

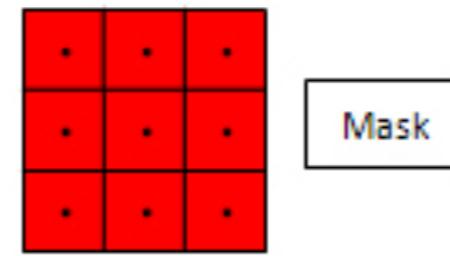
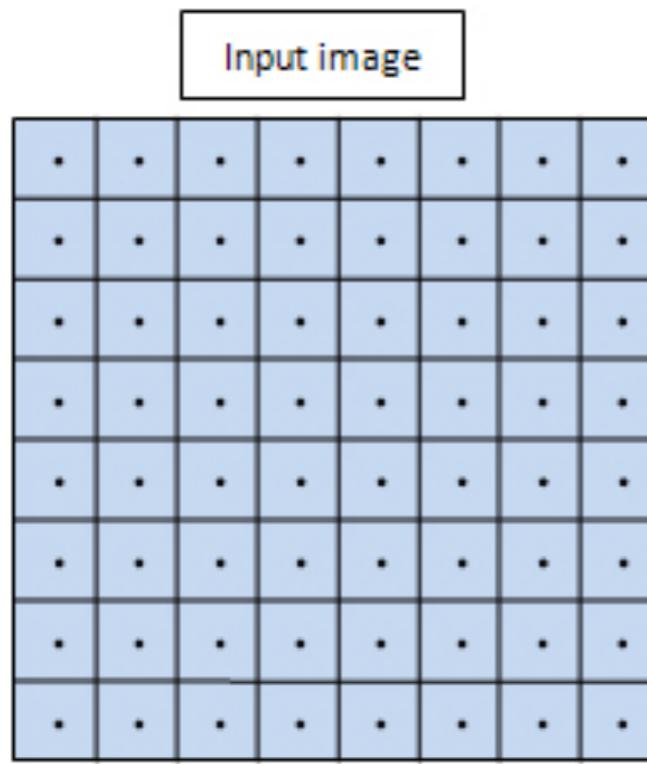
Deep Learning: Theory and Practice

