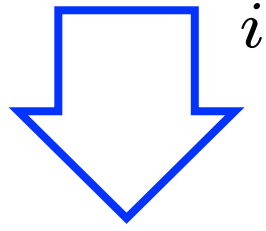
$$y = w^\top x + \epsilon, \;\; \epsilon \sim N(0, \sigma^2)$$

$$P(y_i|w, x_i, \sigma^2) = N(w^\top x_i, \sigma^2)$$

$$P(y|w, X, \sigma^2) = \prod_i P(y_i|w, x_i, \sigma^2)$$



maximize log likelihood

$$\max \;\; \ln(P(y|w, x, \sigma^2) = \max \sum_i \ln(N(y_i|w, x_i, \sigma^2))$$

$$w_{\text{MLE}} = \text{argmin}_w \frac{1}{2} \sum_i (y_i - x_i^\top w)^2$$

$$w = (X^\top X)^{-1} X^\top y$$