UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
FACULTAD DE CIENCIAS
DIPLOMADO EN MINERÍA DE DATOS

Módulo 6. *Minería de Datos*

Redes neuronales

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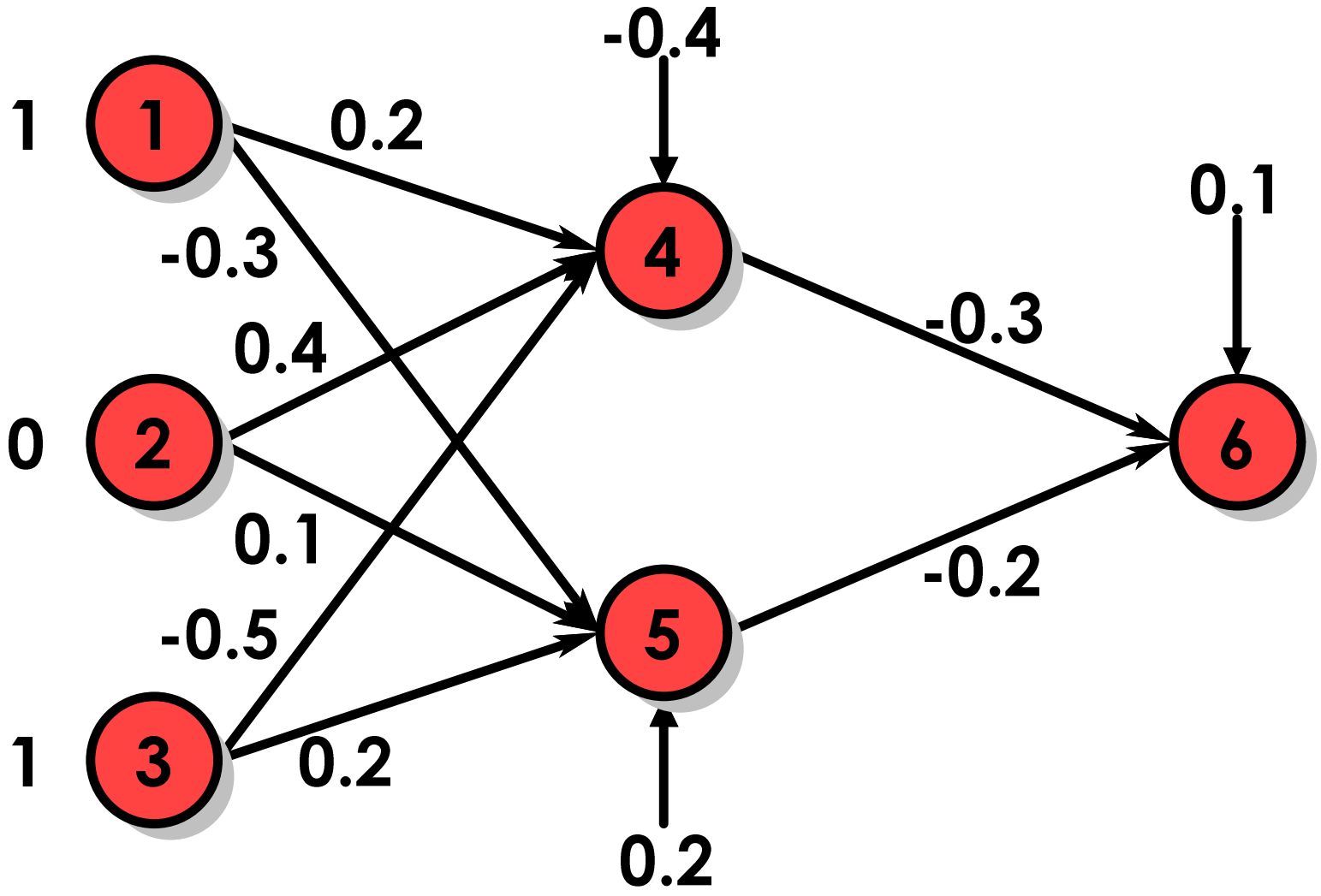
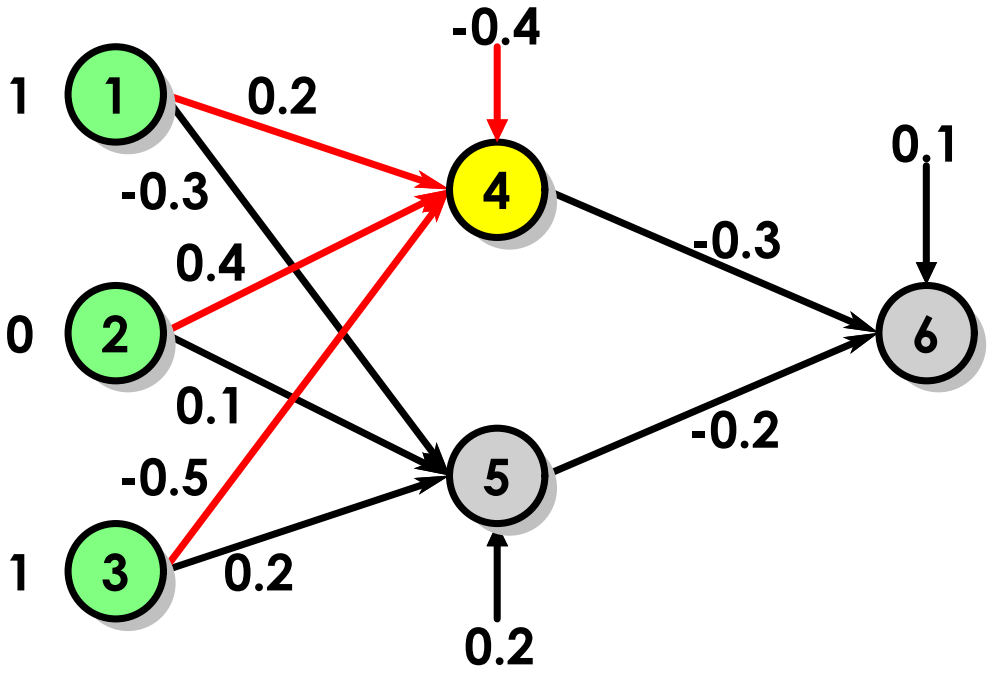
Ejemplo



