

Programming Project #3

a) With input size of 32 I got the following results:

- Training Accuracy: 84.26%
- Testing Accuracy: 78.31%

With input size of 64 I got the following results:

- Training Accuracy: 92.66%
- Testing Accuracy: 80.19%

The increase in input size from 32 to 64 significantly improved the training accuracy. The testing accuracy also improved slightly with the larger input size, but the improvement was not as substantial as in the training set. The increase in input size however has led to an increase in training time per epoch and there is a possibility of over-fitting as the training accuracy is considerably higher than the testing accuracy.

b) With 2 convolutional and sub sampling layers

- Training Accuracy: ~84.26%
- Testing Accuracy: ~78.31%
- Loss on Testing Set: 0.4504

With additional convolutional and sub sampling layer

- Training Accuracy: ~84.16%
- Testing Accuracy: ~77.88%
- Loss on Testing Set: 0.4799

The addition of a third convolutional layer and max-pooling has led to a marginal decrease in training accuracy 84.26% to 84.16%. The testing accuracy has also slightly decreased with the additional layer, going from approximately 78.31% to 77.88%. The computational time for each epoch is slightly reduced with the additional layer, likely due to the smaller input size (22ms/step without the layer vs. 24ms/step with the layer). Based on these results, it seems like adding another layer did not have a significant impact on the model.

c) With 32 filters

- Training Accuracy: ~84.26%
- Testing Accuracy: ~78.31%
- Loss on Testing Set: 0.4504

With 24 filters

- Training Accuracy: ~83.36%

- Testing Accuracy: ~77.56%
- Loss on Testing Set: 0.4664

The reduction in the number of filters from 32 to 24 led to a slight decrease in training accuracy, dropping from approximately 84.26% to 83.36%. The testing accuracy has also slightly decreased with the reduced number of filters, going from approximately 78.31% to 77.56%. The loss on the testing set increased slightly from 0.4504 to 0.4664 and the computational time for each epoch appeared to be similar between the two cases.

d) With Max Pooling

- Training Accuracy: 84.26%
- Testing Accuracy: 78.31%

With Average Pooling

- Training Accuracy: 82.64%
- Testing Accuracy: 78.81%

The training accuracy slightly increased from 84.26% in the original model to 82.64% in the model with average pooling layers. The testing accuracy improved marginally from 78.31% in the original model to 78.81% in the modified model. While the training time per epoch decreased in the modified model, there's still a possibility of over-fitting as the training accuracy is higher than the testing accuracy