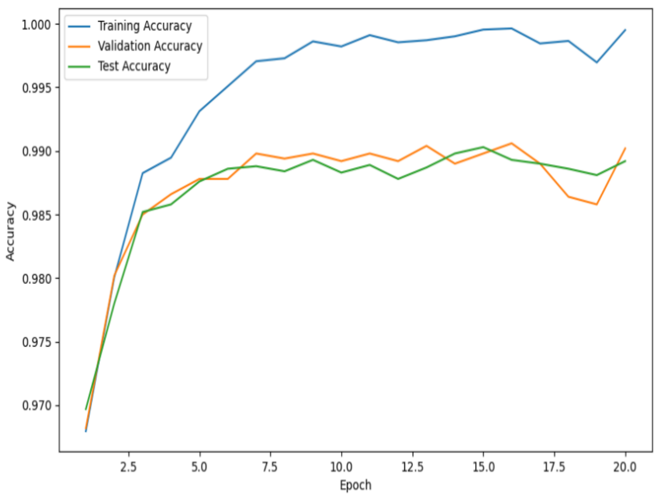
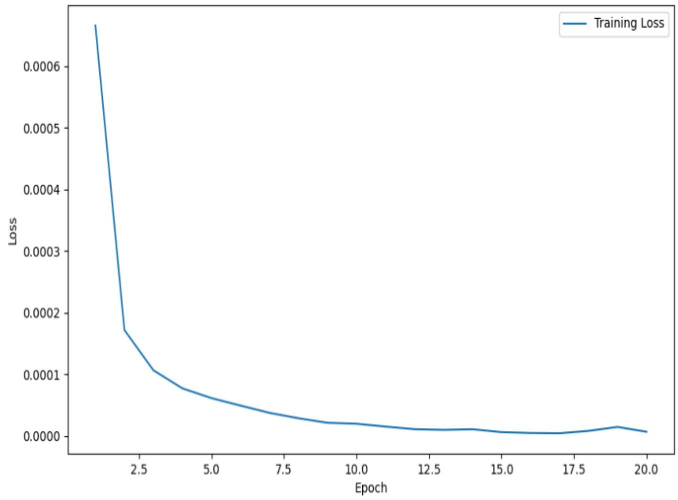
311605012 機器人碩士 楊曜瑋

