



UNIDAD DE
DATA SCIENCE
UNIVERSIDAD DE CONCEPCIÓN

Deep Learning

Manuel Pérez Carrasco
Unidad de Data Science, Facultad de Ingeniería
Universidad de Concepción

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Machine Learning

For an input x and some output y , it is possible to find a mapping from the input space to the output space using a function:

$$y = f(x) + \epsilon$$

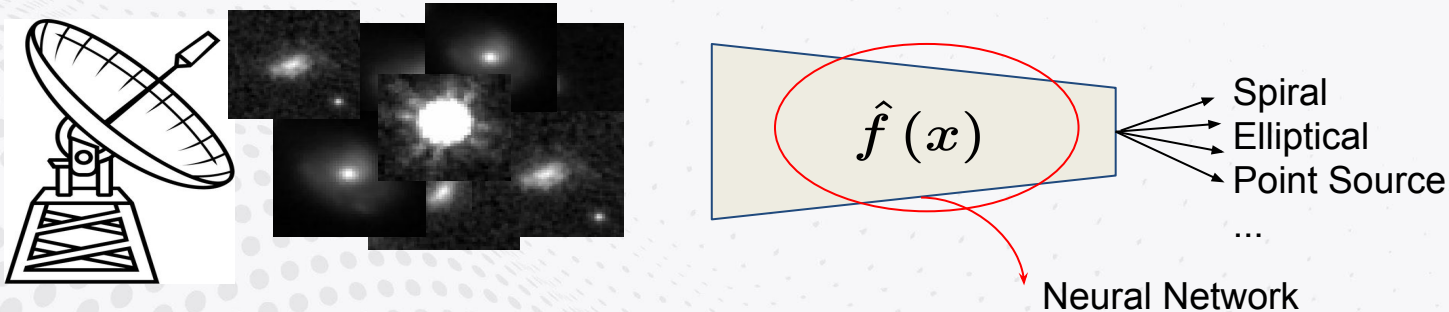
In machine learning or statistical learning we try to find an approximated function $\hat{f}(x)$ using data. Neural networks are a machine learning models.

