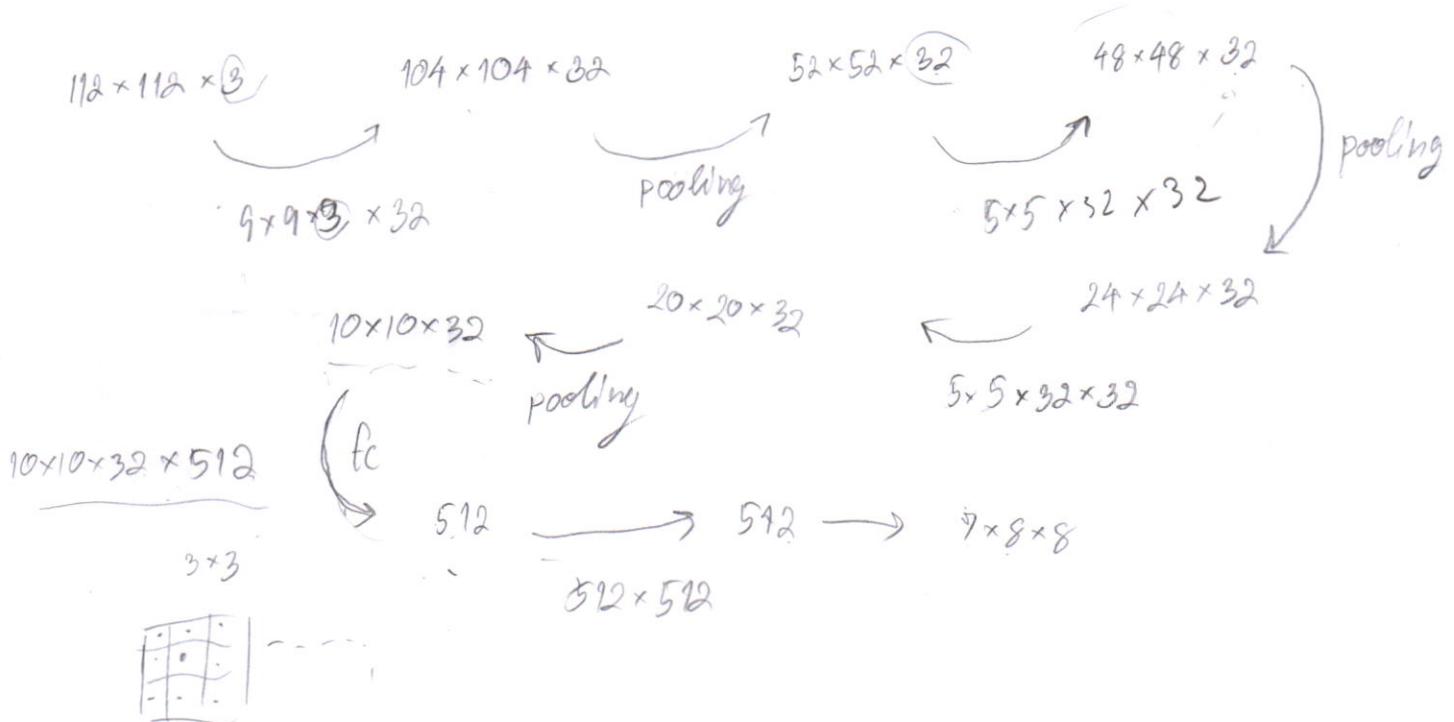


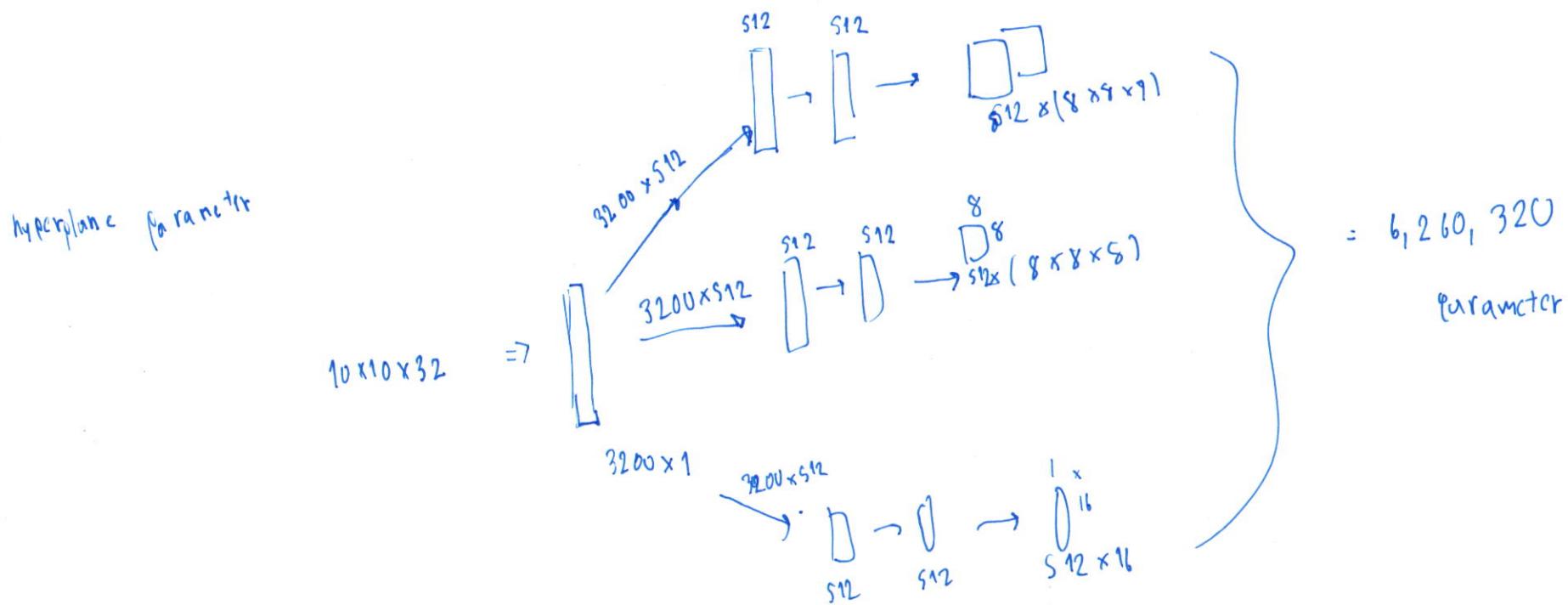
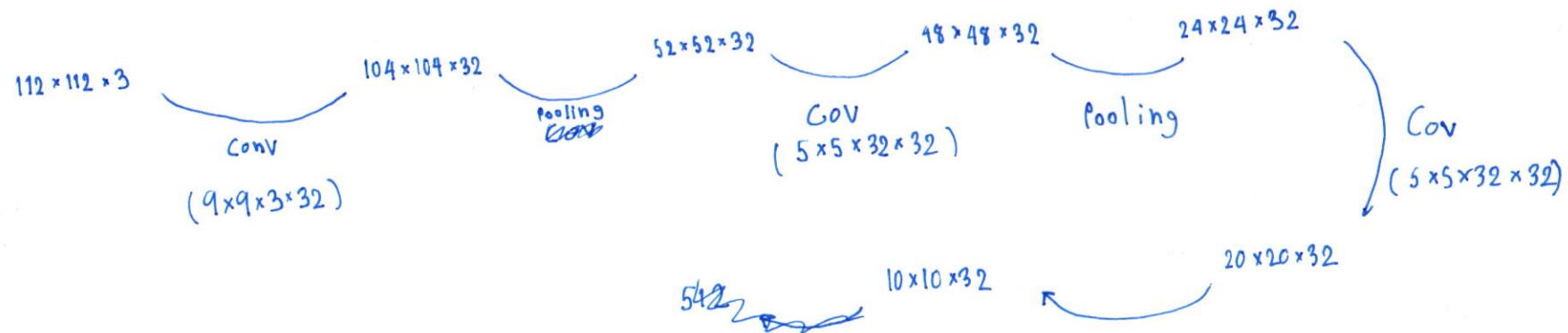
ស៊ីអីហ្មុត្រូ ឈីលីលី 59011449



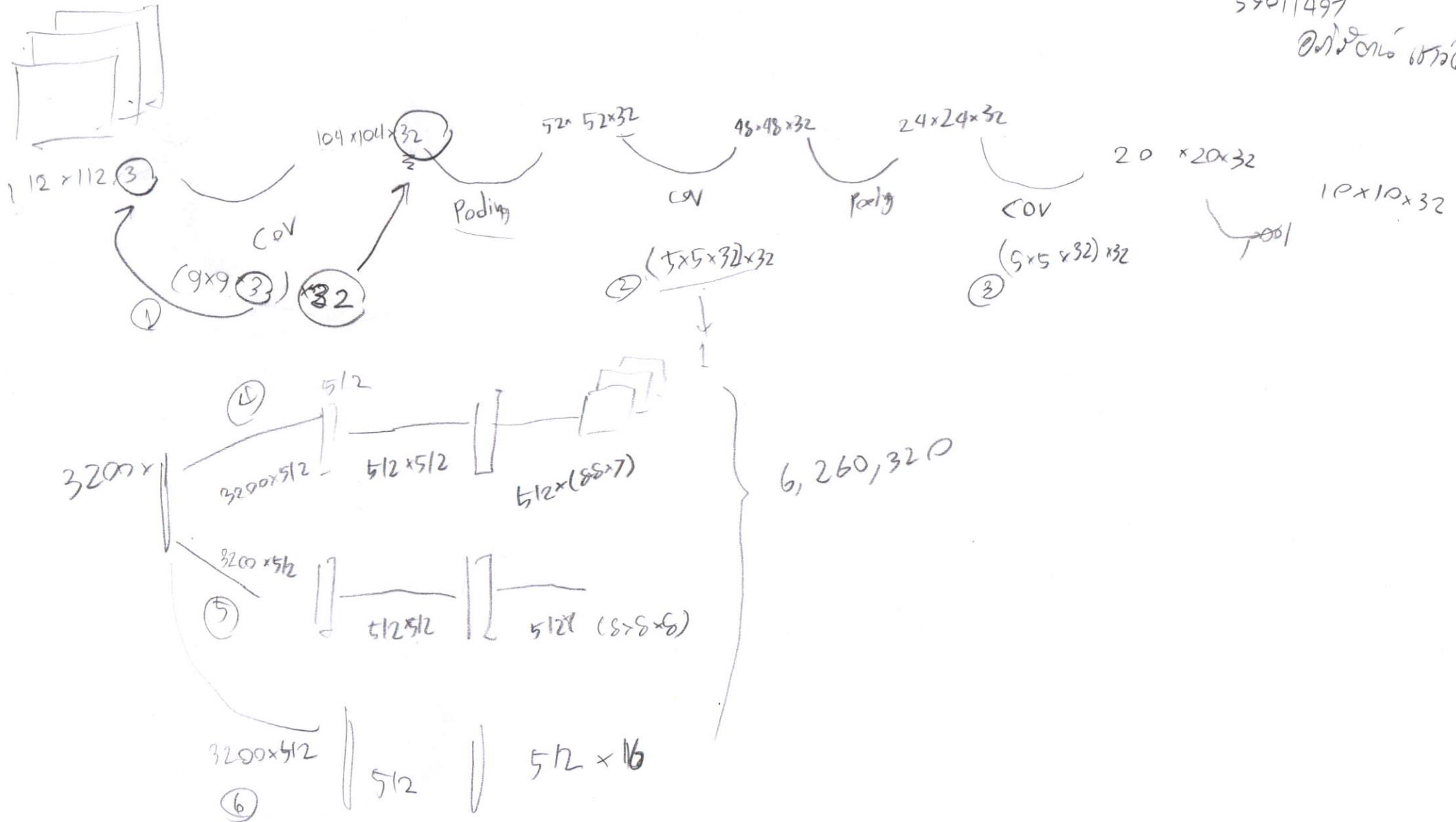
$$\text{params} \sim \mathcal{N}(0, I_{512})$$

