```
!pip install torch==1.8.1+cu111 torchvision==0.9.1+cu111 torchaudio===0.8.1 -f https://downlo
#torch 1.9.0+cu102  | 1.8.1+cu111
```

```
Looking in links: https://download.pytorch.org/whl/torch_stable.html
Collecting torch==1.8.1+cu111
  Downloading https://download.pytorch.org/whl/cu111/torch-1.8.1%2Bcu111-cp37-cp37m-linu
     |▌                               | 834.1 MB 1.3 MB/s eta 0:14:42tcmalloc: large all
     |▋                               | 1055.7 MB 1.4 MB/s eta 0:11:17tcmalloc: large al
     |▊                               | 1336.2 MB 1.3 MB/s eta 0:08:06tcmalloc: large a
     |▉                               | 1691.1 MB 1.2 MB/s eta 0:03:59tcmalloc: large a
     |████████████████████████████████| 1982.2 MB 1.2 MB/s eta 0:00:01tcmalloc: large al
tcmalloc: large alloc 2477727744 bytes == 0x55728ca9c000 @  0x7feb58cca615 0x557123fd802
     |████████████████████████████████| 1982.2 MB 1.2 kB/s
Collecting torchvision==0.9.1+cu111
  Downloading https://download.pytorch.org/whl/cu111/torchvision-0.9.1%2Bcu111-cp37-cp37
     |████████████████████████████████| 17.6 MB 1.2 MB/s
Collecting torchaudio===0.8.1
  Downloading torchaudio-0.8.1-cp37-cp37m-manylinux1_x86_64.whl (1.9 MB)
     |████████████████████████████████| 1.9 MB 8.2 MB/s
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from tor
Requirement already satisfied: pillow>=4.1.1 in /usr/local/lib/python3.7/dist-packages (
Installing collected packages: torch, torchvision, torchaudio
  Attempting uninstall: torch
    Found existing installation: torch 1.9.0+cu102
    Uninstalling torch-1.9.0+cu102:
      Successfully uninstalled torch-1.9.0+cu102
  Attempting uninstall: torchvision
    Found existing installation: torchvision 0.10.0+cu102
    Uninstalling torchvision-0.10.0+cu102:
      Successfully uninstalled torchvision-0.10.0+cu102
ERROR: pip's dependency resolver does not currently take into account all the packages t
torchtext 0.10.0 requires torch==1.9.0, but you have torch 1.8.1+cu111 which is incompat
Successfully installed torch-1.8.1+cu111 torchaudio-0.8.1 torchvision-0.9.1+cu111
```

execution time : 5

```
!pip install transformers requests beautifulsoup4 pandas numpy
```

```
Collecting transformers
  Downloading transformers-4.9.2-py3-none-any.whl (2.6 MB)
     |████████████████████████████████| 2.6 MB 7.5 MB/s
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (2.23
Requirement already satisfied: beautifulsoup4 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages (1.1.5)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (1.19.5)
Requirement already satisfied: filelock in /usr/local/lib/python3.7/dist-packages (from
Collecting pyyaml>=5.1
  Downloading PyYAML-5.4.1-cp37-cp37m-manylinux1_x86_64.whl (636 kB)
     |████████████████████████████████| 636 kB 68.5 MB/s
Collecting tokenizers<0.11,>=0.10.1
  Downloading tokenizers-0.10.3-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manyli
```

```
     |████████████████████████████████| 3.3 MB 58.3 MB/s
Requirement already satisfied: tqdm>=4.27 in /usr/local/lib/python3.7/dist-packages (fro
Requirement already satisfied: importlib-metadata in /usr/local/lib/python3.7/dist-packa
Collecting sacremoses
  Downloading sacremoses-0.0.45-py3-none-any.whl (895 kB)
     |████████████████████████████████| 895 kB 62.5 MB/s
Requirement already satisfied: packaging in /usr/local/lib/python3.7/dist-packages (from
Collecting huggingface-hub==0.0.12
  Downloading huggingface_hub-0.0.12-py3-none-any.whl (37 kB)
Requirement already satisfied: regex!=2019.12.17 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: pyparsing>=2.0.2 in /usr/local/lib/python3.7/dist-package
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: pytz>=2017.2 in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/dist-p
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: zipp>=0.5 in /usr/local/lib/python3.7/dist-packages (from
Requirement already satisfied: joblib in /usr/local/lib/python3.7/dist-packages (from sa
Requirement already satisfied: click in /usr/local/lib/python3.7/dist-packages (from sac
Installing collected packages: tokenizers, sacremoses, pyyaml, huggingface-hub, transfor
  Attempting uninstall: pyyaml
    Found existing installation: PyYAML 3.13
    Uninstalling PyYAML-3.13:
      Successfully uninstalled PyYAML-3.13
Successfully installed huggingface-hub-0.0.12 pyyaml-5.4.1 sacremoses-0.0.45 tokenizers-
```

```
from transformers import AutoTokenizer, AutoModelForSequenceClassification
import torch
import requests
from bs4 import BeautifulSoup
import re


import pandas as pd
```

Processed Data

```
df= pd.read_csv('/content/drive/MyDrive/Colab Notebooks/CapstoneGL/imdbgbprep.csv', encoding=


df.head()
```

	Unnamed: 0	Title	reviewed_by	reviews
0	0	final fantasy the spirits within	evelyn c	capsule this very dark scifi fantasy is

```
df.drop('Unnamed: 0', axis=1, inplace=True)
```

1	1	sexy beast 2000	mark r leeper	roger ebert asks in his review of sexy

```
def clean_str(string):
  """
  String cleaning before vectorization
  """
  try:
    string = re.sub(r'^https?:\/\/<>.*[\r\n]*', '', string, flags=re.MULTILINE)
    string = re.sub(r"[^A-Za-z]", " ", string)
    words = string.strip().lower().split()
    words = [w for w in words if len(w)>=1]
    return " ".join(words)
  except:
    return ""


df['clean_reviews'] = df['reviews'].apply(clean_str)
df.head()
```

	Title	reviewed_by	reviews	clean_reviews
0	final fantasy the spirits within 2001	evelyn c leeper	capsule this very dark scifi fantasy is magnif...	capsule this very dark scifi fantasy is magnif...
1	sexy beast 2000	mark r leeper	roger ebert asks in his review of sexy beast w...	roger ebert asks in his review of sexy beast w...
2	final fantasy the spirits within 2001	robin clifford	aliens beings have taken over the earth the gr...	aliens beings have taken over the earth the gr...
3	jurassic park iii 2001	susan	susan grangers review of	susan grangers review of

```
df.loc[0, 'clean_reviews']
```

```
'capsule this very dark scifi fantasy is magnificent visually but it has a nearly incoh
erent plot final fantasy is a japaneseamerican coproduction entirely animated but with
a very real threedimensional look and with very reallooking characters in the year alie
ns that appear to us as translucent images but still very deadly creatures have invaded
earth saving the earth requires resorting to semimystical means to understand and halt
the enemy if this film had been done in liveaction the scenes more spectacular than tho
```