Convolutional Neural Networks

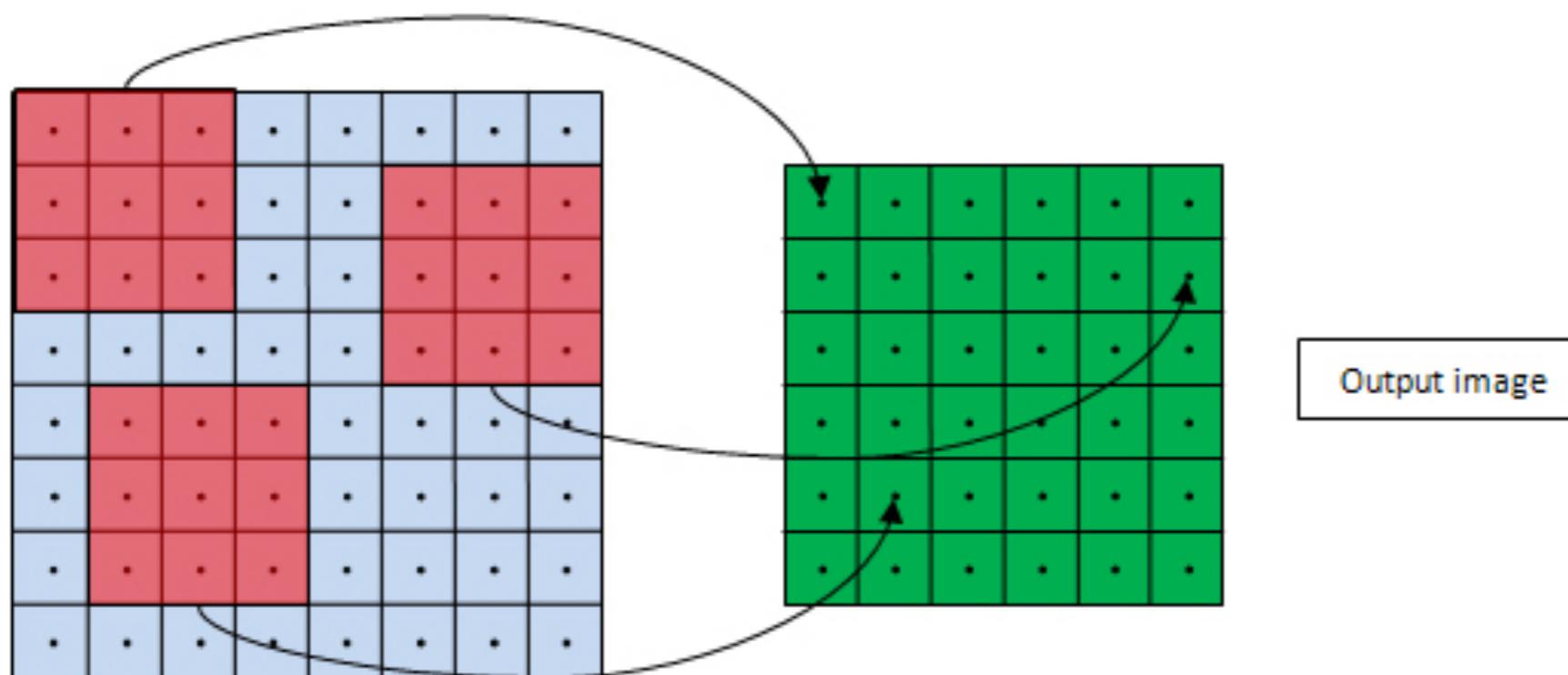
21-03-2019

deeplearning.cce2019@gmail.com

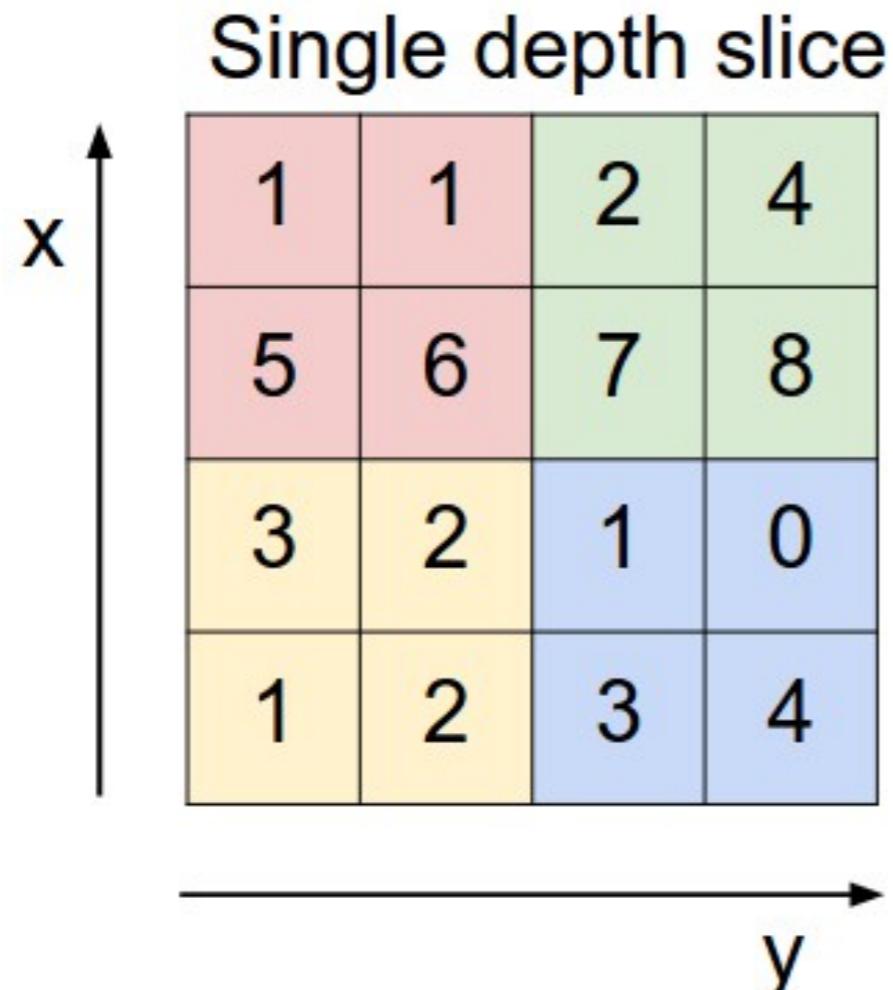
Other Architectures - Convolution Operation



