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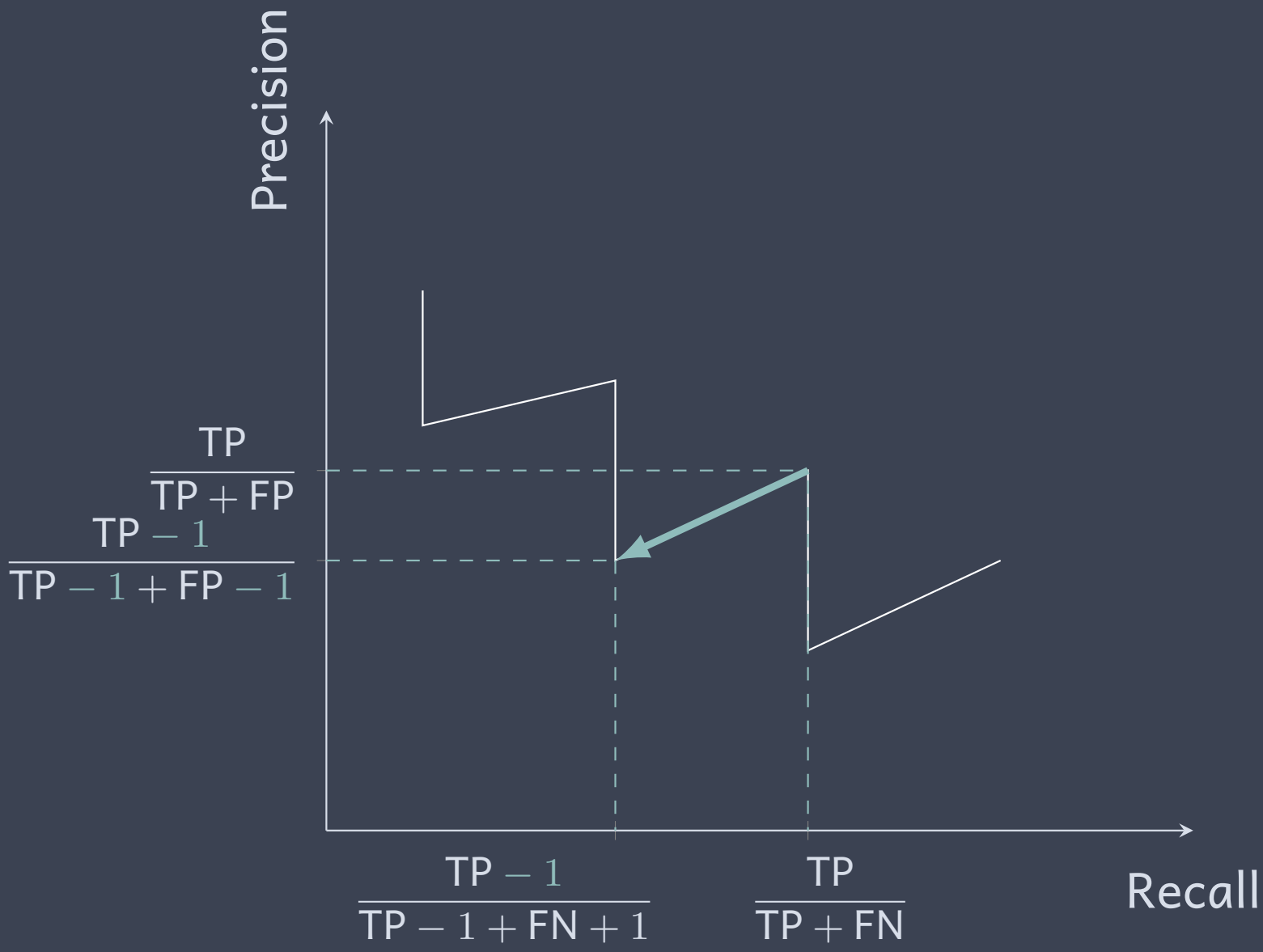
* Precision

