BERT_Disaster_Tweets

May 15, 2022

```
[ ]: !pip3 install transformers
     !pip3 install datasets
     !pip3 install tensorflow_text
     !pip3 install tf-models-official
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Requirement already satisfied: transformers in /usr/local/lib/python3.7/dist-
packages (4.19.1)
Requirement already satisfied: importlib-metadata in
/usr/local/lib/python3.7/dist-packages (from transformers) (4.11.3)
Requirement already satisfied: pyyaml>=5.1 in /usr/local/lib/python3.7/dist-
packages (from transformers) (6.0)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.7/dist-
packages (from transformers) (21.3)
Requirement already satisfied: regex!=2019.12.17 in
/usr/local/lib/python3.7/dist-packages (from transformers) (2019.12.20)
Requirement already satisfied: filelock in /usr/local/lib/python3.7/dist-
packages (from transformers) (3.6.0)
Requirement already satisfied: tqdm>=4.27 in /usr/local/lib/python3.7/dist-
packages (from transformers) (4.64.0)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-
packages (from transformers) (2.23.0)
Requirement already satisfied: numpy>=1.17 in /usr/local/lib/python3.7/dist-
packages (from transformers) (1.21.6)
Requirement already satisfied: huggingface-hub<1.0,>=0.1.0 in
/usr/local/lib/python3.7/dist-packages (from transformers) (0.6.0)
Requirement already satisfied: tokenizers!=0.11.3,<0.13,>=0.11.1 in
/usr/local/lib/python3.7/dist-packages (from transformers) (0.12.1)
Requirement already satisfied: typing-extensions>=3.7.4.3 in
/usr/local/lib/python3.7/dist-packages (from huggingface-
hub<1.0,>=0.1.0->transformers) (4.2.0)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in
/usr/local/lib/python3.7/dist-packages (from packaging>=20.0->transformers)
(3.0.8)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-
packages (from importlib-metadata->transformers) (3.8.0)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.7/dist-packages (from requests->transformers) (2021.10.8)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-

packages (from requests->transformers) (2.10)
Requirement already satisfied: chardet<4,>=3.0.2 in
/usr/local/lib/python3.7/dist-packages (from requests->transformers) (3.0.4)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
/usr/local/lib/python3.7/dist-packages (from requests->transformers) (1.25.11)
Requirement already satisfied: datasets in /usr/local/lib/python3.7/dist-
packages (2.2.1)
Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages
(from datasets) (1.3.5)
Requirement already satisfied: numpy>=1.17 in /usr/local/lib/python3.7/dist-
packages (from datasets) (1.21.6)
Requirement already satisfied: fsspec[http]>=2021.05.0 in
/usr/local/lib/python3.7/dist-packages (from datasets) (2022.3.0)
Requirement already satisfied: pyarrow>=6.0.0 in /usr/local/lib/python3.7/dist-
packages (from datasets) (6.0.1)
Requirement already satisfied: xxhash in /usr/local/lib/python3.7/dist-packages
(from datasets) (3.0.0)
Requirement already satisfied: huggingface-hub<1.0.0,>=0.1.0 in
/usr/local/lib/python3.7/dist-packages (from datasets) (0.6.0)
Requirement already satisfied: importlib-metadata in
/usr/local/lib/python3.7/dist-packages (from datasets) (4.11.3)
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-
packages (from datasets) (21.3)
Requirement already satisfied: requests>=2.19.0 in
/usr/local/lib/python3.7/dist-packages (from datasets) (2.23.0)
Requirement already satisfied: responses<0.19 in /usr/local/lib/python3.7/dist-
packages (from datasets) (0.18.0)
Requirement already satisfied: aiohttp in /usr/local/lib/python3.7/dist-packages
(from datasets) (3.8.1)
Requirement already satisfied: dill in /usr/local/lib/python3.7/dist-packages
(from datasets) (0.3.4)
Requirement already satisfied: multiprocess in /usr/local/lib/python3.7/dist-
packages (from datasets) (0.70.12.2)
Requirement already satisfied: tqdm>=4.62.1 in /usr/local/lib/python3.7/dist-
packages (from datasets) (4.64.0)
Requirement already satisfied: pyyaml in /usr/local/lib/python3.7/dist-packages
(from huggingface-hub<1.0.0,>=0.1.0->datasets) (6.0)
Requirement already satisfied: typing-extensions>=3.7.4.3 in
/usr/local/lib/python3.7/dist-packages (from huggingface-
hub<1.0.0,>=0.1.0->datasets) (4.2.0)
Requirement already satisfied: filelock in /usr/local/lib/python3.7/dist-
packages (from huggingface-hub<1.0.0,>=0.1.0->datasets) (3.6.0)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in
/usr/local/lib/python3.7/dist-packages (from packaging->datasets) (3.0.8)
Requirement already satisfied: chardet<4,>=3.0.2 in
/usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->datasets) (3.0.4)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-
packages (from requests>=2.19.0->datasets) (2.10)

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Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
/usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->datasets)
(1.25.11)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->datasets)
(2021.10.8)
Requirement already satisfied: frozenlist>=1.1.1 in
/usr/local/lib/python3.7/dist-packages (from aiohttp->datasets) (1.3.0)
Requirement already satisfied: asynctest==0.13.0 in
/usr/local/lib/python3.7/dist-packages (from aiohttp->datasets) (0.13.0)
Requirement already satisfied: async-timeout<5.0,>=4.0.0a3 in
/usr/local/lib/python3.7/dist-packages (from aiohttp->datasets) (4.0.2)
Requirement already satisfied: yarl<2.0,>=1.0 in /usr/local/lib/python3.7/dist-
packages (from aiohttp->datasets) (1.7.2)
Requirement already satisfied: aiosignal>=1.1.2 in
/usr/local/lib/python3.7/dist-packages (from aiohttp->datasets) (1.2.0)
Requirement already satisfied: attrs>=17.3.0 in /usr/local/lib/python3.7/dist-
packages (from aiohttp->datasets) (21.4.0)
Requirement already satisfied: multidict<7.0,>=4.5 in
/usr/local/lib/python3.7/dist-packages (from aiohttp->datasets) (6.0.2)
Requirement already satisfied: charset-normalizer<3.0,>=2.0 in
/usr/local/lib/python3.7/dist-packages (from aiohttp->datasets) (2.0.12)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-
packages (from importlib-metadata->datasets) (3.8.0)
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-
packages (from pandas->datasets) (2022.1)
Requirement already satisfied: python-dateutil>=2.7.3 in
/usr/local/lib/python3.7/dist-packages (from pandas->datasets) (2.8.2)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-
packages (from python-dateutil>=2.7.3->pandas->datasets) (1.15.0)
Requirement already satisfied: tensorflow_text in /usr/local/lib/python3.7/dist-
packages (2.8.2)
Requirement already satisfied: tensorflow-hub>=0.8.0 in
/usr/local/lib/python3.7/dist-packages (from tensorflow_text) (0.12.0)
Requirement already satisfied: tensorflow<2.9,>=2.8.0 in
/usr/local/lib/python3.7/dist-packages (from tensorflow_text) (2.8.0)
Requirement already satisfied: termcolor>=1.1.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (1.1.0)
Requirement already satisfied: opt-einsum>=2.3.2 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (3.3.0)
Requirement already satisfied: tf-estimator-nightly==2.8.0.dev2021122109 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (2.8.0.dev2021122109)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (1.44.0)
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Requirement already satisfied: keras<2.9,>=2.8.0rc0 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (2.8.0)
Requirement already satisfied: astunparse>=1.6.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (1.6.3)
Requirement already satisfied: absl-py>=0.4.0 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (1.0.0)
Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (3.1.0)
Requirement already satisfied: flatbuffers>=1.12 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (2.0)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (0.25.0)
Requirement already satisfied: typing-extensions>=3.6.6 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (4.2.0)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (1.14.0)
Requirement already satisfied: setuptools in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (57.4.0)
Requirement already satisfied: numpy>=1.20 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (1.21.6)
Requirement already satisfied: protobuf>=3.9.2 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (3.17.3)
Requirement already satisfied: gast>=0.2.1 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (0.5.3)
Requirement already satisfied: keras-preprocessing>=1.1.1 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (1.1.2)
Requirement already satisfied: tensorboard<2.9,>=2.8 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (2.8.0)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (1.15.0)
Requirement already satisfied: libclang>=9.0.1 in /usr/local/lib/python3.7/dist-
packages (from tensorflow<2.9,>=2.8.0->tensorflow_text) (14.0.1)
Requirement already satisfied: google-pasta>=0.1.1 in
/usr/local/lib/python3.7/dist-packages (from
tensorflow<2.9,>=2.8.0->tensorflow_text) (0.2.0)
Requirement already satisfied: wheel<1.0,>=0.23.0 in
/usr/local/lib/python3.7/dist-packages (from
astunparse>=1.6.0->tensorflow<2.9,>=2.8.0->tensorflow_text) (0.37.1)
Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-
packages (from h5py>=2.9.0->tensorflow<2.9,>=2.8.0->tensorflow_text) (1.5.2)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in
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/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (0.4.6)
Requirement already satisfied: google-auth<3,>=1.6.3 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (1.35.0)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (0.6.1)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (1.8.1)
Requirement already satisfied: requests<3,>=2.21.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (2.23.0)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-
packages (from tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text)
(3.3.6)
Requirement already satisfied: werkzeug>=0.11.15 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (1.0.1)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in
/usr/local/lib/python3.7/dist-packages (from google-
auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text)
(4.2.4)
Requirement already satisfied: pyasn1-modules>=0.2.1 in
