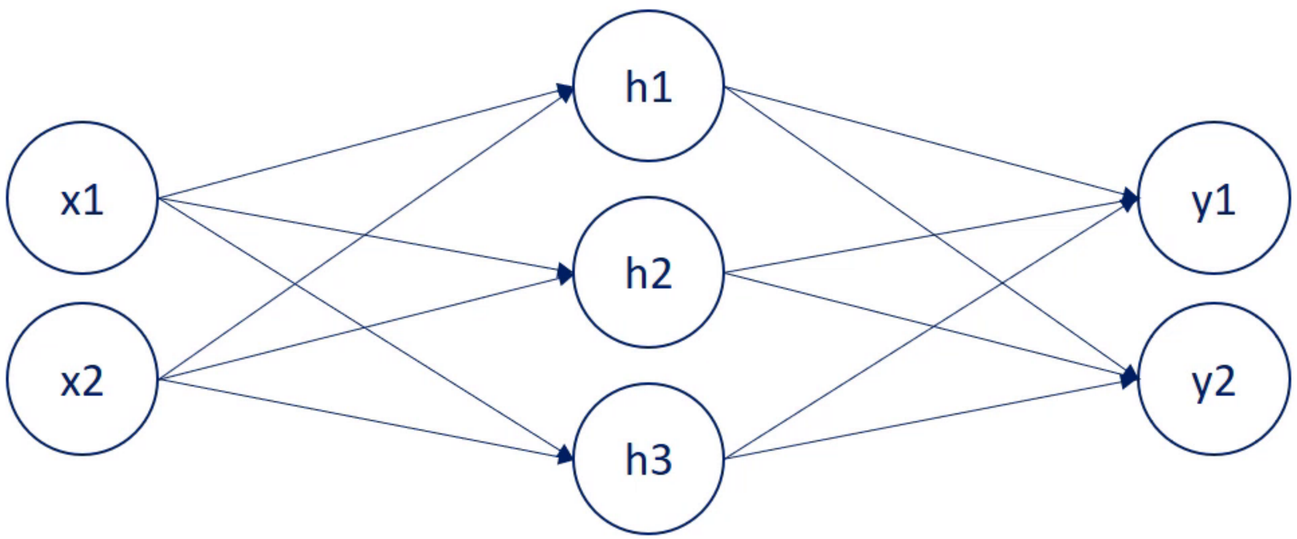
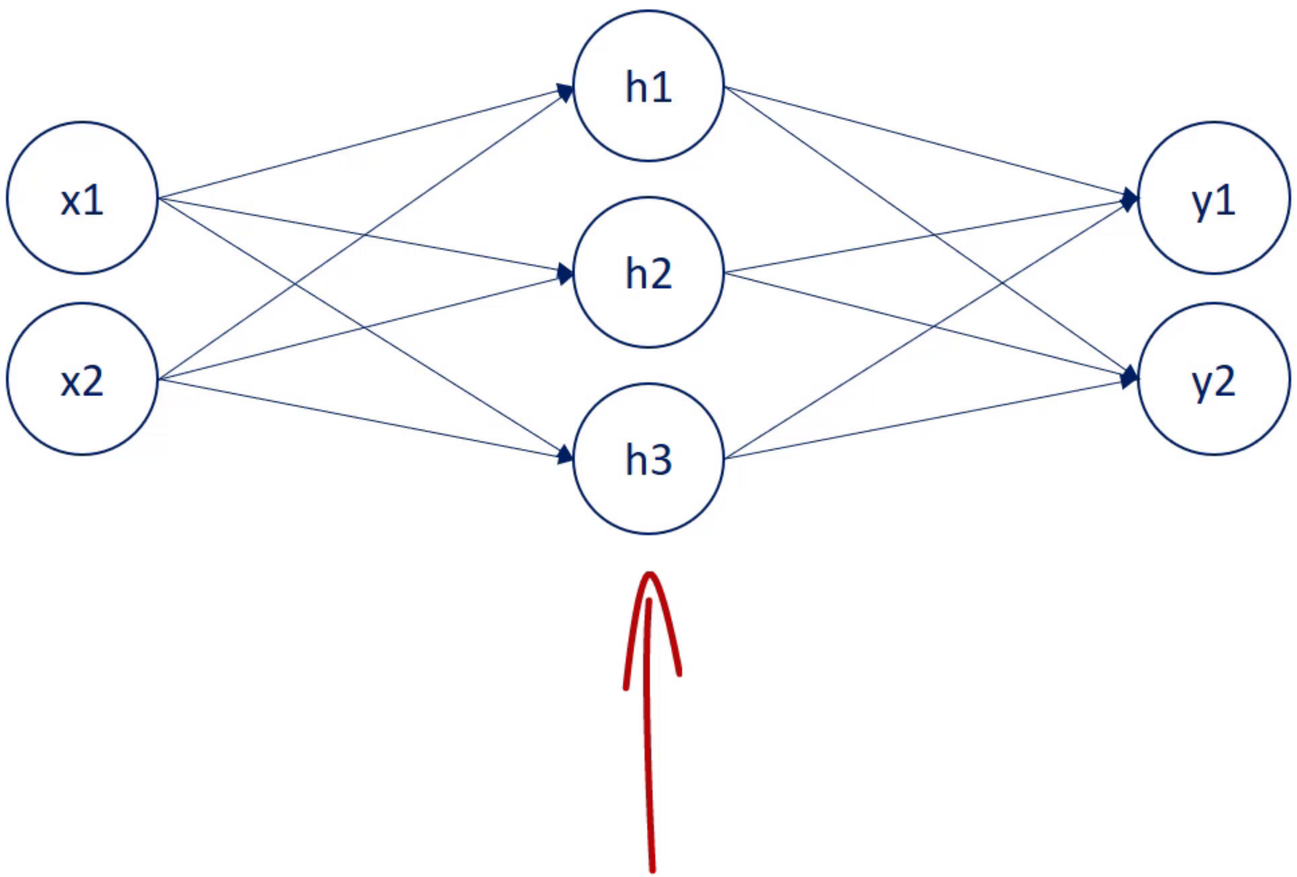
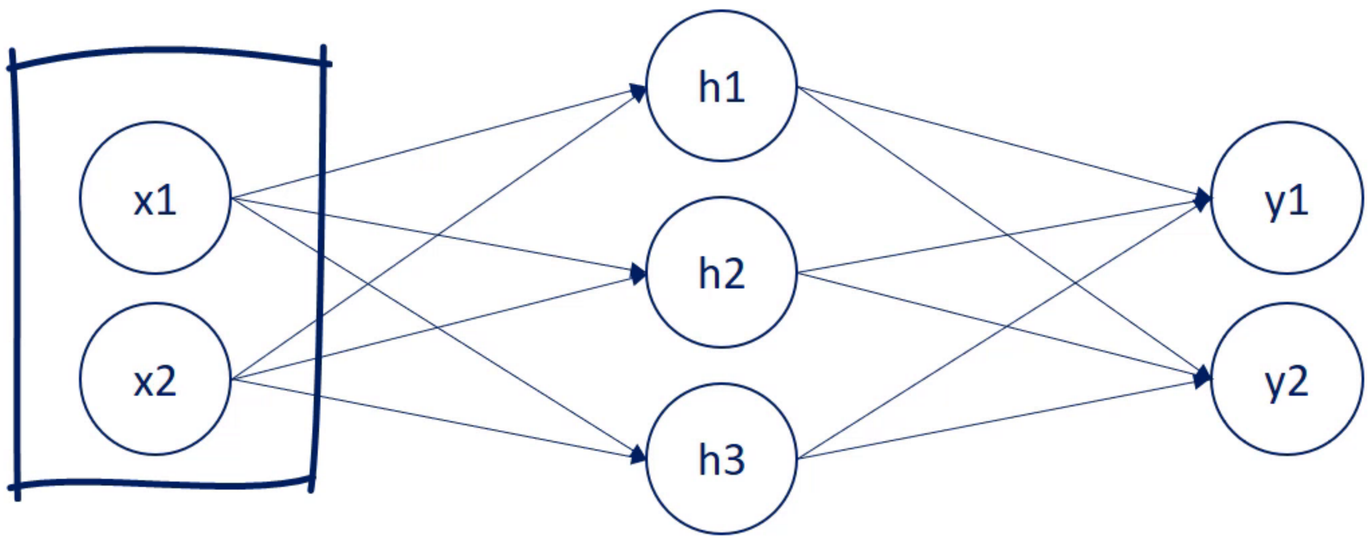
Backpropagation



