```
import pandas as pd
import re

url = 'https://raw.githubusercontent.com/rizalespe/Dataset-Sentimen-
Analisis-Bahasa-Indonesia/master/
dataset_tweet_sentiment_opini_film.csv'
df = pd.read_csv(url)
df.head()
```

```
   Id Sentiment                                         Text Tweet
0   1  negative  Jelek filmnya... apalagi si ernest gak mutu bg...
1   2  negative  Film king Arthur ini film paling jelek dari se...
2   3  negative  @beexkuanlin Sepanjang film gwa berkata kasar ...
3   4  negative  Ane ga suka fast and furious..menurutku kok je...
4   5  negative  @baekhyun36 kan gua ga tau film nya, lu bilang...
```

```
df.drop('Id',axis=1,inplace=True)

#ubah nama kolom
df = df.rename(columns={'Sentiment':'sentiment',
                        'Text Tweet':'text_tweet'})

#ubah data kategorik menjadi data numerik
df['sentiment'].replace(['negative','positive'], [0,1], inplace=True)

df
```

```
     sentiment                                         text_tweet
0            0  Jelek filmnya... apalagi si ernest gak mutu bg...
1            0  Film king Arthur ini film paling jelek dari se...
2            0  @beexkuanlin Sepanjang film gwa berkata kasar ...
3            0  Ane ga suka fast and furious..menurutku kok je...
4            0  @baekhyun36 kan gua ga tau film nya, lu bilang...
..         ...                                                ...
195          1  Fargo juga adaptasi dari film yang cukup berha...
196          1  637.000 waw ini sangat keren flm horor dng jum...
197          1  @filmziarah film yang tenang dan menghanyutkan...
198          1  Film yg amat menarik. Kisah cinta & kesetiaan ...
199          1  Nntn @filmziarah , film bagus, ada kali 5 meni...

[200 rows x 2 columns]
```

```
def pre_processing(text_tweet):
  text_tweet = text_tweet.lower()
  text_tweet = text_tweet.strip()
  text_tweet = re.sub(r'https?://\S+|www\.\S+','', text_tweet)
  text_tweet = re.sub(r'[-+]?[0-9]+','', text_tweet)
  text_tweet = re.sub(r'[^\w\s]','', text_tweet)
  return text_tweet
df['text_tweet'] = df['text_tweet'].apply(pre_processing)
```

```
df
```

```
     sentiment                                         text_tweet
0            0  jelek filmnya apalagi si ernest gak mutu bgt a...
1            0  film king arthur ini film paling jelek dari se...
2            0  beexkuanlin sepanjang film gwa berkata kasar t...
3            0  ane ga suka fast and furiousmenurutku kok jele...
4            0  baekhyun kan gua ga tau film nya lu bilang per...
..         ...                                                ...
195          1  fargo juga adaptasi dari film yang cukup berha...
196          1   waw ini sangat keren flm horor dng jumlah pen...
197          1  filmziarah film yang tenang dan menghanyutkan ...
198          1  film yg amat menarik kisah cinta  kesetiaan yg...
199          1  nntn filmziarah  film bagus ada kali  menit pe...

