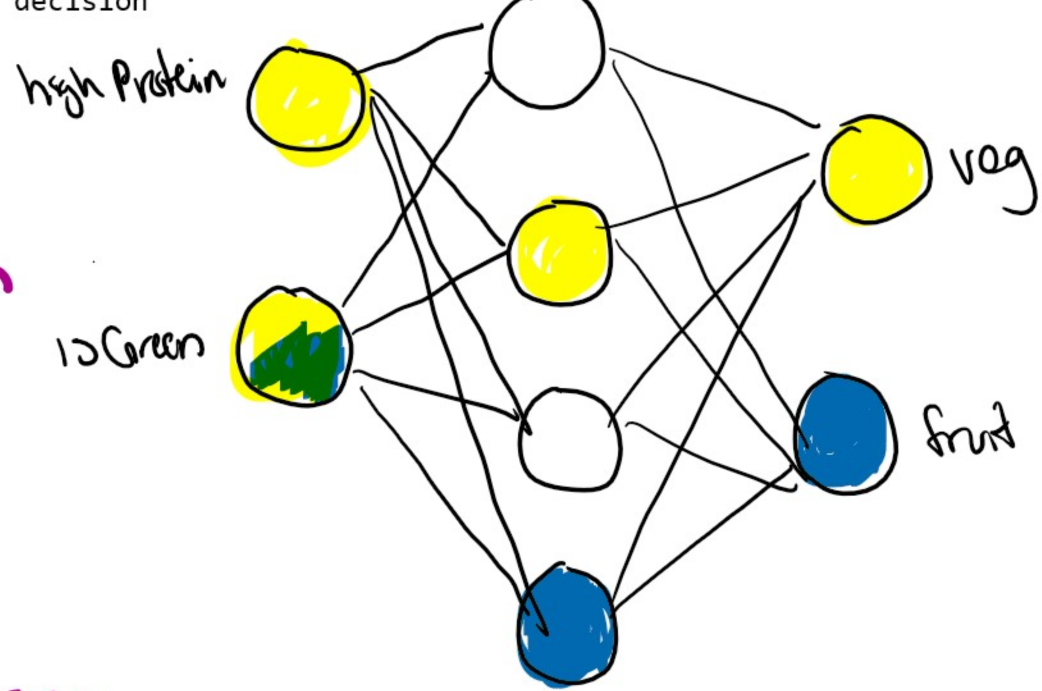
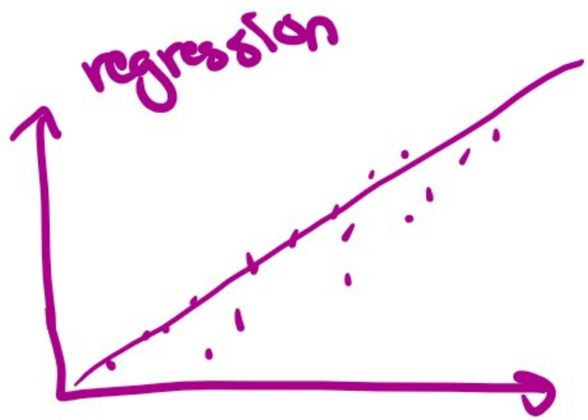
classifiers

Thursday, December 1, 2022 6:50 PM

name	color	highProtein	type
kale	green	yes	vegetable
apple	green	no	fruit
carrot	orange	no	vegetable
sweet potato	orange	yes	vegetable

Another way to construct a predictor: "light up" some circles if the correct combo of inputs is lit up.
Here, the middle column represents all possible combos. We can then use the middle column to make a classification decision