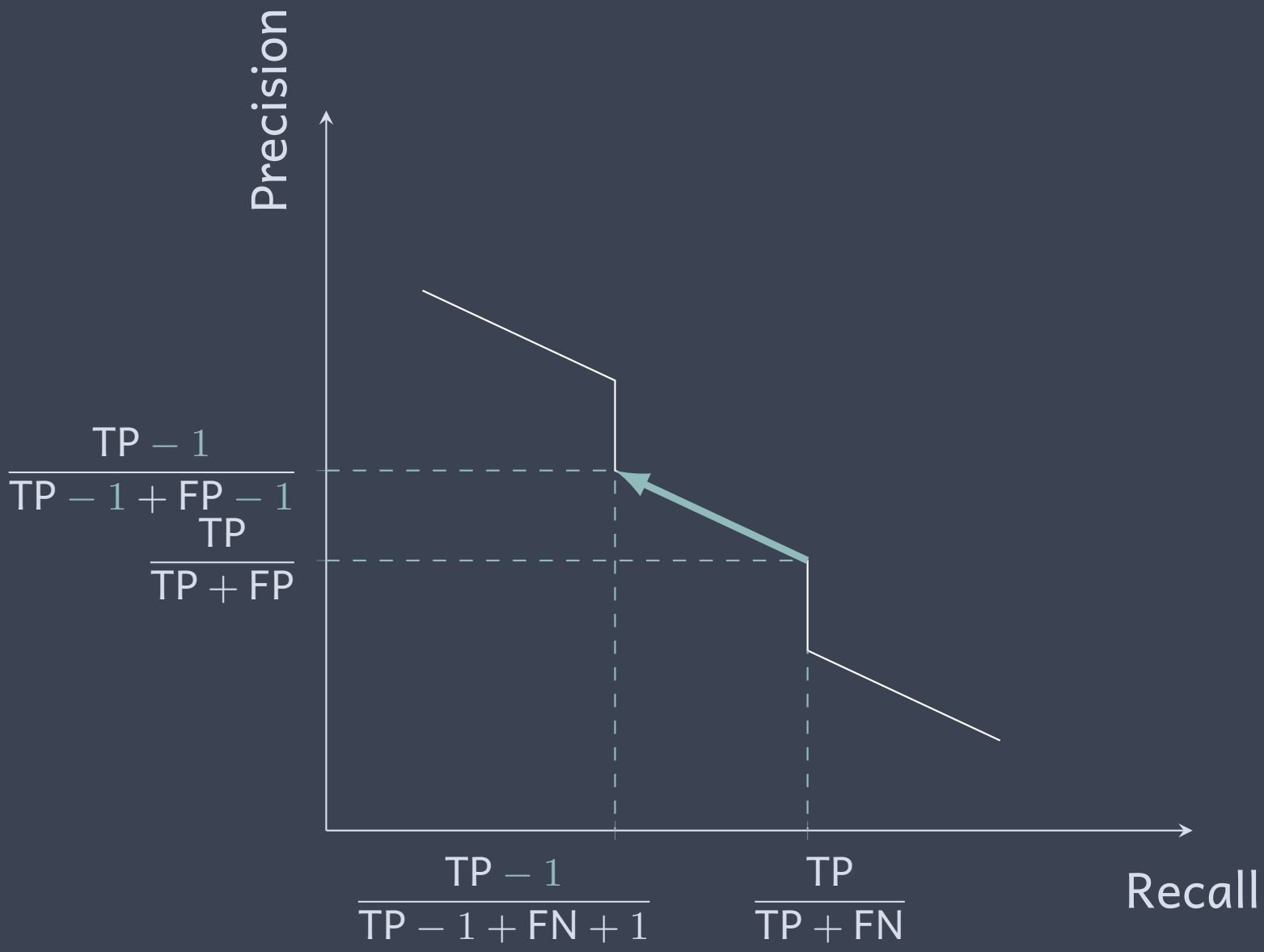
$$\text{Precision} = \frac{\text{TP}}{\text{TP} + \text{FP}}$$


