C1_W3_Lab_1_lambda-layer

December 23, 2020

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 79us/sample - loss: 0.2255 -
accuracy: 0.9366
Epoch 2/5
60000/60000 [==============================] - 4s 75us/sample - loss: 0.0910 -
accuracy: 0.9730
Epoch 3/5
60000/60000 [==============================] - 4s 75us/sample - loss: 0.0629 -
accuracy: 0.9805
Epoch 4/5
60000/60000 [==============================] - 4s 74us/sample - loss: 0.0480 -
accuracy: 0.9851
Epoch 5/5
60000/60000 [==============================] - 4s 75us/sample - loss: 0.0370 -
accuracy: 0.9880
10000/10000 [==============================] - 0s 38us/sample - loss: 0.0815 -
accuracy: 0.9765
```

[4]:
```
[0.08145424895579927, 0.9765]
```

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.

[ ]:
```
import numpy as np
def my_relu(x):
    return K.maximum(0.3, x**2)

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 77us/sample - loss: 0.2448 -
accuracy: 0.9334
Epoch 2/5
19776/60000 [========>…] - ETA: 3s - loss: 0.1004 -
accuracy: 0.9726
```

[ ]: