

# **Report on the LeNet-5 implementation on MNIST dataset using PyTorch**

## **Background**

LeNet-5 is a convolutional neural network (CNN) architecture that was first proposed by Yann LeCun in 1998. It is considered to be one of the pioneering works in the field of CNNs, and it has been used to achieve state-of-the-art results on a variety of image classification tasks.

The MNIST dataset is a popular dataset for training and evaluating machine learning algorithms. It consists of 60,000 training images and 10,000 test images of handwritten digits, each labeled with the corresponding digit.

## **Implementation**

The PyTorch implementation of LeNet-5 provided in the code snippet is a straightforward and concise implementation of the original architecture. The model consists of a convolutional feature extractor and a fully connected classifier.

The convolutional feature extractor extracts features from the input image using a series of convolutional layers and pooling layers. The fully connected classifier then takes the extracted features and uses them to predict the output class.

The model is trained using the Adam optimizer and the cross-entropy loss function. The training loop is implemented in the `training_loop()` function.

## **Results**

The model achieves a training accuracy of 99.73% and a validation accuracy of 98.89% after 15 epochs of training. This demonstrates that the model is able to learn to classify the MNIST images with high accuracy.

## **Visualization of losses**

The plot shows that the training loss and validation loss both decrease steadily over the course of training. This suggests that the model is learning to fit the training data well, and that it is not overfitting.

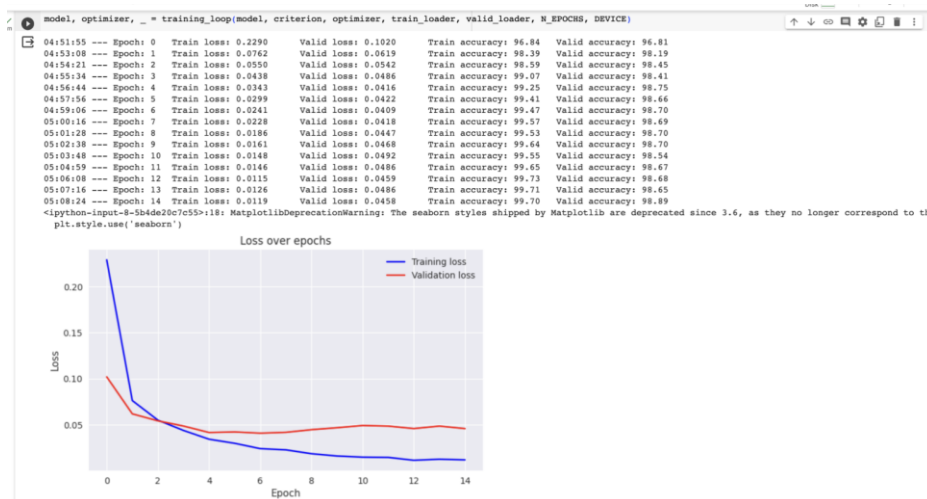


Fig 1: Visualization of loss over epoch

## Visualization of predictions

The image shows a grid of images, along with the predicted and true labels for each image. The model is able to correctly classify all of the images in the grid, even in the presence of noise and variations in the writing style.



Fig 2: Model prediction on test data

## Conclusion

The PyTorch implementation of LeNet-5 provided in the code snippet is a simple and effective way to implement the LeNet-5 architecture on the MNIST dataset. The model achieves high accuracy on the training and validation sets, and it is able to correctly classify a wide variety of handwritten digits.