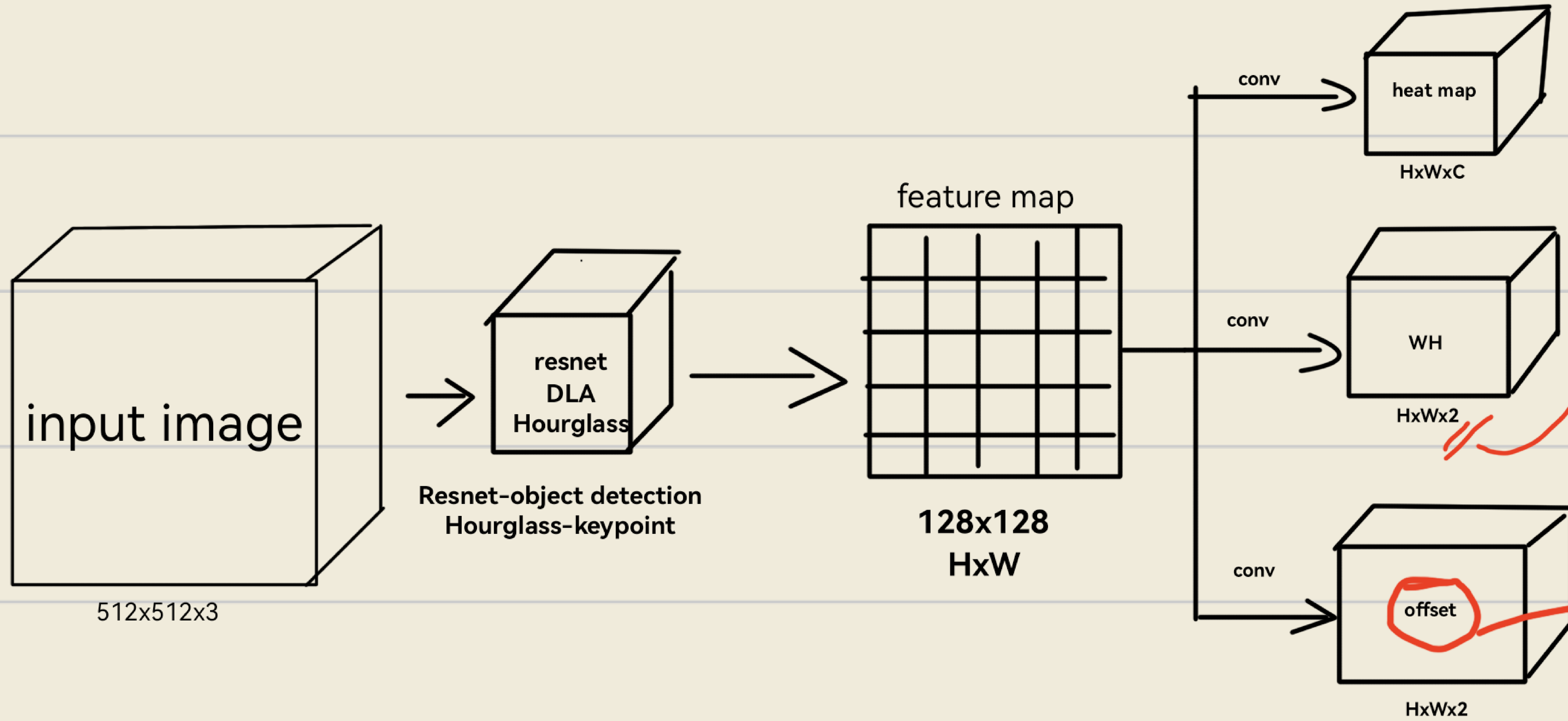


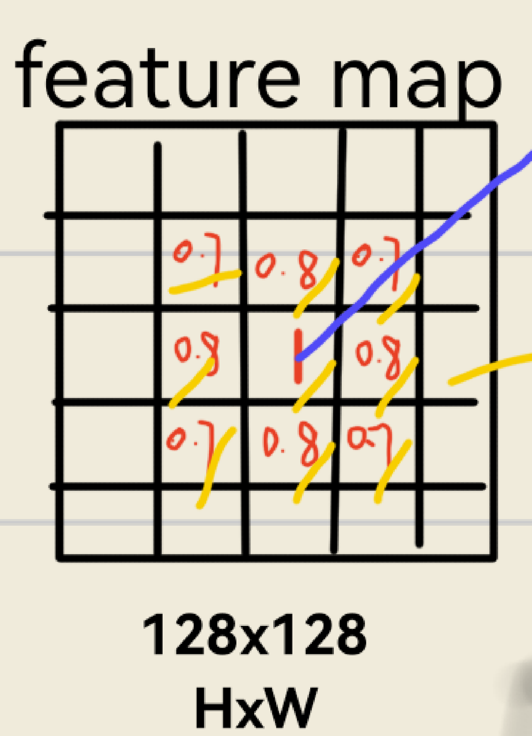
C代表类别

注意:这里是2，而不是2C，这是因为centernet有个假设:feature map的每个格子只有一个目标

