



Machine Learning

Linear Algebra review (optional)

Matrix-vector multiplication

Example

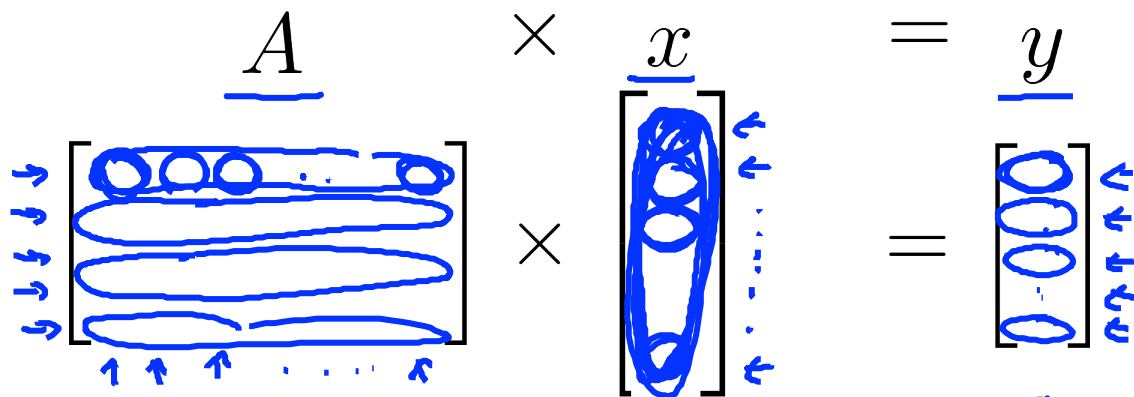
$$\begin{bmatrix} 1 & 3 \\ 4 & 0 \\ 2 & 1 \end{bmatrix}_{3 \times 2} \begin{bmatrix} 1 \\ 5 \end{bmatrix}_{2 \times 1} = \begin{bmatrix} 16 \\ 4 \\ 7 \end{bmatrix}_{3 \times 1} \text{ matrix}$$

$$1 \times 1 + 3 \times 5 = 16$$

$$4 \times 1 + 0 \times 5 = 4$$

$$2 \times 1 + 1 \times 5 = 7$$

Details:

$$\underline{A} \times \underline{x} = \underline{y}$$


n iguais nos 2

$m \times n$ matrix
(m rows,
 n columns)

$n \times 1$ matrix
(n -dimensional
vector)

m -dimensional
vector

→ To get y_i , multiply A 's i^{th} row with elements of vector x , and add them up.

Example

$$\begin{bmatrix} 1 & 2 & 1 & 5 \\ 0 & 3 & 0 & 4 \\ -1 & -2 & 0 & 0 \end{bmatrix}_{3 \times 4} \begin{matrix} \downarrow \\ \begin{bmatrix} 1 \\ 3 \\ 2 \\ 1 \end{bmatrix}_{4 \times 1} \end{matrix} = \begin{bmatrix} 14 \\ 13 \\ -7 \end{bmatrix}_{3 \times 1} = \begin{bmatrix} 14 \\ 13 \\ -7 \end{bmatrix}$$

$$\left. \begin{array}{l} 1 \times 1 + 2 \times 3 + 1 \times 2 + 5 \times 1 = 14 \\ 0 \times 1 + 3 \times 3 + 0 \times 2 + 4 \times 1 = 13 \\ -1 \times 1 + (-2) \times 3 + 0 \times 2 + 0 \times 1 = -7 \end{array} \right\}$$

House sizes:

- 2104
- 1416
- 1534
- 852

Matrix

4x2

1	2104
1	1416
1	1534
1	852

Oclave

X

$h_0(x)$

2x1

Vector

$$\begin{bmatrix} -40 \\ 0.25 \end{bmatrix}$$

=

4x1 matrix

$-40 \times 1 + 0.25 \times 2104$
$-40 \times 1 + 0.25 \times 1416$

$h_0(1416)$

for $i = 1:1000$,
prediction(i) = ...

Prediction = Data Matrix * Parameters

4x1