likelihood function.

$$P(t|x,w,\beta) = \prod_{n=1}^{N} \mathcal{N}(t_n|y(x_n,w),\beta^{-1})$$

apply log on both sides

$$\log P(t|x,w,\beta) = \log\left[\prod_{n=1}^{N} \mathcal{N}(t_n|y(x_n,w),\beta^{-1})\right]$$

$$\log P(t|x,w,\beta) = \sum_{n=1}^{N}\left[-\frac{\beta}{2}\left[y(x_n,w)-t_n\right]^2\right] - \sum_{n=1}^{N} \log(2\pi\beta^{-1})^{1/2}$$

substituted $N(t_n|y(x_n,w);\beta^{-1}) = \frac{1}{(2\pi\beta^{-1})^{1/2}} e^{-\beta/2\left[y(x_n,w)-t_n\right]^2}$

$$\Rightarrow \log P(t|x,w,\beta) = -\frac{\beta}{2}\sum_{n=1}^{N}(y(x_n,w)-t_n)^2 - \frac{n}{2}\log 2\pi + \frac{n}{2}\log\beta.$$

Given $(x_1,t_1) = (1,1.2)$ $(x_2,t_2) = (2,1.9)$ $(x_3,t_3) = (3,3.2)$.
$\beta = 1$

we know that

$$\frac{1}{\beta_{ML}} = \frac{1}{N}\sum_{n=1}^{N}\{y(x_n,w_{ML})-t_n\}^2 \quad (\because \text{maximizing w.r.t } \beta.)$$

$$1 = \frac{1}{3}\left[\sum_{n=1}^{3}\{y(x_n,w_{ML})-t_n\}^2\right]$$

$y(x_n,w) = w_1x+w_0$
$= w^Tx.$

$$\boxed{3 = (w_1(1)+w_0-1.2)^2 + (w_1(2)+w_0-1.9)^2 + (w_1(3)+w_0-3.2)^2.} \to (1)$$

Boozo

maximizing w.r.t W

$$\Rightarrow -\frac{1}{2} \times 2 \sum_{n=1}^{N} \{y(x_n, W) - t_n\} \times \frac{\partial}{\partial W} y(x_n, W) = 0.$$

$$\Rightarrow \sum_{n=1}^{N} (y(x_n, W) - t_n) = 0 \quad \left[\frac{\partial}{\partial w} y(x_n, w) = 1 \text{ since } \cancel{\text{degree}} \text{ linear function.}\right]$$

$$W_1 + W_0 - 1.2 + W_1(2) + W_0 - 1.9 + W_1(3) + W_0 - 3.2 = 0$$

$$\Rightarrow 6W_1 + 3W_0 - 6.3 = 0$$

$$\Rightarrow \boxed{2W_1 + W_0 = 2.1} \rightarrow (2)$$

Substitute $W_0 = 2.1 - 2W_1$ in (1).

$$\Rightarrow 3 = (W_1 + 2.1 - 2W_1 - 1.2)^2 + (\cancel{2W_1} + 2.1 - \cancel{2W_1} - 1.9)^2 + (3W_1 + 2.1 - 2W_1 - 3.2)^2$$

$$3 = (0.9 - W_1)^2 + (0.2)^2 + (W_1 - 1.1)^2$$

~~$3 = (W_1^2 + 0$~~

$$3 = 0.81 + W_1^2 - 1.8W_1 + 0.04 + W_1^2 + 1.21 - 2.2W_1$$

$$3 = 2W_1^2 - 4W_1 + 2.06$$

$$\Rightarrow 2W_1^2 - 4W_1 - 0.94 = 0$$

$$\Rightarrow W_1^2 - 2W_1 - 0.47 = 0.$$

$$\Rightarrow W_1 = \frac{2 \pm \sqrt{4 - 4(1)(-0.47)}}{2}.$$

$\Rightarrow w_1 = \dfrac{2 \pm 2.42}{2}$

$w_1 = 2.21, -0.21$

for $\cancel{x}$ $w_1 = 2.21$

$w_0 = 2.1 - 2w_1$

$\Rightarrow w_0 = 2.1 - 4.42$

$w_0 = -2.32$

for $w_1 = -0.21$

$w_0 = 2.1 - 2w_1$

$= 2.1 - 2(-0.21)$

$= 2.1 + 0.42$

$= 2.52$.

$\Rightarrow$ consider line 3 since it gives less error difference

$y = 2.21x - 2.32$ plot it

$\Rightarrow y = w_1 x + w_0$.

$\Rightarrow y = 2.21x - 2.32$ — 3 and $y = -0.21x + 2.52$ — 4

we have to check between 3 and 4 lines