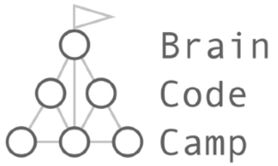
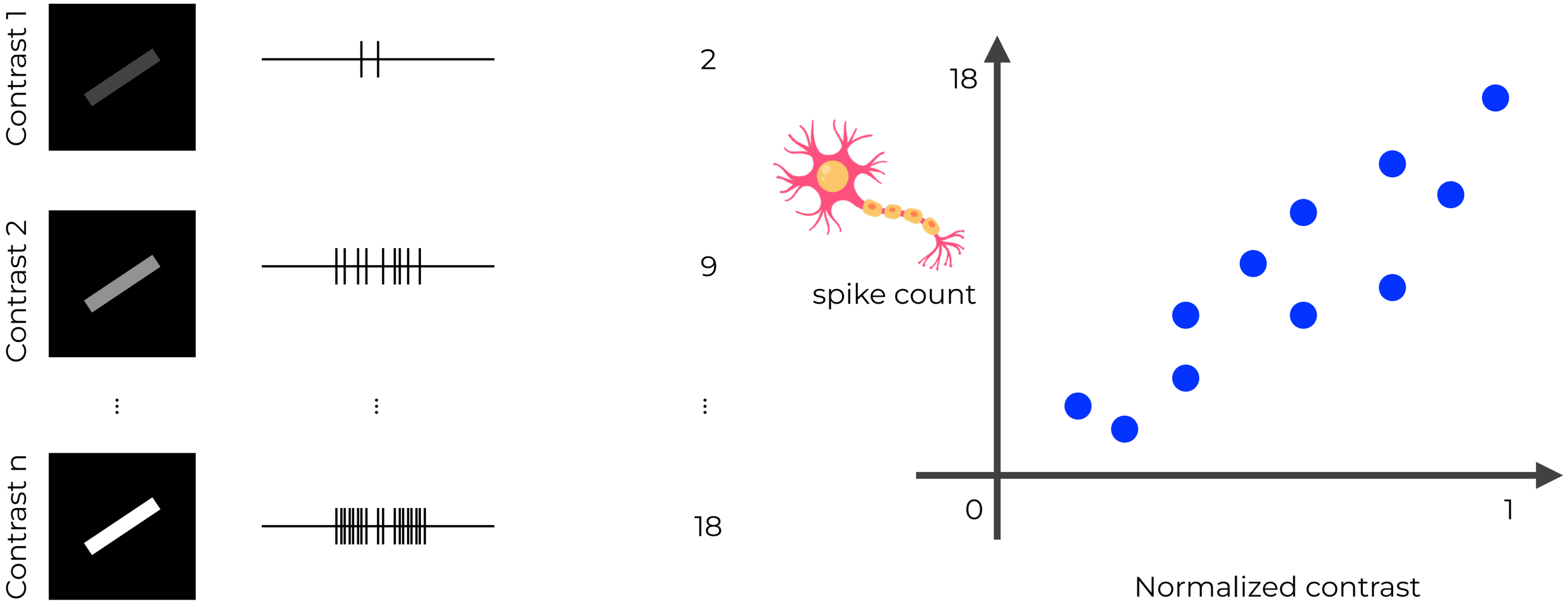