/usr/local/lib/python3.7/dist-packages (from google-
auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text)
(0.2.8)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-
packages (from google-
auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text)
(4.8)
Requirement already satisfied: requests-oauthlib>=0.7.0 in
/usr/local/lib/python3.7/dist-packages (from google-auth-oauthlib<0.5,>=0.4.1->t
ensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (1.3.1)
Requirement already satisfied: importlib-metadata>=4.4 in
/usr/local/lib/python3.7/dist-packages (from
markdown>=2.6.8->tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text)
(4.11.3)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-
packages (from importlib-metadata>=4.4->markdown>=2.6.8->tensorboard<2.9,>=2.8->
tensorflow<2.9,>=2.8.0->tensorflow_text) (3.8.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in
/usr/local/lib/python3.7/dist-packages (from pyasn1-modules>=0.2.1->google-
auth<3,>=1.6.3->tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text)
(0.4.8)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.
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9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (2021.10.8)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-
packages (from requests<3,>=2.21.0->tensorboard<2.9,>=2.8->tensorflow<2.9,>=2.8.
0->tensorflow_text) (2.10)
Requirement already satisfied: chardet<4,>=3.0.2 in
/usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.
9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (3.0.4)
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in
/usr/local/lib/python3.7/dist-packages (from requests<3,>=2.21.0->tensorboard<2.
9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (1.25.11)
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-
packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<0.5,>=0.4.1->tenso
rboard<2.9,>=2.8->tensorflow<2.9,>=2.8.0->tensorflow_text) (3.2.0)
Collecting tf-models-official
  Downloading tf_models_official-2.8.0-py2.py3-none-any.whl (2.2 MB)
     | | 2.2 MB 4.5 MB/s
Collecting pyyaml<6.0,>=5.1
  Downloading PyYAML-5.4.1-cp37-cp37m-manylinux1_x86_64.whl (636 kB)
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Collecting tf-slim>=1.1.0
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Requirement already satisfied: pycocotools in
/usr/local/lib/python3.7/dist-packages (from tf-models-official) (2.0.4)
Requirement already satisfied: psutil>=5.4.3 in /usr/local/lib/python3.7/dist-
packages (from tf-models-official) (5.4.8)
Collecting tensorflow-model-optimization>=0.4.1
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Requirement already satisfied: oauth2client in
/usr/local/lib/python3.7/dist-packages (from tf-models-official) (4.1.3)
Requirement already satisfied: pandas>=0.22.0 in /usr/local/lib/python3.7/dist-
packages (from tf-models-official) (1.3.5)
Collecting seqeval
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Requirement already satisfied: scipy>=0.19.1 in
/usr/local/lib/python3.7/dist-packages (from tf-models-official) (1.4.1)
Requirement already satisfied: kaggle>=1.3.9 in /usr/local/lib/python3.7/dist-
packages (from tf-models-official) (1.5.12)
Requirement already satisfied: tensorflow-text~=2.8.0 in
/usr/local/lib/python3.7/dist-packages (from tf-models-official) (2.8.2)
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages
(from tf-models-official) (1.15.0)
Requirement already satisfied: Pillow in /usr/local/lib/python3.7/dist-packages
(from tf-models-official) (7.1.2)
Requirement already satisfied: tensorflow~=2.8.0 in
/usr/local/lib/python3.7/dist-packages (from tf-models-official) (2.8.0)

Requirement already satisfied: gin-config in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (0.5.0)
Requirement already satisfied: Cython in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (0.29.28)
Requirement already satisfied: google-api-python-client>=1.6.7 in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (1.12.11)
Requirement already satisfied: tensorflow-hub>=0.6.0 in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (0.12.0)
Requirement already satisfied: numpy>=1.15.4 in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (1.21.6)
Collecting sentencepiece
  Downloading
sentencepiece-0.1.96-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (1.2 MB)
     | | 1.2 MB 55.5 MB/s
Collecting tensorflow-addons
  Downloading tensorflow_addons-0.16.1-cp37-cp37m-manylinux_2_12_x86_64.manylinux2010_x86_64.whl (1.1 MB)
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  Downloading opencv_python_headless-4.5.5.64-cp36-abi3-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (47.8 MB)
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Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (3.2.2)
Requirement already satisfied: tensorflow-datasets in /usr/local/lib/python3.7/dist-packages (from tf-models-official) (4.0.1)
Collecting sacrebleu
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Collecting py-cpuinfo>=3.3.0
  Downloading py-cpuinfo-8.0.0.tar.gz (99 kB)
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Requirement already satisfied: google-api-core<3dev,>=1.21.0 in /usr/local/lib/python3.7/dist-packages (from google-api-python-client>=1.6.7->tf-models-official) (1.31.5)
Requirement already satisfied: google-auth-httplib2>=0.0.3 in /usr/local/lib/python3.7/dist-packages (from google-api-python-client>=1.6.7->tf-models-official) (0.0.4)
Requirement already satisfied: httplib2<1dev,>=0.15.0 in /usr/local/lib/python3.7/dist-packages (from google-api-python-client>=1.6.7->tf-models-official) (0.17.4)
Requirement already satisfied: uritemplate<4dev,>=3.0.0 in /usr/local/lib/python3.7/dist-packages (from google-api-python-client>=1.6.7->tf-models-official) (3.0.1)
Requirement already satisfied: google-auth<3dev,>=1.16.0 in /usr/local/lib/python3.7/dist-packages (from google-api-python-client>=1.6.7->tf-models-official) (1.35.0)

Requirement already satisfied: pytz in /usr/local/lib/python3.7/dist-packages
(from google-api-core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-
official) (2022.1)
Requirement already satisfied: googleapis-common-protos<2.0dev,>=1.6.0 in
/usr/local/lib/python3.7/dist-packages (from google-api-
core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official)
(1.56.0)
Requirement already satisfied: protobuf>=3.12.0 in
/usr/local/lib/python3.7/dist-packages (from google-api-
core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official)
(3.17.3)
Requirement already satisfied: requests<3.0.0dev,>=2.18.0 in
/usr/local/lib/python3.7/dist-packages (from google-api-
core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official)
(2.23.0)
Requirement already satisfied: setuptools>=40.3.0 in
/usr/local/lib/python3.7/dist-packages (from google-api-
core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official)
(57.4.0)
Requirement already satisfied: packaging>=14.3 in /usr/local/lib/python3.7/dist-
packages (from google-api-core<3dev,>=1.21.0->google-api-python-
client>=1.6.7->tf-models-official) (21.3)
Requirement already satisfied: pyasn1-modules>=0.2.1 in
/usr/local/lib/python3.7/dist-packages (from google-auth<3dev,>=1.16.0->google-
api-python-client>=1.6.7->tf-models-official) (0.2.8)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in
/usr/local/lib/python3.7/dist-packages (from google-auth<3dev,>=1.16.0->google-
api-python-client>=1.6.7->tf-models-official) (4.2.4)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/dist-
packages (from google-auth<3dev,>=1.16.0->google-api-python-client>=1.6.7->tf-
models-official) (4.8)
Requirement already satisfied: certifi in /usr/local/lib/python3.7/dist-packages
(from kaggle>=1.3.9->tf-models-official) (2021.10.8)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.7/dist-
packages (from kaggle>=1.3.9->tf-models-official) (2.8.2)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/dist-packages
(from kaggle>=1.3.9->tf-models-official) (1.25.11)
Requirement already satisfied: python-slugify in /usr/local/lib/python3.7/dist-
packages (from kaggle>=1.3.9->tf-models-official) (6.1.2)
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/dist-packages
(from kaggle>=1.3.9->tf-models-official) (4.64.0)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in
/usr/local/lib/python3.7/dist-packages (from packaging>=14.3->google-api-
core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official) (3.0.8)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in
/usr/local/lib/python3.7/dist-packages (from pyasn1-modules>=0.2.1->google-
auth<3dev,>=1.16.0->google-api-python-client>=1.6.7->tf-models-official) (0.4.8)
Requirement already satisfied: chardet<4,>=3.0.2 in

/usr/local/lib/python3.7/dist-packages (from requests<3.0.0dev,>=2.18.0->google-api-core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official) (3.0.4)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests<3.0.0dev,>=2.18.0->google-api-core<3dev,>=1.21.0->google-api-python-client>=1.6.7->tf-models-official) (2.10)
Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (1.6.3)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (1.14.0)
Requirement already satisfied: tf-estimator-nightly==2.8.0.dev2021122109 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (2.8.0.dev2021122109)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (3.3.0)
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (1.1.0)
Requirement already satisfied: flatbuffers>=1.12 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (2.0)
Requirement already satisfied: libclang>=9.0.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (14.0.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (0.25.0)
Requirement already satisfied: keras<2.9,>=2.8.0rc0 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (2.8.0)
Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (0.2.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (1.44.0)
Requirement already satisfied: keras-preprocessing>=1.1.1 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (1.1.2)
Requirement already satisfied: tensorboard<2.9,>=2.8 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (2.8.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (4.2.0)
Requirement already satisfied: absl-py>=0.4.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow~=2.8.0->tf-models-official) (1.0.0)