[200 rows x 2 columns]
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 2 columns):
 #   Column      Non-Null Count  Dtype 
---  ------      --------------  ----- 
 0   sentiment   200 non-null    int64 
 1   text_tweet  200 non-null    object
dtypes: int64(1), object(1)
memory usage: 3.2+ KB
```

```
!pip install transformers
```

```
Requirement already satisfied: transformers in
/usr/local/lib/python3.10/dist-packages (4.33.2)
Requirement already satisfied: filelock in
/usr/local/lib/python3.10/dist-packages (from transformers) (3.12.2)
Requirement already satisfied: huggingface-hub<1.0,>=0.15.1 in
/usr/local/lib/python3.10/dist-packages (from transformers) (0.17.2)
Requirement already satisfied: numpy>=1.17 in
/usr/local/lib/python3.10/dist-packages (from transformers) (1.23.5)
Requirement already satisfied: packaging>=20.0 in
/usr/local/lib/python3.10/dist-packages (from transformers) (23.1)
Requirement already satisfied: pyyaml>=5.1 in
/usr/local/lib/python3.10/dist-packages (from transformers) (6.0.1)
Requirement already satisfied: regex!=2019.12.17 in
/usr/local/lib/python3.10/dist-packages (from transformers) (2023.6.3)
Requirement already satisfied: requests in
/usr/local/lib/python3.10/dist-packages (from transformers) (2.31.0)
Requirement already satisfied: tokenizers!=0.11.3,<0.14,>=0.11.1 in
/usr/local/lib/python3.10/dist-packages (from transformers) (0.13.3)
Requirement already satisfied: safetensors>=0.3.1 in
```

```
/usr/local/lib/python3.10/dist-packages (from transformers) (0.3.3)
Requirement already satisfied: tqdm>=4.27 in
/usr/local/lib/python3.10/dist-packages (from transformers) (4.66.1)
Requirement already satisfied: fsspec in
/usr/local/lib/python3.10/dist-packages (from huggingface-
hub<1.0,>=0.15.1->transformers) (2023.6.0)
Requirement already satisfied: typing-extensions>=3.7.4.3 in
/usr/local/lib/python3.10/dist-packages (from huggingface-
hub<1.0,>=0.15.1->transformers) (4.5.0)
Requirement already satisfied: charset-normalizer<4,>=2 in
/usr/local/lib/python3.10/dist-packages (from requests->transformers)
(3.2.0)
Requirement already satisfied: idna<4,>=2.5 in
/usr/local/lib/python3.10/dist-packages (from requests->transformers)
(3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in
/usr/local/lib/python3.10/dist-packages (from requests->transformers)
(2.0.4)
Requirement already satisfied: certifi>=2017.4.17 in
/usr/local/lib/python3.10/dist-packages (from requests->transformers)
(2023.7.22)
```

```python
sentences = df.text_tweet.values
labels = df.sentiment.values
```

```python
from transformers import BertTokenizer

print("Loading BERT Tokenizer")
bert_tokenizer =
BertTokenizer.from_pretrained('indobenchmark/indobert-base-p2')
```

```
Loading BERT Tokenizer
```

```python
print("Original: ", sentences[0])

print("Tokenized: ", bert_tokenizer.tokenize(sentences[0]))

print("Token IDS: ",
bert_tokenizer.convert_tokens_to_ids(bert_tokenizer.tokenize(sentences
[0])))
```

```
Original:  jelek filmnya apalagi si ernest gak mutu bgt actingnya film
sampah
Tokenized:  ['jelek', 'filmnya', 'apalagi', 'si', 'ern', '##est',
'gak', 'mutu', 'bgt', 'act', '##ingnya', 'film', 'sampah']
Token IDS:  [8302, 17943, 2087, 356, 21471, 623, 1489, 4516, 6948,
25100, 8152, 1460, 3876]
```

```
input_ids = []
for sent in sentences:
  encoded_sent = bert_tokenizer.encode(
      sent,
      add_special_tokens= True
  )
  input_ids.append(encoded_sent)

print("Original: ", sentences[0])
print("Token IDs: ", input_ids[0])
```

```
Original:  jelek filmnya apalagi si ernest gak mutu bgt actingnya film
sampah
Token IDs:  [2, 8302, 17943, 2087, 356, 21471, 623, 1489, 4516, 6948,
25100, 8152, 1460, 3876, 3]
```

```
print("Max sentences length: ", max([len(sen) for sen in input_ids]))
```

```
Max sentences length:  41
```

```
!pip install keras-preprocessing
```

```
Requirement already satisfied: keras-preprocessing in
/usr/local/lib/python3.10/dist-packages (1.1.2)
Requirement already satisfied: numpy>=1.9.1 in
/usr/local/lib/python3.10/dist-packages (from keras-preprocessing)
(1.23.5)
Requirement already satisfied: six>=1.9.0 in
/usr/local/lib/python3.10/dist-packages (from keras-preprocessing)
(1.16.0)
```

```
from keras_preprocessing.sequence import pad_sequences

