

Consider 3×3 convolution & depthwise separable convolution

Compare # of weights? # of computations?

of weights

conv

$$3 \times 3 \times 20 \times 40 = 7200$$

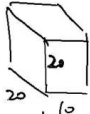
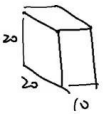
of computations

$$(3 \times 3 \times 20) \times 15 \times 15 \times 40 = 1,620,000$$

depth

$$3 \times 3 \times 20 + 1 \times 1 \times 20 \times 40 = 980$$

$$3 \times 3 \times 20 \times 15 \times 15 + 1 \times 1 \times 20 \times 15 \times 15 \times 40 = 40500 + 180,000 = 220,500$$



Design 3 cascaded convolution layers 1×1 , 3×3 , 1×1 , such that input & final output feature maps are both $20 \times 20 \times 10$.
Zero padding? stride? # of channels? for each layer

zero padding: P

stride: S

$$\frac{(20 - 1 + 2P_1)}{S_1} + 1 = 20 \Rightarrow \begin{cases} P_1 = 0 \\ S_1 = 1 \end{cases} \text{ channel}_1 = 10$$

$$\frac{(20 - 3 + 2P_2)}{S_2} + 1 = 20 \Rightarrow \begin{cases} P_2 = 1 \\ S_2 = 1 \end{cases} \text{ channel}_2 = 10$$

$$\frac{(20 - 1 + 2P_3)}{S_3} + 1 = 20 \Rightarrow \begin{cases} P_3 = 0 \\ S_3 = 1 \end{cases} \text{ channel}_3 = 10$$

Input $20 \times 20 \times 10$

CNN layer 1×1
 $20 \times 20 \times 10$

CNN layer 3×3
 $20 \times 20 \times 10$

CNN layer 1×1
 $20 \times 20 \times 10$

Output $20 \times 20 \times 10$