Instantiate Model

```
tokenizer = AutoTokenizer.from_pretrained('nlptown/bert-base-multilingual-uncased-sentiment')

model = AutoModelForSequenceClassification.from_pretrained('nlptown/bert-base-multilingual-un
```

```
Downloading: 100%  953/953 [00:00<00:00, 23.6kB/s]
Downloading: 100%  872k/872k [00:00<00:00, 3.71MB/s]
Downloading: 100%  112/112 [00:00<00:00, 2.17kB/s]
Downloading: 100%  39.0/39.0 [00:00<00:00, 973B/s]
Downloading: 100%  669M/669M [00:14<00:00, 46.9MB/s]
```

```
!pip install torchinfo
```

```
Collecting torchinfo
  Downloading torchinfo-1.5.3-py3-none-any.whl (19 kB)
Installing collected packages: torchinfo
Successfully installed torchinfo-1.5.3
```

```
from torchinfo import summary
```

```
summary(model, depth=12)
```

```
│    │    │    └─BertLayer: 4-10                   --
│    │    │    │    └─BertAttention: 5-28          --
│    │    │    │    │    └─BertSelfAttention: 6-55 --
│    │    │    │    │    │    └─Linear: 7-64       590,592
│    │    │    │    │    │    └─Linear: 7-65       590,592
│    │    │    │    │    │    └─Linear: 7-66       590,592
│    │    │    │    │    │    └─Dropout: 7-67      --
│    │    │    │    │    └─BertSelfOutput: 6-56    --
│    │    │    │    │    │    └─Linear: 7-68       590,592
│    │    │    │    │    │    └─LayerNorm: 7-69    1,536
│    │    │    │    │    │    └─Dropout: 7-70      --
│    │    │    │    └─BertIntermediate: 5-29       --
│    │    │    │    │    └─Linear: 6-57            2,362,368
│    │    │    │    └─BertOutput: 5-30             --
│    │    │    │    │    └─Linear: 6-58            2,360,064
│    │    │    │    │    └─LayerNorm: 6-59         1,536
│    │    │    │    │    └─Dropout: 6-60           --
│    │    │    └─BertLayer: 4-11                   --
│    │    │    │    └─BertAttention: 5-31          --
│    │    │    │    │    └─BertSelfAttention: 6-61 --
│    │    │    │    │    │    └─Linear: 7-71       590,592
│    │    │    │    │    │    └─Linear: 7-72       590,592
│    │    │    │    │    │    └─Linear: 7-73       590,592
│    │    │    │    │    │    └─Dropout: 7-74      --
│    │    │    │    │    └─BertSelfOutput: 6-62    --
│    │    │    │    │    │    └─Linear: 7-75       590,592
│    │    │    │    │    │    └─LayerNorm: 7-76    1,536
│    │    │    │    │    │    └─Dropout: 7-77      --
│    │    │    │    └─BertIntermediate: 5-32       --
│    │    │    │    │    └─Linear: 6-63            2,362,368
│    │    │    │    └─BertOutput: 5-33             --
│    │    │    │    │    └─Linear: 6-64            2,360,064
│    │    │    │    │    └─LayerNorm: 6-65         1,536
│    │    │    │    │    └─Dropout: 6-66           --
│    │    │    └─BertLayer: 4-12                   --
```

```
│    │    │    │    └─BertAttention: 5-34               --
│    │    │    │    │    └─BertSelfAttention: 6-67      --
│    │    │    │    │    │    └─Linear: 7-78            590,592
│    │    │    │    │    │    └─Linear: 7-79            590,592
│    │    │    │    │    │    └─Linear: 7-80            590,592
│    │    │    │    │    │    └─Dropout: 7-81           --
│    │    │    │    │    └─BertSelfOutput: 6-68         --
│    │    │    │    │    │    └─Linear: 7-82            590,592
│    │    │    │    │    │    └─LayerNorm: 7-83         1,536
│    │    │    │    │    │    └─Dropout: 7-84           --
│    │    │    │    └─BertIntermediate: 5-35           --
│    │    │    │    │    └─Linear: 6-69                2,362,368
│    │    │    │    └─BertOutput: 5-36                 --
│    │    │    │    │    └─Linear: 6-70                2,360,064
│    │    │    │    │    └─LayerNorm: 6-71             1,536
│    │    │    │    │    └─Dropout: 6-72               --
│    │    └─BertPooler: 2-3                           --
│    │    │    └─Linear: 3-7                          590,592
│    │    │    └─Tanh: 3-8                            --
├─Dropout: 1-2                                        --
├─Linear: 1-3                                         3,845
==========================================================================================
Total params: 167,360,261
Trainable params: 167,360,261
```

```
print(model)
```

```
BertForSequenceClassification(
  (bert): BertModel(
    (embeddings): BertEmbeddings(
      (word_embeddings): Embedding(105879, 768, padding_idx=0)
      (position_embeddings): Embedding(512, 768)
      (token_type_embeddings): Embedding(2, 768)
      (LayerNorm): LayerNorm((768,), eps=1e-12, elementwise_affine=True)
      (dropout): Dropout(p=0.1, inplace=False)
    )
    (encoder): BertEncoder(
      (layer): ModuleList(
        (0): BertLayer(
          (attention): BertAttention(
            (self): BertSelfAttention(
              (query): Linear(in_features=768, out_features=768, bias=True)
              (key): Linear(in_features=768, out_features=768, bias=True)
              (value): Linear(in_features=768, out_features=768, bias=True)
              (dropout): Dropout(p=0.1, inplace=False)
            )
            (output): BertSelfOutput(
              (dense): Linear(in_features=768, out_features=768, bias=True)
              (LayerNorm): LayerNorm((768,), eps=1e-12, elementwise_affine=True)
              (dropout): Dropout(p=0.1, inplace=False)
            )
          )
          (intermediate): BertIntermediate(
            (dense): Linear(in_features=768, out_features=3072, bias=True)
          )
          (output): BertOutput(
```

```
      (dense): Linear(in_features=3072, out_features=768, bias=True)
      (LayerNorm): LayerNorm((768,), eps=1e-12, elementwise_affine=True)
      (dropout): Dropout(p=0.1, inplace=False)
    )
  )
  (1): BertLayer(
    (attention): BertAttention(
      (self): BertSelfAttention(
        (query): Linear(in_features=768, out_features=768, bias=True)
        (key): Linear(in_features=768, out_features=768, bias=True)
        (value): Linear(in_features=768, out_features=768, bias=True)
        (dropout): Dropout(p=0.1, inplace=False)
      )
      (output): BertSelfOutput(
        (dense): Linear(in_features=768, out_features=768, bias=True)
        (LayerNorm): LayerNorm((768,), eps=1e-12, elementwise_affine=True)
        (dropout): Dropout(p=0.1, inplace=False)
      )
    )
    (intermediate): BertIntermediate(
      (dense): Linear(in_features=768, out_features=3072, bias=True)
    )
    (output): BertOutput(
      (dense): Linear(in_features=3072, out_features=768, bias=True)
      (LayerNorm): LayerNorm((768,), eps=1e-12, elementwise_affine=True)
      (dropout): Dropout(p=0.1, inplace=False)
    )
  )
  (2): BertLayer(
    (attention): BertAttention(
```

Encode and Calculate Sentiment

```
tokens = tokenizer.encode('It was good but couldve been better. Great', return_tensors='pt')
```

```
result = model(tokens)
```

```
result.logits
```

```
tensor([[-2.7768, -1.2353,  1.4419,  1.9804,  0.4584]],
       grad_fn=<AddmmBackward>)
```

```
int(torch.argmax(result.logits))+1
```

```
4
```

Load Reviews

```
df.head()
```

	Title	reviewed_by	reviews	clean_reviews
0	final fantasy the spirits within 2001	evelyn c leeper	capsule this very dark scifi fantasy is magnif...	capsule this very dark scifi fantasy is magnif...
1	sexy beast 2000	mark r leeper	roger ebert asks in his review of sexy beast w...	roger ebert asks in his review of sexy beast w...
2	final fantasy the spirits within 2001	robin clifford	aliens beings have taken over the earth the gr...	aliens beings have taken over the earth the gr...
		susan	susan grangers review of	susan grangers review of

```
df.drop(['Title','reviewed_by','reviews',], axis=1, inplace=True)
```

```
df.head()
```

	clean_reviews
0	capsule this very dark scifi fantasy is magnif...
1	roger ebert asks in his review of sexy beast w...
2	aliens beings have taken over the earth the gr...
3	susan grangers review of jurassic park iii uni...
4	susan grangers review of final fantasy spirits...

```
df['clean_reviews'].iloc[0]
```

```
'capsule this very dark scifi fantasy is magnificent visually but it has a nearly incoh
erent plot final fantasy is a japaneseamerican coproduction entirely animated but with
a very real threedimensional look and with very reallooking characters in the year alie
ns that appear to us as translucent images but still very deadly creatures have invaded
earth saving the earth requires resorting to semimystical means to understand and halt
the enemy if this film had been done in liveaction the scenes more spectacular than tho
```

```
def sentiment_score(review):
    tokens = tokenizer.encode(review, return_tensors='pt')
    result = model(tokens)
    return int(torch.argmax(result.logits))+1
```

```
sentiment_score(df['clean_reviews'].iloc[10])
```

```
2
```

```
df['clean_reviews'].iloc[10]
```

```
'it has to be a record even with writers alison fouse greg grabianski davepolsky michae
l anthony snowden craig wayans marlon wayans and shawn wayansscary movie still couldnt
come up with a single good scene another recordmight go for the biggest drop in quality
from the original movie to the sequel scary movie was imaginative and funny but its seq
uel is neither longstretches of boredom are interrupted periodically by whispered groan
s ofyuck although outrageous physical comedy can be hilarious as theres something about
```

```
from time import time  # To time our operation
```

```
aging of the bedroom barfing scene from the exorcist they appeared tohave used the same
```

```
t = time()

df['sentiment'] = df['clean_reviews'].apply(lambda x: sentiment_score(x[:512]))

print('Time taken to build : {} mins'.format(round((time() - t) / 60, 2)))
```

```
Time taken to build : 169.0 mins
```

```
df.head()
```

	clean_reviews	sentiment
0	capsule this very dark scifi fantasy is magnif...	3
1	roger ebert asks in his review of sexy beast w...	3
2	aliens beings have taken over the earth the gr...	4
3	susan grangers review of jurassic park iii uni...	4
4	susan grangers review of final fantasy spirits...	4

```
s_counts = df['sentiment'].value_counts()
s_counts
```

```
3    9229
4    7506
2    5423
1    4212
5    1497
Name: sentiment, dtype: int64
```

```
df.to_csv(r'/content/drive/MyDrive/Colab Notebooks/CapstoneGL/imdbautomodelgb08152021.csv', i
```

