

Popular CNNs and Novel Concepts

AlexNet (2012) and VGG (2014):

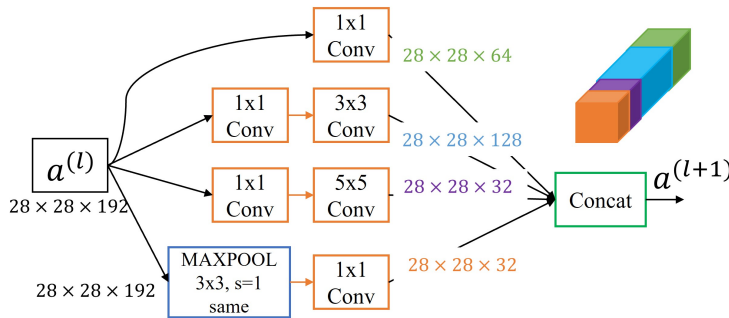
AlexNet has 8 layers with 60M parameters. Alexnet has used ReLU activations and **local response normalization** technique. **VGG-16** is designed to use the **deeper network** with 16 layers and 138M parameters.

Inception-v1 (2014):

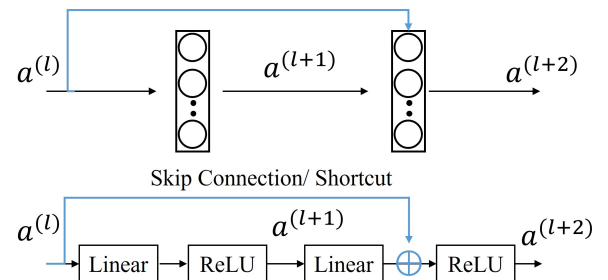
Inception-v1 has introduced **1×1 convolutional layer** to decrease the depth size of the feature map which significantly reduces the computational time. **Auxiliary classifiers** are also used to increase the gradient signal in the backpropagation stage. **Inception modules**, having 1×1 , 3×3 , and 5×5 parallel filters, are used to learn global and area specific features from the input.

ResNet (2015):

ResNet has introduced the concept of **skip connections** in order to address the issue of vanishing gradient in deep neural networks. It also uses **batch normalization** to solve the internal covariate shift problem.



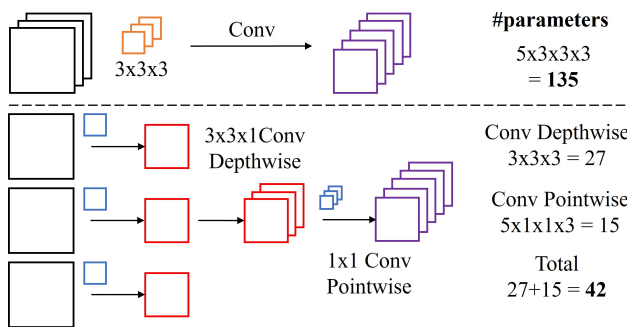
(a) Inception module



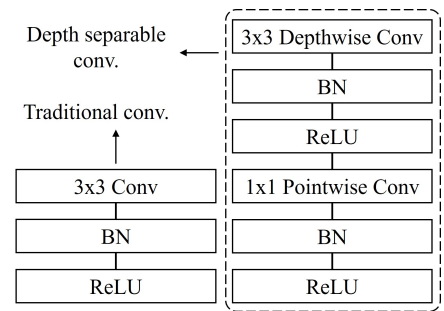
(b) ResNet residual module

MobileNet(2017):

MobileNet has utilized the concept of **depthwise separable convolution** (depthwise convolution + 1×1 pointwise convolution) to replace the traditional convolution technique. It greatly reduces network parameters and makes MobilenNet, a lightweight and efficient network.



(a) Traditional and depth separable convolution parameters



(b) Difference in convolutions

Summary:

CNN Architecture	#Layers	#Weights	Activation Function	New Concepts
AlexNet	8	60M	ReLU	Local Response Normalization
VGG-16	16	138M	ReLU	Deep network
Inception-v1	22	7M	ReLU	Inception Modules and auxiliary classifiers
ResNet-50	50	26M	ReLU	Residual Blocks and Batch Normalization
MobileNet-v1	28	4.2M	ReLU	Depth wise separable Convolution