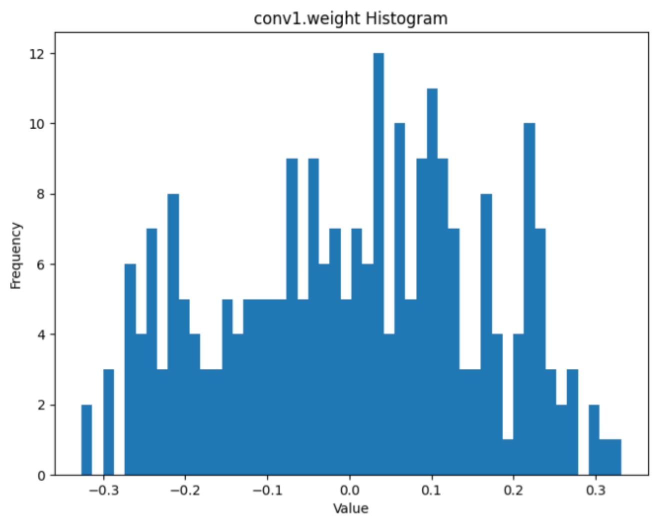
1-1 Mnist

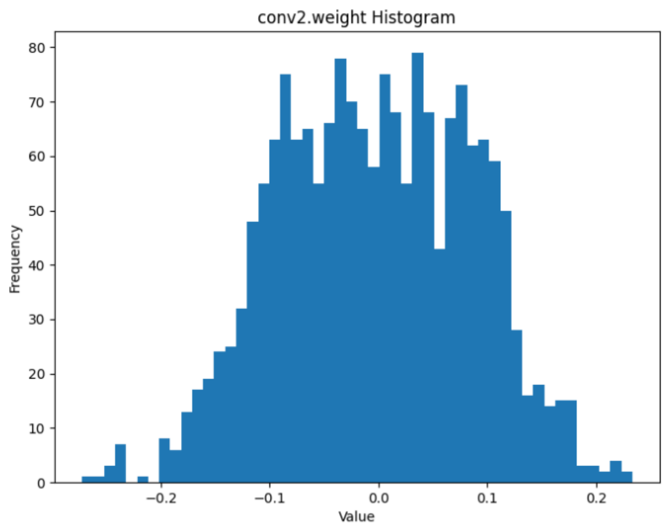
Conv1: stride 1,kernal size 5

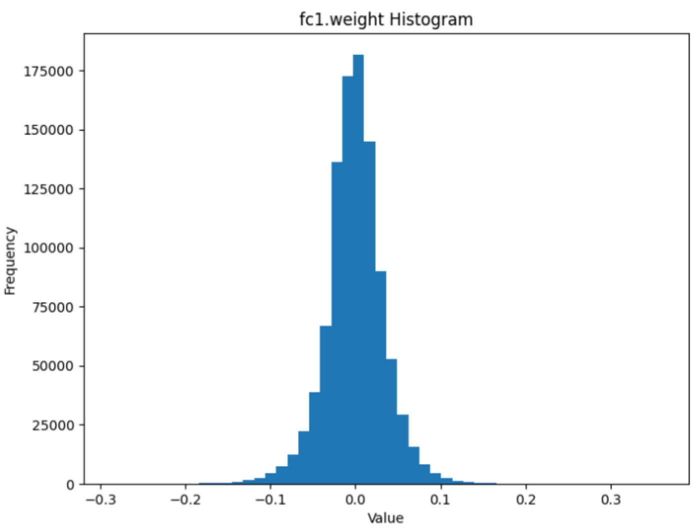
Conv2: stride 1,kernel size 3

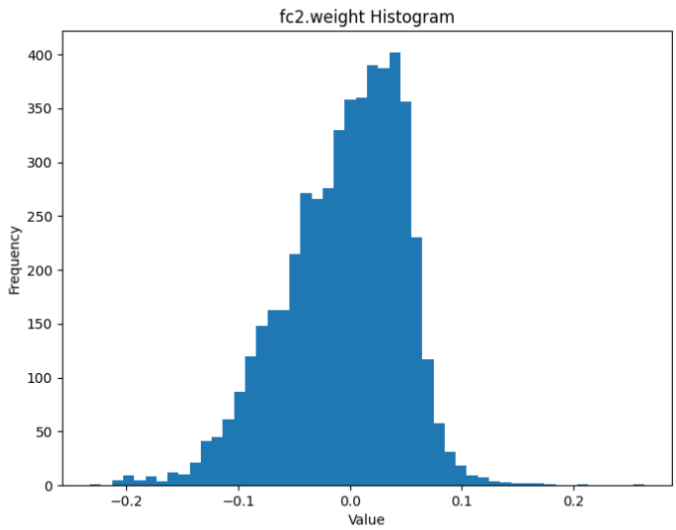






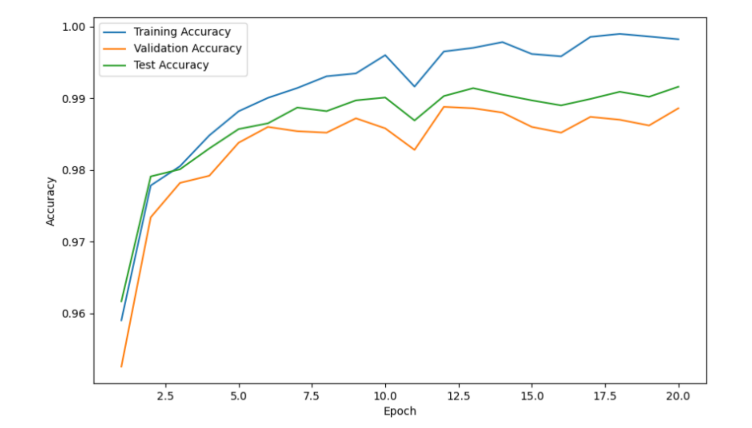


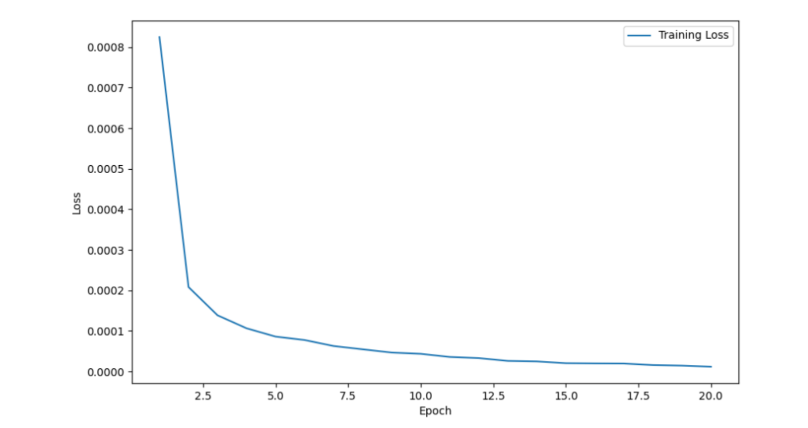


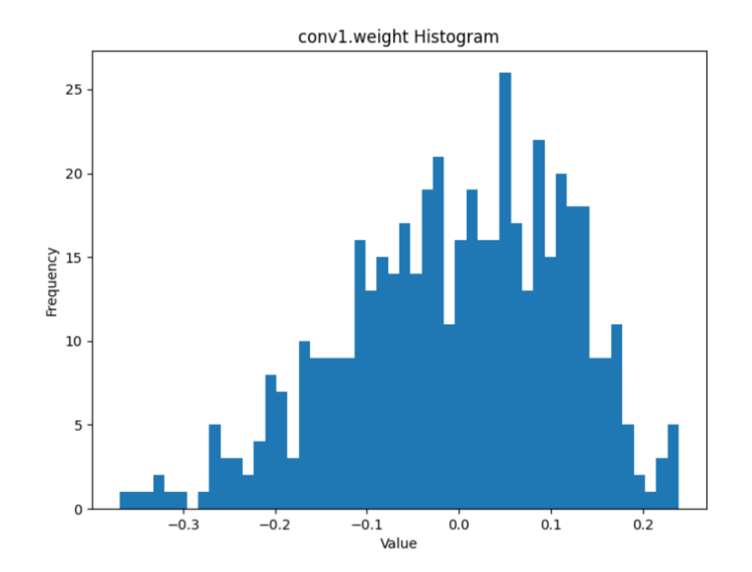


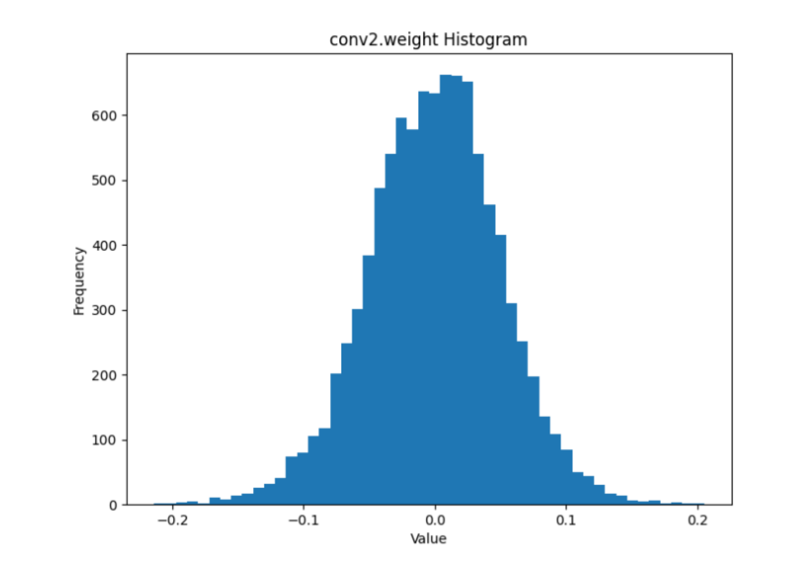
311605012 機器人碩士 楊曜瑋

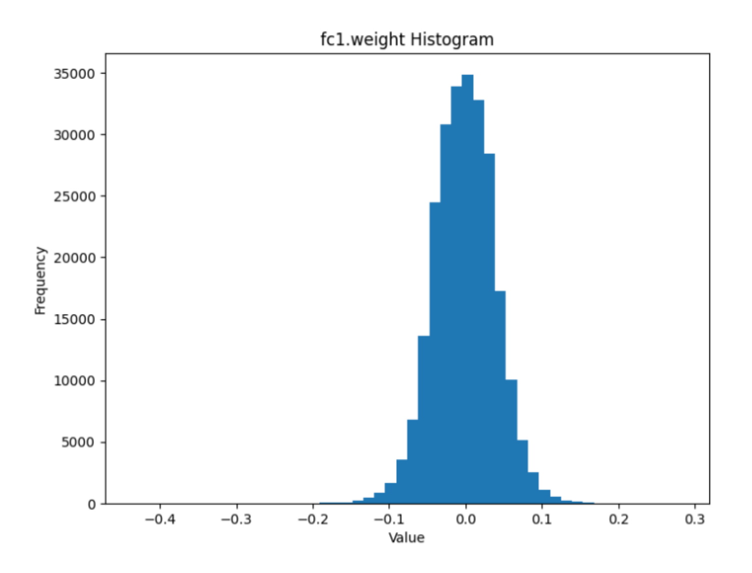
Conv1: stride 1,kernal size 7
Conv2: stride 1,kernel size 7