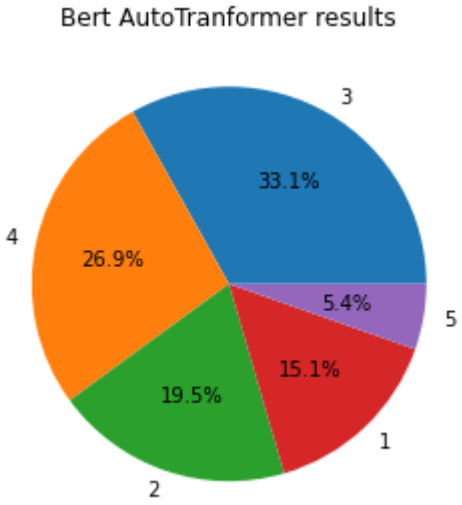
```
import matplotlib.pyplot as plt
%matplotlib inline
```

```
Bert_counts= df['sentiment'].value_counts()
```

```
plt.figure(figsize=(15,7))
plt.subplot(1,3,1)
```

```
plt.title("Bert AutoTranformer results")
plt.pie(Bert_counts.values, labels = Bert_counts.index, explode = None, autopct='%1.1f%%', sh
```

```
([<matplotlib.patches.Wedge at 0x7f05b3d59a90>,
  <matplotlib.patches.Wedge at 0x7f05b3d64350>,
  <matplotlib.patches.Wedge at 0x7f05b3d64c90>,
  <matplotlib.patches.Wedge at 0x7f05b3d6e4d0>,
  <matplotlib.patches.Wedge at 0x7f05b3d6ef90>],
 [Text(0.5564310655783481, 0.9488859095061662, '3'),
  Text(-1.074783013264829, 0.23418256638224508, '4'),
  Text(-0.3541337542486788, -1.0414361641991008, '2'),
  Text(0.7565579160084718, -0.7985111894800964, '1'),
  Text(1.0843723260507565, -0.18476108490499799, '5')],
 [Text(0.30350785395182617, 0.5175741324579088, '33.1%'),
  Text(-0.586245279962634, 0.12773594529940638, '26.9%'),
  Text(-0.19316386595382481, -0.5680560895631458, '19.5%'),
  Text(0.4126679541864391, -0.43555155789823435, '15.1%'),
  Text(0.5914758142095035, -0.10077877358454435, '5.4%')])
```




```
Class = { 1: 'Negative',2: 'Partially_Negative',3: 'Neutral',4: 'Partially_Positive',5: 'Posi
```

```
t = time()
```

```
df.sentiment =[Class[item] for item in df.sentiment]
```

```
print('Time taken to build : {} mins'.format(round((time() - t) / 60, 2)))
```

```
Time taken to build : 0.0 mins
```

```
df.head()
```

	clean_reviews	sentiment
0	capsule this very dark scifi fantasy is magnif...	Neutral
1	roger ebert asks in his review of sexy beast w...	Neutral
2	aliens beings have taken over the earth the gr...	Partially_Positive

```
df['clean_reviews'].iloc[2]
```

```
'aliens beings have taken over the earth the great cities are deserted andprecious few
humans remain to repel the invaders and reclaim the world formankind aki ross voice of
mingna and her mentor dr sid voice ofdonald sutherland must develop their wave theory t
he only antidote tocounter the alien phantoms in this latest video game to become a fea
turelength movie in final fantasy the spirits within it was inevitable ever since pixar
animation brought the tin toy to lifein as the first allcomputer generated and oscarwin
```

```
df['clean_reviews'].iloc[1]
```

```
'roger ebert asks in his review of sexy beast who would have guessed that the most sava
ge maddog frothing gangster in recent movies would be played by ben kingsley my respons
e would be that anyone who has seen alan arkin in wait until dark henry fonda in once u
pon a time in the west or anthony hopkins in the silence of the lambs should have guess
ed it they should know that the way for a film to create a really creepy sociopath is c
ast someone who generally plays mild sympathetic or even ineffectual character roles th
```

```
df.sample(5)
```

	clean_reviews	sentiment
5137	all about my mother todo sobre mi madresony cl...	Partially_Positive
9626	the blair witch projectchadz rating out of ver...	Partially_Positive
85	legally blonde reese witherspoon luke wilson s...	Negative
8183	the cinema of the s will be remembered for two...	Partially_Negative
18101	batman and robingeorge clooney chris odonnell ...	Partially_Negative

```
df.to_csv(r'/content/drive/MyDrive/Colab Notebooks/CapstoneGL/imdbgb08162021bertsentiment.csv
```

```
df['clean_reviews'].iloc[85]
```

```
'legally blonde reese witherspoon luke wilson selma blair matthew davis victorgarber je
nnifer coolidge holland taylor ali larter screenplay bykaren mccullah lutz and kirsten
smith based on the novel by amandabrown directed by robert luketic minutesrated pg star
s out of five stars review by ed johnsonott nuvo newsweeklywwwnuvocomarchive reviews at
httpreviewsimdbcomreviewsbyedward johnsonottto receive reviews by email at no charge se
nd subscription requests toejohnsonottprodigynet or email ejohnsonottsubscribeonelistco
```

```
df['clean_reviews'].iloc[18101]
```

```
'batman and robingeorge clooney chris odonnell arnold schwarzenegger uma thurmanrating
and out of five stars review by ed johnsonottfor more reviews go to wwwnuvoonlinecom an
d click on film the ads for batman and robin scream the event of the summer is here and
```

```
!pip install ktrain
```

```
Requirement already satisfied: setuptools>=18.5 in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: prompt-toolkit<2.0.0,>=1.0.4 in /usr/local/lib/python3
Requirement already satisfied: pexpect in /usr/local/lib/python3.7/dist-packages (fro
Requirement already satisfied: decorator in /usr/local/lib/python3.7/dist-packages (f
Requirement already satisfied: traitlets>=4.2 in /usr/local/lib/python3.7/dist-packag
Requirement already satisfied: pygments in /usr/local/lib/python3.7/dist-packages (fr
Requirement already satisfied: pickleshare in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: wcwidth in /usr/local/lib/python3.7/dist-packages (fro
Requirement already satisfied: ipython-genutils in /usr/local/lib/python3.7/dist-pack
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packa
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-pa
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages
Requirement already satisfied: click in /usr/local/lib/python3.7/dist-packages (from
Building wheels for collected packages: ktrain, seqeval, keras-bert, keras-transforme
  Building wheel for ktrain (setup.py) ... done
  Created wheel for ktrain: filename=ktrain-0.27.2-py3-none-any.whl size=25283088 sha
  Stored in directory: /root/.cache/pip/wheels/88/be/4a/971c83a380a40f12e877f643ca1b9
  Building wheel for seqeval (setup.py) ... done
  Created wheel for seqeval: filename=seqeval-0.0.19-py3-none-any.whl size=9929 sha25
  Stored in directory: /root/.cache/pip/wheels/f5/ac/f1/4e13d7aff05c722d142b7d20a88ad
  Building wheel for keras-bert (setup.py) ... done
  Created wheel for keras-bert: filename=keras_bert-0.88.0-py3-none-any.whl size=3420
  Stored in directory: /root/.cache/pip/wheels/a2/90/cd/c038f2366929a3a5e3414a303b673
  Building wheel for keras-transformer (setup.py) ... done
  Created wheel for keras-transformer: filename=keras_transformer-0.39.0-py3-none-any
  Stored in directory: /root/.cache/pip/wheels/bc/01/e0/5a1a14bed6726f2ed73f7917d2d2c
  Building wheel for keras-embed-sim (setup.py) ... done
  Created wheel for keras-embed-sim: filename=keras_embed_sim-0.9.0-py3-none-any.whl
  Stored in directory: /root/.cache/pip/wheels/a8/1e/d2/9bc15513dd2f8b9de3e628b3aa9d2

  Building wheel for keras-layer-normalization (setup.py) ... done
  Created wheel for keras-layer-normalization: filename=keras_layer_normalization-0.1
  Stored in directory: /root/.cache/pip/wheels/4d/be/fe/55422f77ac11fe6ddcb471198038d
  Building wheel for keras-multi-head (setup.py) ... done
  Created wheel for keras-multi-head: filename=keras_multi_head-0.28.0-py3-none-any.w
  Stored in directory: /root/.cache/pip/wheels/79/4a/ea/9503ab5a02201dfb8635ba2cc8f30
  Building wheel for keras-pos-embd (setup.py) ... done
  Created wheel for keras-pos-embd: filename=keras_pos_embd-0.12.0-py3-none-any.whl s
  Stored in directory: /root/.cache/pip/wheels/77/99/fd/dd98f4876c3ebbef7aab0dbfbd37b
  Building wheel for keras-position-wise-feed-forward (setup.py) ... done
  Created wheel for keras-position-wise-feed-forward: filename=keras_position_wise_fe
  Stored in directory: /root/.cache/pip/wheels/2d/12/02/1ad455c4f181cda1a4e60c5445855
  Building wheel for keras-self-attention (setup.py) ... done
  Created wheel for keras-self-attention: filename=keras_self_attention-0.50.0-py3-no
  Stored in directory: /root/.cache/pip/wheels/92/7a/a3/231bef5803298e7ec1815215bc061
  Building wheel for langdetect (setup.py) ... done
  Created wheel for langdetect: filename=langdetect-1.0.9-py3-none-any.whl size=99324
  Stored in directory: /root/.cache/pip/wheels/c5/96/8a/f90c59ed25d75e50a8c10a1b1c2d4
  Building wheel for syntok (setup.py) ... done
  Created wheel for syntok: filename=syntok-1.3.1-py3-none-any.whl size=20917 sha256=
  Stored in directory: /root/.cache/pip/wheels/5e/c2/33/e5d7d8f2f8b0c391d76bf82b844c3
```

```
  Stored in directory: /root/.cache/pip/wheels/3e/c2/55/e5d7d8f2f8b6c591d76bf82b844c5
Successfully built ktrain seqeval keras-bert keras-transformer keras-embed-sim keras-
Installing collected packages: keras-self-attention, keras-position-wise-feed-forward
  Attempting uninstall: scikit-learn
    Found existing installation: scikit-learn 0.22.2.post1
    Uninstalling scikit-learn-0.22.2.post1:
      Successfully uninstalled scikit-learn-0.22.2.post1
Successfully installed cchardet-2.1.7 keras-bert-0.88.0 keras-embed-sim-0.9.0 keras-l
```

```
#Import libraries

import numpy as np
import pandas as pd
import tensorflow as tf
import seaborn as sns
import ktrain
from ktrain import text
from sklearn.feature_extraction.text import CountVectorizer
from keras.preprocessing.text import Tokenizer
from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Dense, Embedding, LSTM, SpatialDropout1D
from sklearn.model_selection import train_test_split
from keras.utils.np_utils import to_categorical
import re
```

```
df= pd.read_csv('/content/drive/MyDrive/Colab Notebooks/CapstoneGL/imdbgb08162021bertsentimen
```

```
df.sample(5)
```

