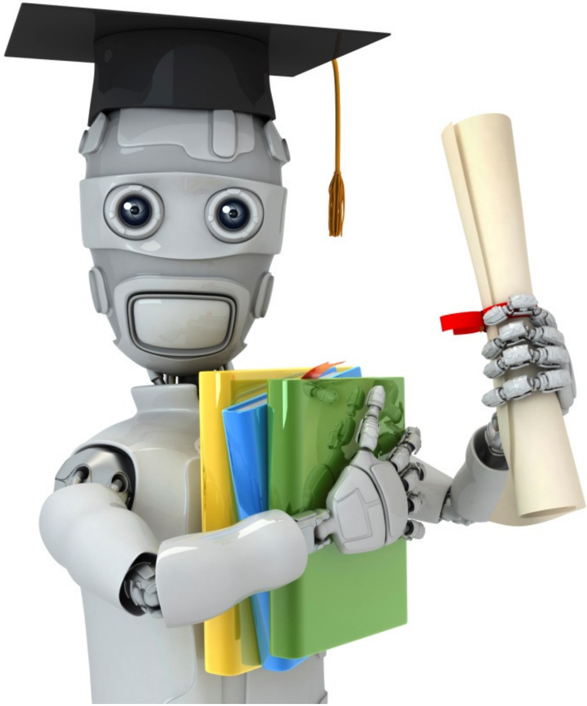
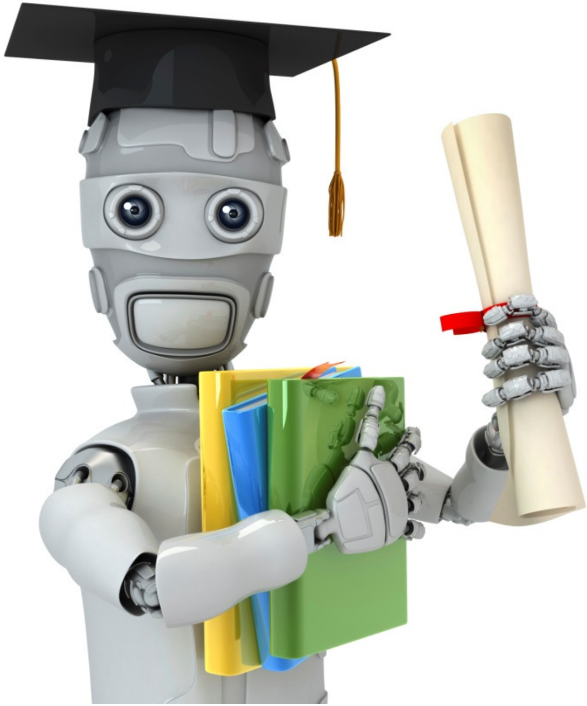


Machine Learning

Octave Tutorial

Basic operations



Machine Learning

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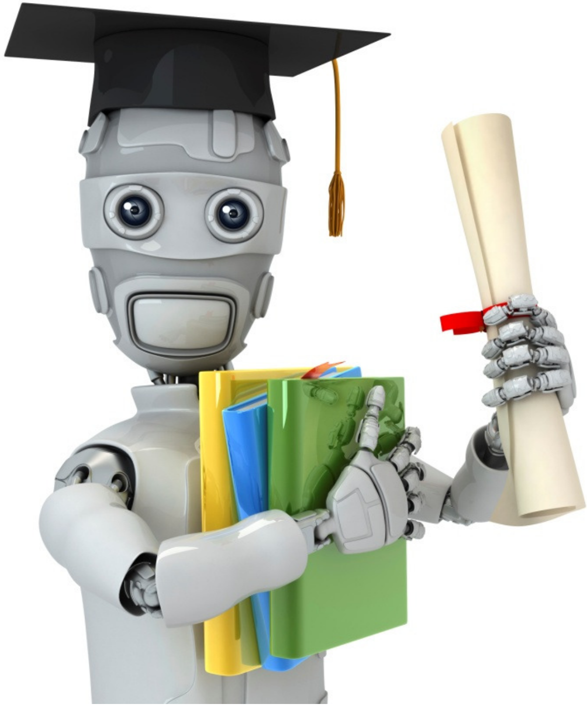
Moving data around



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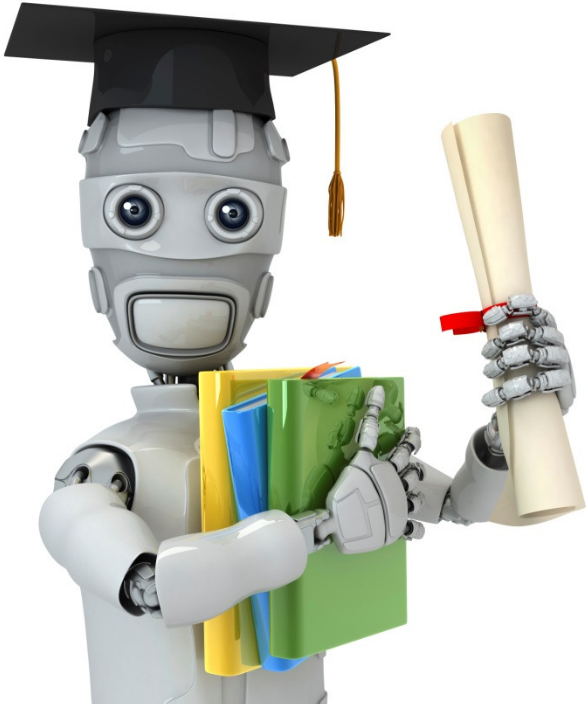
Computing on data