Simple Linear Models

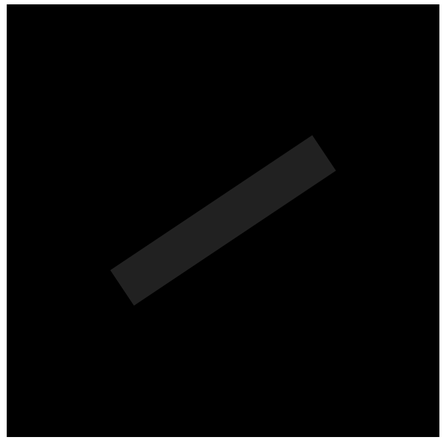
Itthi Chatnuntawech

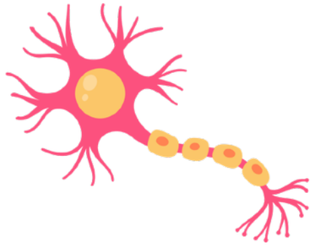
Spike Count Prediction



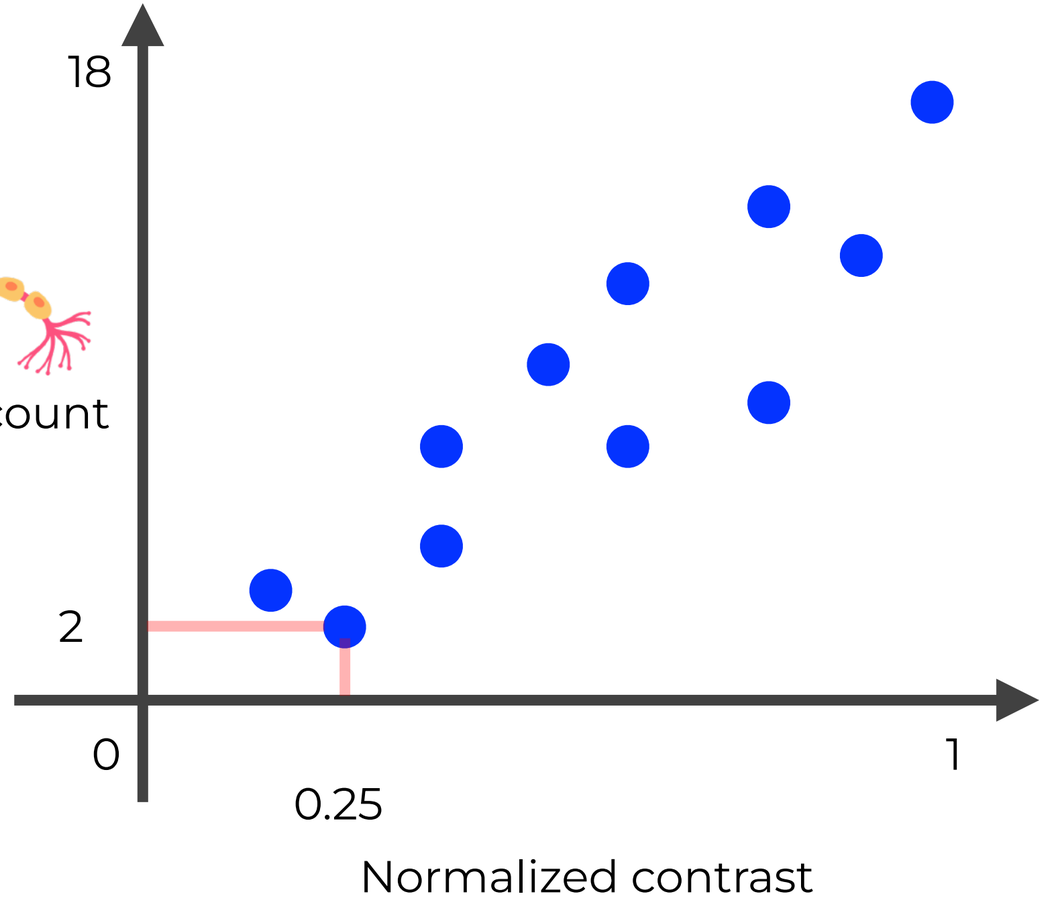
Spike Count Prediction

Normalized contrast = 0.25



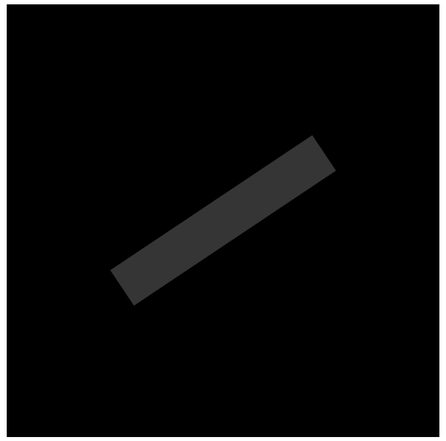


