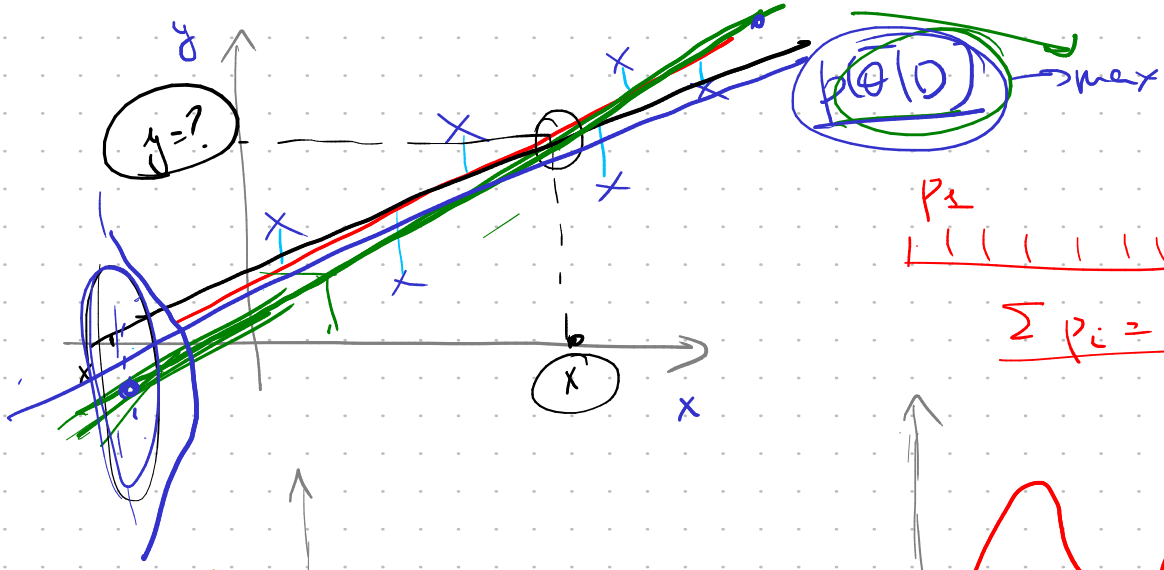
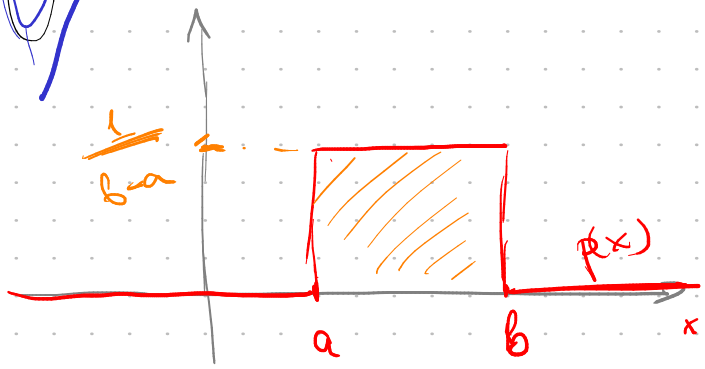
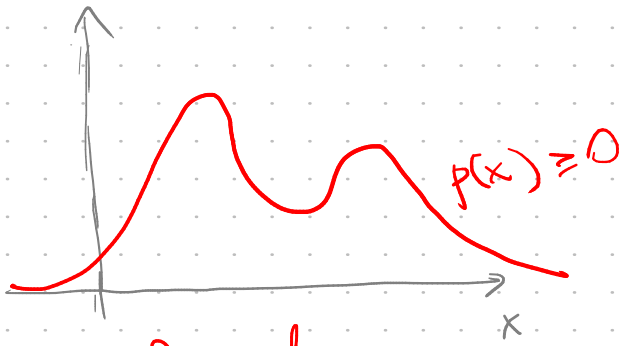