…Ejemplo

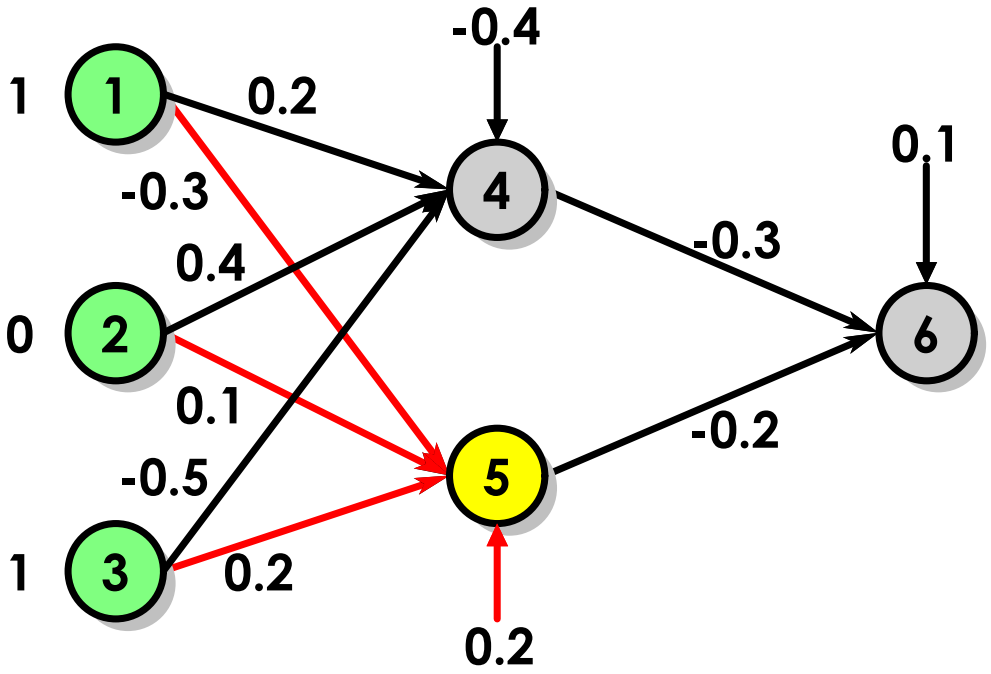


$$I_j = \sum_i w_{ij} O_i + \theta_j$$

$$O_j = \frac{1}{1 + e^{-I_j}}$$

Unidad	Entrada (I_j)	Salida (O_j)
4	$0.2(1) + 0.4(0) - 0.5(1) - 0.4 = -0.7$	$\frac{1}{1 + e^{0.7}} = 0.332$

…Ejemplo

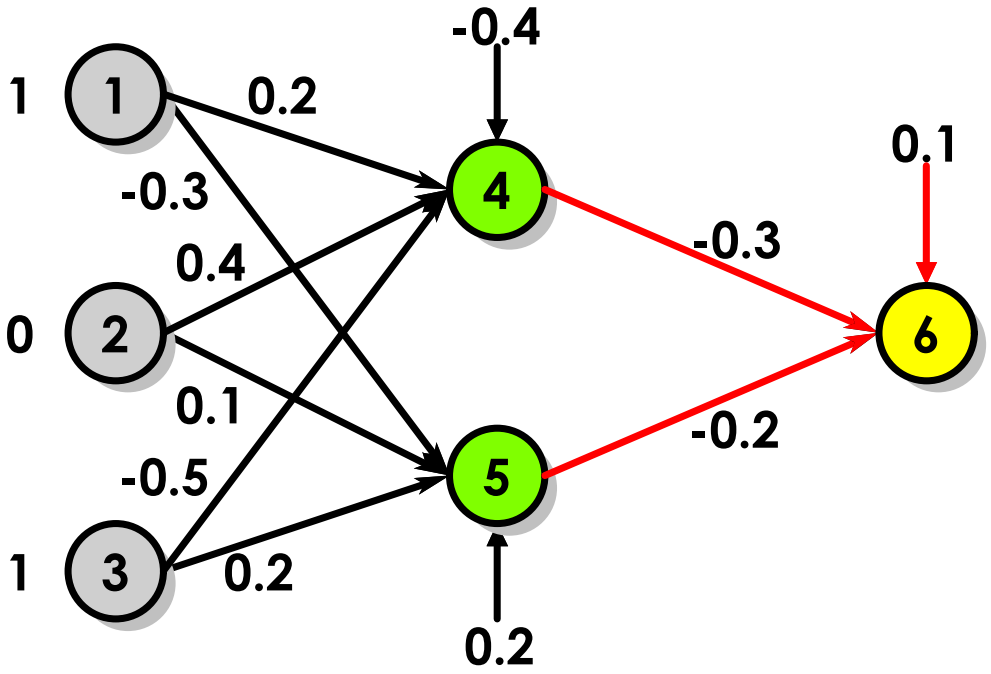


$$I_j = \sum_i w_{ij} O_i + \theta_j$$

$$O_j = \frac{1}{1 + e^{-I_j}}$$

Unidad	Entrada (I_j)	Salida (O_j)
5	$-0.3(1) + 0.1(0) + 0.2(1) + 0.2 = -0.1$	$\frac{1}{1 + e^{-0.1}} = 0.525$

