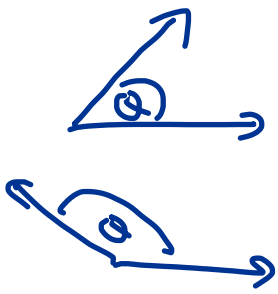
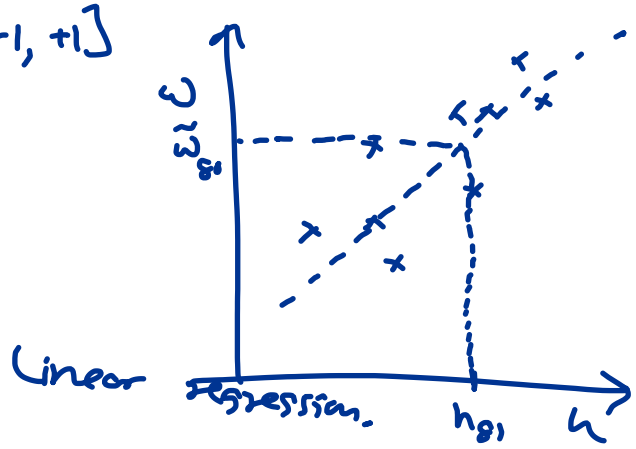
Students	heights	weights
S_1	h_1	ω_1
S_2	h_2	ω_2
$\vdots$		
S_{80}	h_{80}	ω_{80}



$$\rho = \frac{\sum_{i=1}^{80}(h_i-\hat{h})(\omega_i-\hat{\omega})}{\sqrt{\sum_{i=1}^{80}(h_i-\hat{h})^2}\sqrt{\sum_{i=1}^{80}(\omega_i-\hat{\omega})^2}} \in [-1,+1]$$

Pearson correlation coefficient.



$$h = a\omega + b \simeq a_1 \sin(\omega) + \omega^2 a_2 + b$$

$$l(a,b) = (h_i - \tilde{h}_i)^2 = (h_i - a\omega_i - b)^2$$

$$\frac{\partial l}{\partial a} = 2(h_i - a\omega_i - b)(-\omega_i) = 0$$

$$\frac{\partial l}{\partial b} = 2(h_i - a\omega_i - b)(-1) = 0.$$

$$h_i\omega_i - a\omega_i^2 - b\omega_i = 0.$$

$$h_i - a\omega_i - b = 0.$$

$$\sum_i h_i\omega_i - a\sum_i \omega_i^2 - b\sum \omega_i = 0.$$

$$\sum_i h_i - a\sum \omega_i - bN = 0.$$

$$a^{(k+1)} = a^{(k)} - \eta\frac{\partial l}{\partial a^{(k)}}$$

$$= a^{(k)} + 2\eta\omega_i(h_i - a^{(k)}\omega_i - b^{(k)}).$$

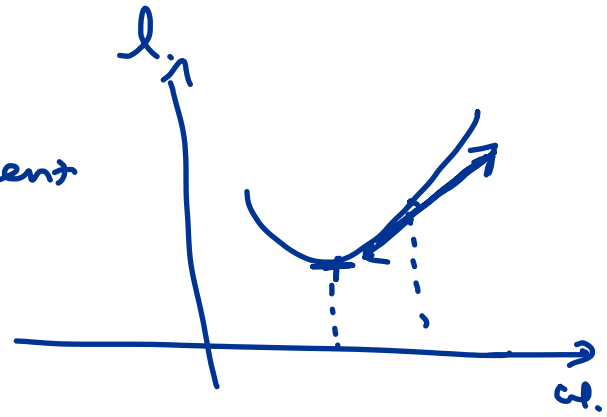
$$b^{(k+1)} = b^{(k)} - \eta\frac{\partial l}{\partial b^{(k)}}$$

$$= b^{(k)} + 2(h_i - a^{(k)}\omega_i - b^{(k)}).$$

$$(a^{(0)}, b^{(0)}) = (0.3, 0.5)$$

$$w^{(k+1)} = w^{(k)} - \eta \frac{\partial l}{\partial w^{(k)}}$$

Stochastic Gradient Descent (SGD)



(2).