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MSDS 422
Assignment 3 Part 3
2/20/2021

Name three (3) different regularization methods that can be used to improve the performance of neural networks. Explain how, and why, each one can be helpful.

Three different regularization techniques are dropout, early stopping and data augmentation. Dropout provides a probability of different neurons being inactive at each training step. This helps to avoid overfitting by having the dropped neurons output zero. Early stopping is a method that watches the degradation of the validation performance and stops the training process if it degrades. This helps ensure the best epoch is used. The last method is data augmentation which is a method of artificially increasing the dataset size by making minor adjustments to existing images to be saved as new images. This helps avoid overfitting by providing more variations to train on.

Imagine that the Northwestern SPS is developing some new technology to use handwriting samples of people applying to the MSDS program to predict gradepoint at graduation. The handwriting sample data consist of digital images of applicants' submissions of handwritten letters of the alphabet, both printed and as cursives. Suppose that the school has commissioned you to develop a neural network that can solve this prediction problem for it. What kind(s) of neural networks would you propose to train, and what other data, if any, do you think you'd need?

The neural network I would train would be a Multilayer Perceptron similar to those used in Part 1 of the assignment. I would need as many images of the different letters as I could get, both for printed and cursive types. We would also need some labeled data to aid in training the model.

Next, imagine that Northwestern would like to deploy an AI based fund-raising effort that uses neural network technology to solicit donations from alumni. The effort will be called CBP, the "cat bite" program. What kind of neural network(s) would you suggest that the school train to empower the CBP with fund-raising intelligence, and what data would you recommend be used?

For this I might use a Multilayer Perceptron to help predict someone's likelihood to donate. Certain demographic data like age, income, employment status, if they own a home, if they have internet access, etc. would all be valuable data. It would also be nice to see if we have historical data of them donating to other fundraisers.