2代表预测回归框的with and height

原图512x512，feature map是128x128，位置除以4，当结果有小数时，进行的下采样，损失了精度，因此这里用offset来补足精度

1、heat map GT



假设目标的中心点落在这个格子里

Centernet是有目标中心的格子里的值大，其他的盒子里按高斯分布填充值

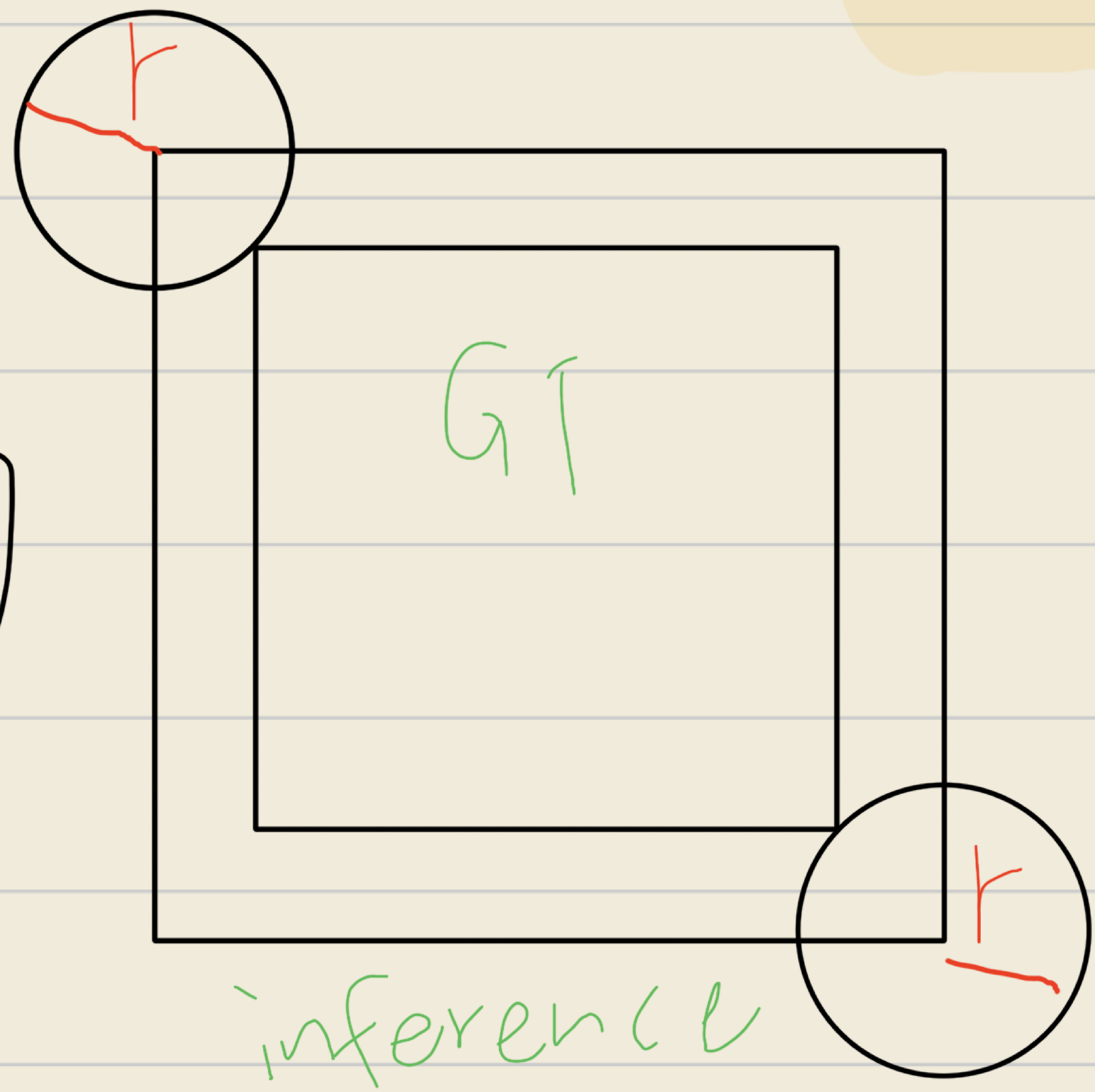
$$\boxed{Y_{xyc} = \exp\left(-\frac{(x-\tilde{p}_x)^2+(y-\tilde{p}_y)^2}{2\sigma_p^2}\right)}$$

