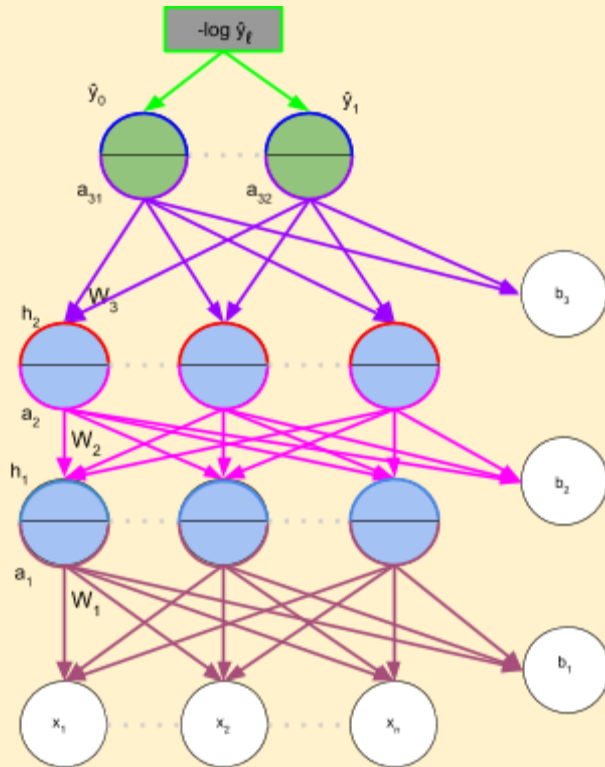


Understanding the dimensions of gradients

What are we interested in?

1. Consider the backpropagation illustration from the previous section



2. What we are interested in is $\frac{\partial L(\theta)}{\partial a_{Li}} = \frac{\partial(-\log \hat{y}_l)}{\partial a_{Li}}$ (where true output $y = 1$, L = Layer number, l is the index of the correct class-label for the given input, and i is the neuron number)
3. We know that $\frac{\partial L(\theta)}{\partial a_{Li}}$ is dependent on a_{31} and a_{32}
4. Therefore, the derivative at the output layer

$$\nabla_{a_3} L(\theta) = \begin{bmatrix} \frac{\partial L}{\partial a_{31}} \\ \frac{\partial L}{\partial a_{32}} \end{bmatrix}$$

5. In the above gradient, $L = 3$ and $i \in \{1, 2\}$
6. Henceforth, we can use these notations in place of numbers to simplify gradient calculation for all possible gradients.