```
Requirement already satisfied: h5py>=2.9.0 in /usr/local/lib/python3.7/dist-
packages (from tensorflow~=2.8.0->tf-models-official) (3.1.0)
Requirement already satisfied: gast>=0.2.1 in /usr/local/lib/python3.7/dist-
packages (from tensorflow~=2.8.0->tf-models-official) (0.5.3)
Requirement already satisfied: wheel<1.0,>=0.23.0 in
/usr/local/lib/python3.7/dist-packages (from
astunparse>=1.6.0->tensorflow~=2.8.0->tf-models-official) (0.37.1)
Requirement already satisfied: cached-property in /usr/local/lib/python3.7/dist-
packages (from h5py>=2.9.0->tensorflow~=2.8.0->tf-models-official) (1.5.2)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-official) (0.4.6)
Requirement already satisfied: markdown>=2.6.8 in /usr/local/lib/python3.7/dist-
packages (from tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-official)
(3.3.6)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-official) (1.8.1)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-official) (0.6.1)
Requirement already satisfied: werkzeug>=0.11.15 in
/usr/local/lib/python3.7/dist-packages (from
tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-official) (1.0.1)
Requirement already satisfied: requests-oauthlib>=0.7.0 in
/usr/local/lib/python3.7/dist-packages (from google-auth-
oauthlib<0.5,>=0.4.1->tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-
official) (1.3.1)
Requirement already satisfied: importlib-metadata>=4.4 in
/usr/local/lib/python3.7/dist-packages (from
markdown>=2.6.8->tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-official)
(4.11.3)
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-
packages (from importlib-
metadata>=4.4->markdown>=2.6.8->tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-
models-official) (3.8.0)
Requirement already satisfied: oauthlib>=3.0.0 in /usr/local/lib/python3.7/dist-
packages (from requests-oauthlib>=0.7.0->google-auth-
oauthlib<0.5,>=0.4.1->tensorboard<2.9,>=2.8->tensorflow~=2.8.0->tf-models-
official) (3.2.0)
Requirement already satisfied: dm-tree~=0.1.1 in /usr/local/lib/python3.7/dist-
packages (from tensorflow-model-optimization>=0.4.1->tf-models-official) (0.1.7)
Requirement already satisfied: kiwisolver>=1.0.1 in
/usr/local/lib/python3.7/dist-packages (from matplotlib->tf-models-official)
(1.4.2)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-
packages (from matplotlib->tf-models-official) (0.11.0)
Requirement already satisfied: text-unidecode>=1.3 in
```

/usr/local/lib/python3.7/dist-packages (from python-slugify->kaggle>=1.3.9->tf-models-official) (1.3)
Collecting portalocker
  Downloading portalocker-2.4.0-py2.py3-none-any.whl (16 kB)
Requirement already satisfied: regex in /usr/local/lib/python3.7/dist-packages
(from sacrebleu->tf-models-official) (2019.12.20)
Requirement already satisfied: tabulate>=0.8.9 in /usr/local/lib/python3.7/dist-packages (from sacrebleu->tf-models-official) (0.8.9)
Collecting colorama
  Downloading colorama-0.4.4-py2.py3-none-any.whl (16 kB)
Requirement already satisfied: scikit-learn>=0.21.3 in
/usr/local/lib/python3.7/dist-packages (from seqeval->tf-models-official)
(1.0.2)
Requirement already satisfied: joblib>=0.11 in /usr/local/lib/python3.7/dist-packages (from scikit-learn>=0.21.3->seqeval->tf-models-official) (1.1.0)
Requirement already satisfied: threadpoolctl>=2.0.0 in
/usr/local/lib/python3.7/dist-packages (from scikit-learn>=0.21.3->seqeval->tf-models-official) (3.1.0)
Requirement already satisfied: typeguard>=2.7 in /usr/local/lib/python3.7/dist-packages (from tensorflow-addons->tf-models-official) (2.7.1)
Requirement already satisfied: tensorflow-metadata in
/usr/local/lib/python3.7/dist-packages (from tensorflow-datasets->tf-models-official) (1.7.0)
Requirement already satisfied: attrs>=18.1.0 in /usr/local/lib/python3.7/dist-packages (from tensorflow-datasets->tf-models-official) (21.4.0)
Requirement already satisfied: future in /usr/local/lib/python3.7/dist-packages
(from tensorflow-datasets->tf-models-official) (0.16.0)
Requirement already satisfied: importlib-resources in
/usr/local/lib/python3.7/dist-packages (from tensorflow-datasets->tf-models-official) (5.7.1)
Requirement already satisfied: dill in /usr/local/lib/python3.7/dist-packages
(from tensorflow-datasets->tf-models-official) (0.3.4)
Requirement already satisfied: promise in /usr/local/lib/python3.7/dist-packages
(from tensorflow-datasets->tf-models-official) (2.3)
Building wheels for collected packages: py-cpuinfo, seqeval
  Building wheel for py-cpuinfo (setup.py) … done
  Created wheel for py-cpuinfo: filename=py_cpuinfo-8.0.0-py3-none-any.whl
size=22257
sha256=fbea462499479c4e312e6b57b855d4968979e8ef853e3371f83a85abea372cb4
  Stored in directory: /root/.cache/pip/wheels/d2/f1/1f/041add21dc9c4220157f1bd2
bd6afe1f1a49524c3396b94401
  Building wheel for seqeval (setup.py) … done
  Created wheel for seqeval: filename=seqeval-1.2.2-py3-none-any.whl size=16180
sha256=c2e278708a4d0c3bf036efa23f752fbaa3030adc45d956eeb0c5a4f1f964f42c
  Stored in directory: /root/.cache/pip/wheels/05/96/ee/7cac4e74f3b19e3158dce26a
20a1c86b3533c43ec72a549fd7
Successfully built py-cpuinfo seqeval
Installing collected packages: portalocker, colorama, tf-slim, tensorflow-model-