	Unnamed: 0	clean_reviews	sentiment
15569	15569	mutiny on the bounty is an outstanding film wi...	Partially_Positive
20849	20849	sometimes an audience can work against you for...	Partially_Positive
15571	15571	armageddon written by jonathan hensleigh and j...	Partially_Positive
25910	25910	capsule review what would you get if robert al...	Partially_Positive
6248	6248	is there a lot brewing within anywhere but her...	Partially_Positive

```
df.drop(['Unnamed: 0'], axis=1, inplace=True)
```

```
df.sample(5)
```

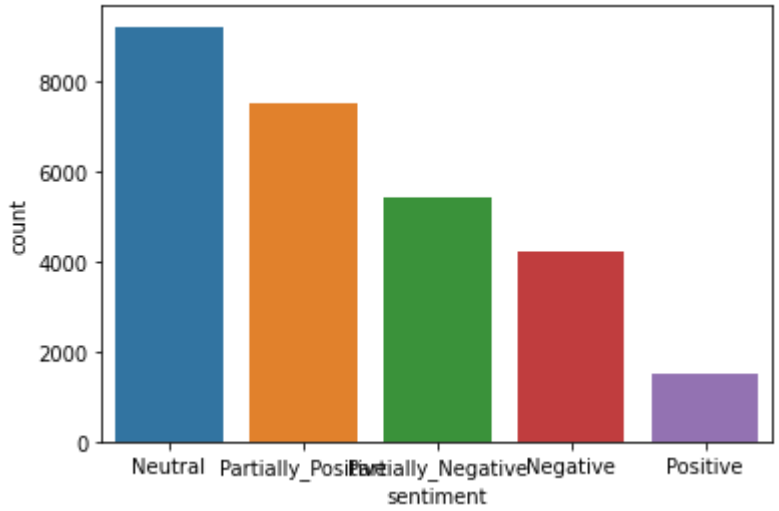
	clean_reviews	sentiment
24422	hey you want just to have some fun at the movi...	Negative
24340	the madness of king george is a movie based on...	Partially_Positive
14027	member of the internet movie critics associati...	Negative

```
s_counts = df['sentiment'].value_counts()
s_counts
```

```
Neutral              9229
Partially_Positive   7506
Partially_Negative   5423
Negative             4212
Positive             1497
Name: sentiment, dtype: int64
```

```
sns.countplot(df["sentiment"])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7efb58e58450>
```




```
df.isna().sum()/len(df) * 100
```

```
clean_reviews    0.0933
sentiment        0.0000
dtype: float64
```

```
df.isnull().sum()
```

```
clean_reviews    26
sentiment         0
dtype: int64
```

```
df.dropna(inplace=True)
```

```
df.isna().sum()/len(df) * 100
```

```
clean_reviews    0.0
sentiment        0.0
dtype: float64
```

```
s_counts = df['sentiment'].value_counts()
s_counts
```

```
Neutral              9229
Partially_Positive   7480
Partially_Negative   5423
Negative             4212
Positive             1497
Name: sentiment, dtype: int64
```

```
s_counts = df['sentiment'].value_counts()
s_counts
```

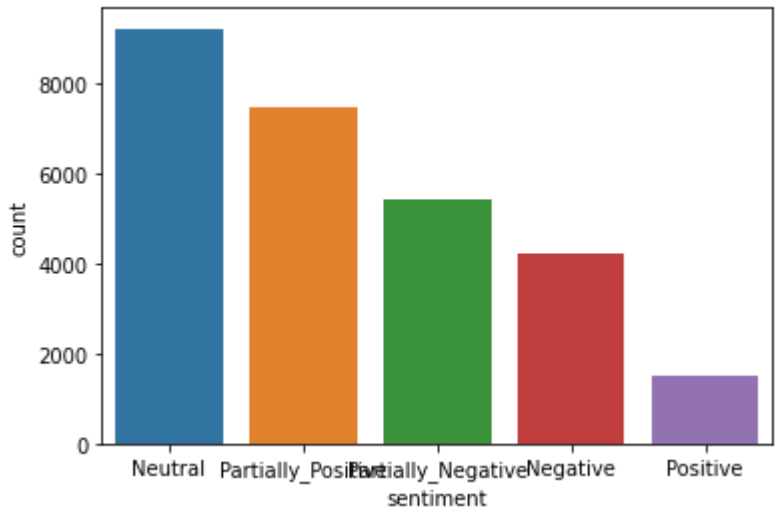
```
Neutral              9229
Partially_Positive   7480
Partially_Negative   5423
Negative             4212
Positive             1497
Name: sentiment, dtype: int64
```

```
s_counts.sum()
```

```
27841
```

```
sns.countplot(df["sentiment"])
```

