```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mou
```

```
import tensorflow as tf
from keras.preprocessing.text import Tokenizer
from keras import layers, models

from sklearn.preprocessing import LabelEncoder
import pickle
import numpy as np
import pandas as pd


train_set = pd.read_csv('drive/MyDrive/Corona_NLP_train.csv', encoding='latin-1', usecols=[4,
test_set = pd.read_csv('drive/MyDrive/Corona_NLP_test.csv', encoding='latin-1', usecols=[4,5]

train_set.loc[train_set['Sentiment'] == 'Extremely Negative', 'Sentiment'] = 0
train_set.loc[train_set['Sentiment'] == 'Negative', 'Sentiment'] = 1
train_set.loc[train_set['Sentiment'] == 'Neutral', 'Sentiment'] = 2
train_set.loc[train_set['Sentiment'] == 'Positive', 'Sentiment'] = 3
train_set.loc[train_set['Sentiment'] == 'Extremely Positive', 'Sentiment'] = 4

test_set.loc[test_set['Sentiment'] == 'Extremely Negative', 'Sentiment'] = 0
test_set.loc[test_set['Sentiment'] == 'Negative', 'Sentiment'] = 1
test_set.loc[test_set['Sentiment'] == 'Neutral', 'Sentiment'] = 2
test_set.loc[test_set['Sentiment'] == 'Positive', 'Sentiment'] = 3
test_set.loc[test_set['Sentiment'] == 'Extremely Positive', 'Sentiment'] = 4

print(train_set)
print(test_set)
```

```
                                       OriginalTweet Sentiment
0    @MeNyrbie @Phil_Gahan @Chrisitv https://t.co/i...         2
1    advice Talk to your neighbours family to excha...         3
2    Coronavirus Australia: Woolworths to give elde...         3
3    My food stock is not the only one which is emp...         3
4    Me, ready to go at supermarket during the #COV...         0
..                                                 ...       ...
995  Connectivity is essential during times of cris...         1
996  @standwithPrager Wells Fargo is committed to h...         4
997  @KariLeeAK907 Wells Fargo is committed to help...         4
998  @TheIndigoAuthor Wells Fargo is committed to h...         4
999  @WinAtLifeOnline Rest assured that our team is...         1

[1000 rows x 2 columns]
                                       OriginalTweet Sentiment
0   TRENDING: New Yorkers encounter empty supermar...         0
1   When I couldn't find hand sanitizer at Fred Me...         3
```

```
2   Find out how you can protect yourself and love...         4
3   #Panic buying hits #NewYork City as anxious sh...         1
4   #toiletpaper #dunnypaper #coronavirus #coronav...         2
..                                                  ...       ...
95  The government must provide hand sanitizer in ...         4
96  What You Need If Quarantined at Home | #Corona...         2
97  See the new @FujifilmX_US X-T4 and X100V at Ro...         4
98  Spiking prices during a state of emergency is ...         0
99  Besides canned food and toilet paper.\r\r\n\r\...         2

[100 rows x 2 columns]
```

```
# set up X and Y
num_labels = 5
vocab_size = 10000
batch_size = 100

# fit the tokenizer on the training data
tokenizer = Tokenizer(num_words=vocab_size)
tokenizer.fit_on_texts(train_set.OriginalTweet)

x_train = tokenizer.texts_to_matrix(train_set.OriginalTweet, mode='tfidf')
x_test = tokenizer.texts_to_matrix(test_set.OriginalTweet, mode='tfidf')

encoder = LabelEncoder()
encoder.fit(train_set.Sentiment)
y_train = encoder.transform(train_set.Sentiment)
y_test = encoder.transform(test_set.Sentiment)

# check shape
print("train shapes:", x_train.shape, y_train.shape)
print("test shapes:", x_test.shape, y_test.shape)
print("test first five labels:", y_test[:5])
```

```
train shapes: (1000, 10000) (1000,)
test shapes: (100, 10000) (100,)
test first five labels: [0 3 4 1 2]
```

```
import keras.backend as K


model = models.Sequential()
model.add(layers.Dense(500, input_dim=vocab_size, kernel_initializer='normal', activation='re
