→ Linear Regression : Multiple Features

Size in feet x_1	Number of bedrooms x_2	Number of floors x_3	Age of Home x_4	Price ($)
2104	5	1	45	460
1416	3	2	40	232
1534	3	2	30	315

$\Big\}\ m = \cancel{3}\,4$

$x_j \equiv j^{th}$ feature

$m \equiv$ number of features

$\vec{x}^{(i)} \equiv$ features of i^{th} training example

$\vec{x}^{(2)} = [1416 \quad 3 \quad 2 \quad 40]$

$x_3^{(2)} = 2$

- Model

$$f_{w,b}(x) = w_1 x_1 + w_2 x_2 + w_3 x_3 + w_4 x_4 + b$$

$\vec{w} = [w_1 \quad w_2 \quad w_3 \quad w_4]$

b is a number

$\vec{x} = [x_1 \quad x_2 \quad x_3 \quad x_4]$

dot product

$$f_{\vec{w},b}(\vec{x}) = \vec{w} \cdot \vec{x} + b$$

- Without vectorization

$$f_{\vec{w},b}(\vec{x}) = \sum_{j=1}^{m} w_j x_j + b$$

- Vectorization

$$f_{\vec{w},b}(\vec{x}) = \vec{w} \cdot \vec{x} + b$$

- Gradient Descent for Multiple Linear Regression

- Parameters : $\vec{w} = [w_1 \cdots w_m]$; b still a number
- Model : $f_{\vec{w},b}(\vec{x}) = \vec{w} \cdot \vec{x} + b$
- Cost Function : $J(\vec{w}, b)$
- Gradient Descent : repeat $\{$ $w_j = w_j - \alpha \dfrac{\partial}{\partial w_j} J(\vec{w}, b)$

$$b = b - \alpha \frac{\partial}{\partial b} J(\vec{w}, b)$$

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