AIML Session 13 Lab Abstract

Here is what we have planned for Session 13 - Lab. There are 5 experiments (strongly prefer GPU for all experiments, dataset for first 4 experiments is the **MNIST**) viz.

a) Experiment 1-4
b) Experiment 5: A Kaggle Hosted competition on Bronchitis Classification

Experiment 1:
Objective: Investigate effects of adding a Regularizer
For this experiment we will look at how adding a regularizer influences the behavior of a network. A loss function allows us to determine how well (or poorly) our set of parameters (i.e., weight matrix, and bias vector) are performing on a given classification task, the loss function itself does not take into account how the weight matrix "looks".
Part1: Here, we will observe the behaviour of the weight space after adding a regularization term. **Part2:** In this we will use some property of the learnt weight space to remove redundant connections.

Experiment 2:
Objective: Investigate effects of Weight Quantization
Neural network models can take up a lot of space on disk, with the original AlexNet being over 200 MB in float format for example. Almost all of that size is taken up with the weights for the neural connections, since there are often many millions of these in a single model. Because they're all slightly different floating point numbers, simple compression formats like zip don't compress them well.
We look at different kinds of Quantization: Uniform & Non-Uniform.

Experiment 3:
Objective: Explore Student Teacher Networks

Training thin deep networks following the student-teacher learning paradigm has received intensive attention because of its excellent performance. In such a paradigm, there is a huge neural network known as the teacher network which is expert at performing a certain task. There is also a much smaller student network which learns to perform the same task using some form of guidance from the teacher.

The student can be small in terms of 1) Depth 2) Number of parameters. In this notebook we will see one such setup where the guidance is provided by the outputs of the teacher network.

Experiment 4:
Objective: Pruning Neurons in Neural Networks

Throughout the course, we have been discussing big neural networks models with a huge amount of parameters. The concentration of the parameters is much more in the fully connected layers and this brings us to the question whether so many parameters in the FC Layers are necessary.
While pruning connections of the network by making the weight space sparse, we were able to drop connections. Thus we would not be able to exploit that procedure to its fullest unless we write separate modules for sparse matrix multiplications in neural networks which the deep learning libraries do not provide. Through this approach we can not only reduce the size of the network on disk but the resultant model as whole will occupy less space in the RAM during a forward pass. We are going to explore this

Experiment 5: Bronchitis detection - Hosted on Kaggle (A leading hospital has entrusted us with building a DL algorithm that can classify images into normal or abnormal lung)
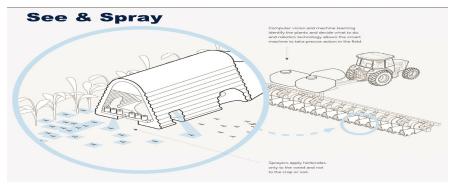
In India, bronchitis roughly affects around 5,00,000 people every year and costs crores of rupees to the public exchequer to the healthcare industry. Also worldwide, it remains the leading cause of carcinogenic deaths for both men and women. Thus, early detection becomes vital in successful diagnosis, as well as prevention and survival. Existing solutions in terms of detection are essentially observation-based, where doctors observe x-rays and use their judgment in order to diagnose the disease. The idea of this competition is to use machine learning technique to classify the image into a normal or abnormal lung.

There is a deadline for the Kaggle leaderboard to be frozen (maximum of 20 submissions/day).

Note: This data is proprietary please do not share the dataset with anyone. The Solution Test file and the solution python notebook will not be provided.

Good luck! (Trivia below) Blue River (startup company) used DL and vision in Agriculture. Find out how much Blue River got purchased for USD _____ Million.
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