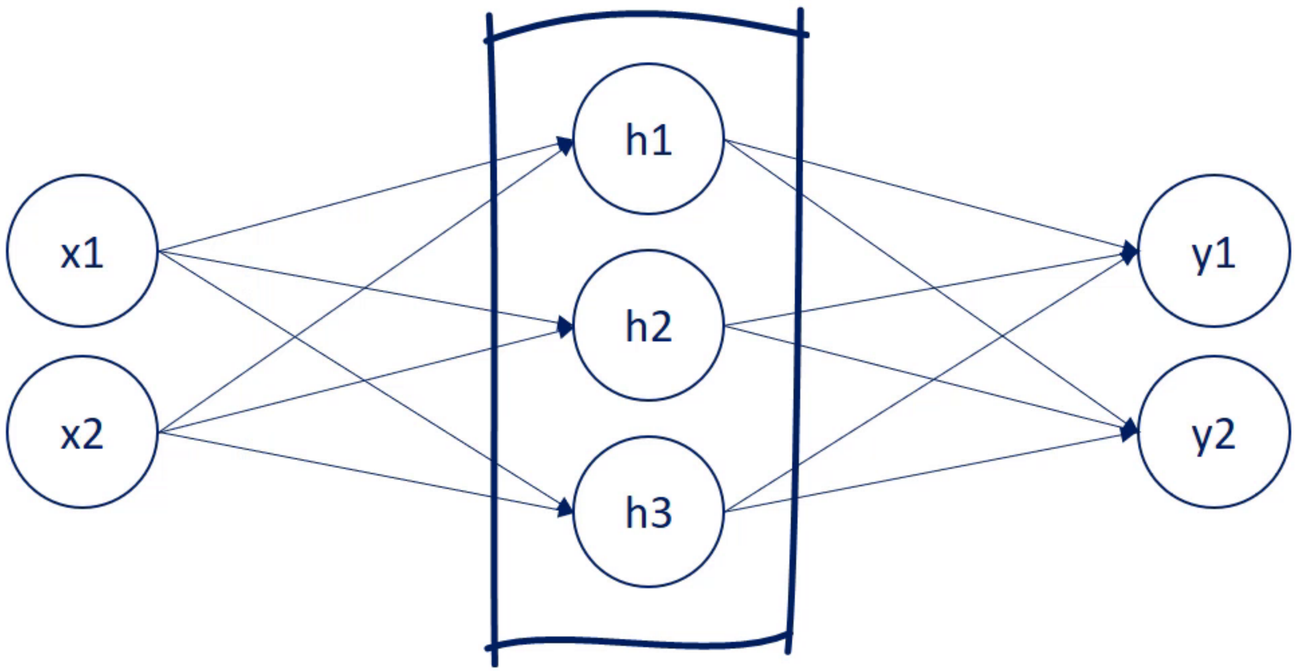
Backpropagation



Backpropagation



Backpropagation



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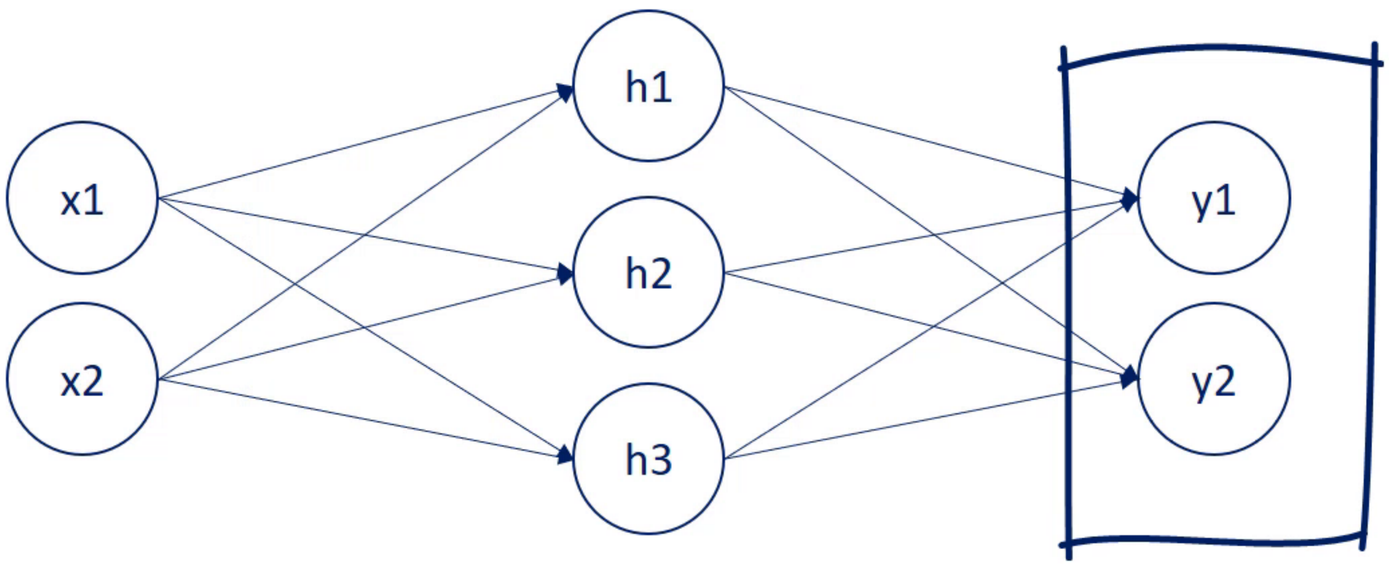
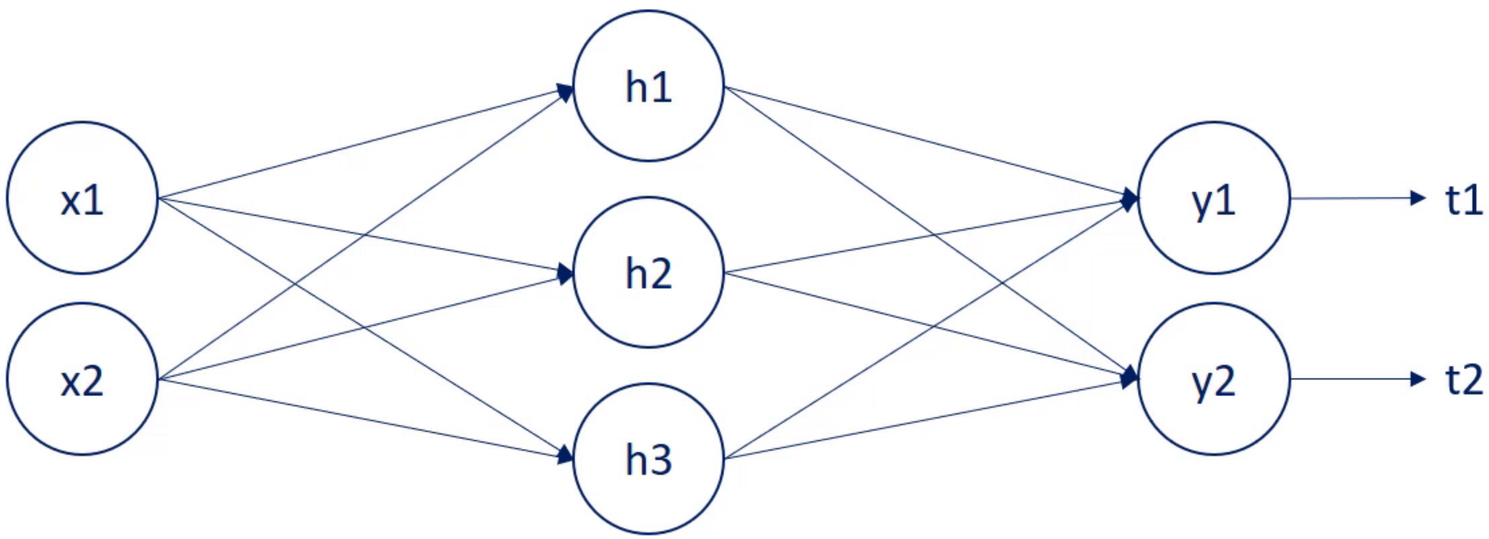


