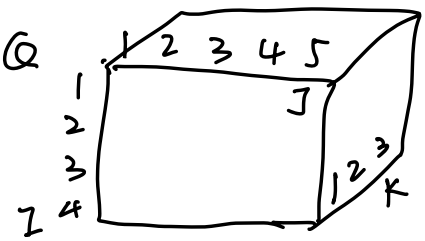
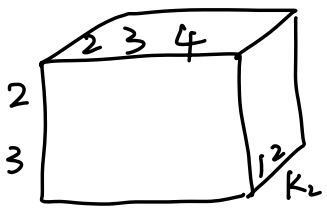
22-S2-Q4

Q





(a) Q fully connect?

Solution

$$y_{ijk} = \sum_{i'=1}^{I} \sum_{j'=1}^{J} \sum_{k'=1}^{K} w_{ijk}^{i'j'k'} x_{i'j'k'} \qquad \begin{array}{l} i = 2 \text{ to } I-1 \\ j = 2 \text{ to } J-1 \\ k = 1 \text{ to } k_2 \end{array}$$

$$N_{params} = [(I-2)(J-2)k_2] \times (I \times J \times k_1)$$

$$N_{multiplications} = (I-2)(J-2)k_2 \times I \times J \times k_1$$

(b) Q: CNN $3 \times 3 \times k_1$

Solution

$$y_{ijk} = \sum_{m=1}^{3} \sum_{n=1}^{3} \sum_{k'=1}^{k_1} h_{mnk'k} x_{(i+m-2)(j+n-2)k'}$$

$$N_{params} = (3 \times 3 \times k_1) \times k_2$$

$$N_{mult} = (I-2)(J-2)k_2 \times 3 \times 3 \times k_1$$

(c) Q differences?

Solution

	fully connected	CNN
① parameters	massive ~	significantly fewer ~
② training time	longer	fast
③ memory requirement	higher	lower
④ multiplication	a large number	fewer
⑤ capturing local pattern	less effective	effectively