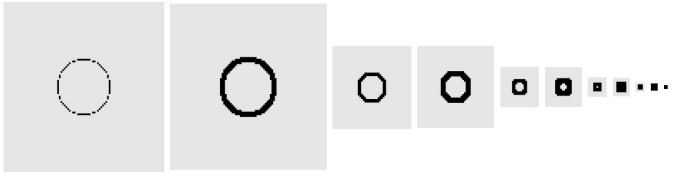
Spatially-sparse convolutional neural networks

Group 85: Calin Botoroaga, Yao Ma

Introduction

The use of spatially-sparse input is a technique to speed up computation. For general input, slow pooling is relatively computationally expensive as the spatial size of the hidden layers reduces more slowly. When the input array is sparse, this is offset by the fact that sparsity is preserved in the early hidden layers[1]. Only have the values of the hidden variables where they differ from their ground state are calculated.



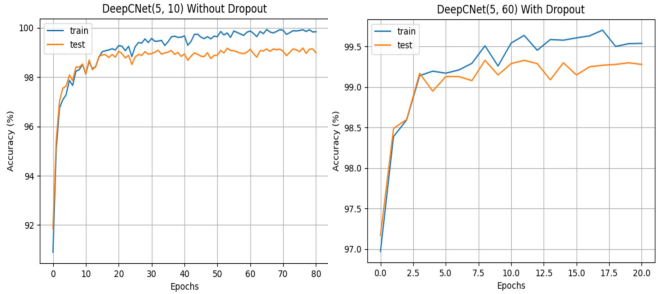
Datasets

The experiments are respectively based on one offline dataset and one online dataset.

- MNIST Dataset: an offline image dataset.
- Assamese Dataset: an online handwritten assamese characters, which contains 45 samples of 183 Indo-Aryan characters.

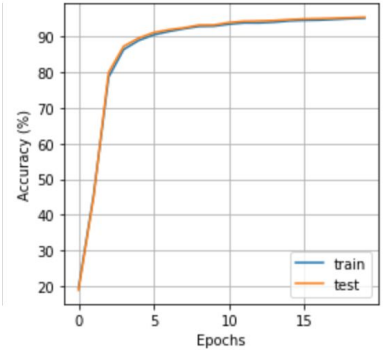
Experiments

For MNIST, as in the original paper, we implemented customized DeepCNet networks with different levels of dropout in Pytorch.



For the Assamese dataset, a sparse VGG style network was tested

Moreover, a simple CNN has also been implemented for the MNIST and Assamese dataset in order to compare it with the architecture proposed in the paper, and it has been found to be significantly slower and with comparable performance.



Conclusion

When comparing with a normal CNN, the sparse network has been found to be indeed significantly faster. For DeepCNet we have obtained accuracy results that are close to those claimed by the author.

[1]Graham, Benjamin. "Spatially-sparse convolutional neural networks." *arXiv preprint arXiv:1409.6070* (2014).