```
optimization, tensorflow-addons, seqeval, sentencepiece, sacrebleu, pyyaml, py-
cpuinfo, opencv-python-headless, tf-models-official
  Attempting uninstall: pyyaml
    Found existing installation: PyYAML 6.0
    Uninstalling PyYAML-6.0:
      Successfully uninstalled PyYAML-6.0
Successfully installed colorama-0.4.4 opencv-python-headless-4.5.5.64
portalocker-2.4.0 py-cpuinfo-8.0.0 pyyaml-5.4.1 sacrebleu-2.0.0
sentencepiece-0.1.96 seqeval-1.2.2 tensorflow-addons-0.16.1 tensorflow-model-
optimization-0.7.2 tf-models-official-2.8.0 tf-slim-1.1.0
```

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

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from tqdm.notebook import tqdm
import tensorflow as tf
print(tf.__version__)
from nltk.stem import WordNetLemmatizer
from nltk.corpus import stopwords
import tensorflow as tf
import tensorflow_hub as hub
import tensorflow_text as text
import tensorflow_addons as tfa
from official.nlp import optimization


wordLemm = WordNetLemmatizer()
```

```
2.8.0
```

```python
train_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/
 ↪nlp-getting-started/train.csv')
test_df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/
 ↪nlp-getting-started/test.csv')
```

```python
train_df.head(10)
```

```
   id keyword location                                          text  \
0   1     NaN      NaN  Our Deeds are the Reason of this #earthquake M…
1   4     NaN      NaN             Forest fire near La Ronge Sask. Canada
2   5     NaN      NaN  All residents asked to 'shelter in place' are …
3   6     NaN      NaN  13,000 people receive #wildfires evacuation or…
4   7     NaN      NaN  Just got sent this photo from Ruby #Alaska as …
```

```
5    8      NaN      NaN   #RockyFire Update => California Hwy. 20 closed…
6   10      NaN      NaN   #flood #disaster Heavy rain causes flash flood…
7   13      NaN      NaN   I'm on top of the hill and I can see a fire in…
8   14      NaN      NaN   There's an emergency evacuation happening now …
9   15      NaN      NaN   I'm afraid that the tornado is coming to our a…

   target
0       1
1       1
2       1
3       1
4       1
5       1
6       1
7       1
8       1
9       1
```
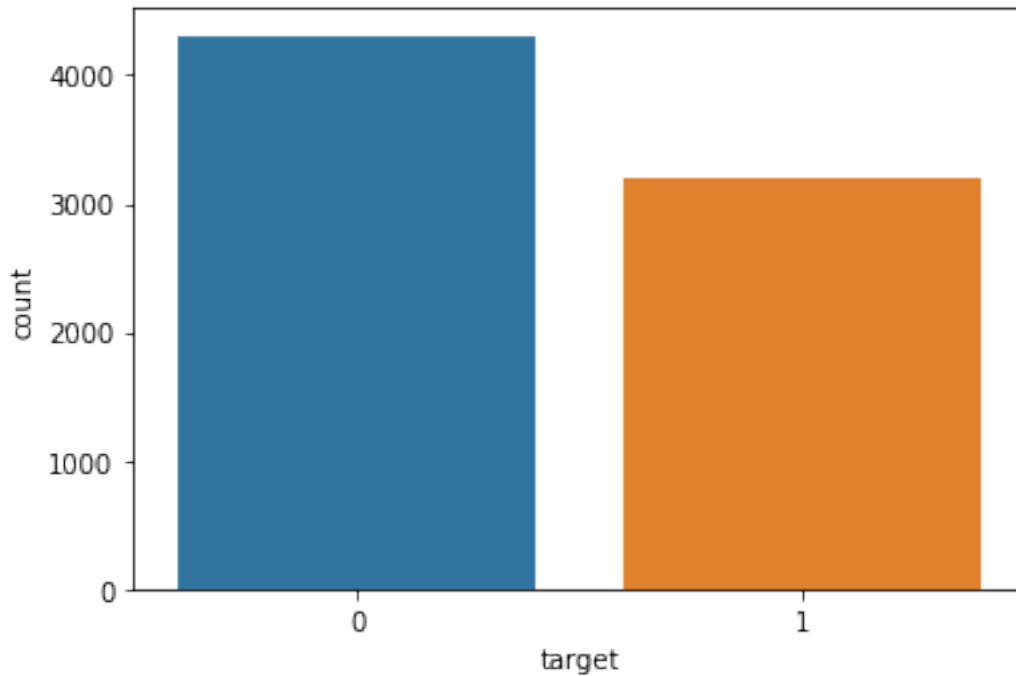
[ ]: ```python
print(len(train_df))
train_df = train_df.drop_duplicates('text', keep = 'last')
print(len(train_df))
```

