ml

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(data + learning algorithm) $\rightarrow$ function

1 Supervised learning

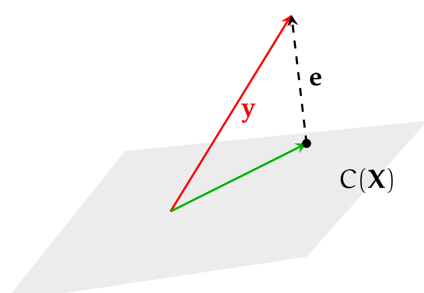
1.1 Regression

model, parameters, cost function, objective

1.1.1 Linear (in w) Regression

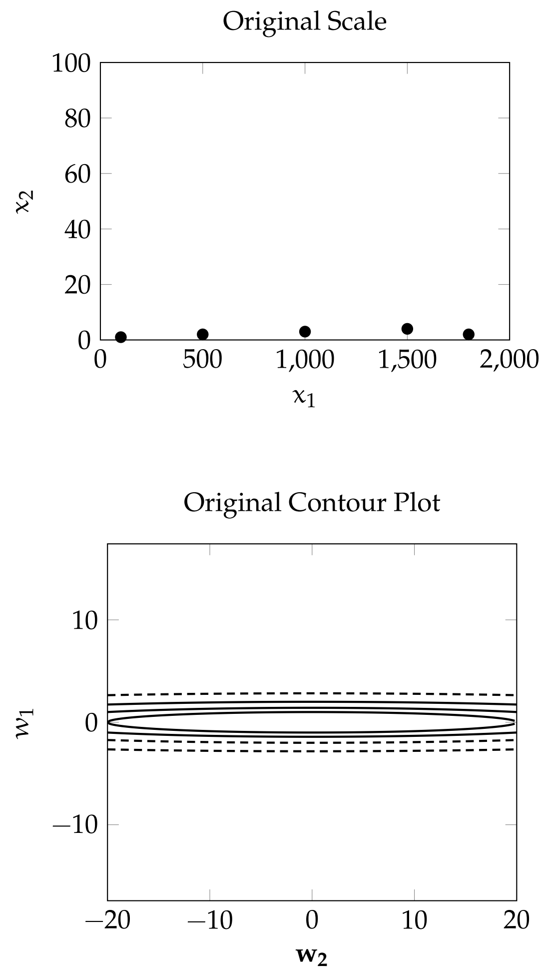
$\mathbf{X}^{m \times n}$ has m examples, each having n features. Usually $m >> n$. $\mathbf{y}^{m \times 1}$ are the corresponding outputs.

$$\mathbf{X}\mathbf{w} \approx \mathbf{y}$$
$$\mathbf{e} = \mathbf{X}\mathbf{w} - \mathbf{y}$$
$$\underset{\mathbf{w}}{\text{minimize}}\ J(\mathbf{w}) = \|\mathbf{e}\|^2 = (\mathbf{X}\mathbf{w} - \mathbf{y})^T(\mathbf{X}\mathbf{w} - \mathbf{y})$$
$$\text{gradient descent: } \mathbf{w} = \mathbf{w} - \alpha \frac{\partial J}{\partial \mathbf{w}} = \mathbf{w} - 2\alpha \mathbf{X}^T(\mathbf{X}\mathbf{w} - \mathbf{y}) = \mathbf{w} - 2\alpha \mathbf{X}^T \mathbf{e}$$



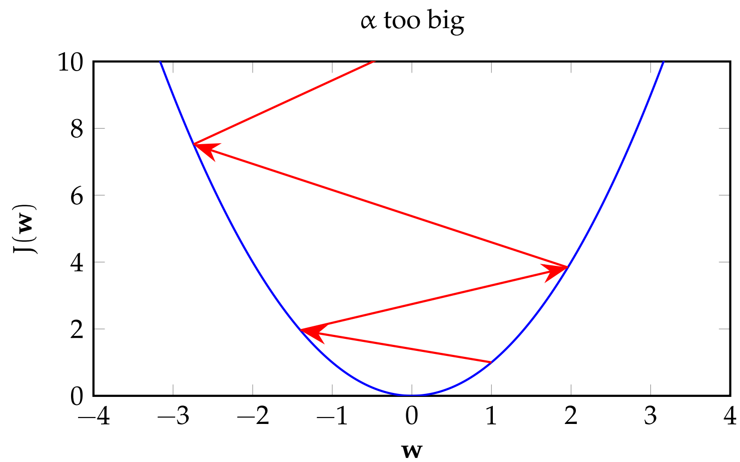
1.2 Normalization

Changes scale keeping the shape of distribution same. Gradient descent now works, with more ease, in the world of concentric circular contours.



1.3 Learning rate, α

A good value is between too small (slow convergence) and too big (divergence).



1.4 Classification

1.5 Logistic Regression