nla_training

April 16, 2019

```
In [0]: import pandas as pd
        import numpy as np

In [44]: df = pd.read_csv('training.csv')
         df.head()

Out[44]:                                                    text      label
         0                                          dumb nigger  [1, 0, 0]
         1                                        yanke winnnn   [0, 0, 1]
         2  kuroda gave hi put career number get run suppo...   [0, 0, 1]
         3  shi peopl tend great observ skill make easier ...   [0, 0, 1]
         4                                fuck niggah gay lol   [0, 1, 0]

In [45]: df.groupby('label').count()

Out[45]:            text
         label
         [0, 0, 1]  4994
         [0, 1, 0]  1400
         [1, 0, 0]  2000

In [19]: embedding_ = np.load('embeddings_latest.npy')
         embedding_.shape

Out[19]: (19210, 256)

In [0]: from keras.models import Sequential, load_model, save_model
        from keras.layers import Embedding, Dropout, Bidirectional, LSTM, Dense
        INPUT_SIZE = 512
        def get_model(embedding, vocab_size=INPUT_SIZE):
            model = Sequential()
            model.add(Embedding(*embedding.shape, weights=[embedding], input_length=vocab_size
            model.add(Dropout(0.2, name="Dropout"))
            model.add(Bidirectional(LSTM(vocab_size, dropout=0.1, recurrent_dropout=0.25, name=

            model.add(Dense(64, activation='relu', name="Dense_64"))
            model.add(Dense(32, activation='relu', name="Dense_32"))
            model.add(Dense(3, activation='sigmoid',name='Dense_3'))
```

```
            model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['categori
            print(model.summary())
            return model
```

```
In [21]: model = get_model(embedding_, INPUT_SIZE)
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/tensorflow/python/framework/op_d
Instructions for updating:
Colocations handled automatically by placer.
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorflow_backend
Instructions for updating:
Please use `rate` instead of `keep_prob`. Rate should be set to `rate = 1 - keep_prob`.
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
Embedding_Layer (Embedding)  (None, 512, 256)          4917760
_________________________________________________________________
Dropout (Dropout)            (None, 512, 256)          0
_________________________________________________________________
bidirectional_1 (Bidirection (None, 1024)              3149824
_________________________________________________________________
Dense_64 (Dense)             (None, 64)                65600
_________________________________________________________________
Dense_32 (Dense)             (None, 32)                2080
_________________________________________________________________
Dense_3 (Dense)              (None, 3)                 99
=================================================================
Total params: 8,135,363
Trainable params: 8,135,363
Non-trainable params: 0
_________________________________________________________________
None
```

```
In [24]: import tensorflow as tf
         tf.test.gpu_device_name()
```

```
Out[24]: '/device:GPU:0'
```

```
In [25]: !pip3 install keras_tqdm
```

```
Requirement already satisfied: keras_tqdm in /usr/local/lib/python3.6/dist-packages (2.0.1)
Requirement already satisfied: tqdm in /usr/local/lib/python3.6/dist-packages (from keras_tqdm)
Requirement already satisfied: Keras in /usr/local/lib/python3.6/dist-packages (from keras_tqdm
Requirement already satisfied: keras-preprocessing>=1.0.5 in /usr/local/lib/python3.6/dist-pack
Requirement already satisfied: numpy>=1.9.1 in /usr/local/lib/python3.6/dist-packages (from Ker
Requirement already satisfied: pyyaml in /usr/local/lib/python3.6/dist-packages (from Keras->ke
Requirement already satisfied: keras-applications>=1.0.6 in /usr/local/lib/python3.6/dist-packa
```

```
Requirement already satisfied: h5py in /usr/local/lib/python3.6/dist-packages (from Keras->kera
Requirement already satisfied: six>=1.9.0 in /usr/local/lib/python3.6/dist-packages (from Keras
Requirement already satisfied: scipy>=0.14 in /usr/local/lib/python3.6/dist-packages (from Kera
```

```
In [46]: import pickle
         from keras.preprocessing.text import Tokenizer
         from sklearn.model_selection import train_test_split
         from ast import literal_eval
         dataset = pd.read_csv('training.csv')
         _X, _y = dataset['text'].astype('str'), dataset['label']
         tokenizer = pickle.load(open('tokenizer.pkl', 'rb'))
         X = tokenizer.texts_to_matrix(_X)
         y = np.array(list(map(lambda label: literal_eval(label), _y)))
         X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=69, test_size=
         X_train.shape, X_test.shape
```

```
Out[46]: ((8400, 512), (0, 512))
```

```
In [47]: from keras_tqdm import TQDMNotebookCallback
         import datetime
         history = model.fit(X_train, y_train, batch_size=64, epochs=4, validation_split=0.2, v
         model_name = f"model_{datetime.datetime.now()}.h5"
         model.save(model_name)
```

```
HBox(children=(IntProgress(value=0, description='Training', max=4, style=ProgressStyle(descript
```

```
HBox(children=(IntProgress(value=0, description='Epoch 0', max=6720, style=ProgressStyle(descri
```

```
HBox(children=(IntProgress(value=0, description='Epoch 1', max=6720, style=ProgressStyle(descri
```

```
HBox(children=(IntProgress(value=0, description='Epoch 2', max=6720, style=ProgressStyle(descri
```