```
7613
7503
```

[ ]: ```python
sns.countplot(train_df['target'])
```

```
/usr/local/lib/python3.7/dist-packages/seaborn/_decorators.py:43: FutureWarning:
Pass the following variable as a keyword arg: x. From version 0.12, the only
valid positional argument will be `data`, and passing other arguments without an
explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7fe93bd5cb10>

```
[ ]: train_df['target'].value_counts()
```
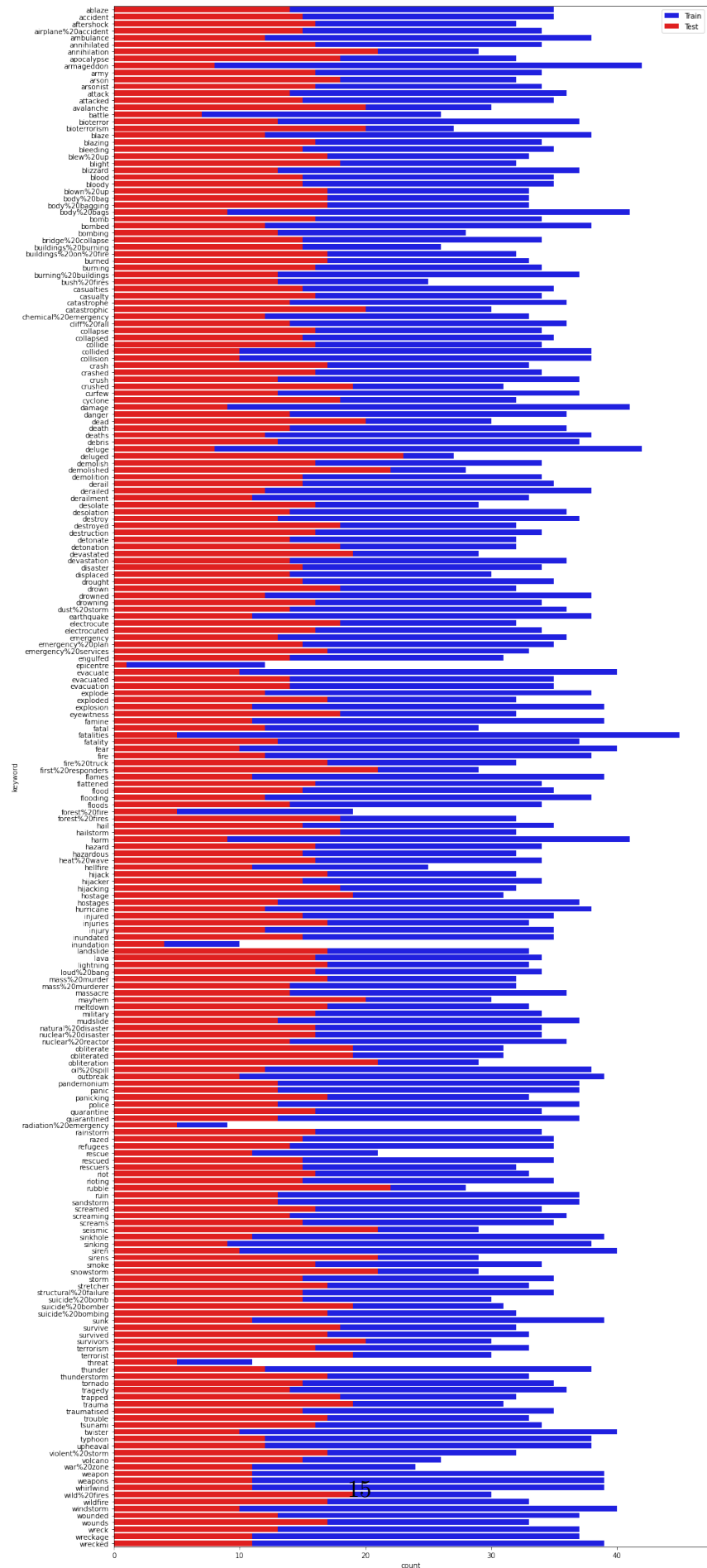
```
[ ]: 0    4307
     1    3196
     Name: target, dtype: int64
```

