Session-5

CNN - Image Similarity

March 20, 2024

me:
```
fit_train(model, train_dl, test_d
          epoch=epochs, scheduler=s
          scheduler_step_metric='ac
```

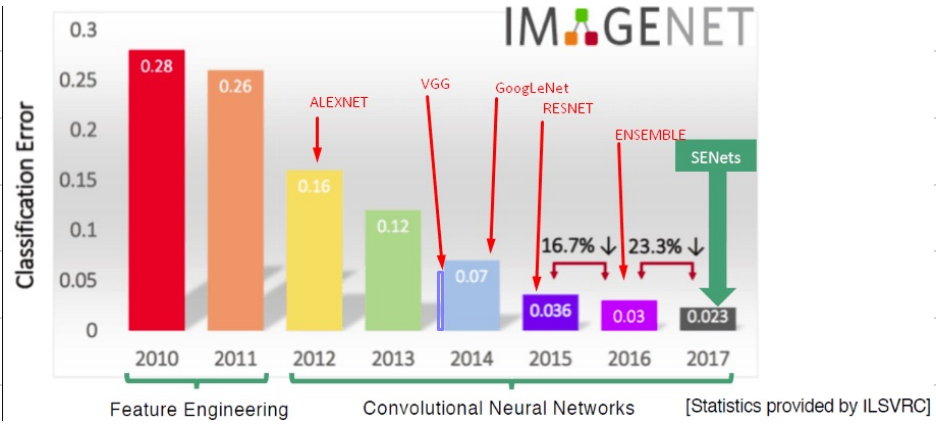
literally ever fan in my pc:

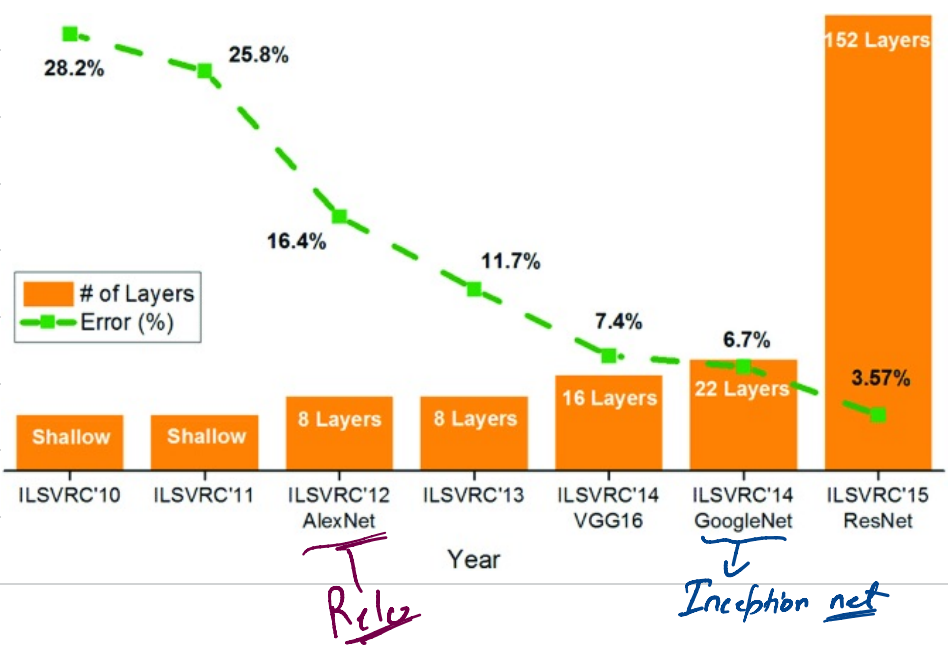
Me killing the training process knowing it won't improve further

Agenda

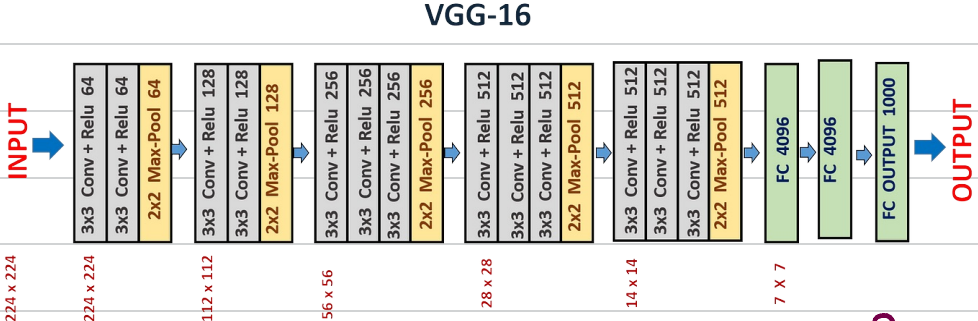
1. Need for deeper CNN
2. Inception net
3. Resnet
4. High RF
5. Image Similarity.