$$2 + u \quad \text{---} \quad u + 92 \times 8 \times 8$$

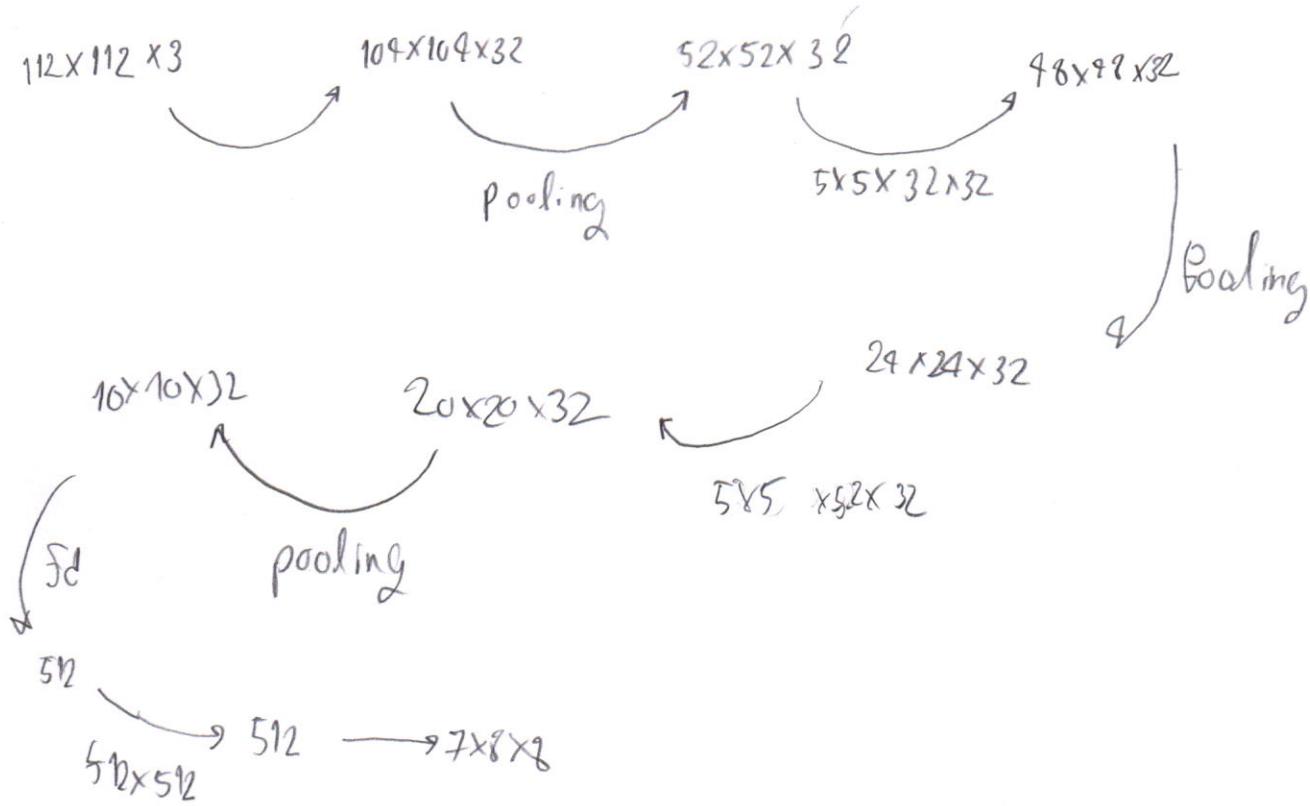
$\{ \rightarrow n \}$ + 512x16



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ເນັ້ນໄງ້ ດອນໄລ໌ 59011179



$$\text{Param 1} = 3200 \times 512 + 512 \times 512 + 512 \times 7 \times 8 \times 8$$

$$2 = 1 + 512 \times 7 \times 8 \times 8$$

$$3 = 1 + 512 \times 76$$

59010759

Bundit Seeda

$$\begin{array}{ccccccc}
 3@112^2 & \rightarrow & 32@104^2 & \rightarrow & 32@52^2 & \rightarrow & 32@48^2 \\
 & & m=9^2 & & m=5^2 & & m=5^2 \\
 & & \text{maxpool} & & \text{maxpool} & & \text{maxpool} \\
 & & 9 \times 32 \times 52 & & 5 \times 32 \times 52 & & 5 \times 32 \times 52 \\
 & & \downarrow & & \downarrow & & \downarrow \\
 7776 & & & = & 25,600 & & = \\
 & & & & & & 25,600 \\
 & & & & & & = \\
 & & & & & & 58,976
 \end{array}$$

$$32@10^2 \rightarrow 512 \rightarrow 512 \rightarrow 7@8^2 \quad (\text{Path bedAtt})$$

$$(32,000 \times 512) + (512 \times 512) + (512 \times 448) = 2,129,920$$

$$\rightarrow 2129920 = 2129920$$

$$\rightarrow 8@8^2 \quad (\text{Joint Deff/ln})$$

sum =

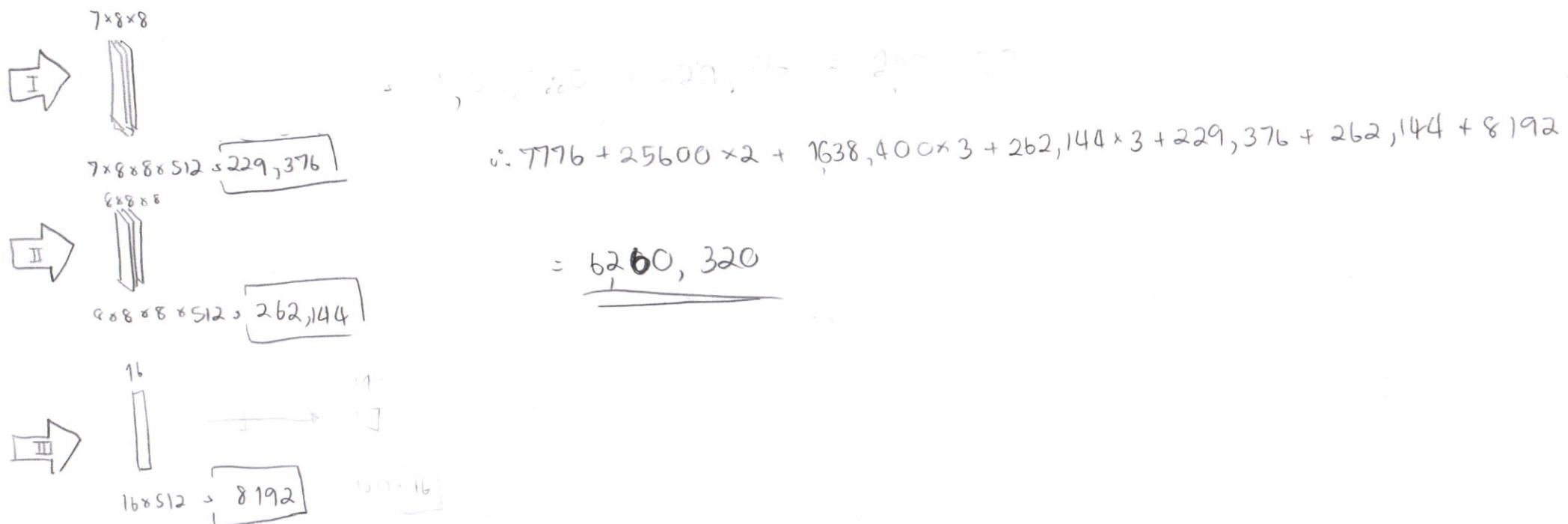
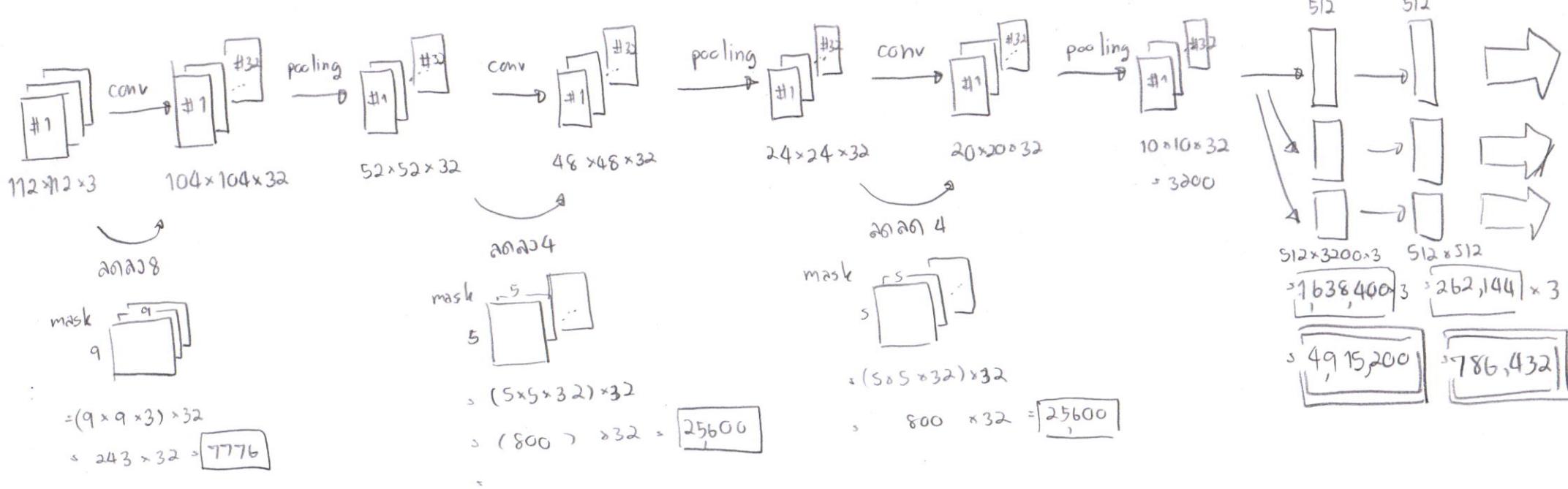
$$6,260,320$$

$$(32,000 \times 512) + (512^2) + (512 \times 384) = 2,162,688$$

$$\rightarrow 16 \quad (\text{Joint regression})$$

hyper parameter

$$(32,000 \times 512) + (512^2) + (512 \times 16) = 1,908,736$$



$$\begin{aligned}
 & 9 \times 9 \times 32 \times 3 + 5 \times 5 \times 32 \times 32 + 5 \times 5 \times 32 \times 32 + 10 \times 10 \times 32 \times 512 \times 3 \\
 & + 512 \times 512 \times 3 + 512 \times 7 \times 8 \times 8 + 512 \times 8 \times 8 \times 8 + 512 \times 16 = 6,260,320 \text{ purams}
 \end{aligned}$$

ନାନ୍ଦିଶ୍ଵରୀ ପ୍ରାଚୀମନ୍ତର

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મનુષ્યની બન્દોરણ

59011061

$$(9 \times 9 \times 3) \times 32 \rightarrow (5 \times 5 \times 32) \times 32 \rightarrow (5 \times 5 \times 32) \times 32$$

①

②

③



flatten

~~10 × 10 × 32~~

3200 × 1

3200 × 512

3200 × 512

3200 × 512

512

512

512

512 × 512 ⑦

512 × 512 ⑧

512 × 512 ⑨

512

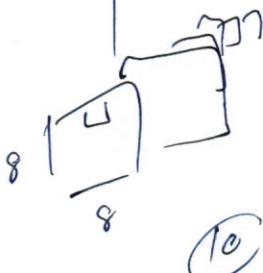
512

512

512 × (8 × 8 × 7)

512 × (8 × 8 × 7)

