

15.

$x_1$	0	0	1	1	0	0	1	1	1	0
$x_2$	0	1	0	1	1	1	1	1	1	1
$y$	0	0	0	0	0	1	1	1	1	1

$$Pr(Y=0 | X_1=1, X_2=1)$$

$$Pr(Y=1 | X_1=1, X_2=1)$$

$Y$	0	1
$Pr(Y)$	0,5	0,5

	$X_1$	
$Y$	0	1
0	0,6	0,4
1	0,4	0,6

	$X_2$	
$Y$	0	1
0	0,4	0,6
1	0	1

$$Pr(Y=0 | X_1=1, X_2=1) =$$

$$= \frac{Pr(0) \cdot Pr(X_1=1|0) \cdot Pr(X_2=1|0)}{Pr(X_1=1, X_2=1)}$$

$$= \frac{0,5 \cdot 0,4 \cdot 0,6}{0,12 + 0,3} = \frac{0,12}{0,42} = 0,2857$$

$$Pr(Y=1 | X_1=1, X_2=1) =$$

$$= \frac{Pr(1) \cdot Pr(X_1=1|1) \cdot Pr(X_2=1|1)}{Pr(X_1=1, X_2=1)}$$

$$= \frac{0,5 \cdot 0,6 \cdot 1}{0,12 + 0,3} = \frac{0,3}{0,42} = 0,7143$$

40.

TN	FN
FP	TP

TPR, TNR, PPV, NPV

N P кол-во представителей классов

$$TPR = \frac{TP}{FN + TP}$$

$$TNR = \frac{TN}{TN + FP}$$

$$PPV = \frac{TP}{FP + TP}$$

$$NPV = \frac{TN}{TN + FN}$$

$$1) TP = TPR (FN + TP) = TPR \cdot P$$

$$TN = TNR (TN + FP) = TNR \cdot N$$

$$FP = N - TN = N - TNR \cdot N$$

$$FN = P - TP = P - TPR \cdot P$$

$$\Rightarrow PPV = \frac{TPR \cdot P}{N - TNR \cdot N + TPR \cdot P}$$

$$NPV = \frac{TNR \cdot N}{TNR \cdot N + P - TPR \cdot P}$$

42.

$i$	1	2	3	4	5	6	7	8	9
$y^{(i)}$	0	0	0	0	0	1	1	1	1
$g(x^{(i)})$	0,75	0,15	0,11	0,23	0,09	0,10	0,66	0,82	0,50
	1	0	0	0	0	0	1	1	1

TN=4	FN=1
FP=1	TP=3
N=5	P=4

$$I(g(x) \geq 0,5)$$

$$FPR = \frac{FN}{N} = \frac{1}{5}$$

$$FNR = \frac{FN}{P} = \frac{1}{4}$$

$$TNP = \frac{TN}{N} = \frac{4}{5}$$

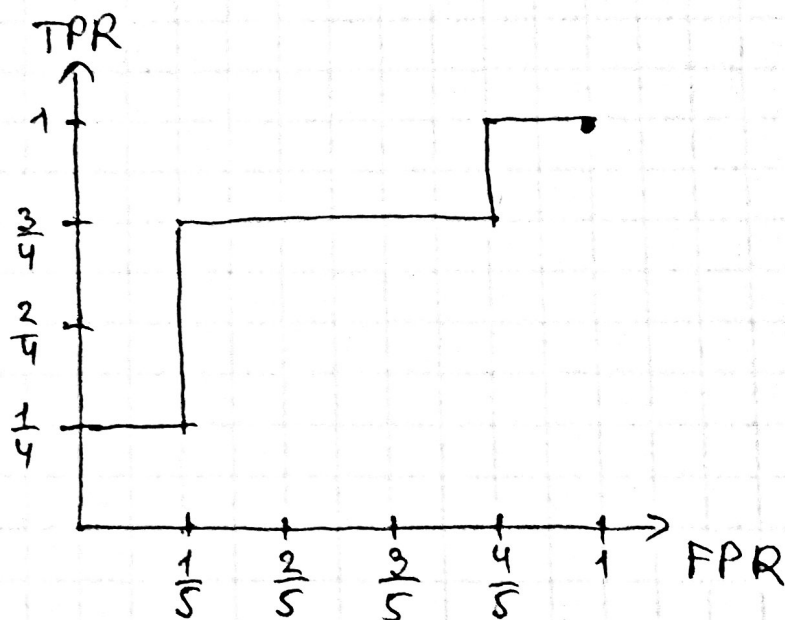
$$TPR = \frac{TP}{P} = \frac{3}{4}$$

$$PPV = \frac{TP}{FP+TP} = \frac{3}{4}$$

$$\text{accuracy} = \frac{TP+TN}{P+N} = \frac{7}{9}$$

$$\text{error} = 1 - \text{accuracy} = \frac{2}{9}$$

$$F1 = \frac{2 \cdot PPV \cdot TPR}{PPV + TPR} = \frac{2 \cdot \frac{3}{4} \cdot \frac{3}{4}}{\frac{3}{4} + \frac{3}{4}} = \frac{3}{4}$$



$$AUC = \frac{1}{20} + \frac{9}{20} + \frac{1}{5} = 0,7$$