$\sigma_p = \frac{r}{3}$，r为高斯分布的半径

如何求解？

r的求解用的cornernet中的方法　**这里用到了iou的求法**

①



$$\text{overlap} = \frac{wh}{(w+2r)(h+2r)}$$

$$4\,\text{overlap}\cdot r^2 + 2\,\text{overlap}(h+w)r + (\text{overlap}-1)hw = 0$$

$$a = 4\,\text{overlap}$$

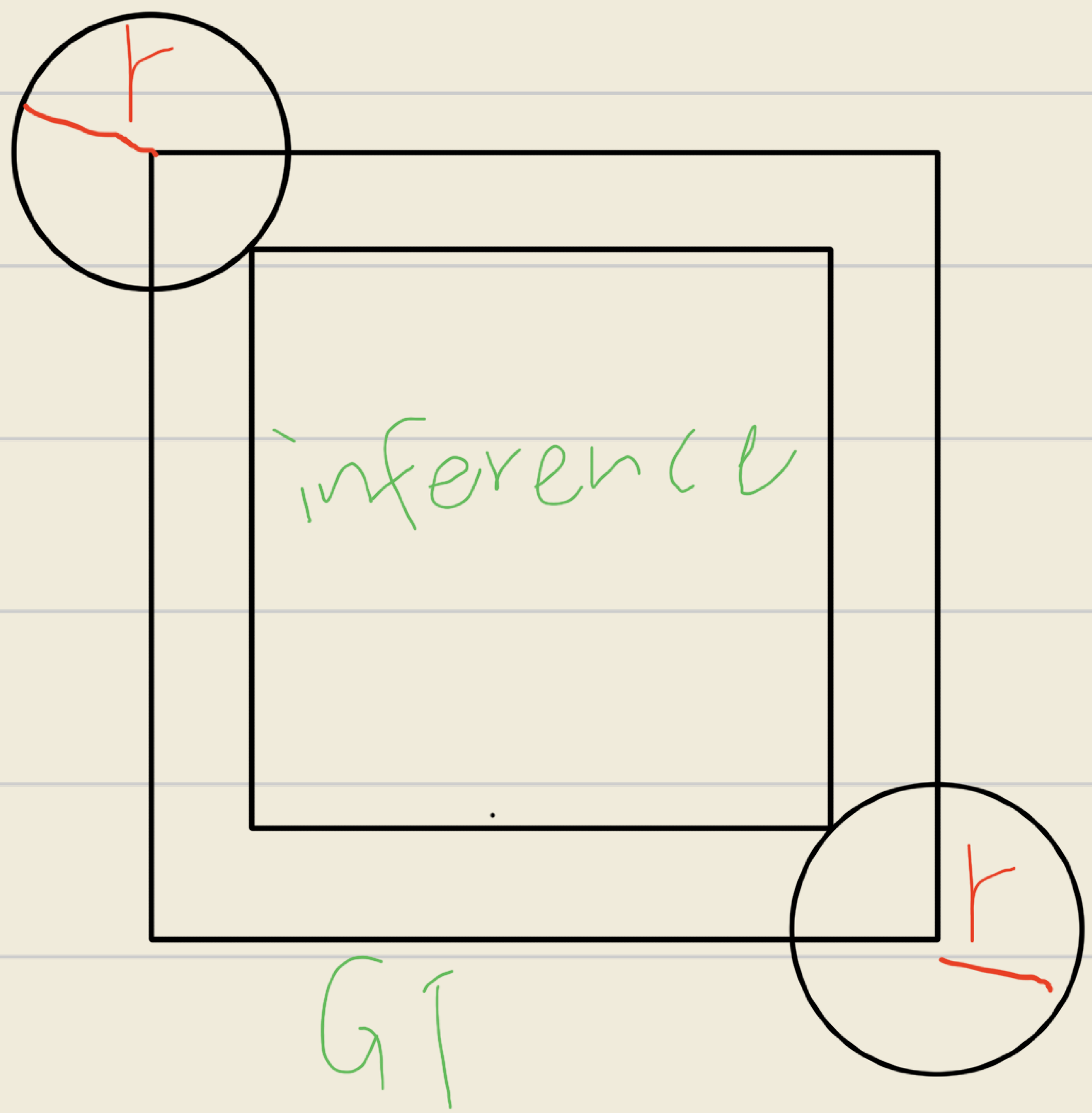
$$b = 2\,\text{overlap}(h+w)$$

$$c = (\text{overlap}-1)hw$$

求根公式: $r = \dfrac{-b + \sqrt{b^2-4ac}}{2a}$

r为正，因此没有"−"

