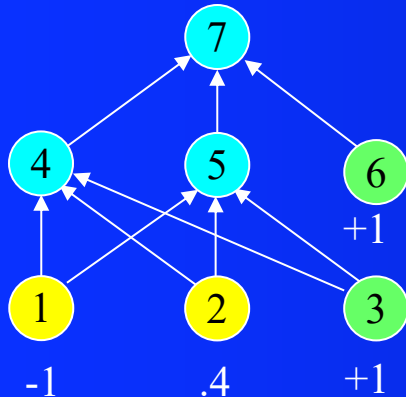# Backprop Homework

1. For your homework, update the weights for a second pattern -1 .4 -> .2. Continue using the updated weights shown on the previous slide. Show your work like we did on the previous slide.

2. Then go to the link below: Neural Network Playground using the *tensorflow* tool and play around with the BP simulation. Try different training sets, layers, inputs, etc. and get a feel for what the nodes are doing. You do not have to hand anything in for this part.

● http://playground.tensorflow.org/

Backpropagation Homework Solution

$$Z_j = f(net_j) = \frac{1}{1 + e^{-net_j}}$$

$$f'(net_j) = Z_j(1 - Z_j)$$

$net_4 = -1 * .4896 + .4 * .4931 + 1 * .4885 = .196$
$net_5 = -1 * .4896 + .4 * .4931 + 1 * .4885 = .196$
$z_4 = 1/(1 + e^{-.196}) = .549$
$z_5 = . 549$
$net_7 = . 549 * .3964 + . 549 * .3964 + 1 * .3667 = .802$
$z_7 = 1/(1 + e^{-.802}) = .690$
$\delta_7 = (.2 - .690) * .690 * (1 - .690) = -.105$
$\delta_4 = (-.105 * .3964) * .549 * (1 - .549) = -.0103$
$\delta_5 = -.0103$

$w_{14} = .4896 + (1 * -.0103 * -1) = .4999$
$w_{15} = .4999$
$w_{24} = .4931 + (1 * -.0103 * .4) = . 4890$
$w_{25} = .4890$
$w_{34} = .4885 + (1 * -.0103 * 1) = .4782$
$w_{35} = .4782$
$w_{47} = .3964 + (1 * -.105 * .548) = .3388$
$w_{57} = .3388$
$w_{67} = .3667 + (1 * -.105 * 1) = .2619$

$$\Delta w_{ij} = C \delta_j Z_i$$

$$\delta_j = (T_j - Z_j) f'(net_j) \qquad \text{[Output Node]}$$

$$\delta_j = \sum_k (\delta_k w_{jk}) f'(net_j) \qquad \text{[Hidden Node]}$$

Note that if two hidden nodes have the exact same input and
output weights then those weights will be updated the same throughout training