

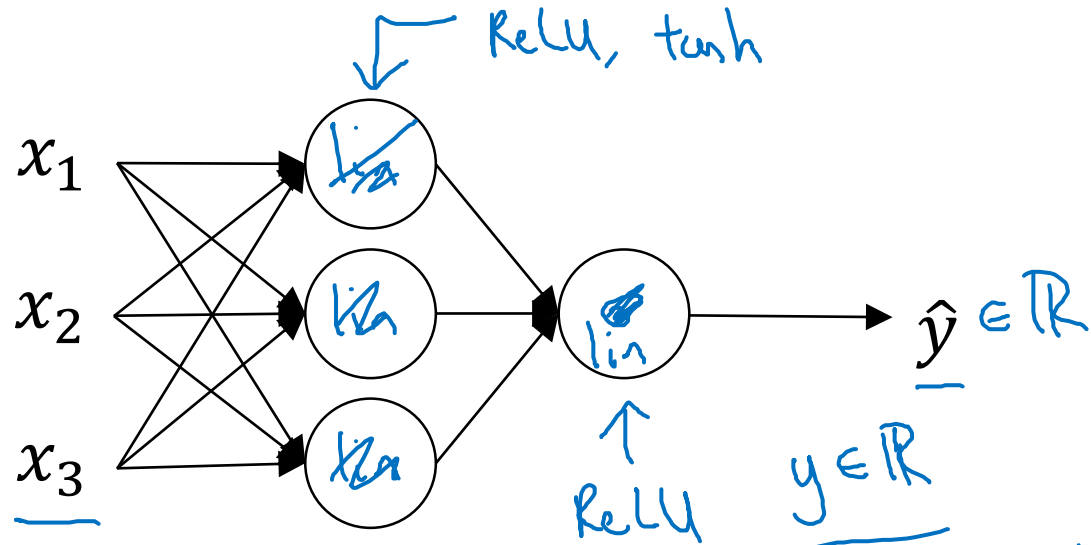


deeplearning.ai

One hidden layer Neural Network

Why do you
need non-linear
activation functions?

Activation function



Given x :

$$\begin{aligned} \rightarrow z^{[1]} &= W^{[1]}x + b^{[1]} \\ \rightarrow a^{[1]} &= \cancel{g^{[1]}(z^{[1]})} z^{[1]} \\ \rightarrow z^{[2]} &= W^{[2]}a^{[1]} + b^{[2]} \\ \rightarrow a^{[2]} &= \cancel{g^{[2]}(z^{[2]})} z^{[2]} \end{aligned}$$

$g(z) = z$
"linear activation function"

$$\begin{aligned} a^{[1]} = z^{[1]} &= W^{[1]}x + b^{[1]} \\ a^{[2]} = z^{[2]} &= W^{[2]}a^{[1]} + b^{[2]} \end{aligned}$$

$$a^{[2]} = W^{[2]} \left(W^{[1]}x + b^{[1]} \right) + b^{[2]}$$

$$\begin{aligned} &= \underbrace{\left(W^{[2]} W^{[1]} \right)}_{w'} x + \underbrace{\left(W^{[2]} b^{[1]} + b^{[2]} \right)}_{b'} \\ &= \underline{w'x + b'} \end{aligned}$$

$$g(z) = z$$