Weight sharing



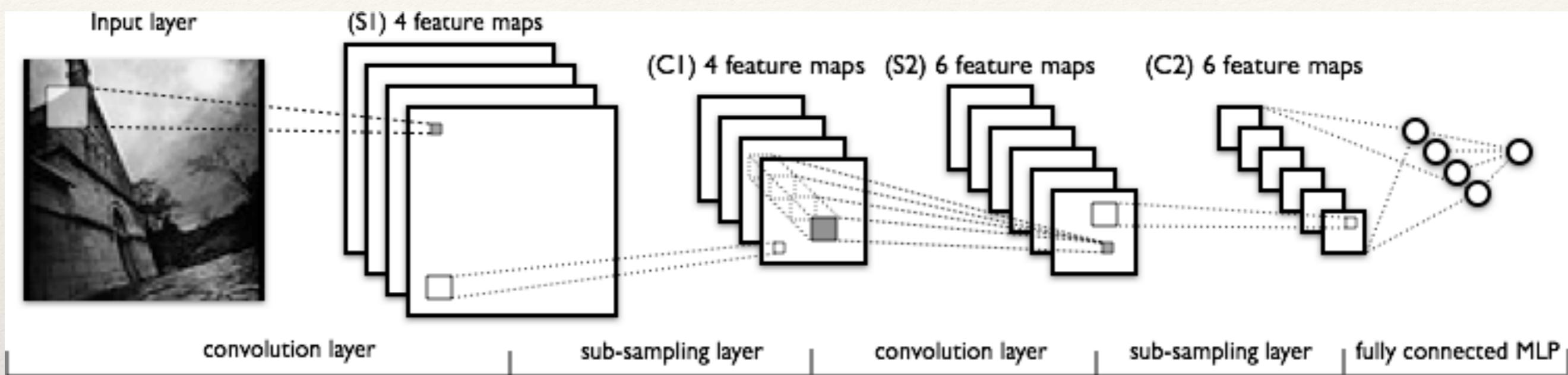
Max Pooling Operation



max pool with 2x2 filters
and stride 2

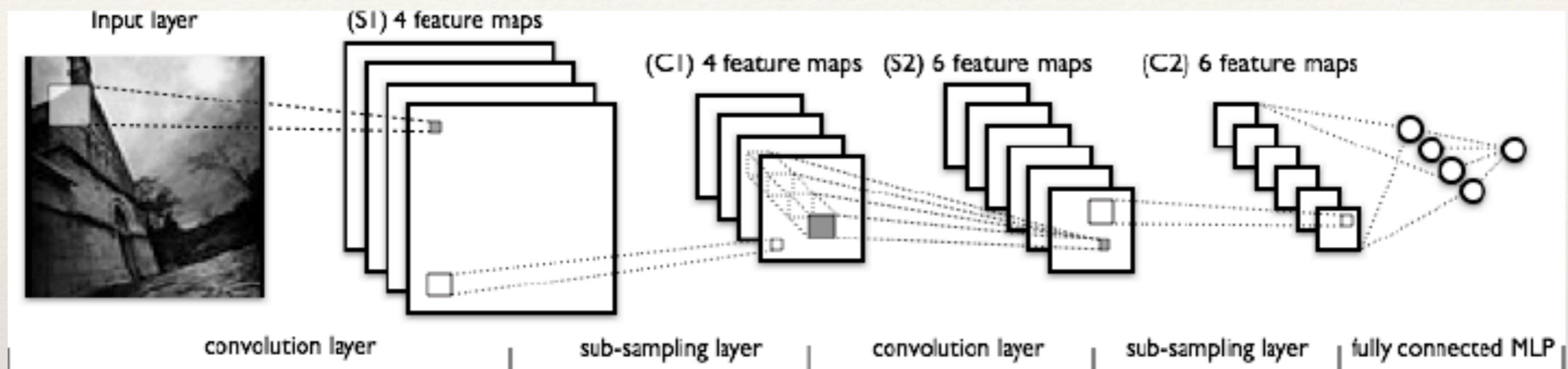
| | |
|---|---|
| 6 | 8 |
