

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

8-9× fewer ops

Parameter Reduction

Massive reduction



Used In

MobileNet, EfficientNet, Xception



Trade-off

Slightly lower accuracy, massive efficiency