

C1_W3_Lab_3_custom-layer-activation

December 9, 2020

1 Ungraded Lab: Activation in Custom Layers

In this lab, we extend our knowledge of building custom layers by adding an activation parameter. The implementation is pretty straightforward as you'll see below.

1.1 Imports

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

    import tensorflow as tf
    from tensorflow.keras.layers import Layer
```

1.2 Adding an activation layer

To use the built-in activations in Keras, we can specify an `activation` parameter in the `__init__()` method of our custom layer class. From there, we can initialize it by using the `tf.keras.activations.get()` method. This takes in a string identifier that corresponds to one of the [available activations](#) in Keras. Next, you can now pass in the forward computation to this activation in the `call()` method.

```
[2]: class SimpleDense(Layer):

      # add an activation parameter
      def __init__(self, units=32, activation=None):
          super(SimpleDense, self).__init__()
          self.units = units

          # define the activation to get from the built-in activation layers in
          ↪ Keras
          self.activation = tf.keras.activations.get(activation)
```

```

def build(self, input_shape):
    w_init = tf.random_normal_initializer()
    self.w = tf.Variable(name="kernel",
        initial_value=w_init(shape=(input_shape[-1], self.units),
            dtype='float32'),
            trainable=True)
    b_init = tf.zeros_initializer()
    self.b = tf.Variable(name="bias",
        initial_value=b_init(shape=(self.units,), dtype='float32'),
            trainable=True)
    super().build(input_shape)

def call(self, inputs):
    # pass the computation to the activation layer
    return self.activation(tf.matmul(inputs, self.w) + self.b)

```

We can now pass in an activation parameter to our custom layer. The string identifier is mostly the same as the function name so 'relu' below will get `tf.keras.activations.relu`.

```

[3]: 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

model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(input_shape=(28, 28)),
    SimpleDense(128, activation='relu'),
    tf.keras.layers.Dropout(0.2),
    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)

```

```

Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-
datasets/mnist.npz
11493376/11490434 [=====] - 0s 0us/step
Train on 60000 samples
Epoch 1/5
60000/60000 [=====] - 5s 75us/sample - loss: 0.2986 -
accuracy: 0.9128

```

Epoch 2/5
60000/60000 [=====] - 4s 70us/sample - loss: 0.1454 -
accuracy: 0.9567
Epoch 3/5
60000/60000 [=====] - 4s 70us/sample - loss: 0.1096 -
accuracy: 0.9664
Epoch 4/5
60000/60000 [=====] - 4s 70us/sample - loss: 0.0875 -
accuracy: 0.9725
Epoch 5/5
60000/60000 [=====] - 4s 69us/sample - loss: 0.0763 -
accuracy: 0.9761
10000/10000 [=====] - 0s 26us/sample - loss: 0.0703 -
accuracy: 0.9771

[3]: [0.07034913657852448, 0.9771]