$$\sum p_i = 1$$





$$\int p(x)\,dx = 1$$

Совместная вероятность

$p(x, y)$

$p(\#1 = \boxdot) = 1/6$

$p(\#2 = \boxdot) = 1/6$

$p(\#1 = \boxdot, \#2 = \boxdot) = 1/36$

$p(\#1 = \text{чётное число}) = 1/2$

$p(\#1 = \text{чётное число}, \#1 = \boxdot) = 1/6$

Независимость

$p(x, y) \overset{def}{=} p(x) \cdot p(y)$

Условная вероятность

$p(x \mid y)$

$p(x \mid y) \overset{def}{=} \frac{p(x, y)}{p(y)}$

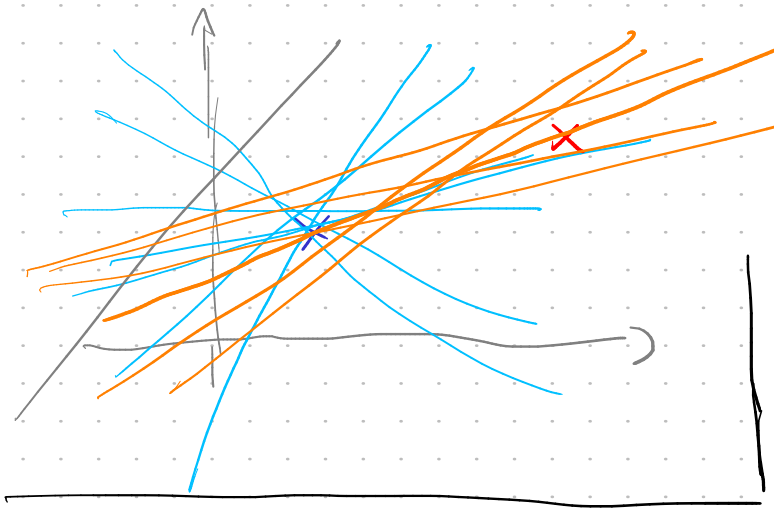
$p(\#1 = \boxdot \mid \#1 = \text{чётное число}) = 1/3 = \frac{1/6}{1/2}$

$p(\#1 = \text{чётное} \mid \#1 = \boxdot) = 1 = \frac{1/6}{1/6}$

$p(\#1 = \text{чётное} \mid \#2 = \boxdot) = 1/2 = \frac{1/12}{1/6}$

$$p(y|x)\,p(x) = p(x,y) = p(x|y)\,p(y)$$

$$p(y|x) = \frac{p(y)\,p(x|y)}{p(x)}$$ — Bayes theorem



$d = 1$ — "Болен"

$t = 1$ — "Тест +"

$p(t=1 \mid d=1) = 0.95$

$p(t=0 \mid d=0) = 0.95$

$p(d=1) = 0.01$

$$p(d=1 \mid t=1) = \frac{p(d=1)\,p(t=1 \mid d=1)}{p(t=1)}$$

(0.01, 0.95)

$$p(t=1) = p(t=1, d=1) + p(t=1, d=0)$$

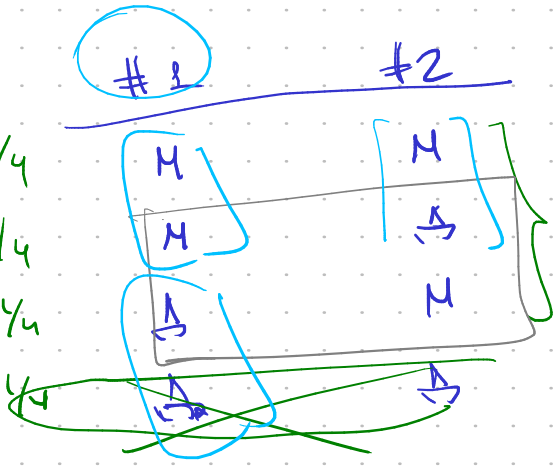
(0.95)

$$= p(d=1)\,p(t=1 \mid d=1) + p(d=0)\,p(t=1 \mid d=0)$$

(0.01; 0.99; 0.05)

$$= \frac{0.01 \cdot 0.95}{0.01 \cdot 0.95 + 0.99 \cdot 0.05} \approx \frac{1}{6}$$

