Queen Mary University Of London

Neural Networks and Deep Learning

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COURSEWORK

Fashion - MNIST Classification using MLPs

Task 1- Reading the data set and creating data loaders.

The my utils package was used to import the data set by loading the my utils.py file from lab 3, which contains an Inbuilt data set.
The function load data fashion mnist(), which returns the train and test datasets, receives an argument specifying a suitable batch size.

Task 2- Creating the model.

The model is made up of Stem - each batch has 256 photos. The images, which are 28*28 pixels in size, are converted into 49 patches of 4*4 matrices.

Backbone - The backbone is provided an input of 16 x 256 tensors that are trained using two MLPs with two Linear layers each.

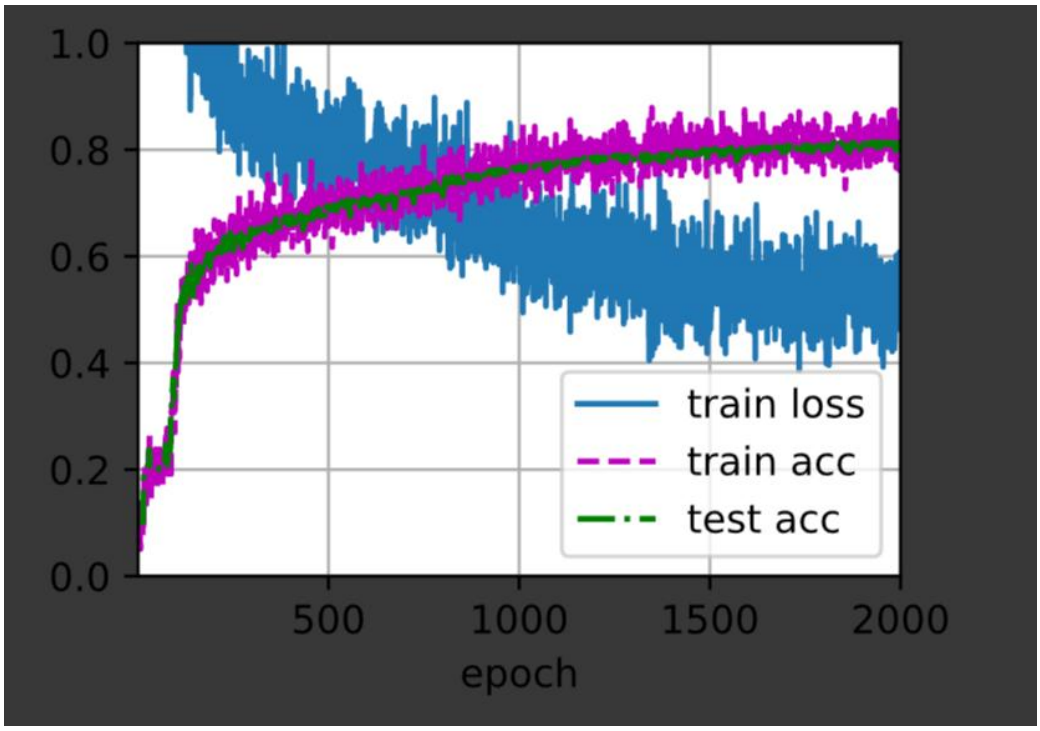
Classifier – The mean features from the backbone's output, which is 49 x 10 for the 49 patches. The ultimate result will be an average of these 49 patches, resulting in a ten-value vector.

Task 3- Create the loss and optimizer.

The Adam optimizer is utilized because it has a higher convergence rate. The hyper-parameters have straightforward meanings and require minimal adjustment in most cases.
The learning rate is set at 0.001.
The Cross-Entropy Loss is the loss function employed in this case. It is best suited for classification tasks and use the soft - max regression algorithm by default.

Task 4-Creating a training script for the model

1. The curves for loss evolution
2. The evolution curves of training and validation (test) accuracies
3. All training specifics, including hyper-parameters.



In the graph above, the curves for the evolution of loss, training, and validation (test) accuracies are displayed.

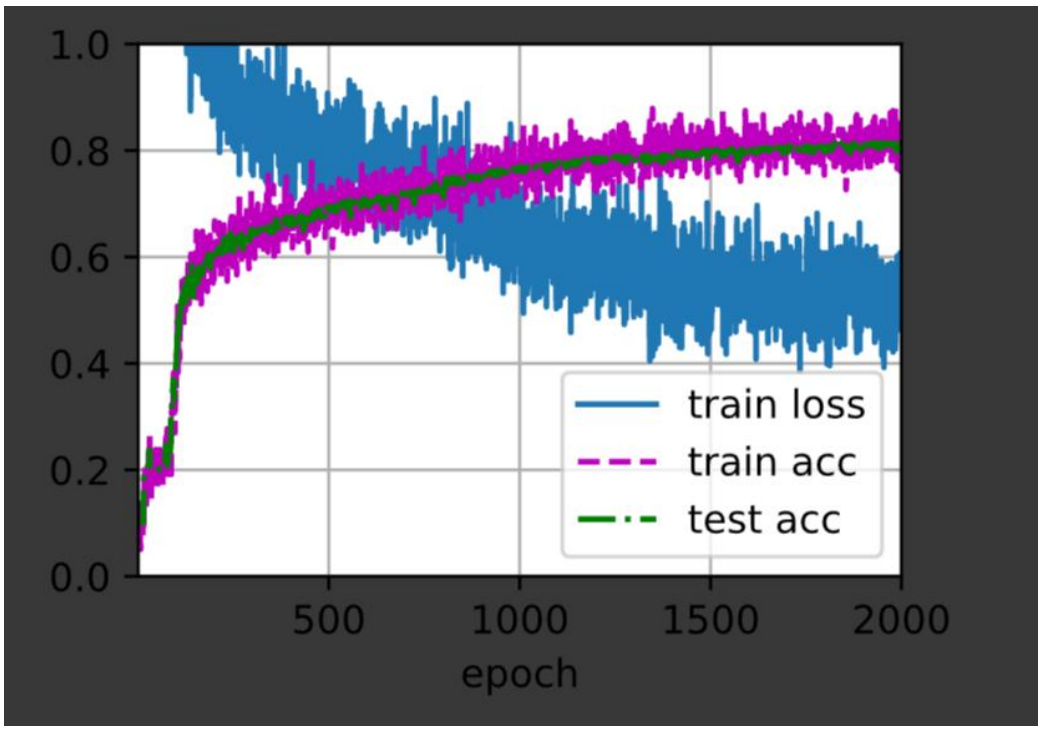
As the training progresses through 2000 epochs, the training loss can be seen converge at 0.4.

As the number of epochs increases, the training and validation accuracies converge soon to about 80%. As it reaches 1500 epochs, the accuracies are found to attain a saturation of roughly 80 percent.

The hyper parameters used:
Learning rate: 0.001
The number of epochs: 2000
Batch size: 256

The vectorised patches are turned into a 128-dimensional feature vector. The first MLP linear layer has a 49x128 weight matrix.
The weight matrix of 128x128 is used in the next two levels. The last layer has a 128x10 weight matrix. The weights are all initialised to have a normal distribution.
All of the biases for all of the fully linked layers are set to zero.

Task 5



On the Fashion-Mnist Validation Set, the final model correctness was tested. With the hyperparameters listed below:

0.001 learning rate
There have been 2000 epochs since the beginning of time.
Batch size: 256
The model's ultimate accuracy with the test set is 80.1 percent.