MAX_LEN = 50

print("Padding/truncating all sentences to %d values" % MAX_LEN)
print('Padding token: "{:}", ID: {:}'.format(bert_tokenizer.pad_token,
bert_tokenizer.pad_token_id))

input_ids = pad_sequences(input_ids, maxlen=MAX_LEN, dtype='long',
value=0, truncating='post', padding='post')

print("Done")
```

```
Padding/truncating all sentences to 50 values
Padding token: "[PAD]", ID: 0
Done
```

```
input_ids[0]
```

```
array([    2,  8302, 17943,  2087,   356, 21471,   623,  1489,  4516,
        6948, 25100,  8152,  1460,  3876,     3,     0,     0,     0,
           0,     0,     0,     0,     0,     0,     0,     0,     0,
           0,     0,     0,     0,     0,     0,     0,     0,     0,
           0,     0,     0,     0,     0,     0,     0,     0,     0,
           0,     0,     0,     0,     0])

attention_mask = []

for sent in input_ids:
  att_mask = [int(token_id > 0)for token_id in sent]

  attention_mask.append(att_mask)
```

Persiapan Data

```
from sklearn.model_selection import train_test_split

train_input, test_input, train_labels, test_labels =
train_test_split(input_ids,

labels,

random_state=2021,

test_size=0.2)
train_mask, test_mask, _, _ = train_test_split(attention_mask,
                                               labels,
                                               random_state=2021,
                                               test_size=0.2)

train_input, validation_input, train_labels, validation_labels =
train_test_split(train_input,

train_labels,

random_state=2022,

test_size=0.5)
train_mask, validation_mask, _, _ = train_test_split(train_mask,
                                                     train_mask,

random_state=2022,
                                                     test_size=0.5)

import numpy as np
print("==Train==")
print("Input: ", train_input.shape)
print("Label: ", train_labels.shape)
print("Mask: ", np.array(train_mask).shape)
```

```python
print("==Validation==")
print("Input: ", validation_input.shape)
print("Label: ", validation_labels.shape)
print("Mask: ", np.array(validation_mask).shape)

print("==Test==")
print("Input: ", test_input.shape)
print("Label: ", test_labels.shape)
print("Mask: ", np.array(test_mask).shape)
```

```
==Train==
Input:  (80, 50)
Label:  (80,)
Mask:  (80, 50)
==Validation==
Input:  (80, 50)
Label:  (80,)
Mask:  (80, 50)
==Test==
Input:  (40, 50)
Label:  (40,)
Mask:  (40, 50)
```

```python
import torch

train_input = torch.tensor(train_input)
train_labels = torch.tensor(train_labels)
train_mask = torch.tensor(train_mask)

validation_input = torch.tensor(validation_input)
validation_labels = torch.tensor(validation_labels)
validation_mask = torch.tensor(validation_mask)

test_input = torch.tensor(test_input)
test_labels = torch.tensor(test_labels)
test_mask = torch.tensor(test_mask)

from torch.utils.data import TensorDataset, DataLoader, RandomSampler,
SequentialSampler

batch_size = 32

train_data = TensorDataset(train_input, train_mask, train_labels)
train_sampler = RandomSampler(train_data)
train_dataloader = DataLoader(train_data, sampler=train_sampler,
batch_size=batch_size)

validation_data = TensorDataset(validation_input, validation_mask,
validation_labels)
validation_sampler = SequentialSampler(validation_data)
validation_dataloader = DataLoader(validation_data,
sampler=validation_sampler, batch_size=batch_size)

test_data = TensorDataset(test_input, test_mask, test_labels)
test_sampler = SequentialSampler(test_data)
test_dataloader = DataLoader(test_data, sampler=test_sampler,
batch_size=batch_size)
```

Pemodelan pre-trained BERT

```
torch.cuda.is_available()
```

```
True
```

```
from transformers import BertForSequenceClassification, AdamW,
BertConfig

model = BertForSequenceClassification.from_pretrained(
    'indobenchmark/indobert-base-p2',
    num_labels = 2,
    output_attentions = False,
    output_hidden_states = False
)
```

```
Some weights of BertForSequenceClassification were not initialized
from the model checkpoint at indobenchmark/indobert-base-p2 and are
newly initialized: ['classifier.weight', 'classifier.bias']
You should probably TRAIN this model on a down-stream task to be able
to use it for predictions and inference.