Precision
$\frac{\mathsf{TP}}{\mathsf{TP}+\mathsf{FP}}$
$\frac{\mathsf{TP}-1}{\mathsf{TP}-1+\mathsf{FP}-1}$
$\frac{\mathsf{TP}-1}{\mathsf{TP}-1+\mathsf{FN}+1}$
$\frac{\mathsf{TP}}{\mathsf{TP}+\mathsf{FN}}$
Recall

$$\frac{\mathsf{TP}}{\mathsf{TP}+\mathsf{FP}} > \frac{\mathsf{TP}-1}{\mathsf{TP}-1+\mathsf{FP}-1}$$

$$\Rightarrow \mathsf{TP}^2 + \mathsf{TP} \times \mathsf{FP} - 2 \times \mathsf{TP} > \mathsf{TP}^2 + \mathsf{TP} \times \mathsf{FP} - \mathsf{TP} - \mathsf{FP}$$

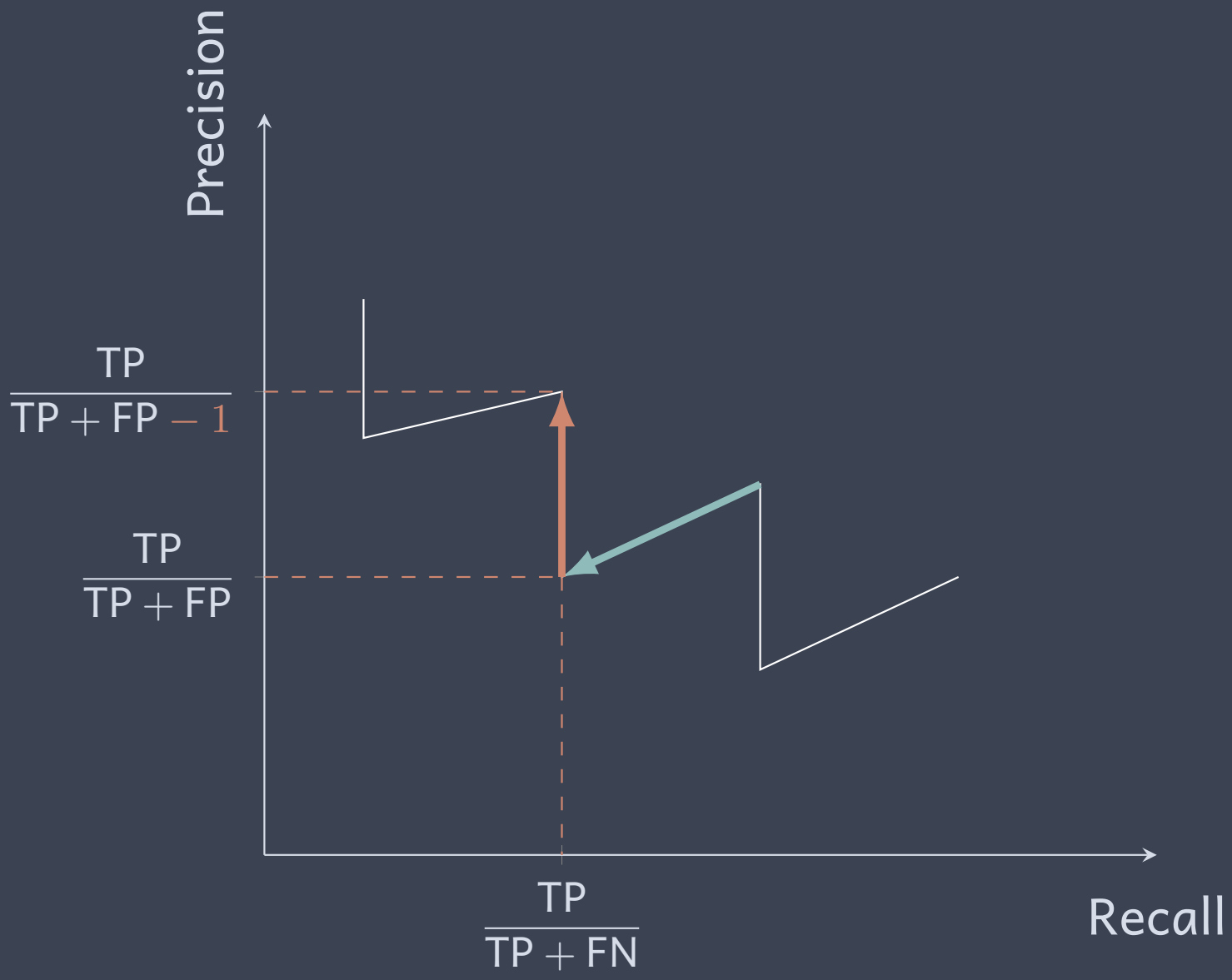
$$\Rightarrow \mathsf{TP} < \mathsf{FP}$$