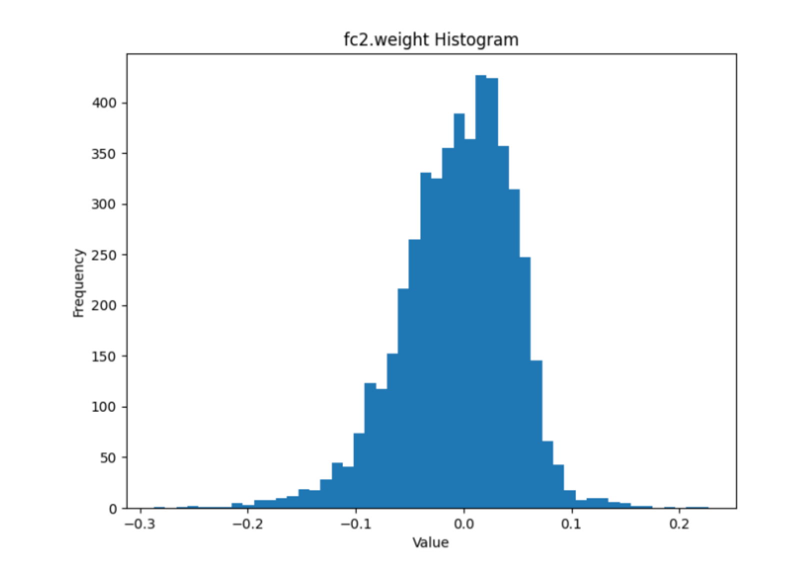






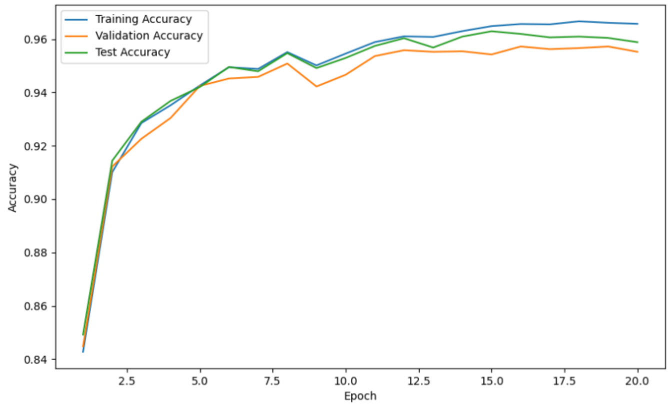


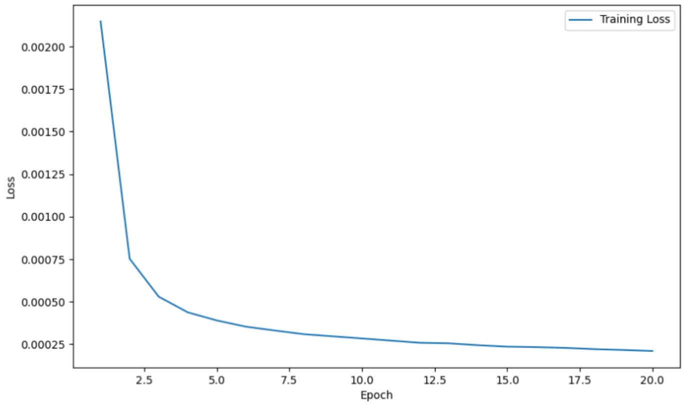


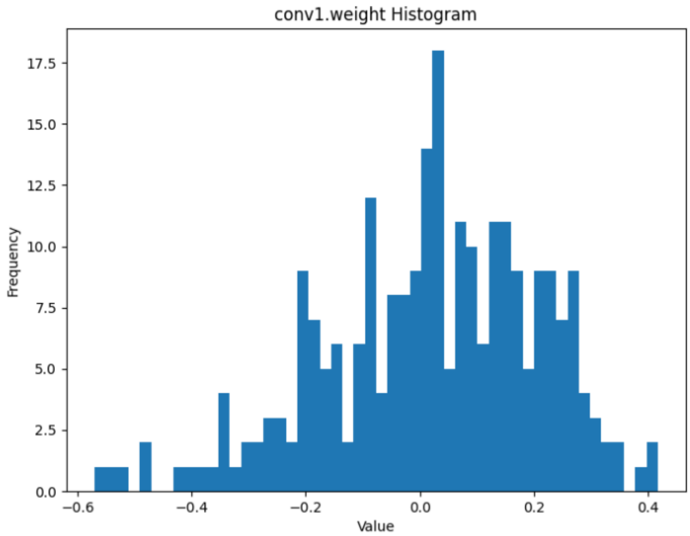


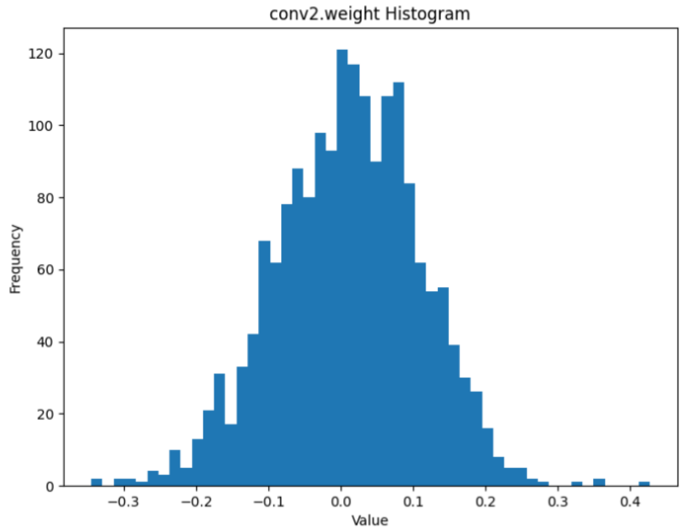
311605012 機器人碩士 楊曜瑋

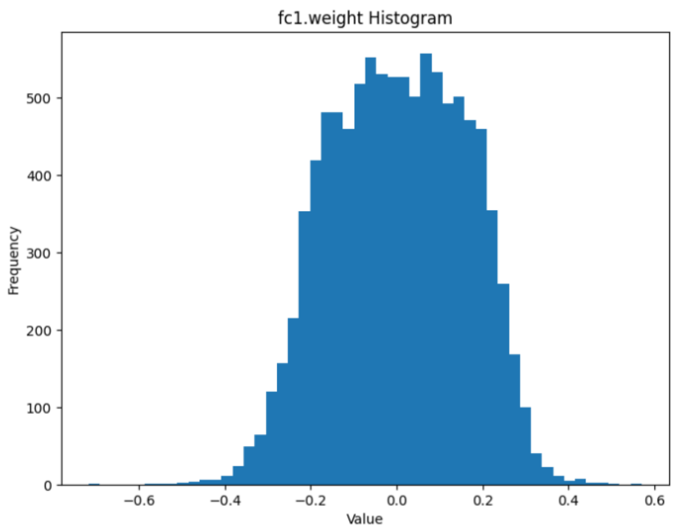
Conv1: stride 3, kernel size 5
Conv2: stride 3, kernel size 3

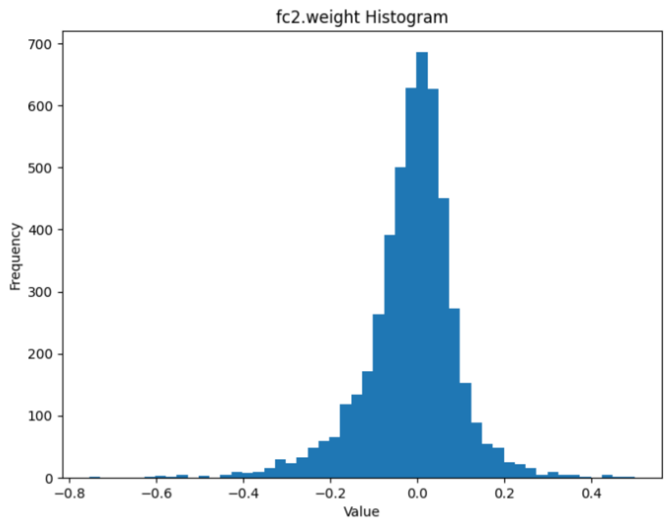












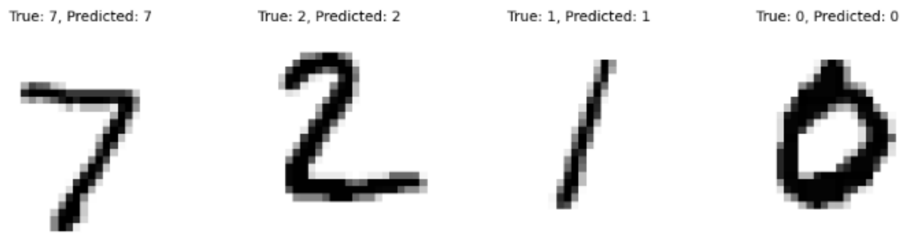
A larger convolutional kernel is advantageous for capturing more extensive features, but it can escalate the model's parameter count, resulting in higher computational complexity. Likewise, a larger stride in convolutional layers may diminish the output size, potentially reducing computational costs, but it could lead to the loss of finer details.

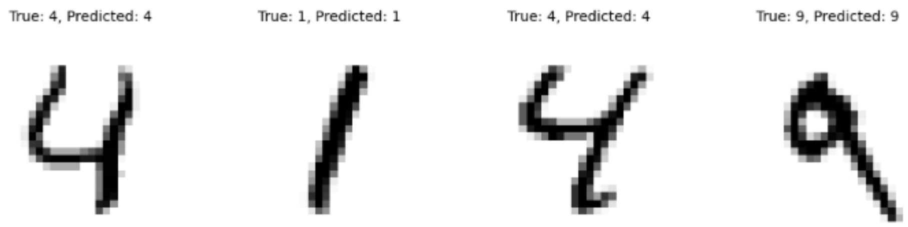
In the experiment, when strides increase from 1 to 3, there is a slight deterioration in accuracy. Conversely, as the kernel size increases from 5 to 7, both the number of parameters and accuracy also show an increase.

