CS/ECE 528: Embedded Systems and Machine Learning
Fall 2023

Homework Lab 1: Getting Started with Deep Learning

Assigned: 7 September 2023
Due: 14 September 2023

Instructions:

- Submit your solutions via Canvas.
- Submissions should include your jupyter notebooks in a zip file, with notebooks names q1.ipynb, q2.ipynb, etc. in a single folder. You can include comments in your notebooks to explain your design choices.
- **"Save and checkpoint" your notebook after running your notebook, so that cell outputs are preserved.** If you are using Colab, make sure to 'Save' your notebook after running it, before downloading it and submitting.

Q1. (50 points) Open and run the model described in 01-keras-mnist-baseline.ipynb. The notebook has a simple model for MNIST digit recognition. Enhance this model to create a CNN-based model to achieve greater than 99.3% accuracy on the test dataset. Your score will depend on the accuracy achieved by your model. Note: only train your model on the training dataset and only after training should you evaluate it on the test dataset, to verify your model accuracy.

Q2. (50 points) Starting from the skeleton code in 01-keras-cifar10-cnn.ipynb, create a CNN-based model to achieve the highest possible accuracy on the test dataset with the cifar10 image dataset (aim for 77% or higher). Your score will depend on the accuracy achieved by your model.

Q3. (50 points) Unlike the previous two questions which involved classification, in this question you will devise a model for regression. Starting from the code in 01-regression-fuel-eff.ipynb, devise a DNN model to predict automotive fuel efficiency with the highest possible accuracy, i.e., smallest mean absolute error (MAE) on the test dataset. Aim for an MAE < 1.75MPG. Your score will depend on the accuracy achieved by your model.