512 × 16

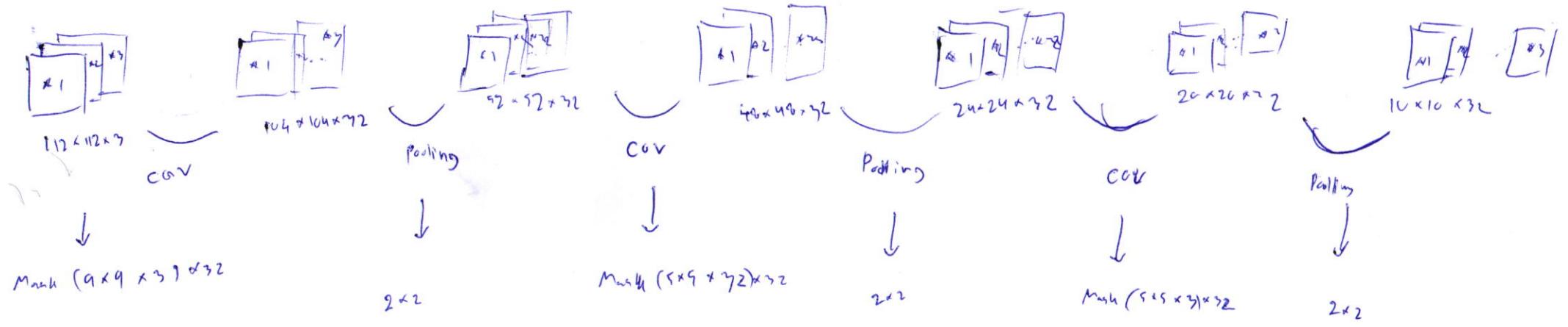


⑩

⑪

⑫

Sum parameter = 6,260,320



* hyperplane parameter

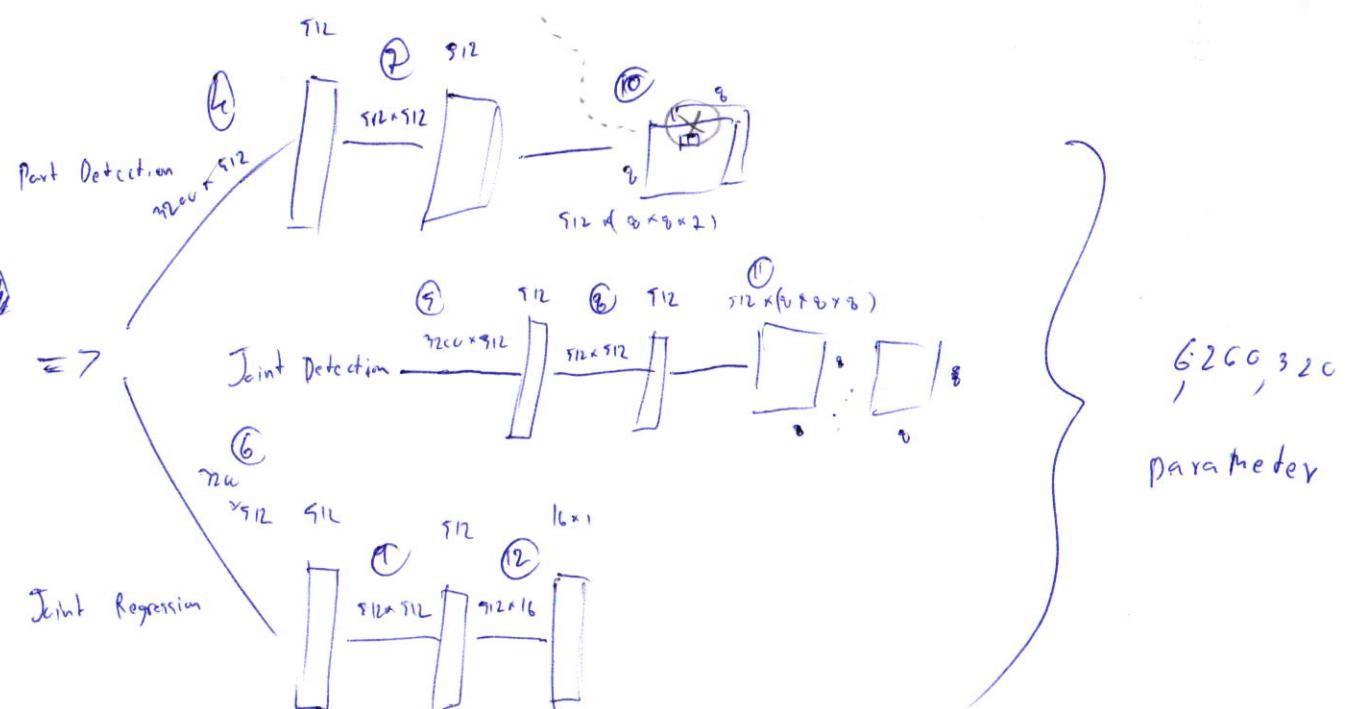
$$(9 \times 9 \times 3) \times 32 \quad ①$$