1-2

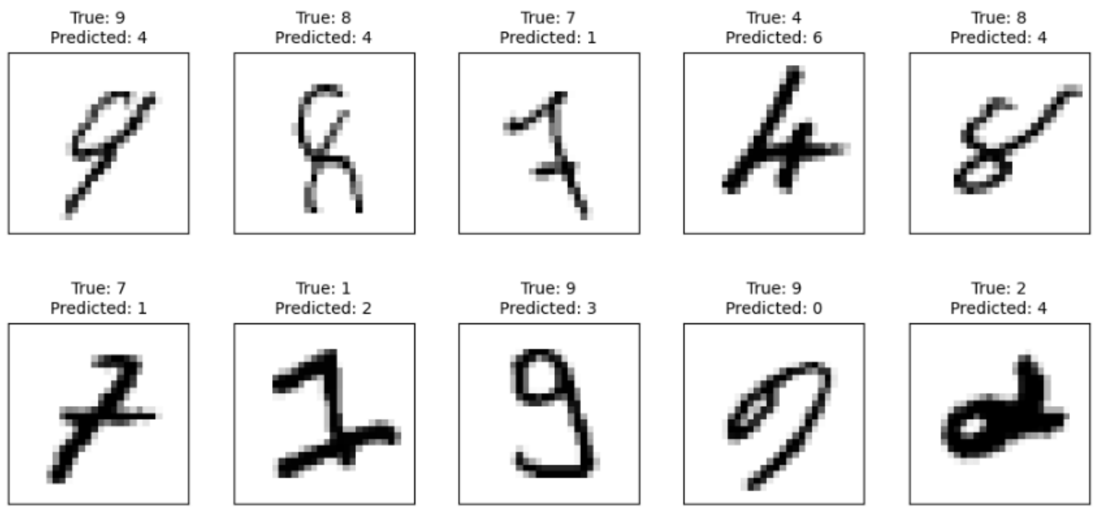
The pictures at the top are clearer than the ones at the bottom, making them easier to classify. However, some images at the bottom can be misleading, such as seven or two, making them more challenging to recognize for both people and models.

Correct:



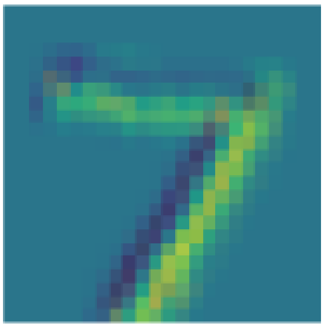
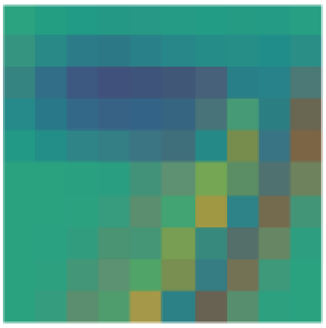


Wrong



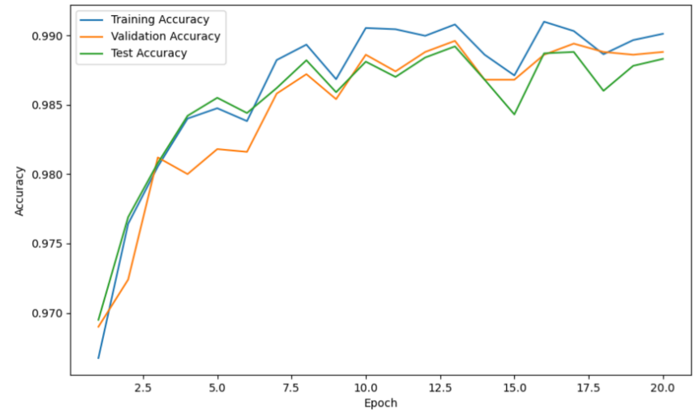
1-3

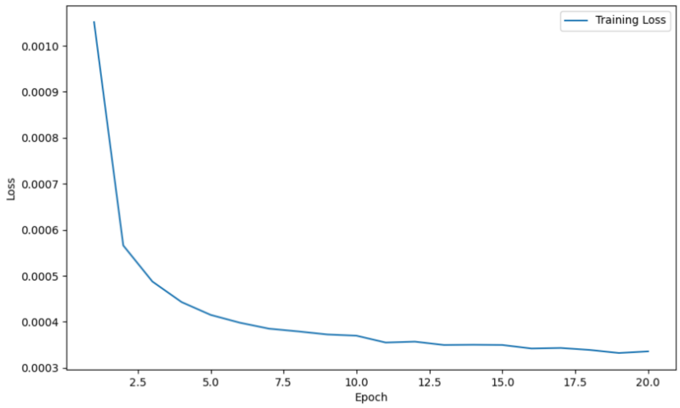
In the two convolutional layers I employed, the first layer is designed to learn the edges or simple patterns present in the data. I opted for a larger kernel size in this layer to capture more detailed content. In the second layer, the model is aimed at learning the content or more complex and abstract features. Consequently, you may observe that the output of the first layer appears clearer, while the output of the second layer appears more blurred.

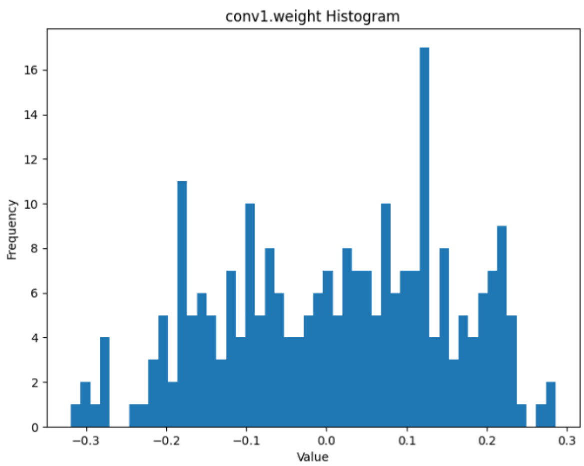



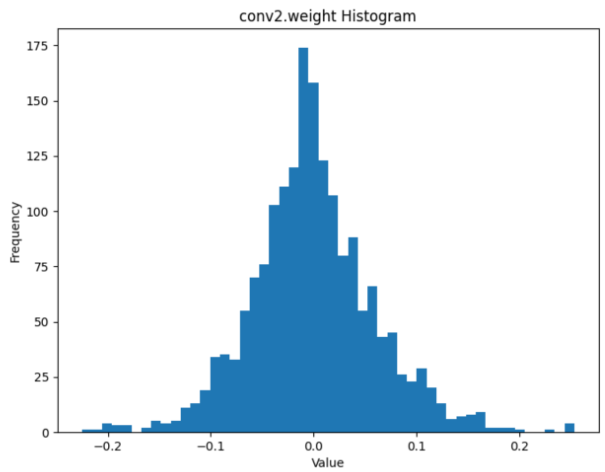
1-4 L2

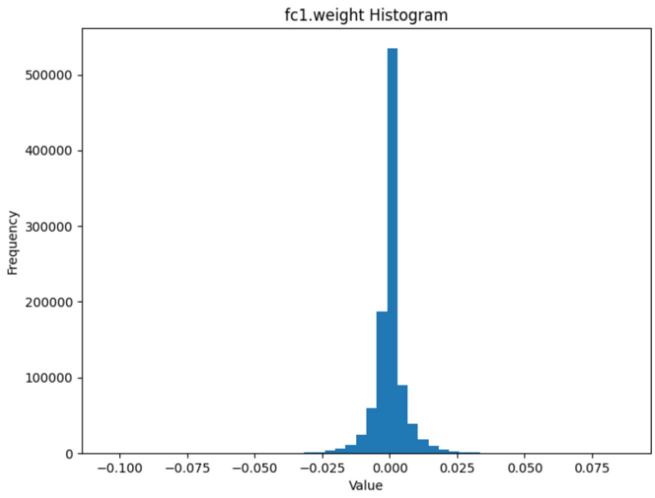
L2 regularization introduces a penalty term based on the squared magnitudes of the weights into the loss function, discouraging excessively large weights and promoting a more restrained weight distribution. In histogram pictures, the weight distribution is more centralized, contributing to increased predictive accuracy. This centralization in the histograms serves as an indicator of the effective impact of L2 regularization.