Machine Learning

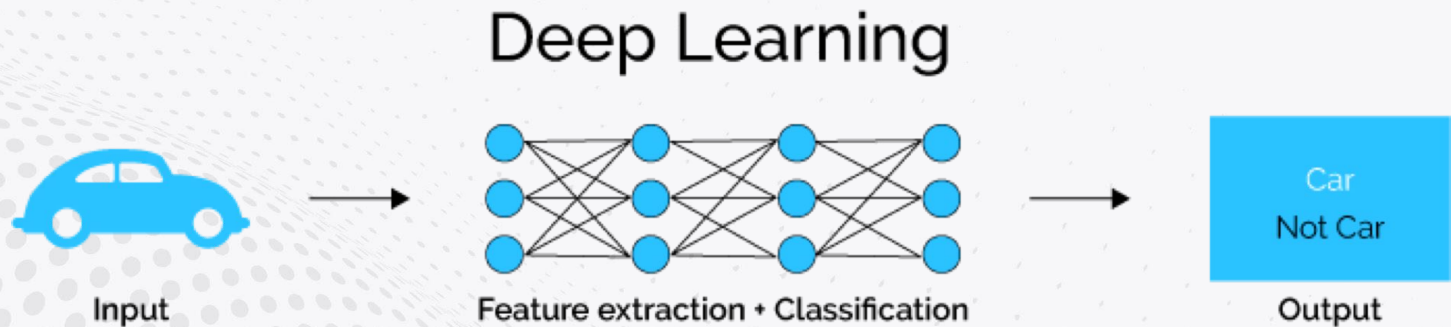
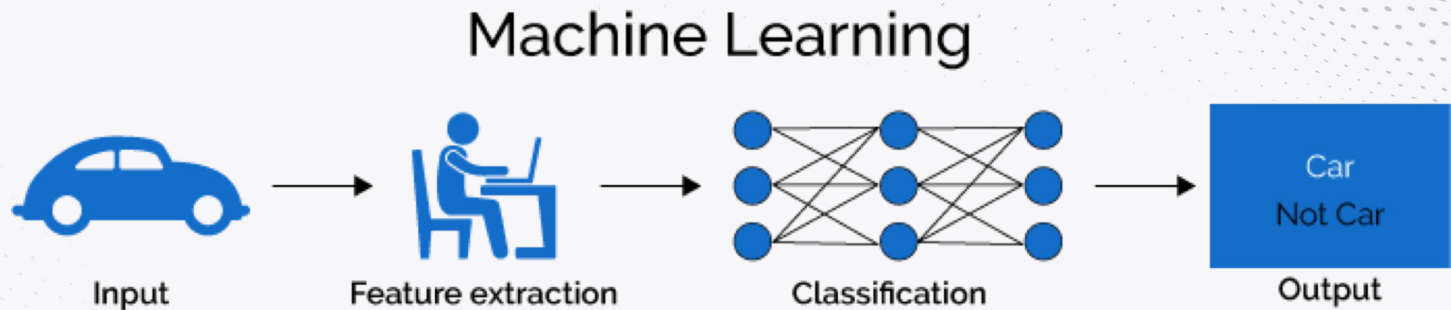
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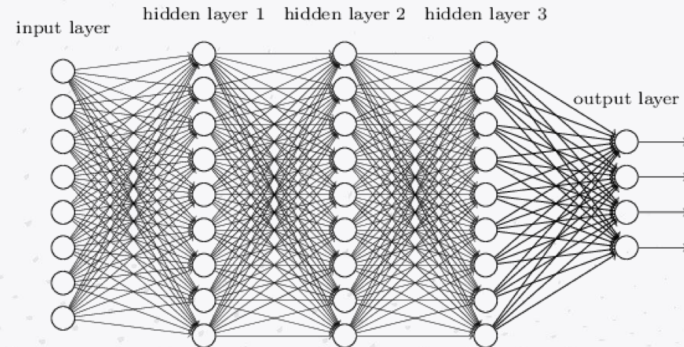
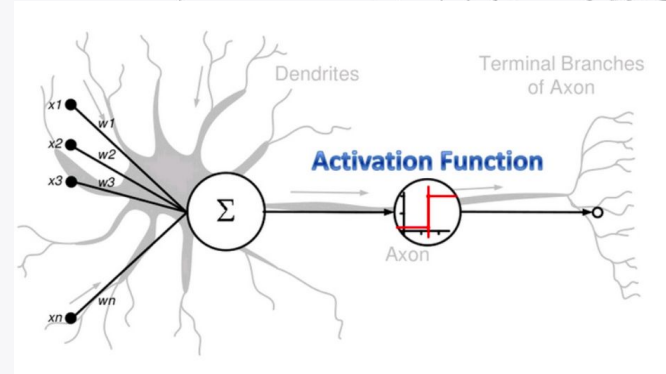
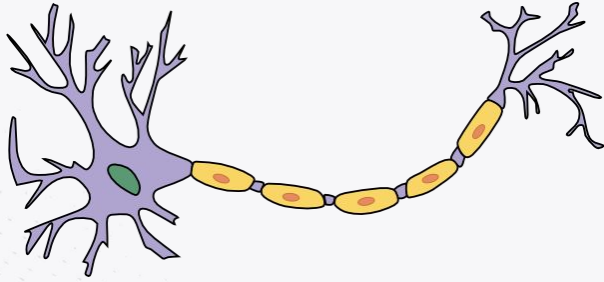
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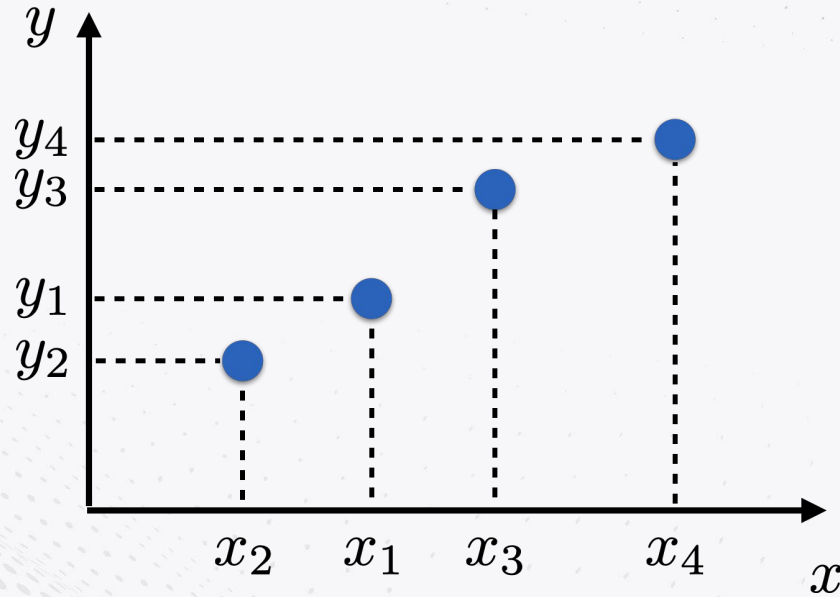
Machine Learning / Deep Learning