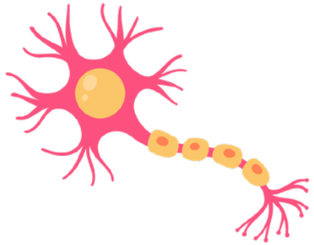
spike count



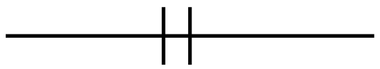
Spike Count Prediction

Normalized contrast = 0.31

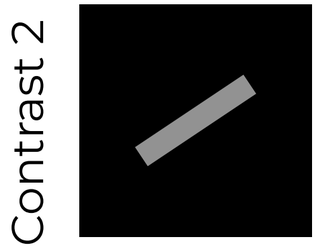




Spike Count Prediction

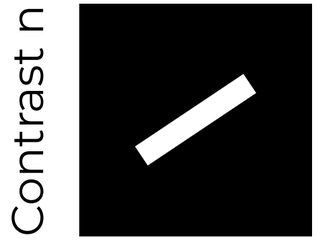


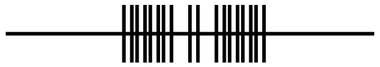
2



9

⋮ ⋮ ⋮

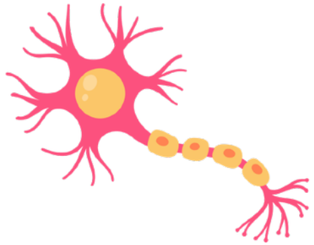




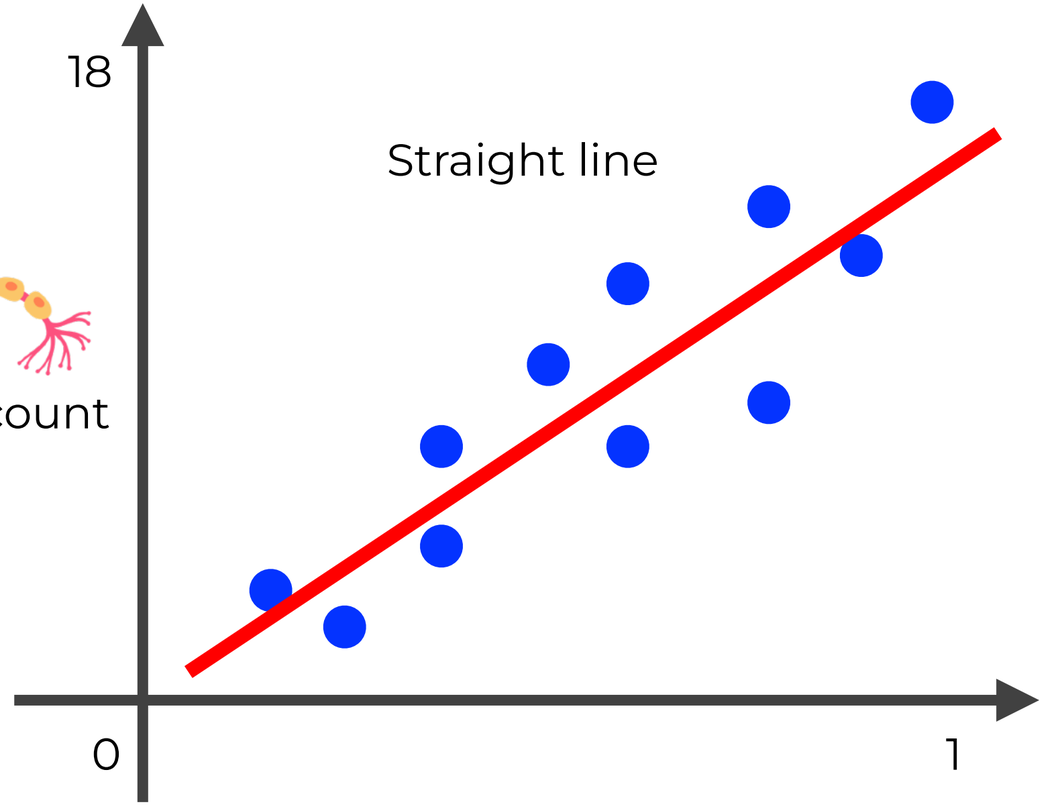
18

spike trains

spike count

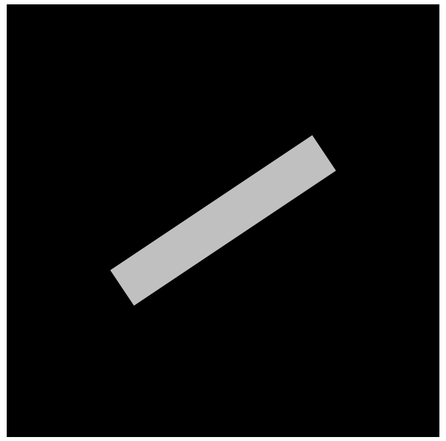


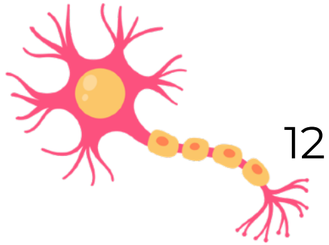
spike count



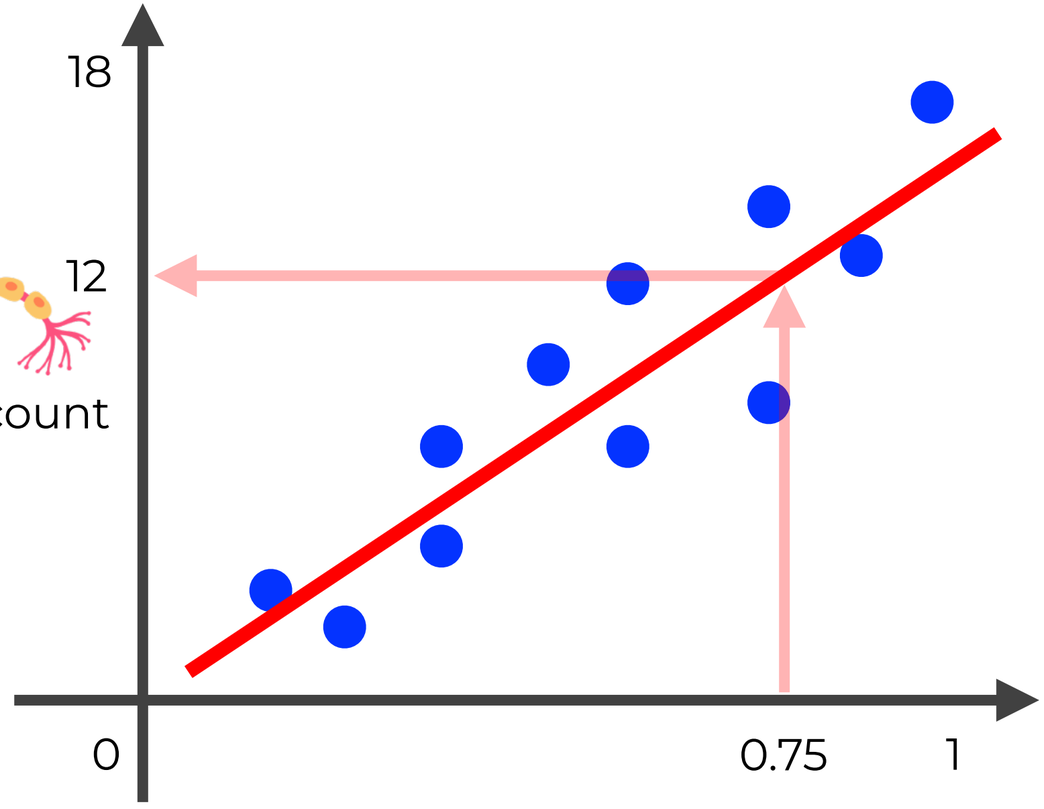