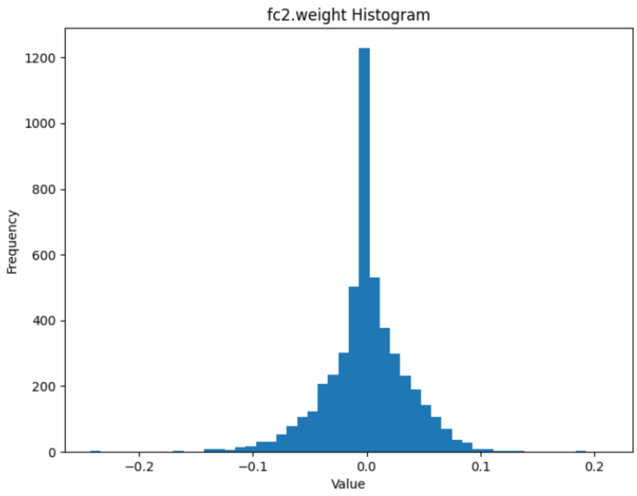






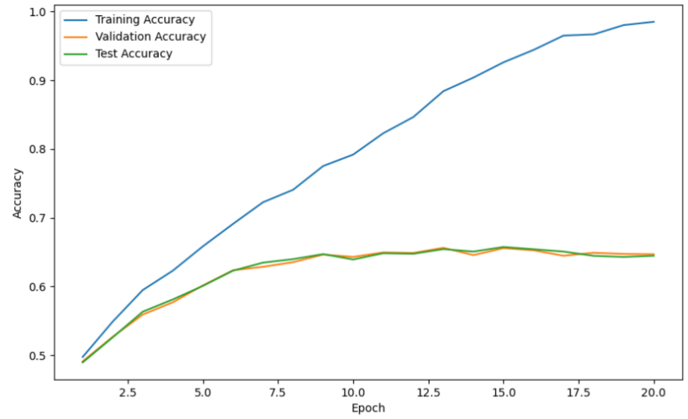


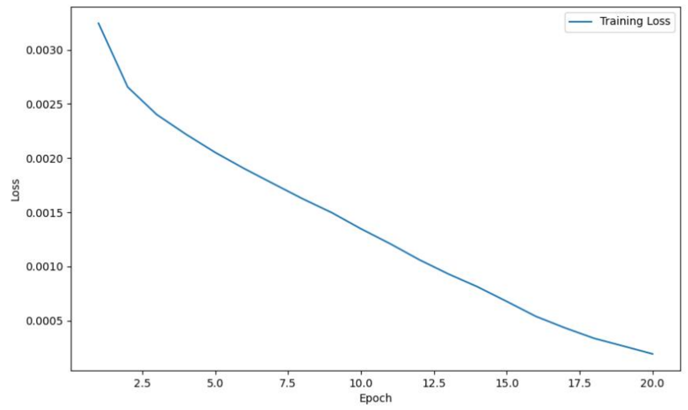


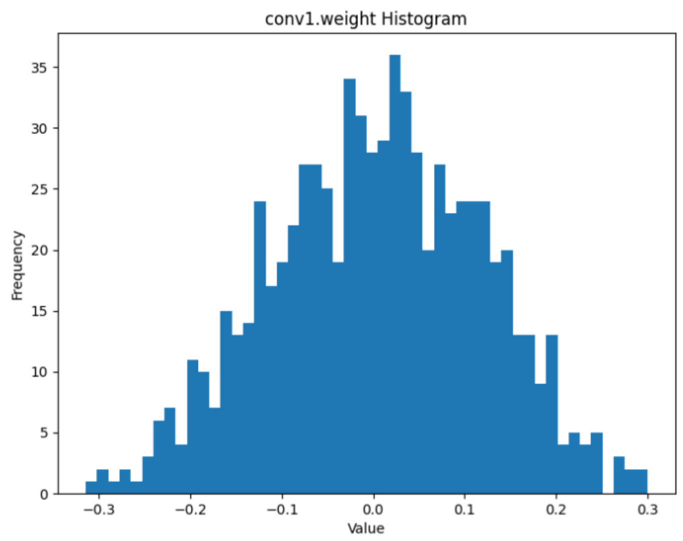


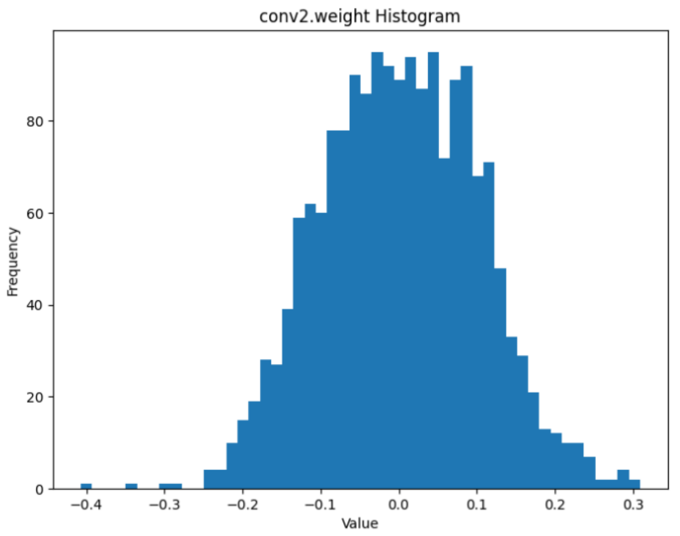
311605012 機器人碩士 楊曜瑋

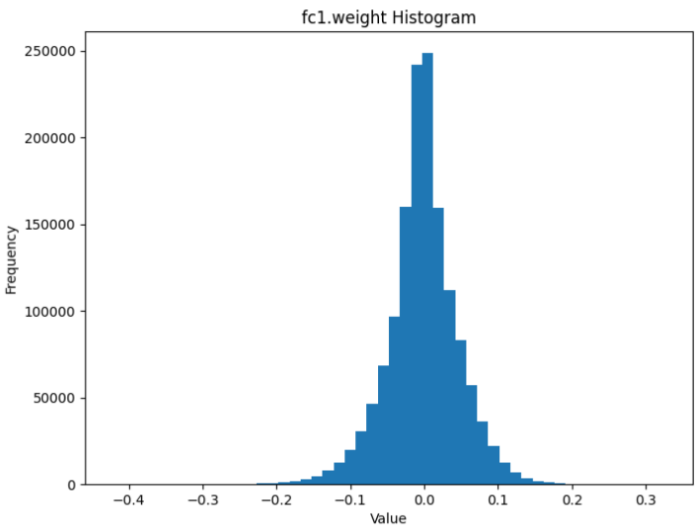
2-1 Cifar
Conv1: stride 1,kernal size 5
Conv2: stride 1,kernel size 3