Precision
$\frac{TP-1}{TP-1+FP-1}$
$\frac{TP}{TP+FP}$
$\frac{TP-1}{TP-1+FN+1}$
$\frac{TP}{TP+FN}$
Recall

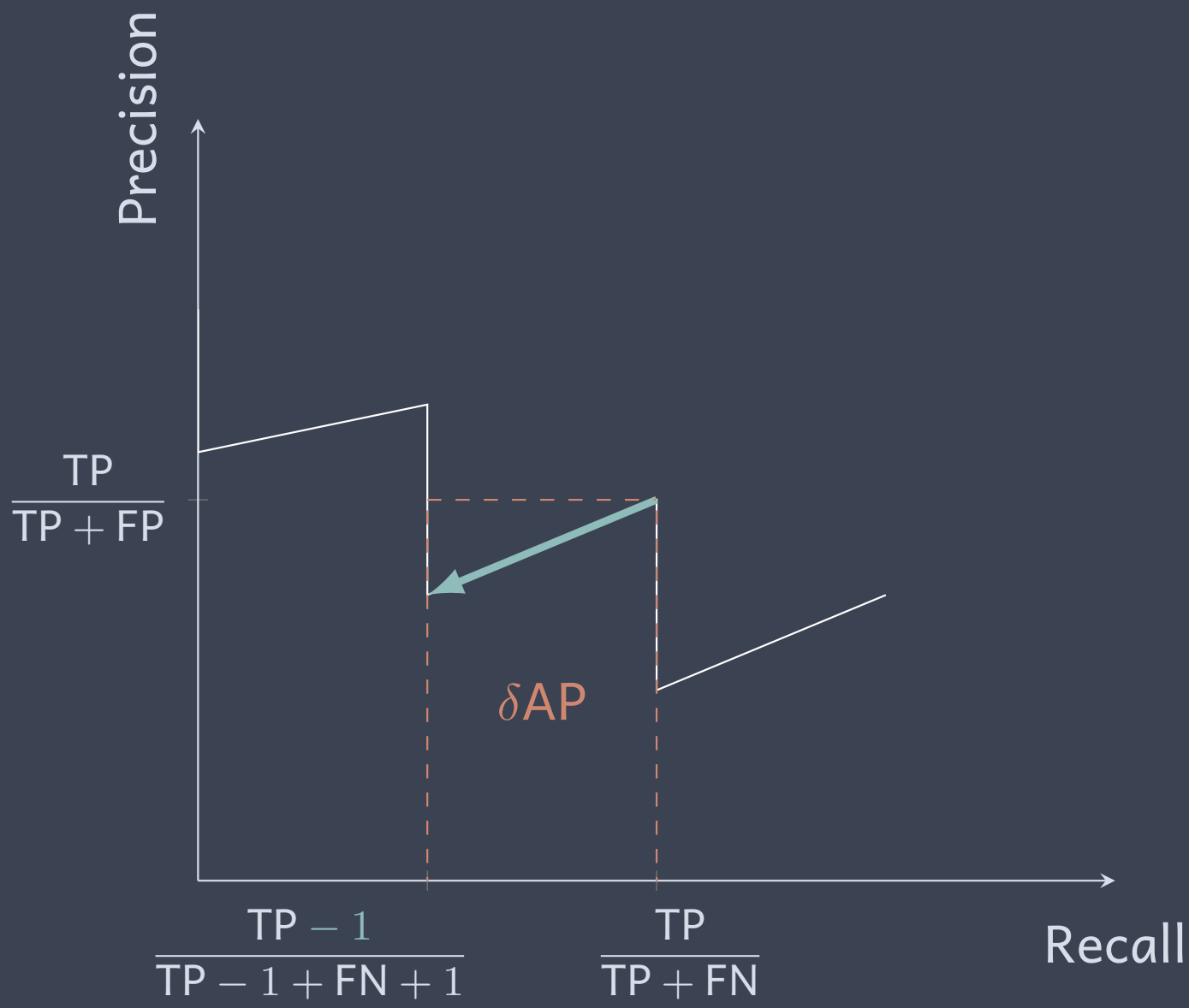
$$\frac{\mathsf{TP}}{\mathsf{TP}+\mathsf{FP}} < \frac{\mathsf{TP}-1}{\mathsf{TP}-1+\mathsf{FP}-1}$$