…Ejemplo: salidas



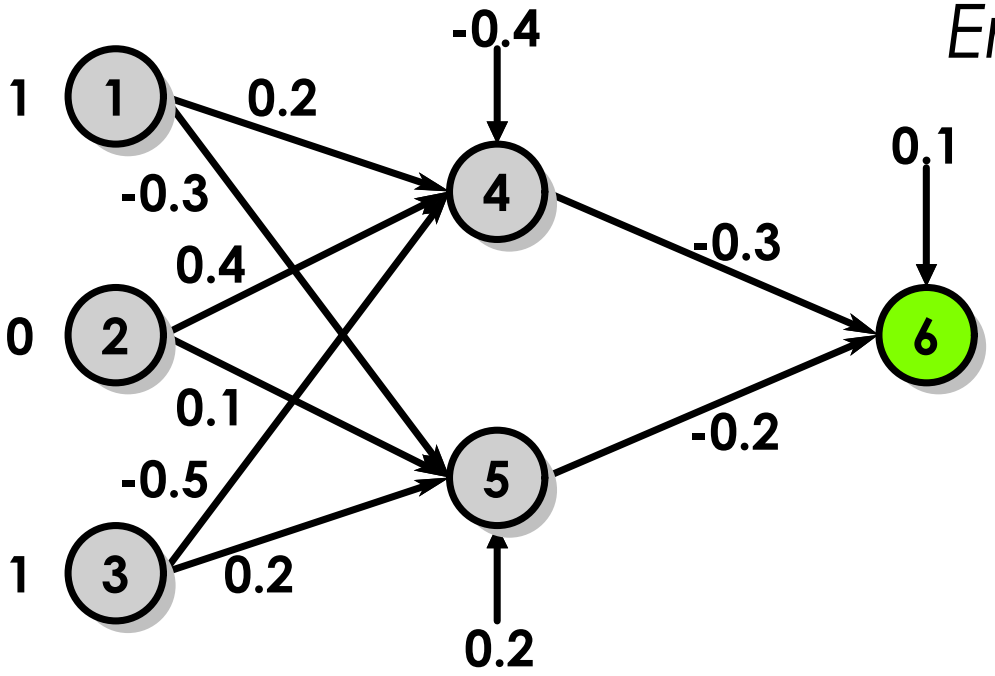
$$I_j = \sum_i w_{ij} O_i + \theta_j$$

$$O_j = \frac{1}{1 + e^{-I_j}}$$

$$O_4 = 0.332, \qquad O_5 = 0.525$$

Unidad	Entrada (I_j)	Salida (O_j)
6	$-0.3(0.332) - 0.2(0.525) + 0.1 = -0.105$	$\frac{1}{1 + e^{0.105}} = 0.474$

Ejemplo: retropropagación



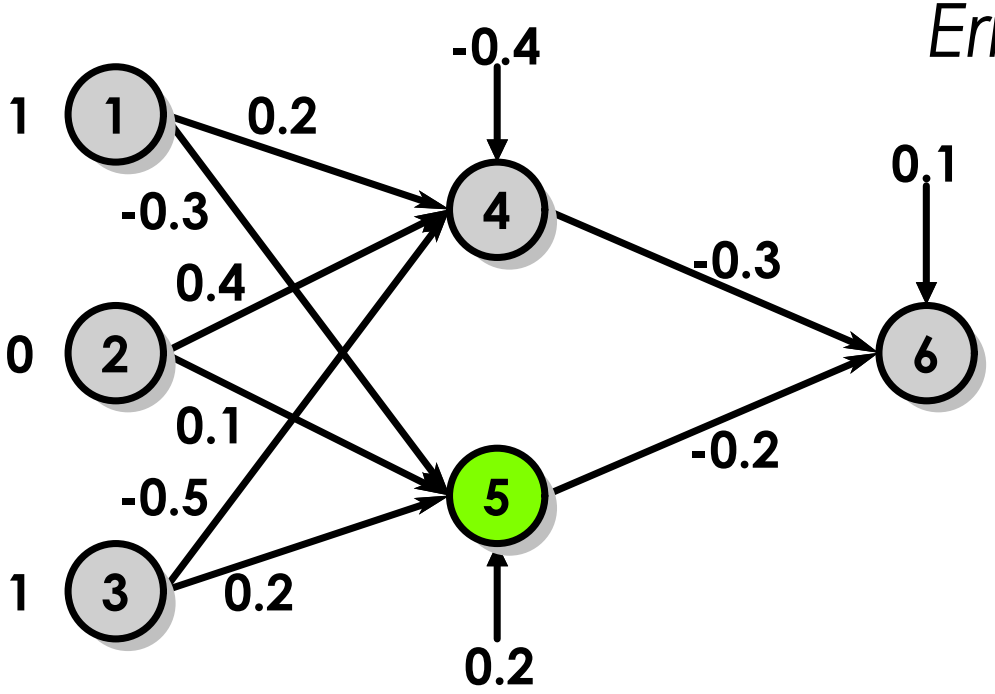
$$Err_j = O_j\left(1-O_j\right)\left(T_j-O_j\right)$$