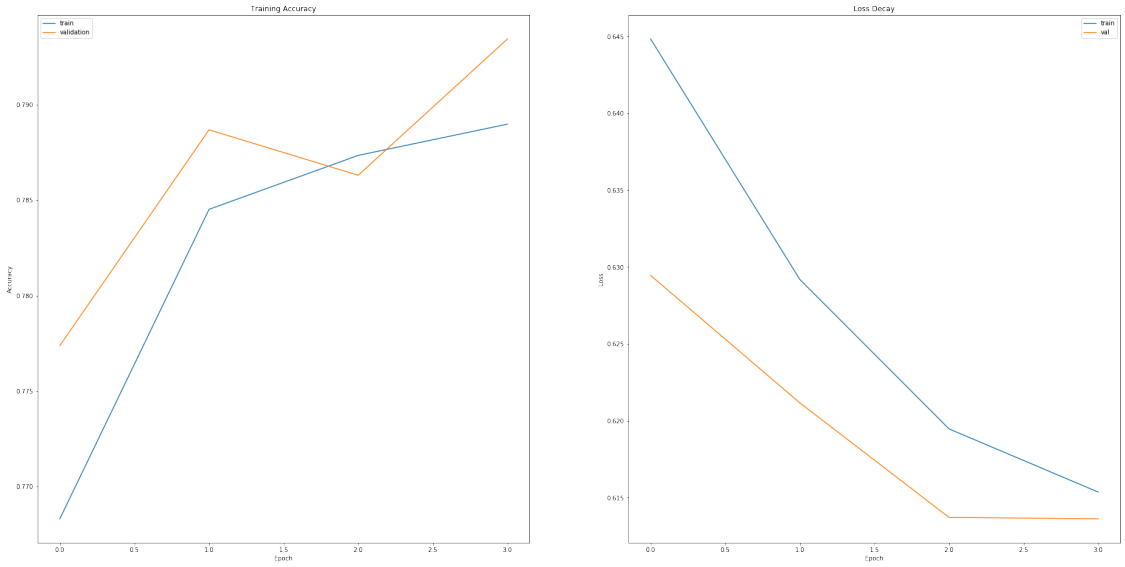
```
HBox(children=(IntProgress(value=0, description='Epoch 3', max=6720, style=ProgressStyle(descri
```

```
In [49]: import matplotlib.pyplot as plt
         %matplotlib inline

         fig = plt.figure(figsize=(32, 16))
         fig.add_subplot(1, 2, 1)
         plt.plot(history.history['acc'])
         plt.plot(history.history['val_acc'])
         plt.legend(['train', 'validation'], loc='upper left')
         plt.title("Training Accuracy")
```

```
        plt.xlabel("Epoch"), plt.ylabel("Accuracy")
        fig.add_subplot(1, 2, 2)
        plt.plot(history.history['loss'])
        plt.plot(history.history['val_loss'])
        plt.title('Loss Decay')
        plt.ylabel('Loss'), plt.xlabel('Epoch')
        plt.legend(['train', 'val'], loc='upper right')
```

Out[49]: <matplotlib.legend.Legend at 0x7f602657ecc0>




```
In [60]: from keras.utils import plot_model
         test_df = pd.read_csv('final.csv')[['text', 'label']]
         model = load_model(model_name)  # change this to the corresponding model file
         # plot_model(model, to_file='model.png')
         print(test_df.head(), test_df.shape, sep='\n')
         print(model.summary())
```

```
                                                text      label
0            mr. mine you say babe what's yeah first  [0, 0, 1]
1  mr. mine you say babe what's yeah first of a d...  [0, 0, 1]
2            of a dynamic punch get it good mr. line  [0, 0, 1]
3  of a dynamic punch get it good mr. line you'll...  [0, 0, 1]
4               you'll get stronger glabra it's your  [0, 0, 1]
(6822, 2)
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
Embedding_Layer (Embedding)  (None, 512, 256)          4917760
_________________________________________________________________
```

```
Dropout (Dropout)            (None, 512, 256)          0
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Total params: 8,135,363
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_________________________________________________________________
None
```

```
In [71]: test_df = test_df.sample(frac=1).reset_index(drop=True)
         _X_test, y_test = test_df.text, np.array([literal_eval(_) for _ in test_df.label.value
         _X_test.shape
```

```
Out[71]: (6822,)
```

```
In [72]: import nltk
         nltk.download('stopwords')
         nltk.download('wordnet')
         from nltk.corpus import stopwords
         from nltk.stem import WordNetLemmatizer, PorterStemmer
         wnl = WordNetLemmatizer()
         ps = PorterStemmer()
         en_stops = set(stopwords.words('english'))
         _X_test = _X_test.map(lambda x: ' '.join(list(filter(lambda y: y not in en_stops, [ps
         _X_test.shape
```

```
[nltk_data] Downloading package stopwords to /root/nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
[nltk_data] Downloading package wordnet to /root/nltk_data...
[nltk_data]   Package wordnet is already up-to-date!
```

```
Out[72]: (6822,)
```

```
In [73]: tokenizer = pickle.load(open('tokenizer.pkl', 'rb'))
         X_test = tokenizer.texts_to_matrix(_X_test)
         X_test.shape
```

```
Out[73]: (6822, 512)
```

```
In [0]: y_hat = model.predict(X_test)
```

In [75]:
```
from sklearn.metrics import classification_report
from keras.utils import to_categorical
y_hat_ = to_categorical([np.argmax(_) for _ in y_hat], num_classes=3).astype('int')
print(classification_report(y_test, y_hat_))
```

```
              precision    recall  f1-score   support

           0       0.83      0.15      0.25      1280
           1       0.53      0.40      0.46      1068
           2       0.90      0.98      0.94      5298

   micro avg       0.85      0.76      0.80      7646
   macro avg       0.75      0.51      0.55      7646
weighted avg       0.84      0.76      0.76      7646
 samples avg       0.85      0.81      0.83      7646
```

In [76]:
```
labels = [[0, 1, 0], [0, 0, 1], [1, 0, 0]]
print([np.count_nonzero(y_hat_ == label) for label in labels])
print([np.count_nonzero(y_test == label) for label in labels])
```

```
[8422, 18418, 7270]
[8134, 16594, 8558]
```