```
[ ]: plt.figure(figsize = (15,40))
     print(f'Unique keywords num = {len(train_df.keyword.unique())}')
     print(f'Unique keywords num = {len(test_df.keyword.unique())}')
     sns.countplot(y=train_df['keyword'],color = (0,0,1), label = 'Train')
     sns.countplot(y=test_df['keyword'],color = (1,0,0), label = 'Test')
     plt.legend()
```

```
Unique keywords num = 222
Unique keywords num = 222
```

```
[ ]: <matplotlib.legend.Legend at 0x7fe93bd16090>
```
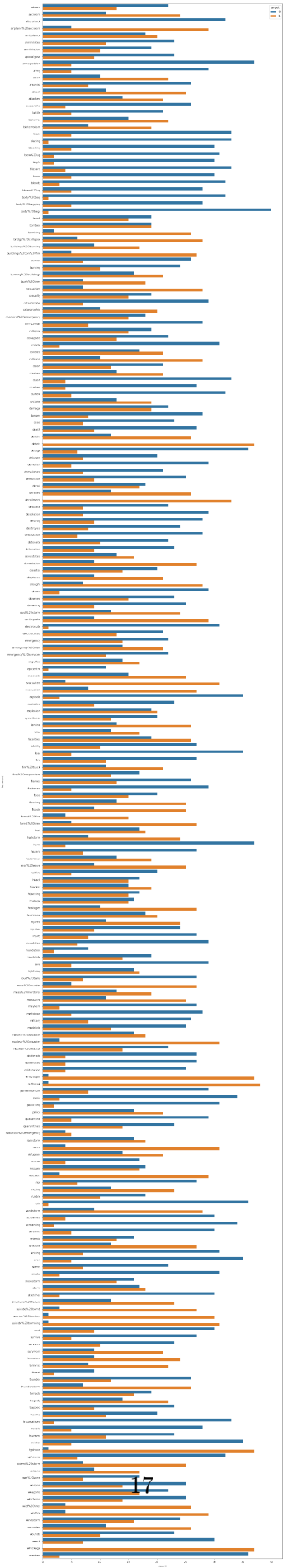
```
plt.figure(figsize = (15,100))
sns.countplot(data = train_df, y = 'keyword',hue = 'target')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe93c0e2390>
```

17

```
EMOJIS = {':)': 'smile', ':-)': 'smile', ';d': 'wink', ':-E': 'vampire', ':(':␣
 ↪'sad',
          ':-(': 'sad', ':-<': 'sad', ':P': 'raspberry', ':O': 'surprised',
          ':-@': 'shocked', ':@': 'shocked',':-$': 'confused', ':\\': 'annoyed',
          ':#': 'mute', ':X': 'mute', ':^)': 'smile', ':-&': 'confused', '$_$':␣
 ↪'greedy',
          '@@': 'eyeroll', ':-!': 'confused', ':-D': 'smile', ':-0': 'yell', 'O.
 ↪o': 'confused',
          '<(-_-)>': 'robot', 'd[-_-]b': 'dj', ":'-)": 'sadsmile', ';)': 'wink',
          ';-)': 'wink', 'O:-)': 'angel','O*-)': 'angel','(:-D': 'gossip', '=^.
 ↪^=': 'cat'}
URLPATTERN       = r"((http://)[^ ]*|(https://)[^ ]*|( www\.)[^ ]*)"
USERPATTERN      = '@[^\s]+'
SEQPATTERN   = r"(.)\1\1+"
SEQREPLACE = r"\1\1"
```

```python
import re

def preprocess_text(text):
    text = re.sub(URLPATTERN,' URL',text)
    for emoji in EMOJIS.key():
        text = text.replace(emoji, 'EMOJI' + EMOJIS[emoji])
        return text
```

```python

```

```python

```

```python

```

```python
from sklearn.model_selection import train_test_split
X_train, X_valid, y_train, y_valid = train_test_split(train_df['text'].
 ↪tolist(),\
                                                       train_df['target'].
 ↪tolist(),\
                                                       test_size=0.05,\
                                                       stratify =␣
 ↪train_df['target'].tolist(),\
                                                       random_state=0)
```

```python
batch_size = 32
seed = 42
train_ds = tf.data.Dataset.from_tensor_slices((train_df['text'].
 ↪tolist(),train_df['target'].tolist())).batch(batch_size)
```

```
test_ds = tf.data.Dataset.from_tensor_slices((test_df['text'].tolist())).
 ↪batch(batch_size)
```