model.add(layers.Dense(5, kernel_initializer='normal', activation='softmax'))

model.compile(loss='sparse_categorical_crossentropy',
              optimizer='adam',
              metrics=['accuracy'])

history = model.fit(x_train, y_train,
                    batch_size=batch_size,
```

```
                epochs=30,
                verbose=1,
                validation_split=0.1)
```

```
Epoch 1/30
9/9 [==============================] - 1s 83ms/step - loss: 1.7421 - accuracy: 0.2600
Epoch 2/30
9/9 [==============================] - 1s 67ms/step - loss: 0.5140 - accuracy: 0.9067
Epoch 3/30
9/9 [==============================] - 1s 66ms/step - loss: 0.1772 - accuracy: 0.9922
Epoch 4/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0824 - accuracy: 0.9989
Epoch 5/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0475 - accuracy: 0.9989
Epoch 6/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0311 - accuracy: 1.0000
Epoch 7/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0232 - accuracy: 0.9989
Epoch 8/30
9/9 [==============================] - 1s 64ms/step - loss: 0.0182 - accuracy: 0.9989
Epoch 9/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0142 - accuracy: 1.0000
Epoch 10/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0118 - accuracy: 1.0000
Epoch 11/30
9/9 [==============================] - 1s 69ms/step - loss: 0.0104 - accuracy: 0.9989
Epoch 12/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0087 - accuracy: 1.0000
Epoch 13/30
9/9 [==============================] - 1s 64ms/step - loss: 0.0078 - accuracy: 1.0000
Epoch 14/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0067 - accuracy: 1.0000
Epoch 15/30
9/9 [==============================] - 1s 62ms/step - loss: 0.0060 - accuracy: 1.0000
Epoch 16/30
9/9 [==============================] - 1s 69ms/step - loss: 0.0055 - accuracy: 1.0000
Epoch 17/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0050 - accuracy: 1.0000
Epoch 18/30
9/9 [==============================] - 1s 64ms/step - loss: 0.0047 - accuracy: 1.0000
Epoch 19/30
9/9 [==============================] - 1s 70ms/step - loss: 0.0040 - accuracy: 1.0000
Epoch 20/30
9/9 [==============================] - 1s 64ms/step - loss: 0.0040 - accuracy: 1.0000
Epoch 21/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0033 - accuracy: 1.0000
Epoch 22/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0033 - accuracy: 1.0000
Epoch 23/30
9/9 [==============================] - 1s 68ms/step - loss: 0.0029 - accuracy: 1.0000
Epoch 24/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0027 - accuracy: 1.0000
Epoch 25/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0026 - accuracy: 1.0000
Epoch 26/30
9/9 [==============================] - 1s 66ms/step - loss: 0.0026 - accuracy: 1.0000
```

```
Epoch 27/30
9/9 [==============================] - 1s 65ms/step - loss: 0.0023 - accuracy: 1.0000
Epoch 28/30
9/9 [==============================] - 1s 63ms/step - loss: 0.0021 - accuracy: 1.0000
Epoch 29/30
```

```
print(x_test)
print(y_test)
score = model.evaluate(x_test, y_test, batch_size=batch_size, verbose=1)
print('Accuracy: ', score[1])
```

```
[[0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.95946744 ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 ...
 [0.         0.95159035 1.62451959 ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]]
[0 3 4 1 2 2 3 2 0 4 3 0 0 4 3 0 4 2 3 4 1 4 4 4 0 3 1 1 1 3 1 4 0 0 2 0 1
 2 1 4 3 1 2 3 3 4 4 0 0 0 0 2 1 4 0 1 1 3 3 2 0 0 4 0 3 1 3 4 3 3 1 4 3 1
 2 0 1 3 3 3 0 1 4 1 1 1 1 2 1 1 1 1 3 1 1 4 2 4 0 2]
1/1 [==============================] - 0s 37ms/step - loss: 1.9284 - accuracy: 0.3800
Accuracy:  0.3799999952316284
```

```
model = models.Sequential()
model.add(layers.Embedding(vocab_size, 32))
model.add(layers.SimpleRNN(32))