Backpropagation



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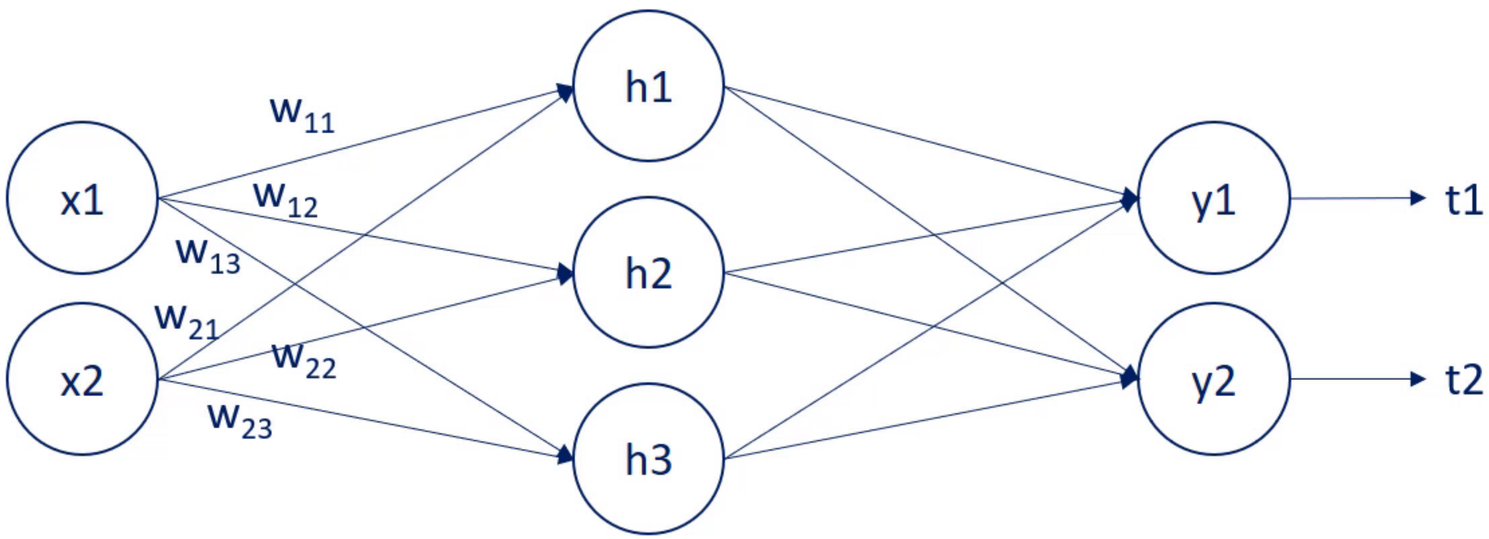
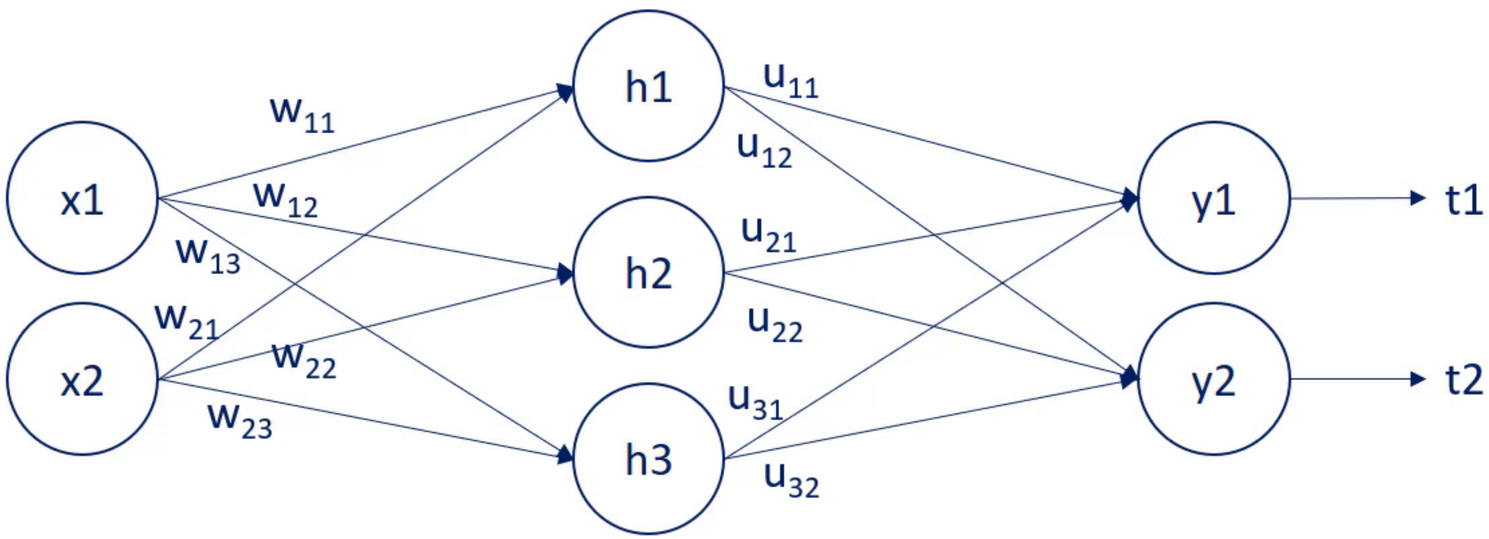


