @_tiffnasty: Why do y'all niggas entertain that Nicole bitch? I don't see how y'a

We side with the author's observations in analysis of misclassified tweets that tweets contain-
 ing a lot of slurs or curse words are frequently misclassified as hate speech. We also see that the
 model has difficulty picking up directed hate, for example, the nonhate tagged tweets have the
 subject targetted however we see that either no profanity or negative sentiment word is in use or
 that there are shortened spellings. The authors had hate label misclassified 40% of the time, in our
 case, it is much better since it gets mislabelled on 4% of the time. However, we must keep in mind
 that this is training data and deep learning methods tend to overfit easily.