

Homework #4

You must report your results clearly and answer all questions to receive full credit.

Please complete the assignment using Jupyter Notebook or Google Colab and implement your code using PyTorch.

Please email your completed assignment as a single PDF file to `mmarini2@Central.UH.EDU`.

CIFAR-10 Classification

This problem involves multiclass classification on the CIFAR-10 dataset (see <https://pytorch.org/vision/stable/generated/torchvision.datasets.CIFAR10.html>).

This set includes 50,000 images for training/validation and 10,000 images for testing.

1. Implement a CNN using the AlexNet architecture (see https://pytorch.org/hub/pytorch_vision_alexnet/) for multi-class classification using batch-normalization and **no dropout** (that is, dropout probability $p = 0$).
2. Train a classification model on the CIFAR-10 dataset using 45,000 images for training and setting aside 5,000 images for validation. Choose batch size = 128. Evaluate the model's performance by **plotting the training and validation loss function** and the **classification accuracy** on the validation set with respect to the number of epochs. Once you have found the epoch number giving the best validation accuracy, compute the classification accuracy on the test set.
3. Repeat the entire procedure using dropout with **dropout probability** $p = 0.5$. Compare the two test classification accuracy values (with and without dropout) including the respective confidence intervals.
4. Compare the training loss function with and without dropout by displaying the two loss function curves with respect to the number of training epochs.