Machine Learning Assignment 3

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1 Implementation

`https://github.com/FoyerD/ML_A3.git`

In the new implementation of the Neural Network, we added a layer to the network architecture. We modified the forward step, the backpropagation, and the Stochastic Gradient Descent update, to match the 2 layers.

2 Evaluation Details

We compare three models, using Macro AUC for evaluation:

1. 1L: The original Neural Network in the notebook.
2. 2L: Our Neural Network, which adds a hidden layer, and changes the dim of both hidden layers to 500.
3. PT: Implementation of the same network architecture as ours in PyTorch, with momentum of 0.9.

We use a 60-10-30 train-validation-test split.

3 Train-validation

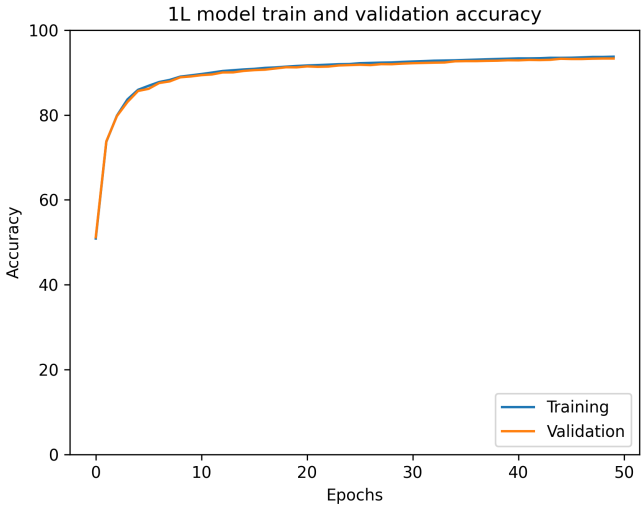