Backpropagation



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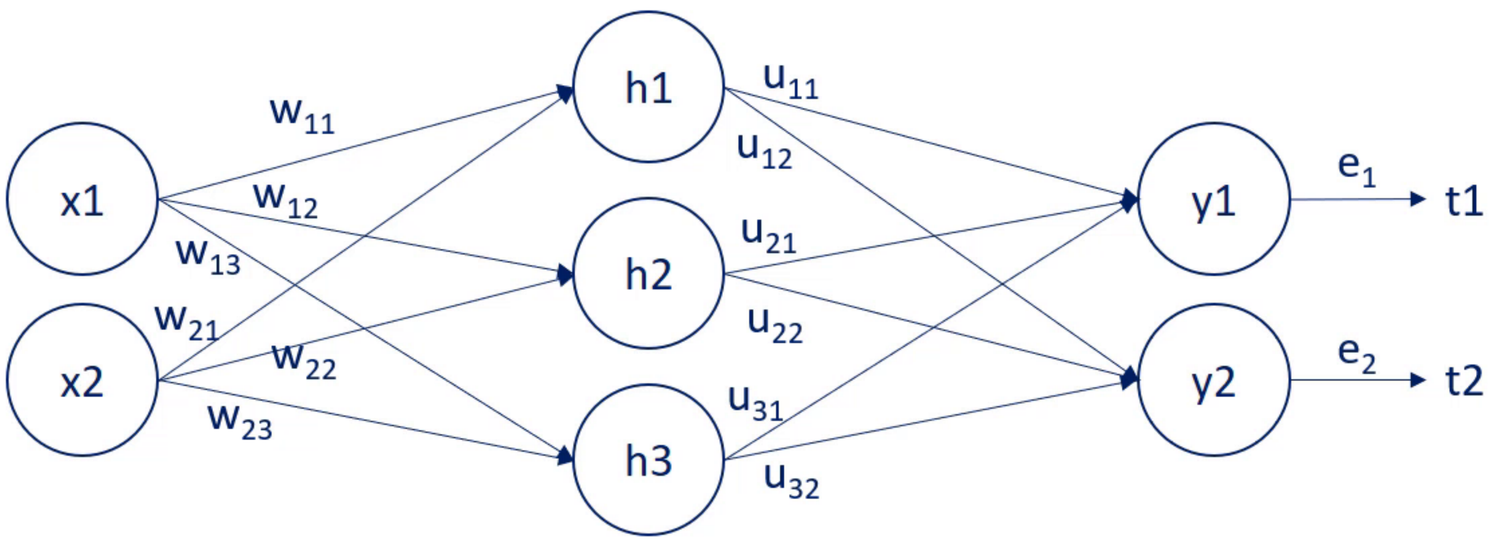
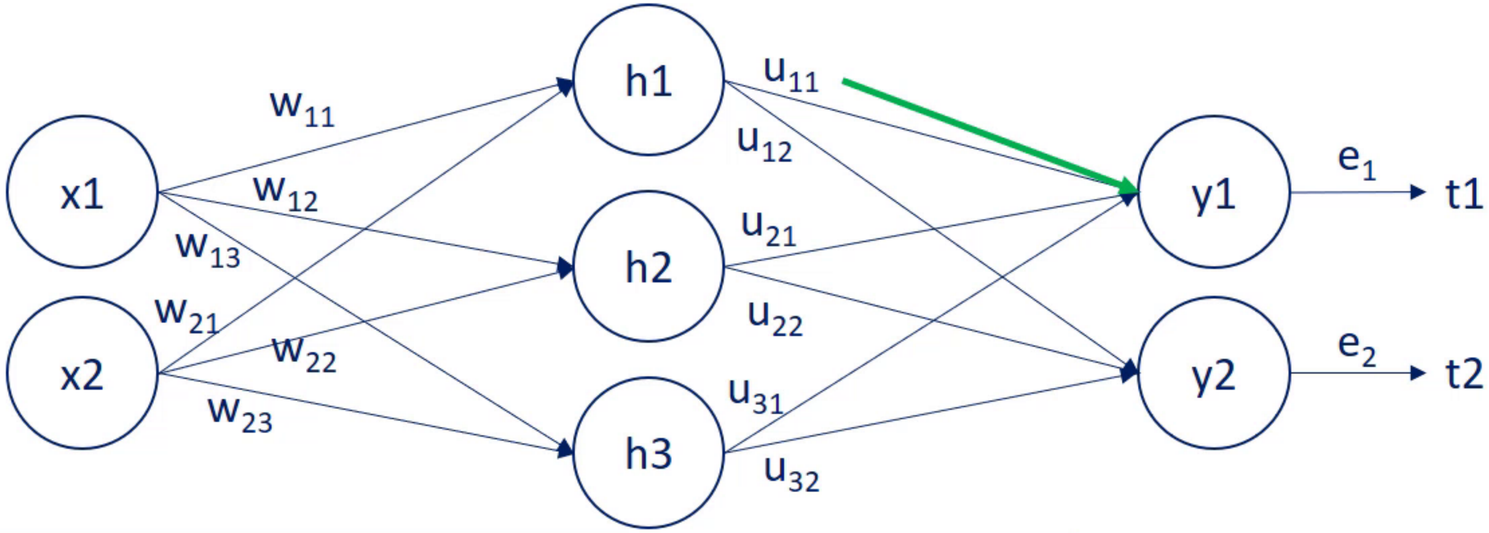
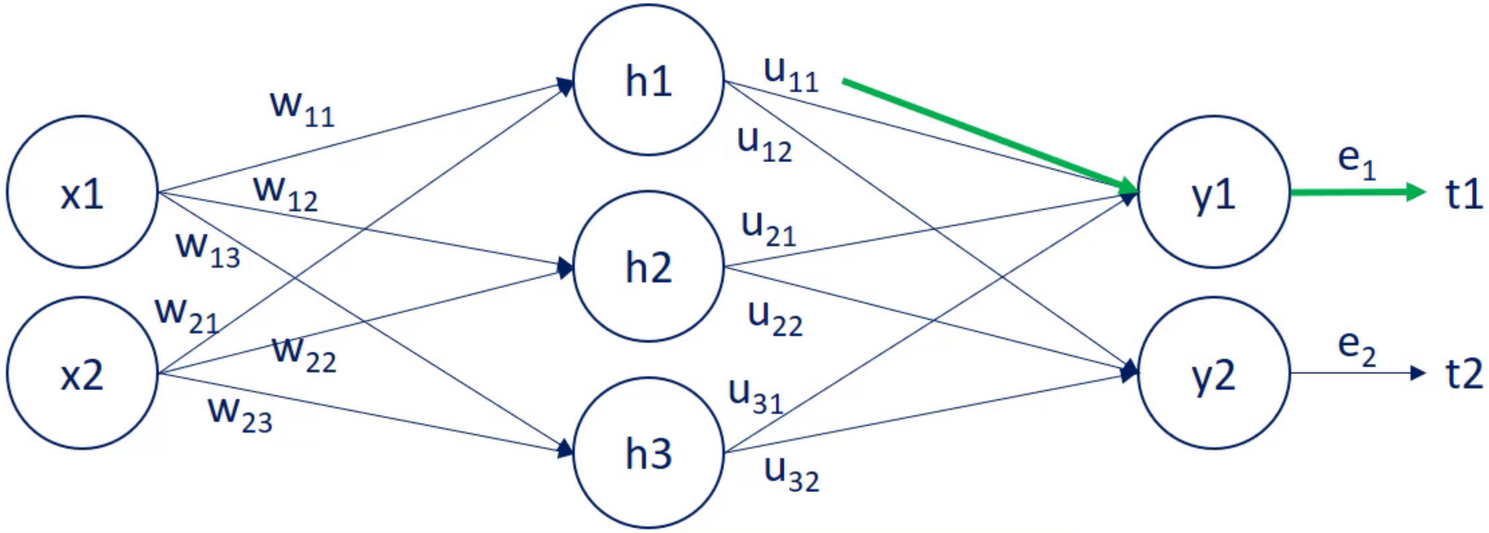


Backpropagation



U_{11} contributes to a single error e_1

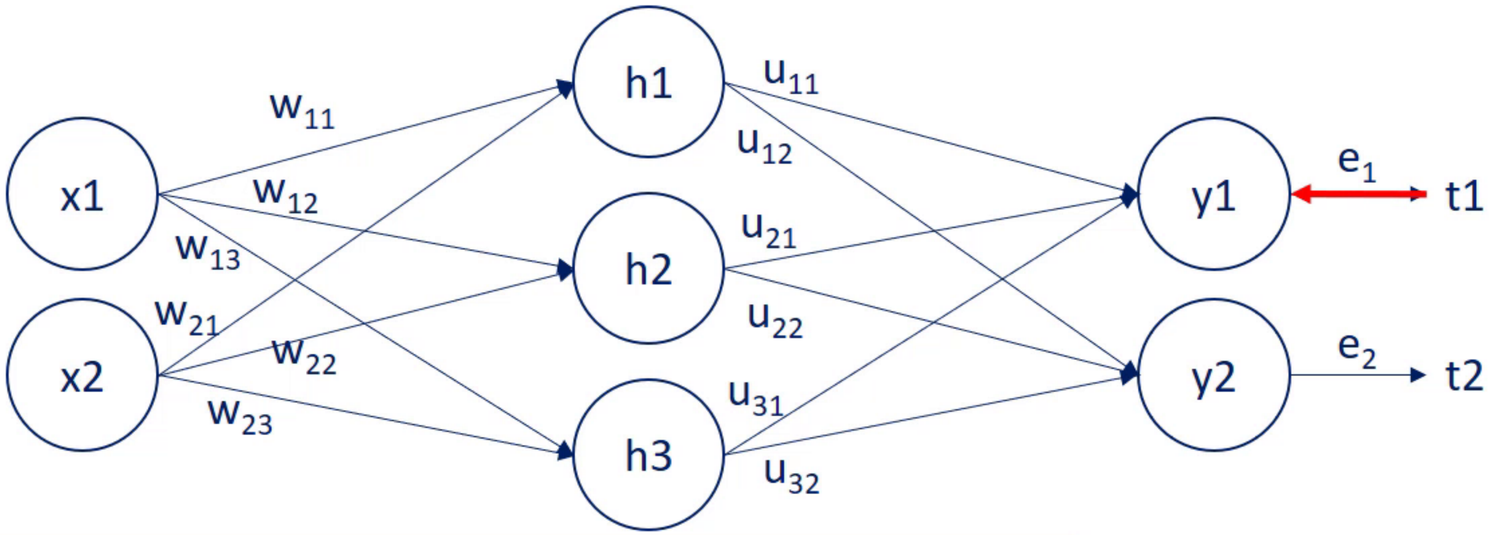
Backpropagation



U_{11} contributes to a single error e_1

we find its derivative (gradient) $\boldsymbol{u}_{i+1} = \boldsymbol{u}_i - \eta \nabla_{\mathbf{u}} L(\boldsymbol{u}_i)$