| 3 | 4 |

Convolutional Neural Networks



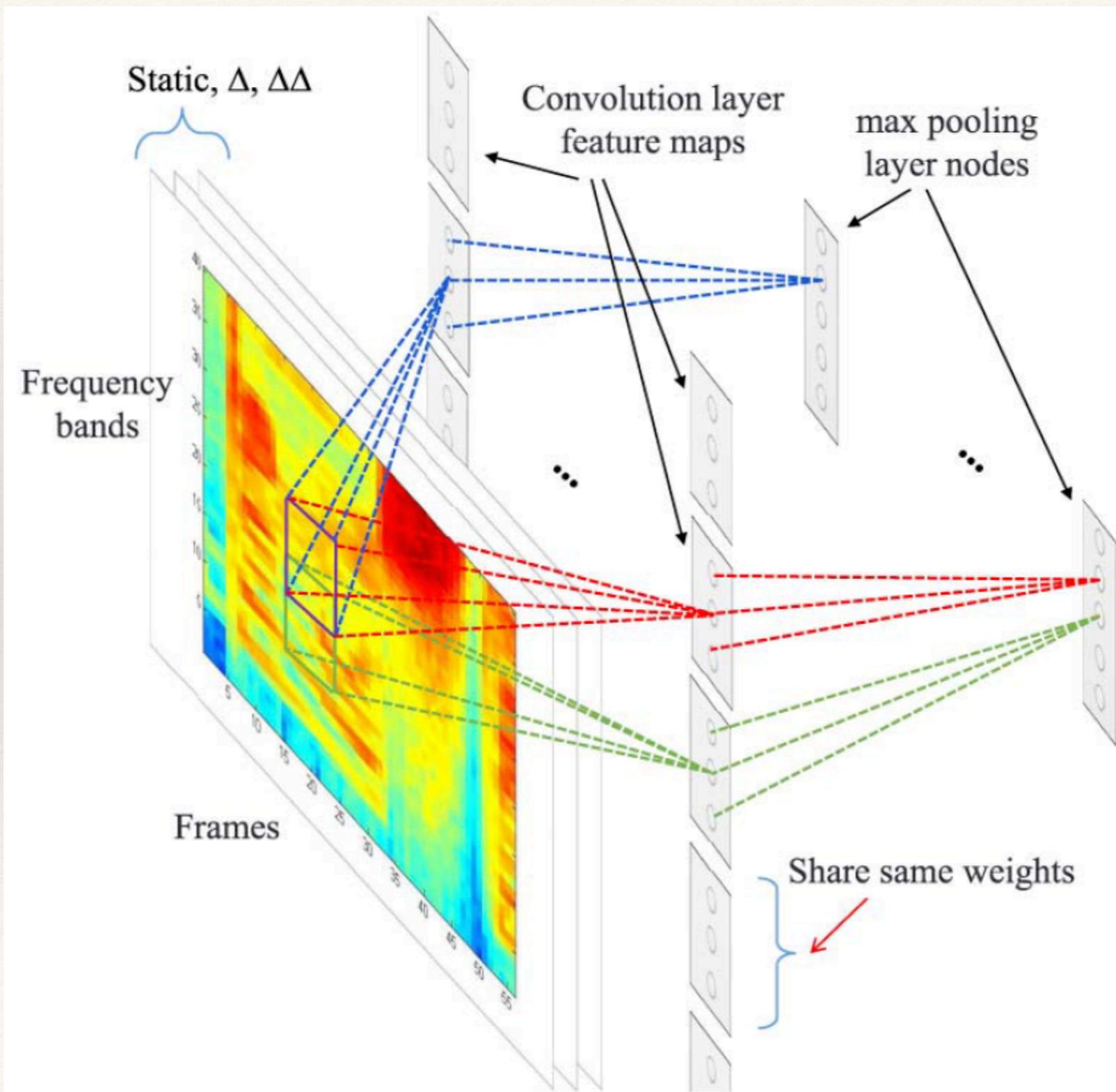
- Multiple levels of filtering and subsampling operations.
- Feature maps are generated at every layer.

