**Deep Learning and Neural Networks**

Home Task 04



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**Student ID: F2022266626**

**Course Code: CS4152**

**Section: V2**

**Topic: Multi-Class Classification Using Feedforward Neural Networks in PyTorch**

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**Objective**

The objective of this assignment was to design, implement, and evaluate a feedforward Neural Network (NN) using PyTorch for a multi-class classification task. The aim was to observe the performance of the network in terms of loss reduction and accuracy improvement across different configurations—varying the number of hidden layers and epochs.

**Implementation**

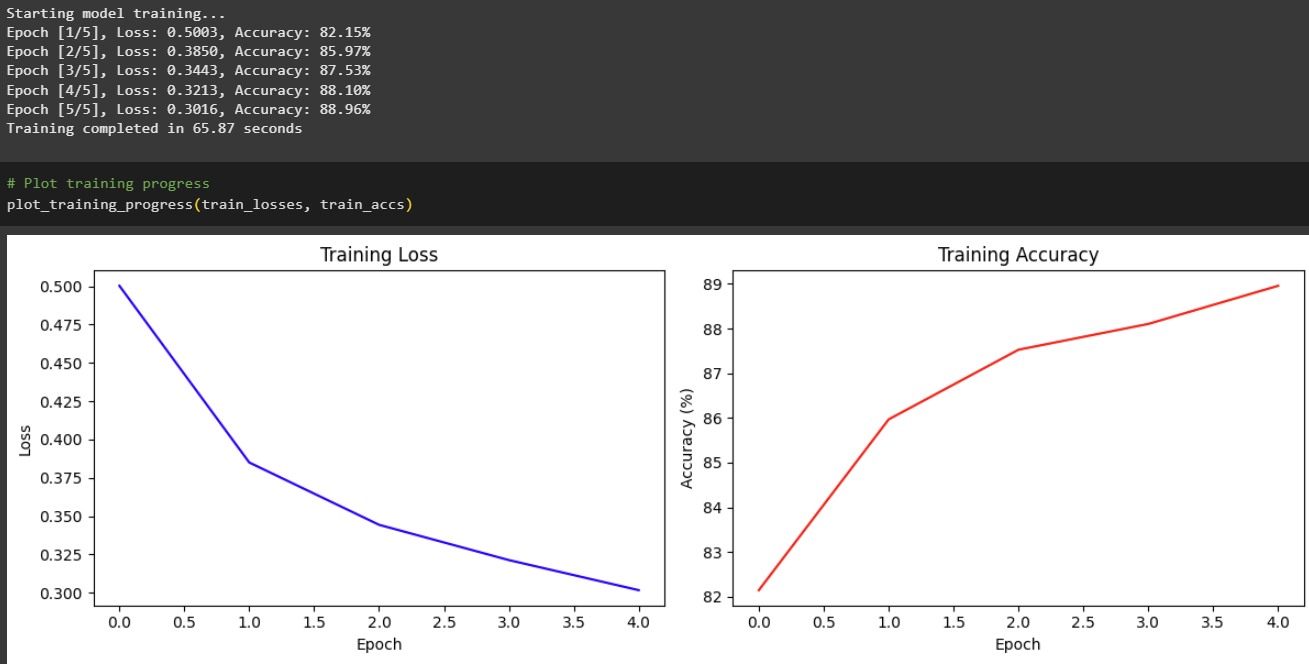
* Framework Used: PyTorch
* Model Type: Feedforward Neural Network
* Task: Multi-class classification
* Dataset: 🔗[Fashion MNIST](https://www.kaggle.com/datasets/zalando-research/fashionmnist)
* Evaluation Metrics: Training loss, training accuracy, training time

**Different Configurations**

Experiments can conduct under the following configurations:

1. One hidden layer, 5 epochs

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1. One hidden Layer, 10 epochs

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1. Two hidden layers, 5 epochs