Figure 1: Training accuracy of the original model

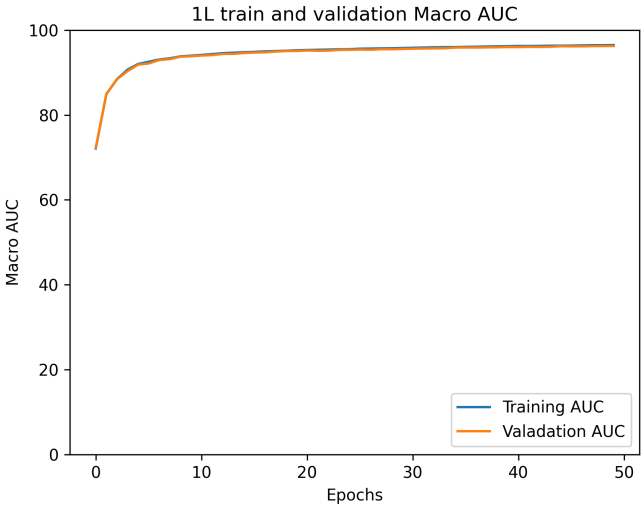

Figure 2: Training AUC of the original model

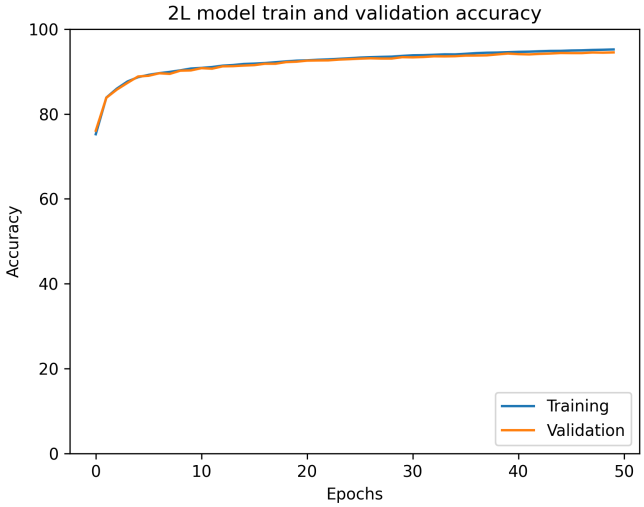

Figure 3: Training accuracy for our model

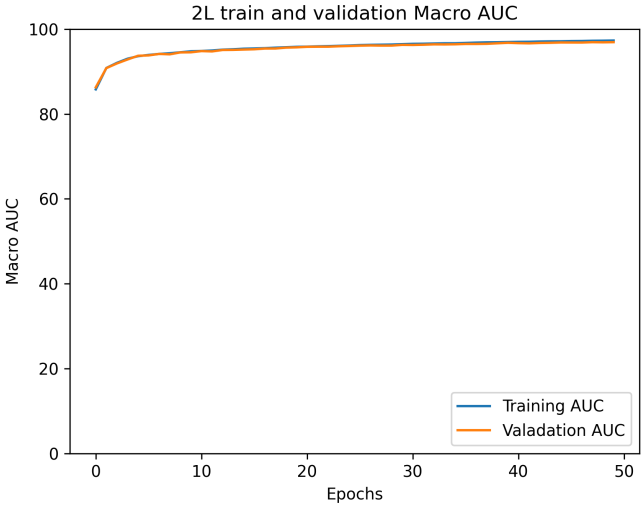

Figure 4: Training AUC for our model

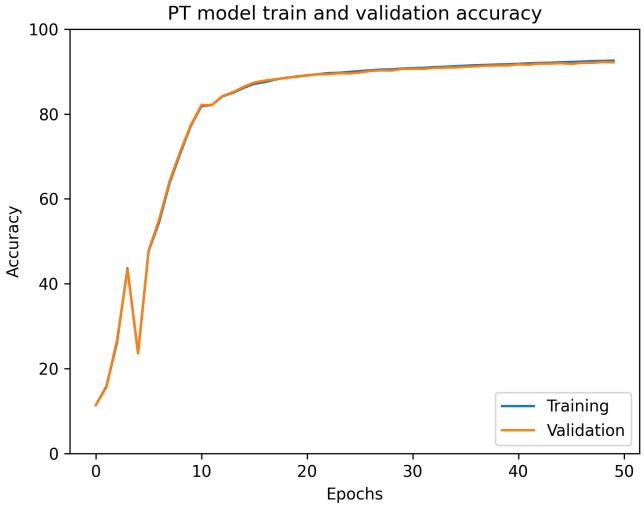

Figure 5: Training accuracy for the PyTorch model

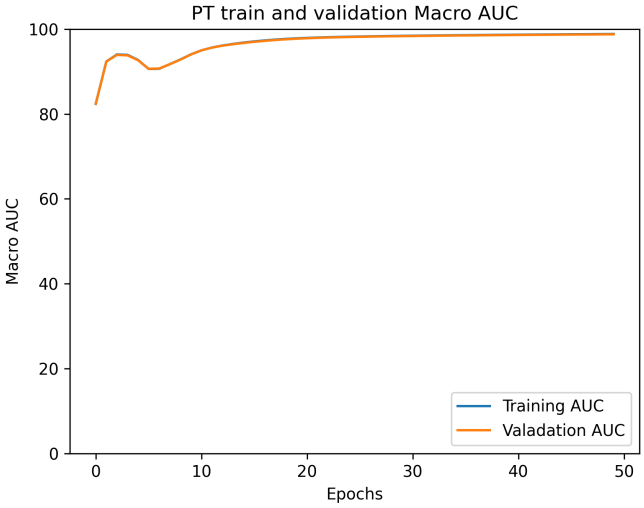

Figure 6: Training AUC for the PyTorch model

4 Test Results

Model	Learning Rate	Epochs	Accuracy	Macro AUC
Original NN	0.05	50	93.13%	96.14%
Our NN	0.05	50	94.60%	96.97%
PyTorch NN	0.05	50	92.13%	98.75%

As expected, the deeper neural network with two hidden layers performed better than the shallower one hidden layer network, and the PT model performed best, thanks to the momentum given.