Problem 1

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$g(z) = \frac{1}{1+e^{-z}}$

$\delta = (y-o)o(1-o)$

$w_{ij}^{(l)}{}_{(new)} = w_{ij}^{(l)}{}_{(old)} + \alpha \delta a_i^{(l-1)}$

$\alpha = 0.1$

## Back propagation

$a_1^{(1)} = g[0.8(-1) + 0.5(1) + 0.4(1)]$
$= g[-0.8 + 0.5 + 0.4]$
$= g[0.1]$
$= 0.52$

$a_2^{(1)} = g[-0.1(-1) + 0.9(1) + 1.0(1)]$
$g[0.1 + 0.9 + 1.0]$
$g[2.0]$
$= 0.88$

$a_1^{(2)} = g[0.3(1) + 1.2(0.52) + 1.1(0.88)]$
$= g[0.3 + 0.62 + 0.97]$
$= g[1.89]$
$= 0.87$ = Output O

$\delta = (O - 0.87)\,0.87\,(1-0.87)$
$= (-0.87)(0.87)(0.13)$
$= -0.10$

$\delta_1^{(1)} = [(-1.2)(-0.1)](0.52)[1-0.52]$
$= (0.12)(0.52)(0.48)$
$= 0.03$

$\delta_2^{(1)} = [(1.1)(-0.1)](0.88)[1-0.88]$
$= (0.11)(0.88)(0.12)$
$= 0.01$

$w_{10}^{(2)} = (0.3) + (0.1)(-0.10)(-1)$
$= 0.3 - 0.01$
$= 0.29$

$w_{11}^{(2)} = (-1.2) + (0.1)(-0.10)(0.52)$
$= (-1.2) - 0.01$
$= -1.21$

$w_{12}^{(2)} = (1.1) + (0.1)(-0.10)(0.88)$
$= (1.1) - 0.01$
$= 1.09$

$w_{10}^{(1)} = (0.8) + 0.1(0.03)(1)$
$= 0.8 + 0.0$
$= 0.8$

$w_{11}^{(1)} = 0.5 + 0.1(0.03)(1)$
$= 0.5 + 0.0$
$= 0.5$

$w_{12}^{(1)} = 0.4 + 0.1(0.03)(1)$
$= 0.4 + 0.0$
$= 0.4$

$w_{20}^{(1)} = -0.1 + 0.1(0.01)(1)$
$= -0.1 + 0.0$
$= -0.1$

$w_{21}^{(1)} = 0.9 + 0.1(0.01)(1)$
$= 0.9 + 0.0$
$= 0.9$

$w_{22}^{(1)} = 1.0 + 0.1(0.01)(1)$
$= 1.0 + 0.0$
$= 1.0$

Back prop