Neural Networks

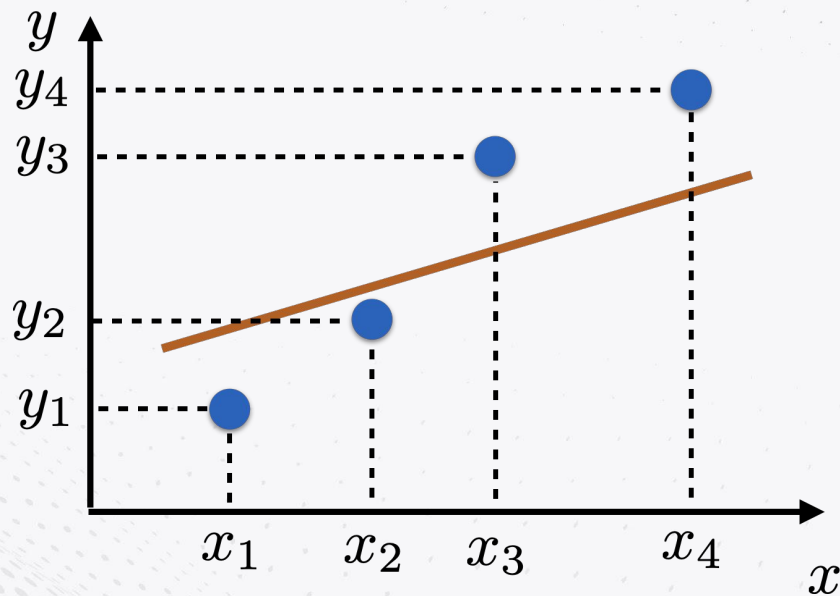


Cost Function



$$\mathcal{D} = \{(x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4)\}$$

Cost Function



$$\mathcal{L}_1 = (\hat{y}(x_1) - y_1)^2$$

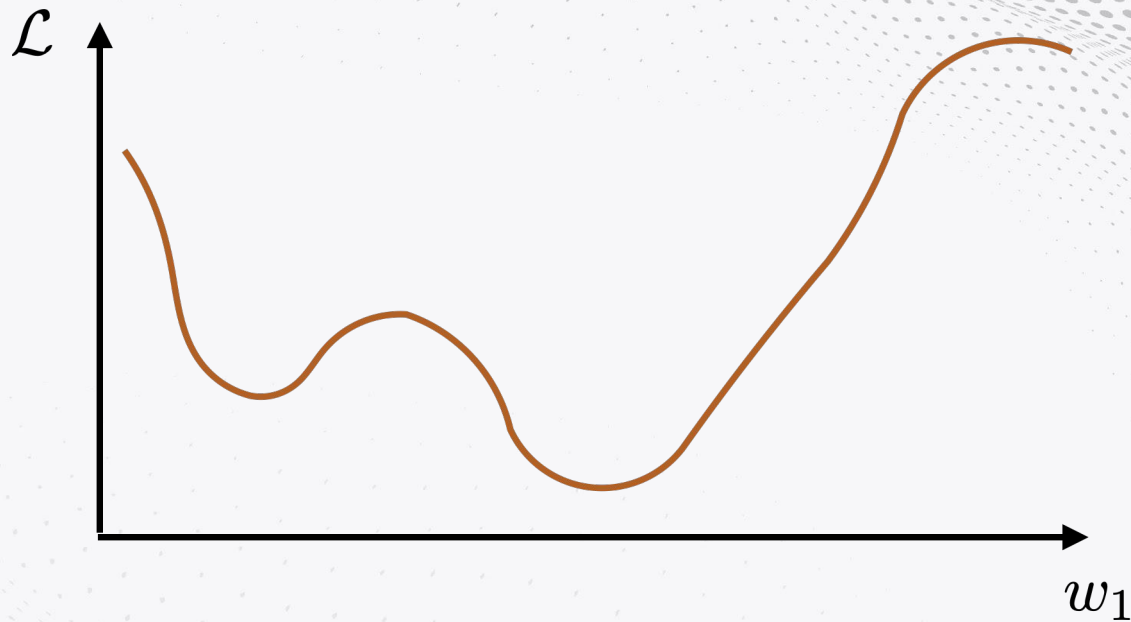
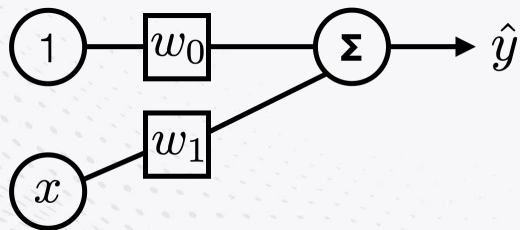
$$\mathcal{L}_2 = (\hat{y}(x_2) - y_2)^2$$