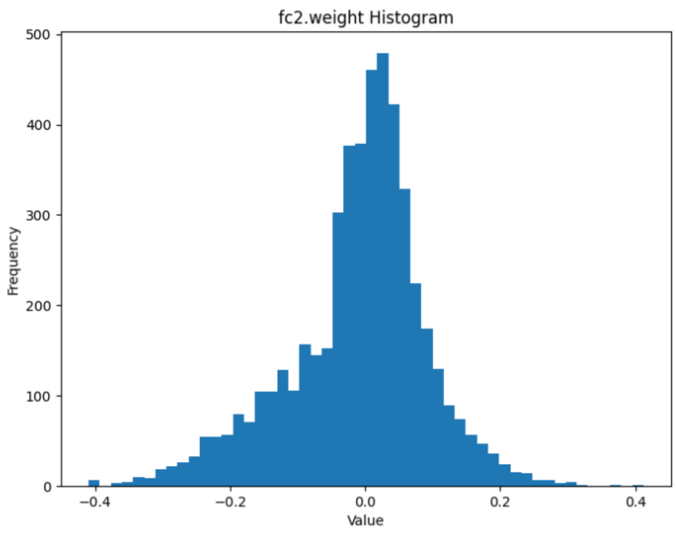






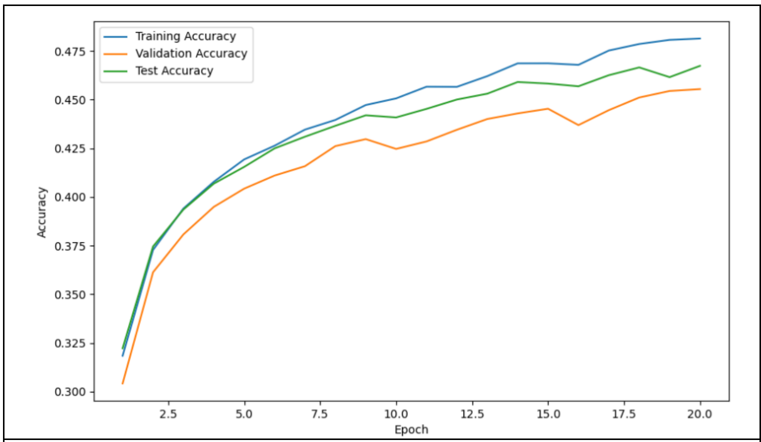


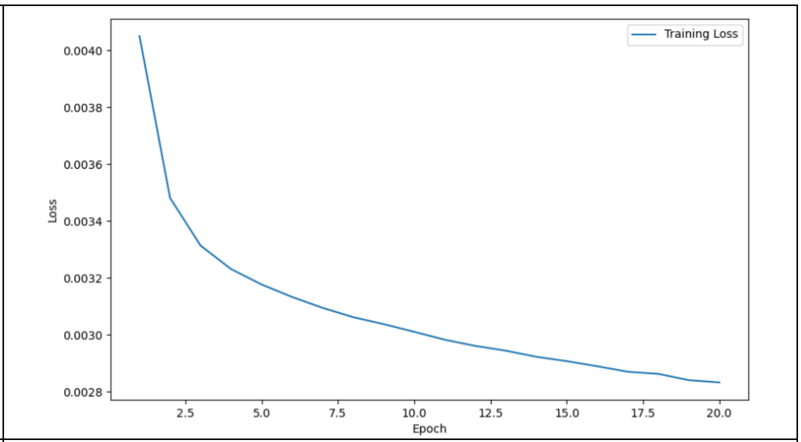


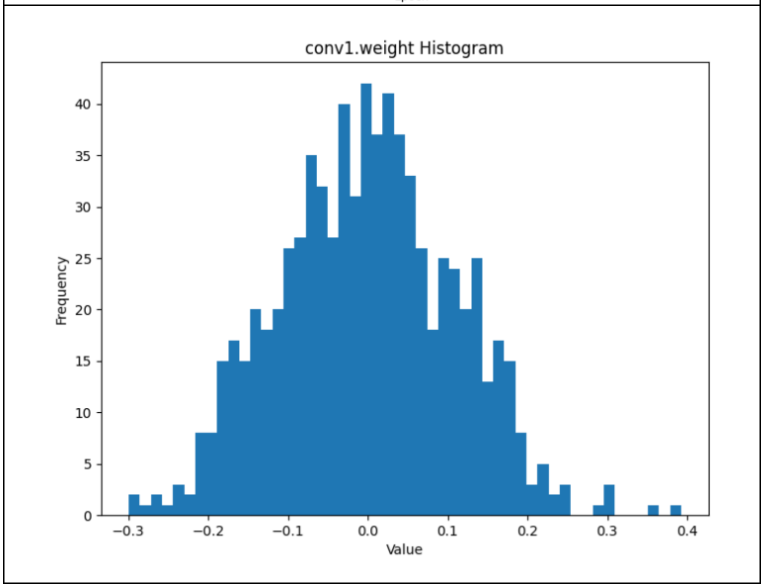


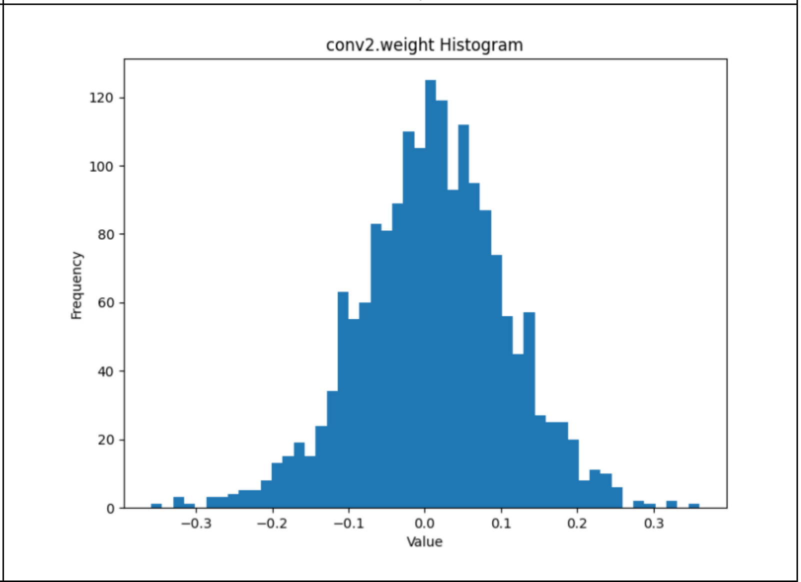
311605012 機器人碩士 楊曜瑋

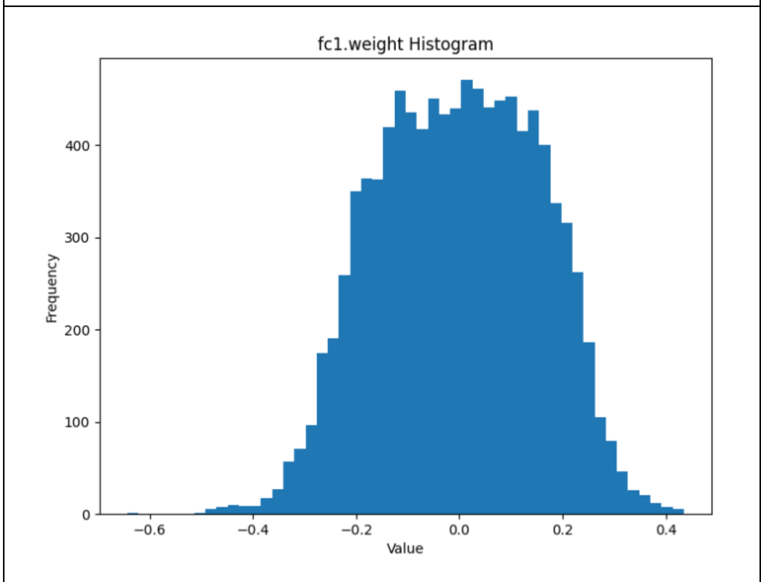
Conv1: stride 3,kernal size 5
Conv2: stride 3,kernel size 3