Convolutional Neural Networks



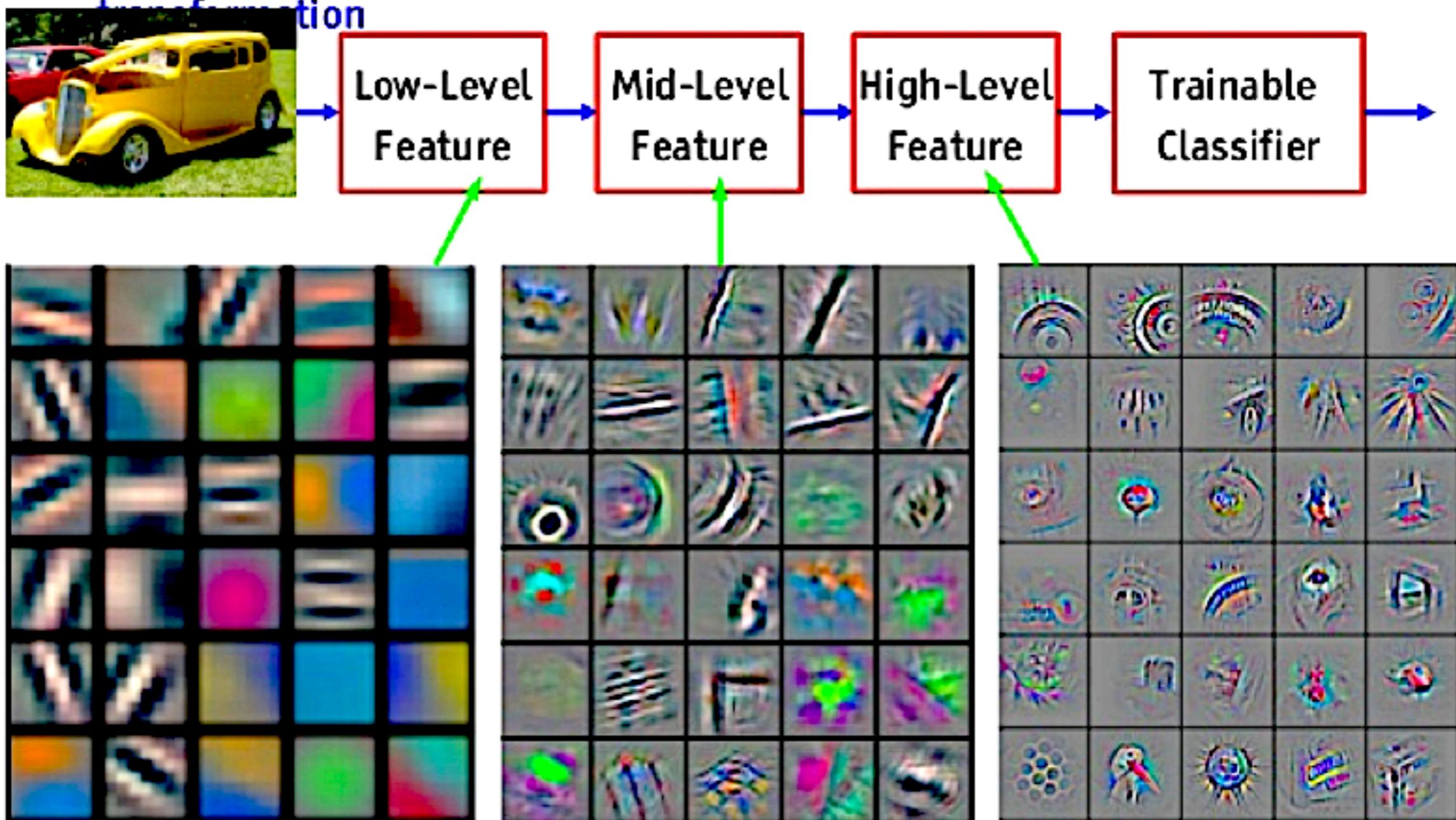
- Multiple levels of filtering and subsampling operations.
- Feature maps are generated at every layer.

CNNs for Speech and Audio



Representation Learning in CNNs

■ It's **deep** if it has **more than one stage** of non-linear feature transformation



Feature visualization of convolutional net trained on ImageNet from [Zeiler & Fergus 2013]