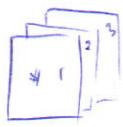
$$\downarrow$$

$$(9 \times 9 \times 32) \times 32 \quad ②$$

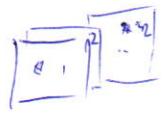
$$\downarrow$$

$$(9 \times 9 \times 32) \times 32 \quad ③$$



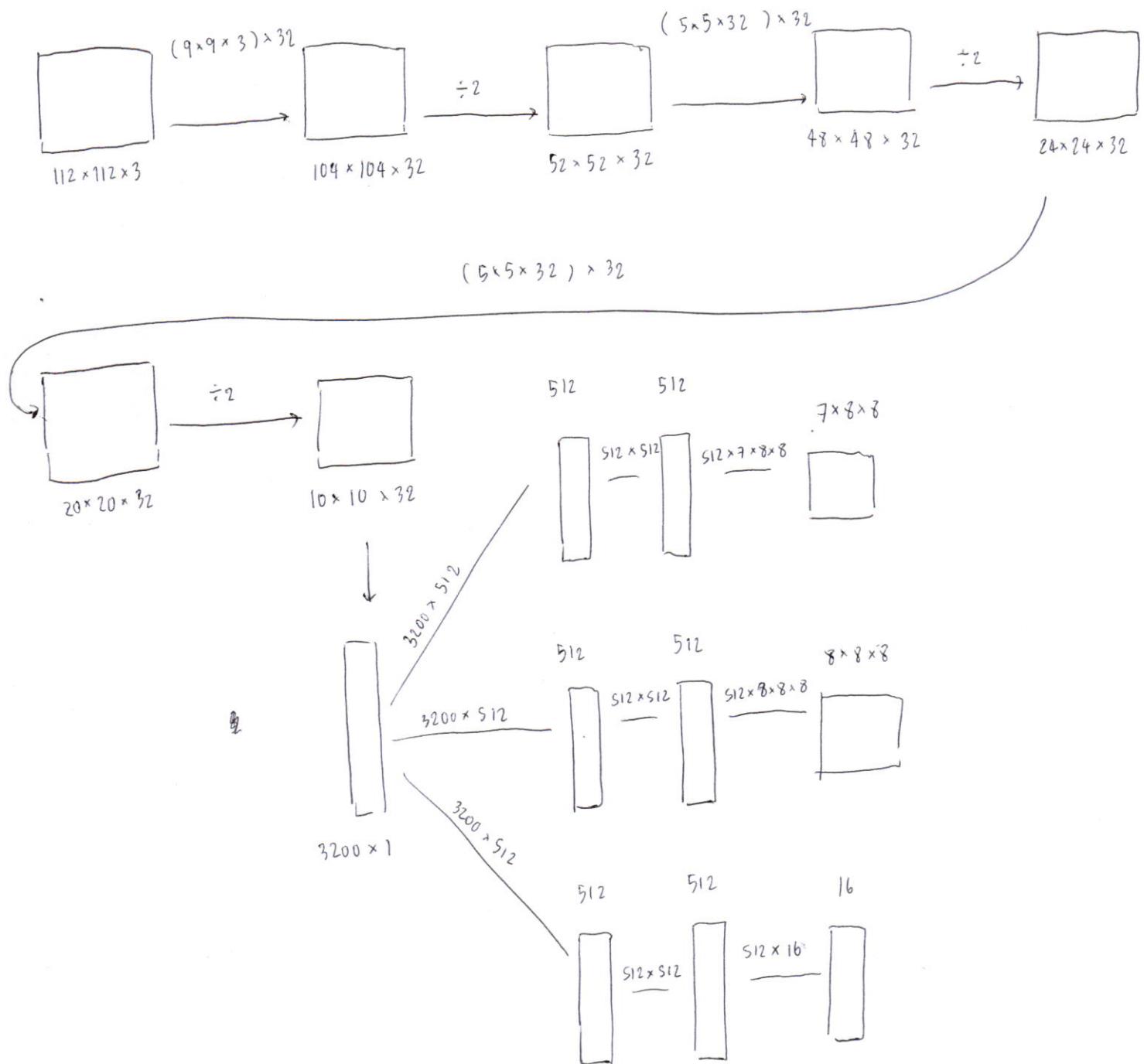


112 × 112 × 3



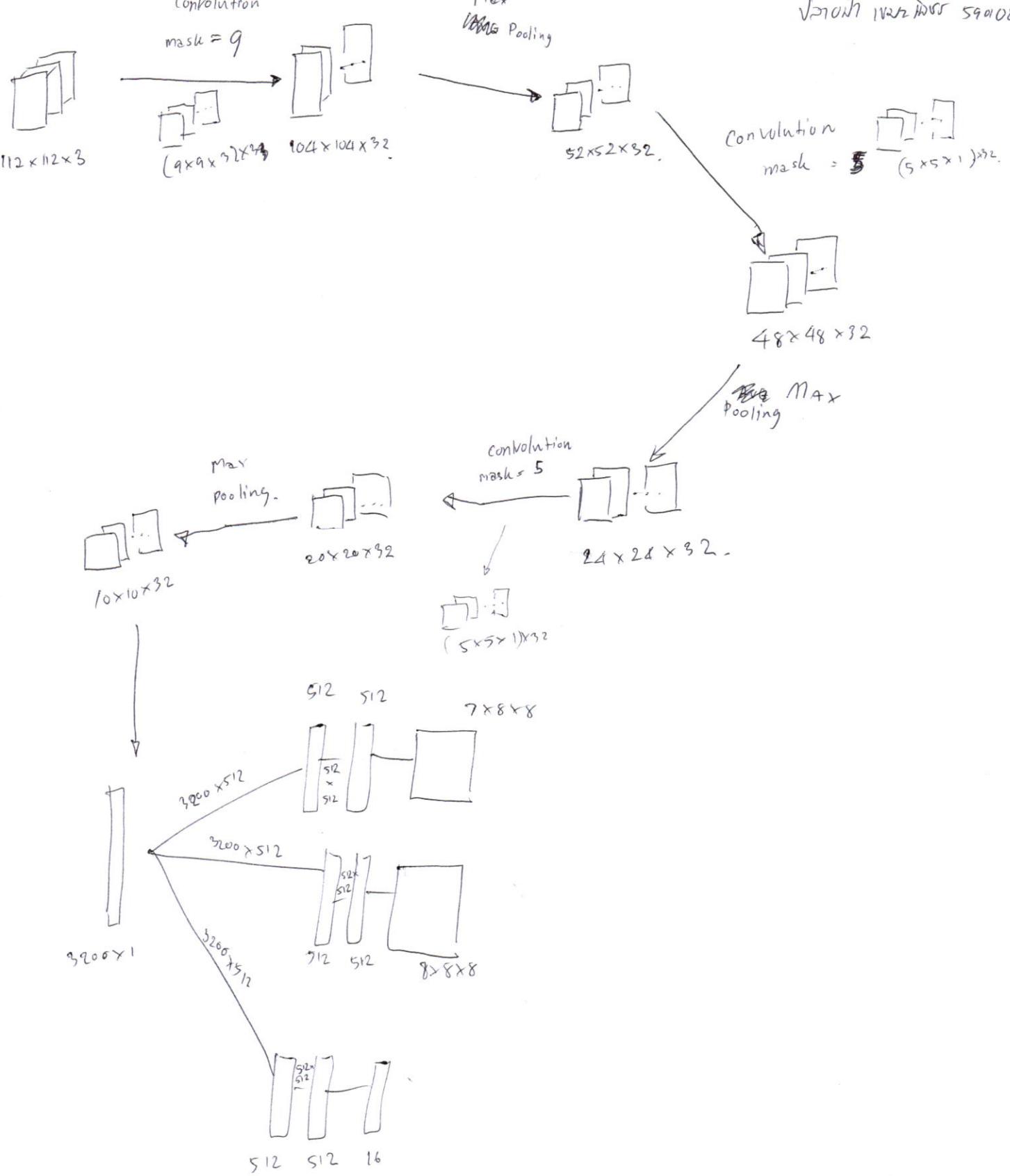
104 × 104 × 2





parameter = 6260, 320

Vision Warf 59010823



$$(9 \times 9 \times 3) \times 32 \rightarrow (5 \times 5 \times 32) \times 32$$

ՕՐԻՆԱԿ պայմանագիր

59011511



$$(5 \times 5 \times 32) \times 32$$

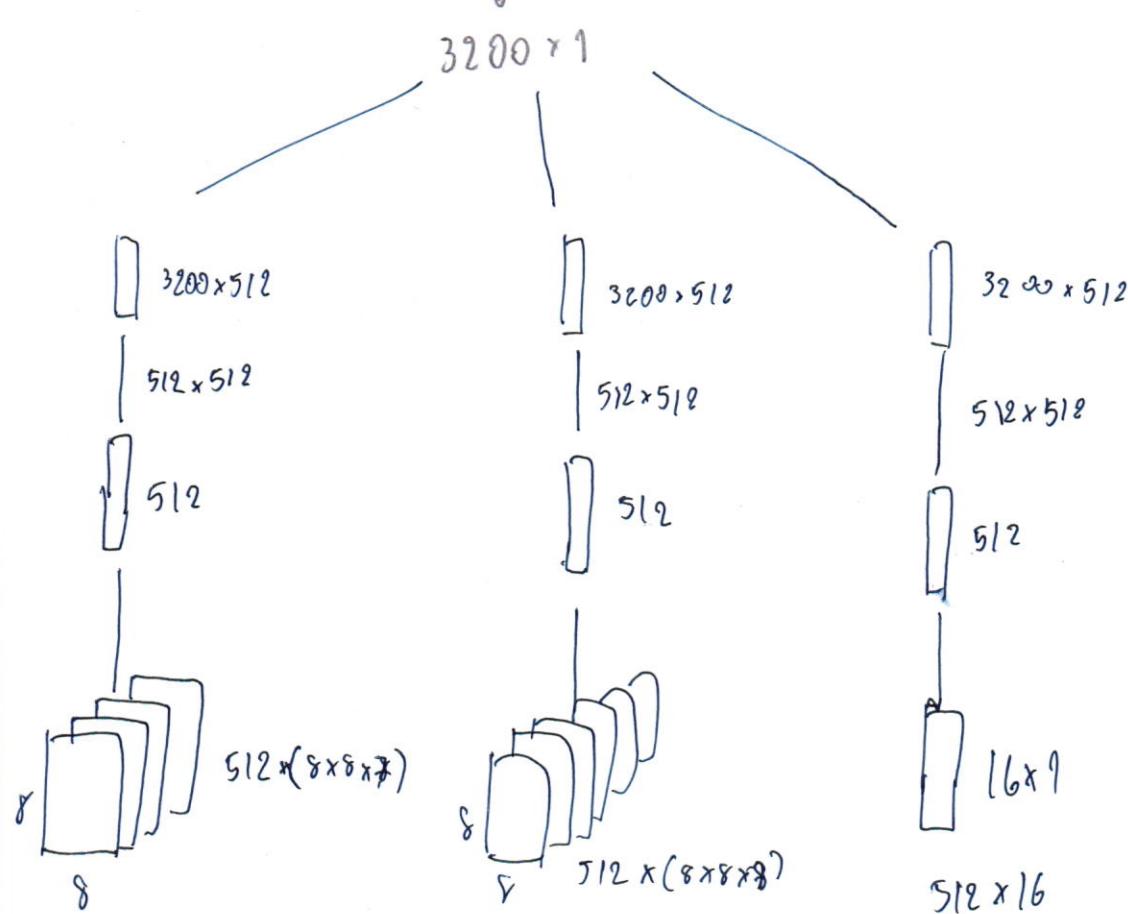


$$(10 \times 10 \times 32)$$



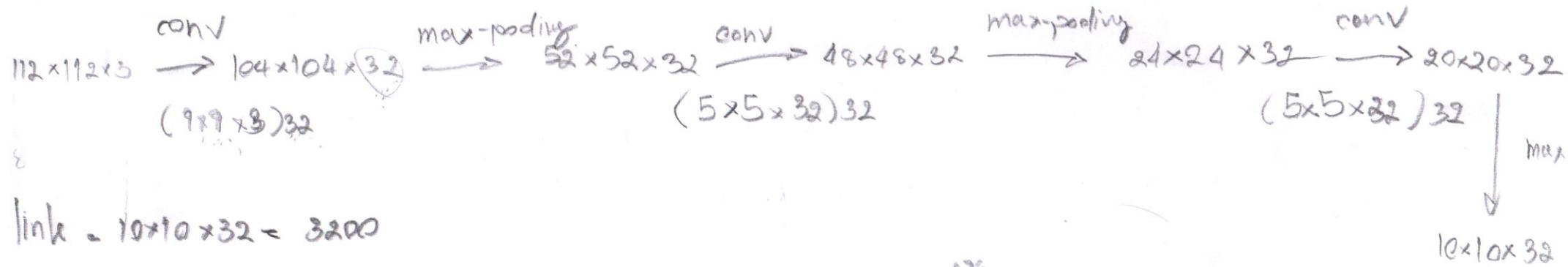
$$3200 \times 1$$

ՕՐԻՆԱԿ պայմանագիր



Պարան

6260320



part Detection



Joint Detection



Joint Regression

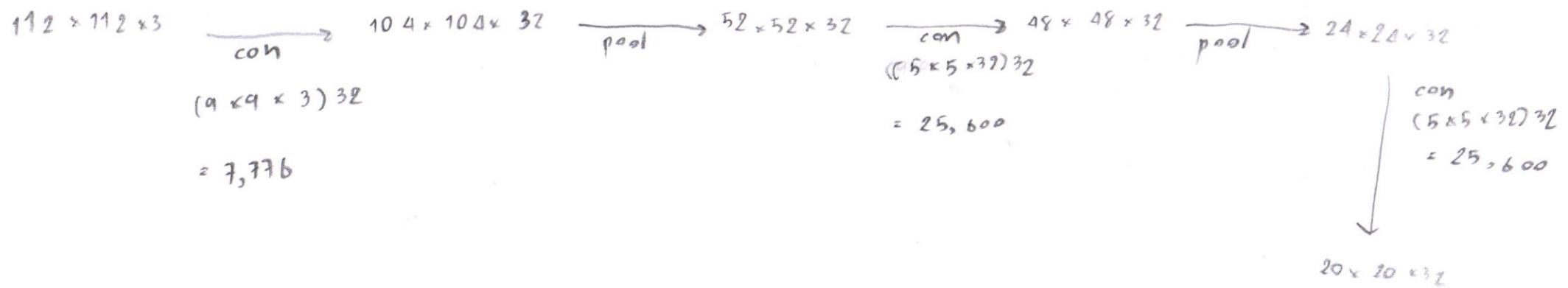


$$\begin{aligned}
 & (9 \times 9 \times 3)32 + (5 \times 5 \times 32)32 + (5 \times 5 \times 32)32 \\
 & 3200 \times 512 + 512 \times 512 + (8 \times 8 \times 7) + \\
 & = 58976 + 190936
 \end{aligned}$$

$$\begin{aligned}
 & (9 \times 9 \times 3)32 + (5 \times 5 \times 32)32 + (5 \times 5 \times 32)32 \\
 & 3200 \times 512 + 512 + 512 + 8 \times 8 \times 8 + \\
 & = 58976 + 1901056
 \end{aligned}$$

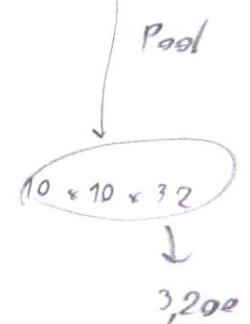
$$\begin{aligned}
 & (9 \times 9 \times 3)32 + (5 \times 5 \times 32)32 + (5 \times 5 \times 32)32 \\
 & 3200 \times 512 + 512 \times 512 + 16 \\
 & = 58976 + 1900560
 \end{aligned}$$

$$\begin{aligned}
 & \therefore 58976 + 1900992 + 1901056 + 1900560 \\
 & = 6260320
 \end{aligned}$$



Part Detection

$$\begin{aligned}
 &= 7776 + 25,600 + 25,600 + (3200 \times 512) + (512 \times 512) + (7 \times 8 \times 8) \\
 &= 58,976 + 1900992
 \end{aligned}$$



Joint Detection

$$= 58,976 + (3200 \times 512) + (512 \times 512) + (8 \times 8 \times 8) = 58,976 + 1901,056$$

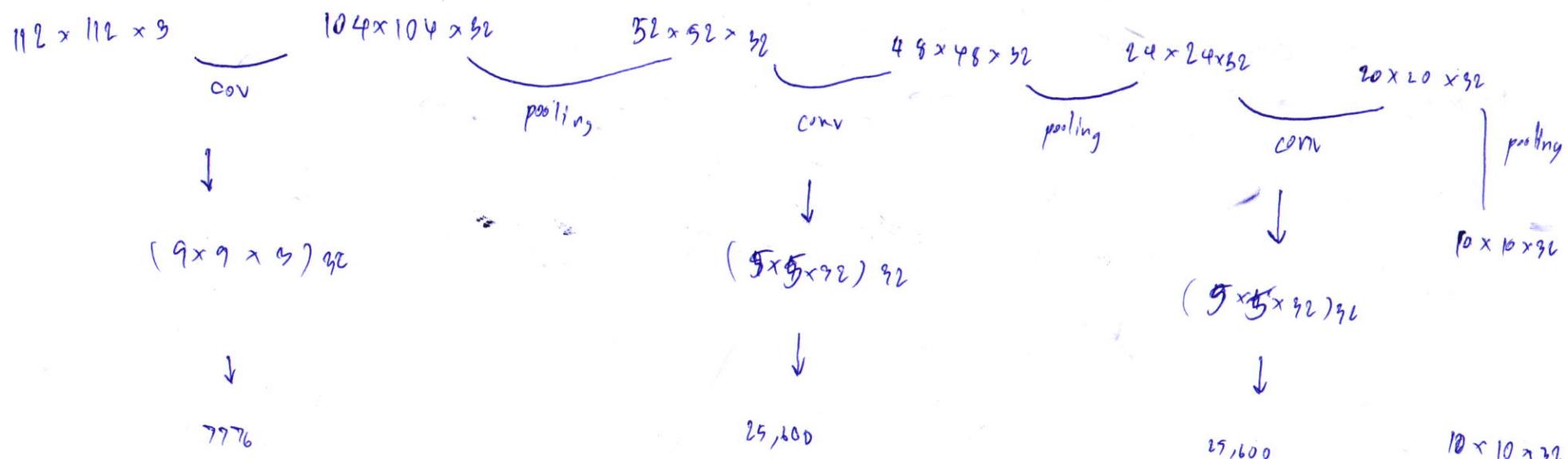
Joint Regression

$$= 58,976 + 1900,560$$

$$\begin{aligned}
 &58,976 + 1900,996 + 1901,056 + 1900,560 \\
 &= 6,260,320
 \end{aligned}$$

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Devendra Mpar 59010555



6,260,320

Z

$$\begin{aligned}
 & 1,638,400 & 262,144 & 3200 \\
 & (3200 \times 312) + (512 \times 512) + (512 \times 8 \times 8) & & 229,576 \\
 & + & & \\
 & (3200 \times 512) + (512 \times 512) + (8 \times 8 \times 9) \times 512 & 212,144 \\
 & + & & \\
 & (3200 \times 512) + (512 \times 512) + (512 \times 16) & 8192
 \end{aligned}$$

$$49,15,200 + 746,432$$

$$112 - 104 = 8$$

$$112 \times 112 \times 3 \rightarrow 92 \times 104 \times 104 \rightarrow 92 \times 52 \times 52 \rightarrow 32 \times 44 \times 44 \rightarrow 32 \times$$

$$\text{Ansatz: } (9 \times 9 \times 32) \text{ MByte}$$

mag 329

5 x 5

۷۳۹

9 x 9

$\gamma = 1 + \frac{1}{\sqrt{2}}$

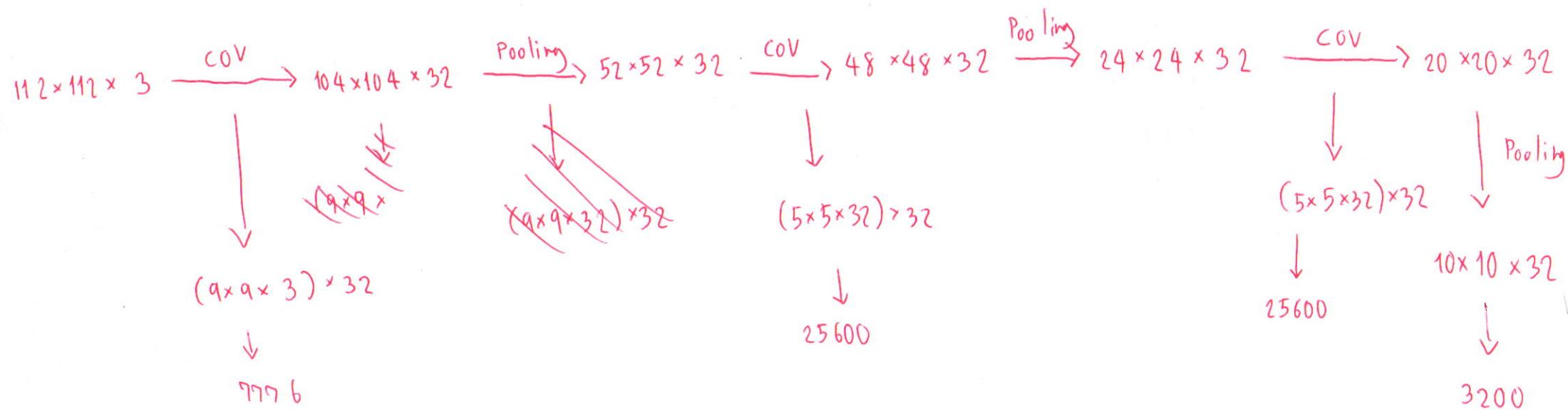
1

3

12

3

3



$$\text{Part Detection} \Rightarrow \cancel{7776 + 25600 + 25600} + (3200 \times 512) + (512 \times 512) + (512 \times 7 \times 8 \times 8) = 1900936$$