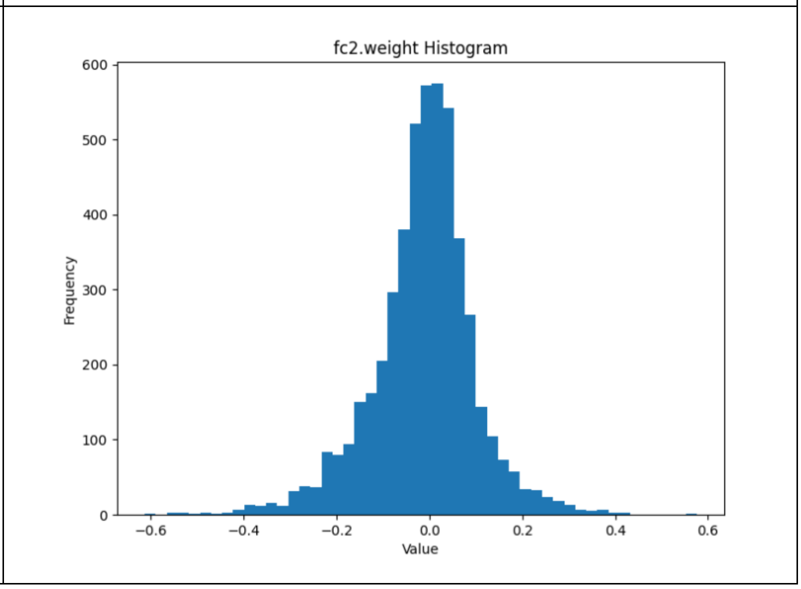






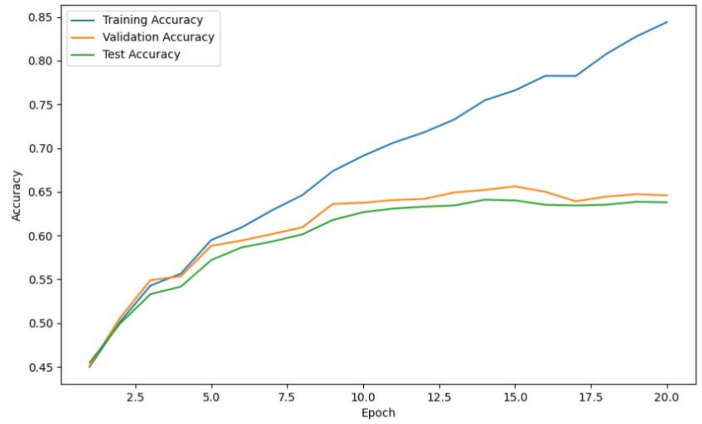


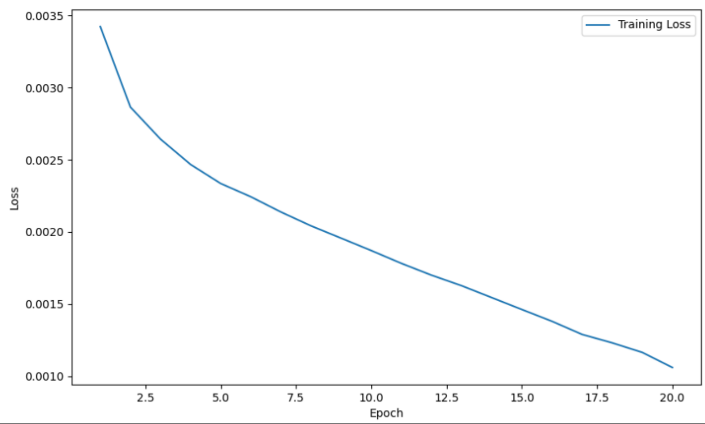


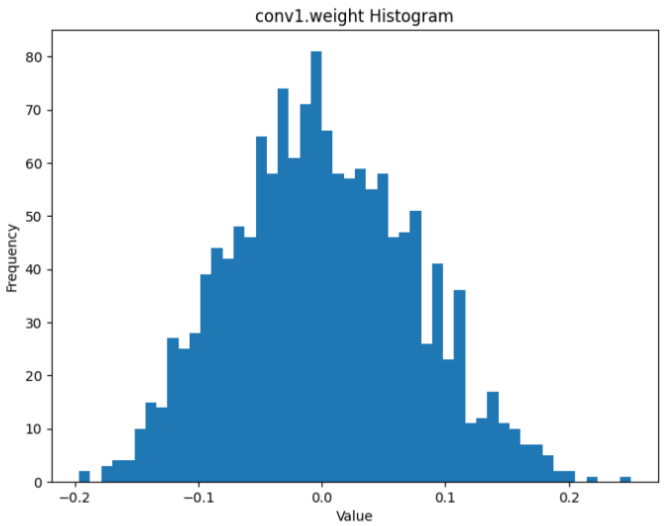


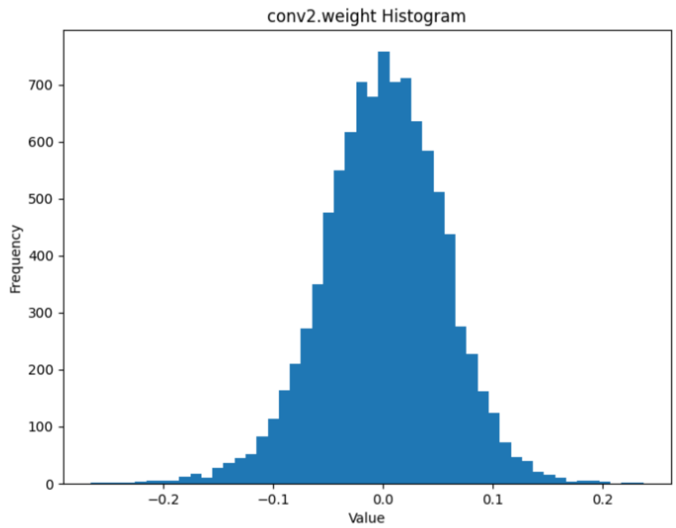
311605012 機器人碩士 楊曜瑋

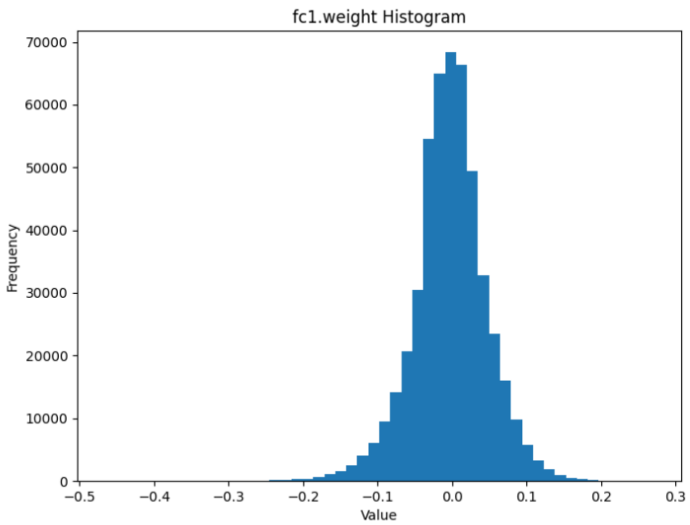
Conv1: stride 1,kernal size 7
Conv2: stride 1,kernel size 7

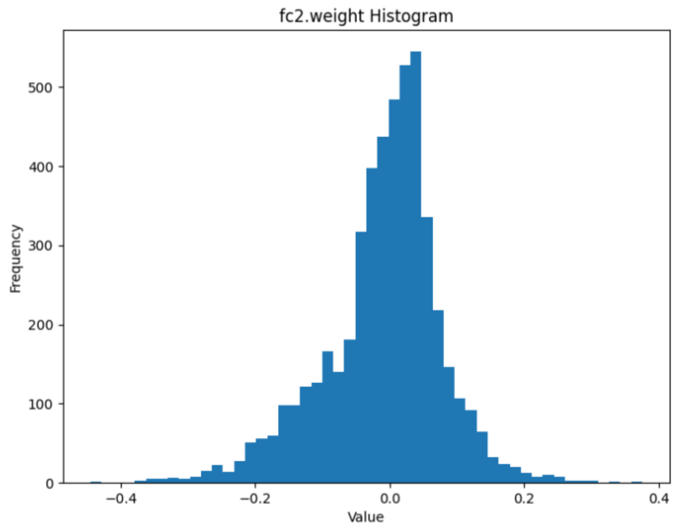












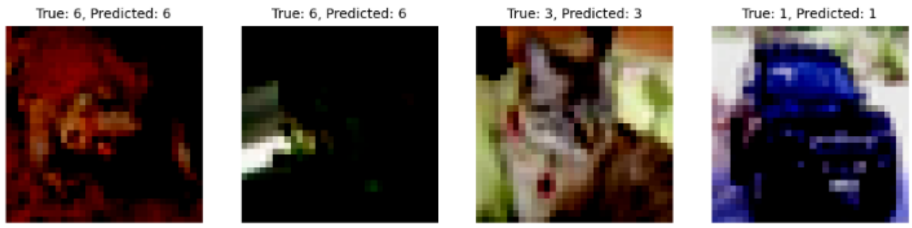
I used the same parameters as MNIST in the experiment. When the stride increases from 1 to 3, there is a significant drop in accuracy. As for the increase in kernel size, the training accuracy experiences a considerable decrease, while other metrics show only minor differences compared to the previous settings. However, it's important to note that the total number of parameters increases in this scenario.

2-2

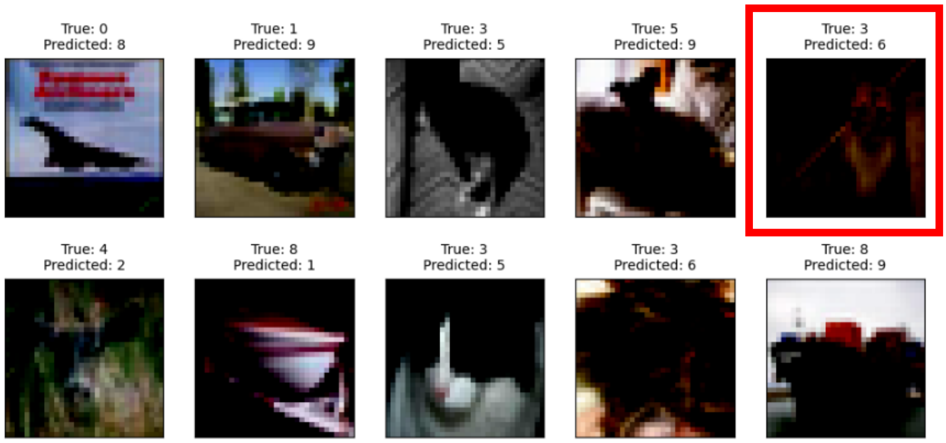
airplane	automobile	bird	cat	deer	dog	frog	horse	ship	truck
0	1	2	3	4	5	6	7	8	9

The correct pictures are clearer and brighter, making them easier to classify. However, some of the incorrect pictures are quite dark, posing a challenge for the model to recognize. For instance, the one in the red corner is particularly difficult to discern; even when I look at it, I'm unsure of what it represents.