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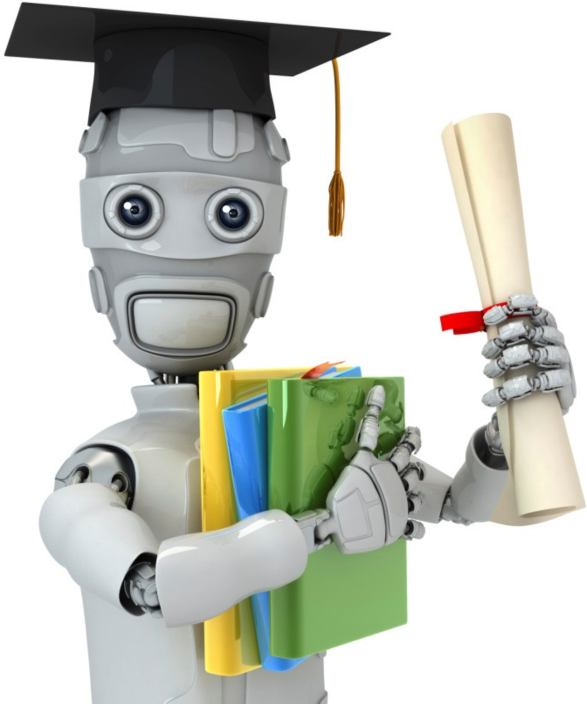
Plotting data



Machine Learning

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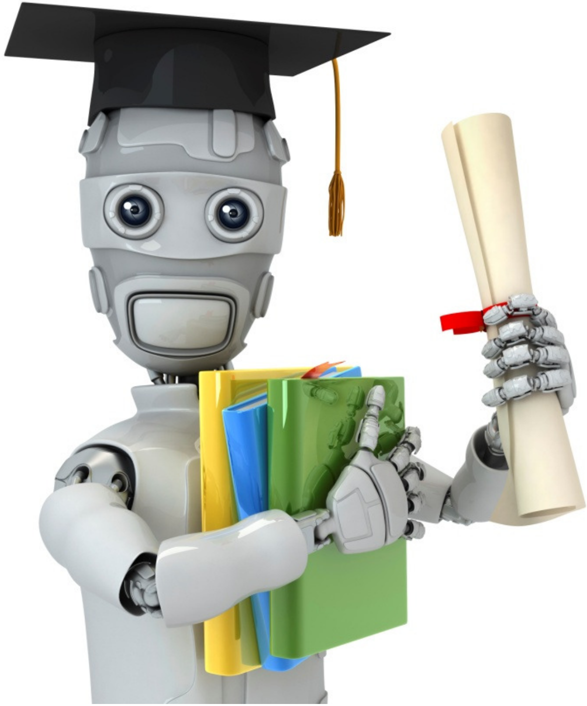
Control statements: for, while, if statements



Machine Learning

Octave Tutorial

Vectorial implementation

Vectorization example.

$$h_\theta(x) = \sum_{j=\theta}^{n} \theta_j x_j$$

$$= \underline{\theta^T x}$$

theta(1)

$$\theta = \begin{bmatrix} \theta_1 \\ \theta_2 \\ \theta_3 \end{bmatrix} \qquad x = \begin{bmatrix} x_0 \\ x_1 \\ x_2 \end{bmatrix}$$

Unvectorized implementation

```
prediction = 0.0;
for j = 1:n+1,
  prediction = prediction +
               theta(j) * x(y)
end;
```

Vectorized implementation

```
prediction = theta' * x;
```

matriz dos input
dados

Vectorization example.

c++

$$h_\theta(x) = \sum_{j=0}^{n} \theta_j x_j$$

$$= \theta^T x$$

<u>Unvectorized implementation</u>

```
double prediction = 0.0;
for (int j = 0; j < n; j++)
  prediction += theta[j] * x[y];
```

<u>Vectorized implementation</u>

```
double prediction
  = theta.transpose() * x;
```

Gradient descent

$$\theta_j := \theta_j - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)}) x_j^{(i)}$$

(for all j)

---

multiplos

$$\theta_0 := \theta_0 - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)}) x_0^{(i)}$$

$$\theta_1 := \theta_1 - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)}) x_1^{(i)}$$

$$\theta_2 := \theta_2 - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)}) x_2^{(i)}$$

$$\theta_0 := \theta_0 - \alpha \boxed{\frac{1}{m}\sum_{i=1}^{m}(h_\theta(x^{(i)}) - y^{(i)})x_0^{(i)}}$$

$$\theta_1 := \theta_1 - \alpha \frac{1}{m}\sum_{i=1}^{m}(h_\theta(x^{(i)}) - y^{(i)})x_1^{(i)}$$

$$\theta_2 := \theta_2 - \alpha \frac{1}{m}\sum_{i=1}^{m}(h_\theta(x^{(i)}) - y^{(i)})x_2^{(i)}$$

$(n = 2)$

$$u(j) = 2v(j) + 5w(j) \quad \text{(for all } j\text{)}$$

$$u = 2v + 5w$$

$\theta := \theta - \alpha\delta$, Where $\delta = \frac{1}{m}\sum_{i=1}^{m}(h_\theta x - y)x$

$\delta = \begin{bmatrix} \delta_0 \\ \delta_1 \\ \delta_2 \end{bmatrix}$, $\delta_0 = \boxed{\frac{1}{m}\sum (h_\theta - y)\cdot x}$