$$\mathcal{L}_3 = (\hat{y}(x_3) - y_3)^2$$

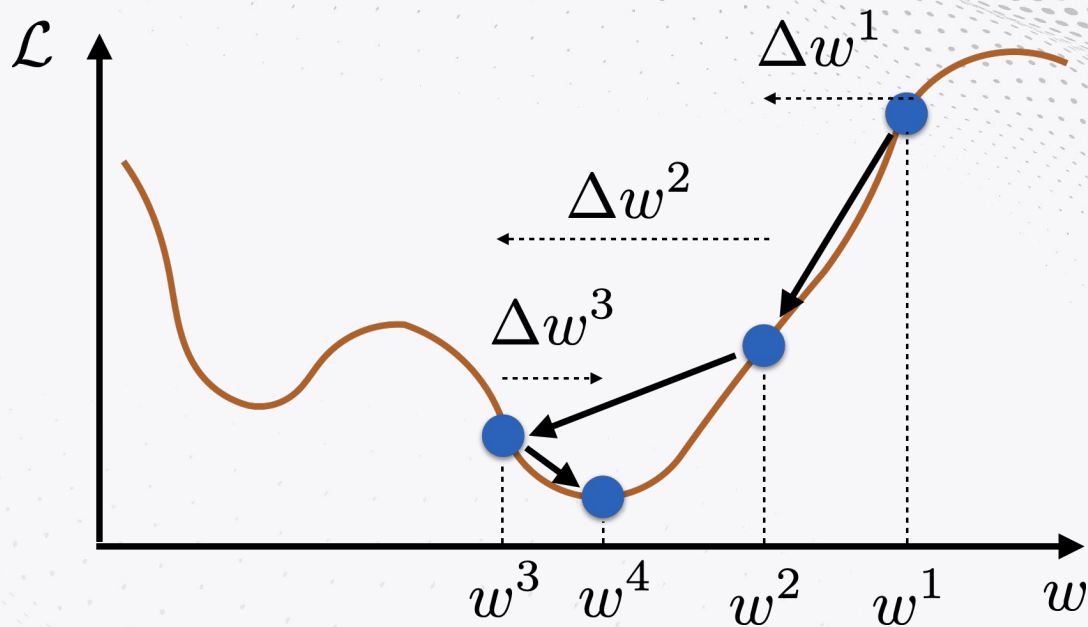
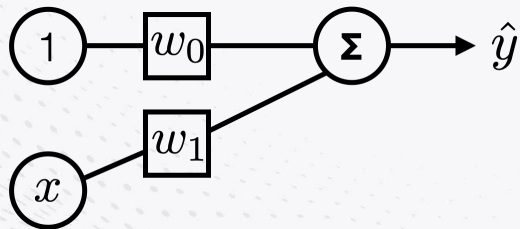
$$\mathcal{L}_4 = (\hat{y}(x_4) - y_4)^2$$

$$\mathcal{L} = \frac{1}{N} [(\hat{y}(x_1) - y_1)^2 + (\hat{y}(x_2) - y_2)^2 + \cdots + (\hat{y}(x_N) - y_N)^2]$$

