# Formulas

Backpropagation output layer

𝑊23∗ = 𝑊23 − 𝜂𝛿. 𝐴3

𝛿 = (y - Y)\*y\*(1-y)

Backpropagation hidden layer

𝑊𝑛∗ = 𝑊𝑛 − 𝜂( 𝐸𝑡/𝑊𝑛)

Forward pass

1. 𝑍1 = (𝐼𝑛1𝑥 𝑊11)
2. 𝐴1 = 𝑓 (𝑍1)
3. 𝑍4 = (𝐴1𝑥 𝑊21)
4. 𝑦 = 𝑓 (𝑍4)
5. 𝐸𝑡𝑜𝑡𝑎𝑙 = sum(1/2 (𝑡𝑎𝑟𝑔𝑒𝑡 – 𝑜𝑢𝑡𝑝𝑢𝑡)^2)

# Exercise

Forward pass

Z1 = I1\*W11 + I2\*W14 = -2.7788

Z2 = I1\*W12 + I2\*W15 = -1.241

Z3 = I1\*W13 + I2\*W16 = 1.3835

𝑆𝑖𝑔𝑚𝑜𝑖𝑑 = 1/(1 + 𝑒^−𝑍1)

A1 = 0.0585

A2 = 0.2243

A3 = 0.7996

Z4 = A1\*W21 + A22\*W22 + A3\*W23 = 1.6238

y = 0.8353

E = 0.0036

Backpropagation

𝛿 = 0.011735

w21\* = w21 – 0.5\* 𝛿\*A1 = 0.1097

w22\* = w22 – 0.5\* 𝛿\*A2 = 2.2187

w23\* = w23 – 0.5\* 𝛿\*A3 = 1.3953

w11\* = w11 – 0.5(E/w11) = -3.5995

w12\* = w12 – 0.5(E/w12) = 1.4988

w13\* = w13 – 0.5(E/w13) = 0.9882

w14\* = w14 – 0.5(E/w14) = -1.2285

w15\* = w15 – 0.5(E/w15) = -3.5995

w16\* = w16 – 0.5(E/w16) = 1.3987

Forward pass

Z1 = I1\*W11 + I2\*W14 = -2.7777

Z2 = I1\*W12 + I2\*W15 = -1.2414

Z3 = I1\*W13 + I2\*W16 = 1.3817

𝑆𝑖𝑔𝑚𝑜𝑖𝑑 = 1/(1 + 𝑒^−𝑍1)

A1 = 0.0585

A2 = 0.2242

A3 = 0.7993

Z4 = A1\*W21 + A22\*W22 + A3\*W23 = 1.6191

y = 0.8347

E = 0.003587