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HW2 report

I adapted Szegedy et al.'s googlenet architecture with transfer learning to train a convolutional neural net to classify whether or not a 2D image of single cells contains the parasite Plasmodium. I chose googlenet because of the combination of its high documented classification accuracy and efficiency of training. It contains many fewer parameters than other, only slightly more powerful, nets that do residual learning. Before feeding the images into googlenet, they were resized to 250x250 pixels. The output layer of the network was fine tuned by replacing the standard fully connected layer with a sequence of three rectified fully connected linear layers to fit the 2D classification task. I tested a couple of different hyperparameters but found the out-of-the-box architecture to be quite powerful. Like for HW1, I started with a learning rate of 0.001, and the Adam optimization algorithm, which proved an effective combination at converging toward a train and test classification accuracy of over 90% after just one epoch of transfer learning. Originally, I scheduled the network to learn the new dataset over five epochs but found this amount of training was unnecessary and used the model generated after just two or three epochs of transfer learning to save computing time. I tested several batch sizes including 64, 128, and 1024 samples. The network trained on the largest batch size converged more quickly and over fewer epochs to produce a loss under < 0.05 and achieved the highest classification accuracy of the hidden set, as compared to networks trained on smaller batch sizes. Indeed, this network reached peak classification accuracy of 96.8% on the hidden test set after 3 epochs, and plateaued (with a slightly lower accuracy) with more training likely due to overfitting.