$$O_6 = 0.474$$

Unidad	Err_6
6	$(0.474)(1-0.474)(1-0.474) = -0.1311$

…Ejemplo: retropropagación

$$Err_j = O_j\left(1 - O_j\right)\sum_k Err_k w_{jk}$$

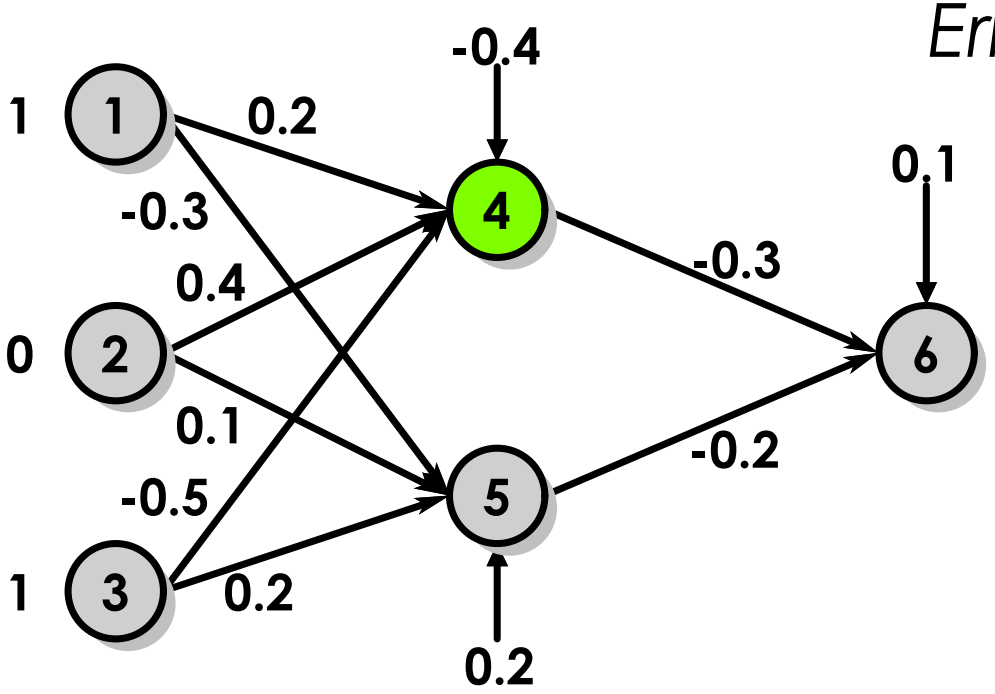


$$O_5 = 0.525 \quad , \quad Err_6 = -0.1311$$

Unidad	Err_5
5	$(0.525)(1-0.525)(0.1311)(-0.2) = -0.0065$

…Ejemplo: retropropagación

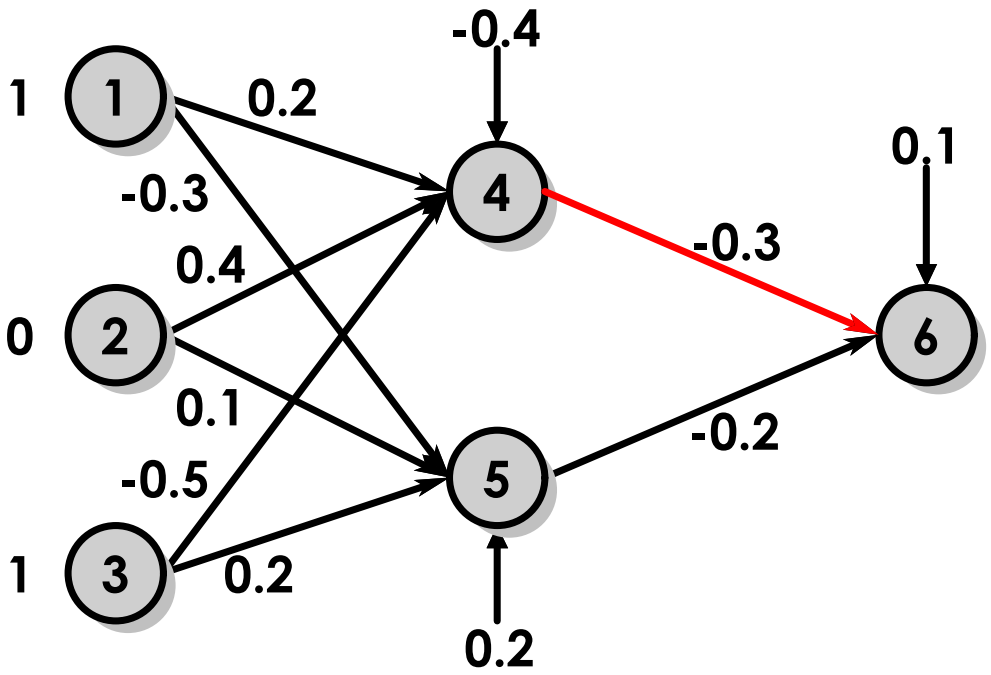
$$Err_j = O_j\left(1 - O_j\right)\sum_k Err_k w_{jk}$$



$$O_4 = 0.332 \quad , \quad Err_6 = -0.1311$$

Unidad	Err_4
4	$(0.332)(1-0.332)(0.1311)(-0.3) = -0.0087$

Ejemplo: Actualizar pesos



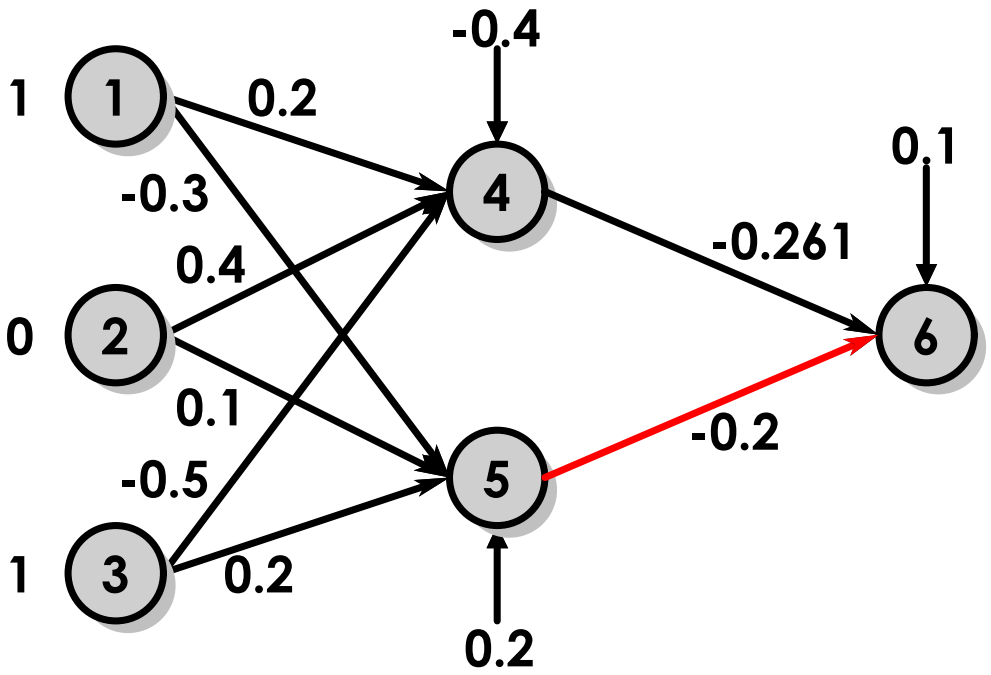
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_4 = 0.332 \quad , \quad Err_6 = -0.1311 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{46}	$-0.3 + (0.9)(0.1311)(0.332) = -0.261$