Spike Count Prediction

Normalized contrast = 0.75



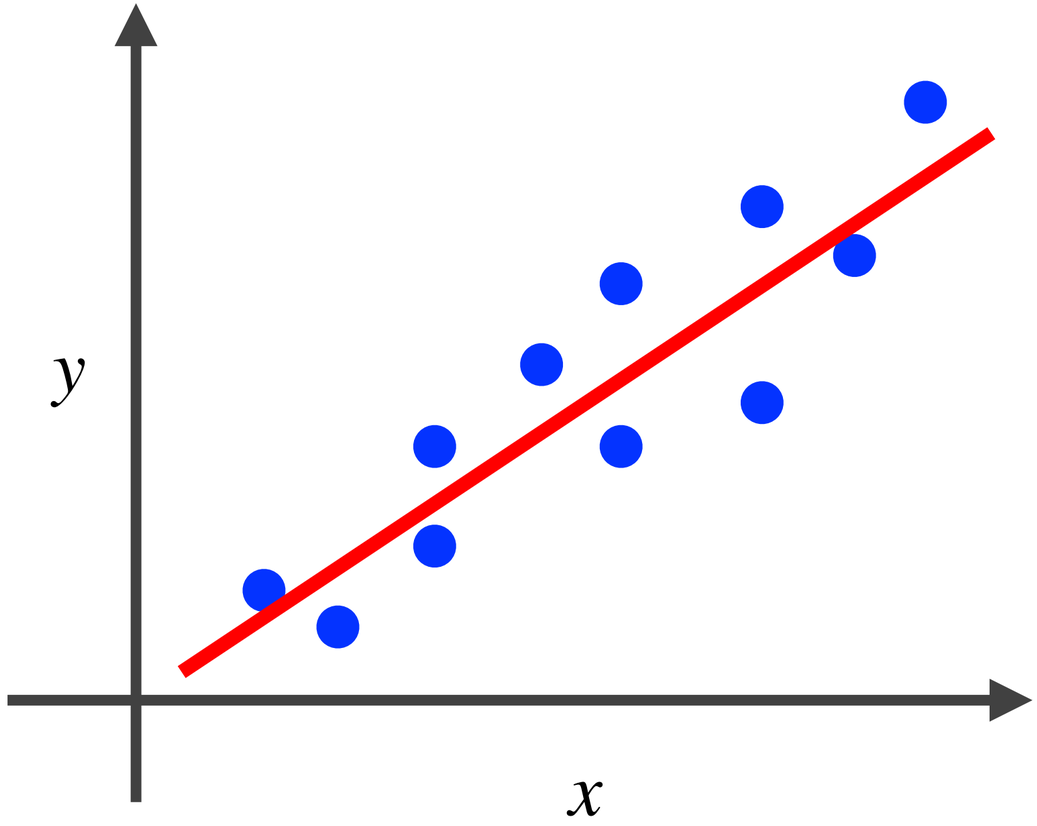


spike count



Normalized contrast

Linear Model



$y = mx + c$

m: slope

c: y-intercept

2 parameters

$y = w_0 + w_1 x$

w_1: slope

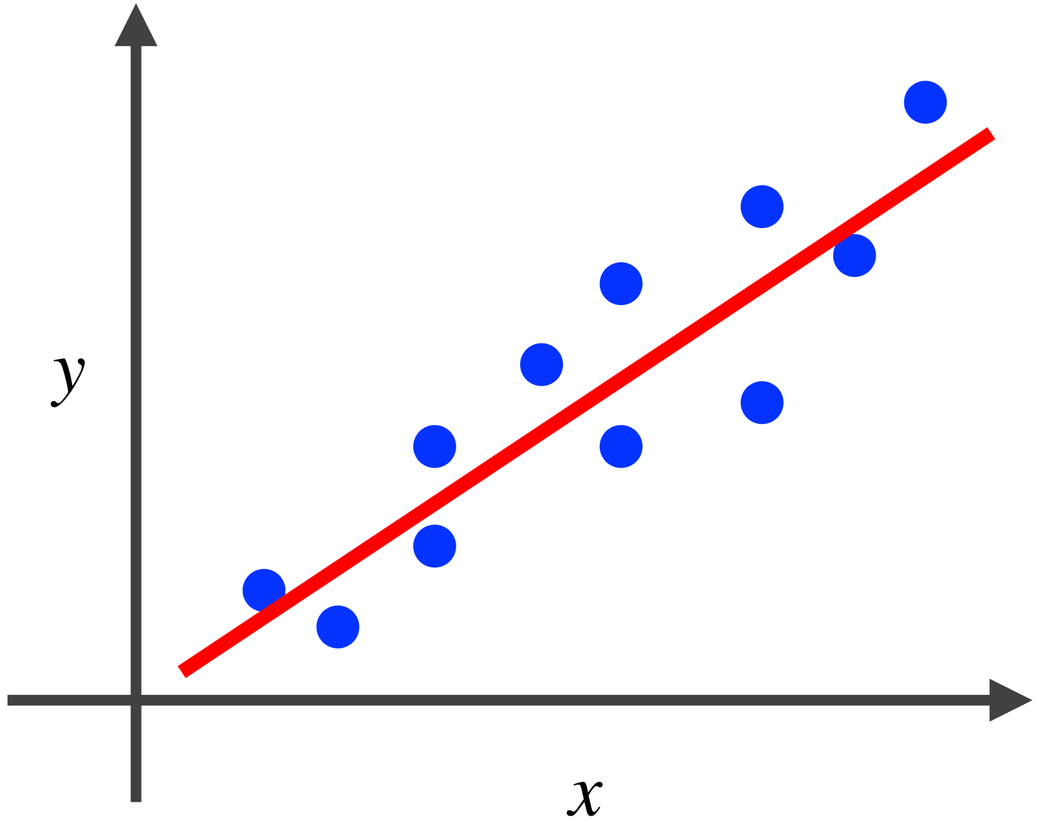
w_0: y-intercept