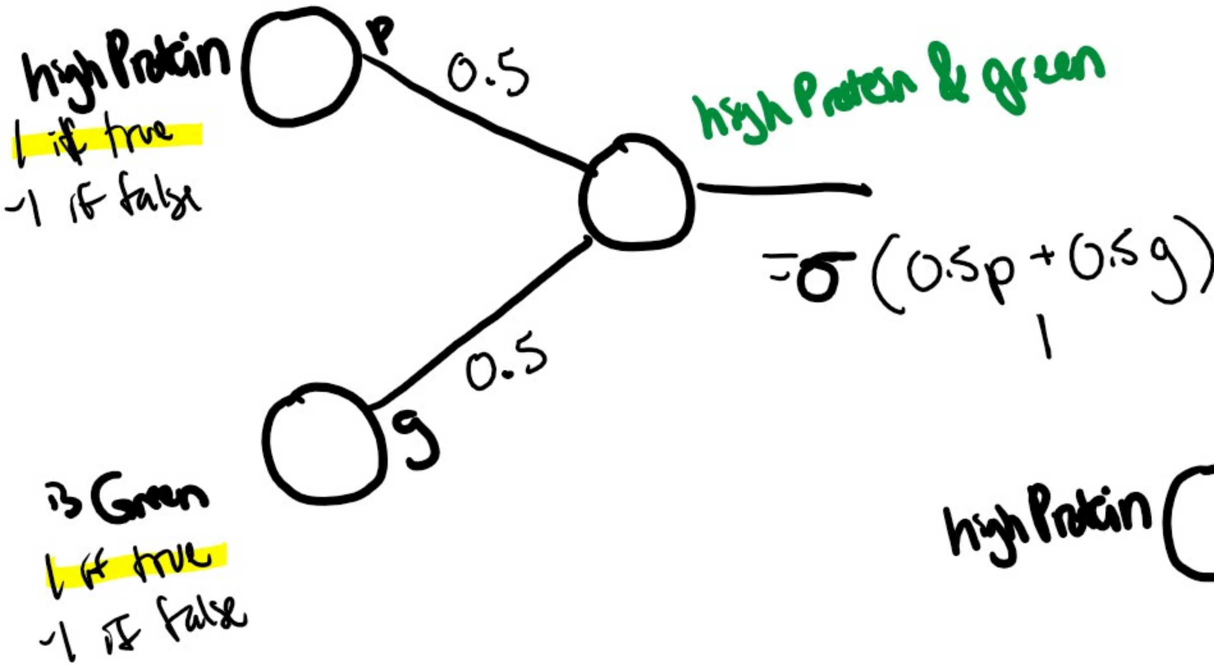


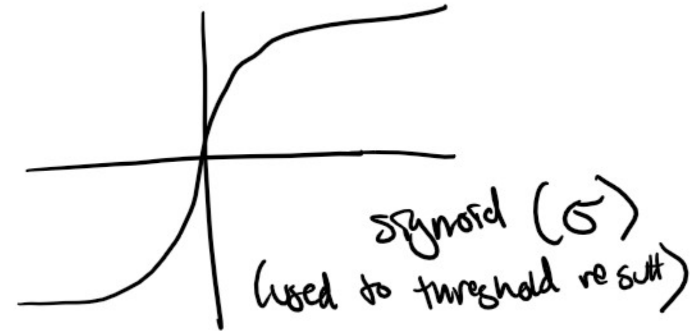


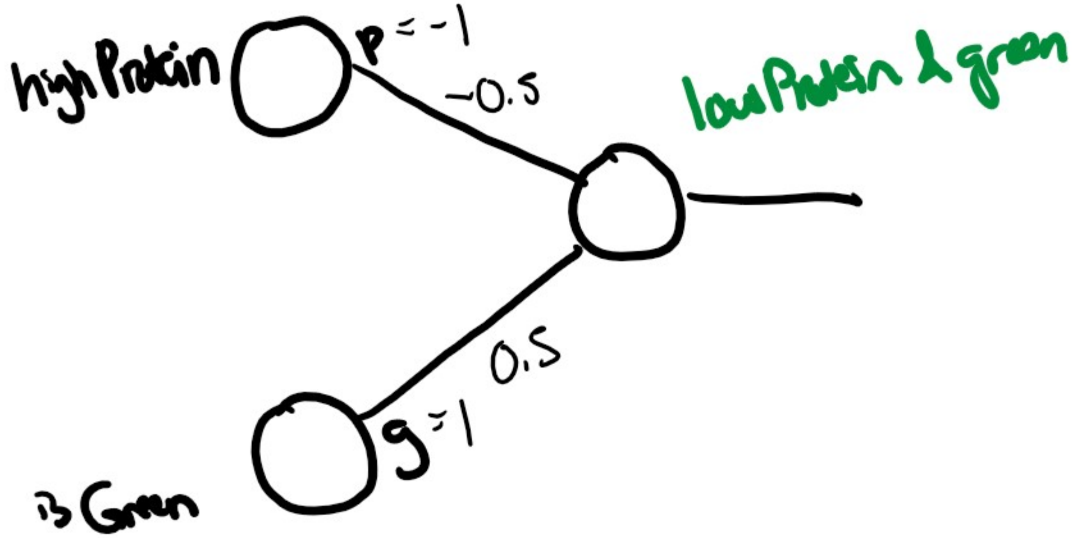
Decision trees essentially build a mathematical function from a set of input data to predict classification of future data
You may have seen a similar concept in science class, where you found a regression (line of best fit) from data points in an experiment