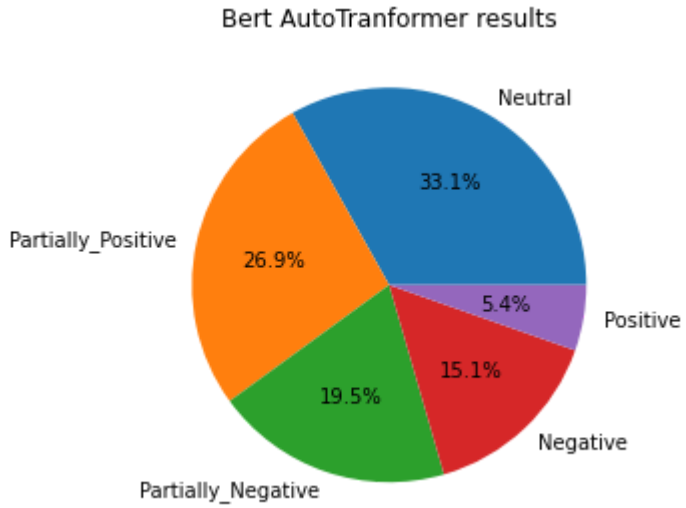
```
<matplotlib.axes._subplots.AxesSubplot at 0x7efb58dd1150>
```




```
plt.figure(figsize=(15,7))
plt.subplot(1,3,1)
plt.title("Bert AutoTranformer results")
```

```
plt.pie(s_counts.values, labels = s_counts.index, explode = None, autopct='%1.1f%%', shadow=F
```

```
([<matplotlib.patches.Wedge at 0x7efb54fd5dd0>,
  <matplotlib.patches.Wedge at 0x7efb54fe3550>,
  <matplotlib.patches.Wedge at 0x7efb54fe3dd0>,
  <matplotlib.patches.Wedge at 0x7efb54feb710>,
  <matplotlib.patches.Wedge at 0x7efb54ff6250>],
 [Text(0.5555088100093617, 0.9494261224560777, 'Neutral'),
  Text(-1.074736070577655, 0.23439790655912848, 'Partially_Positive'),
  Text(-0.3559797707356584, -1.0408066116368535, 'Partially_Negative'),
  Text(0.7559518643433558, -0.7990849634399366, 'Negative'),
  Text(1.084343188254864, -0.18493201476563492, 'Positive')],
 [Text(0.3030048054596518, 0.5178687940669514, '33.1%'),
  Text(-0.586219674860539, 0.12785340357770641, '26.9%'),
  Text(-0.19417078403763186, -0.5677126972564656, '19.5%'),
  Text(0.4123373805509213, -0.43586452551269267, '15.1%'),
  Text(0.5914599208662893, -0.10087200805398268, '5.4%')])
```




```
s_counts.sum()
```

```
27841
```

```
TRAIN_SIZE = 22000
TEST_SIZE = 5840

data_train = df[:TRAIN_SIZE]
data_test = df[TRAIN_SIZE:].reset_index(drop=True)
```

```
data_train.head()
```

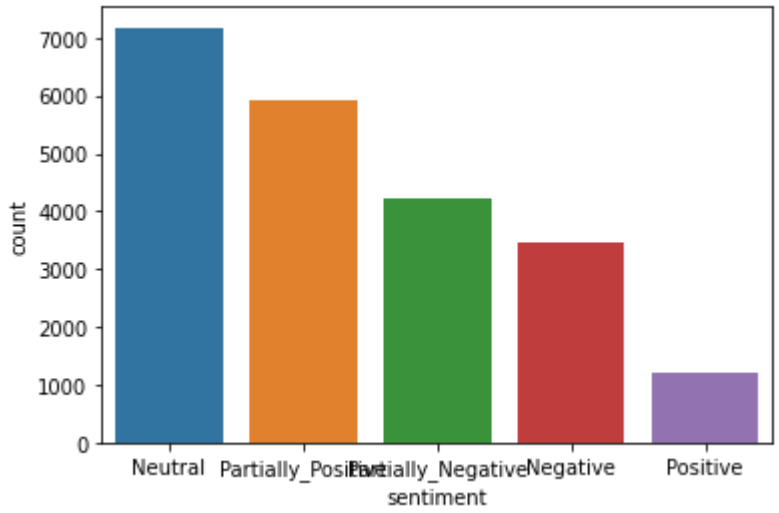
	clean_reviews	sentiment
0	capsule this very dark scifi fantasy is magnif...	Neutral

```
data_train['sentiment'].value_counts()
```

```
Neutral               7174
Partially_Positive    5903
Partially_Negative    4234
Negative              3476
Positive              1213
Name: sentiment, dtype: int64
```

```
sns.countplot(data_train["sentiment"])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7efb54fabdd0>
```




```
data_train.isna().sum()/len(data_train) * 100
```

```
clean_reviews    0.0
sentiment        0.0
dtype: float64
```

```
data_test.head()
```

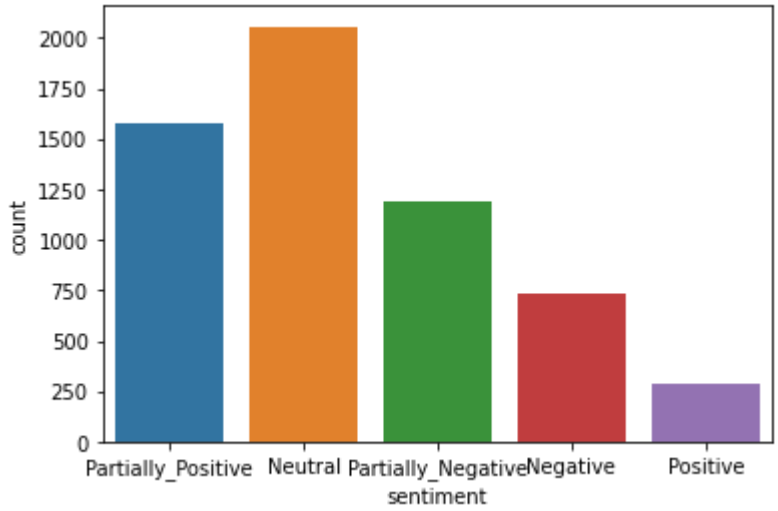
	clean_reviews	sentiment
0	jim jarmuschs stranger than paradise down by l...	Partially_Positive
1	venezuela running length mpaa classification n...	Neutral
2	united states us release date beginning limite...	Partially_Negative
3	united states us release date beginning wideru...	Partially_Negative
4	franceguinea running length mpaa classificatio...	Partially_Negative

```
data_test['sentiment'].value_counts()
```

```
Neutral              2055
Partially_Positive   1577
Partially_Negative   1189
Negative              736
Positive              284
Name: sentiment, dtype: int64
```

```
sns.countplot(data_test["sentiment"])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7efb54f8d090>
```




```
data_test.isna().sum()/len(data_test) * 100
```

```
clean_reviews    0.0
sentiment        0.0
dtype: float64
```

```
#dimension of the dataset

print("Size of train dataset: ",data_train.shape)
print("Size of test dataset: ",data_test.shape)
```

```
Size of train dataset:  (22000, 2)
Size of test dataset:  (5841, 2)
```

```
# maxlen means it is considering that much words and rest are getting trucated
# preprocess_mode means tokenizing, embedding and transformation of text corpus(here it is co


(X_train, y_train), (X_test, y_test), preproc = text.texts_from_df(train_df=data_train,
                                                                   text_column = 'clean_revie
                                                                   label_columns = 'sentiment
                                                                   val_df = data_test,
                                                                   maxlen = 500,
                                                                   ngram_range=2
```

```
                                                                ngram_range=2,
                                                                preprocess_mode = 'bert')
```

```
['Negative', 'Neutral', 'Partially_Negative', 'Partially_Positive', 'Positive']
   Negative  Neutral  Partially_Negative  Partially_Positive  Positive
0       0.0      1.0                 0.0                 0.0       0.0
1       0.0      1.0                 0.0                 0.0       0.0
2       0.0      0.0                 0.0                 1.0       0.0
3       0.0      0.0                 0.0                 1.0       0.0
4       0.0      0.0                 0.0                 1.0       0.0
['Negative', 'Neutral', 'Partially_Negative', 'Partially_Positive', 'Positive']
   Negative  Neutral  Partially_Negative  Partially_Positive  Positive
0       0.0      0.0                 0.0                 1.0       0.0
1       0.0      1.0                 0.0                 0.0       0.0
2       0.0      0.0                 1.0                 0.0       0.0
3       0.0      0.0                 1.0                 0.0       0.0
4       0.0      0.0                 1.0                 0.0       0.0
downloading pretrained BERT model (uncased_L-12_H-768_A-12.zip)...
[████████████████████████████████████████████████████████████]
extracting pretrained BERT model...
done.

cleanup downloaded zip...
done.

preprocessing train...
language: en
done.
Is Multi-Label? False
preprocessing test...
language: en
done.
```

```
len(X_train[1])
```

```
22000
```

```
X_train[0].shape
```

```
(22000, 500)
```

```
print('review: \n', X_train[0])
print('label: \n', y_train[0])
```

```
review:
 [[  101 18269  2023 ...  2011 17512   102]
 [  101  5074 22660 ... 19104  1037   102]
 [  101 12114  9552 ... 23805 23808   102]
 ...
 [  101  1996  2732 ... 17729  4945   102]
 [  101  3459  3744 ...  5000  2247   102]
 [  101  1996  2034 ...  2046  1996   102]]
label:
 [0. 1. 0. 0. 0.]
```