2 parameters

Higher dimensions

$$y = w_0 + w_1 x_1 + w_2 x_2 + w_3 x_3 + \ldots + w_p x_p$$

Linear Model



$$y = w_0 + w_1 x$$

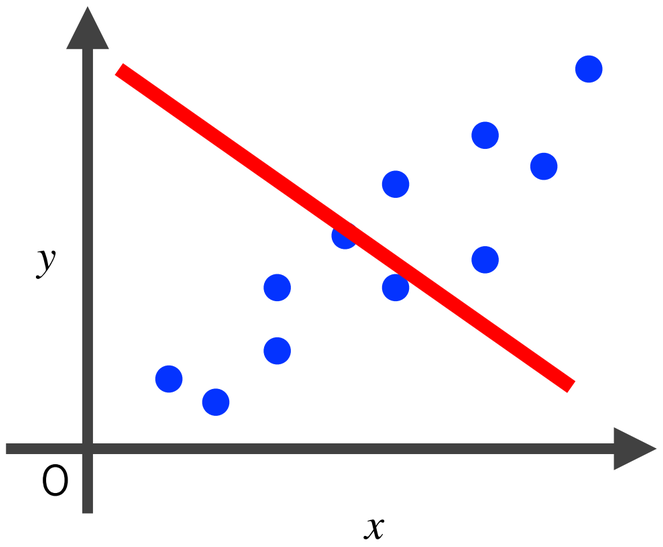
w_1: slope

w_0: y-intercept

2 parameters

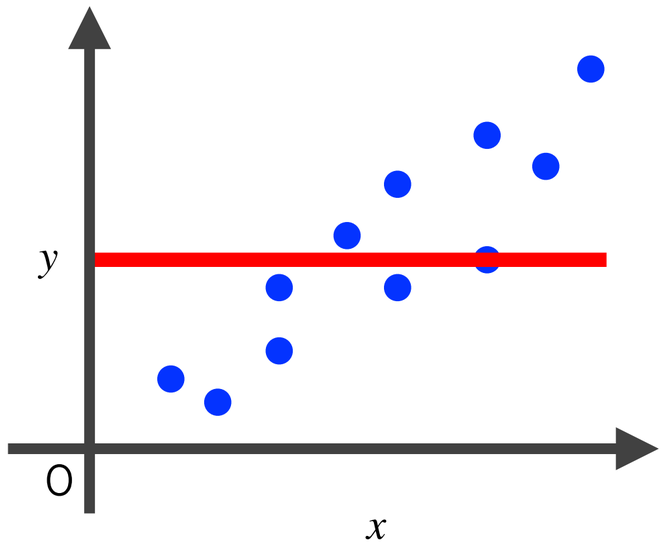
Linear Model

$$y = w_0 + w_1 x$$