②



$$\text{Overlap} = \frac{(w-2r)(h-2r)}{wh}$$

$$4r^2 - 2(h+w)r + (1-\text{overlap})hw = 0$$

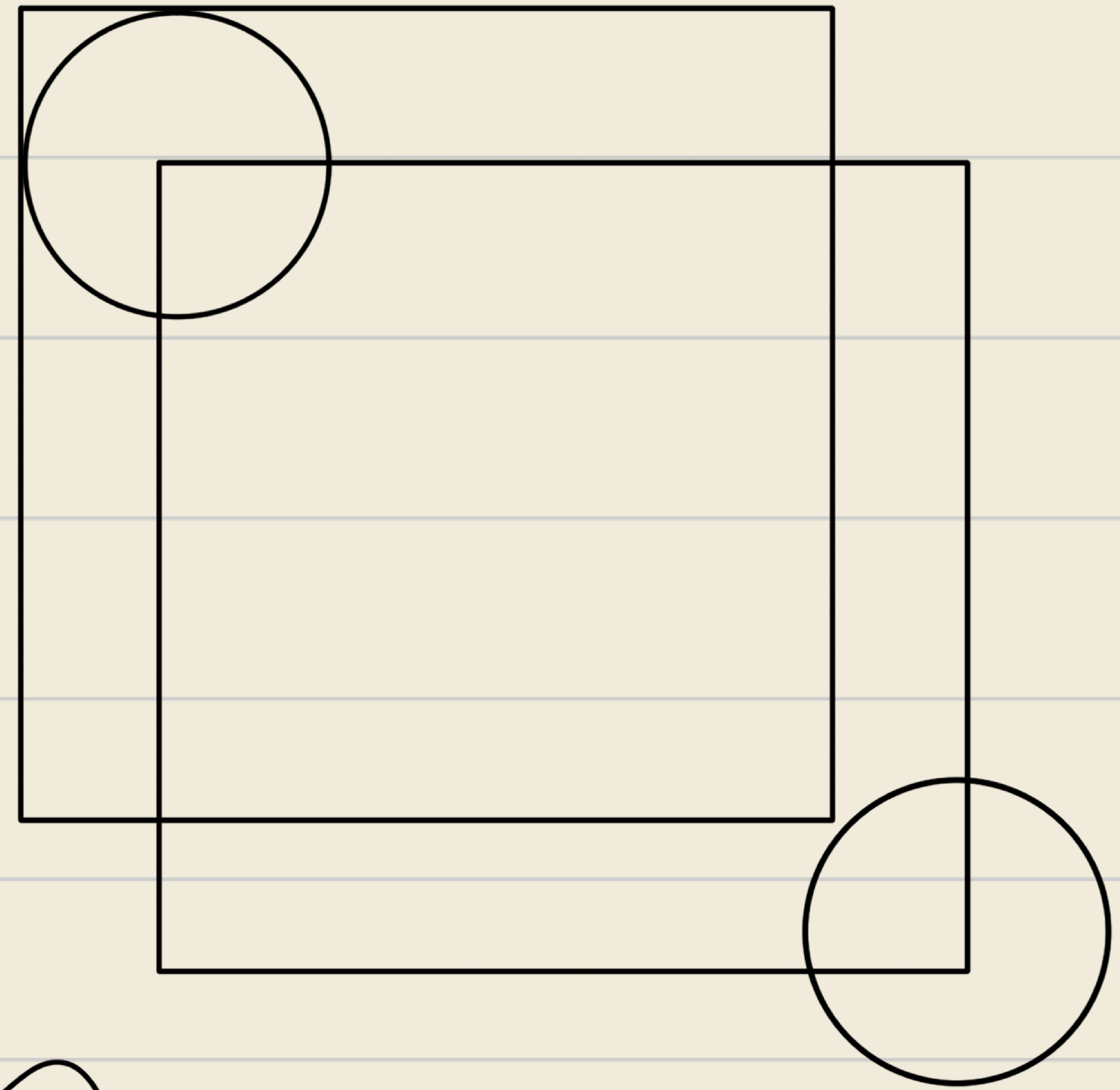
$a = 4$

$b = -2(h+w)$

$c = (1-\text{overlap})hw$

求根公式: $r = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$

r为正，因此没有"—"



③

$$\text{overlap} = \frac{(w-r)(h-r)}{2wh-(w-r)(h-r)}$$

$$r^2-(h+w)r+\frac{(1-\text{overlap})hw}{1+\text{overlap}}=0$$

$a=1$

$b=-(h+w)$

$c=\frac{(1-\text{overlap})hw}{1+\text{overlap}}$

r取这5种情况计算出的最小值

求根公式：$r=\frac{-b+\sqrt{b^2-4ac}}{2a}$，

r为正，因此没有“—”

heatmap loss

$$L_k = \frac{-1}{N}\sum \begin{cases} (1-\hat{Y}_{xyc})^{\alpha}\log(\hat{Y}_{xyc}) & \text{if } Y_{xyc}=1 \\ (1-Y_{xyc})^{\beta}(\hat{Y}_{xyc})^{\alpha}\log(1-\hat{Y}_{xyc}) & \text{else} \end{cases}$$