Optimization



Optimization



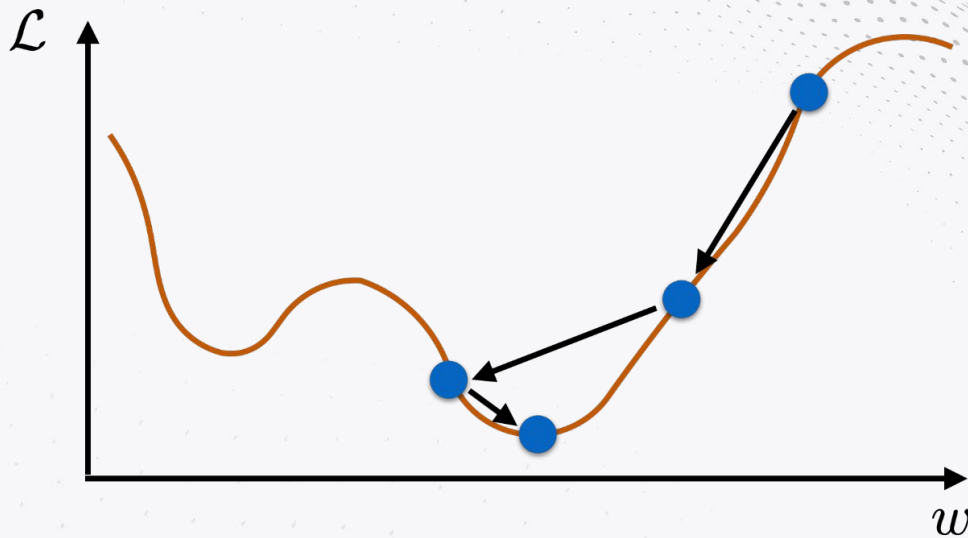
Optimization

$$w^{t+1} = w^t + \Delta w^t$$

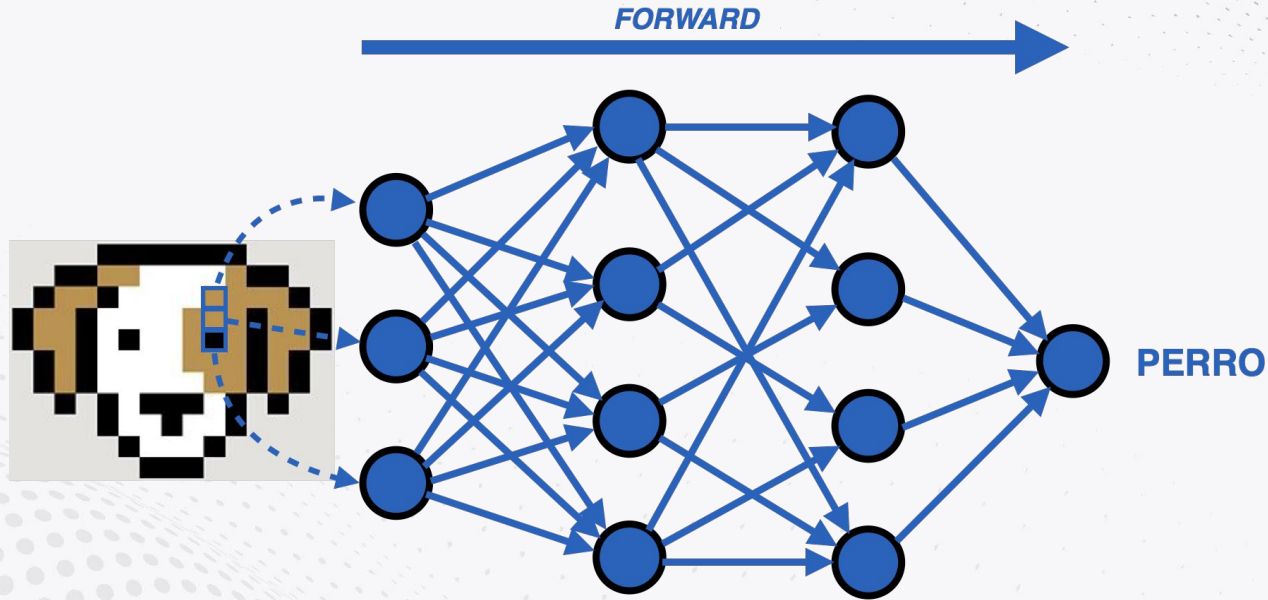
$$\Delta w^t \propto -\frac{d\mathcal{L}}{dw}$$