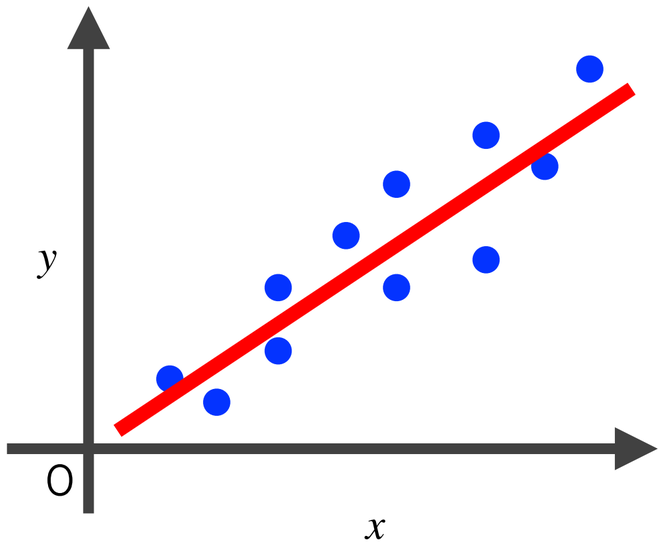
$w_1 < 0$

$w_0 > 0$



$w_1 = 0$

$w_0 > 0$



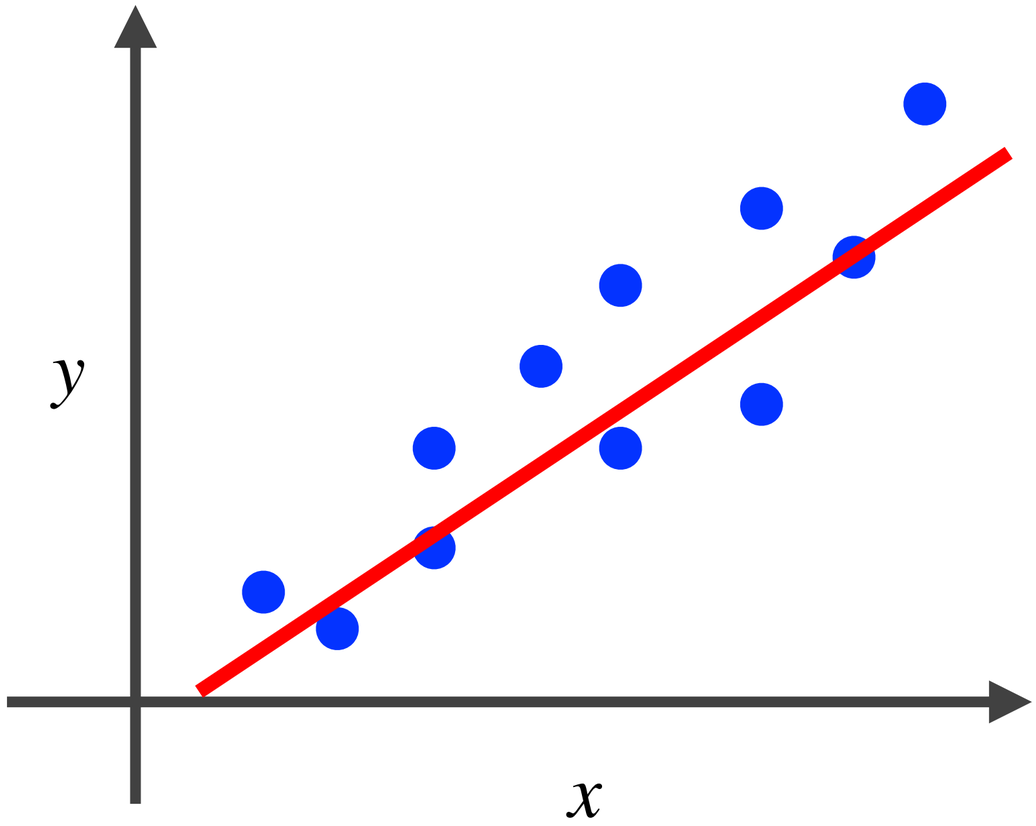
$w_1 > 0$

$w_0 \approx 0$

Brain Code Camp

Linear Model

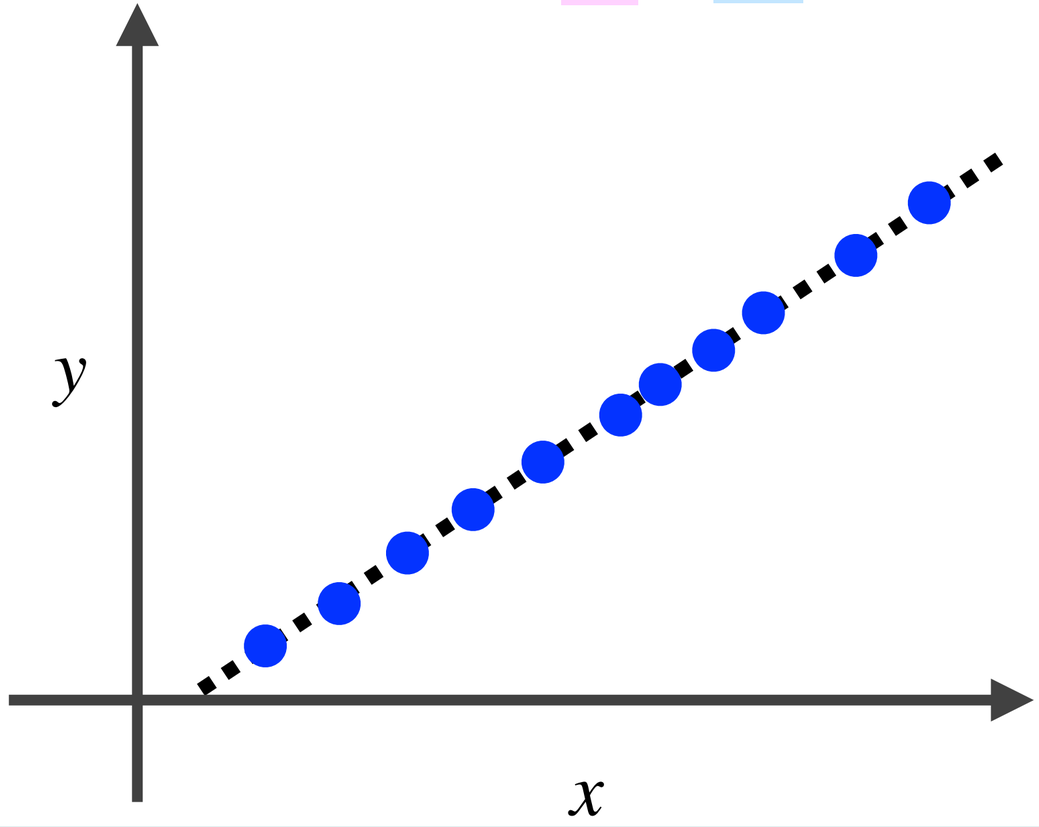
$$y = w_0 + w_1 x$$



Signal and Noise