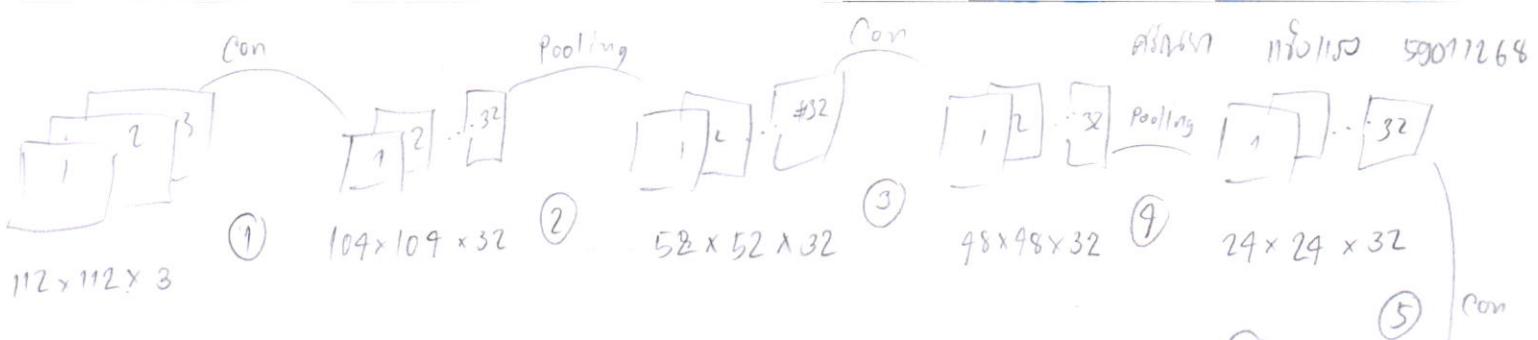
$$\text{Joint Detection} \Rightarrow \cancel{7776 + 25600 + 25600} + (3200 \times 512) + (512 \times 512) + (512 \times 8 \times 8 \times 8) = 1901056$$

$$\text{Joint Regression} \Rightarrow \cancel{58976} + (3200 \times 512) + (512 \times 512) + (512 \times 8 \times 8 \times 16) = 5832704$$

$$\therefore 58976 + 1900936 + 1901056 + 5832704 = 6,260,320$$

XX

7776 4801872 590106515



① mask 9x9 112 ผลลัพธ์ 109 ความกว้าง 8

ผลลัพธ์ทั้งหมด 9 ต่อ 1 ผลลัพธ์ mask ขนาด 4+9+1 = 9

$$\text{mask} = 9 \times 9, 9 \times 9 \times 3 \times 32 = 7,776$$

② pooling ผลลัพธ์ $\frac{1}{2}$ ของ 109 ผลลัพธ์ 52

$$③ 52 - 98 = 4$$

$$\text{จำนวน} 2 = 2+2+1 = 5$$

$$\text{mask } 5 \times 5, 5 \times 5 \times 32 \times 32 = 25600$$

$$⑤ 24 - 20 = 4$$

$$2+2+1 = 5$$

$$\text{mask} = 5 \times 5, 5 \times 5 \times 32 \times 32 = 25600$$

$$10 \times 10 \times 32$$

$$3200 \times 512 = 1638400$$

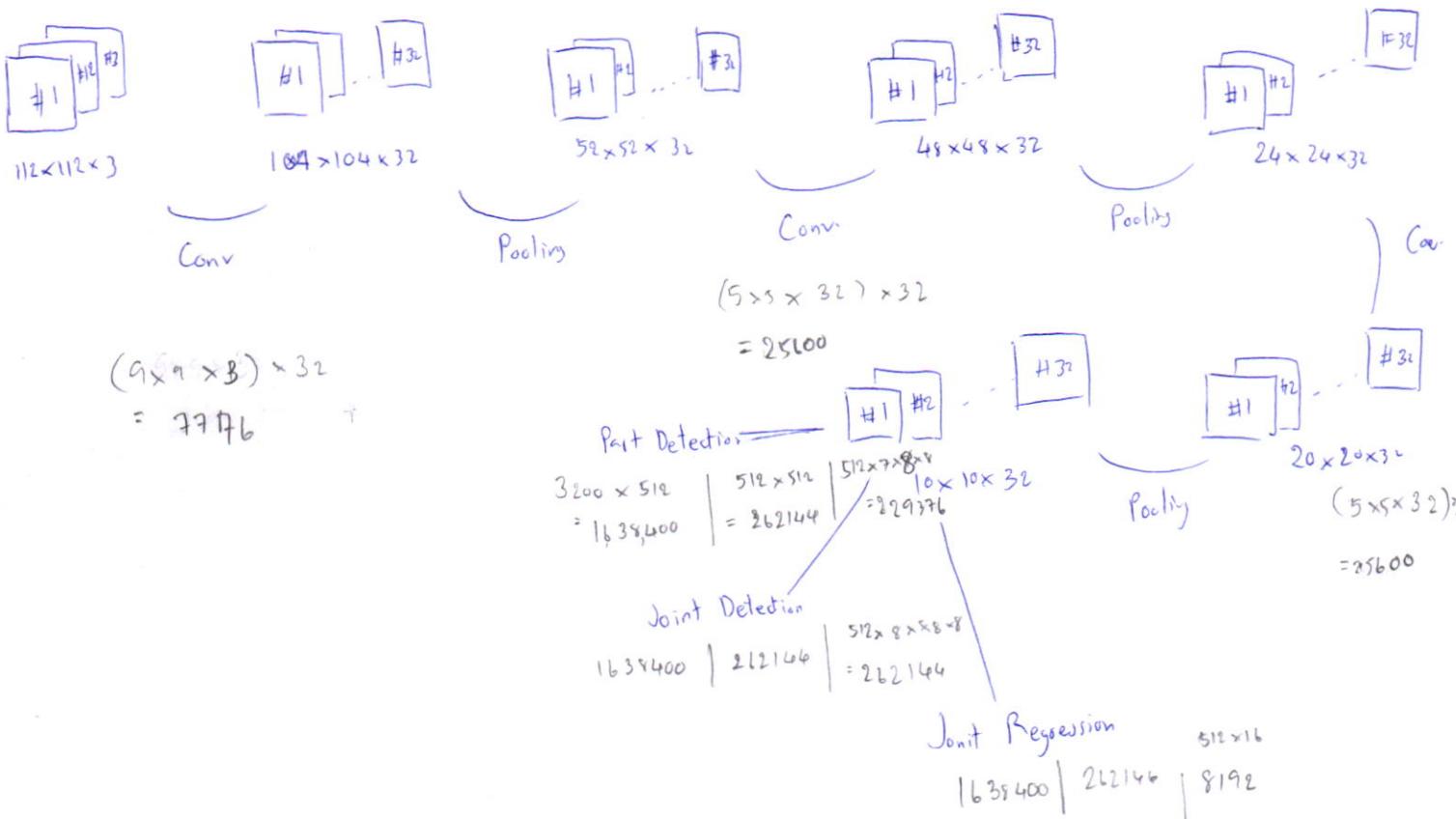
$$512 \times 512 \times 262144 = 229,376$$

$$= 2,729,920$$

$$= (3200 \times 512) + (512 \times 512) + (512 \times (8 \times 8 \times 8)) \\ = 2,762,688$$

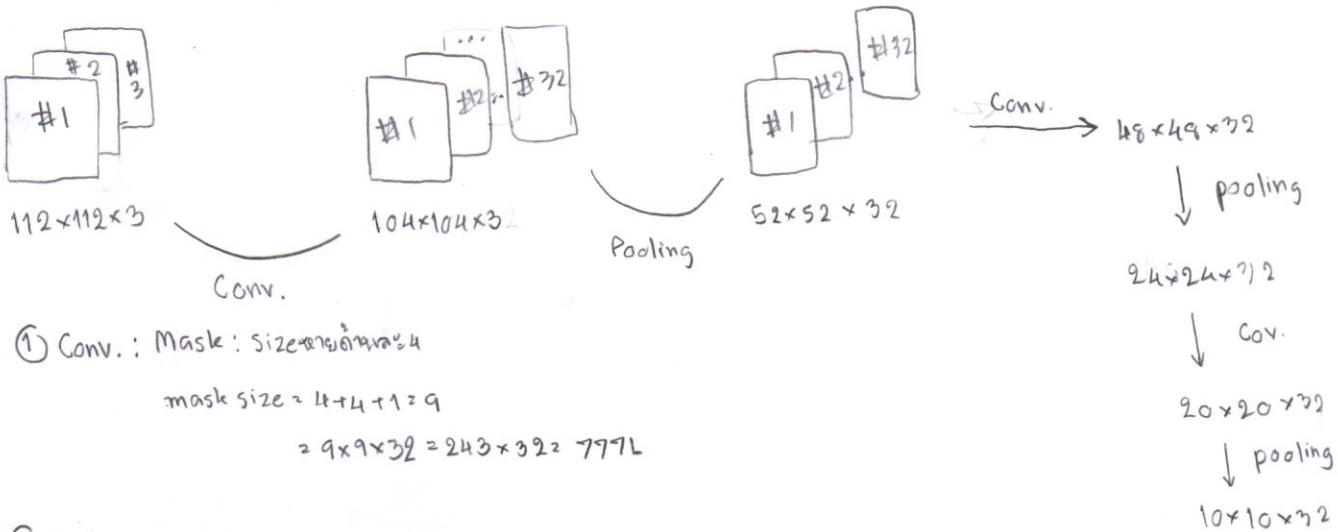
$$= (3200 \times 512) + (512 \times 512) + (512 \times 16) \\ = 1,908,736$$

$$\text{ผลรวม} = 7776 + 25600 + 25600 + 2,729,920 + 2,762,688 + 1,908,736 = 6260320$$



$$7776 + 25600 + 25600 + (1638400 + 262144) \times 3 + 291376 + 262144 + 8192$$

$$= 6,260,320 \text{ parameters}$$



① Conv.: Mask: size 3x3x3x3 = 27

$$\begin{aligned} \text{mask size} &= 4+4+1 = 9 \\ &= 9 \times 9 \times 32 = 243 \times 32 = 7776 \end{aligned}$$

② Pooling

③ Conv.: Mask: size 5x5x3x3 = 25

$$\begin{aligned} \text{mask size} &= 2+2+1 = 5 \\ &= 5 \times 5 \times 32 = 800 \times 32 = 25600 \end{aligned}$$

④ Pooling

⑤ Conv.: Mask size 5x5x32 = 800 + 32 = 832

⑥ Pooling = 10x10x32 = 100x32 = 3200

Path Detection

$$\begin{aligned} - 3200 \times 512 &= 1638400 \\ - 512 \times 512 &= 262144 \\ - 512 \times 7 \times 8 \times 8 &= 299376 \end{aligned}$$

Joint Detection

$$\begin{aligned} - 3200 \times 512 &= 1638400 \\ - 512 \times 512 &= 262144 \\ - 512 \times 8 \times 8 \times 4 &= 262144 \end{aligned}$$

