Install Package

```
%pip install datasets
```

Show hidden output

Import Libraries

```
from datasets import load_dataset,DatasetDict
from transformers import AutoTokenizer,TFAutoModelForSequenceClassification
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
```

Load Dataset

```
import pandas as pd

pandas_df = pd.read_parquet("hf://datasets/tdavidson/hate_speech_offensive/data/train-00000-of-00001.parquet")
```

```
pandas_df.head()
```

	count	hate_speech_count	offensive_language_count	neither_count	class	tweet
0	3	0	0	3	2	!!! RT @mayasolovely: As a woman you shouldn't...
1	3	0	3	0	1	!!!!! RT @mleew17: boy dats cold...tyga dwn ba...
2	3	0	3	0	1	!!!!!!! RT @UrKindOfBrand Dawg!!!! RT @80sbaby...
3	3	0	2	1	1	!!!!!!!!! RT @C_G_Anderson: @viva_based she lo...
4	6	0	6	0	1	!!!!!!!!!!!!! RT @ShenikaRoberts: The shit you...

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```
pandas_df['class']
```

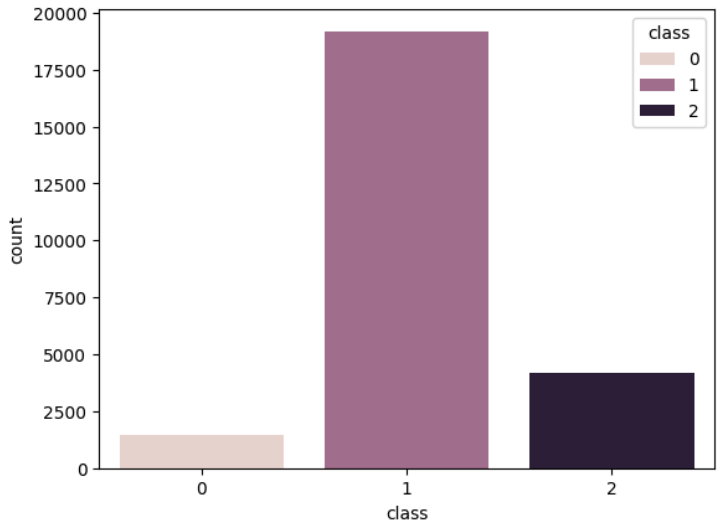
	class
0	2
1	1
2	1
3	1
4	1
...	...
24778	1
24779	2
24780	1
24781	1
24782	2

24783 rows × 1 columns

dtype: int64

```
import seaborn as sns
sns.countplot(x='class', data=pandas_df, hue='class')
```

```
<Axes: xlabel='class', ylabel='count'>
```



Clean Data

```
pandas_df['tweet_cleaned'] = pandas_df['tweet'].str.replace('@[A-Za-z0-9]+\s?', '', regex=True)
pandas_df.head()
```

	count	hate_speech_count	offensive_language_count	neither_count	class	tweet	tweet_cleaned
0	3	0	0	3	2	!!! RT @mayasolovely: As a woman you shouldn't...	!!! RT : As a woman you shouldn't complain abo...
1	3	0	3	0	1	!!!!! RT @mleew17: boy dats cold...tyga dwn ba...	!!!!! RT : boy dats cold...tyga dwn bad for cu...
2	3	0	3	0	1	!!!!!!! RT @UrKindOfBrand Dawg!!!! RT @80sbaby...	!!!!!!! RT Dawg!!!! RT : You ever fuck a bitch...
3	3	0	2	1	1	!!!!!!!!! RT @C_G_Anderson: @viva_based she lo...	!!!!!!!!! RT _G_Anderson: _based she look like...
4	6	0	6	0	1	!!!!!!!!!!!!! RT @ShenikaRoberts: The shit you...	!!!!!!!!!!!!! RT : The shit you hear about me ...

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```
from datasets import Dataset

ds = Dataset.from_pandas(pandas_df)
ds
```

```
Dataset({
    features: ['count', 'hate_speech_count', 'offensive_language_count', 'neither_count', 'class', 'tweet', 'tweet_cleaned'],
    num_rows: 24783
})
```

```
train_test_valid = ds.train_test_split()

test_valid = train_test_valid['test'].train_test_split()

train_test_valid_dataset = DatasetDict({
    'train': train_test_valid['train'],
    'test': test_valid['test'],
    'valid': test_valid['train']
    })


dataset = train_test_valid_dataset.remove_columns(['hate_speech_count', 'offensive_language_count', 'neither_count', 'count'])
dataset
```

```
DatasetDict({
    train: Dataset({
        features: ['class', 'tweet', 'tweet_cleaned'],
        num_rows: 18587
    })
    test: Dataset({
        features: ['class', 'tweet', 'tweet_cleaned'],
        num_rows: 1549
    })
    valid: Dataset({
        features: ['class', 'tweet', 'tweet_cleaned'],
        num_rows: 4647
    })
})
```