Underlying relationship

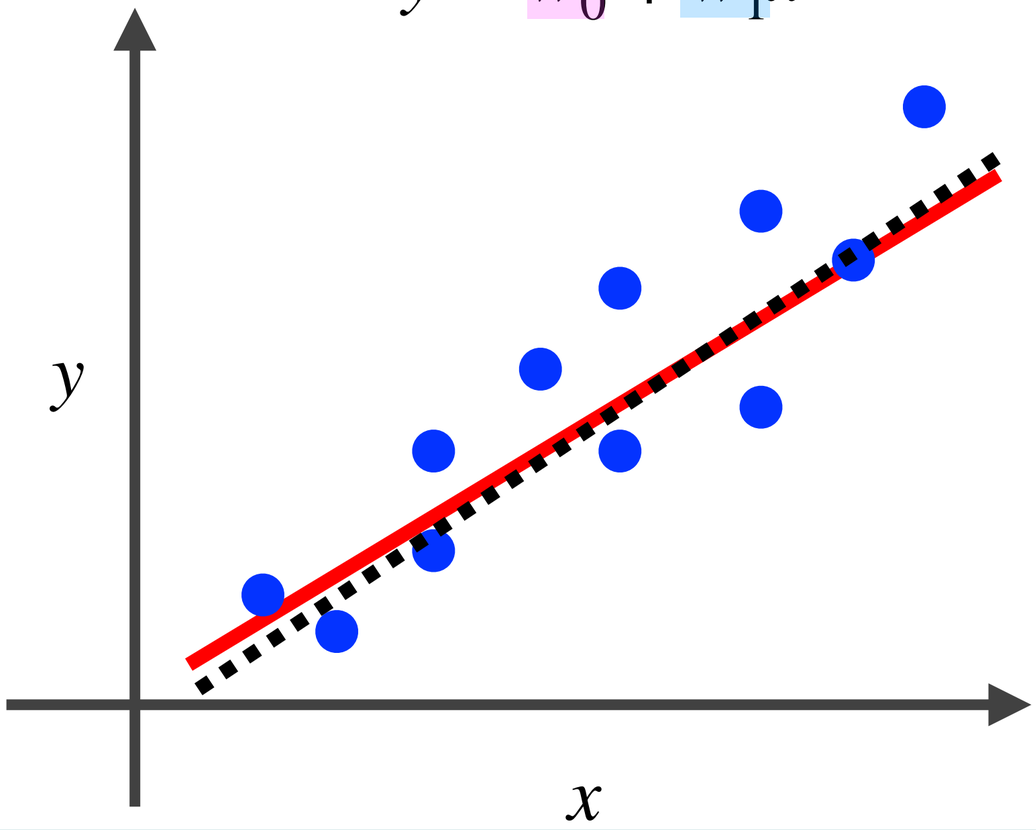
$$y = w_0 + w_1 x$$



Observed data

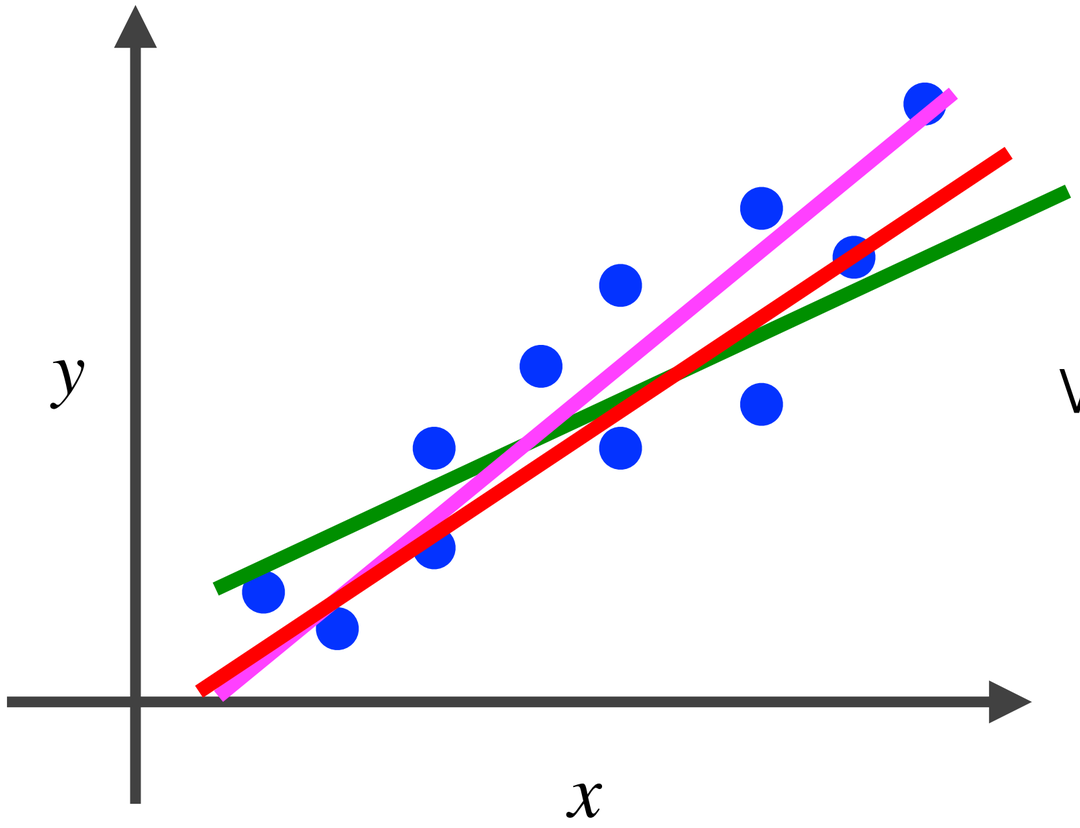
$$y = w_0 + w_1 x + \text{noise}$$

$$\hat{y} = \hat{w}_0 + \hat{w}_1 x$$



Linear Model

$$\hat{y} = \hat{w}_0 + \hat{w}_1 x$$



Which one is the best?