(1/1+5)



$$p(\text{есть } \Delta \mid \text{есть } М) = \frac{p(\text{и } \Delta, \text{и } М)}{p(\text{есть } М)}$$

$$= 2/3$$

$p(\text{рак}) = 0.01$

$p(\text{рак} \mid \text{невинен}) = 0.01 \Rightarrow p(\text{невинен} \mid \text{рак})$

$p(\text{невинен} \mid \text{рак}) = 0.99$

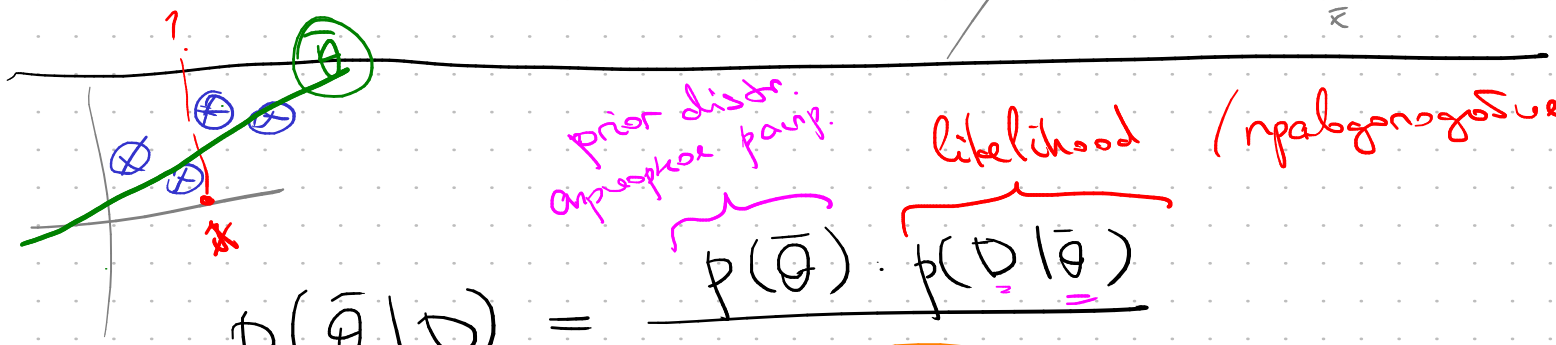
$\Rightarrow p(\text{друго рак} \mid \text{невинен}) = 0.99$

$$p(\text{виновен} \mid \text{рак}) = \frac{p(\text{виновен})\, p(\text{рак} \mid \text{виновен})}{p(\text{рак})}$$

~~$p(\text{виновен} \mid \text{рак}) \cdot p(\text{рак})$~~

$p(\text{убит} \mid \text{сем. насилие}) = 1/2500$

$p(\text{убит мъж} \mid \text{сем. насилие} \;\&\; \text{кой е убит})$



$$p(\bar{\theta} \mid D) = \frac{p(\bar{\theta})\, p(D \mid \bar{\theta})}{p(D)}$$

prior distr. — априорно разп. — likelihood — правдоподобие

$p(D)$ — evidence probability

posterior distribution

апостериорно разп. — a posteriori

$$p(\bar{\theta} \mid D) \propto p(\bar{\theta}) p(D \mid \bar{\theta})$$

$$p(x \mid D) = \int p(x, \bar{\theta} \mid D)\, d\bar{\theta} =$$

$$= \int p(x \mid \bar{\theta}, \cancel{D})\, p(\bar{\theta} \mid D)\, d\bar{\theta} =$$

$$p(D) = \int p(\bar{\theta}, D)\, d\bar{\theta} =$$

$$= \int p(\bar{\theta}) p(D \mid \bar{\theta})\, d\bar{\theta}$$

$$= \int p(x \mid \bar{\theta})\, p(\bar{\theta} \mid D)\, d\bar{\theta} = E_{p(\bar{\theta} \mid D)}[p(x \mid \bar{\theta})]$$