Multiple features (variables)

Size in feet² x_1	Number of bedrooms x_2	Number of floors x_3	Age of home in years x_4	Price ($) in $1000's
2104	5	1	45	460
1416	3	2	40	232
1534	3	2	30	315
852	2	1	36	178
…	…	…	…	…

$i=2$

$j=1\ldots4$

$n=4$

- ✓ x_j = j^{th} feature
- ✓ n = number of features
- ✓ $\vec{x}^{(i)}$ = features of ith training example
- ✓ $x_j^{(i)}$ = value of feature j in i^{th} training example

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

$x_3^{(2)} = 2$

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→ Here we see all notations.

→ Here $\vec{x}$ is a vector and means a collection of features.

→ Before we seen a single featured model.

→ Now we need to consider multiple features.

→ Now we will see the model for multiple features.

Model:

Previously: $f_{w,b}(x) = wx + b$

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

example

$$f_{w,b}(x) = 0.1 x_1 + 4 x_2 + 10 x_3 + -2 x_4 + 80$$

size #bedrooms #floors years base price

$$f_{w,b}(x) = w_1 x_1 + w_2 x_2 + \cdots + w_n x_n + b$$

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→ Here is the model and an example for 4 features.

→ Where b is the base price. and the numbers besides those variable shows how often the price shift based on the change of those variable.

→ e.g. for every bedrooms increase the price may increase 4k $ and 1 floor ↑ → 10k $ ↑

$$f_{\vec{w},b}(\vec{x}) = w_1x_1 + w_2x_2 + \cdots + w_nx_n + b$$

$\vec{w} = [w_1 \ w_2 \ w_3 \ \ldots \ w_n]$ parameters of the model

b is a number

vector $\vec{x} = [x_1 \ x_2 \ x_3 \ \ldots \ x_n]$

$$f_{\vec{w},b}(\vec{x}) = \vec{w} \cdot \vec{x} + b = w_1x_1 + w_2x_2 + w_3x_3 + \cdots + w_nx_n + b$$

dot product

multiple linear regression

(not multivariate regression)

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→ New fact. Vector is the collection of parameters like array.

→ Here $\vec{x}$ and $\vec{w}$ is now vector.

→ We can write the simplify version. that is: $\vec{w} \cdot \vec{x}$

→ And if we expand this we will get the model. means we need to perform dot product.

→ This model is called multiple linear regression.