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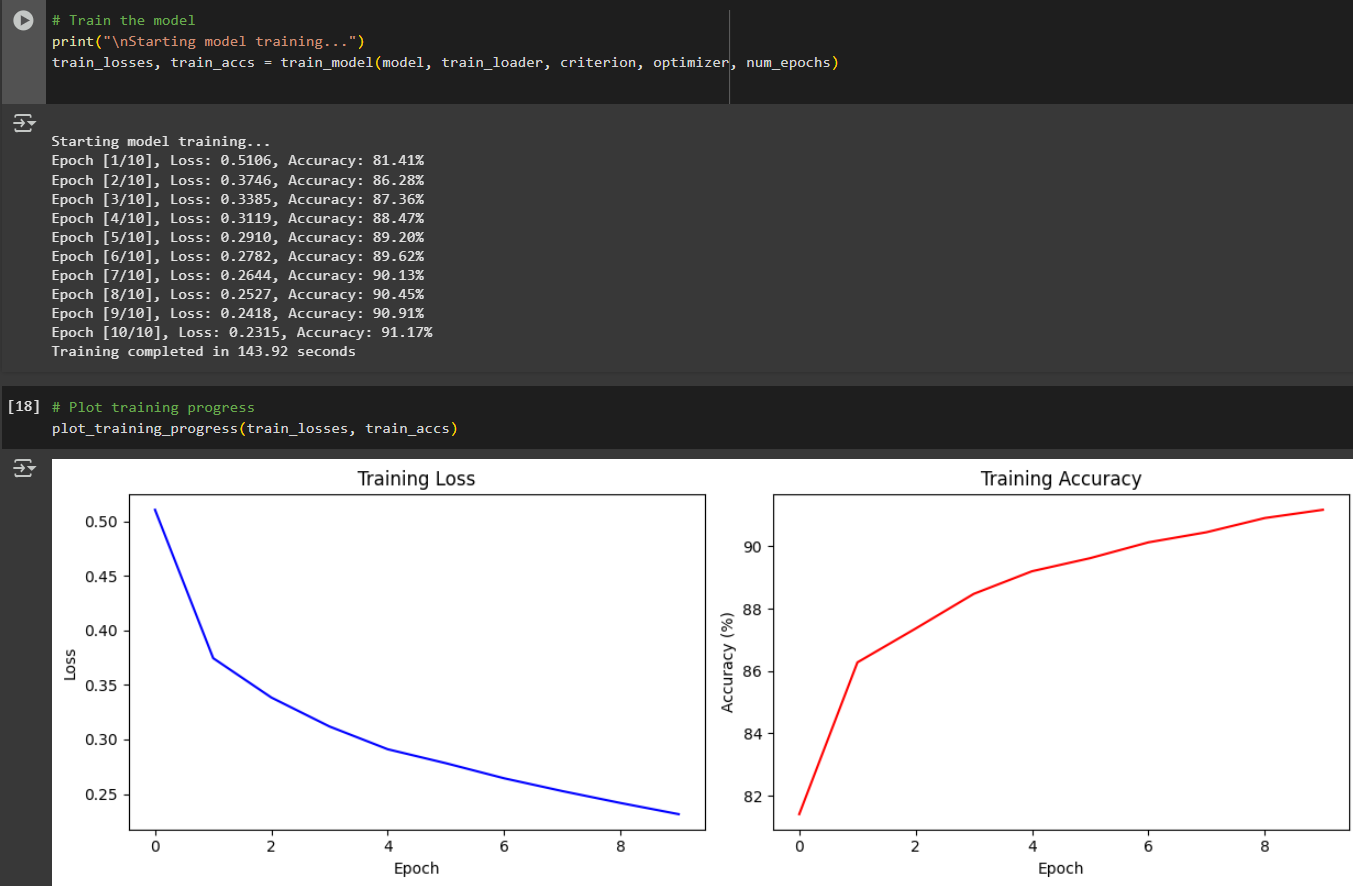
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1. Two hidden layers, 10 epochs

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1. Three hidden layers, 5 epochs

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1. Three hidden layers, 10 epochs

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| **Configurations** | **Final Loss** | **Final Accuracy** | **Training Time (s)** |
| 1 Hidden Layer, 5 Epochs | 0.3016 | 88.96% | 65.87 |
| 1 Hidden Layer, 10 Epochs | 0.2425 | 91.10% | 123.80 |
| 2 Hidden Layers, 5 Epochs | 0.2910 | 89.18% | 70.66 |
| 2 Hidden Layers, 10 Epochs | 0.2315 | 91.17% | 143.92 |
| 3 Hidden Layers, 5 Epochs | 0.2950 | 89.09% | 78.51 |
| 3 Hidden Layers, 10 Epochs | 0.2349 | 91.02% | 132.40 |

**Results Summary**

**Analysis**

* More epochs (like 10 instead of 5) helped the model learn better and gave higher accuracy.
* Using more hidden layers (like 2 or 3) gave only a small improvement in accuracy.
* The best accuracy was 91.17% with 2 hidden layers and 10 epochs.