Linear Regression in multivariable

Size (feet²) x_1	# bedrooms x_2	# floors x_3	Age x_4	Price ($1000)
2104	5	1	45	460
1416	3	2	40	232
1534	3	2	30	315
852	2	1	36	178
⋮	⋮	⋮	⋮	

this data (training set) has 4 features

n = # features

$x^{(i)}$ = input (features) of i^{th} training example

$x_j^{(i)}$ = value of feature j in i^{th} training example.

$$x^{(2)} = \begin{bmatrix} 1416 \\ 3 \\ 2 \\ 40 \end{bmatrix} \in \mathbb{R}^4 \quad (\mathbb{R}^n)$$

$x_3^{(2)} = 2$

$x_1^{(4)} = 852$

$$h_\theta(x) = \theta_0 + \theta_1 x_1 + \theta_2 x_2 + \theta_3 x_3 + \theta_4 x_4$$

(x_1 → size, x_2 → # bedrooms, x_3 → # floors, x_4 → Age)

Eg) $h_\theta(x) = 80 + 0.1 x_1 + 0.01 x_2 + 3 x_3 - 2 x_4$

$$h_\theta(x) = \theta_0 + \theta_1 x_1 + \cdots + \theta_n x_n \quad (\text{where } x_0^{(i)} = 1)$$

$$x = \begin{bmatrix} x_0 \\ x_1 \\ \vdots \\ x_n \end{bmatrix} \Rightarrow \mathbb{R}^{n+1} \qquad \theta = \begin{bmatrix} \theta_0 \\ \theta_1 \\ \vdots \\ \theta_n \end{bmatrix} \Rightarrow \mathbb{R}^{n+1}$$

$\boxed{x_0 = 1}$

$$h_\theta(x) = \theta_0 x_0 + \theta_1 x_1 + \cdots + \theta_n x_n = \theta^T x$$