AlexNet Paper Review

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1 Introduction

AlexNet is a Convolutional Neural Network that became really popular when it won the Imagenet Large Scale Visual Recognition Challenge (LSVRC).It beat its competitor by more than 10% margin. It achieved a top **5 error-rate of 17%** thus taking a big leap in computer vision

2 Fundamental Features

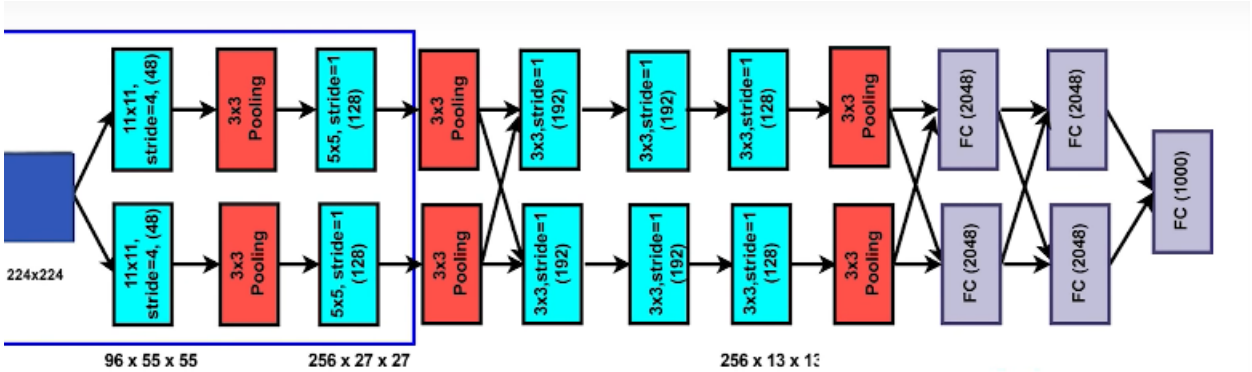
Alexnet is characterized by following features:
Number of layers: 8
Alexnet is a CNN of depth 8 consisting of 5 convolutional and 3 fully connected layers.
Filters used:

- 11x11 filters
- 5x5 filters
- 3x3 filters

Number of parameters: 60 million
Activation functions used: ReLU activation in all layers

3 Salient features

AlexNet used multi-GPUs by putting half of the model's neurons on one GPU and the other half on another GPU.



It used the recently developed Dropout regularisation which was quite effective for handling over-fitting issues.

4 Data

The model was trained on imageNet data which contains about 1.2 million images. Every image was scaled to to 256x256 pixels.

5 Training

The training was done on two separate GPUs (NVIDIA GTX 580 GPU with 3GB of memory) as the data was too big to fit in. Stochastic Gradient Descent along with learning rate 0.01, momentum 0.9 and weight decay 0.0005 was used

6 Over-fitting

To over come the problem of over-fitting authors used 2 ways:

- Dropout Regularisation
- Data-Augmentation

7 Comments and Drawbacks

Alexnet's success was partly based on this factors:

- L2 regularisation combined with Dropout Regularisation
- Using ReLU activation to deal with problem of vanishing gradient
- Intelligent use of dual GPU for CNN implementation to get more computational power

The drawback's felt in Alexnet are:

- Use of large filters like 5x5 and 11x11 which did not appear to be that effective
- Not very deep network as compared to its successors like VGG which almost doubled the depth
- Use of Gaussian distribution for initialisation instead of xavier initialisation which can cause problems of vanishing gradient.

References

[1] George D. Greenwade. "The Comprehensive Tex Archive Network (CTAN)". In: *TUGBoat* 14.3 (1993), pp. 342–351.

[2] NPTEL. *Alexnet dual-gpu image*. URL: https://www.youtube.com/watch?v=T7t1uTzh3oI.