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Brief comments on the CNN

I adapted Szegedy et al.'s googlenet architecture with transfer learning to train a convolutional neural net to classify whether or not a microscopic images of red blood cells contain the parasite Plasmodium. I chose googlenet as a base network because of its documented high classification accuracy and efficiency of training. Googlenet contains many fewer parameters than other, only slightly more powerful, nets performing residual learning. Images were resized to 250x250 pixels before feeding the images into googlenet for transfer learning. 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. A learning rate of 0.001, along with the Adam optimization algorithm, 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 conserve compute time. Batch sizes of 64, 128, and 1024 samples were tested. 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.

Szegedy, C., et al. (2015) Going Deeper with Convolutions. 2015 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), Boston, MA, 7-12 June 2015, 1-9. https://doi.org/10.1109/CVPR.2015.7298594