

C1_W2_Lab_1_huber-loss

December 6, 2020

1 Ungraded Lab: Huber Loss

In this lab, we'll walk through how to create custom loss functions. In particular, we'll code the [Huber Loss](#) and use that in training the model.

1.1 Imports

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

    import tensorflow as tf
    import numpy as np
    from tensorflow import keras
```

1.2 Prepare the Data

Our dummy dataset is just a pair of arrays `xs` and `ys` defined by the relationship $y = 2x - 1$. `xs` are the inputs while `ys` are the labels.

```
[2]: # inputs
xs = np.array([-1.0, 0.0, 1.0, 2.0, 3.0, 4.0], dtype=float)

# labels
ys = np.array([-3.0, -1.0, 1.0, 3.0, 5.0, 7.0], dtype=float)
```

1.3 Training the model

Let's build a simple model and train using a built-in loss function like the `mean_squared_error`.

```
[3]: model = tf.keras.Sequential([keras.layers.Dense(units=1, input_shape=[1])])
model.compile(optimizer='sgd', loss='mean_squared_error')
model.fit(xs, ys, epochs=500, verbose=0)
```

```
print(model.predict([10.0]))
```

```
[[18.986788]]
```

1.3.1 Custom Loss

Now let's see how we can use a custom loss. We first define a function that accepts the ground truth labels (`y_true`) and model predictions (`y_pred`) as parameters. We then compute and return the loss value in the function definition.

```
[4]: def my_huber_loss(y_true, y_pred):  
    threshold = 1  
    error = y_true - y_pred  
    is_small_error = tf.abs(error) <= threshold  
    small_error_loss = tf.square(error) / 2  
    big_error_loss = threshold * (tf.abs(error) - (0.5 * threshold))  
    return tf.where(is_small_error, small_error_loss, big_error_loss)
```

Using the loss function is as simple as specifying the loss function in the `loss` argument of `model.compile()`.

```
[5]: model = tf.keras.Sequential([keras.layers.Dense(units=1, input_shape=[1])])  
model.compile(optimizer='sgd', loss=my_huber_loss)  
model.fit(xs, ys, epochs=500, verbose=0)  
print(model.predict([10.0]))
```

```
[[18.71449]]
```