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ECE471, Selected Topics in Machine Learning – Assignment 3

Submit by Sept. 25, 10PM

tldr: Classify MNIST digits with a convoultional neural network. Get at least 95.5% accuracy on the test test.

Problem Statement   Consider the MNIST dataset consisting of 50,000 training images, and 10,000 test images. Each instance is a 28×28 pixel handwritten digit zero through nine. Train a convolutional neural network for classification using the training set that achieves at least 95.5% accuracy on the test set. Do not explicitly tune hyperparameters based on the test set performance, use a validation set taken from the training set as discussed in class. Use dropout and an L^2 penalty for regularization. Note: if you write a sufficiently general program the next assignment will be very easy.

Do not use the built in MNIST data class from tensorflow.

Extra challenge (optional)   In addition to the above, the student with the fewest number of parameters for a network that gets at least 80% accuracy on the test set will receive a prize. There will be an extra prize if any one can achieve 80% on the test set with a single digit number of parameters. For this extra challenge you can make your network have any crazy kind of topology you'd like, it just needs to be optimized by a gradient based algorithm.