Correct:

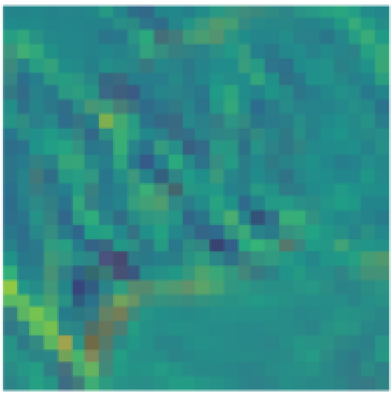


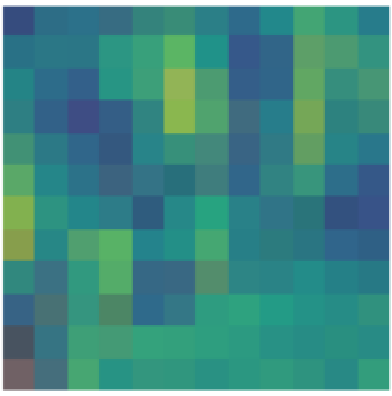
Wrong:



2-3

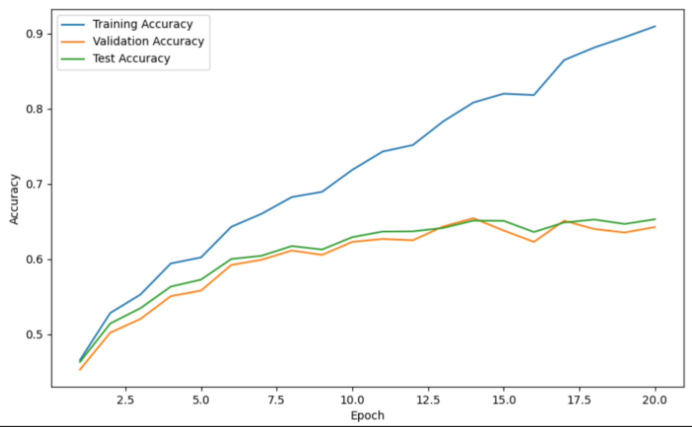
I incorporated two convolutional layers into my model. The initial layer is tailored to identify edges within the data, utilizing a larger kernel size to capture intricate details. On the other hand, the second layer is designed to comprehend more abstract features. The outcome aligns with the results of the MNIST experiment, where you may observe that the output from the first layer appears sharper, while the output from the second layer presents a more blurred representation.

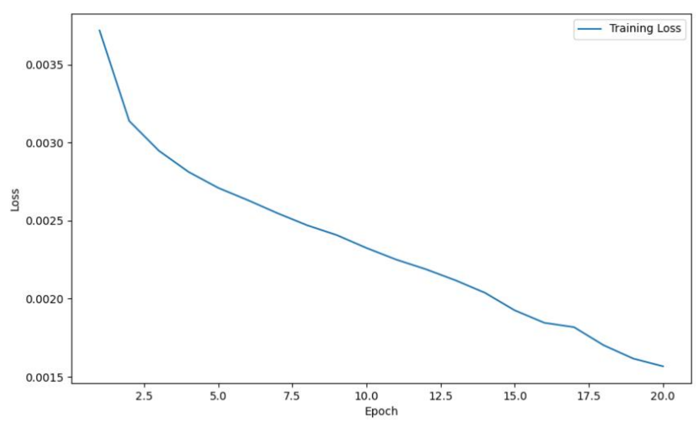


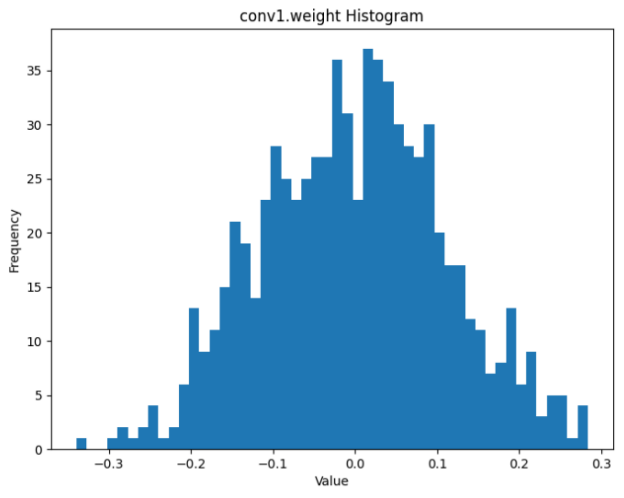


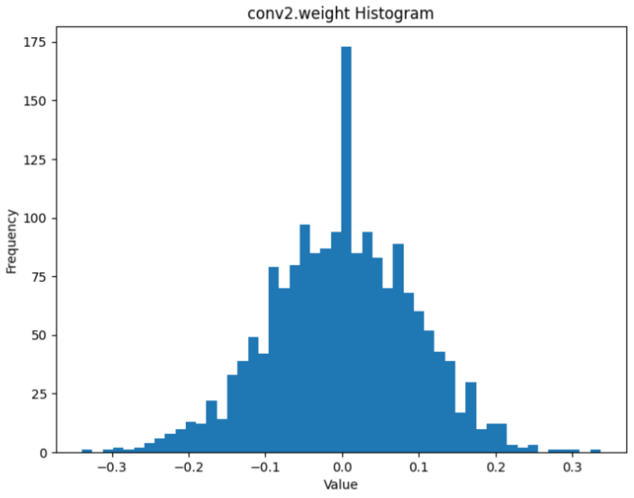
2-4 L2

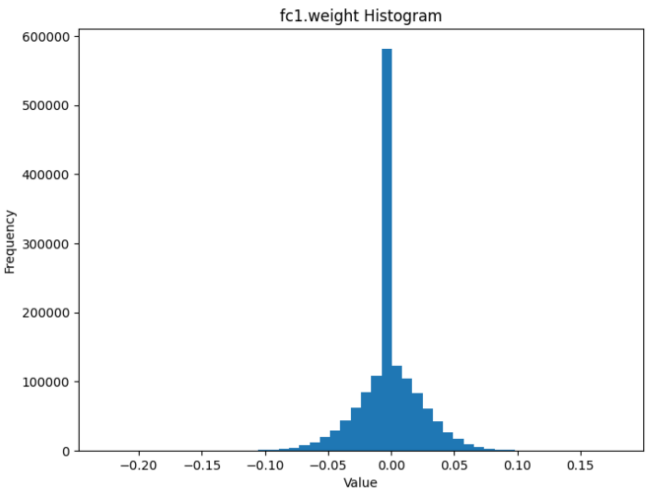
The histogram of weights distribution are more centralized than before. It also indicates that L2 regularization is effectively constraining the magnitude of the weights in the neural network. L2 regularization is designed to mitigate overfitting by discouraging the model from fitting noise in the training data.

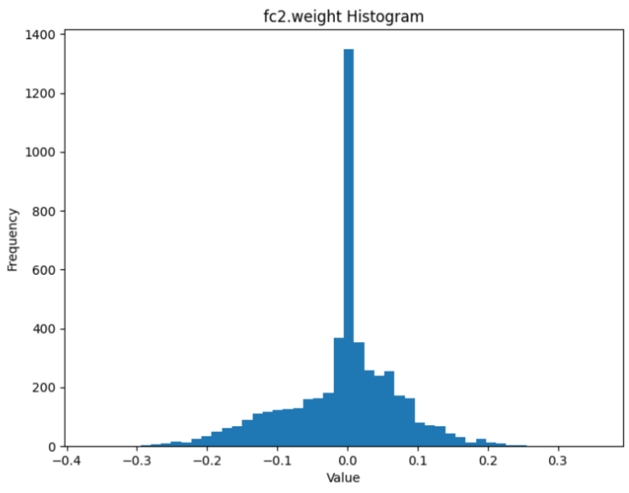












2-5 Preprocessing

First, I transform the image into a tensor for training. Next, I normalize the image by subtracting 0.5 from each channel and dividing by 0.5 to achieve scaling, ensuring that pixel values are within the range of -1 to 1.