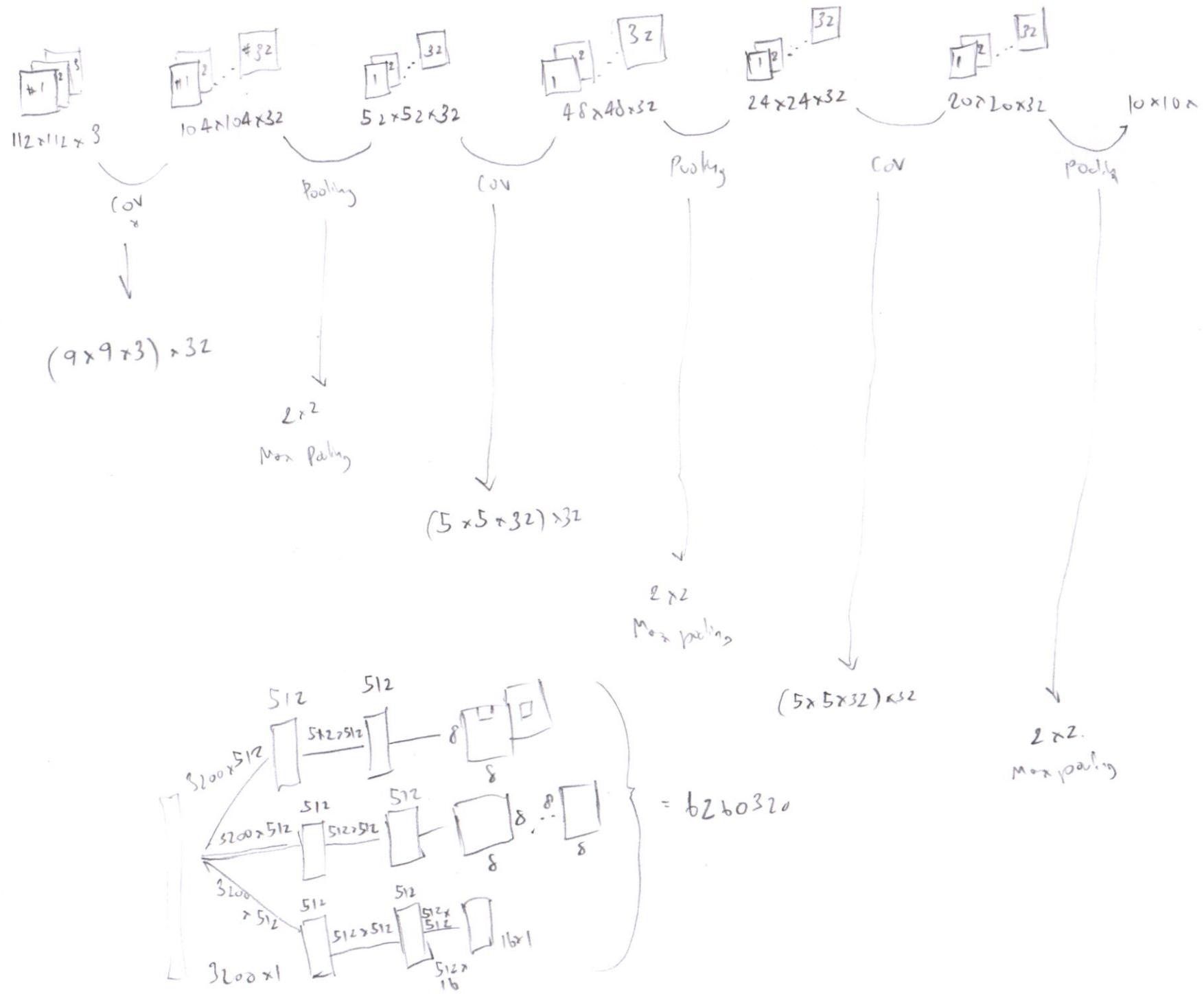
Joint Regression

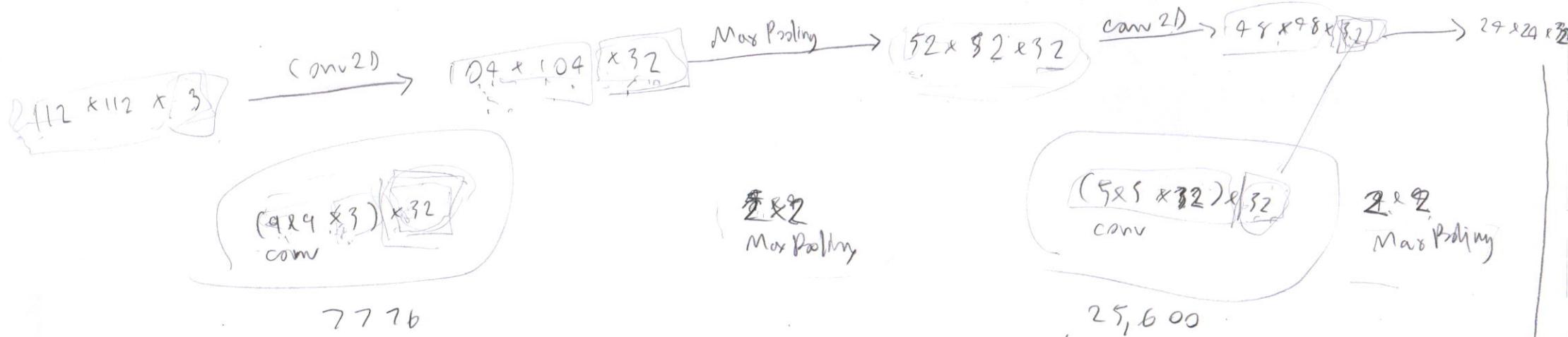
$$\begin{aligned} - 3200 \times 512 &= 1638400 \\ - 512 \times 512 &= 262144 \\ - 512 \times 16 &= 8192 \end{aligned}$$

$$\begin{aligned} \text{Weight} &= 7776 + 25600 + 832 + 1638400 + 262144 + 299376 + 1638400 + 262144 + 262144 \\ &\quad + 1638400 + 262144 + 8192 = 6260320 \end{aligned}$$

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J155 6677M 8:00



112

92

$$\begin{aligned}
 & 1,638,400 \quad 2,62,144 \\
 & 32 \times 32 \times 8 \times 12 + 512 \times 8 \times 12 + 512(7 \times 8 \times 9) \\
 & 32 \times 32 \times 8 \times 12 + 512 \times 8 \times 12 + 512(8 \times 8 \times 8) \\
 & 32 \times 32 \times 8 \times 12 + 512 \times 8 \times 12 + 512 \times 16
 \end{aligned}$$

$$\} 6,267,720$$

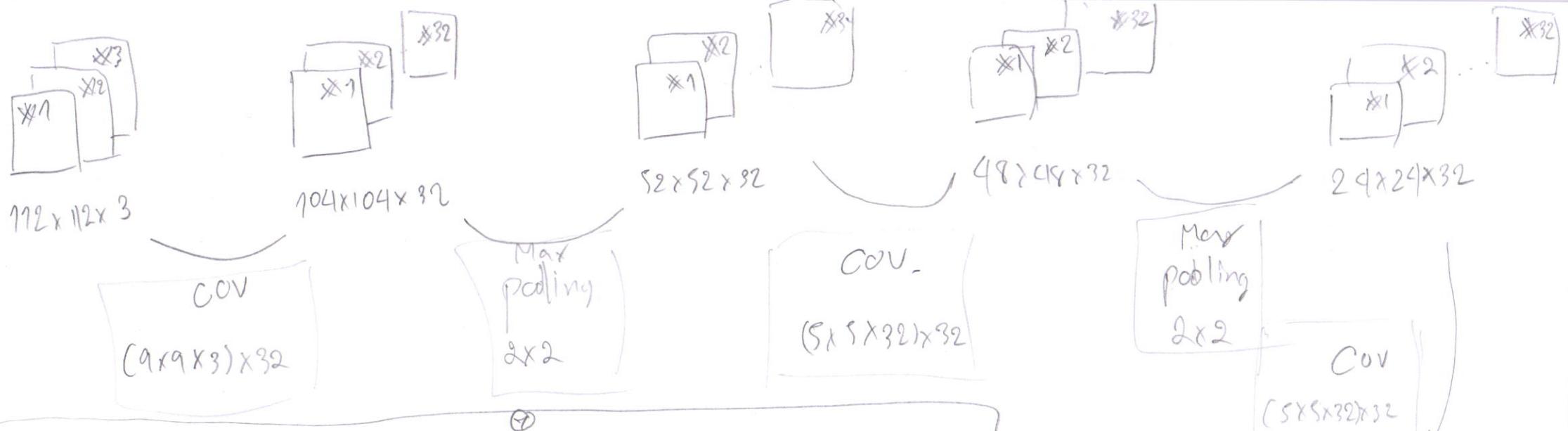
$$\begin{array}{c}
 \xleftarrow[2 \times 2]{\text{Max Pool}} \\
 (721 \times 232) \times 32 \quad 2,082,0832
 \end{array}$$

$$\text{Params} = 58,976$$

$$17,17$$

$$\begin{array}{c}
 (5 \times 5 \times 32) \times 32 \\
 \sim 25,600
 \end{array}$$





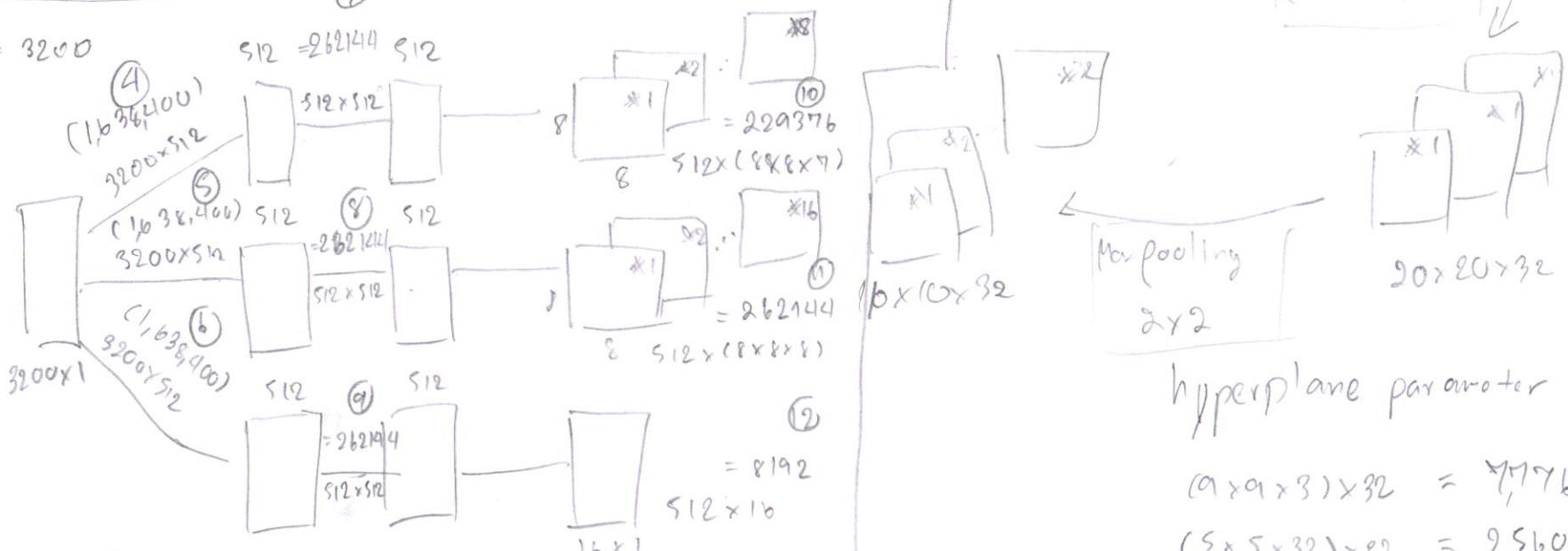
$$\text{link} = 10 \times 10 \times 32 = 3200$$

