

```
import numpy as np
#tensorflow packages
!pip install tensorflow
```

Collecting tensorflow  
Using cached tensorflow-2.12.0-cp310-cp310-win\_amd64.whl (1.9 kB)

Requirement already satisfied: tensorflow-intel==2.12.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow) (2.12.0)

Requirement already satisfied: packaging in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.1.2)

Requirement already satisfied: astunparse==1.6.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.6.0)

Requirement already satisfied: jax==0.3.15 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.3.15)

Requirement already satisfied: termcolor==1.1.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.1.0)

Requirement already satisfied: absl-py==1.0.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.0.0)

Requirement already satisfied: flatbuffers==2.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.0)

Requirement already satisfied: gast==0.4.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.4.0)

Requirement already satisfied: opt-einsum==2.3.2 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.3.2)

Requirement already satisfied: numpy<1.24,>=1.22 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.23.5)

Requirement already satisfied: grpcio<2.0,>=1.24.3 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.24.3)

Requirement already satisfied: wrapt<1.15,>=1.11.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.11.0)

Requirement already satisfied: libclang==13.0.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (13.0.0)

Requirement already satisfied: keras<2.13,>=2.12.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.12.0)

Requirement already satisfied: tensorboard<2.13,>=2.12 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.12.0)

Requirement already satisfied: tensorflow-estimator<2.13,>=2.12.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.12.0)

Requirement already satisfied: setuptools in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (59.0.0)

Requirement already satisfied: tensorflow-io-gcs-filesystem==0.23.1 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.23.1)

Requirement already satisfied: typing-extensions==3.6.6 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (3.6.6)

Requirement already satisfied: google-pasta==0.1.1 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.1.1)

Requirement already satisfied: h5py==2.9.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.9.0)

Requirement already satisfied: protobuf==4.21.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (4.21.0)

Requirement already satisfied: six==1.12.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.12.0)

Requirement already satisfied: wheel<1.0,>=0.23.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.23.0)

Requirement already satisfied: scipy==1.7 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.7)

Requirement already satisfied: ml-dtypes==0.1.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.1.0)

Requirement already satisfied: google-auth<3,>=1.6.3 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.6.3)

Requirement already satisfied: google-auth-oauthlib<1.1,>=0.5 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.5)

Requirement already satisfied: requests<3,>=2.21.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.21.0)

Requirement already satisfied: werkzeug==1.0.1 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.0.1)

Requirement already satisfied: markdown==2.6.8 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.6.8)

Requirement already satisfied: rsa<5,>=3.1.4 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (3.1.4)

Requirement already satisfied: cachetools<6.0,>=2.0.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.0.0)

Requirement already satisfied: pyasn1-modules==0.2.1 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.2.1)

Requirement already satisfied: urllib3<2.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (1.26.15)

Requirement already satisfied: requests-oauthlib==0.7.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.7.0)

Requirement already satisfied: idna<4,>=2.5 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.10)

Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.0.12)

Requirement already satisfied: certifi==2017.4.17 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2017.4.17)

Requirement already satisfied: MarkupSafe==2.1.1 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (2.1.1)

Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (0.4.8)

Requirement already satisfied: oauthlib==3.0.0 in c:\users\dell\anaconda3\lib\site-packages (from tensorflow-intel==2.12.0->tensorflow) (3.0.0)

Installing collected packages: tensorflow

Successfully installed tensorflow-2.12.0

```
import tensorflow as tf
import tensorflow_hub as hub
import tensorflow_datasets as tfds
```

```
train_data, validation_data, test_data = tfds.load(name="imdb_reviews", split=('train[60%]', 'train[60%]', 'test'), as_supervised=True)
```

Downloading and preparing dataset Unknown size (download: Unknown size, generated: Unknown size, total:

D1 Completed...: 0 url [00:00, ? url/s]

D1 Size...: 0 MiB [00:00, ? MiB/s]

Generating splits...: 0% | 0/3 [00:00?, ? splits/s]

Generating train examples...: 0 examples [00:00, ? examples/s]

Shuffling

C:\Users\Dell\tensorflow\_datasets\imdb\_reviews\plain\_text\1.0.0.incompleteT26BFJ\imdb\_reviews-train...

Generating test examples...: 0 examples [00:00, ? examples/s]

Shuffling

C:\Users\Dell\tensorflow\_datasets\imdb\_reviews\plain\_text\1.0.0.incompleteT26BFJ\imdb\_reviews-test.t...

