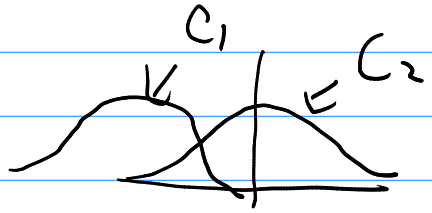
$$f(x|\mu,\sigma^2) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{(x-\mu)^2}{2\sigma^2}\right\}$$

MLE



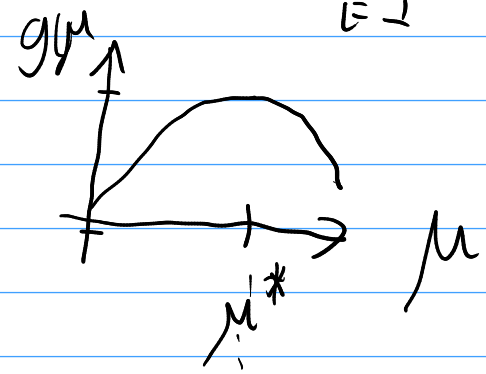
	170	180	
C_1	0.9	0.01	0.009
C_2	0.6	0.3	0.18 ✓

$x_1, x_2, x_3, \cdots, x_n$

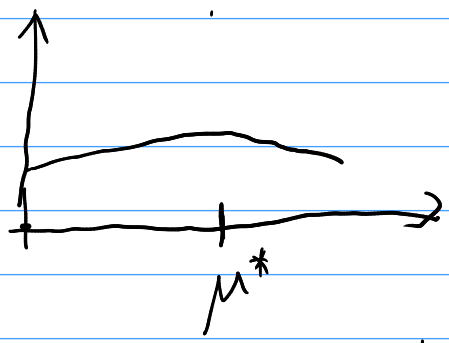
$p(x_1), p(x_2), \cdots, p(x_n)$

$$p(x_1)p(x_2)\cdots p(x_n) = \prod_{i=1}^{N} p(x_i)$$

$$g(\mu) = \prod_{i=1}^{N} p(x_i)$$



$\log g(\mu)$



$$\log\left(\prod p(x_i)\right) = \sum \log p(x_i)$$

$\log(ab) = \log a + \log b$

$$f(x|\mu,\sigma^2) = \frac{1}{\sqrt{2\pi}\sigma} \exp\left\{-\frac{(x-\mu)^2}{2\sigma^2}\right\}$$

$x_1, x_2, x_3, \cdots x_N$

$$g = \prod f(x_i|\mu,\sigma) = \left(\frac{1}{\sqrt{2\pi}}\right)^N \left(\frac{1}{\sigma}\right)^N \prod \exp\left\{\frac{-(x_i-\mu)^2}{2\sigma^2}\right\}$$

σ^{-N}

$$\log(g) = \log\left(\frac{1}{\sqrt{2\pi}}\right)^N - N\log\sigma + \sum \log\left[\exp\left\{\frac{-(x_i-\mu)^2}{2\sigma^2}\right\}\right]$$

$\log e^a = a$

$$l(\mu,\sigma) = \log\left(\frac{1}{\sqrt{2\pi}}\right)^N - N\log\sigma + \sum_{i=1}^{N}\left\{\frac{-(x_i-\mu)^2}{2\sigma^2}\right\}$$

$$\frac{\partial l}{\partial \mu} = 0, \quad \frac{\partial l}{\partial \sigma} = 0$$

$$\frac{\partial l}{\partial \mu} = 0 + 0 + \sum \frac{\partial}{\partial \mu}\left[\frac{-(x_i-\mu)^2}{2\sigma^2}\right]$$

$$= \sum \frac{-(x_i-\mu)2}{2\sigma^2}(-1) = 0$$

$$\frac{2(-1)(-1)}{2\sigma^2}\sum(x_i-\mu) = 0$$

$$\Sigma(x_i - \mu) = 0$$

$$\Sigma x_i - \sum_{i=1}^{N} \mu = 0$$

$$\Sigma x_i - N\mu = 0 \Rightarrow \mu = \frac{\Sigma x_i}{N} = \bar{x}$$

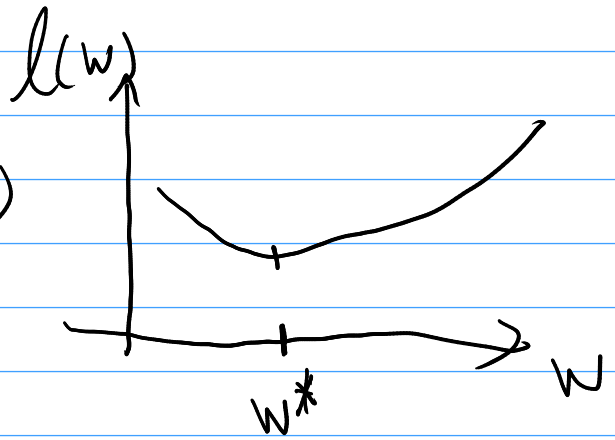
$$\sigma^2 = \frac{1}{n} \sum_{i=1}^{n} (x_i - \bar{x})^2$$

$x_1, x_2, x_3, \cdots, x_N$

$P(x_1), P(x_2), \cdots, P(x_n)$

$\Pi P(x_i)$

$-\log \Pi P(x_i) = l(w)$



$\Pi P(x_i)$