BERT Model Building

```
# name = "bert" means, here we are using BERT model.

model = text.text_classifier(name = 'bert',
                             train_data = (X_train, y_train),
                             preproc = preproc)
```

```
Is Multi-Label? False
maxlen is 500
done.
```

```
model.summary()
```

```
_________________________________________________________________
Encoder-4-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-4-MultiHeadS
_________________________________________________________________
Encoder-4-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-3-FeedForwar
                                                                 Encoder-4-MultiHeadS
_________________________________________________________________
Encoder-4-MultiHeadSelfAttentio (None, 500, 768)     1536        Encoder-4-MultiHeadS
_________________________________________________________________
Encoder-4-FeedForward (FeedForw (None, 500, 768)     4722432     Encoder-4-MultiHeadS
_________________________________________________________________
Encoder-4-FeedForward-Dropout ( (None, 500, 768)     0           Encoder-4-FeedForwar
_________________________________________________________________
Encoder-4-FeedForward-Add (Add) (None, 500, 768)     0           Encoder-4-MultiHeadS
                                                                 Encoder-4-FeedForwar
_________________________________________________________________
Encoder-4-FeedForward-Norm (Lay (None, 500, 768)     1536        Encoder-4-FeedForwar
_________________________________________________________________
Encoder-5-MultiHeadSelfAttentio (None, 500, 768)     2362368     Encoder-4-FeedForwar
_________________________________________________________________
Encoder-5-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-5-MultiHeadS

_________________________________________________________________
Encoder-5-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-4-FeedForwar
                                                                 Encoder-5-MultiHeadS
_________________________________________________________________
Encoder-5-MultiHeadSelfAttentio (None, 500, 768)     1536        Encoder-5-MultiHeadS
_________________________________________________________________
Encoder-5-FeedForward (FeedForw (None, 500, 768)     4722432     Encoder-5-MultiHeadS
_________________________________________________________________
Encoder-5-FeedForward-Dropout ( (None, 500, 768)     0           Encoder-5-FeedForwar
_________________________________________________________________
Encoder-5-FeedForward-Add (Add) (None, 500, 768)     0           Encoder-5-MultiHeadS
                                                                 Encoder-5-FeedForwar
_________________________________________________________________
Encoder-5-FeedForward-Norm (Lay (None, 500, 768)     1536        Encoder-5-FeedForwar
_________________________________________________________________
Encoder-6-MultiHeadSelfAttentio (None, 500, 768)     2362368     Encoder-5-FeedForwar
_________________________________________________________________
Encoder-6-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-6-MultiHeadS
_________________________________________________________________
```

```
Encoder-6-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-5-FeedForwar
                                                                 Encoder-6-MultiHeadS
__________________________________________________________________________________________
Encoder-6-MultiHeadSelfAttentio (None, 500, 768)     1536        Encoder-6-MultiHeadS
__________________________________________________________________________________________
Encoder-6-FeedForward (FeedForw (None, 500, 768)     4722432     Encoder-6-MultiHeadS
__________________________________________________________________________________________
Encoder-6-FeedForward-Dropout ( (None, 500, 768)     0           Encoder-6-FeedForwar
__________________________________________________________________________________________
Encoder-6-FeedForward-Add (Add) (None, 500, 768)     0           Encoder-6-MultiHeadS
                                                                 Encoder-6-FeedForwar
__________________________________________________________________________________________
Encoder-6-FeedForward-Norm (Lay (None, 500, 768)     1536        Encoder-6-FeedForwar
__________________________________________________________________________________________
Encoder-7-MultiHeadSelfAttentio (None, 500, 768)     2362368     Encoder-6-FeedForwar
__________________________________________________________________________________________
Encoder-7-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-7-MultiHeadS
__________________________________________________________________________________________
Encoder-7-MultiHeadSelfAttentio (None, 500, 768)     0           Encoder-6-FeedForwar
```

```
#here we have taken batch size as 6 as from the documentation it is recommend to use this wit

learner = ktrain.get_learner(model=model, train_data=(X_train, y_train),
                  val_data = (X_test, y_test),
                  batch_size = 6)


#Essentially fit is a very basic training loop, where as fit one cycle uses the one cycle pol

learner.fit_onecycle(lr = 2e-5, epochs = 1)
```

```
begin training using onecycle policy with max lr of 2e-05...
3667/3667 [==============================] - 4085s 1s/step - loss: 1.2004 - accuracy: 0
<tensorflow.python.keras.callbacks.History at 0x7efb4010c090>
```

```
predictor = ktrain.get_predictor(learner.model, preproc)
predictor.save("/content/drive/MyDrive/Colab Notebooks/CapstoneGL/new_model")


df.loc[4, 'sentiment']
```

```
'Partially_Positive'
```

```
#sample dataset to test on

data = ['movie was half good watchable but not great','this movie was horrible, the plot was
        'the fild is really sucked. there is not plot and acting was bad',
        'what a beautiful movie. great plot. acting was good. will see it again',]
```

```
predictor_load.predict(data)
```

```
['Neutral', 'Partially_Negative', 'Negative', 'Partially_Positive']
```

```
#return_proba = True means it will give the prediction probabilty for each class
```

```
predictor_load.predict(data, return_proba=True)
```

```
array([[3.8568873e-03, 8.1107748e-01, 1.5770593e-01, 2.6736544e-02,
        6.2313885e-04],
       [3.1286815e-01, 7.5921856e-02, 6.0201305e-01, 7.7268970e-03,
        1.4700212e-03],
       [6.7886770e-01, 1.2580841e-02, 3.0633354e-01, 1.7213557e-03,
        4.9658422e-04],
       [1.4146597e-02, 7.1383864e-02, 2.0277960e-02, 5.3569973e-01,
        3.5849184e-01]], dtype=float32)
```

```
#classes available
```

```
predictor_load.get_classes()
```

```
['Negative', 'Neutral', 'Partially_Negative', 'Partially_Positive', 'Positive']
```