model.add(layers.Dense(5, kernel_initializer='normal', activation='softmax'))

model.compile(loss='sparse_categorical_crossentropy',
              optimizer='rmsprop',
              metrics=['accuracy'])

history = model.fit(x_train, y_train,
                    batch_size=batch_size,
                    epochs=30,
                    verbose=1,
                    validation_split=0.1)
```

```
Epoch 2/30
9/9 [==============================] - 101s 11s/step - loss: 1.5935 - accuracy: 0.262
Epoch 3/30
9/9 [==============================] - 100s 11s/step - loss: 1.5833 - accuracy: 0.262
Epoch 4/30
9/9 [==============================] - 101s 11s/step - loss: 1.5788 - accuracy: 0.262
Epoch 5/30
9/9 [==============================] - 106s 12s/step - loss: 1.5778 - accuracy: 0.258
Epoch 6/30
9/9 [==============================] - 103s 11s/step - loss: 1.5781 - accuracy: 0.248
Epoch 7/30
9/9 [==============================] - 102s 11s/step - loss: 1.5779 - accuracy: 0.233
Epoch 8/30
```

```
9/9 [==============================] - 103s 12s/step - loss: 1.5792 - accuracy: 0.253
Epoch 9/30
9/9 [==============================] - 102s 11s/step - loss: 1.5780 - accuracy: 0.253
Epoch 10/30
9/9 [==============================] - 102s 11s/step - loss: 1.5783 - accuracy: 0.256
Epoch 11/30
9/9 [==============================] - 100s 11s/step - loss: 1.5784 - accuracy: 0.262
Epoch 12/30
9/9 [==============================] - 100s 11s/step - loss: 1.5793 - accuracy: 0.243
Epoch 13/30
9/9 [==============================] - 101s 11s/step - loss: 1.5780 - accuracy: 0.242
Epoch 14/30
9/9 [==============================] - 104s 12s/step - loss: 1.5778 - accuracy: 0.260
Epoch 15/30
9/9 [==============================] - 103s 11s/step - loss: 1.5786 - accuracy: 0.264
Epoch 16/30
9/9 [==============================] - 104s 12s/step - loss: 1.5782 - accuracy: 0.247
Epoch 17/30
9/9 [==============================] - 102s 11s/step - loss: 1.5777 - accuracy: 0.255
Epoch 18/30
9/9 [==============================] - 104s 12s/step - loss: 1.5783 - accuracy: 0.248
Epoch 19/30
9/9 [==============================] - 104s 12s/step - loss: 1.5782 - accuracy: 0.263
Epoch 20/30
9/9 [==============================] - 103s 11s/step - loss: 1.5785 - accuracy: 0.243
Epoch 21/30
9/9 [==============================] - 103s 11s/step - loss: 1.5783 - accuracy: 0.262
Epoch 22/30
9/9 [==============================] - 104s 12s/step - loss: 1.5779 - accuracy: 0.262
Epoch 23/30
9/9 [==============================] - 103s 11s/step - loss: 1.5781 - accuracy: 0.244
Epoch 24/30
9/9 [==============================] - 101s 11s/step - loss: 1.5788 - accuracy: 0.235
Epoch 25/30
9/9 [==============================] - 102s 11s/step - loss: 1.5780 - accuracy: 0.262
Epoch 26/30
9/9 [==============================] - 102s 11s/step - loss: 1.5784 - accuracy: 0.262
Epoch 27/30
9/9 [==============================] - 100s 11s/step - loss: 1.5779 - accuracy: 0.253
Epoch 28/30
9/9 [==============================] - 102s 11s/step - loss: 1.5779 - accuracy: 0.243
Epoch 29/30
9/9 [==============================] - 99s 11s/step - loss: 1.5778 - accuracy: 0.2611
Epoch 30/30
```

```
print(x_test)
print(y_test)
score = model.evaluate(x_test, y_test, batch_size=batch_size, verbose=1)
print('Accuracy: ', score[1])
```

```
[[0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.95946744 ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 ...
 [0.         0.95159035 1.62451959 ... 0.         0.         0.        ]
```

```
 [0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]]
[0 3 4 1 2 2 3 2 0 4 3 0 0 4 3 0 4 2 3 4 1 4 4 4 0 3 1 1 1 3 1 4 0 0 2 0 1
 2 1 4 3 1 2 3 3 4 4 0 0 0 0 2 1 4 0 1 1 3 3 2 0 0 4 0 3 1 3 4 3 3 1 4 3 1
 2 0 1 3 3 3 0 1 4 1 1 1 1 2 1 1 1 1 3 1 1 4 2 4 0 2]