Tokenizer

load tokenizer

```
tokenizer = AutoTokenizer.from_pretrained("bert-base-cased")
```

```
/usr/local/lib/python3.10/dist-packages/transformers/tokenization_utils_base.py:1601: FutureWarning: `clean_up_tokenization_spaces` was not se
  warnings.warn(
```

Test tokenizer

```
text = "Just checking tokenization"

output = tokenizer(text)

output
```

```
{'input_ids': [101, 2066, 9444, 22559, 2734, 102], 'token_type_ids': [0, 0, 0, 0, 0, 0], 'attention_mask': [1, 1, 1, 1, 1, 1]}
```

```
tokens = tokenizer.convert_ids_to_tokens(output['input_ids'])
tokens
```

```
['[CLS]', 'Just', 'checking', 'token', '##ization', '[SEP]']
```

```
print(f"Tokenized text: {tokenizer.convert_tokens_to_string(tokens)}")
```

```
Tokenized text: [CLS] Just checking tokenization [SEP]
```

```
print(f"Vocab size is : {tokenizer.vocab_size}")

print(f"Model max length is : {tokenizer.model_max_length}")

print(f"Model input names are: {tokenizer.model_input_names}")
```

```
Vocab size is : 28996
Model max length is : 512
Model input names are: ['input_ids', 'token_type_ids', 'attention_mask']
```

Tokenize Function

```
def tokenize_function(train_dataset):
    return tokenizer(train_dataset['tweet_cleaned'], padding='max_length', truncation=True)


tokenized_dataset = dataset.map(tokenize_function, batched=True)

tokenized_dataset
```

```
Map: 100%                                  18587/18587 [00:14<00:00, 2023.54 examples/s]

Map: 100%                                  1549/1549 [00:01<00:00, 1143.47 examples/s]

Map: 100%                                  4647/4647 [00:02<00:00, 1565.90 examples/s]
DatasetDict({
    train: Dataset({
        features: ['class', 'tweet', 'tweet_cleaned', 'input_ids', 'token_type_ids', 'attention_mask'],
        num_rows: 18587
    })
    test: Dataset({
        features: ['class', 'tweet', 'tweet_cleaned', 'input_ids', 'token_type_ids', 'attention_mask'],
        num_rows: 1549
    })
    valid: Dataset({
        features: ['class', 'tweet', 'tweet_cleaned', 'input_ids', 'token_type_ids', 'attention_mask'],
        num_rows: 4647
    })
})
```

Tokenize Dataset

```
train_dataset = tokenized_dataset['train']
eval_dataset = tokenized_dataset['valid']
test_dataset = tokenized_dataset['test']
```

```
train_dataset
```

```
Dataset({
    features: ['class', 'tweet', 'tweet_cleaned', 'input_ids', 'token_type_ids', 'attention_mask'],
    num_rows: 18587
})
```

```
train_set = train_dataset.remove_columns(['tweet', "tweet_cleaned"]).with_format('tensorflow')

tf_eval_dataset = eval_dataset.remove_columns(['tweet', "tweet_cleaned"]).with_format('tensorflow')

tf_test_dataset = test_dataset.remove_columns(['tweet', "tweet_cleaned"]).with_format('tensorflow')
```

```
train_features = { x: train_set[x] for x in tokenizer.model_input_names  }

train_set_for_final_model = tf.data.Dataset.from_tensor_slices((train_features, train_set['class'] ))

train_set_for_final_model = train_set_for_final_model.shuffle(len(train_set)).batch(8)
```

```
eval_features = {x: tf_eval_dataset[x] for x in tokenizer.model_input_names}
val_set_for_final_model = tf.data.Dataset.from_tensor_slices((eval_features, tf_eval_dataset["class"]))
val_set_for_final_model = val_set_for_final_model.batch(8)

test_features = {x: tf_test_dataset[x] for x in tokenizer.model_input_names}
test_set_for_final_model = tf.data.Dataset.from_tensor_slices((test_features, tf_test_dataset["class"]))
test_set_for_final_model =test_set_for_final_model.batch(8)
```

Load and compile Model

```
model = TFAutoModelForSequenceClassification.from_pretrained("bert-base-cased", num_labels=3)


model.compile(
    optimizer=tf.keras.optimizers.Adam(learning_rate=5e-5),
    loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True),
    metrics=tf.metrics.SparseCategoricalAccuracy(),
)
```

```
model.safetensors: 100%                                    436M/436M [00:02<00:00, 171MB/s]
All PyTorch model weights were used when initializing TFBertForSequenceClassification.

Some weights or buffers of the TF 2.0 model TFBertForSequenceClassification were not initialized from the PyTorch model and are newly initiali
You should probably TRAIN this model on a down-stream task to be able to use it for predictions and inference.
```

