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## Gradient Descent For Multiple Variables

## **Gradient Descent for Multiple Variables**

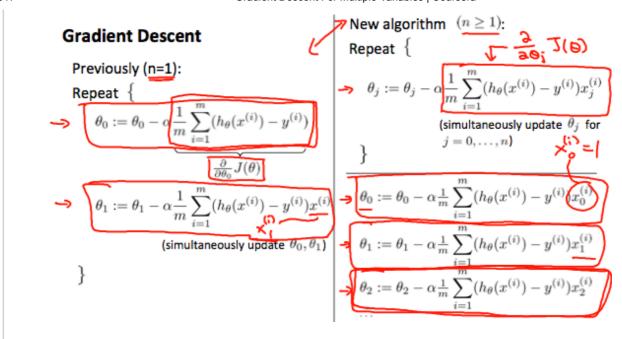
The gradient descent equation itself is generally the same form; we just have to repeat it for our 'n' features:

$$egin{aligned} ext{repeat until convergence: } \{ \ heta_0 &:= heta_0 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_0^{(i)} \ heta_1 &:= heta_1 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_1^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_1 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - lpha \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - a \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - a \, rac{1}{m} \sum_{i=1}^m (h_ heta(x^{(i)}) - y^{(i)}) \cdot x_2^{(i)} \ heta_2 &:= heta_2 - a \,$$

In other words:

$$\begin{array}{l} \text{repeat until convergence: } \{\\ \theta_j := \theta_j - \alpha \, \frac{1}{m} \sum_{i=1}^m (h_\theta(x^{(i)}) - y^{(i)}) \cdot x_j^{(i)} \qquad \text{ for j} := 0... \mathrm{n} \\ \} \end{array}$$

The following image compares gradient descent with one variable to gradient descent with multiple variables:



✓ Complete





