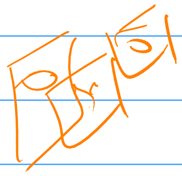
$$\xrightarrow{?}$$

cat / dog

$$f(\bar{x}) = \hat{y} \approx$$

$$p(y|\bar{x})$$ discrim.



$$p(\bar{x})$$ generative

$$\int p(\bar{x})\, d\bar{x} = 1 \qquad p(\bar{x} \in A) = \int_A p(\bar{x})\, d\bar{x}$$

$$p(x) = \int p(x,y)\, dy$$ marginalization

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

independence

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

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

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

$$\boxed{p(x|y) = \frac{p(y|x)\,p(x)}{p(y)}}$$

$$p(d|t) = \frac{\overbrace{p(t|d)}^{0.95}\,\overbrace{p(d)}^{0.01}}{\boxed{p(t)}} = \frac{\overset{0.95}{p(t|d)}\,\overset{0.01}{p(d)}}{\underset{0.95}{p(t|d)}\,\underset{0.01}{p(d)} + \underset{0.05}{p(t|\bar{d})}\,\underset{0.99}{p(\bar{d})}} \approx \frac{1}{6}$$

$$p(t) = p(t,d) + p(t,\bar{d})$$

max

$$\underbrace{p(\theta|D)}_{\text{posterior}} = \frac{\overbrace{p(D|\theta)}^{\text{likelihood}}\overbrace{p(\theta)}^{\text{prior}}}{\underbrace{p(D)}_{\text{model evidence}}}$$

MAP

θ — model parameters, D — data

$$\theta_{MAP} = \arg\max p(\theta|D)$$

$$p(\theta|D) \propto p(D|\theta)\,p(\theta)$$

$$p(y,\bar{x}) = p(y)\cdot\prod p(x_i|y)$$

$$\theta_{wy} = p(x_i = w\,|\,y)$$

$$\theta_y = p(y)$$

$$p(\bar{\theta}|D) = p(D|\bar{\theta})$$

$$p(y,\bar{x}|\bar{\theta}) = \left(\prod_a \theta_a^{[y=a]}\right)\cdot\left(\prod_i\prod_w\prod_a \theta_{wa}^{[x_i=w,\,y=a]}\right)$$

$$p(D|\bar{\theta}) = \prod p(y,\bar{x}|\bar{\theta})$$

ML - max likelihood

$$p(\text{heads}) = \theta$$

$$p(\text{tails}) = 1-\theta$$

$$D = hhthtthh$$

$$p(D|\theta) = \theta^n(1-\theta)^m$$

$\downarrow \theta$ max

n ревнье, m орлов

$$\ln\frac{\theta}{1-\theta}$$

$$\theta_{ML} = ?$$

$$n\theta^{n-1}(1-\theta)^m - m\theta^n(1-\theta)^{m-1} =$$

$$= \theta^{n-1}(1-\theta)^{m-1}\left(n(1-\theta) - m\theta\right) = 0$$

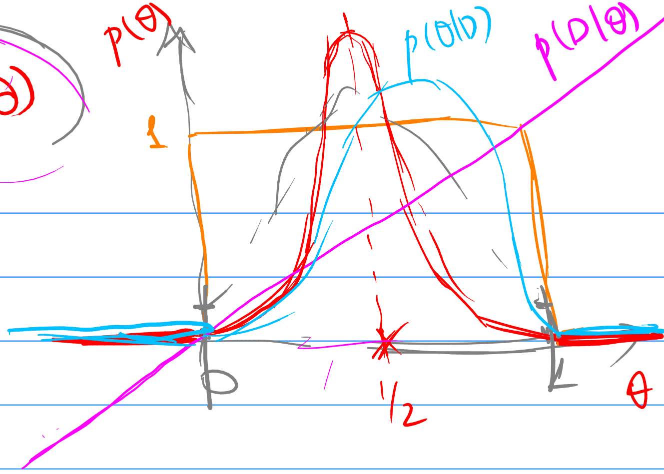
$$\theta_{ML} = \frac{n}{n+m}$$

$$D = h$$

$$p(D|\theta) = \theta \rightarrow \infty$$

$$\theta_{ML} = 1$$

$$p(\theta|D) \propto \underbrace{p(D|\theta)}_{\theta}\, p(\theta)$$



$p(x=1) = p(x=2) \ldots = \frac{1}{6}$

$A =$ „$x \in \{1, 2, 3\}$" $p(A) = 1/2$

$B =$ „x rétho" $p(B) = 1/2$

$p(A, B) = 1/6$ $p(B|A) = \frac{p(A,B)}{p(A)} = \frac{1/6}{1/2} = 1/3$

$$\boxed{p(A, B) \neq p(A)\,p(B)}$$