```

```
optimizer = AdamW(
    model.parameters(),
    lr = 2e-5,
    eps = 1e-8
)
```

```
/usr/local/lib/python3.10/dist-packages/transformers/
optimization.py:411: FutureWarning: This implementation of AdamW is
deprecated and will be removed in a future version. Use the PyTorch
implementation torch.optim.AdamW instead, or set
`no_deprecation_warning=True` to disable this warning
  warnings.warn(
```

```
from transformers import get_linear_schedule_with_warmup

epochs = 5

total_steps = len(train_dataloader) * epochs

scheduler = get_linear_schedule_with_warmup(optimizer,
                                            num_warmup_steps = 0,
                                            num_training_steps = 
total_steps
                                            )

import numpy as np

def flat_accuracy(preds, labels):
  pred_flat = np.argmax(preds, axis=1).flatten()
  labels_flat = labels.flatten()
  return np.sum(pred_flat == labels_flat) / len(labels_flat)

import time
import datetime

def format_time(elapsed):
  elapsed_rounded = int(round(elapsed))
  return str(datetime.timedelta(seconds=elapsed_rounded))
```

Training BERT

```
device = torch.device("cpu")

import random

seed_val = 42

random.seed(seed_val)
np.random.seed(seed_val)
torch.manual_seed(seed_val)
torch.cuda.manual_seed_all(seed_val)

loss_values = []

for epoch_i in range (0, epochs):

  #================================
  #          Training
  #================================

  print("======== Epoch {:} / {:} ========".format(epoch_i+1, epochs))
  print("Training...")

  t0 = time.time()

  total_loss = 0

  model.train()
  # For each batch of training data
  for step, batch in enumerate(train_dataloader):

    # Progress update every 40 batches
    if step % 40 == 0 and not step == 0:
      elapsed = format_time(time.time() - t0)

      print("Batch {:>5,} of {:>5,}.      Elapsed: {:}".format(step,
len(train_dataloader), elapsed))

    b_input_ids = batch[0].to(device)
    b_input_mask = batch[1].to(device)
    b_labels = batch[2].to(device)

    model.zero_grad()

    outputs = model(b_input_ids,
                    token_type_ids=None,
                    attention_mask=b_input_mask,
                    labels=b_labels)

    loss = outputs[0]

    total_loss += loss.item()

    loss.backward()

    torch.nn.utils.clip_grad_norm_(model.parameters(), 1.0)

    optimizer.step()

    scheduler.step()

  avg_train_loss = total_loss / len(train_dataloader)

  loss_values.append(avg_train_loss)

  print("   Avarage training loss: {0:.2f}".format(avg_train_loss))
  print("   Training epoch took: {:}".format(format_time(time.time() -
t0)))

  #================================
  #          Validation
  #================================

  print("Running Validation...")

  t0 = time.time()

  model.eval()
  eval_loss, eval_accuracy = 0, 0
  nb_eval_steps, nb_eval_examples = 0, 0

  for batch in validation_dataloader:

    batch = tuple(t.to(device) for t in batch)

    b_input_ids, b_input_mask, b_labels = batch

    with torch.no_grad():
      outputs = model(b_input_ids,
                      token_type_ids=None,
                      attention_mask=b_input_mask)

    logits = outputs[0]
    logits = logits.detach().cpu().numpy()
    label_ids = b_labels.to('cpu').numpy()

    tmp_eval_accuracy = flat_accuracy(logits, label_ids)

    eval_accuracy += tmp_eval_accuracy

    nb_eval_steps += 1

  print("   Accuracy: {0:.2f}".format(eval_accuracy/nb_eval_steps))
  print("   Validation took: {:}".format(format_time(time.time() -
t0)))

print("Training complete!")


