In [1]:

```
import warnings
warnings.filterwarnings("ignore")
import numpy as np
import pandas as pd
import seaborn as sns
from tqdm import tqdm
import os
from matplotlib import pyplot as plt
from sklearn.neighbors import KNeighborsRegressor
from sklearn.feature_extraction.text import TfidfVectorizer
from tensorflow.keras.layers import Input, Dense, Activation, Dropout
from sklearn.feature_extraction.text import CountVectorizer
from sklearn.metrics import mean_squared_error
import re
import tensorflow as tf
import tensorflow_hub as hub
from tensorflow.keras.models import Model

from tensorflow.keras.layers import Dense, Input
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.models import Model
from tensorflow.keras.callbacks import ModelCheckpoint
import transformers
```

In [2]:

```
#REf:https://www.kaggle.com/xhlulu/jigsaw-tpu-distilbert-with-huggingface-and-keras
```

In [3]:

```
from transformers import DistilBertTokenizer, TFDistilBertModel
tokenizer = DistilBertTokenizer.from_pretrained('../input/tfdistilbertbaseuncased')
```

In [4]:

```
train_data = pd.read_csv('../input/commonlitreadabilityprize/train.csv')
test_data = pd.read_csv('../input/commonlitreadabilityprize/test.csv')

# removing unused columns
train_data.drop(['url_legal', 'license','standard_error'], axis=1, inplace=True)
test_data.drop(['url_legal', 'license'], axis=1, inplace=True)

#for i in range(len(train_data)):
#  train_data['excerpt'][i]=re.sub('[^A-Za-z0-9]+', ' ', train_data['excerpt'][i]).strip(
)
#for i in range(len(test_data)):
#  test_data['excerpt'][i]=re.sub('[^A-Za-z0-9]+', ' ', test_data['excerpt'][i]).strip()

from sklearn.model_selection import train_test_split
X=train_data['excerpt']
y=train_data['target']
#x_train, x_test, y_train, y_test = train_test_split(X, y, test_size=0.15,random_state=20
)
#x_train, x_cv, y_train, y_cv = train_test_split(x_train, y_train, test_size=0.15,random_
state=20)
x_td=test_data['excerpt']
#X_td_tokens,X_td_mask,X_td_segment=tokenize(x_td)
#X_td_pooled_output=bert_model.predict([X_td_tokens, X_td_mask, X_td_segment])
```

In [5]:

```
MAX_LENGTH = 150
```

In [6]:

```
def batch_encode(tokenizer, texts, batch_size=256, max_length=MAX_LENGTH):
    input_ids = []
    attention_mask = []
    for i in range(0, len(texts), batch_size):
        batch = texts[i:i+batch_size]
        inputs = tokenizer.batch_encode_plus(batch,max_length=max_length,padding='longes
t', #implements dynamic padding
                                                     truncation=True,
                                                     return_attention_mask=True,
                                                     return_token_type_ids=False
                                                     )
        input_ids.extend(inputs['input_ids'])
        attention_mask.extend(inputs['attention_mask'])
    return tf.convert_to_tensor(input_ids), tf.convert_to_tensor(attention_mask)
```

In [7]:

```
x_td_ids, x_td_attention = batch_encode(tokenizer, x_td.tolist())
```

In [8]:

```
from transformers import TFDistilBertModel, DistilBertConfig
DISTILBERT_DROPOUT = 0.1
DISTILBERT_ATT_DROPOUT = 0.1
# Configure DistilBERT's initialization
config = DistilBertConfig(dropout=DISTILBERT_DROPOUT,
                          attention_dropout=DISTILBERT_ATT_DROPOUT,
                          output_hidden_states=True)
distilBERT = TFDistilBertModel.from_pretrained('../input/tfdistilbertbaseuncased', config
=config)

# Make DistilBERT layers untrainable
for layer in distilBERT.layers:
    layer.trainable = False
```

```
Some layers from the model checkpoint at ../input/tfdistilbertbaseuncased were not used w
hen initializing TFDistilBertModel: ['vocab_layer_norm', 'vocab_transform', 'vocab_projec
tor', 'activation_13']
- This IS expected if you are initializing TFDistilBertModel from the checkpoint of a mod
el trained on another task or with another architecture (e.g. initializing a BertForSeque
nceClassification model from a BertForPreTraining model).
- This IS NOT expected if you are initializing TFDistilBertModel from the checkpoint of a
model that you expect to be exactly identical (initializing a BertForSequenceClassificati
on model from a BertForSequenceClassification model).
All the layers of TFDistilBertModel were initialized from the model checkpoint at ../inpu
t/tfdistilbertbaseuncased.
If your task is similar to the task the model of the checkpoint was trained on, you can a
lready use TFDistilBertModel for predictions without further training.
```