…Ejemplo: Actualizar pesos



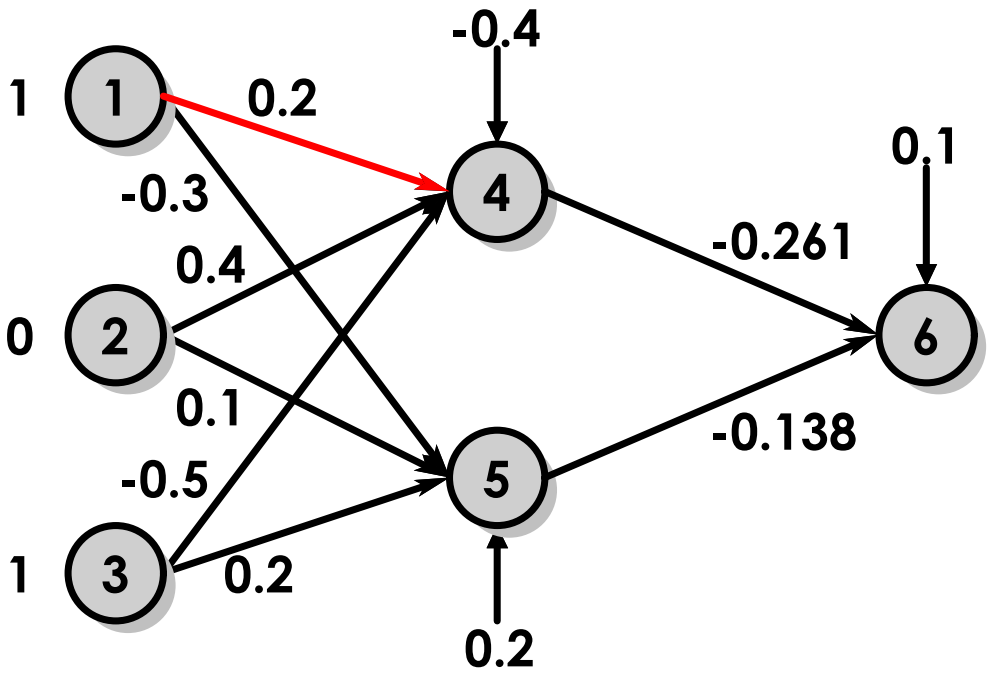
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_5 = 0.525 \quad , \quad Err_6 = -0.1311 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{56}	$-0.2 + (0.9)(0.1311)(0.525) = -0.138$

…Ejemplo: Actualizar pesos



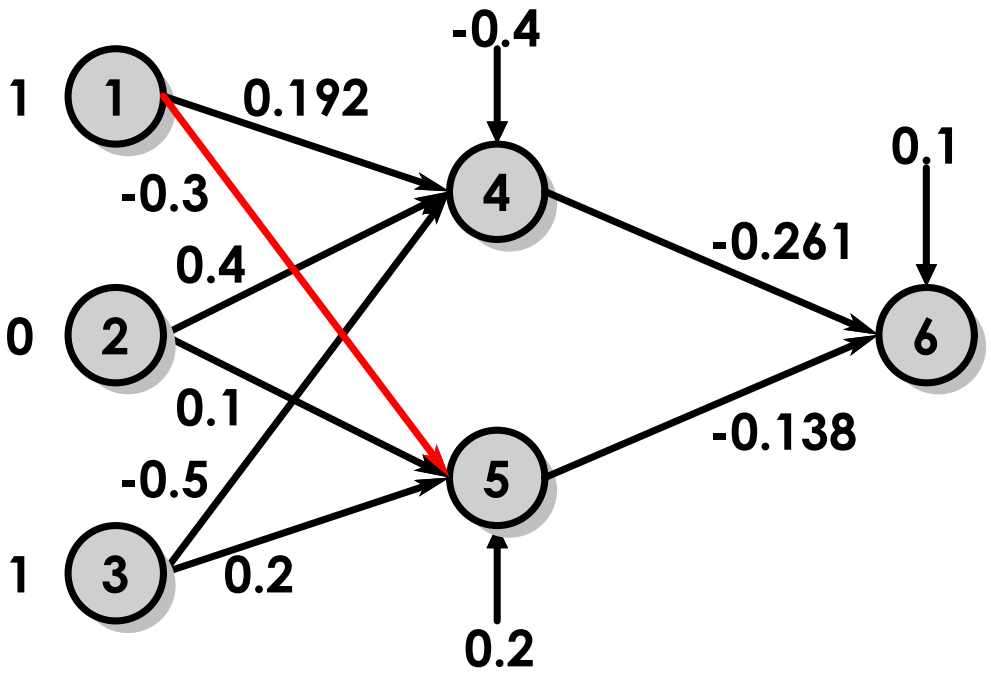
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_1 = 1 \quad , \quad Err_4 = -0.0087 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{14}	$-0.2 + (0.9)(-0.0087)(1) = 0.192$

…Ejemplo: Actualizar pesos



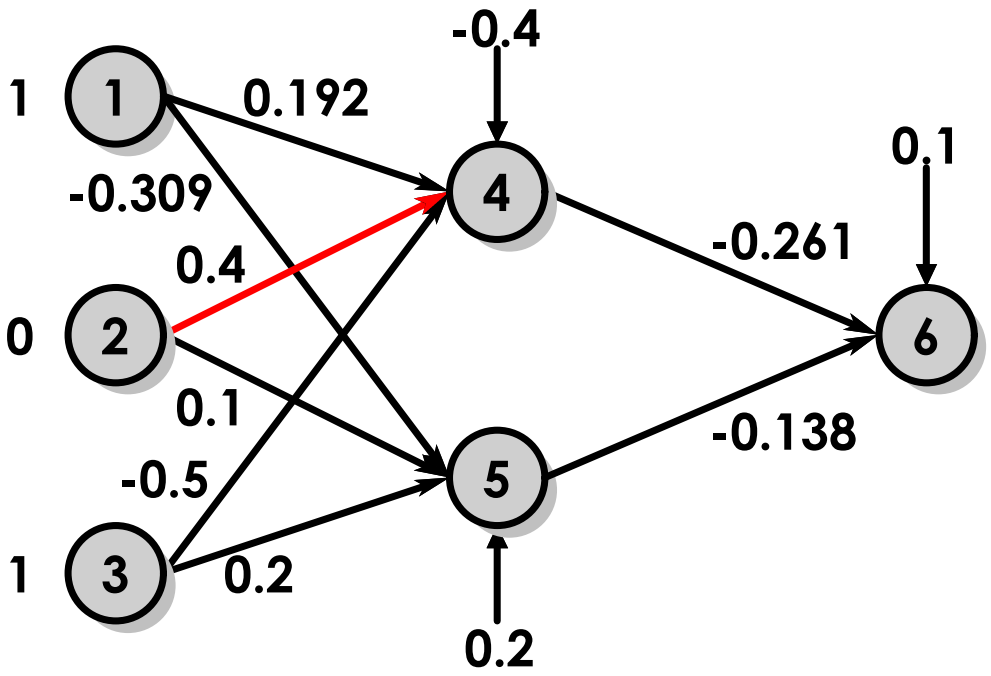
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_1 = 1 \quad , \quad Err_5 = -0.0065 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{15}	$-0.3 + (0.9)(-0.0065)(1) = -0.309$