ImageNet Competition





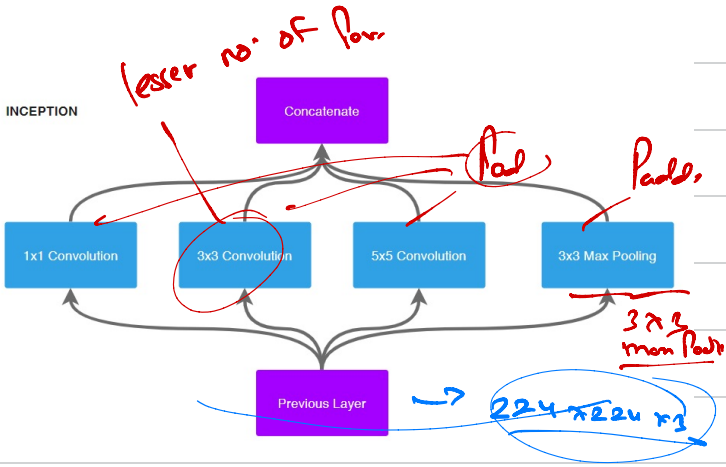
Problems With Training Deeper Models

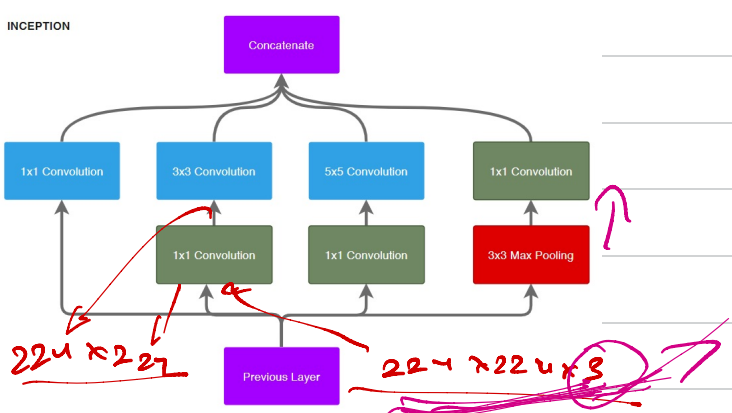


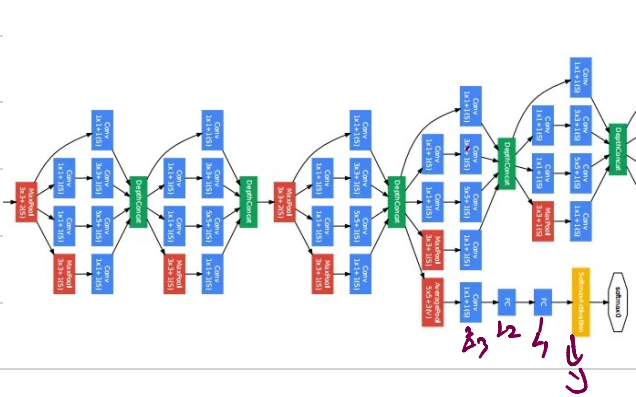
→ BN helps

→ Vanishing Gradients

GoogLeNet / Inception

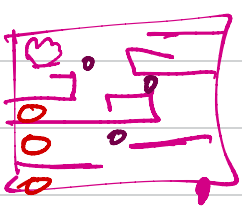


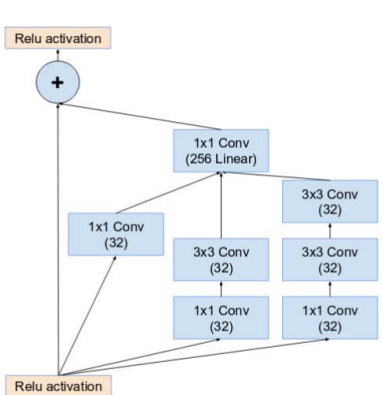


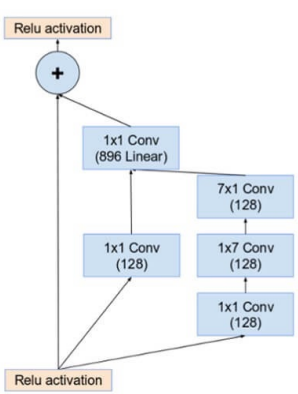


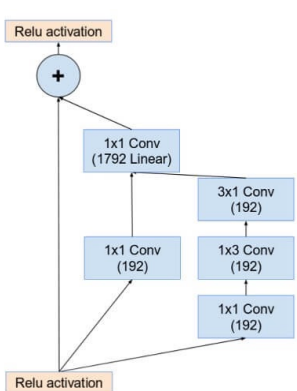
$$\frac{\partial L}{\partial y} \times \frac{\partial L}{\partial L_2} \times \frac{\partial L_2}{\partial L_1}$$