In [9]:

```
def build_model(transformer, max_length=MAX_LENGTH):
    input_ids_layer = tf.keras.layers.Input(shape=(max_length,),
                                            name='input_ids',
                                            dtype='int32')
    input_attention_layer = tf.keras.layers.Input(shape=(max_length,),
                                                  name='input_attention',
                                                  dtype='int32')
    last_hidden_state = transformer([input_ids_layer, input_attention_layer])[0]
    cls_token = last_hidden_state[:, 0, :]
    layer1 = Dense(256,activation='relu',kernel_initializer=tf.keras.initializers.Glorot
Normal(seed=42))(cls_token)
    Dropout_layer_1=Dropout(0.1)(layer1)
    layer2 = Dense(128,activation='relu',kernel_initializer=tf.keras.initializers.Glorot
Normal(seed=42))(Dropout_layer_1)
    Dropout_layer_2=Dropout(0.1)(layer2)
    layer3 = Dense(32,activation='relu',kernel_initializer=tf.keras.initializers.GlorotN
ormal(seed=42))(Dropout_layer_2)
    output = tf.keras.layers.Dense(1,activation='linear',kernel_initializer=tf.keras.ini
tializers.GlorotNormal(seed=42))(layer3)
    model = tf.keras.Model([input_ids_layer, input_attention_layer], output)
    rmse=tf.keras.metrics.RootMeanSquaredError()
    mse = tf.keras.losses.MeanSquaredError()
    model.compile(optimizer='adam',  loss=mse,metrics=[rmse])
    return model
```

In [10]:

```
import numpy as np
from sklearn.model_selection import KFold
models_list=[]
kf=KFold(n_splits=5, random_state=None, shuffle=False)
for train_index, test_index in kf.split(X):
    print(train_index[0])
    x_train, x_cv = X[train_index], X[test_index]
    y_train, y_cv = y[train_index], y[test_index]
    x_train_ids, x_train_attention = batch_encode(tokenizer, x_train.tolist())
    x_cv_ids, x_cv_attention = batch_encode(tokenizer, x_cv.tolist())
    model=build_model(distilBERT,150)
    EPOCHS = 50
    BATCH_SIZE = 64
    NUM_STEPS = len(x_train.index) // BATCH_SIZE

    # Train the model

    from keras.callbacks import EarlyStopping,TensorBoard
    early_stop_1=EarlyStopping(monitor='val_root_mean_squared_error',patience=5,restore_b
est_weights=True)
    model.fit(
    x = [x_train_ids, x_train_attention],
    y = y_train.to_numpy(),
    epochs = EPOCHS,
    batch_size = BATCH_SIZE,
    steps_per_epoch = NUM_STEPS,
    validation_data = ([x_cv_ids, x_cv_attention], y_cv.to_numpy()),
    verbose=0,callbacks=[early_stop_1]
    )
    models_list.append(model)
```

```
1417
0
```

In [11]:

```
y_pred=np.zeros((x_td_ids.shape[0],1))
for i in range(len(models_list)):
  y_pred=y_pred+models_list[i].predict([x_td_ids, x_td_attention])
y_pred=y_pred/len(models_list)
y_pred
```

Out[11]:

```
array([[-0.91043407],
       [ 0.34788071],
       [-0.19051353],
       [-1.8105737 ],
       [-0.75478372],
       [-0.88103384],
       [ 0.25316399]])
```

In [12]:

```
#y_pred_test=model.predict([x_test_ids, x_test_attention])
#mean_squared_error(y_pred,y_test,squared=False)
```

Predicting Test data

In [25]:

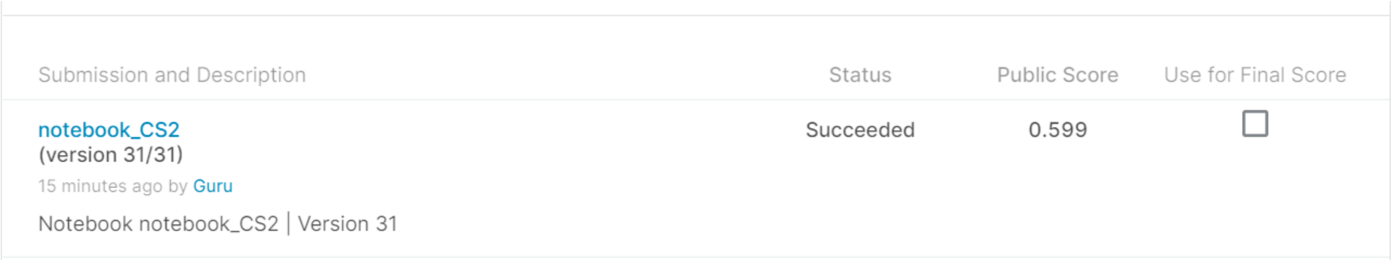
```
test_dat = pd.read_csv('../input/commonlitreadabilityprize/test.csv',index_col='id')
y_pred_pd=pd.DataFrame(y_pred,index=test_dat.index,columns=['target'])
```

```
#y_pred_pd=y_pred_pd.reset_index()
#saving test data predicted
y_pred_pd.to_csv('./submission.csv')
y_pred_pd
```

Out[25]:

	id	target
0	c0f722661	-0.910434
1	f0953f0a5	0.347881
2	0df072751	-0.190514
3	04caf4e0c	-1.810574
4	0e63f8bea	-0.754784
5	12537fe78	-0.881034
6	965e592c0	0.253164

LeaderBoard



Submission and Description	Status	Public Score	Use for Final Score
notebook_CS2 (version 31/31) 15 minutes ago by Guru Notebook notebook_CS2 | Version 31	Succeeded	0.599	☐

In [ ]:

```

```