…Ejemplo: Actualizar pesos



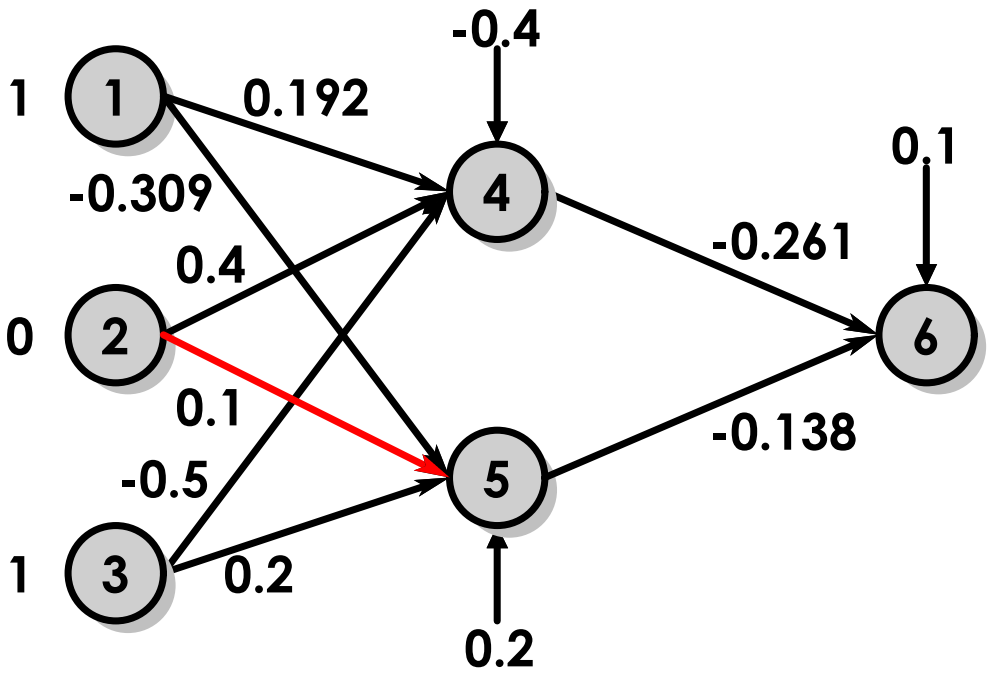
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_2 = 0 \quad , \quad Err_4 = -0.0087 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{24}	$0.4 + (0.9)(-0.0087)(0) = 0.4$

…Ejemplo: Actualizar pesos



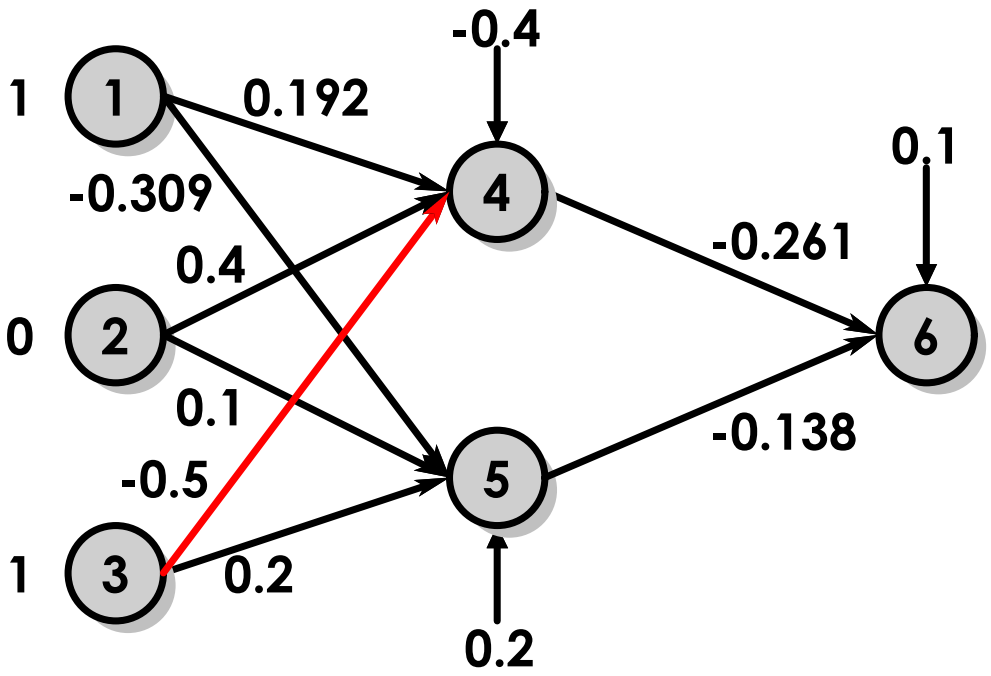
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_2 = 0 \quad , \quad Err_5 = -0.0065 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{25}	$0.1 + (0.9)(-0.0065)(0) = 0.1$

…Ejemplo: Actualizar pesos



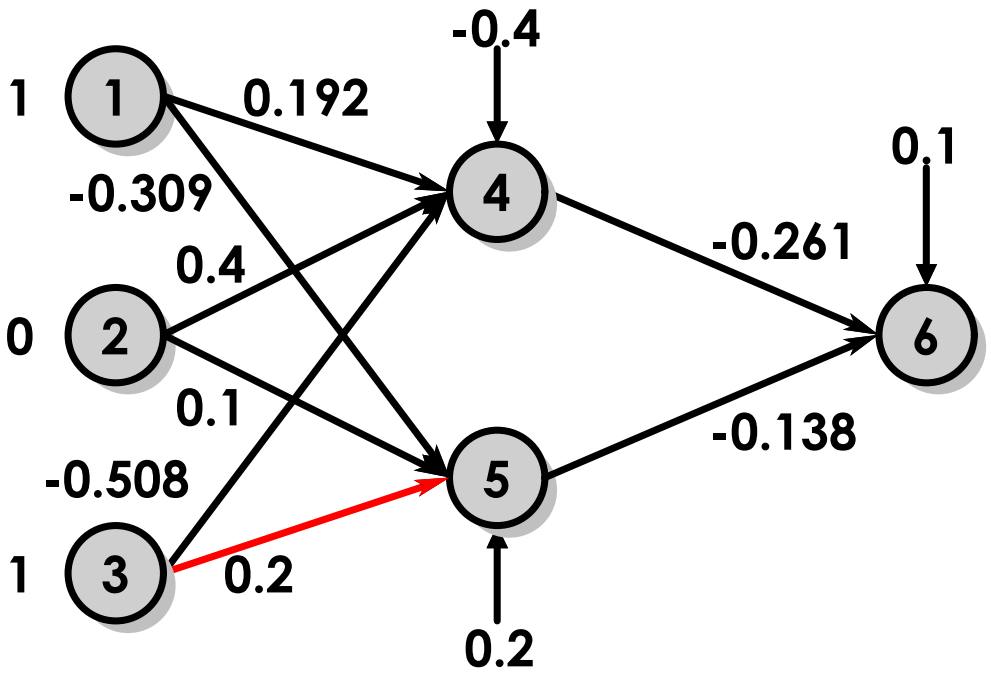
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_3 = 1 \quad , \quad Err_4 = -0.0087 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{34}	$-0.5 + (0.9)(-0.0087)(1) = -0.508$

