# Homework4 Part2

Incorporating a convolutional neural network (CNN) into the neural network framework amplifies its capacity to comprehend and scrutinize images.

Within our model, CNN layers are introduced through an initial application of filters to input images, aiding in the detection of crucial patterns.

Subsequently, pooling layers condense feature sizes while retaining their fundamental information.

The flattened output then progresses to conventional fully connected layers for classification.

This sequential arrangement enables CNN to proficiently grasp and discern patterns within images, thereby enhancing the model's precision in tasks such as image classification. The ensuing observations were as follows:

A screenshot of a computer

Description automatically generated**Initial**

Fully connected layers: 2

CNN: 0

Activation functions: ReLu, Softmax

Epochs: 1

Test Accuracy: 94 %

Average loss: 0.1955

A screenshot of a computer

Description automatically generated**With added convolutional layers**

Fully connected layers: 2

CNN and max pooling: 2

Activation functions: ReLu, Softmax

Learning rate: 0.01

Epochs: 5

Test Accuracy: 99 %

Average loss: 0.0259

A computer code with text

Description automatically generated with medium confidence

A screenshot of a computer

Description automatically generatedA screenshot of a graph

Description automatically generated

A white paper with black text and numbers

Description automatically generated

The introduction of a convolutional neural network (CNN) evidently boosted the model's efficacy. In the absence of CNN, the accuracy on the test set stood at 94%, whereas with CNN, accuracy surged to 99%. This showcases CNN’s effectiveness in extracting and assimilating features from image data, thus fostering improved classification accuracy. The reduced average loss with CNN suggests that the model's predictions align more closely with the ground truth labels, reinforcing the premise that CNNs augment the model's capacity to comprehend and assess image data.