C1_W3_Lab_1_lambda-layer

February 3, 2025

0.1 Ungraded Lab: Lambda Layer

This lab will show how you can define custom layers with the Lambda layer. You can either use lambda functions within the Lambda layer or define a custom function that the Lambda layer will call. Let's get started!

0.2 Imports

[1]:
```
try:
  # %tensorflow_version only exists in Colab.
  %tensorflow_version 2.x
except Exception:
  pass

import tensorflow as tf
from tensorflow.keras import backend as K
```

0.3 Prepare the Dataset

[2]:
```
mnist = tf.keras.datasets.mnist

(x_train, y_train),(x_test, y_test) = mnist.load_data()
x_train, x_test = x_train / 255.0, x_test / 255.0
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-
datasets/mnist.npz
11493376/11490434 [==============================] - 0s 0us/step
```

0.4 Build the Model

Here, we'll use a Lambda layer to define a custom layer in our network. We're using a lambda function to get the absolute value of the layer input.

[3]:
```
model = tf.keras.models.Sequential([
  tf.keras.layers.Flatten(input_shape=(28, 28)),
```

```
  tf.keras.layers.Dense(128),
  tf.keras.layers.Lambda(lambda x: tf.abs(x)),
  tf.keras.layers.Dense(10, activation='softmax')
])
```

[4]:
```
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

model.fit(x_train, y_train, epochs=5)
model.evaluate(x_test, y_test)
```

```
Train on 60000 samples
Epoch 1/5
60000/60000 [==============================] - 5s 87us/sample - loss: 0.2226 -
accuracy: 0.9367
Epoch 2/5
60000/60000 [==============================] - 5s 80us/sample - loss: 0.0941 -
accuracy: 0.9724
Epoch 3/5
60000/60000 [==============================] - 5s 76us/sample - loss: 0.0655 -
accuracy: 0.9800
Epoch 4/5
60000/60000 [==============================] - 5s 75us/sample - loss: 0.0498 -
accuracy: 0.9842
Epoch 5/5
60000/60000 [==============================] - 5s 76us/sample - loss: 0.0391 -
accuracy: 0.9872
10000/10000 [==============================] - 0s 41us/sample - loss: 0.0913 -
accuracy: 0.9753
```

[4]:
```
[0.09127738068415783, 0.9753]
```

Another way to use the Lambda layer is to pass in a function defined outside the model. The code below shows how a custom ReLU function is used as a custom layer in the model.

[5]:
```
def my_relu(x):
    return K.maximum(-0.1, x)

model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(input_shape=(28, 28)),
    tf.keras.layers.Dense(128),
    tf.keras.layers.Lambda(my_relu),
    tf.keras.layers.Dense(10, activation='softmax')
])

model.compile(optimizer='adam',
```

```
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

model.fit(x_train, y_train, epochs=5)
model.evaluate(x_test, y_test)
```

```
Train on 60000 samples
Epoch 1/5
60000/60000 [==============================] - 5s 84us/sample - loss: 0.2601 -
accuracy: 0.9258
Epoch 2/5
60000/60000 [==============================] - 4s 74us/sample - loss: 0.1113 -
accuracy: 0.9677
Epoch 3/5
60000/60000 [==============================] - 4s 73us/sample - loss: 0.0775 -
accuracy: 0.9766
Epoch 4/5
60000/60000 [==============================] - 4s 73us/sample - loss: 0.0567 -
accuracy: 0.9832
Epoch 5/5
60000/60000 [==============================] - 4s 72us/sample - loss: 0.0450 -
accuracy: 0.9863
10000/10000 [==============================] - 0s 32us/sample - loss: 0.0693 -
accuracy: 0.9787
```

[5]: [0.0692768937622197, 0.9787]

[ ]: