Deep Learning Practical Assignment 2B

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[1]:
```
from tensorflow.keras.datasets import imdb
```

[2]:
```
(x_train, y_train), (x_test, y_test) = imdb.load_data(num_words=10000)
```

[3]:
```
print("Train Shape :",x_train.shape)
print("Test Shape :",x_test.shape)
```

```
Train Shape : (25000,)
Test Shape : (25000,)
```

[4]:
```
print("y_train shape :",y_train.shape)
print("y_test shape :",y_test.shape)
```

```
y_train shape : (25000,)
y_test shape : (25000,)
```

[5]:
```
print(x_train[1])
```

```
[1, 194, 1153, 194, 8255, 78, 228, 5, 6, 1463, 4369, 5012, 134, 26, 4, 715, 8,
118, 1634, 14, 394, 20, 13, 119, 954, 189, 102, 5, 207, 110, 3103, 21, 14, 69,
188, 8, 30, 23, 7, 4, 249, 126, 93, 4, 114, 9, 2300, 1523, 5, 647, 4, 116, 9,
35, 8163, 4, 229, 9, 340, 1322, 4, 118, 9, 4, 130, 4901, 19, 4, 1002, 5, 89, 29,
952, 46, 37, 4, 455, 9, 45, 43, 38, 1543, 1905, 398, 4, 1649, 26, 6853, 5, 163,
11, 3215, 2, 4, 1153, 9, 194, 775, 7, 8255, 2, 349, 2637, 148, 605, 2, 8003, 15,
123, 125, 68, 2, 6853, 15, 349, 165, 4362, 98, 5, 4, 228, 9, 43, 2, 1157, 15,
299, 120, 5, 120, 174, 11, 220, 175, 136, 50, 9, 4373, 228, 8255, 5, 2, 656,
245, 2350, 5, 4, 9837, 131, 152, 491, 18, 2, 32, 7464, 1212, 14, 9, 6, 371, 78,
22, 625, 64, 1382, 9, 8, 168, 145, 23, 4, 1690, 15, 16, 4, 1355, 5, 28, 6, 52,
154, 462, 33, 89, 78, 285, 16, 145, 95]
```

[6]:
```
print(y_train[1])
```

```
0
```

[7]:
```
vocab=imdb.get_word_index()
print(vocab["the"])
```

1

[8]:
```
class_names=['Negative', 'Positive']
```

Decoding

[9]:
```
reverse_index = dict([(value, key) for (key, value) in vocab.items()])
```

[10]:
```
def decode(review):
  text=""
  for i in review:
    text=text+reverse_index[i]
    text=text+" "
  return text
```

[11]:
```
decode(x_train[1])
```

[11]: "the thought solid thought senator do making to is spot nomination assumed while he of jack in where picked as getting on was did hands fact characters to always life thrillers not as me can't in at are br of sure your way of little it strongly random to view of love it so principles of guy it used producer of where it of here icon film of outside to don't all unique some like of direction it if out her imagination below keep of queen he diverse to makes this stretch and of solid it thought begins br senator and budget worthwhile though ok and awaiting for ever better were and diverse for budget look kicked any to of making it out and follows for effects show to show cast this family us scenes more it severe making senator to and finds tv tend to of emerged these thing wants but and an beckinsale cult as it is video do you david see scenery it in few those are of ship for with of wild to one is very work dark they don't do dvd with those them "

[12]:
```
def showlen():
    print("Length of first training sample: ",len(x_train[0]))
    print("Length of second training sample: ",len(x_train[1]))
    print("Length of first test sample: ",len(x_test[0]))
    print("Length of second test sample: ",len(x_test[1]))
showlen()
```

```
Length of first training sample:  218
Length of second training sample:  189
Length of first test sample:  68
Length of second test sample:  260
```

Padding

[13]:
```
from tensorflow.keras.preprocessing.sequence import pad_sequences
```

[14]:
```
x_train=pad_sequences(x_train, value=vocab['the'], padding='post', maxlen=256)
x_test=pad_sequences(x_test, value=vocab['the'], padding='post', maxlen=256)
```

[15]:
```
showlen()
```

```
Length of first training sample:  256
Length of second training sample:  256
Length of first test sample:  256
Length of second test sample:  256
```

[16]:
```
decode(x_train[1])
```

[16]: "the thought solid thought senator do making to is spot nomination assumed while he of jack in where picked as getting on was did hands fact characters to always life thrillers not as me can't in at are br of sure your way of little it strongly random to view of love it so principles of guy it used producer of where it of here icon film of outside to don't all unique some like of direction it if out her imagination below keep of queen he diverse to makes this stretch and of solid it thought begins br senator and budget worthwhile though ok and awaiting for ever better were and diverse for budget look kicked any to of making it out and follows for effects show to show cast this family us scenes more it severe making senator to and finds tv tend to of emerged these thing wants but and an beckinsale cult as it is video do you david see scenery it in few those are of ship for with of wild to one is very work dark they don't do dvd with those them the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the the "