```
bert_model_name = 'bert_en_uncased_L-12_H-768_A-12'  #@param
 ↪["bert_en_uncased_L-12_H-768_A-12", "bert_en_cased_L-12_H-768_A-12",
 ↪"bert_multi_cased_L-12_H-768_A-12", "small_bert/
 ↪bert_en_uncased_L-2_H-128_A-2", "small_bert/bert_en_uncased_L-2_H-256_A-4",
 ↪"small_bert/bert_en_uncased_L-2_H-512_A-8", "small_bert/
 ↪bert_en_uncased_L-2_H-768_A-12", "small_bert/bert_en_uncased_L-4_H-128_A-2",
 ↪"small_bert/bert_en_uncased_L-4_H-256_A-4", "small_bert/
 ↪bert_en_uncased_L-4_H-512_A-8", "small_bert/bert_en_uncased_L-4_H-768_A-12",
 ↪"small_bert/bert_en_uncased_L-6_H-128_A-2", "small_bert/
 ↪bert_en_uncased_L-6_H-256_A-4", "small_bert/bert_en_uncased_L-6_H-512_A-8",
 ↪"small_bert/bert_en_uncased_L-6_H-768_A-12", "small_bert/
 ↪bert_en_uncased_L-8_H-128_A-2", "small_bert/bert_en_uncased_L-8_H-256_A-4",
 ↪"small_bert/bert_en_uncased_L-8_H-512_A-8", "small_bert/
 ↪bert_en_uncased_L-8_H-768_A-12", "small_bert/
 ↪bert_en_uncased_L-10_H-128_A-2", "small_bert/
 ↪bert_en_uncased_L-10_H-256_A-4", "small_bert/
 ↪bert_en_uncased_L-10_H-512_A-8", "small_bert/
 ↪bert_en_uncased_L-10_H-768_A-12", "small_bert/
 ↪bert_en_uncased_L-12_H-128_A-2", "small_bert/
 ↪bert_en_uncased_L-12_H-256_A-4", "small_bert/
 ↪bert_en_uncased_L-12_H-512_A-8", "small_bert/
 ↪bert_en_uncased_L-12_H-768_A-12", "albert_en_base", "electra_small",
 ↪"electra_base", "experts_pubmed", "experts_wiki_books", "talking-heads_base"]

map_name_to_handle = {
    'bert_en_uncased_L-12_H-768_A-12':
        'https://tfhub.dev/tensorflow/bert_en_uncased_L-12_H-768_A-12/3',
    'bert_en_cased_L-12_H-768_A-12':
        'https://tfhub.dev/tensorflow/bert_en_cased_L-12_H-768_A-12/3',
    'bert_multi_cased_L-12_H-768_A-12':
        'https://tfhub.dev/tensorflow/bert_multi_cased_L-12_H-768_A-12/3',
    'small_bert/bert_en_uncased_L-2_H-128_A-2':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-2_H-128_A-2/
 ↪1',
    'small_bert/bert_en_uncased_L-2_H-256_A-4':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-2_H-256_A-4/
 ↪1',
    'small_bert/bert_en_uncased_L-2_H-512_A-8':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-2_H-512_A-8/
 ↪1',
    'small_bert/bert_en_uncased_L-2_H-768_A-12':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-2_H-768_A-12/
 ↪1',
    'small_bert/bert_en_uncased_L-4_H-128_A-2':
```

```
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-4_H-128_A-2/
↪1',
    'small_bert/bert_en_uncased_L-4_H-256_A-4':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-4_H-256_A-4/
↪1',
    'small_bert/bert_en_uncased_L-4_H-512_A-8':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-4_H-512_A-8/
↪1',
    'small_bert/bert_en_uncased_L-4_H-768_A-12':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-4_H-768_A-12/
↪1',
    'small_bert/bert_en_uncased_L-6_H-128_A-2':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-6_H-128_A-2/
↪1',
    'small_bert/bert_en_uncased_L-6_H-256_A-4':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-6_H-256_A-4/
↪1',
    'small_bert/bert_en_uncased_L-6_H-512_A-8':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-6_H-512_A-8/
↪1',
    'small_bert/bert_en_uncased_L-6_H-768_A-12':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-6_H-768_A-12/
↪1',
    'small_bert/bert_en_uncased_L-8_H-128_A-2':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-8_H-128_A-2/
↪1',
    'small_bert/bert_en_uncased_L-8_H-256_A-4':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-8_H-256_A-4/
↪1',
    'small_bert/bert_en_uncased_L-8_H-512_A-8':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-8_H-512_A-8/
↪1',
    'small_bert/bert_en_uncased_L-8_H-768_A-12':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-8_H-768_A-12/
↪1',
    'small_bert/bert_en_uncased_L-10_H-128_A-2':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-10_H-128_A-2/
↪1',
    'small_bert/bert_en_uncased_L-10_H-256_A-4':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-10_H-256_A-4/
↪1',
    'small_bert/bert_en_uncased_L-10_H-512_A-8':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-10_H-512_A-8/
↪1',
    'small_bert/bert_en_uncased_L-10_H-768_A-12':
```

```python
        'https://tfhub.dev/tensorflow/small_bert/
↪bert_en_uncased_L-10_H-768_A-12/1',
    'small_bert/bert_en_uncased_L-12_H-128_A-2':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-12_H-128_A-2/
↪1',
    'small_bert/bert_en_uncased_L-12_H-256_A-4':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-12_H-256_A-4/
↪1',
    'small_bert/bert_en_uncased_L-12_H-512_A-8':
        'https://tfhub.dev/tensorflow/small_bert/bert_en_uncased_L-12_H-512_A-8/
↪1',
    'small_bert/bert_en_uncased_L-12_H-768_A-12':
        'https://tfhub.dev/tensorflow/small_bert/
↪bert_en_uncased_L-12_H-768_A-12/1',
    'albert_en_base':
        'https://tfhub.dev/tensorflow/albert_en_base/2',
    'electra_small':
        'https://tfhub.dev/google/electra_small/2',
    'electra_base':
        'https://tfhub.dev/google/electra_base/2',
    'experts_pubmed':
        'https://tfhub.dev/google/experts/bert/pubmed/2',
    'experts_wiki_books':
        'https://tfhub.dev/google/experts/bert/wiki_books/2',
    'talking-heads_base':
        'https://tfhub.dev/tensorflow/talkheads_ggelu_bert_en_base/1',
}

map_model_to_preprocess = {
    'bert_en_uncased_L-12_H-768_A-12':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'bert_en_cased_L-12_H-768_A-12':
        'https://tfhub.dev/tensorflow/bert_en_cased_preprocess/2',
    'small_bert/bert_en_uncased_L-2_H-128_A-2':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'small_bert/bert_en_uncased_L-2_H-256_A-4':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'small_bert/bert_en_uncased_L-2_H-512_A-8':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'small_bert/bert_en_uncased_L-2_H-768_A-12':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'small_bert/bert_en_uncased_L-4_H-128_A-2':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'small_bert/bert_en_uncased_L-4_H-256_A-4':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
    'small_bert/bert_en_uncased_L-4_H-512_A-8':
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
```

