

## Step-1

The least squares solution to a problem  $ax = b$  in one unknown is  $\hat{x} = \frac{a^T b}{a^T a}$

If  $x = b_1, x = b_2$  are the observations and  $w_1 > w_2$ , then the weighted error  $E^2 = w_1^2 (x - b_1)^2 + w_2^2 (x - b_2)^2$

The error is minimized at  $\hat{x}_w = \frac{w_1^2 b_1 + w_2^2 b_2}{w_1^2 + w_2^2}$

If  $w_1$  approaches to zero, then it becomes  $\hat{x}_w = \frac{w_2^2 b_2}{w_2^2}$   
 $= b_2$

So, even if the observation  $x = b_1$  is totally unreliable, we get the weighted average  $\hat{x}_w$  is equal to observation  $x = b_2$ .