Building our Model

[17]:
```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Embedding, GlobalAveragePooling1D
```

[18]:
```
model=Sequential()
model.add(Embedding(10000,16))
model.add(GlobalAveragePooling1D())
model.add(Dense(16,activation='relu'))
model.add(Dense(1,activation='sigmoid'))
model.compile(optimizer='adam', loss='binary_crossentropy',␣
↪metrics=['accuracy'])
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 embedding (Embedding)       (None, None, 16)          160000

 global_average_pooling1d (G  (None, 16)               0
 lobalAveragePooling1D)
```

```
 dense (Dense)                (None, 16)                272

 dense_1 (Dense)              (None, 1)                 17

=================================================================
Total params: 160,289
Trainable params: 160,289
Non-trainable params: 0
_________________________________________________________________
```

Training our Model

[19]:
```
model.fit(x_train, y_train, epochs=4, batch_size=128, verbose=1,␣
↪validation_data=(x_test, y_test))
```

```
Epoch 1/4
196/196 [==============================] - 4s 13ms/step - loss: 0.6618 -
accuracy: 0.6706 - val_loss: 0.5869 - val_accuracy: 0.8018
Epoch 2/4
196/196 [==============================] - 2s 12ms/step - loss: 0.4622 -
accuracy: 0.8427 - val_loss: 0.3876 - val_accuracy: 0.8576
Epoch 3/4
196/196 [==============================] - 2s 11ms/step - loss: 0.3169 -
accuracy: 0.8852 - val_loss: 0.3183 - val_accuracy: 0.8732
Epoch 4/4
196/196 [==============================] - 2s 11ms/step - loss: 0.2580 -
accuracy: 0.9048 - val_loss: 0.2929 - val_accuracy: 0.8813
```

[19]:
```
<keras.callbacks.History at 0x1ee98c07250>
```

Testing our Model

[20]:
```
x_test[10]
```

[20]:
```
array([   1, 1581,   34, 7908, 5082,   23,    6, 1374, 1120,    7,  107,
        349,    2, 1496,   11, 5116,   18,  397, 3767,    7,    4,  107,
         84, 6763,   56,   68,  456, 1402,    2,   39,    4, 1374,    9,
         35,  204,    5,   55, 4412,  212,  193,   23,    4,  326,   45,
          6, 1109,    8, 1738,    2,   15,   29,  199, 1040,    5, 2684,
         11,   14, 1403,  212, 1528,   10,   10, 2160,    2,    9,    4,
        452,   37,    2,    4,  598,  425,    5,   45, 4394,  138,   59,
        214,  467,    4, 2391,    7, 1738,    2,   19,   41, 2455, 3028,
          5, 6866, 1489,   90,  180,   18,  101, 1403,    2, 1514, 5257,
          9,    4,  564,  871,  322,   47, 2586,   27,  274,  326,    5,
          9,  150,  112,    2,   17,    6,   87,  162, 2133,   60, 3256,
         23,    4, 7999,  123,    8,   11,    2,   29,  144,   30, 2961,
       1346,    2,  214,    4,  326,    7,    2, 1496,    8, 3767,  533,
          7,  134,    2, 6229,   10,   10,    7,  265,  285,    5,  233,
         70,  593,   54,  564, 4124,    2, 1625,   27, 1546,    2,   19,
```

```
   2, 1008,   18,   89,    4,  114, 3209,    5,   45, 1139,   32,
   4,   96,  143, 3760,  958,    7,  919,    5, 7611,  367,    4,
  96,   17,   73,   17,    6,   52,  855,    7,  836,   10,   10,
  18,    2,    7,  328,  212,   14,   31,    9, 5523,    8,  591,
   1,    1,    1,    1,    1,    1,    1,    1,    1,    1,    1,
   1,    1,    1,    1,    1,    1,    1,    1,    1,    1,    1,
   1,    1,    1,    1,    1,    1,    1,    1,    1,    1,    1,
   1,    1,    1,    1,    1,    1,    1,    1,    1,    1,    1,
   1,    1,    1])
```

[21]:
```
y_test[10]
```

[21]: 1

[22]:
```
import numpy as np
predicted_value=model.predict(np.expand_dims(x_test[10], 0))
print(predicted_value)
if predicted_value>0.5:
  final_value=1
else:
  final_value=0
print(final_value)
print(class_names[final_value])
```

```
1/1 [==============================] - 0s 131ms/step
[[0.8235816]]
1
Positive
```

Evaluating our Model

[23]:
```
loss, accuracy = model.evaluate(x_test, y_test)
print("Loss :",loss)
print("Accuracy (Test Data) :",accuracy*100)
```

```
782/782 [==============================] - 2s 2ms/step - loss: 0.2929 -
accuracy: 0.8813
Loss : 0.29292917251586914
Accuracy (Test Data) : 88.128000497818
```