$$\frac{\partial L}{\partial y} \times \frac{\partial L}{\partial L_{22}} \times \frac{\partial L_{22}}{\partial L_2} \times \frac{\partial L_{21}}{\partial L_0} \cdots \frac{\partial L_2}{\partial L_1}$$







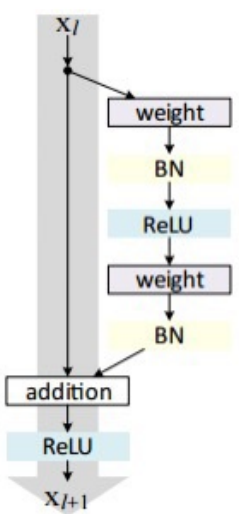


Residual Net

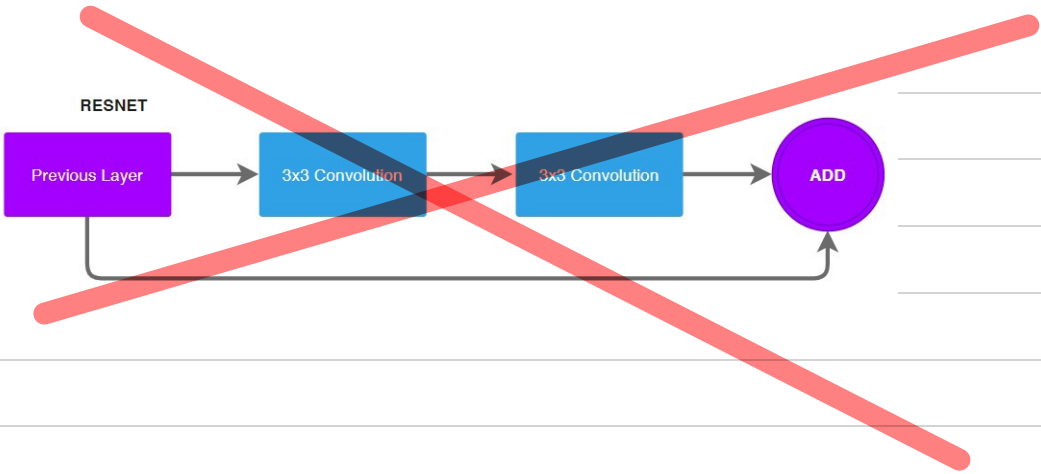
3x3 3x3 conv

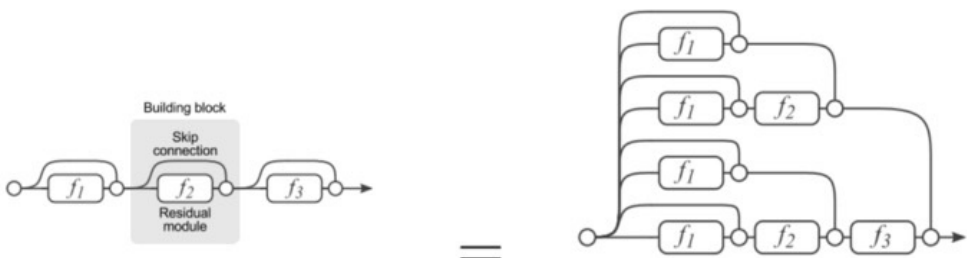
→ Can I train a CNN model with 1 million Identity layers??