 import matplotlib.pyplot as plt

 import seaborn as sns

 sns.set(style='darkgrid')
 plt.rcParams["figure.figsize"] = (12,6)

 plt.plot(loss_values, 'b-o')

 plt.title("Training loss")
 plt.xlabel("Epoch")
 plt.ylabel("Loss")

 plt.show()

import random

# Set seed untuk reproducibility
seed_val = 42
random.seed(seed_val)
```

```
np.random.seed(seed_val)
torch.manual_seed(seed_val)
torch.cuda.manual_seed_all(seed_val)

# List untuk menyimpan data pelatihan dan validasi
loss_values = []
train_accuracy_values = []
validation_accuracy_values = []
training_times = []

# Loop pelatihan
for epoch_i in range(0, epochs):

    print("======== Epoch {:} / {:} ========".format(epoch_i + 1,
epochs))
    print("Training...")

    t0 = time.time()

    total_loss = 0

    model.train()

    # Inisialisasi akurasi training untuk setiap epoch
    total_train_accuracy = 0
    total_train_steps = 0

    for step, batch in enumerate(train_dataloader):

        if step % 40 == 0 and not step == 0:
            elapsed = format_time(time.time() - t0)
            print("Batch {:>5,} of {:>5,}. Elapsed: {:}".format(step,
len(train_dataloader), elapsed))

        b_input_ids = batch[0].to(device)
        b_input_mask = batch[1].to(device)
        b_labels = batch[2].to(device)

        model.zero_grad()

        outputs = model(b_input_ids,
                        token_type_ids=None,
                        attention_mask=b_input_mask,
                        labels=b_labels)

        loss = outputs[0]

        total_loss += loss.item()

        loss.backward()
        torch.nn.utils.clip_grad_norm_(model.parameters(), 1.0)

        optimizer.step()

        scheduler.step()

        # Hitung akurasi training untuk batch saat ini
        logits = outputs[1].detach().cpu().numpy()
        label_ids = b_labels.to('cpu').numpy()
        batch_train_accuracy = flat_accuracy(logits, label_ids)

        total_train_accuracy += batch_train_accuracy
        total_train_steps += 1

    avg_train_loss = total_loss / len(train_dataloader)
    loss_values.append(avg_train_loss)

    # Hitung rata-rata akurasi training untuk setiap epoch
    epoch_train_accuracy = total_train_accuracy / total_train_steps
    train_accuracy_values.append(epoch_train_accuracy)

    print("   Average training loss: {0:.2f}".format(avg_train_loss))
    print("   Training epoch took: {:}".format(format_time(time.time()
- t0)))
    print("   Average training accuracy:
{0:.2f}".format(epoch_train_accuracy))

    # Validasi
    print("Running Validation...")

    t0 = time.time()

    model.eval()

    eval_loss, eval_accuracy = 0, 0
    nb_eval_steps, nb_eval_examples = 0, 0

    for batch in validation_dataloader:

        batch = tuple(t.to(device) for t in batch)
        b_input_ids, b_input_mask, b_labels = batch

        with torch.no_grad():
            outputs = model(b_input_ids,
                            token_type_ids=None,
                            attention_mask=b_input_mask)

        logits = outputs[0]
        logits = logits.detach().cpu().numpy()
        label_ids = b_labels.to('cpu').numpy()
        tmp_eval_accuracy = flat_accuracy(logits, label_ids)
        eval_accuracy += tmp_eval_accuracy
        nb_eval_steps += 1

    print("   Accuracy: {0:.2f}".format(eval_accuracy /
nb_eval_steps))
    print("   Validation took: {:}".format(format_time(time.time() -
t0)))

    # Simpan data akurasi dan waktu validasi
    validation_accuracy_values.append(eval_accuracy / nb_eval_steps)
    training_times.append(time.time() - t0)

print("Training complete!")
```

```
======== Epoch 1 / 5 ========
Training...
   Average training loss: 0.65
   Training epoch took: 0:00:28
   Average training accuracy: 0.57
Running Validation...
   Accuracy: 0.50
   Validation took: 0:00:06
======== Epoch 2 / 5 ========
Training...