1/1 [==============================] - 1s 567ms/step - loss: 1.6062 - accuracy: 0.2100
Accuracy:  0.20999999344348907


model = models.Sequential()
model.add(layers.Embedding(vocab_size, 32))
model.add(layers.LSTM(32))
model.add(layers.Dense(5, kernel_initializer='normal', activation='softmax'))

model.compile(loss='sparse_categorical_crossentropy',
              optimizer='rmsprop',
              metrics=['accuracy'])

history = model.fit(x_train, y_train,
                    batch_size=batch_size,
                    epochs=20,
                    verbose=1,
                    validation_split=0.1)

Epoch 1/20
9/9 [==============================] - 159s 12s/step - loss: 1.6020 - accuracy: 0.2289
Epoch 2/20
9/9 [==============================] - 110s 12s/step - loss: 1.5825 - accuracy: 0.2567
Epoch 3/20
9/9 [==============================] - 113s 13s/step - loss: 1.5799 - accuracy: 0.2533
Epoch 4/20
9/9 [==============================] - 110s 12s/step - loss: 1.5794 - accuracy: 0.2489
Epoch 5/20
9/9 [==============================] - 115s 13s/step - loss: 1.5790 - accuracy: 0.2511
Epoch 6/20
9/9 [==============================] - 111s 12s/step - loss: 1.5785 - accuracy: 0.2533
Epoch 7/20
9/9 [==============================] - 113s 13s/step - loss: 1.5786 - accuracy: 0.2467
Epoch 8/20
9/9 [==============================] - 115s 13s/step - loss: 1.5794 - accuracy: 0.2544
Epoch 9/20
9/9 [==============================] - 115s 13s/step - loss: 1.5781 - accuracy: 0.2622
Epoch 10/20
9/9 [==============================] - 117s 13s/step - loss: 1.5795 - accuracy: 0.2589
Epoch 11/20
9/9 [==============================] - 115s 13s/step - loss: 1.5785 - accuracy: 0.2622
Epoch 12/20
9/9 [==============================] - 116s 13s/step - loss: 1.5784 - accuracy: 0.2456
Epoch 13/20
9/9 [==============================] - 115s 13s/step - loss: 1.5782 - accuracy: 0.2500
Epoch 14/20
9/9 [==============================] - 116s 13s/step - loss: 1.5789 - accuracy: 0.2344
Epoch 15/20
9/9 [==============================] - 117s 13s/step - loss: 1.5784 - accuracy: 0.2633
Epoch 16/20
```

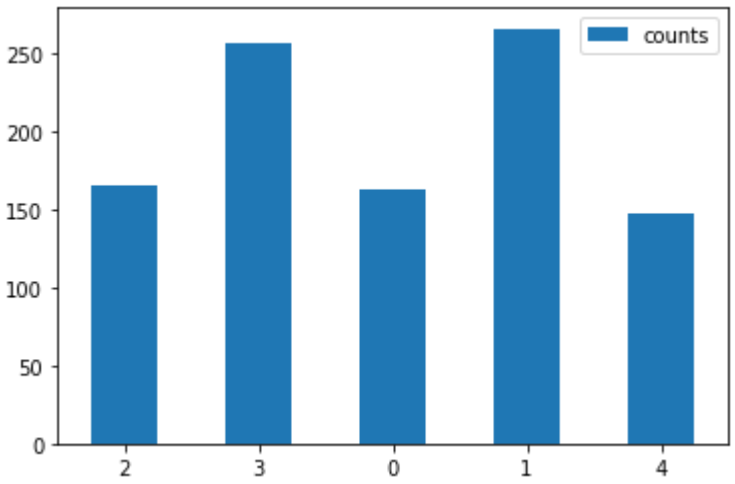
```
9/9 [==============================] - 115s 13s/step - loss: 1.5779 - accuracy: 0.2467
Epoch 17/20
9/9 [==============================] - 116s 13s/step - loss: 1.5799 - accuracy: 0.2622
Epoch 18/20
9/9 [==============================] - 115s 13s/step - loss: 1.5777 - accuracy: 0.2533
Epoch 19/20
9/9 [==============================] - 115s 13s/step - loss: 1.5786 - accuracy: 0.2589
Epoch 20/20
9/9 [==============================] - 114s 13s/step - loss: 1.5786 - accuracy: 0.2456
```

```
print(x_test)
print(y_test)
score = model.evaluate(x_test, y_test, batch_size=batch_size, verbose=1)
print('Accuracy: ', score[1])
```

```
[[0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.95946744 ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 ...
 [0.         0.95159035 1.62451959 ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]
 [0.         0.         0.         ... 0.         0.         0.        ]]
[0 3 4 1 2 2 3 2 0 4 3 0 0 4 3 0 4 2 3 4 1 4 4 4 0 3 1 1 1 3 1 4 0 0 2 0 1
 2 1 4 3 1 2 3 3 4 4 0 0 0 0 2 1 4 0 1 1 3 3 2 0 0 4 0 3 1 3 4 3 3 1 4 3 1
 2 0 1 3 3 3 0 1 4 1 1 1 1 2 1 1 1 1 3 1 1 4 2 4 0 2]
1/1 [==============================] - 2s 2s/step - loss: 1.6054 - accuracy: 0.2100
Accuracy:  0.20999999344348907
```

```
import matplotlib.pyplot as plt
from collections import Counter

counts = Counter(train_set.Sentiment)

labels = {'labels': list(counts.keys())}
instances = {'counts': list(counts.values())}

df = pd.DataFrame(instances, index=list(counts.keys()))

print(labels)
print(instances)

ax = df.plot.bar(rot=0)
```

```
{'labels': [2, 3, 0, 1, 4]}
{'counts': [166, 257, 163, 266, 148]}
```



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