part Detection
3200

Joint Detection
3200

Joint Regression
3200

$$\text{sum}(\textcircled{1}) - (\textcircled{2}) = 6260320 \text{ parameters}$$



hyperplane parameter

$$(9 \times 9 \times 3) \times 32 = 7776 \textcircled{1}$$

$$(5 \times 5 \times 32) \times 32 = 25600 \textcircled{2}$$

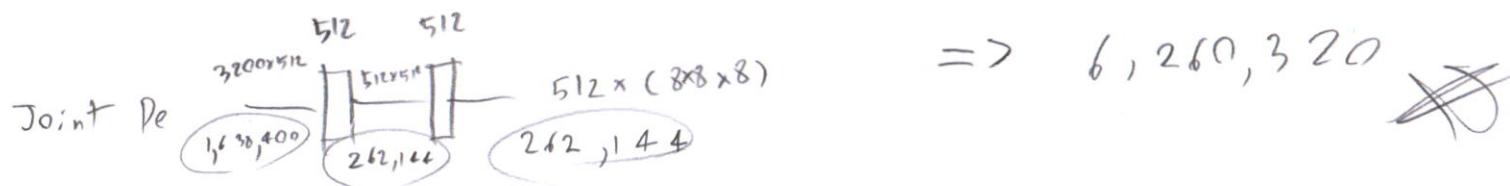
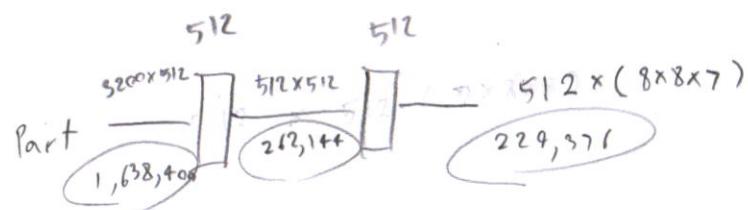
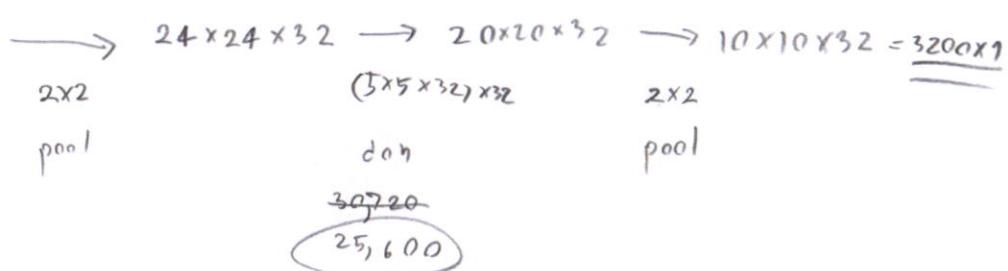
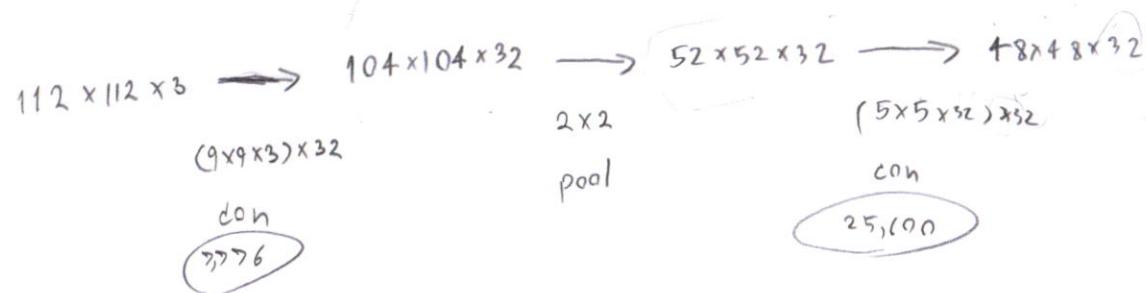
$$(5 \times 5 \times 32) \times 32 = 25,600 \textcircled{3}$$

U

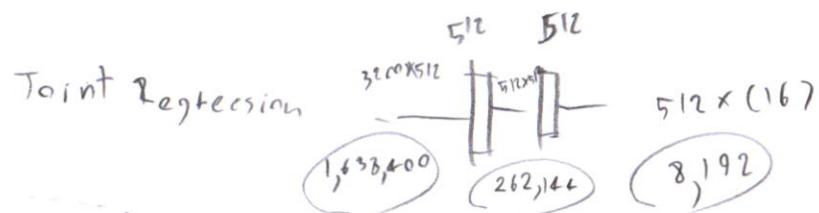
$$10 \times 10 \times 32 = 3200$$

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+ iN



$$\Rightarrow 6,260,320$$

~~6,260,320~~

Posenet Example (ការគិតផ្ទាល់ខ្លួន Parameter នៃការសម្រាប់ការរាយ)

① Input ($112 \times 112 \times 3$) \rightarrow Conv1 ($104 \times 104 \times 32$)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន Volume mask នៅលើ $9 \times 9 \times 3$ ទីតាំង 32 ដុល = $(9 \times 9 \times 3) \times 32 = 7,776$ គន្លឹមបូត្រ

② Conv1 ($104 \times 104 \times 32$) \rightarrow Max-pool1 ($52 \times 52 \times 32$)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន Parameter 9 ដុល

③ Max-pool1 ($52 \times 52 \times 32$) \rightarrow Conv2 ($48 \times 48 \times 32$)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន Volume Mask នៅលើ $5 \times 5 \times 32$ ទីតាំង 32 ដុល = $(5 \times 5 \times 32) \times 32 = 25600$ គន្លឹមបូត្រ

④ Conv2 ($48 \times 48 \times 32$) \rightarrow Max-pool2 ($24 \times 24 \times 32$)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន Parameter 9 ដុល

⑤ Max-pool2 ($24 \times 24 \times 32$) \rightarrow Conv3 ($20 \times 20 \times 32$)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន Volume mask នៅលើ $5 \times 5 \times 32$ ទីតាំង 32 ដុល = $(5 \times 5 \times 32) \times 32 = 25600$ គន្លឹមបូត្រ

⑥ Conv3 ($20 \times 20 \times 32$) \rightarrow Max-pool3 ($10 \times 10 \times 32$)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន parameters 9 ដុល

⑦ Max-pool3 ($10 \times 10 \times 32$) \rightarrow Reshape (3200×1)

\hookrightarrow ការគិតផ្ទាល់ខ្លួន Parameters 2 ដុល

⑧ Reshape (3200×1) \rightarrow FC1 (512×1) \rightarrow FC2 (512×1)
 \hookrightarrow 3200×512 គូស \rightarrow 512×512 គូស = $(3200 \times 512) + (512 \times 512) = 1900544$ គន្លឹមបូត្រ
 (ការគិតផ្ទាល់ខ្លួនមានព័ត៌មាន 3 ដុល = $1900544 \times 3 = 5701632$ គន្លឹមបូត្រ)

(ការរាយ Part Detection)

FC2 (512×1) \rightarrow PD ($7 \times 8 \times 8$)

\hookrightarrow ការរាយ 512 \times $(8 \times 8) \times 7$ = $512 \times 64 \times 7 = 229,376$ គន្លឹមបូត្រ

(ការរាយ Joint Detection)

FC2 (512×1) \rightarrow JD ($8 \times 8 \times 8$)

\hookrightarrow ការរាយ 512 \times $(8 \times 8) \times 8$ = $512 \times 64 \times 8 = 262,144$ គន្លឹមបូត្រ

(ការរាយ Joint Regression)

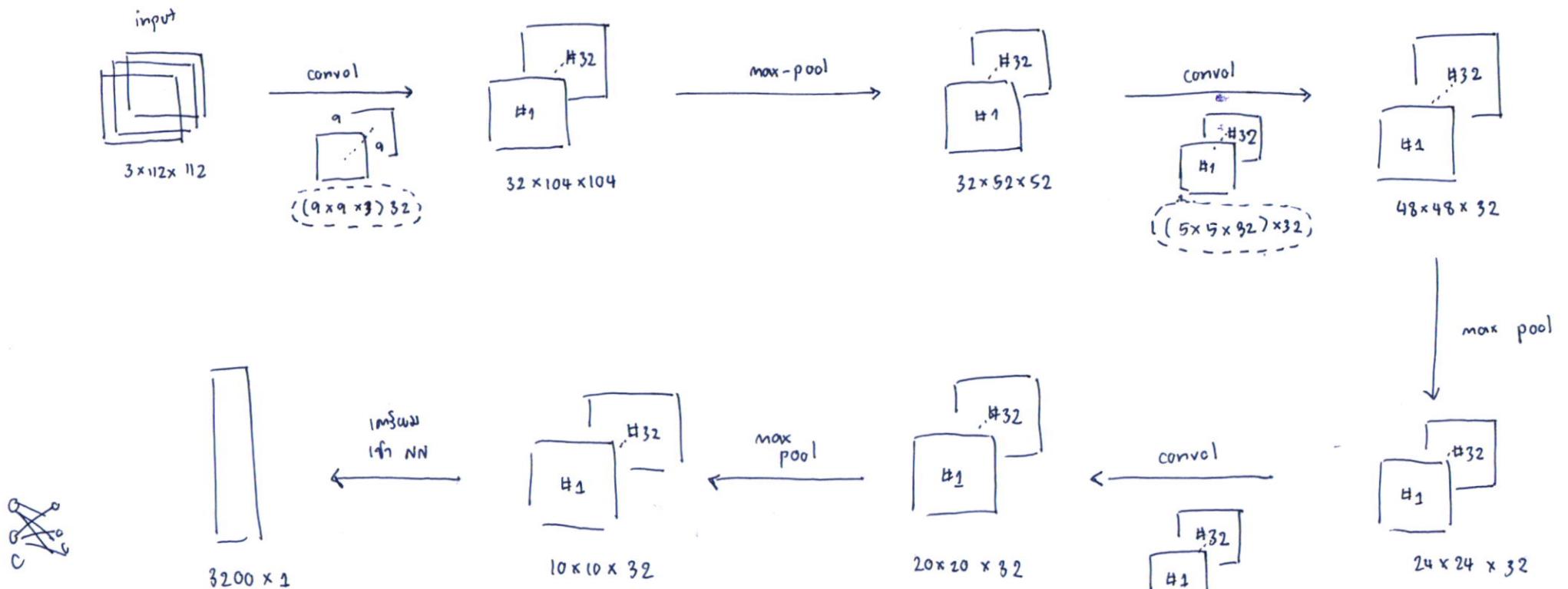
FC2 (512×1) \rightarrow JR (16×1)

\hookrightarrow ការរាយ 512 \times 16 = $8,192$ គន្លឹមបូត្រ

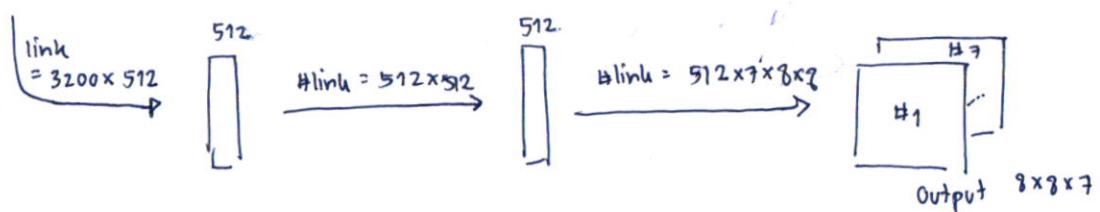
សរុបជំនួយ $7,776 + 25600 + 25600 + 5,701,632 + 229,376 + 262,144 + 8,192 = 6,260,320$ គន្លឹមបូត្រ

Ans

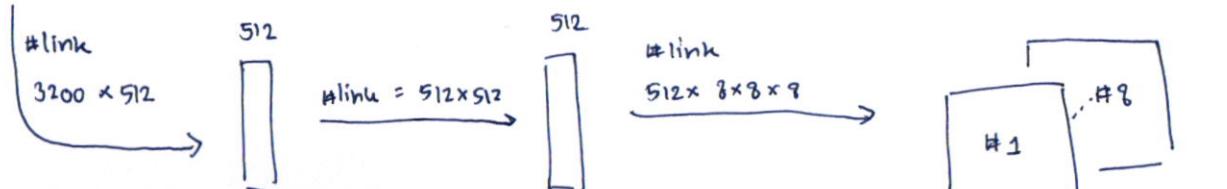
9676 គន្លឹមបូត្រ 25546875 59010728 (រួច Juliet Tang o)



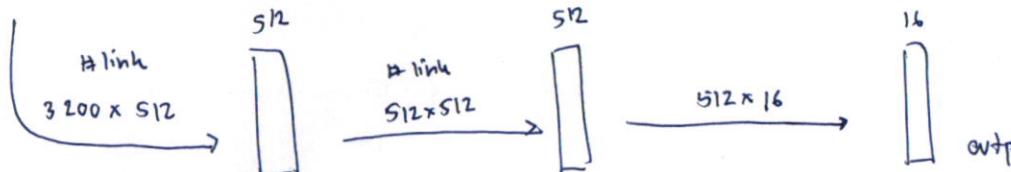
Part
Detection



Joint
Detection



Joint
Regression



Hyperplane parameter

$$\begin{aligned}
 & 25,600 \\
 & (9 \times 9 \times 3 \times 32) + (5 \times 5 \times 32 \times 32) + (3 \times 3 \times 32 \times 32) \\
 & + 3(3200 \times 512) + 3(512 \times 512) + (512 \times 7 \times 8 \times 8) \\
 & + (512 \times 3 \times 8 \times 8) + (512 \times 16) = 2,442,848 \\
 & \text{Hyperplane parameter} \\
 & (2 \times 9 \times 3 \times 32) + (5 \times 5 \times 32 \times 32) + \\
 & (3200 \times 512) + (512 \times 512) + (512 \times 8 \times 8 \times 8) \\
 & = 2,205,280
 \end{aligned}$$

Hyperplane parameter

$$\begin{aligned}
 & (9 \times 9 \times 3 \times 32) + (5 \times 5 \times 32 \times 32) + (3 \times 3 \times 32 \times 32) \\
 & + (3200 \times 512) + (512 \times 512) + (512 \times 16) = 1,951,528
 \end{aligned}$$