Backpropagation

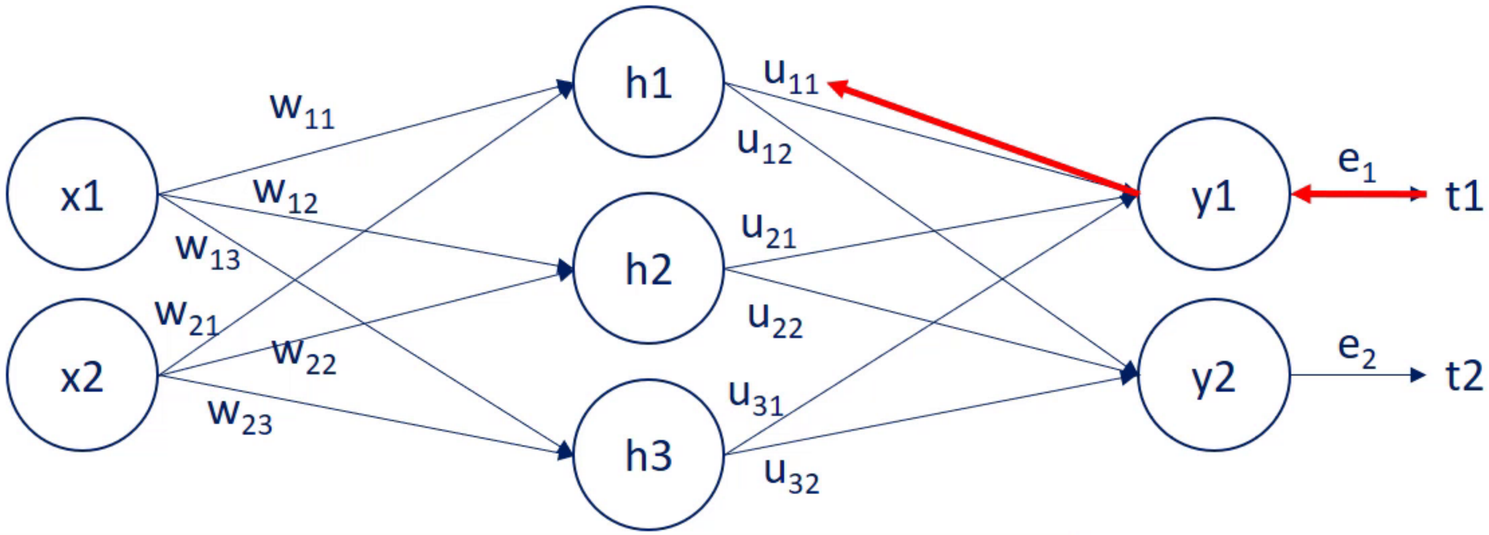


U_{11} contributes to a single error e_1

we find its derivative (gradient) $\boldsymbol{u}_{i+1} = \boldsymbol{u}_i - \eta \nabla_{\mathbf{u}} L(\boldsymbol{u}_i)$

and update the coefficient.

Backpropagation



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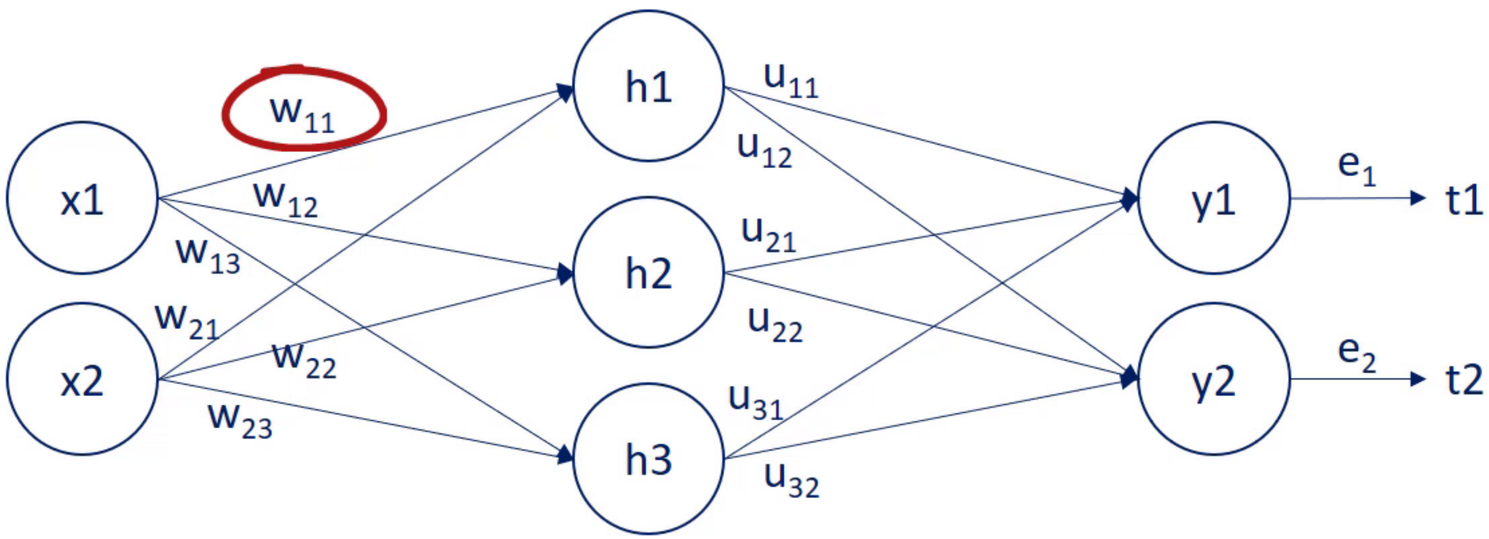
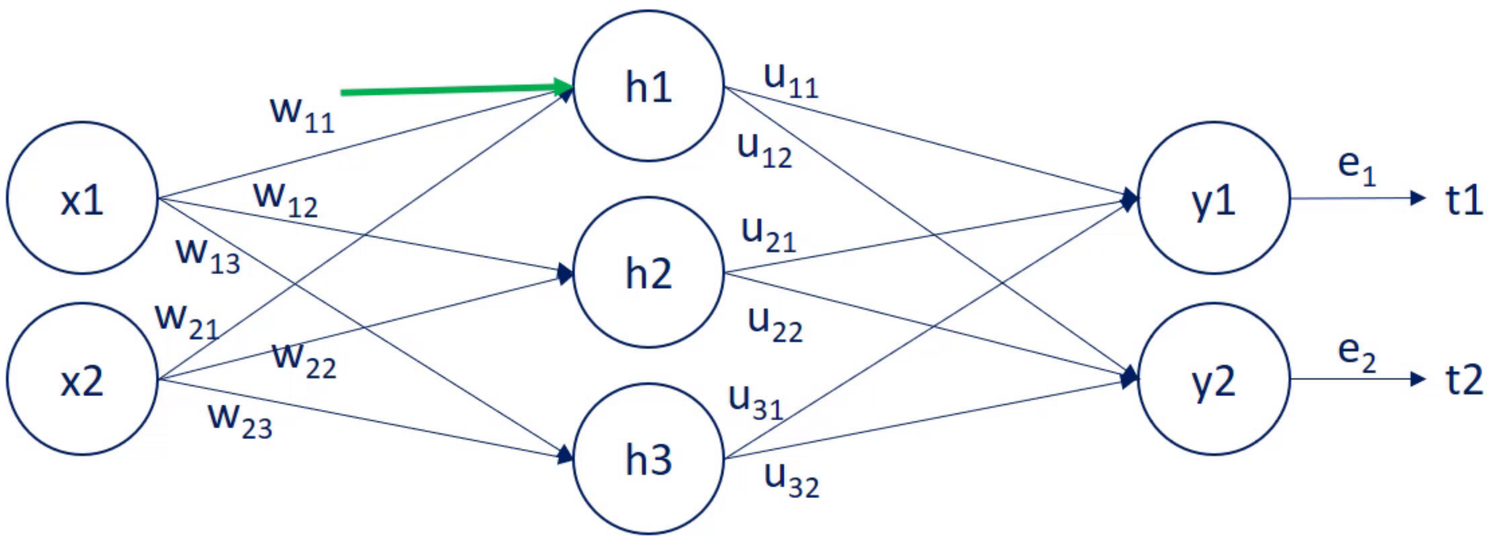
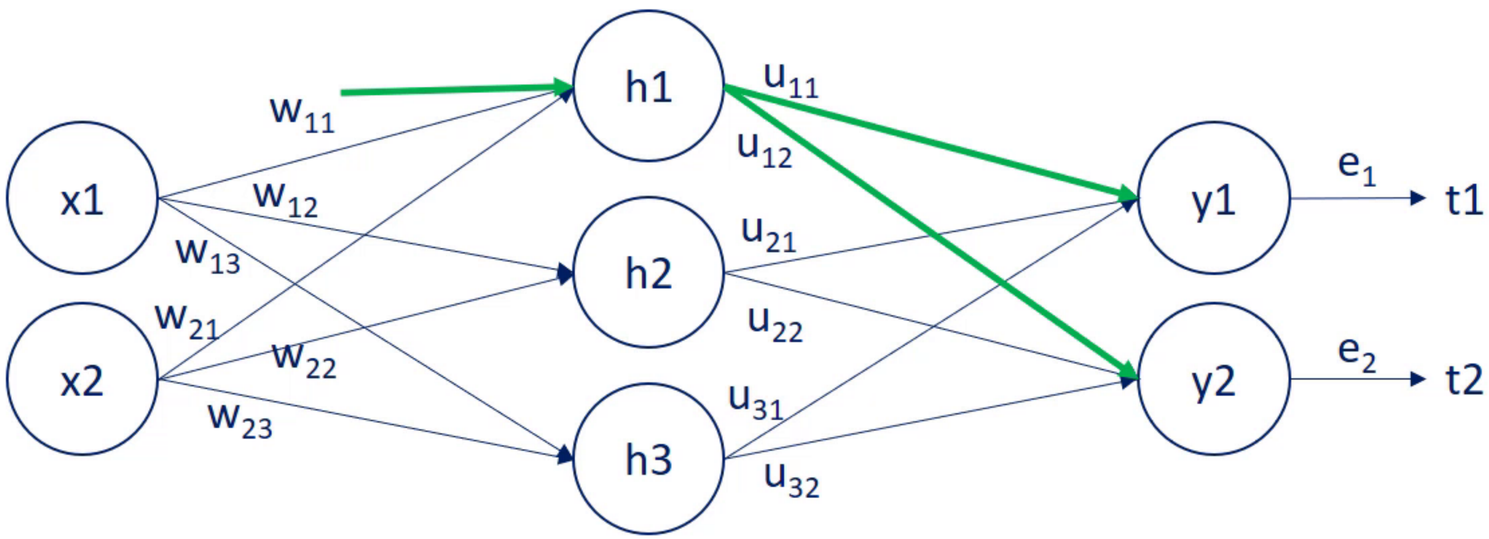