SCPrediction

```
#!pip install ktrain
```

```
#Import libraries

import numpy as np
import pandas as pd
import tensorflow as tf
import seaborn as sns
import ktrain
from ktrain import text
from sklearn.feature_extraction.text import CountVectorizer
from keras.preprocessing.text import Tokenizer
from keras.preprocessing.sequence import pad_sequences
from keras.models import Sequential
from keras.layers import Dense, Embedding, LSTM, SpatialDropout1D
from sklearn.model_selection import train_test_split
from keras.utils.np_utils import to_categorical
import re
```

```
import os
os.chdir(r'/content/drive/MyDrive/Colab Notebooks/CapstoneGL/new_model')
```

```
os.listdir()
```

```
['tf_model.h5', 'tf_model.preproc']
```

```
for file in os.listdir():
    print(f"{file}: {round(os.path.getsize(file)/1e+6,2)} MB")
```

```
tf_model.h5: 1314.47 MB
tf_model.preproc: 1.08 MB
```

```
#loading the model

predictor_load = ktrain.load_predictor("/content/drive/MyDrive/Colab Notebooks/CapstoneGL/new
```

```
predictor_load.get_classes()
```

```
['Negative', 'Neutral', 'Partially_Negative', 'Partially_Positive', 'Positive']
```

```
#sample dataset to test on

data = ['The public went berserk for “Psycho” in 1960, but critics were not as crazy about Al
        'movie was half good watchable but not great','this movie was horrible, the plot was
        'the fild is really sucked. there is not plot and acting was bad',
        'what a beautiful movie. great plot. acting was good. will see it again',]
```

```
predictor_load.predict(data)
```

```
['Partially_Negative',
 'Neutral',
 'Partially_Negative',
 'Negative',
 'Partially_Positive']
```

```
#new_data = ["this movie is shit, feels like i have wasted my time", "best movie i have seen"
new_data = ["The public went berserk for “Psycho” in 1960, but critics were not as crazy abou
            "this movie is shit, feels like i have wasted my time",
            "best movie i have seen",
            "i will rate this movie as average",
            "you are a kind man",
            "worst kind of movie ever created in MCU",
            "I have seen this movie"
            ]
new_prediction = predictor_load.predict(new_data, return_proba=True)
```

```
predictor_load.predict(new_data)
```

```
['Partially_Negative',
 'Negative',
 'Positive',
```

```
       'Neutral',
       'Partially_Positive',
       'Negative',
       'Negative']


#return_proba = True means it will give the prediction probabilty for each class

predictor_load.predict(new_data, return_proba=True)
```

```
     array([[0.02619144, 0.2952079 , 0.653383  , 0.02408519, 0.00113248],
            [0.97995764, 0.00110503, 0.01233785, 0.00195646, 0.00464307],
            [0.02984951, 0.00467052, 0.00744052, 0.04353297, 0.9145065 ],
            [0.07645532, 0.53776073, 0.28896317, 0.09120732, 0.00561343],
            [0.04019133, 0.11195118, 0.04184788, 0.5200695 , 0.2859401 ],
            [0.9804819 , 0.00133124, 0.00577038, 0.00380445, 0.00861199],
            [0.35349956, 0.0769375 , 0.08074535, 0.23584509, 0.25297242]],
           dtype=float32)
```

```
Pred = new_data[5]
new_prediction = predictor_load.predict(new_data, return_proba=True)
for i, pred in enumerate(new_prediction):
  print(np.argmax(pred))
```

```
     2
     0
     4
     1
     3
     0
     0
```

```
#new_data = ["this movie is shit, feels like i have wasted my time", "best movie i have seen"
new_data = ["The public went berserk for “Psycho” in 1960, but critics were not as crazy abou
            "this movie is shit, feels like i have wasted my time",
            "best movie i have seen",
            "i will rate this movie as average",
            "you are a kind man",
            "worst kind of movie ever created in MCU",
            "I have seen this movie"
            ]
new_prediction = predictor_load.predict(new_data, return_proba=True)
new_prediction
```

```
     array([[0.02619144, 0.2952079 , 0.653383  , 0.02408519, 0.00113248],
            [0.97995764, 0.00110503, 0.01233785, 0.00195646, 0.00464307],
            [0.02984951, 0.00467052, 0.00744052, 0.04353297, 0.9145065 ],
            [0.07645532, 0.53776073, 0.28896317, 0.09120732, 0.00561343],
            [0.04019133, 0.11195118, 0.04184788, 0.5200695 , 0.2859401 ],
            [0.9804819 , 0.00133124, 0.00577038, 0.00380445, 0.00861199],
            [0.35349956, 0.0769375 , 0.08074535, 0.23584509, 0.25297242]],
           dtype=float32)
```

```
Pred = new_data[6]
new_prediction = predictor_load.predict(new_data, return_proba=True)
for i, pred in enumerate(new_prediction):
  print(np.argmax(pred))
```

```
2
0
4
1
3
0
0
```

```
for i, pred in enumerate(new_prediction):
    if np.argmax(pred) == 4:
        print(f"{new_data[i]} => \n {pred} => Positive")
    elif np.argmax(pred) == 3:
        print(f"{new_data[i]} => \n {pred} => Partially_Positive")
    elif np.argmax(pred) == 2:
        print(f"{new_data[i]} => \n {pred} => Neutral")
    elif np.argmax(pred) == 1:
        print(f"{new_data[i]} => \n {pred} => Partially_Negative")
    else:
        print(f"{new_data[i]} => \n {pred} => Negative")
```

```
The public went berserk for “Psycho” in 1960, but critics were not as crazy about Alfred
 [0.02619144 0.2952079  0.653383   0.02408519 0.00113248] => Neutral
this movie is shit, feels like i have wasted my time =>
 [0.97995764 0.00110503 0.01233785 0.00195646 0.00464307] => Negative
best movie i have seen =>
 [0.02984951 0.00467052 0.00744052 0.04353297 0.9145065 ] => Positive
i will rate this movie as average =>
 [0.07645532 0.53776073 0.28896317 0.09120732 0.00561343] => Partially_Negative
you are a kind man =>
 [0.04019133 0.11195118 0.04184788 0.5200695  0.2859401 ] => Partially_Positive
worst kind of movie ever created in MCU =>
 [0.9804819  0.00133124 0.00577038 0.00380445 0.00861199] => Negative
I have seen this movie =>
 [0.35349956 0.0769375  0.08074535 0.23584509 0.25297242] => Negative
```

On Yelp

```
from transformers import AutoTokenizer, AutoModelForSequenceClassification
import torch
import requests
from bs4 import BeautifulSoup
import re
```

```
r = requests.get('https://www.yelp.com/biz/social-brew-cafe-pyrmont')
soup = BeautifulSoup(r.text, 'html.parser')
```

```
regex = re.compile('.*comment.*')
results = soup.find_all('p', {'class':regex})
reviews = [result.text for result in results]
```

```
reviews
```

```
['Still one of the favorite coffee shop in Sydney. Staffs have excellent knowledge about
 'I came to Social brew cafe for brunch while exploring the city and on my way to the ac
 "Ricotta hot cakes! These were so yummy. I ate them pretty fast and didn't share with a
 'Good coffee and toasts. Straight up and down - hits the spot with nothing mind blowing
 "Ron & Jo are on the go down under and Wow! \xa0We've found our breakfast place in Sydr
 "Great coffee and vibe. That's all \xa0you need. Crab was outstanding but not good fing
 "Great coffee and vibe. That's all \xa0you need. Crab was outstanding but not good fing
 "We came for brunch twice in our week-long visit to Sydney. Everything on the menu not
 'This is my fave brunch café in and around Sydney. Just love the ambience, food and dri
 "Delicious. The waitress was hot. The burger was juicy but messy that was the only thir
 'This cafe is one of the most popular cafes where we can enjoy eating nice breakfast ir
```

```
yelpdf = pd.DataFrame(np.array(reviews), columns=['review'])
```

```
yelpdf['review'].iloc[0]
```

```
'Still one of the favorite coffee shop in Sydney. Staffs have excellent knowledge about
beans , flavor, brew skills. They make own pastries which are also tasty too.'
```

```
yelpdf.head()
```

	review
0	Still one of the favorite coffee shop in Sydne...
1	I came to Social brew cafe for brunch while ex...
2	Ricotta hot cakes! These were so yummy. I ate ...
3	Good coffee and toasts. Straight up and down -...
4	Ron & Jo are on the go down under and Wow! We...

```
def sentiment_score(review):
    tokens = tokenizer.encode(review, return_tensors='pt')
    result = model(tokens)
    return int(torch.argmax(result.logits))+1
```

```
sentiment_score(yelpdf['review'].iloc[1])
```

```
5
```

```
yelpdf['sentiment'] = yelpdf['review'].apply(lambda x: sentiment_score(x[:512]))
```

```
yelpdf
```

	review	sentiment
0	Still one of the favorite coffee shop in Sydne...	5
1	I came to Social brew cafe for brunch while ex...	5
2	Ricotta hot cakes! These were so yummy. I ate ...	5
3	Good coffee and toasts. Straight up and down -...	5
4	Ron & Jo are on the go down under and Wow! We...	5
5	Great coffee and vibe. That's all you need. C...	5
6	Great coffee and vibe. That's all you need. C...	4
7	We came for brunch twice in our week-long visi...	4
8	This is my fave brunch café in and around Sydn...	5
9	Delicious. The waitress was hot. The burger wa...	4
10	This cafe is one of the most popular cafes whe...	5

```
Class = { 1: 'Negative',2: 'Partially_Negative',3: 'Neutral',4: 'Partially_Positive',5: 'Posi
```

```
yelpdf.sentiment =[Class[item] for item in yelpdf.sentiment]
```

```
yelpdf
```

```
reviews[0]
```

```
'Still one of the favorite coffee shop in Sydney. Staffs have excellent knowledge about
beans, flavor, brew skills. They make own pastries which are also tasty too.'
```

```
predictor_load.predict(reviews)
```

```
['Partially_Positive',
 'Partially_Positive',
 'Positive',
 'Partially_Positive',
 'Partially_Positive',
 'Partially_Positive',
 'Neutral',
 'Partially_Positive',
 'Positive',
 'Neutral',
 'Partially_Positive']
```

```
predictedresult=predictor_load.predict(reviews)
```

```
predictedresult = pd.DataFrame(predictedresult,columns=['PredictedSentiment'])
```

```
predictedresult
```

	PredictedSentiment
0	Partially_Positive
1	Partially_Positive
2	Positive
3	Partially_Positive
4	Partially_Positive
5	Partially_Positive
6	Neutral
7	Partially_Positive
8	Positive
9	Neutral
10	Partially_Positive

```
predictedresult.value_counts()
```

```
PredictedSentiment
```

```
Partially_Positive    7
Positive              2
Neutral               2
dtype: int64
```

