Assignment-4

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1 Manually draw a neural network having 3 hidden layers for classifying images of 10 English digits.

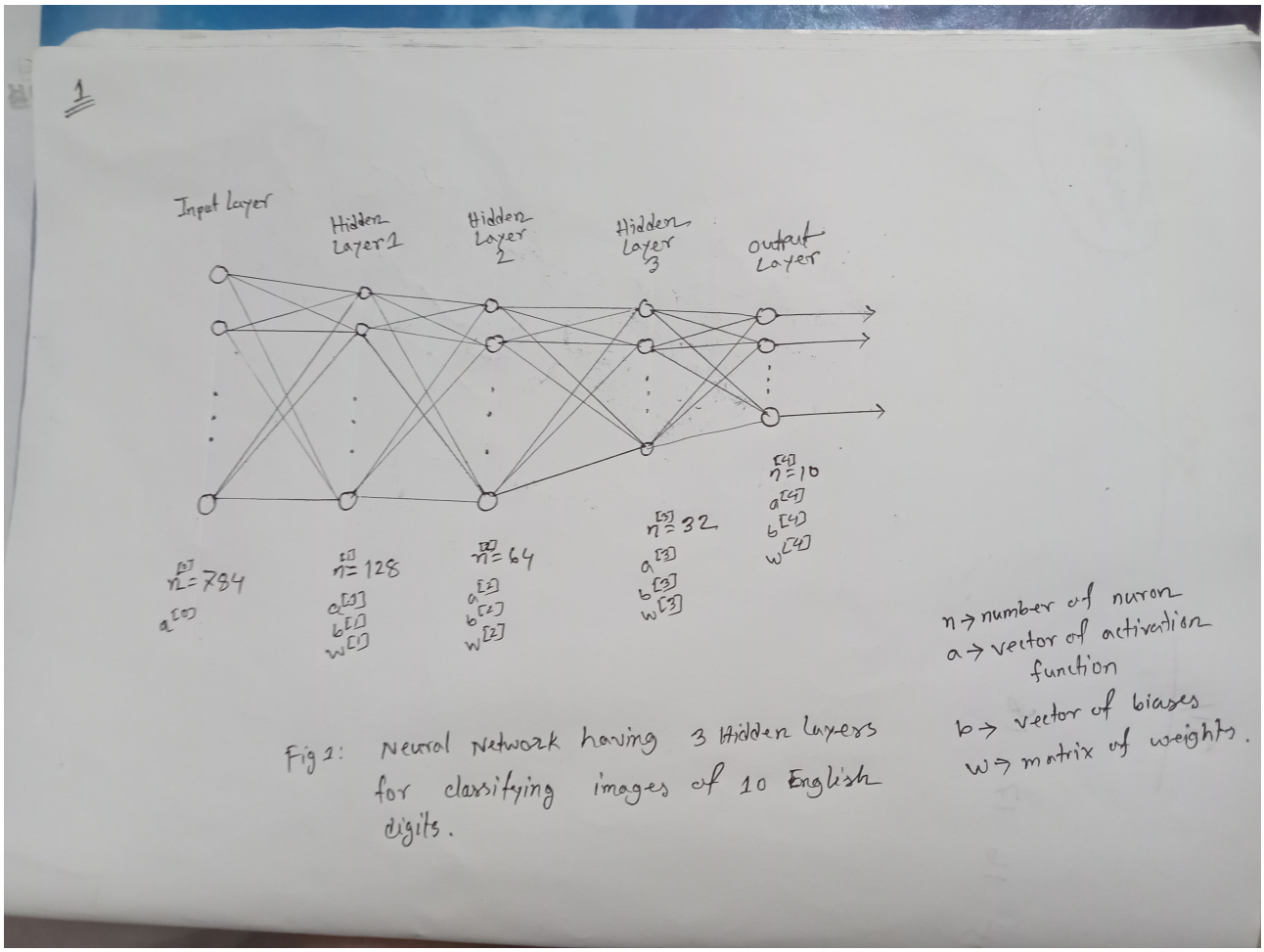

Figure 1: Neural Network having 3 hidden layers for classifying images of 10 English digits.

