SYDE 671: Project Proposal
Regularization of Neural Networks

Brennan Gebotys

1 Project Outline

Neural networks have become very powerful models but are also prone to overfitting. Many regularization techniques have been proposed but they have not been thoroughly compared or analyzed against each other. This project will implement existing regularization techniques and investigate their effect on the learning process of neural networks.

1.1 Single Layer NN & MNIST Dataset

I first plan on comparing the regularization techniques using the MNIST dataset (LeCun et al. (2010)) with its 28x28 image values flattened (resulting in 784-dimensional input vectors). The model will be a single weight matrix (with a shape of 784x10) trained using Stochastic Gradient Descent (SGD). Then for each regularization technique, I'll visualize the weights magnitude, gradients along with other metrics throughout the training process.

1.2 CNN & Sign Language Dataset

Lastly, I will investigate the regularization techniques using a sign-language recognition dataset. The model will be a multi-layer CNN. This scenario will test the regularization techniques in a more realistic and challenging setting. The results will be measured empirically using the model's test accuracy.

1.3 Possible Regularization Techniques

Some of the regularization techniques I plan on experimenting with are the following:

- Frobenius & L2 Norm Regularization

- Lipschitz Regularization (Gulrajani et al. (2017))

- Spectral Norm Regularization (Yoshida and Miyato (2017))

- Orthogonal Regularization (Brock et al. (2017))

- Dropout (Srivastava et al. (2014))

References

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