→ We can train `def func(x): return x`



→ conv layer

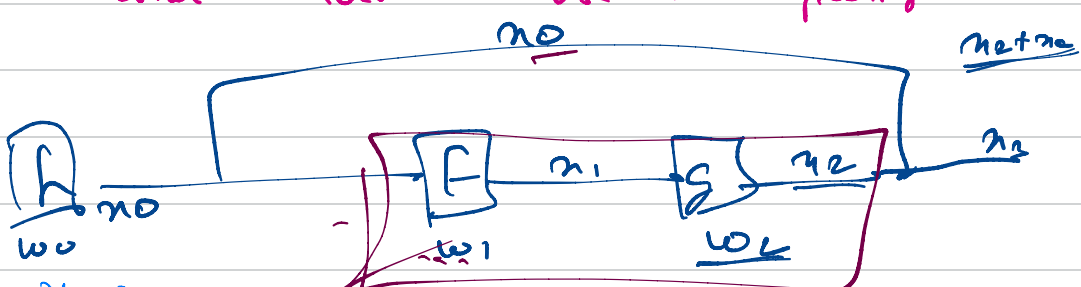




(a) Conventional 3-block residual network

(b) Unraveled view of (a)

Resnet doesn't use max-pooling



$$\frac{\partial L}{\partial w_2} = \frac{\partial L}{\partial x_3} \times \frac{\partial x_3}{\partial x_2} \times \frac{\partial x_2}{\partial w_2}$$

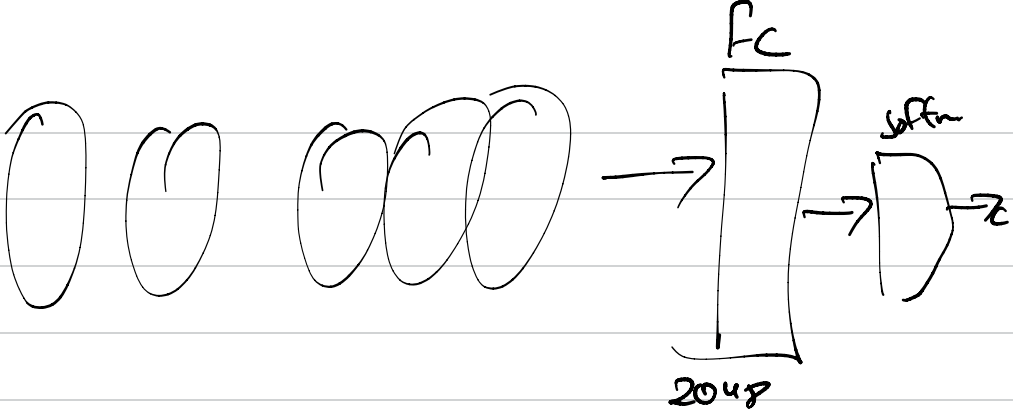
$$\frac{\partial L}{\partial w_0} = \frac{\partial x_0}{\partial w_0} \times \left(\frac{\partial L}{\partial x_3} \times \frac{\partial x_3}{\partial x_2} \times \frac{\partial x_2}{\partial w_2} \times \frac{\partial w_2}{\partial x_0} \right)$$

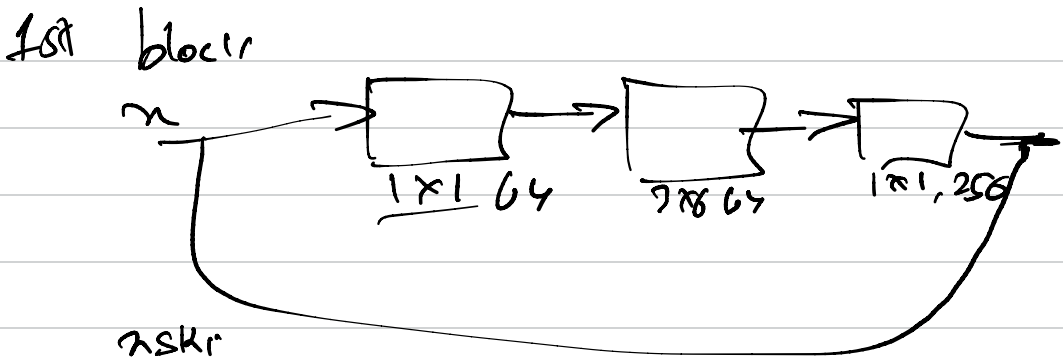
FRANCOIS CHOLLET

He says: They do this because it's what you should be doing. Residual connections with different shapes should be handled via a learned linear transformation between the two tensors, e.g. a 1x1 convolution with appropriate strides and border_mode, or for Dense layers, just matrix multiplication.

H.W -> Diff b/w dotted line & Normal line

Skip Connection


FC
softm
2048


1st block
x
1x1 64
3x3 64
1x1, 256
skip