# Theory - hw1

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## 1 1

, $P(x^{(k)}|y) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x^{(k)} - \mu_{yk})}{2\sigma^2}}$, $P(y|X) \propto \prod_{i=1}^{\infty} P(x^{(k)}|y)$, $P(y|X) \propto exp\left(-\sum_{k=0}^{n} \frac{\left(x^{(k)} - \mu_{yk}\right)^2}{2\sigma^2}\right)$,
, $\sum_{k=0}^{n} \left(x^{(k)} - \mu_{yk}\right)^2$. $X$ $\mu_y$.

## 2 2

ROC-AUC $3 : 0, 0.5, 1$. 1- 3- $(0, 0)$ $(1, 1)$. 2- . $n$ $an$ 1- . TP $ nap$, 1- $na$, $p$ .
$FN = na(1 - p)$,
$TN = n(1 - a)(1 - p)$,
$FP = n(1 - a)p$
False positive rate True negative rate:
$Fpr = \frac{fp}{fp+tn} = \frac{n(1-\alpha)p}{n(1-\alpha)p+n(1-\alpha)(1-p)} = p, Tpr = \frac{tp}{tp+fn} = \frac{n\alpha p}{n\alpha p+n\alpha(1-p)} = p$
, , 0.5 - (p, p). , (0,0), (p,p), (1,1), 1x1, .. ROC-AUC 0.5.

## 3 3

$E_B = min\{P(0|X), P(1|X)\}$
$E_N = P(y \neq y_n) = P(y_n = 1|x_n)P(0|x) + P(y_n = 0|x_n)P(1|x)$
, $P(y|x)$ $x$. $l$ - .
$P(y_n|x_n) \to P(y_n|x)$ $l \to$ inf.

$$E_N \approx 2P(1|x)P(0|x) \leq 2min\{P(0|x), P(1|x)\} = 2E_B$$

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In [ ]:
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