Musik 1

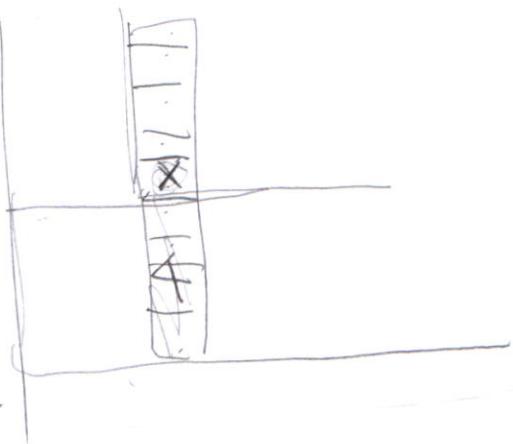
$$989 \times 32 \times 32 = 7976$$

Musik 2

$$585 \times 32 \times 32 = 25,600$$

Musik 3

$$585 \times 32 \times 32 = 25,600$$



$$3200 = 32 \times 10 \times 10$$

$$\rightarrow 512 \times 3200 \rightarrow 512 \times 512 \rightarrow 512 \times 10 \times 512 \\ = 1967840$$

$$\downarrow \quad \quad \quad \quad \quad 512 \times 3200 = 1,638,400$$

$$1638400 \quad 512 \times 3200$$

↓

$$512 \times 512 = 262,144$$

↓

$$512 \times 8 \times 8 \times 8$$

$$= 262,144$$

$$2,122,144$$

$$512 \times 7 \times 8 \times 8$$

$$= 229,376$$

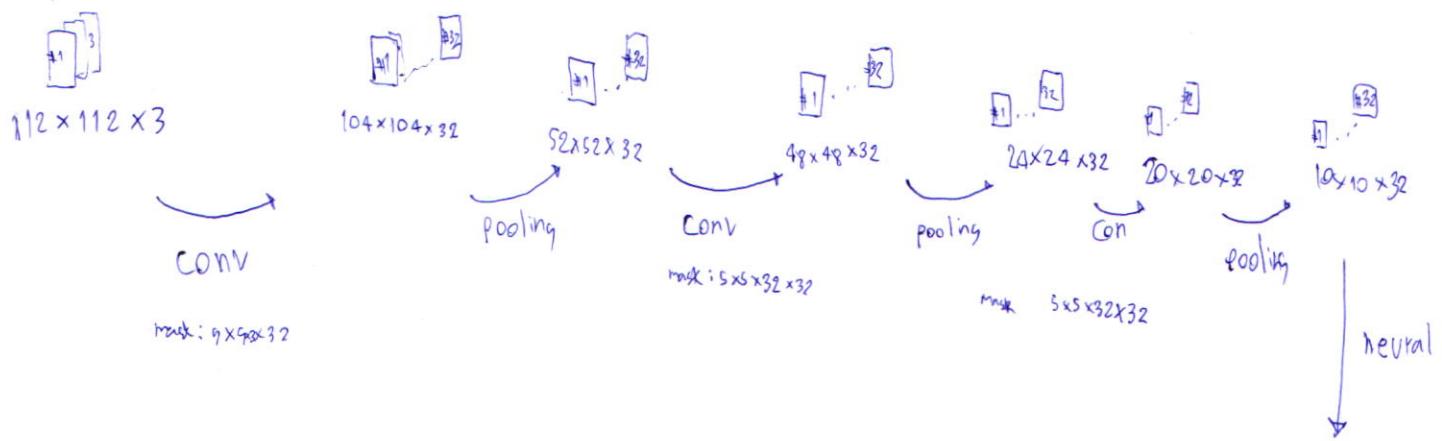
$$2,192,096$$

$$\sum_{\text{foot}} = 6384,800$$

10827

017WV05

89010239



optimize

$$(9 \times 9 \times 3 \times 32) + (5 \times 5 \times 32 \times 32) + (5 \times 5 \times 32 \times 32) = 59,976$$

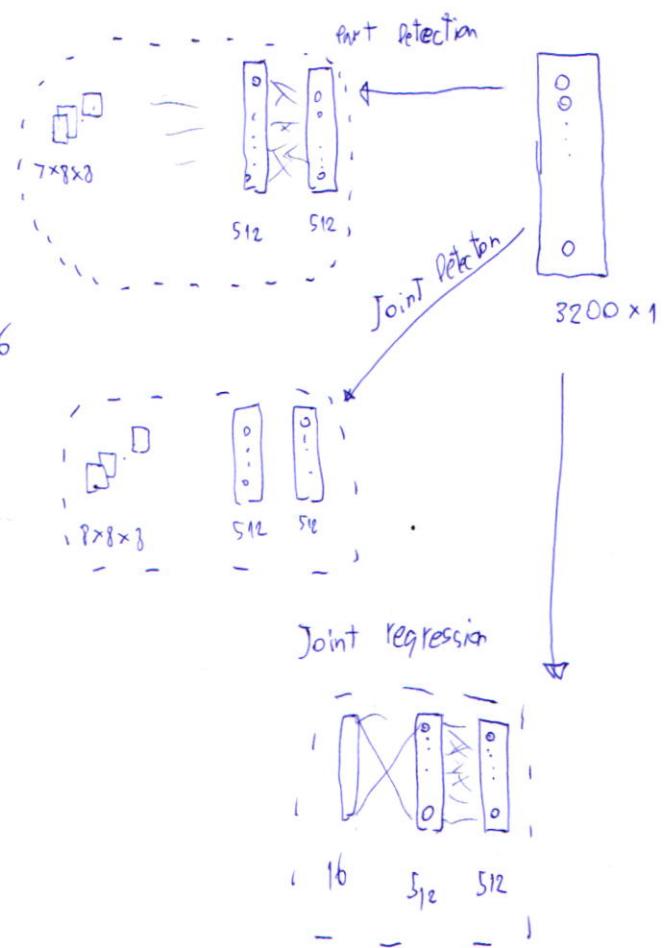
(mesh)

Part Detection : $(3200 \times 512) + (512 \times 512) + (512 \times 7 \times 8 \times 8)$
~~= 59,976~~ 2,129,920

Joint Detection : $(3200 \times 512) + (512 \times 512) + (512 \times 8 \times 8 \times 8)$
~~= 4,100,942~~ 2,162,688

Joint Regression : $(3200 \times 512) + (512 \times 512) + (512 \times 16)$
= 1,908,736

Sum = 61260,320



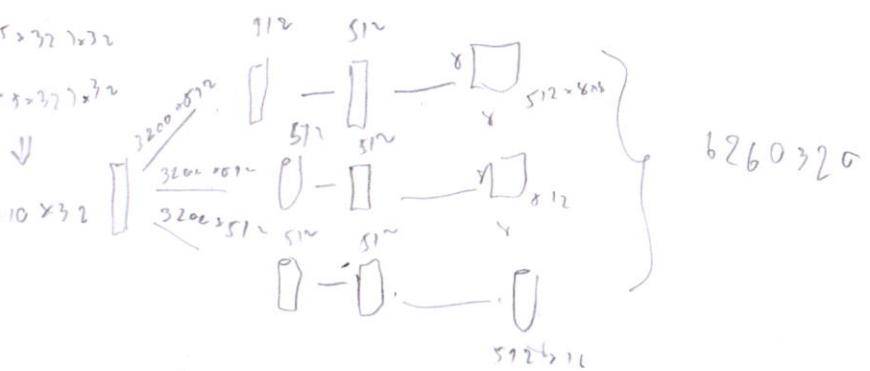
Hyperplane parameters
59010027

Hyperplane parameter

(9x9x3)x32

(5x5x32)x32

(5x5x32)x32

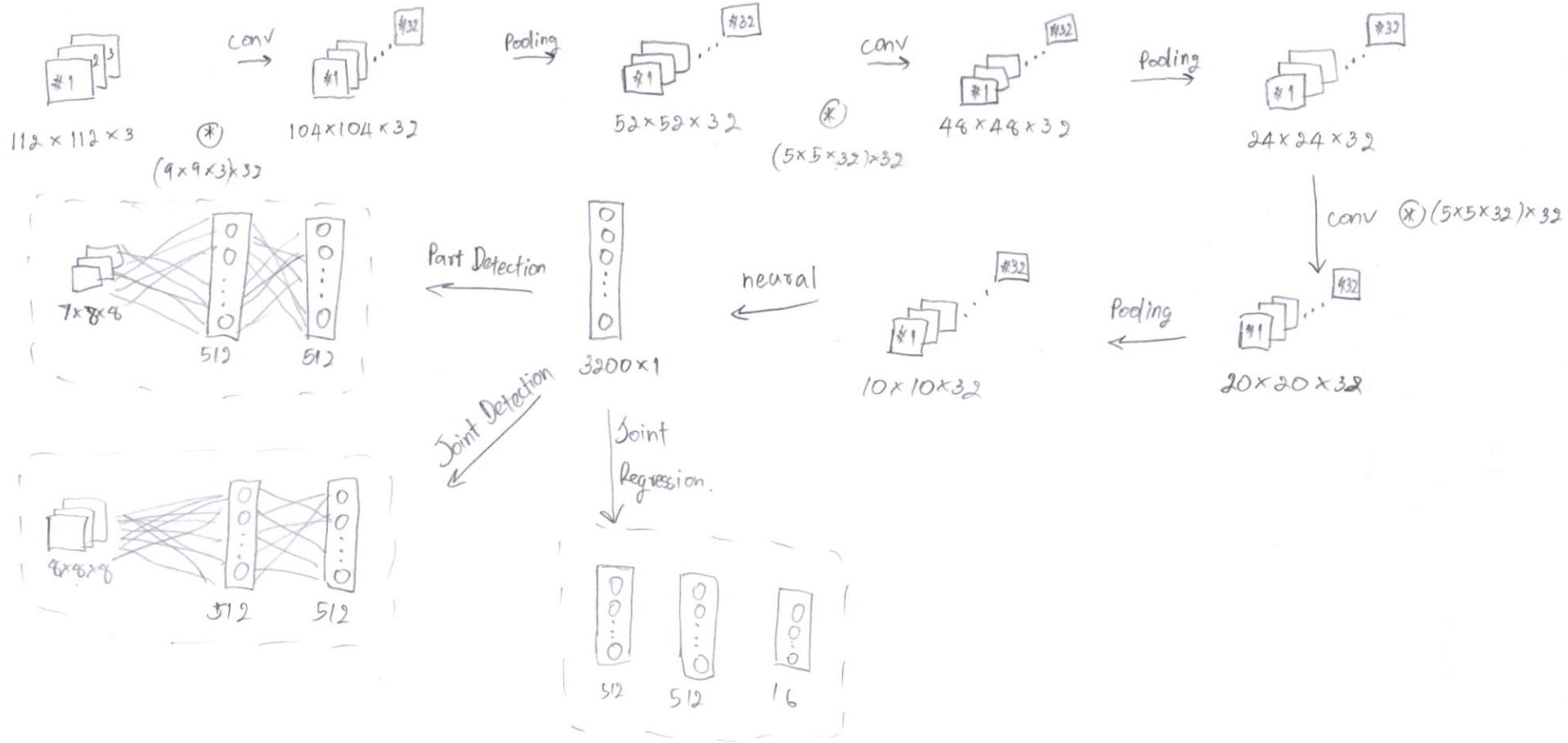


$$*(3200 \times 512) + (512 \times 512) + (512 \times 7 \times 8 \times 4) = 2129920$$

$$*(3200 \times 512) + (512 \times 512) + (512 \times 464 \times 8) = 2162646$$

$$(3200 \times 512) + (512 \times 512) + (512 \times 16) = 1904736$$

$$\text{Optimize} = ((9 \times 9 \times 9 \times 3) \times 32) + ((5 \times 5 \times 32) \times 32) + ((5 \times 5 \times 32) \times 32) = 58970$$



*Optimize

$$\left((9 \times 9 \times 3) \times 32 \right) + \left((5 \times 5 \times 32) \times 32 \right) + \left((5 \times 5 \times 32) \times 32 \right) = 56976$$

$$\text{Part Detection: } (3200 \times 512) + (512 \times 512) + (512 \times 7 \times 8 \times 8) = 2,129,920$$

$$\text{Joint Detection} : (3200 \times 512) + (512 \times 512) + (512 \times 8 \times 8 \times 8) = 2,162,688$$

Joint Regression: $(3200 \times 512) + (512 \times 512) + (512 \times 16) = 1904,736$

Sum = 6,260,320 Parameters.

input : $112 \times 112 \times 3$

convolution : $104 \times 104 \times 32$

mask : $(9 \times 9 \times 3) \times 32$

pooling : $52 \times 52 \times 32$

convolution : $48 \times 48 \times 32$

mask : $(5 \times 5 \times 32) \times 32$

pooling : $24 \times 24 \times 32$

convolution : $20 \times 20 \times 32$

mask : $(5 \times 5 \times 32) \times 32$

pooling : $10 \times 10 \times 32$