Report

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Transfer learning:

Transfer learning learning rate is 1e-2, which the model 1 learning rate is 0.05

1. The train loss for number 1 is decreasing slowly than transfer learning models 2, 3, but eventually after 30 epochs they all reached the same train loss

A screenshot of a cell phone

Description automatically generated

1. For validation loss, both model 2, and model 3 converges after 7 epochs, but model 1 fluctuates and converges after 23 epochs. And the validation loss is higher than that of model 2,3.

A close up of a device

Description automatically generated

1. For validation accuracy: both transfer learning model 2,3 have reached over 95% and converges after 7 epochs. And model 3 accuracy is slightly higher than model 2. Model 1 accuracy keeps increasing and converges after epoch 23. And remains around 75%. We can see that transfer learning model converges much faster than models without convolutions.

A close up of a map

Description automatically generated

1. The test accuracy on the best validation parameters:
   1. first model is: 0.764
   2. second models is: 0.946
   3. third models is: 0.95

we can see that the transfer learning model have higher test performances and therefore generalizes well to unseen data.

1. Observation difference between test and validation accuracy of these models.
   1. Test accuracy – validation accuracy: 0.0369
   2. Test accuracy – validation accuracy: -0.0015
   3. Test accuracy – validation accuracy: 0.0159

we can see that model with transfer learning roughly have the same accuracy as the best validation set, but slightly higher than the validation set.

We can also see that for model 2, it slightly overfits the model because it only train the last linear layer.

Data augmentation:

Task1: using resnet18:

with normalization transformation: accuracy 70%

Without normalization transformation: accuracy 44%

Task2: using resnet18:

five-fold split: accuracy 72%

Task3:

Using resnet50: 75%

Using desenet121: 76%