

Depthwise Separable Convolution

KEY INSIGHT

Spatial and channel-wise processing can be separated

Standard Convolution

Single Operation
All Channels Together

Params: $D^2 \times M \times N$
(expensive)

Depthwise Separable

Depthwise Conv
Each Channel Separate



Pointwise (1×1)
Combine Channels

Params: $D^2 \times M + M \times N$
(efficient)

Efficiency Gains

Computational Savings
8-9x fewer ops

Parameter Reduction
Massive reduction



Used In
MobileNet, EfficientNet, Xception



Trade-off
Slightly lower accuracy, massive efficiency