नेपाल टेलिकम
राष्ट्रको सञ्चार

Sun Mon Tue Wed Thu Fri Sat

Chapter 2:

Q1) Lenet5:

	In, out, kernel	Params
Conv-1	1, 6, 5 = 5x5x6+6	156
Pool-1	~~6, 16, 5~~ =	
Conv-2	16, 5 = 6x5x5x16+16 =	2416
Pool-2	— — .	
Linear-1	16*5*5, 120 = 16*5*5*120+120 =	48,120
Linear-2	120, 84 = 120x84+84 =	10164
Linear-3	84, 10 = 84x10+10 =	850

⇒ 61,706

Q2) Alexnet

Pool(Conv 1)	1, 96, 11 = 11x11x96+96 =	11712
Pool(Conv 2)	96, 256, 5 = 5x5x96x256+256 =	614656
Conv 3	256, 384, 3 = 3x3x384x256+384 =	885120
Conv 4	384, 384, 3 = 3x3x384x384+384 =	1327488
Pool(Conv. 5)	384, 256, 3 = 3x3x384x256+256 =	884992
Linear-1	6400, 4096 = 6400x4096+4096 =	26218496
Linear-2	4096, 4096 = 4096x4096+4096 =	16781312
Linear-3	4096, 1000 = 4096x1000+1000 =	4097000

⇒ 50,820,776

Below is Alexnet with 61M Parameter

a b (x(+ b
b (a (x(+1)

Sun Mon Tue Wed Thu Fri Sat

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3) ~~ZFNet~~ 2) Alexnet with 61 M.

Pool Conv 1 3,64,11 = 1x64x11x11+64 = 23296
Pool Conv 2 64,192,5 = 64x192x5x5+192 = 307392
Conv 3 192,384,3 = 192x3x3x384+384 = 663936
Conv 4 384,256,3 = 384x3x3x256+256 = 884992
Pool Conv 5 256,256,3 = 256x3x3x256+256 = 590080
AvgPool ~~9216~~ ~~4096~~ =
Linear-1 9216, 4096 = 9216x4096+4096 = 37752832
Linear-2 4096, 4096 = 4096x4096+4096 = 16781312
Linear-3 4096, 1000 = 4096x1000+1000 = 4097000

ZFNET → 61,100,840

(3)

Pool Conv 1 1,64,7 = 1x7x7x64+64
Pool Conv 2 64,192,5 = 64x5x5x192+192
Conv 3 192,512,3 = 192x3x3x512+512
Conv 4 512,1024,3 = 512x3x3x1024+1024
Pool Conv 5 1024,512,3 = 1024x3x3x512+512
Linear-1 18432, 4096 = 18432x4096+4096
Linear-2 4096, 4096 = 4096x4096+4096
Linear-3 4096, 1000 = 4096x1000+1000

→ 107,020,712.

Sun Mon Tue Wed Thu Fri Sat

(4) VGG16

Conv2	3, 64, 3	=	1792
Pool Conv 2	64, 64, 3	=	36928
Conv3	64, 128, 3	=	73856
Pool Conv 4	128, 128, 3	=	147584
Conv 5	128, 256, 3	=	295168
Conv 6	256, 256, 3	=	590080
Pool Conv 7	256, 256, 3	=	590080
Conv 8	256, 512, 3	=	1180160
Conv 9	512, 512, 3	=	2359808
Pool Conv 10	512, 512, 3	=	2359808
Conv 11	512, 512, 3	=	2359808
Conv 12	512, 512, 3	=	2359808
Pool Conv 13	512, 512, 3	=	2359808
Linear-1	25088, 4096	=	102764544
Linear-2	4096, 4096	=	16781312
Linear-3	4096, 1000	=	4097000
		→	138357544

idea, in → a, b, c ← out, kernel, stride

Formula → $a \times b \times c \times c + b$ ← out channel

in, out, kernel size (1 in linear)

Sun Mon Tue Wed Thu Fri Sat

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5) VGG19, in out kernel

Conv1	3, 64, 3	=	1792
Pool Conv2	64, 64, 3	=	36928
Conv3	64, 128, 3	=	73856
Pool Conv4	128, 128, 3	=	147584
Conv5	128, 256, 3	=	295168
Conv6	256, 256, 3	=	590080
Conv7	256, 256, 3	=	590080
Pool Conv7+	256, 256, 3	=	590080
Conv8	256, 512, 3	=	~~1180160~~ 1180160 ~~590080~~
Conv9	512, 512, 3	=	~~2359808~~ 2359808 ~~590080~~
~~Pool~~ Conv10	512, 512, 3	=	~~2359808~~ 2359808 ~~590080~~
Pool Conv10+	512, 512, 3	=	~~590080~~ 2359808
Conv11	512, 512, 3	=	~~590080~~ 2359808
Conv12	512, 512, 3	=	~~590080~~ 2359808
Conv13	512, 512, 3	=	~~590080~~ 2359808
Pool Conv13+	512, 512, 3	=	~~590080~~ 2359808
Linear-1	7801, 4096	=	102764544
Linear-2	4096, 4096	=	16781312
Linear-3	4096, 1000	=	4097000

→ 143,667,240