```
'small_bert/bert_en_uncased_L-4_H-768_A-12':
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'small_bert/bert_en_uncased_L-6_H-128_A-2':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-6_H-256_A-4':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-6_H-512_A-8':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-6_H-768_A-12':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-8_H-128_A-2':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-8_H-256_A-4':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-8_H-512_A-8':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-8_H-768_A-12':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-10_H-128_A-2':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-10_H-256_A-4':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-10_H-512_A-8':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
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    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'small_bert/bert_en_uncased_L-12_H-512_A-8':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
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    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
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    'https://tfhub.dev/tensorflow/bert_multi_cased_preprocess/2',
'albert_en_base':
    'https://tfhub.dev/tensorflow/albert_en_preprocess/2',
'electra_small':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'electra_base':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'experts_pubmed':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'experts_wiki_books':
    'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
'talking-heads_base':
```

```
        'https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2',
}

tfhub_handle_encoder = map_name_to_handle[bert_model_name]
tfhub_handle_preprocess = map_model_to_preprocess[bert_model_name]

print(f'BERT model selected           : {tfhub_handle_encoder}')
print(f'Preprocess model auto-selected: {tfhub_handle_preprocess}')
```

```
BERT model selected           :
https://tfhub.dev/tensorflow/bert_en_uncased_L-12_H-768_A-12/3
Preprocess model auto-selected:
https://tfhub.dev/tensorflow/bert_en_uncased_preprocess/2
```

```python
[ ]: def build_classifier_model():
         text_input = tf.keras.layers.Input(shape=(),dtype = tf.string,name = 'text')
         preprocessing_layer = hub.KerasLayer(tfhub_handle_preprocess, name =
      ↪'preprocessing')
         encoder_inputs = preprocessing_layer(text_input)
         encoder = hub.KerasLayer(tfhub_handle_encoder, trainable=True,
      ↪name='BERT_encoder')
         outputs = encoder(encoder_inputs)
         net = outputs['pooled_output']
         net = tf.keras.layers.Dropout(0.1)(net)
         net = tf.keras.layers.Dense(1, activation= "sigmoid" ,
      ↪name='classifier')(net)
         return tf.keras.Model(text_input, net)
```

```python
[ ]: classifier_model = build_classifier_model()
```

```python
[ ]: loss = tf.keras.losses.BinaryCrossentropy(from_logits=True)
     metrics = tf.metrics.BinaryAccuracy()
```

```python
[ ]: epochs = 4
     steps_per_epoch = tf.data.experimental.cardinality(train_ds).numpy()
     num_train_steps = steps_per_epoch * epochs
     num_warmup_steps = int(0.1*num_train_steps)

     init_lr = 3e-5
     optimizer = optimization.create_optimizer(init_lr=init_lr,
                                                num_train_steps=num_train_steps,
                                                num_warmup_steps=num_warmup_steps,
                                                optimizer_type='adamw')
```

```python
[ ]: classifier_model.compile(optimizer=optimizer,
                              loss=loss,
                              metrics=metrics)
```

```python
print(f'Training model with {tfhub_handle_encoder}')
history = classifier_model.fit(X_train,y_train,validation_data =
  ↪(X_valid,y_valid), epochs=epochs)
```

```
Training model with
https://tfhub.dev/tensorflow/bert_en_uncased_L-12_H-768_A-12/3
Epoch 1/4

/usr/local/lib/python3.7/dist-packages/tensorflow/python/util/dispatch.py:1082:
UserWarning: "`binary_crossentropy` received `from_logits=True`, but the
`output` argument was produced by a sigmoid or softmax activation and thus does
not represent logits. Was this intended?"
  return dispatch_target(*args, **kwargs)

223/223 [==============================] - 209s 909ms/step - loss: 0.1712 -
binary_accuracy: 0.9359 - val_loss: 0.1700 - val_binary_accuracy: 0.9574
Epoch 2/4
223/223 [==============================] - 203s 911ms/step - loss: 0.0975 -
binary_accuracy: 0.9645 - val_loss: 0.1936 - val_binary_accuracy: 0.9548
Epoch 3/4
223/223 [==============================] - 205s 920ms/step - loss: 0.0664 -
binary_accuracy: 0.9770 - val_loss: 0.1916 - val_binary_accuracy: 0.9548
Epoch 4/4
223/223 [==============================] - 203s 912ms/step - loss: 0.0459 -
binary_accuracy: 0.9834 - val_loss: 0.1929 - val_binary_accuracy: 0.9548
```

```python
[73]: probs = classifier_model.predict(test_df["text"])
threshold = 0.4
preds = np.where(probs[:,] > threshold, 1, 0)
```

```python
[69]: print(preds[0:9])
```

```
[[1]
 [1]
 [1]
 [1]
 [1]
 [1]
 [0]
 [0]
 [0]]
```

```python
[70]: test_df.head(10)
```

```
[70]:    id keyword location                                      text
    0   0     NaN      NaN                Just happened a terrible car crash
    1   2     NaN      NaN   Heard about #earthquake is different cities, s…
    2   3     NaN      NaN   there is a forest fire at spot pond, geese are…
    3   9     NaN      NaN              Apocalypse lighting. #Spokane #wildfires
```

```
4  11      NaN      NaN        Typhoon Soudelor kills 28 in China and Taiwan
5  12      NaN      NaN                        We're shaking...It's an earthquake
6  21      NaN      NaN   They'd probably still show more life than Arse...
7  22      NaN      NaN                                    Hey! How are you?
8  27      NaN      NaN                                    What a nice hat?
9  29      NaN      NaN                                          Fuck off!
```

```python
[74]: def plot_hist(hist):
          plt.plot(hist.history["binary_accuracy"])
          plt.plot(hist.history["val_binary_accuracy"])
          plt.title(f"model performance")
          plt.ylabel("binary accuracy")
          plt.xlabel("epoch")
          plt.legend(["train", "validation"], loc="upper left")
          plt.show()
          return
      plot_hist(hist=history)
```