   Average training loss: 0.53
   Training epoch took: 0:00:26
   Average training accuracy: 0.81
Running Validation...
   Accuracy: 0.64
   Validation took: 0:00:07
======== Epoch 3 / 5 ========
Training...
   Average training loss: 0.41
   Training epoch took: 0:00:25
   Average training accuracy: 0.92
Running Validation...
   Accuracy: 0.70
   Validation took: 0:00:08
======== Epoch 4 / 5 ========
Training...
   Average training loss: 0.30
   Training epoch took: 0:00:25
   Average training accuracy: 0.96
Running Validation...
   Accuracy: 0.70
   Validation took: 0:00:08
======== Epoch 5 / 5 ========
Training...
   Average training loss: 0.24
   Training epoch took: 0:00:24
   Average training accuracy: 0.98
Running Validation...
   Accuracy: 0.72
   Validation took: 0:00:08
Training complete!
```

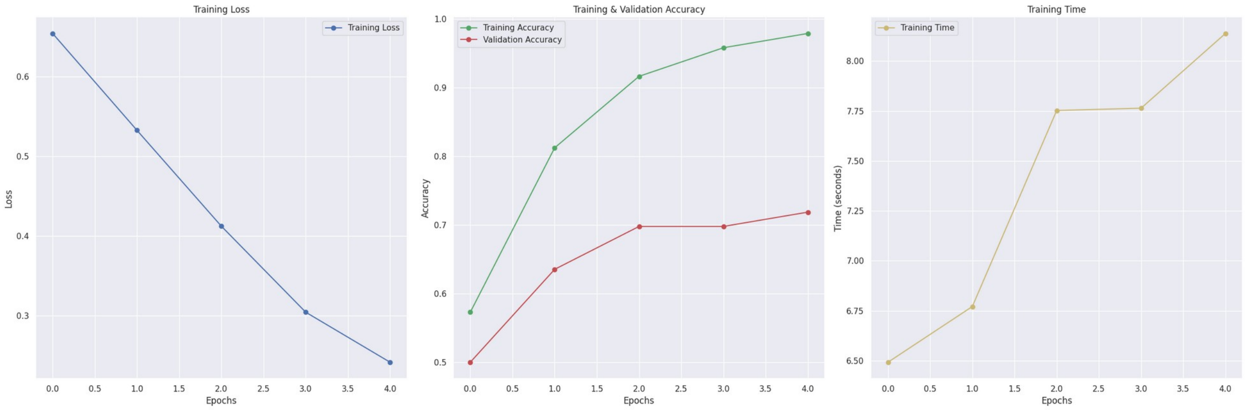
```python
import matplotlib.pyplot as plt

# Visualisasi Loss Training
plt.figure(figsize=(24, 8))
plt.subplot(1, 3, 1)
plt.plot(loss_values, 'b-o', label='Training Loss')
plt.title('Training Loss')
plt.xlabel('Epochs')
plt.ylabel('Loss')
plt.legend()

# Visualisasi Akurasi Training
plt.subplot(1, 3, 2)
plt.plot(train_accuracy_values, 'g-o', label='Training Accuracy')
plt.plot(validation_accuracy_values, 'r-o', label='Validation
Accuracy')
plt.title('Training & Validation Accuracy')
plt.xlabel('Epochs')
plt.ylabel('Accuracy')
plt.legend()

# Visualisasi Training Time
plt.subplot(1, 3, 3)
plt.plot(training_times, 'y-o', label='Training Time')
plt.title('Training Time')
plt.xlabel('Epochs')
plt.ylabel('Time (seconds)')
plt.legend()

# Tampilkan grafik
plt.tight_layout()
plt.show()
```



```python
print("Predicting labels for {:,} test
sentences".format(len(test_input)))

model.eval()

prediction, true_labels = [], []

for batch in test_dataloader:
  batch  = tuple(t.to(device) for t in batch)

  b_input_ids, b_input_mask, b_labels = batch

  with torch.no_grad():
    outputs = model(b_input_ids,
                    token_type_ids=None,
                    attention_mask=b_input_mask)

  logits = outputs[0]

  logits = logits.detach().cpu().numpy()
  label_ids = b_labels.to('cpu').numpy()

  prediction.append(logits)
  true_labels.append(label_ids)

print(" DONE.")