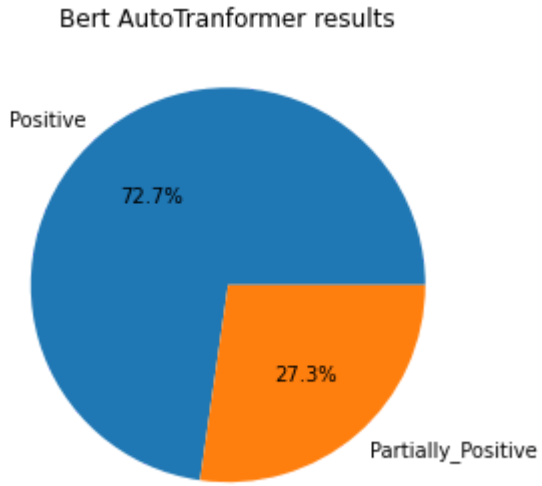
```
predictedbymodel_counts= predictedresult['PredictedSentiment'].value_counts()
```

```
import matplotlib.pyplot as plt
%matplotlib inline
```

```
yelp_counts= yelpdf['sentiment'].value_counts()
```

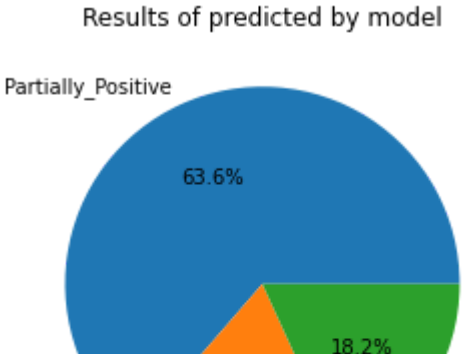
```
plt.figure(figsize=(15,7))
plt.subplot(1,3,1)
plt.title("Bert AutoTranformer results")
plt.pie(yelp_counts.values, labels = yelp_counts.index, explode = None, autopct='%1.1f%%', sh
```

```
([<matplotlib.patches.Wedge at 0x7f1fd25d0410>,
  <matplotlib.patches.Wedge at 0x7f1fd2616a10>],
 [Text(-0.7203468639465174, 0.8313244827396927, 'Positive'),
  Text(0.7203469417807291, -0.8313244152959488, 'Partially_Positive')],
 [Text(-0.3929164712435549, 0.45344971785801413, '72.7%'),
  Text(0.39291651369857944, -0.4534496810705174, '27.3%')])
```




```
plt.figure(figsize=(15,7))
plt.subplot(1,3,1)
plt.title("Results of predicted by model")
plt.pie(predictedbymodel_counts.values, labels = predictedbymodel_counts.index, explode = Non
```

```
([<matplotlib.patches.Wedge at 0x7f1fd25063d0>,
  <matplotlib.patches.Wedge at 0x7f1fd2508750>,
  <matplotlib.patches.Wedge at 0x7f1fd2508310>],
 [Text(-0.45695648023571717, 1.000595210447554, 'Partially_Positive'),
  Text(-0.15654637770487637, -1.0888035780743386, 'Neutral'),
  Text(0.9253788759906098, -0.5947049149539255, 'Positive')],
 [Text(-0.24924898921948208, 0.5457792056986657, '63.6%'),
  Text(-0.08538893329356892, -0.593892860767821, '18.2%'),
  Text(0.5047521141766962, -0.3243844990657775, '18.2%')])
```



IMDB _ The Suicide Squad-2021

Neutral

```
r = requests.get('https://www.imdb.com/title/tt6334354/reviews')
soup = BeautifulSoup(r.text, 'html.parser')
regex = re.compile('.*text show-more__control.*')
results = soup.find_all('div', {'class':regex})
imdb_pipe_reviews2 = [result.text for result in results]
```

```
imdb_pipe_reviews2
```

```
["Remember when James Gunn was 'temporarily' fired by Marvel Studios and we were all dis
 'I remember as if it was yesterday my utter disappointment in 2016 when I purchased my
 'Before I talk about the film, let me talk a bit about DCEU. The difference between DC
 "The Suicide Squad is an upgrade in every conceivable way when compared to the 2016 mov
 "I'm so much lucky that I got to see the movie so early, many many thanks to my you tub
 'This was such a weird experience for me. Had high expectations seeing all the praise i
 "So the movie begins by basically throwing you into the action then slows down to show
 'What a waste of time and money. Trying way too hard to be funny and failed so badly. I
 "The movie is definitely so much worse than the first part.So many things are just lack
 "I don't ever really like to call movies garbage but you couldn't pay me to watch this
 'I expected this to be bad, but the final film exceeded my fears. James Gunn struck gol
 'I like all sorts of films but what the hell was this? It was like it was aimed at 7yr
 'This is an odd movie, its gory, violent, trying to funny with flat humour and it has a
 "Still a little flawed here and there, but it feels like a movie that doesn't try too h
 "The 10th movie in the DCEU and Sequel to 2016 Suicide Squad by WB (Not David Ayer)Some
 "The movie is slow , the characters are boring . And im a huge idres elba fan !! I thir
 "I enjoyed some parts of the film, but a lot of the jokes didn't land for me. The film
 'Man oh man. I don\'t even know where to begin. All I know is once I saw the cast for t
 'This was stupid and unwatchable. Low IQ dialogues, low IQ storyline, unnecessarily vic
 "2 hours and 12 minutes if people saying and doing things no one would've easy or do. I
 '"I cherish peace with all my heart. I don\'t care how many men, women, and children I
 "I was shocked to see such good actors with average performance at best. Whether it's t
```

```
        'Such a forced movie, not even remotely entertaining. The jokes fall flat and are actua
        "I wanted to watch it for Fillion grr.Too long, disjointed and irrelevant.It's just pai
        "While James Gunn was excellent in directing Guardians 1 & 2, I feel he missed the mark
```

```
imdb_pipe_reviews_df2 = pd.DataFrame(np.array(imdb_pipe_reviews2), columns=['review'])
```

```
predicted_TSS2021=predictor_load.predict(imdb_pipe_reviews)
```

```
predicted_TSS2021_Sentiment = pd.DataFrame(predicted_TSS2021,columns=['PredictedSentiment'])
```

```
predicted_TSS2021_Sentiment
```

	PredictedSentiment
0	Positive
1	Negative
2	Neutral

```
predicted_TSS2021_Sentiment.value_counts()
```

```
PredictedSentiment
Partially_Negative    9
Negative              7
Partially_Positive    4
Neutral               3
Positive              2
dtype: int64
```

```
Sentiment_count=predicted_TSS2021_Sentiment.value_counts()
```

```
plt.figure(figsize=(15,7))
plt.subplot(1,3,1)
plt.title("Sentiment predicted by model")
plt.pie(Sentiment_count.values, labels = Sentiment_count.index, explode = None, autopct='%1.1
```

```
([<matplotlib.patches.Wedge at 0x7f1f1bde7790>,
  <matplotlib.patches.Wedge at 0x7f1f1bde7f50>,
  <matplotlib.patches.Wedge at 0x7f1f1bdf4890>,
```

Prediction justification

```
 Text(-0.20611935297230657, -1.0805159935559852, "('Partially_Positive',)"),
```

Positive

```
 [Text(0.25546755054082887, 0.5428962429605394, '36.0%'),
```

```
n =0
print(imdb_pipe_reviews2[n])
print(' \n Predicted Sentiment: ',predicted_TSS2021_Sentiment['PredictedSentiment'].iloc[n])
```

```
Remember when James Gunn was 'temporarily' fired by Marvel Studios and we were all disap

 Predicted Sentiment:  Positive
```

Partially_Positive


```
n = 3
print(imdb_pipe_reviews2[n])
print(' \n Predicted Sentiment: ',predicted_TSS2021_Sentiment['PredictedSentiment'].iloc[n])
```

```
The Suicide Squad is an upgrade in every conceivable way when compared to the 2016 movie

 Predicted Sentiment:  Partially_Positive
```

Neutral

```
n = 2
print(imdb_pipe_reviews2[n])
print(' \n Predicted Sentiment: ',predicted_TSS2021_Sentiment['PredictedSentiment'].iloc[n])
```

```
Before I talk about the film, let me talk a bit about DCEU. The difference between DC an

 Predicted Sentiment:  Neutral
```

Partially_Negative

```
n = 5
print(imdb_pipe_reviews2[n])
print(' \n Predicted Sentiment: ',predicted_TSS2021_Sentiment['PredictedSentiment'].iloc[n])
```

```
This was such a weird experience for me. Had high expectations seeing all the praise it

 Predicted Sentiment:  Partially_Negative
```

Negative

```
n = 7
print(imdb_pipe_reviews2[n])
print(' \n Predicted Sentiment: ',predicted_TSS2021_Sentiment['PredictedSentiment'].iloc[n])
```

```
What a waste of time and money. Trying way too hard to be funny and failed so badly. Jus

 Predicted Sentiment:  Negative
```

End