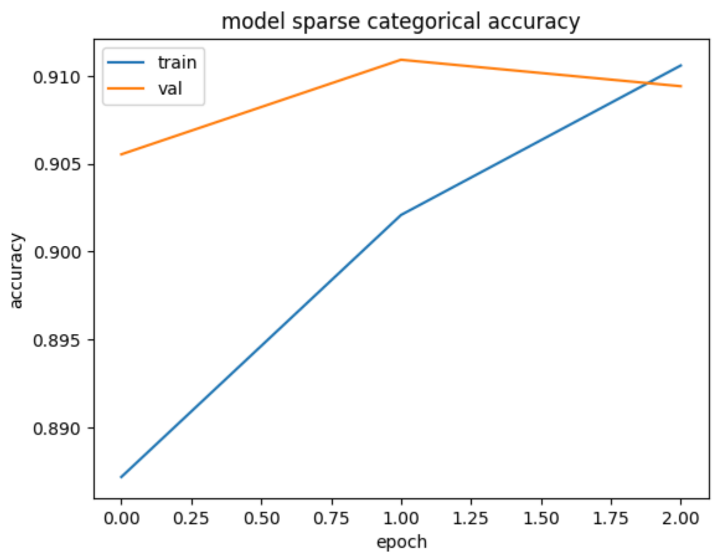
Training Model

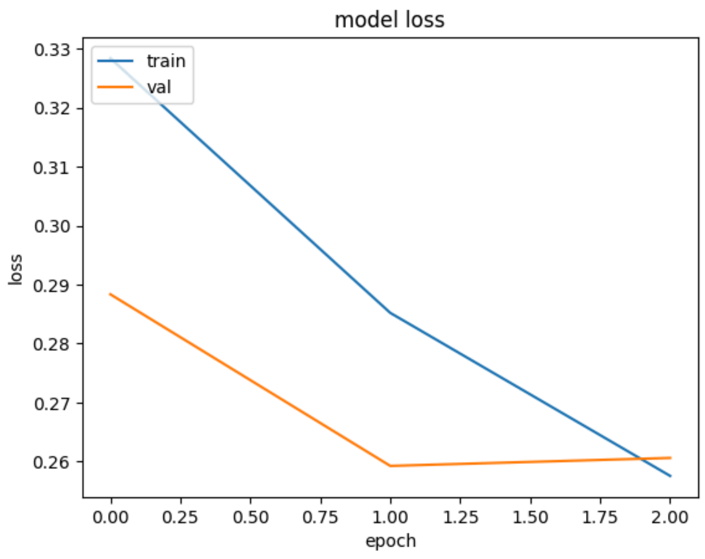
```
history = model.fit(train_set_for_final_model,
                    validation_data=val_set_for_final_model,
                    epochs=3 )
```

```
Epoch 1/3
2324/2324 [==============================] - 2375s 987ms/step - loss: 0.3284 - sparse_categorical_accuracy: 0.8872 - val_loss: 0.2884 - val_sp
Epoch 2/3
2324/2324 [==============================] - 2296s 988ms/step - loss: 0.2852 - sparse_categorical_accuracy: 0.9021 - val_loss: 0.2592 - val_sp
Epoch 3/3
2324/2324 [==============================] - 2290s 985ms/step - loss: 0.2575 - sparse_categorical_accuracy: 0.9106 - val_loss: 0.2606 - val_sp
```

```
plt.plot(history.history['sparse_categorical_accuracy'])
plt.plot(history.history['val_sparse_categorical_accuracy'])
plt.title('model sparse categorical accuracy')
plt.ylabel('accuracy')
plt.xlabel('epoch')
plt.legend(['train', 'val'], loc='upper left')
plt.show()


plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('model loss')
plt.ylabel('loss')
plt.xlabel('epoch')
plt.legend(['train', 'val'], loc='upper left')
plt.show()
```





Evaluate Model

```
test_loss, test_acc = model.evaluate(test_set_for_final_model,verbose=2)
print('\nTest accuracy:', test_acc)
```

```
194/194 - 63s - loss: 0.2516 - sparse_categorical_accuracy: 0.9116 - 63s/epoch - 325ms/step

Test accuracy: 0.911555826663971
```

Predict Bert Model

```
predict_score_and_class_dict = {0: 'Hate Speech',
 1: 'Offensive Language',
 2: 'Neither'}

preds = model(tokenizer(["He is useless, I dont know why he came to our neighbourhood", "That guy sucks", "He is such a retard"],return_tensors="t

print(preds)

class_preds = np.argmax(preds, axis=1)

for pred in class_preds:
  print(predict_score_and_class_dict[pred])
```

```
tf.Tensor(
[[-1.354622    0.49887672  0.855539  ]
 [-1.669037    0.07300647  1.7006899 ]
 [-0.24571076  2.3914983  -2.441549  ]], shape=(3, 3), dtype=float32)
Neither
Neither
Offensive Language
```

```
predict_score_and_class_dict = {0: 'Hate Speech',
 1: 'Offensive Language',
 2: 'Neither'}
preds = model(tokenizer(["He dresses up like a begger thise days"],return_tensors="tf",padding=True,truncation=True))['logits']
print(preds)
class_preds = np.argmax(preds, axis=1)

for pred in class_preds:
  print(predict_score_and_class_dict[pred])
```

```
tf.Tensor([[-1.5158917  0.4804067  1.0637728]], shape=(1, 3), dtype=float32)
Neither
```

```
Start coding or generate with AI.
```