Generating unsupervised examples...: 0 examples [00:00, ? examples/s]

Shuffling

C:\Users\Dell\tensorflow\_datasets\imdb\_reviews\plain\_text\1.0.0.incompleteT26BFJ\imdb\_reviews-unsupe...

```
train_data
```

```
print("GPU is", "available" if tf.config.experimental.list_physical_devices("GPU") else "NOT AVAILABLE")
```

GPU is NOT AVAILABLE

```
train_example_batch, train_labels_batch = next(iter(train_data.batch(10)))
```

```
train_example_batch
```

```
<tf.Tensor: shape=(10,), dtype=string, numpy=
array(["This was an absolutely terrible movie. Don't be lured in by Christopher Walken or Michael Ironside. Both are great
actors, but this must simply be their worst role in history. Even their great acting could not redeem this movie's ridiculous
storyline. This movie is an early nineties US propaganda piece. The most pathetic scenes were those when the Columbian rebels
were making their cases for revolutions. Maria Conchita Alonso appeared phony, and her pseudo-love affair with Walken was
nothing but a pathetic emotional plug in a movie that was devoid of any real meaning. I am disappointed that there are movies
like this, ruining actor's like Christopher Walken's good name. I could barely sit through it.",
      b'I have been known to fall asleep during films, but this is usually due to a combination of things including, really
tired, being warm and comfortable on the sette and having just eaten a lot. However on this occasion I fell asleep because the
film was rubbish. The plot development was constant. Constantly slow and boring. Things seemed to happen, but with no
explanation of what was causing them or why. I admit, I may have missed part of the film, but i watched the majority of it and
everything just seemed to happen of its own accord without any real concern for anything else. I cant recommend this film at
all.',
      b'Mann photographs the Alberta Rocky Mountains in a superb fashion, and Jimmy Stewart and Walter Brennan give enjoyable
performances as they always seem to do. <br /><br />But come on Hollywood - a Mountie telling the people of Dawson City, Yukon
to elect themselves a marshal (yes a marshal!) and to enforce the law themselves, then gunfighters battling it out on the
streets for control of the town? <br /><br />Nothing even remotely resembling that happened on the Canadian side of the border
during the Klondike gold rush. Mr. Mann and company appear to have mistaken Dawson City for Deadwood, the Canadian North for the
American Wild West.<br /><br />Canadian viewers be prepared for a Reefer Madness type of enjoyable howl with this ludicrous
plot, or, to shake your head in disgust.',
      b'This is the kind of film for a snowy Sunday afternoon when the rest of the world can go ahead with its own business as
you descend into a big arm-chair and mellow for a couple of hours. Wonderful performances from Cher and Nicolas Cage (as always)
gently row the plot along. There are no rapids to cross, no dangerous waters, just a warm and witty paddle through New York life
at its best. A family film in every sense and one that deserves the praise it received.',
      b'As others have mentioned, all the women that go nude in this film are mostly absolutely gorgeous. The plot very ably
shows the hypocrisy of the female libido. When men are around they want to be pursued, but when no "men" are around, they become
the pursuers of a 14 year old boy. And the boy becomes a man really fast (we should all be so lucky at this age!). He then gets
up the courage to pursue his true love.',
      b'This is a film which should be seen by anybody interested in, effected by, or suffering from an eating disorder. It is
an amazingly accurate and sensitive portrayal of bulimia in a teenage girl, its causes and its symptoms. The girl is played by
one of the most brilliant young actresses working in cinema today, Alison Lohman, who was later so spectacular in 'Where the
Truth Lies'. I would recommend that this film be shown in all schools, as you will never see a better on this subject. Alison
Lohman is absolutely outstanding, and one marvels at her ability to convey the anguish of a girl suffering from this compulsive