```

```
Predicting labels for 40 test sentences
 DONE.
```

```python
from sklearn.metrics import matthews_corrcoef

matthews_set = []

# Evaluate each test batch using Matthew's correlation coefficient


for i in range(len(true_labels)):
  # The predictions for this batch are a 2-column ndarray (one column
for "0"
  # and one column for "1"). Pick the label with the highest value and
turn this
  # in to a list of 0s and 1s.
  pred_labels_i = np.argmax(prediction[i], axis=1).flatten()

  # Calculate and store the coef for this batch.
  matthews = matthews_corrcoef(true_labels[i], pred_labels_i)
  matthews_set.append(matthews)

flat_prediction = [item for sublist in prediction for item in sublist]
flat_prediction = np.argmax(flat_prediction, axis=1).flatten()

flat_true_labels = [item for sublist in true_labels for item in
sublist]

mcc = matthews_corrcoef(flat_true_labels, flat_prediction)

print("MCC: %.3f" %mcc)
```

```
MCC: 0.814
```

```
# scores for individual batches
matthews_set
```

```
[0.827170191868511, 0.7453559924999299]
```

```
from sklearn.metrics import accuracy_score

# Combine the predictions and true labels
predictions = np.concatenate(prediction, axis=0)
true_labels = np.concatenate(true_labels, axis=0)

# Apply argmax to get the predicted class labels
predicted_labels = np.argmax(predictions, axis=1)

# Compute accuracy
accuracy = accuracy_score(true_labels, predicted_labels)
print("Accuracy: {:.2%}".format(accuracy))
```

```
Accuracy: 90.00%
```

```
from sklearn.metrics import classification_report

# Generate classification report with 4 decimal places
report = classification_report(true_labels, predicted_labels,
digits=4)
print(report)
```

```
              precision    recall  f1-score   support

           0     0.8400    1.0000    0.9130        21
           1     1.0000    0.7895    0.8824        19

    accuracy                         0.9000        40
   macro avg     0.9200    0.8947    0.8977        40
weighted avg     0.9160    0.9000    0.8985        40
```

```
import os

output_dir = './model_save/'


if not os.path.exists(output_dir):
    os.makedirs(output_dir)

print("Saving model to %s" % output_dir)

model_to_save = model.module if hasattr(model, 'module') else model  # Take care of distributed/parallel training
model_to_save.save_pretrained(output_dir)
bert_tokenizer.save_pretrained(output_dir)
```

```
Saving model to ./model_save/
```

```
('./model_save/tokenizer_config.json',
 './model_save/special_tokens_map.json',
 './model_save/vocab.txt',
 './model_save/added_tokens.json')
```

```
from transformers import pipeline

model_1 = BertForSequenceClassification.from_pretrained('/content/model_save')
tokenizer = BertTokenizer.from_pretrained('/content/model_save')

# Inisialisasi pipeline untuk klasifikasi teks dengan model BERT
classifier = pipeline(
    'text-classification',
    model=model_1,
    tokenizer=tokenizer
)

# Contoh penggunaan untuk prediksi
kalimat_1 = "keren bang flm lo radityadika persahabatan keluarga dan cinta kentel banget tokoh pemain pas semua keren bang"
hasil_prediksi_1 = classifier(kalimat_1)
print(hasil_prediksi_1)
```

```
[{'label': 'LABEL_1', 'score': 0.9832446575164795}]
```

```
! tar -czvf bert_sentiment_indo.tar.gz /content/model_save
```

```
tar: Removing leading `/' from member names
/content/model_save/
/content/model_save/special_tokens_map.json
/content/model_save/pytorch_model.bin
/content/model_save/tokenizer_config.json
/content/model_save/vocab.txt
/content/model_save/config.json
```

```
! cp /content/bert_sentiment_indo.tar.gz "/content/drive/MyDrive/Colab
Notebooks/bert_sentiment_indo.tar.gz"
```