2 Manually draw Forward Propagation Computation Graph

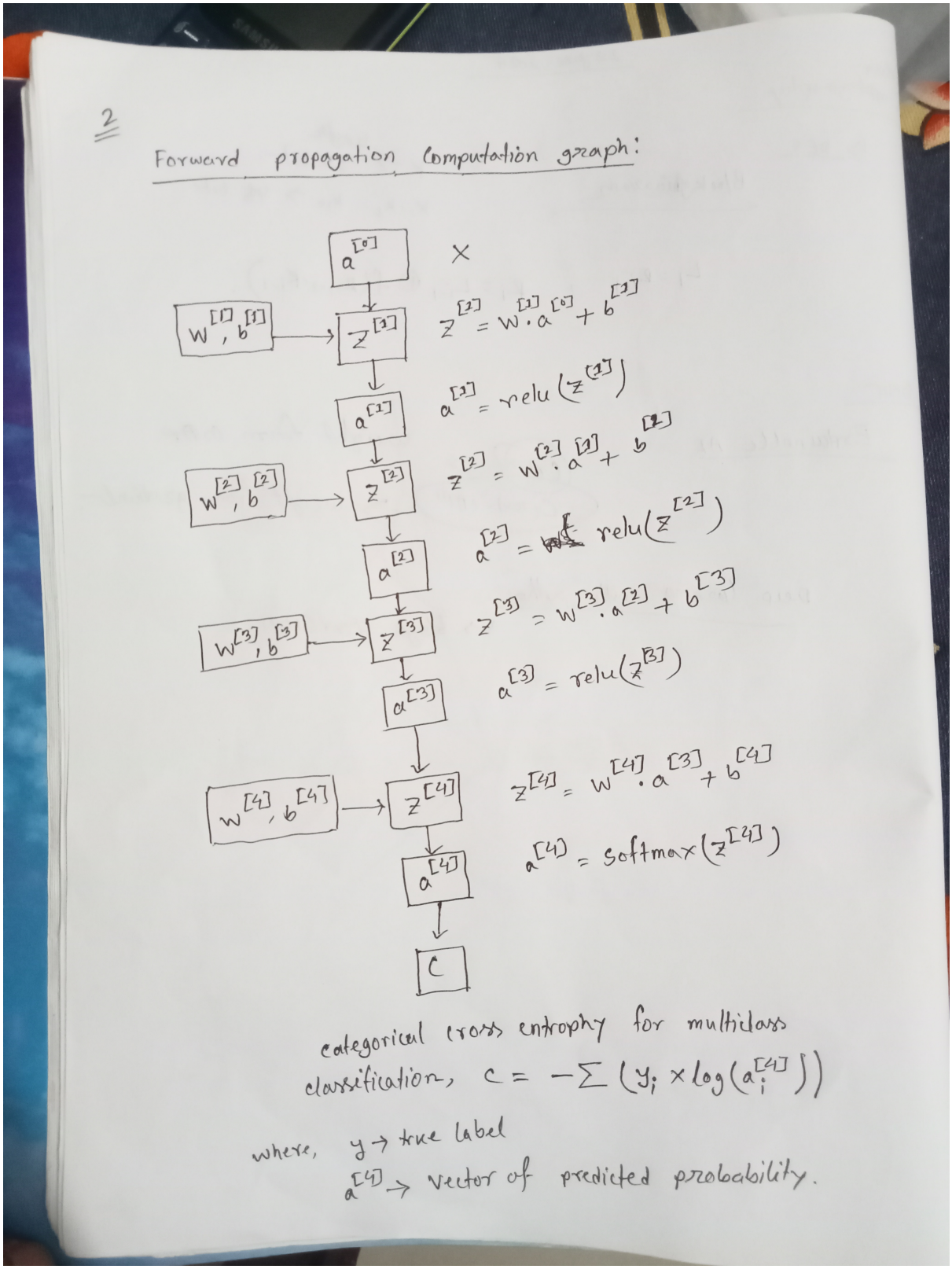

Figure 2: Forward Propagation Computation Graph

3 Manually draw Backpropagation Computation Graph

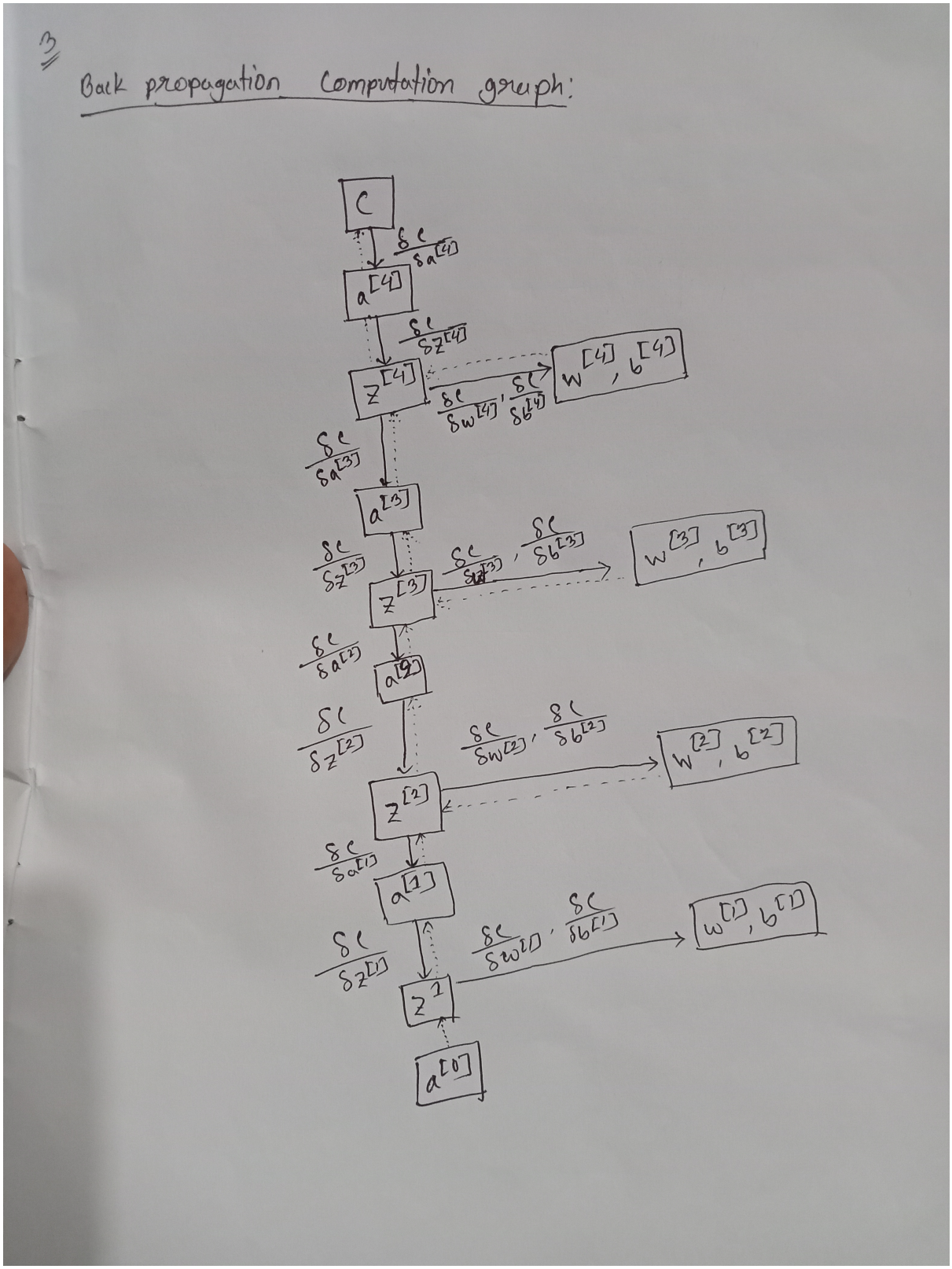

Figure 3: Backpropagation Computation Graph

4 Train model using the MNIST digit dataset with the help of Tensorflow's `tf.GradientTape`

The complete Jupyter Notebook for this implementation can be found here: [Link]

5 Compare the performance of the model trained by tf.GradientTape() with Tensorflow's `model.fit()`

After training for 5 epochs, the final validation accuracy for each method was recorded.

The complete Jupyter Notebook for this implementation can be found here: [Link]

Training Method	**Final Test Accuracy**
`tf.GradientTape` Custom Loop	0.9769
`model.fit()` API	0.9766

Table 1: Final test accuracy after 5 epochs.

As shown in Table 1, the final test accuracy of both models is nearly identical. The minor difference of 0.0003 is negligible and can be attributed to stochastic factors such as the random shuffling of the dataset and the different initial weights of the two distinct model instances. This confirms that both `tf.GradientTape` and `model.fit()` effectively implement the same backpropagation and gradient descent optimization algorithm.