disorder. If barometers tell us the air pressure, Alison Lohman tells us the emotional pressure with the same degree of
accuracy. Her emotional range is so precise, each scene could be measured microscopically for its gradations of trauma, on a
scale of rising hysteria and desperation which reaches unbearable intensity. Mare Winningham is the perfect choice to play her
mother, and does so with immense sympathy and a range of emotions just as finely tuned as Lohman's. Together, they make a pair
of sensitive emotional oscillators vibrating in resonance with one another. This film is really an astonishing achievement, and
director Katt Shea should be proud of it. The only reason for not seeing it is if you are not interested in people. But even if
you like nature films best, this is after all animal behaviour at the sharp edge. Bulimia is an extreme version of how a
tormented soul can destroy her own body in a frenzy of despair. And if we don't sympathise with people suffering from the depths
of despair, then we are dead inside.",
      b'Okay, you have:<br /><br />Penelope Keith as Miss Herringbone-Tweed, B.B.E. (Backbone of England.) She's killed off in
the first scene - that's right, folks; this show has no backbone!<br /><br />Peter O'Toole as Ol' Colonel Cricket from The
First War and now the emblazered Lord of the Manor.<br /><br />Joanna Lumley as the ensweatered Lady of the Manor, 20 years
younger than the colonel and 20 years past her own prime but still glamorous (Brit spelling, not mine) enough to have a toy-boy
on the side. It's alright, they have Col. Cricket's full knowledge and consent (they guy even comes 'round for Christmas!)
Still, she's considerate of the colonel enough to have said toy-boy her own age (what a gall!)<br /><br />David McCallum as said
toy-boy, equally as pointlessly glamorous as his squeeze. Pilcher couldn't come up with any cover for him within the story, so
she gave him a hush-hush job at the Circus.<br /><br />and finally:<br /><br />Susan Hampshire as Miss Polonia Teacups,
Venerable Headmistress of the Venerable Girls' Boarding-School, serving tea in her office with a dash of deep, poignant advice
for life in the outside world just before graduation. Her best bit of advice: "I've only been to Nancherrow (the local Stately
Home of England) once. I thought it was very beautiful but, somehow, not part of the real world." Well, we can't say they
didn't warn us.<br /><br />Ah, Susan - time was, your character would have been running the whole show. They don't write 'em
like that any more. Our loss, not yours.<br /><br />So - with a cast and setting like this, you have the re-makings of
"Brideshead Revisited," right?<br /><br />Wrong! They took these 1-dimensional supporting roles because they paid so well. After
all, acting is one of the oldest temp-jobs there is (YOU name another!)<br /><br />First warning sign: lots and lots of
backlighting. They get around it by shooting outdoors - "hey, it's just the sunlight!"<br /><br />Second warning sign: Leading
```

```
train_labels_batch
```

```
<tf.Tensor: shape=(10,), dtype=int64, numpy=array([0, 0, 0, 1, 1, 1, 0, 0, 0, 0], dtype=int64)>
```

```
embedding="https://tfhub.dev/google/tf2-preview/gnews-swivel-20dim/1"
hub_layer=hub.KerasLayer(embedding,input_shape=[],dtype=tf.string,trainable=True)
```

```
hub_layer(train_example_batch[:3])
```

```
<tf.Tensor: shape=(3, 20), dtype=float32, numpy=
array([[ 1.765786 , -3.882232 ,  3.9134233 , -1.5557289 , -3.3362343 ,
        -1.7357955 , -1.9954445 ,  1.2989551 ,  5.081598 , -1.1041286 ,
        -2.0503852 , -0.72675157, -0.65675956,  0.24436149, -3.7208383 ,
         2.0954835 ,  2.2969332 , -2.0689783 , -2.9489717 , -1.1315987 ],
       [ 1.8804485 , -2.5852382 ,  3.4066997 ,  1.0982676 , -4.056685 ,
        -4.891284 , -2.785554 ,  1.3874227 ,  3.8476458 , -0.9256538 ,
        -1.896706 ,  1.2113281 ,  0.11474707,  0.76209456, -4.8791065 ,
        2.906149 ,  4.7087674 , -2.3652055 , -3.5015898 , -1.6390051 ],
       [ 0.71152234, -0.6353217 ,  1.7385626 , -1.1168286 , -0.5451594 ,
        -1.1808156 ,  0.09504455,  1.4653089 ,  0.66059524,  0.79308075,
