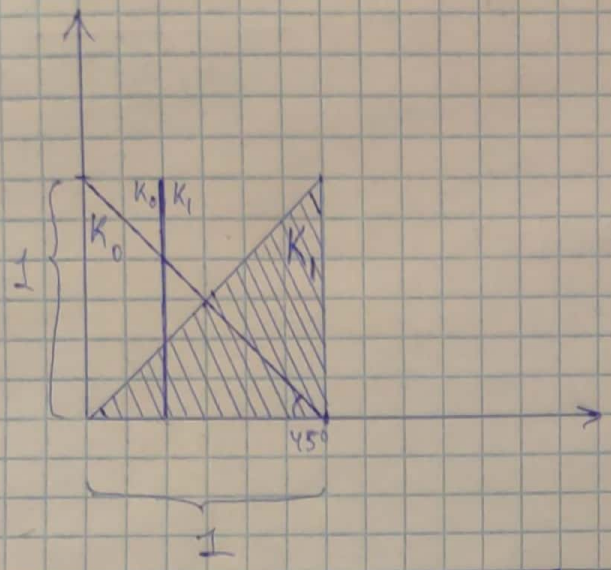
Абрамов, 403-101а

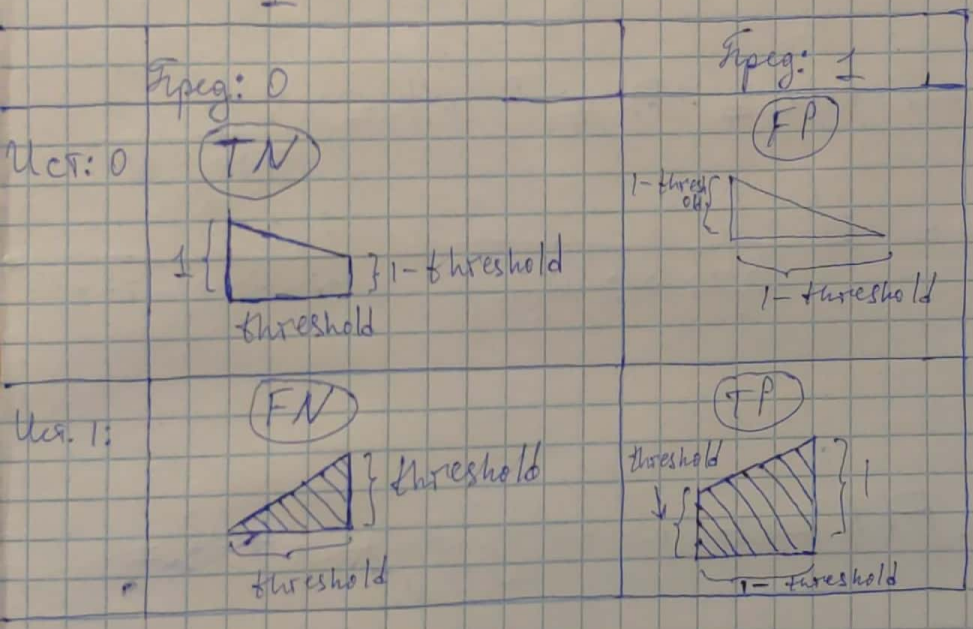


ROC -?

PR -?

Precision (threshold) -?

Recall (threshold) -?



$$TN: \frac{(1+1-threshold)}{2} threshold = \frac{threshold(2-threshold)}{2}$$

$$FP: \frac{(1-threshold)^2}{2}$$

$$FN: \frac{threshold^2}{2}$$

$$TP: \frac{1}{2}(1+treshold)(1-threshold) = \frac{1-threshold^2}{2}$$

• Дальше threshold $\equiv t$.

$$Precision = \frac{TP}{TP+FP} = \frac{1-t^2}{2\frac{1-t^2}{2} + 2\frac{(1-t)^2}{2}} = \frac{(1-t)(1+t)}{(1+t)(1+t)+(1-t)^2} =$$

$$= \frac{1+t}{1+t+1-t} = \boxed{\frac{1+threshold}{2}} \in \left[\frac{1}{2}; 1\right]$$

$$Recall = \frac{TP}{TP+FN} = \frac{1-t^2}{2\frac{1-t^2}{2}+2\frac{t^2}{2}} = \frac{1-t^2}{1-t^2+t^2} = \boxed{1-threshold^2}$$

$$\in [0;1]$$

$P \equiv Precision = \frac{1+t}{2}$; $R \equiv Recall = 1-t^2$;

$t^2 = 1-R$, $t = \sqrt{1-R}$

$$\boxed{P = \frac{1+\sqrt{1-R}}{2}}$$

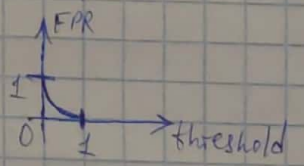
$Sensitivity \equiv True\ Positive\ Rate \equiv TPR \equiv Recall = \frac{TP}{TP+FN}$

$$Specificity = \frac{TN}{TN+FP} = \frac{t(2-t)}{2\frac{t(2-t)}{2}+2\frac{(1-t)^2}{2}} = \frac{t(2-t)}{2t-t^2+1-2t+t^2} =$$

$$= \frac{t(2-t)}{1} = 2t-t^2$$

$False\ Positive\ Rate \equiv FPR = 1-Specificity = 1-2t+t^2 =$

$= (1-threshold)^2$



$TPR = 1-t^2$; $FPR = (1-t)^2$;

$1-t = \sqrt{FPR}$, $t = 1-\sqrt{FPR}$

$$\boxed{TPR = 1-\left(1-\sqrt{FPR}\right)^2}$$