ResNet Paper(Summary)

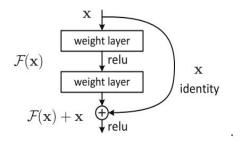
Deep Residual Learning for Image Recognition
----- Mridul Dubey

PROBLEM

Increasing network depth does not work simply by stacking layers together. Deep networks are hard to train because of vanishing gradient problems (As the network goes deeper, its performance gets saturated or even starts degrading rapidly). There were some methods to deal with it but they were not that efficient.

Residual Block

Instead of direct mapping that we apply in plain network, they suggest to use residual functions, they comment that it is easy to optimize the residual mapping than to optimize the original



Here F(x) is stacked non linear layers and x is an identity function(F(x)=x). Is is known as identity shortcut connection. The shortcut connections introduce neither extra parameter nor computation complexity.

Network Architecture

If we stack up many residual blocks we get a ResNet architecture, it consists of one convolution and pooling step followed by 4 layers of similar structure. A plain network can be made a ResNet by just adding a shortcut connection to it.It does not affect the efficiency of the model as the identity function does not take any time to train.In plain

architecture we have a residual block stack together and every residual block has two 3x3 conv. Layer ,whereas in **Deeper Bottleneck Architectures** we have three layer of 1x1 3x3 1x1 ,where 1x1 is responsible for reducing and increasing dimensions for 3x3 layer

Above figure shows how we can add a shortcut connection to convert a 34 layer plain to 34 layer residual.

For plain network error first decreases and after a particular layer error increases but now for residual network error decreases for bigger layers as well.

Results

- 1. Finally we have a deep residual learning framework that eases the training of deep networks.
- 2.Showed that extreme deep residual nets are easy to optimize, but the counterpart "plain" nets (that simply stack layers) exhibit higher training error when depth increases
- 3. Also showed that our deep residual nets can easily enjoy accuracy gains from greatly increasing depth, producing results substantially than the networks used previously