就是focal loss

WH loss

$$\left(x_1^{(k)}, y_1^{(k)}, x_2^{(k)}, y_2^{(k)}\right)$$

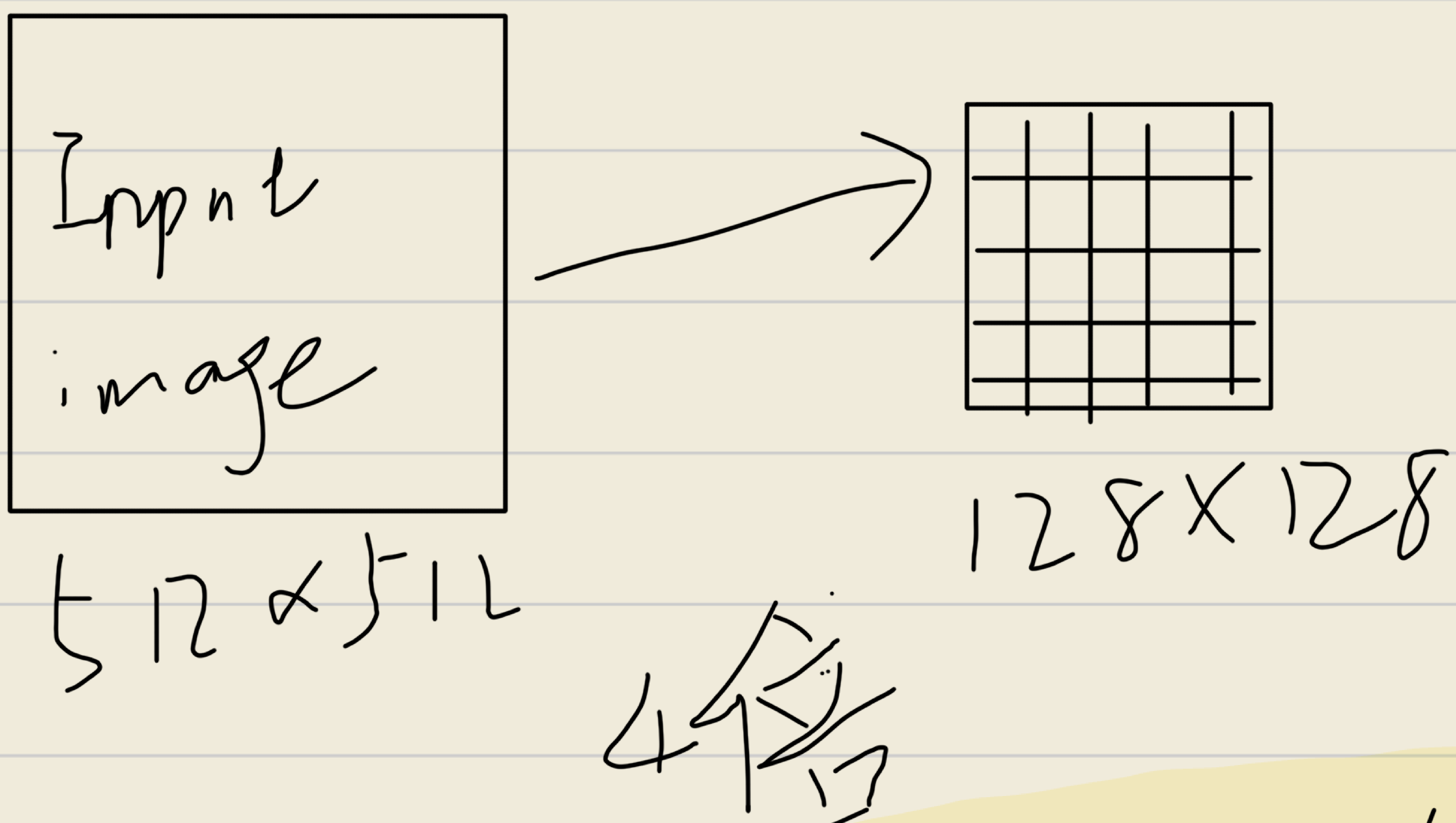
$$S_k = \left(x_2^{(k)} - x_1^{(k)}, y_2^{(k)} - y_1^{(k)}\right)$$

$$L_{size} = \frac{1}{N} \sum_{k=1}^{N} \left| \hat{S}_{pk} - S_k \right|$$

Offset loss

$$(x, y) \rightarrow \left(\left\lfloor \frac{x}{n} \right\rfloor, \left\lfloor \frac{y}{n} \right\rfloor \right)$$

向下取整



$$O_k = \left(\frac{x_k}{n} - \left\lfloor \frac{x_k}{n} \right\rfloor, \frac{y_k}{n} - \left\lfloor \frac{y_k}{n} \right\rfloor \right)$$

$$L_{offset} = \frac{1}{N} \sum_{k=1}^{N} \text{SmoothL1Loss}(O_k, \hat{O}_k)$$

Train loss

$$L_{det} = L_k + \lambda_{size} L_{size} + \lambda_{offset} L_{offset}$$

$$\lambda_{size} = 0.1 \qquad \lambda_{off} = 1$$