



deeplearning.ai

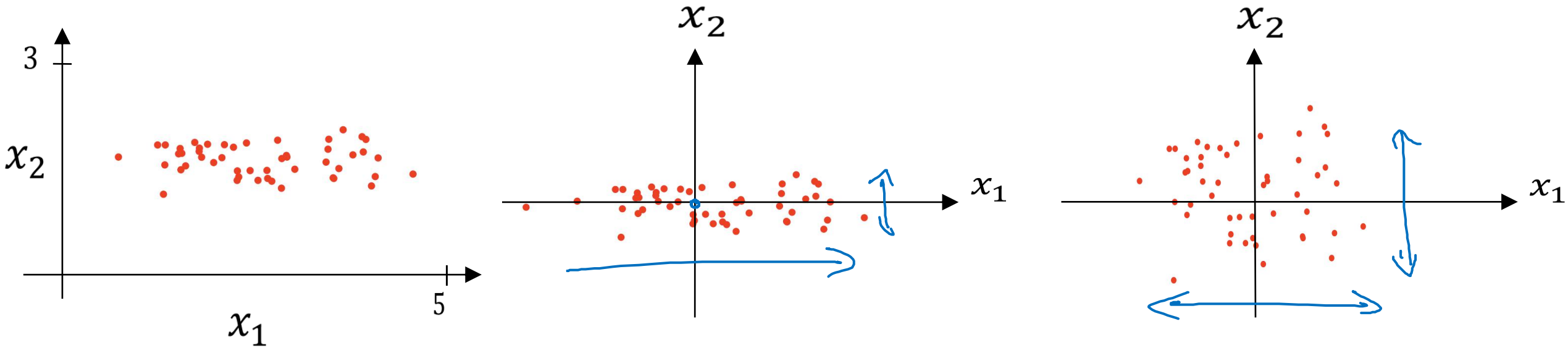
# Setting up your optimization problem

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## Normalizing inputs

# Normalizing training sets

$$x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$



Subtract mean:

$$\bar{\mu} = \frac{1}{n} \sum_{i=1}^n x^{(i)}$$

$$x := x - \mu$$

Normalize variance

$$\sigma^2 = \frac{1}{n} \sum_{i=1}^n x^{(i)} * x^{(i)T}$$

← element-wise

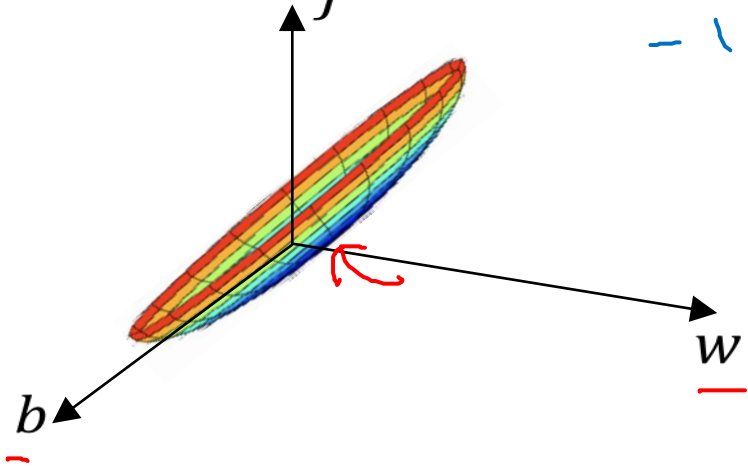
$$x /= \sigma$$

Use same  $\mu$   $\sigma^2$  to normalize test set.

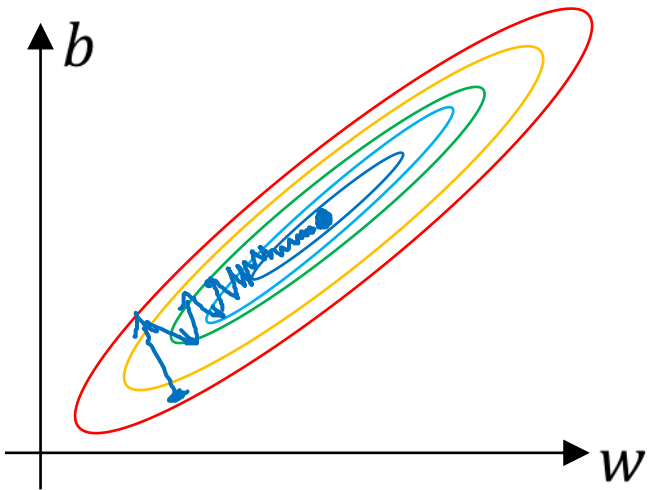
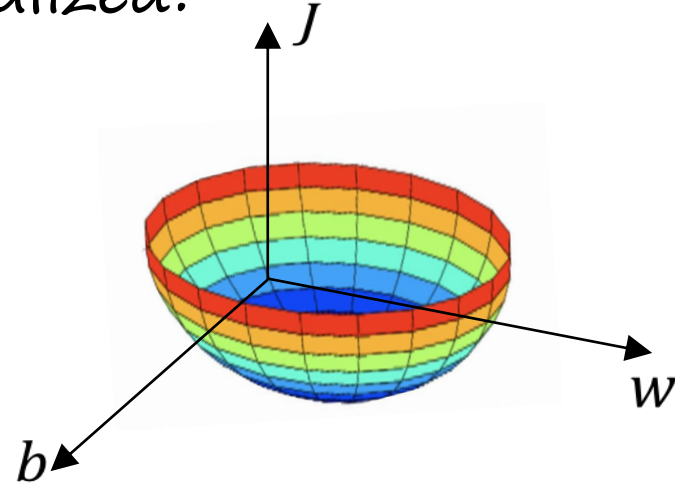
# Why normalize inputs?

$$J(w, b) = \frac{1}{m} \sum_{i=1}^m \mathcal{L}(\hat{y}^{(i)}, y^{(i)})$$

Unnormalized:  
 $w_1: x_1: \underline{1 \dots 1000} \leftarrow$   
 $w_2: x_2: \underline{0 \dots 1} \leftarrow$   
 $\quad \quad \quad -1 \dots 1$



Normalized:



$x_1: 0 \dots 1$   
 $x_2: -1 \dots 1$   
 $x_3: 1 \dots 2$

