⇒ We're now interested in parameter calculation in a CNN architecture.

↓

two steps

I. First, determine the output shape from input shape + layer info.

II. calculate parameters of a layer

↳ covered in class lecture

[also look at the notebook provided for tensorflow implementation]

⇒ Things are a little different during counting #param compared to normal convolution on images.

↓   ↓

in tensorflow,
you do not specify
value of P.

You define.

padding = valid/same

$$\frac{\omega - F + 2P}{S} + 1$$

P = no. of padding
= 0/1/2/3/ ... ...

no padding

pad extra
layer

↳ to keep i/p image size
fixed

wrong
interpretation

↳ o/p size depends on stride

eq^n now

$$\frac{\omega - F + ?}{S} + 1$$

purpose of padding is to
avoid fraction ≈ mismatch

shape ≈ last layer?

⇒ let's look at the examples.

① i/p = (32, 32, 3)

conv → filter = (3, 3)

#kernels = 32

padding = same

stride = 1

(from :ipynb)

↓

o/p = (32, 32, 32)

$$o/p = \frac{32 - 3 + ?}{1} + 1$$

= 30

? = 2

$$\rightarrow \frac{30 - 3 + 2}{1} + 1 = 32$$

② everything as before, except stride = 2

↓

o/p = (16, 16, 32)

$$o/p = \frac{32 - 3 + ?}{2} + 1$$

$$= \frac{29}{2} + 1$$

$$= 14.5 + 1$$

$$= 15.5$$

↑
fraction size not possible

? = 1

$$= \frac{30}{2} + 1$$

$$= 16$$

$\Downarrow$

obs-1 o/p size is not the same as i/p in 'same' padding.

③ stride = 3

$$o/p = \frac{32 - 3 + \ ?}{3} + 1$$

o/p = (11, 11, 32)

$$= \frac{29}{3} + 1$$

? = 1

$$= 9.67 + 1$$

$$= \frac{29 + 1}{3} + 1$$

$$= 10.67$$

$$= 10 + 1$$

$$= 11$$

④ filter = (4, 4)

stride = 2

$$o/p = \frac{32 - 4 + \ ?}{2} + 1$$

o/p = (16, 16, 32)

$$= \frac{28}{2} + 1$$

? = 2

$$= 15$$

$$= \frac{32 - 4 + 2}{2} + 1$$

$$= 16$$

pad
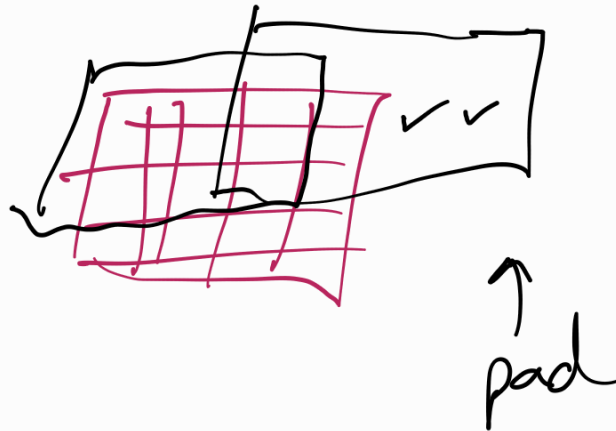
discussion

here, $? = 2P$

$\lfloor_2$ because are pad on both side

when, $2P = 2/4/\cdots$ (even)

$$P = 1/2/\cdots\cdots$$

u pad 1 layer.

but when, $2P = 1/3/\cdots$ (odd)

$$P = 0.5$$

how to find
the value?

↓ meaning ??

↓ interpretation

— u pad only on one side/

— u pad on both side but
  ignore operation on the
  last portion

Solution
_____

⇒ o/p size will be ~~determined~~ by the
  stride value.

⇓

S = 2,   o/p size will be   ip size/2

S = 3,   "   "   "   "   "   " /3

S = 4,   "   "   "   "   "   " /4

$$32 \xrightarrow{s=2} 16$$

$$32 \xrightarrow{s=3} 10 \cdot 67 \approx 11$$

$$32 \xrightarrow{s=4} 8$$

irrespective of the filter size

— add necessary padding to match the o/p dimension

(calculate)

Valid padding

$P = 0$ (no padding)

$$\Rightarrow \frac{32 - 7}{4} + 1$$

$$= \frac{25}{4} + 1$$

$$= 6 \cdot 2 + 1$$

$$\approx 6 + 1$$

$$= 7$$

Noel 11.3.24