…Ejemplo: Actualizar pesos



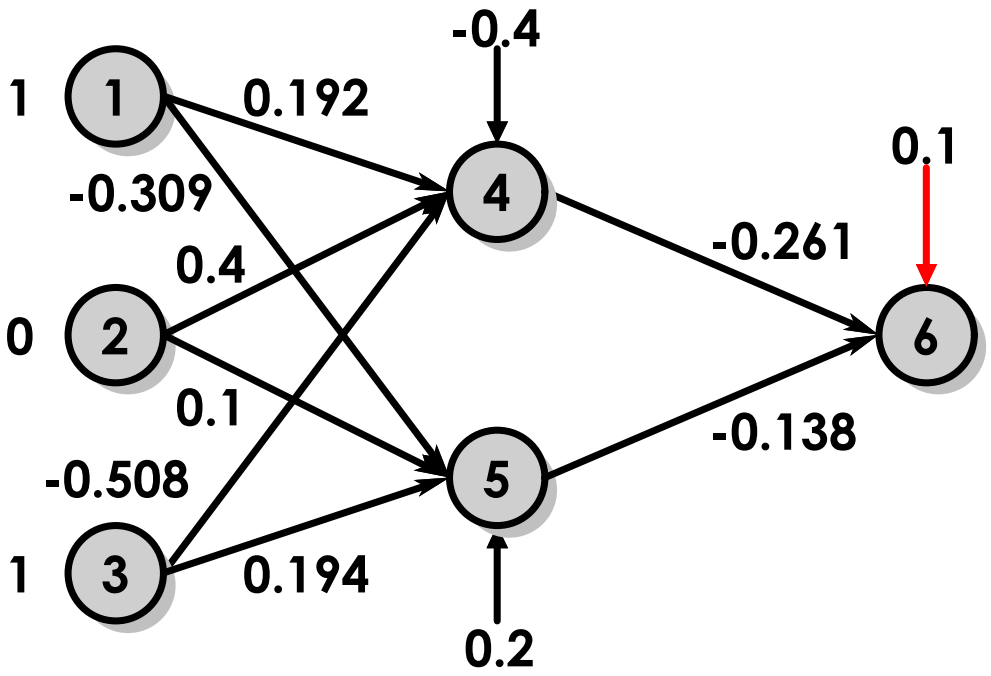
$$\Delta w_{ij} = (\ell) Err_j O_i$$

$$w_{ij} = w_{ij} + \Delta w_{ij}$$

$$O_3 = 1 \quad , \quad Err_5 = -0.0065 \quad , \quad \ell = 0.9$$

Peso	Nuevo valor
w_{35}	$0.2 + (0.9)(-0.0065)(1) = 0.194$

Ejemplo: Actualizar sesgos



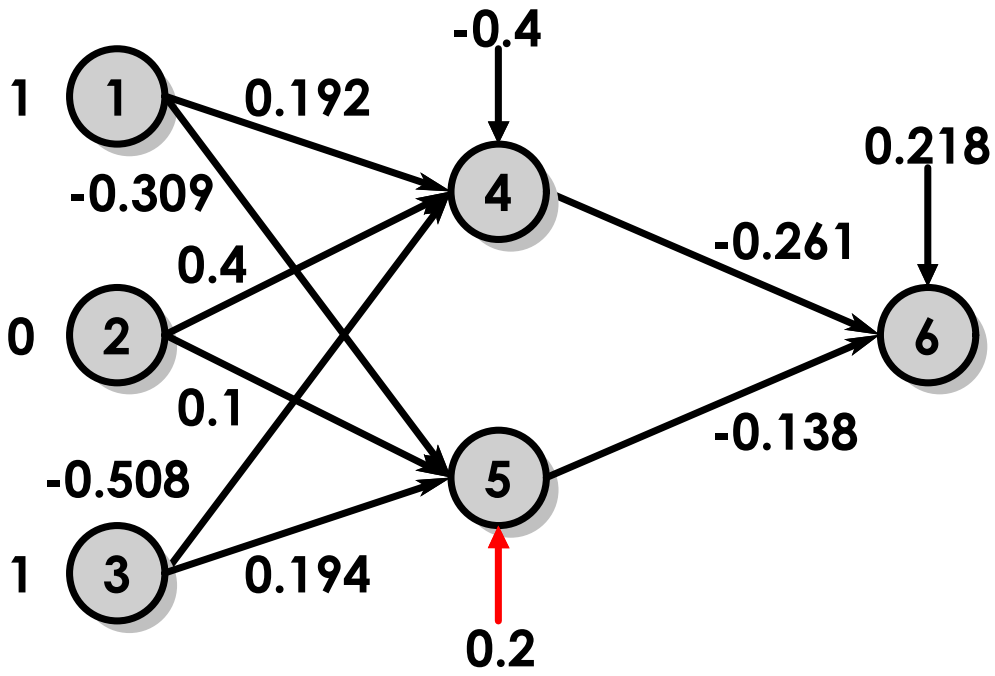
$$\Delta\theta_j = (\ell)Err_j$$

$$\theta_j = \theta_j + \Delta\theta_j$$

$\theta_6 = 0.1$, $Err_6 = 0.1311$, $\ell = 0.9$

Sesgo	Nuevo valor
θ_6	$0.1+(0.9)(0.1311) = 0.218$