$$w^{t+1} = w^t - \eta \left. \frac{d\mathcal{L}}{dw} \right|_{w^t}$$

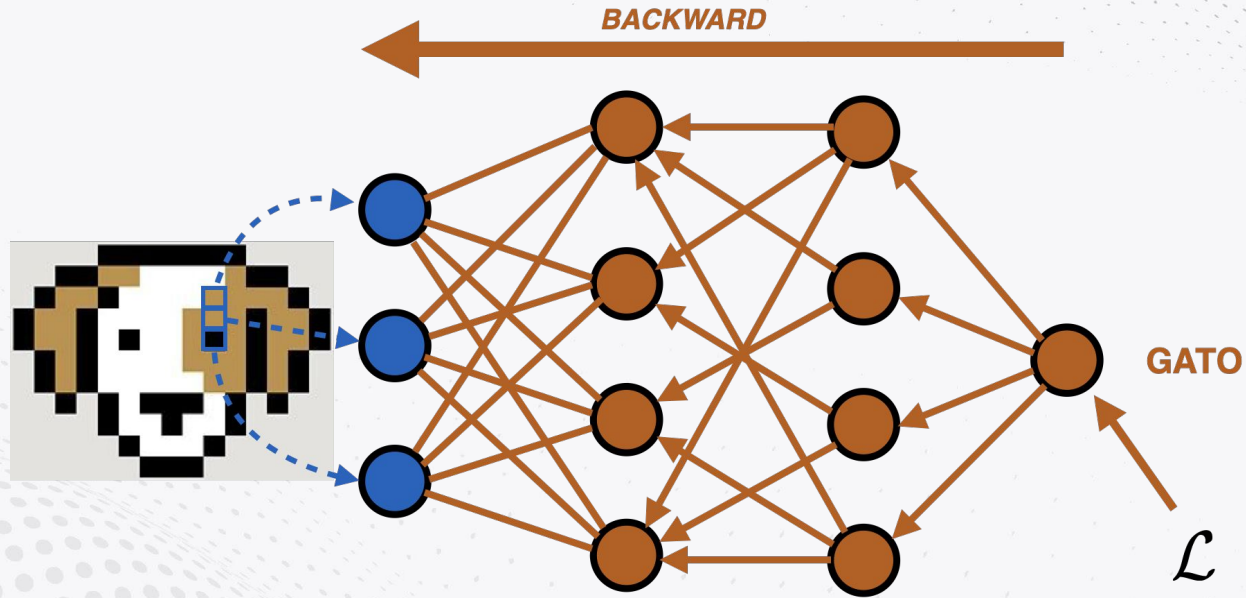
learning rate



Backpropagation

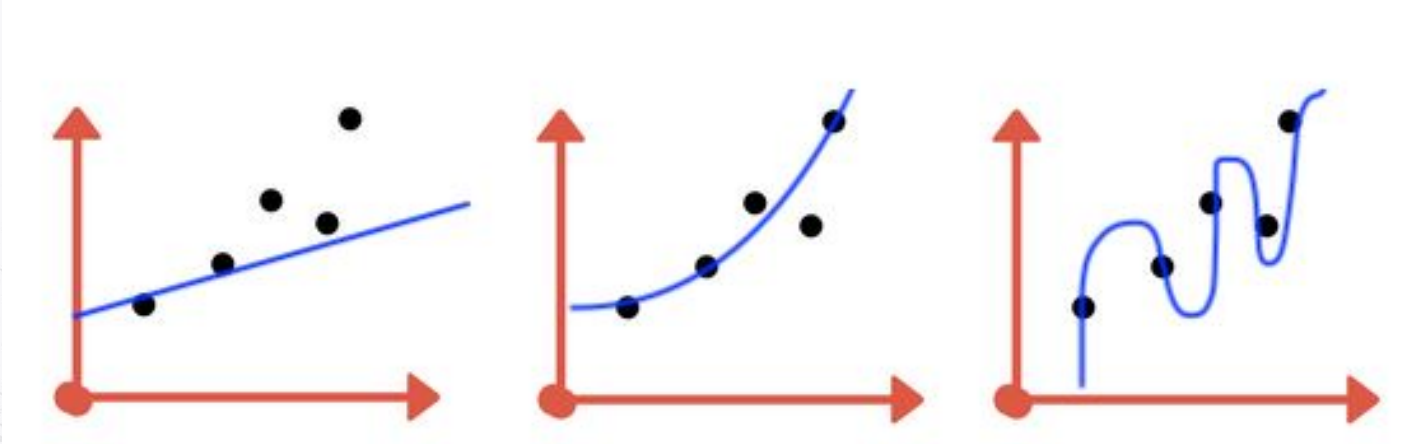


Backpropagation





Overfitting





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