CNNs comparison

Conditions

The comparison will use the CIFAR10 dataset, with two different kinds of data augmentation: `RandomHorizontalFlip`, `RandomResizedCrop`. Also, the dataset has been normalized.

Inception

This model won the ImageNet challenge in 2014. Its novel is that it uses inception blocks. Such blocks apply four convolutions separately on the same feature map.

Its advantages are that it manages to get valuable information without using much resource, this is achieved by applying a 1x1 convolutions for dimensionality reduction.

A disadvantage is that the model seemed to start overfitting, but it’s inevitable sometimes with such large neural networks.

ResNet

This is one of the most cited papers, it was a pioneer on creating neural networks of more than 1000 layers. Two proposals are shown.

One advantage of the pre-activation ResNet is that the gradient flow is guaranteed. This slight change is not that noticeable with shallow neural networks, but it is with very deep ones.

Something to note is that for ResNets, ADAM usually performs worse than Stochastic Gradient Descent with momentum.

DenseNet

This also enables the use of very deep neural networks. It takes a new approach for the residual connections, and allows to use better information, saving resources and allowing the reltion between layers.

It consists of three parts: DenseLayer, DenseBlock and TransitionLayer.

An advantage is that DenseNet doesn’t show any issues with Adam. It is more parameter efficient.

Conclusion

As stated in the paper, ResNet seems to be a good starting point since it outperformed the other architectures and is usually faster. However, for larger tasks, it’s recommended to look at DenseNet.