…Ejemplo: Actualizar sesgos



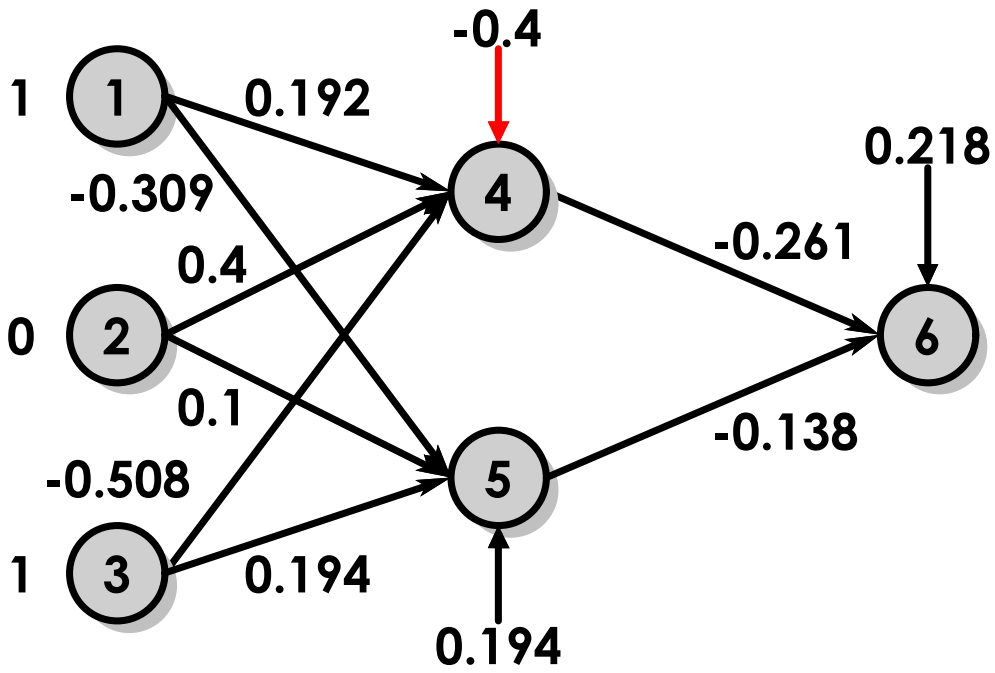
$$\Delta\theta_j = (\ell)Err_j$$

$$\theta_j = \theta_j + \Delta\theta_j$$

$\theta_5 = 0.2$, $Err_5 = -0.0065$, $\ell = 0.9$

Sesgo	Nuevo valor
θ_5	$0.2 + (0.9)(-0.0065) = 0.194$

…Ejemplo: Actualizar sesgos



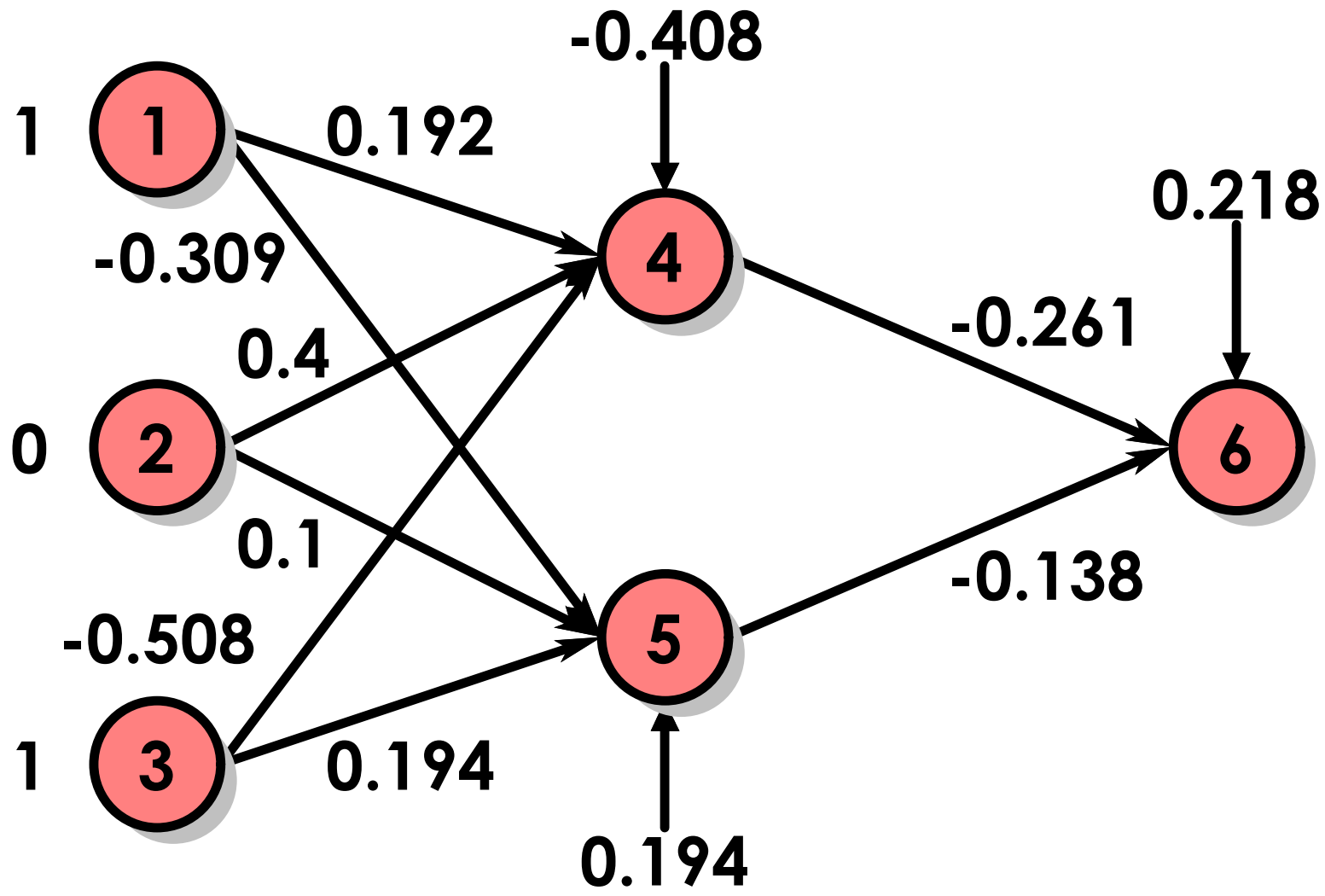
$$\Delta\theta_j = (\ell)Err_j$$

$$\theta_j = \theta_j + \Delta\theta_j$$

$\theta_4 = -0.4$, $Err_5 = -0.0087$, $\ell = 0.9$

Sesgo	Nuevo valor
θ_4	$-0.4 + (0.9)(-0.0087) = -0.408$

…Ejemplo




¡Gracias!