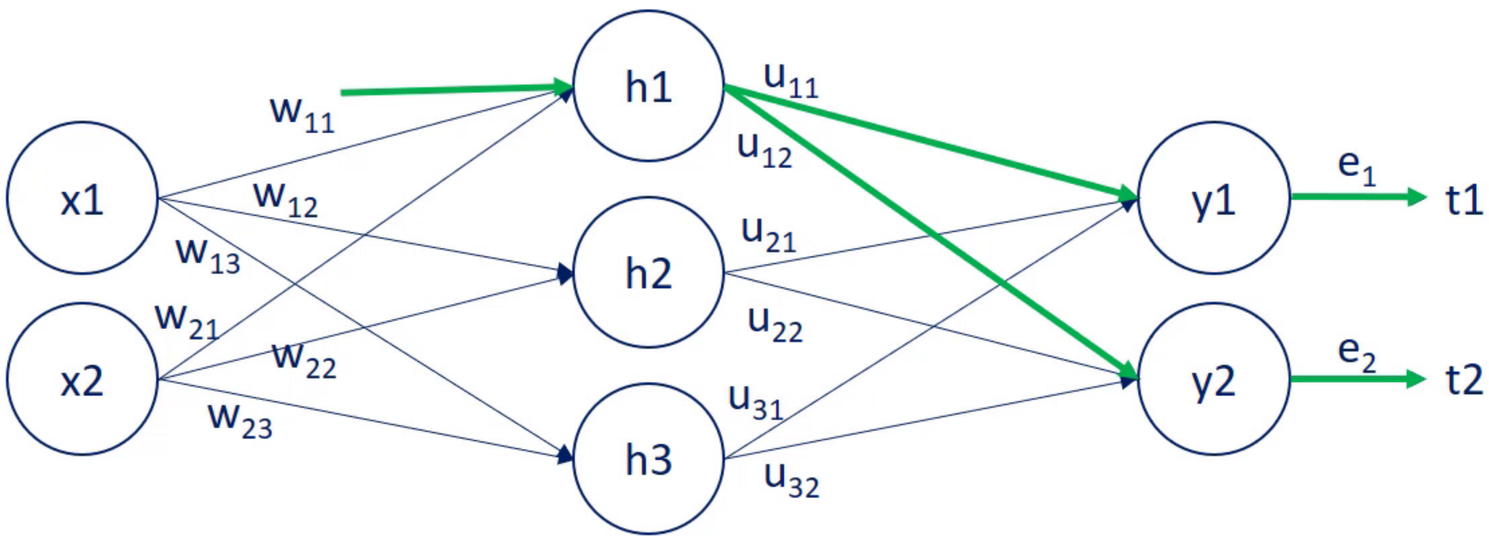
Backpropagation



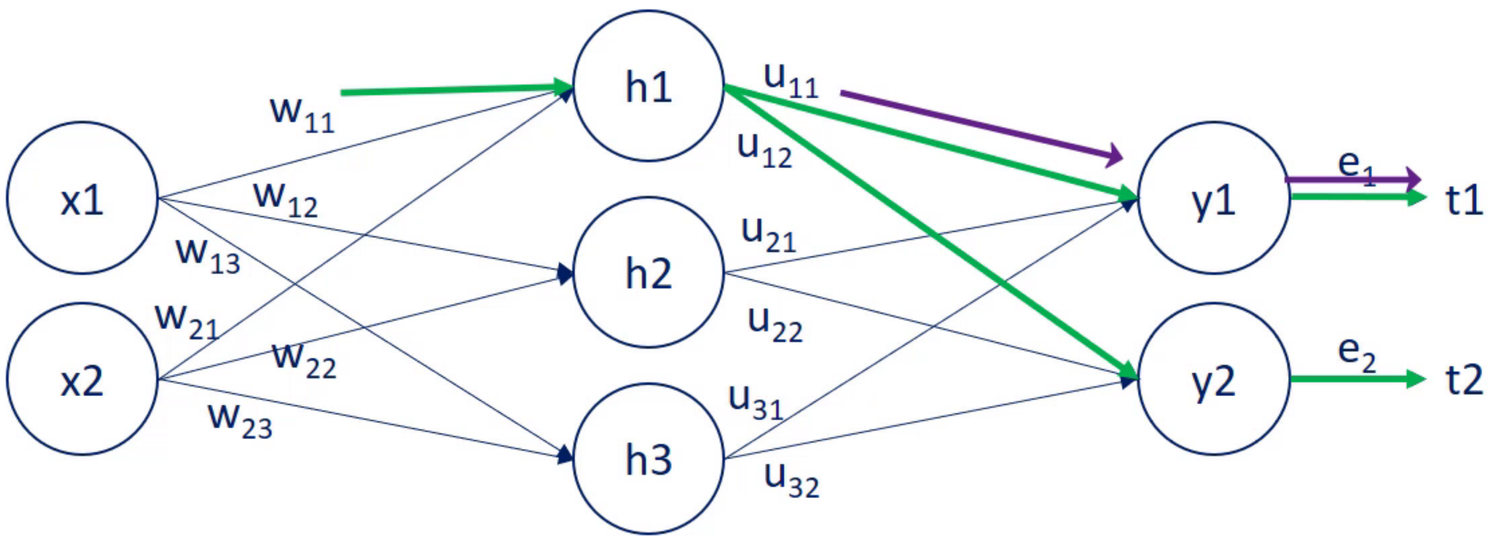
Backpropagation



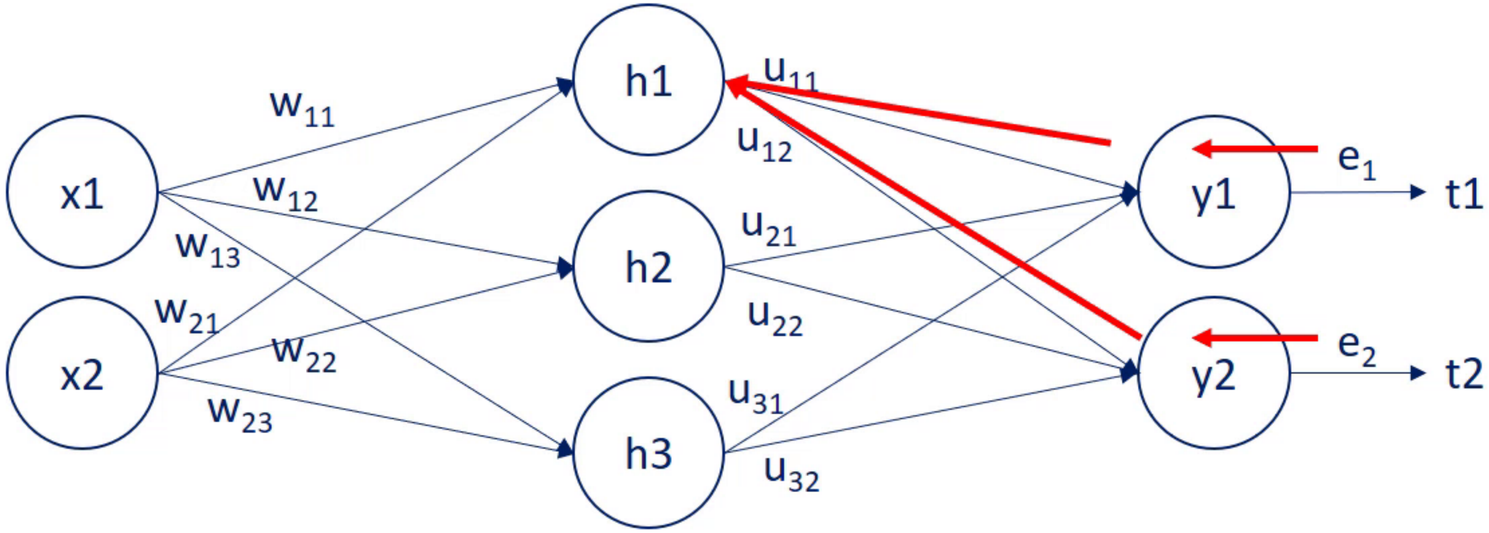
Backpropagation



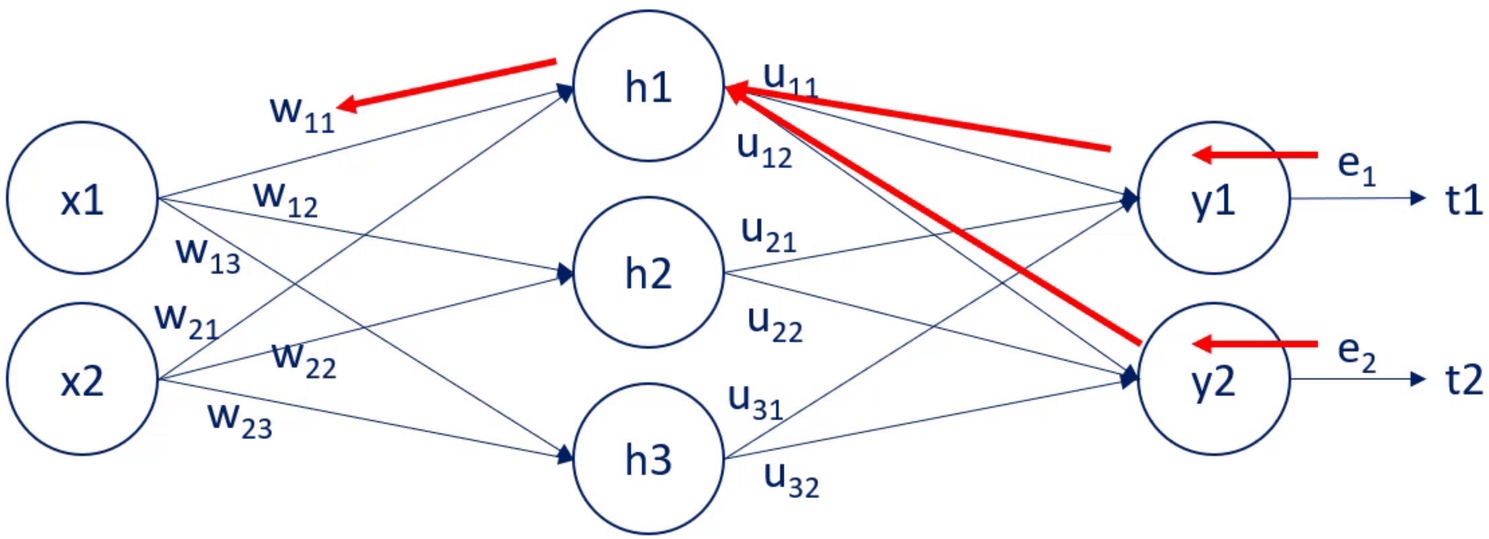
Backpropagation



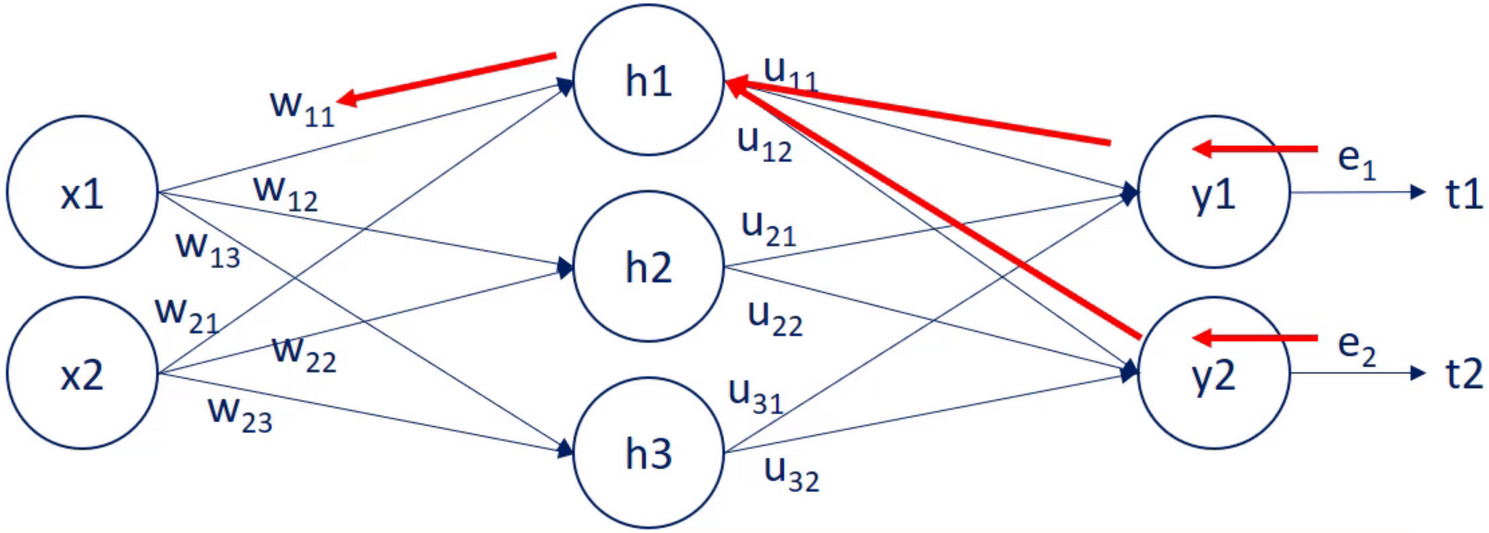