        -2.2268345 ,  0.07446612, -1.4075904 , -0.70645386, -1.907037 ,
         1.4419787 ,  1.9551861 , -0.42660055, -2.8022065 ,  0.43727064]],
      dtype=float32)>
```

```
model=tf.keras.Sequential()
model.add(hub_layer)
```

```
model.add(tf.keras.layers.Dense(16,activation='relu'))
model.add(tf.keras.layers.Dense(1))

model.summary()

Model: "sequential"
-----
Layer (type)                Output Shape              Param #
-----
keras_layer (KerasLayer)    (None, 20)                400020

dense (Dense)               (None, 16)                336

dense_1 (Dense)             (None, 1)                 17
-----
Total params: 400,373
Trainable params: 400,373
Non-trainable params: 0
-----

model.compile(optimizer='adam',loss=tf.keras.losses.BinaryCrossentropy(from_logits=True),metrics=['accuracy'])

history=model.fit(train_data.shuffle(10000).batch(100),epochs=25,
                  validation_data=validation_data.batch(100),verbose=1)

Epoch 1/25
150/150 [=====] - 11s 33ms/step - loss: 0.8471 - accuracy: 0.5941 - val_loss: 0.5692 - val_accuracy: 0.671
Epoch 2/25
150/150 [=====] - 4s 28ms/step - loss: 0.5212 - accuracy: 0.7281 - val_loss: 0.4867 - val_accuracy: 0.7407
Epoch 3/25
150/150 [=====] - 5s 32ms/step - loss: 0.4346 - accuracy: 0.7909 - val_loss: 0.4205 - val_accuracy: 0.7991
Epoch 4/25
150/150 [=====] - 6s 38ms/step - loss: 0.3633 - accuracy: 0.8361 - val_loss: 0.3751 - val_accuracy: 0.8195
Epoch 5/25
150/150 [=====] - 6s 36ms/step - loss: 0.3079 - accuracy: 0.8681 - val_loss: 0.3453 - val_accuracy: 0.8388
Epoch 6/25
150/150 [=====] - 5s 32ms/step - loss: 0.2650 - accuracy: 0.8911 - val_loss: 0.3282 - val_accuracy: 0.8577
Epoch 7/25
150/150 [=====] - 5s 34ms/step - loss: 0.2296 - accuracy: 0.9086 - val_loss: 0.3140 - val_accuracy: 0.8599
Epoch 8/25
150/150 [=====] - 5s 35ms/step - loss: 0.2015 - accuracy: 0.9233 - val_loss: 0.3073 - val_accuracy: 0.8616
Epoch 9/25
150/150 [=====] - 5s 33ms/step - loss: 0.1770 - accuracy: 0.9333 - val_loss: 0.3072 - val_accuracy: 0.8694
Epoch 10/25
150/150 [=====] - 5s 30ms/step - loss: 0.1553 - accuracy: 0.9435 - val_loss: 0.3114 - val_accuracy: 0.8725
Epoch 11/25
150/150 [=====] - 5s 33ms/step - loss: 0.1382 - accuracy: 0.9511 - val_loss: 0.3142 - val_accuracy: 0.8699
Epoch 12/25
150/150 [=====] - 5s 32ms/step - loss: 0.1204 - accuracy: 0.9607 - val_loss: 0.3202 - val_accuracy: 0.8679
Epoch 13/25
150/150 [=====] - 4s 29ms/step - loss: 0.1074 - accuracy: 0.9651 - val_loss: 0.3325 - val_accuracy: 0.8712
Epoch 14/25
150/150 [=====] - 4s 29ms/step - loss: 0.0933 - accuracy: 0.9725 - val_loss: 0.3401 - val_accuracy: 0.8678
Epoch 15/25
150/150 [=====] - 4s 29ms/step - loss: 0.0811 - accuracy: 0.9769 - val_loss: 0.3580 - val_accuracy: 0.8639
Epoch 16/25
150/150 [=====] - 4s 29ms/step - loss: 0.0701 - accuracy: 0.9808 - val_loss: 0.3758 - val_accuracy: 0.8686
Epoch 17/25
150/150 [=====] - 4s 28ms/step - loss: 0.0607 - accuracy: 0.9853 - val_loss: 0.3829 - val_accuracy: 0.8664
Epoch 18/25
150/150 [=====] - 4s 29ms/step - loss: 0.0523 - accuracy: 0.9885 - val_loss: 0.3980 - val_accuracy: 0.8674
Epoch 19/25
150/150 [=====] - 5s 33ms/step - loss: 0.0445 - accuracy: 0.9907 - val_loss: 0.4185 - val_accuracy: 0.8664
Epoch 20/25
150/150 [=====] - 5s 34ms/step - loss: 0.0380 - accuracy: 0.9933 - val_loss: 0.4334 - val_accuracy: 0.8655
Epoch 21/25
150/150 [=====] - 4s 28ms/step - loss: 0.0324 - accuracy: 0.9949 - val_loss: 0.4555 - val_accuracy: 0.8634
Epoch 22/25
150/150 [=====] - 4s 28ms/step - loss: 0.0273 - accuracy: 0.9960 - val_loss: 0.4723 - val_accuracy: 0.8619
Epoch 23/25
150/150 [=====] - 4s 28ms/step - loss: 0.0231 - accuracy: 0.9969 - val_loss: 0.4995 - val_accuracy: 0.8655
Epoch 24/25
150/150 [=====] - 4s 28ms/step - loss: 0.0193 - accuracy: 0.9979 - val_loss: 0.5135 - val_accuracy: 0.8606
Epoch 25/25
150/150 [=====] - 4s 28ms/step - loss: 0.0165 - accuracy: 0.9986 - val_loss: 0.5348 - val_accuracy: 0.8614

results=model.evaluate(test_data.batch(100),verbose=2)

for name,value in zip(model.metrics_names,results):
    print("%s: %3f" % (name,value))

250/250 - 2s - loss: 0.5879 - accuracy: 0.8435 - 2s/epoch - 10ms/step
loss: 0.587918
```

accuracy: 0.843480