$$\Rightarrow \mathsf{TP}^2 + \mathsf{TP} \times \mathsf{FP} - 2 \times \mathsf{TP} < \mathsf{TP}^2 + \mathsf{TP} \times \mathsf{FP} - \mathsf{TP} - \mathsf{FP}$$

$$\Rightarrow \mathsf{TP} > \mathsf{FP}$$


Precision
$\frac{TP}{TP + FP - 1}$
$\frac{TP}{TP + FP}$
$\frac{TP}{TP + FN}$
Recall

* Average Precision (AP)



* Average Precision (AP)

$$\delta\text{AP} = \left(\frac{\text{TP}}{\text{TP} + \text{FP}}\right) \times \left[\frac{\text{TP} - (\text{TP} - 1)}{\text{TP} + \text{FN}}\right]$$

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$$\delta\text{AP} = \left(\frac{\text{TP}}{\text{TP} + \text{FP}}\right) \times \left[\frac{1}{\text{TP} + \text{FN}}\right]$$

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$$\delta\text{AP} = \left(\frac{1}{1 + \frac{\text{FN}}{\text{TP}}}\right) \times \left(\frac{1}{1 + \frac{\text{FP}}{\text{TP}}}\right) \times \frac{1}{\text{TP}}$$

* Average Precision (AP)

$$\delta\mathrm{AP} = \left(\frac{1}{1 + \uparrow \frac{\mathrm{FN}}{\mathrm{TP}}} \right) \times \left[\frac{1}{1 + \downarrow \frac{\mathrm{FP}}{\mathrm{TN}} \left(\frac{\mathrm{TN}}{\mathrm{TP}} \right)} \right] \times \frac{1}{\mathrm{TP}}$$

* Average Precision (AP)

$$\delta\mathrm{AP} = \left(\frac{1}{1 + \uparrow \frac{\mathrm{FN}}{\mathrm{TP}}} \right) \times \left[\frac{1}{1 + \downarrow \frac{\mathrm{FP}}{\mathrm{TN}} \left(\frac{\mathrm{TN}}{\mathrm{TP}} \right)} \right] \times \frac{1}{\mathrm{TP}}$$

$$\mathrm{TP} + \mathrm{FN} = n_P \quad \Rightarrow \quad \frac{\mathrm{FN}}{\mathrm{TP}} = \frac{n_P}{\mathrm{TP}} - 1$$

$$\mathrm{TN} + \mathrm{FP} = n_N \quad \Rightarrow \quad \frac{\mathrm{FP}}{\mathrm{TN}} = \frac{n_N}{\mathrm{TN}} - 1$$