Backpropagation



Backpropagation



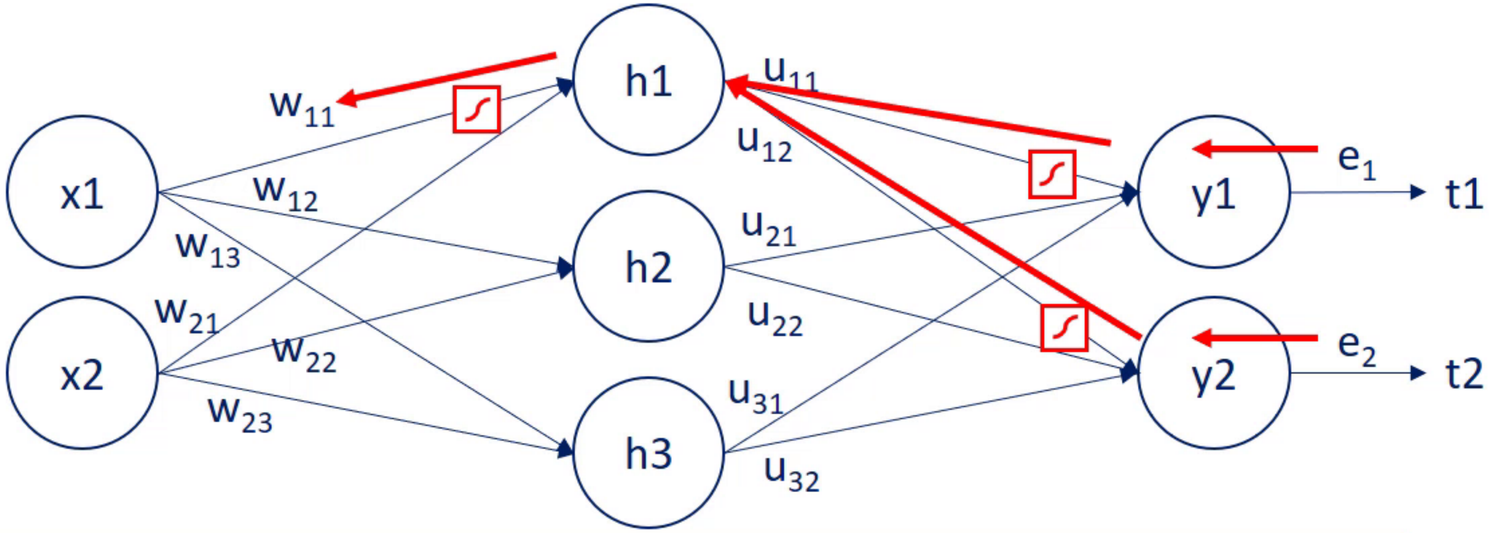
Backpropagation



The algorithm adjusts:

the weights that have a **bigger** contribution to the errors by **more;**
the weights that have a **smaller** contribution to the errors by **less**

Backpropagation



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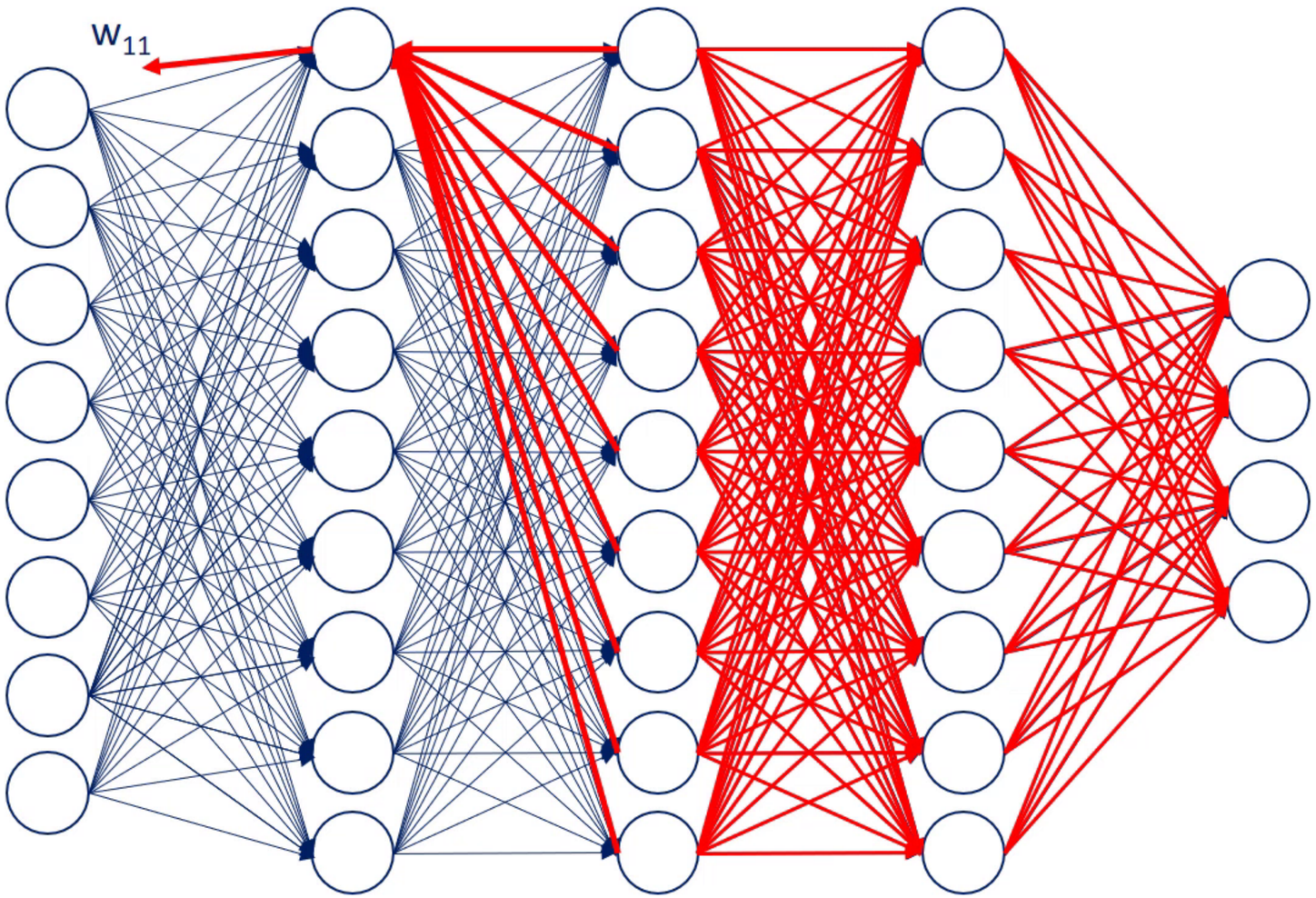
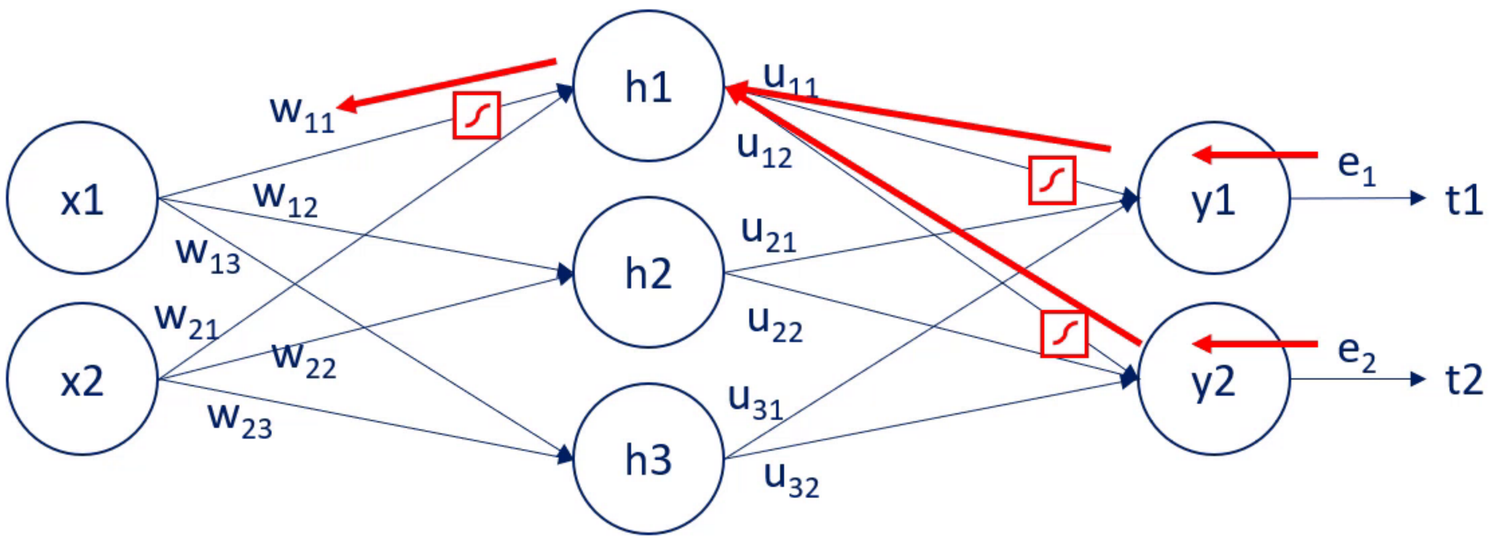


Backpropagation mathematics



$$\frac{\partial L}{\partial w_{ij}} = \delta_j x_i \text{ , where } \delta_j = \sum_k \delta_k w_{jk}\, y_j(1 - y_j)$$