neurons

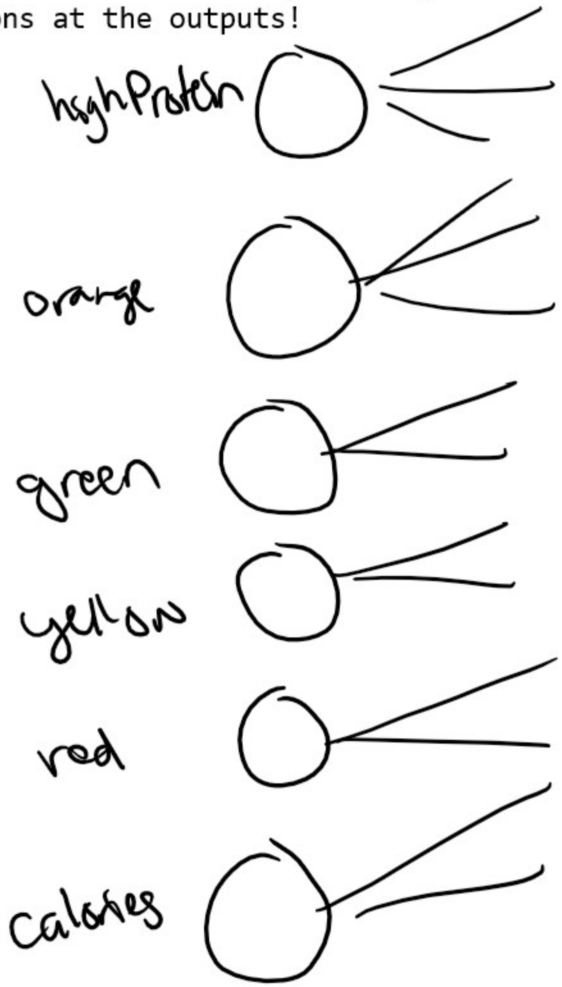
Friday, December 2, 2022 1:06 PM

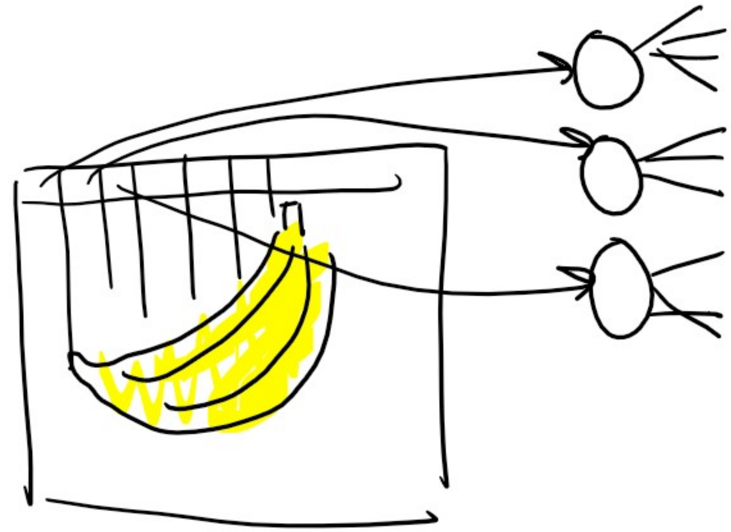






In real life: we do not assign a meaning to the inner neurons, because there may be many different inputs (imagine the below categories, or even pixels in an image). Even if we don't assign meaning to the inner neurons, we can have a computer algorithm settle on correct weights for the edges to come up with accurate predictions at the outputs!

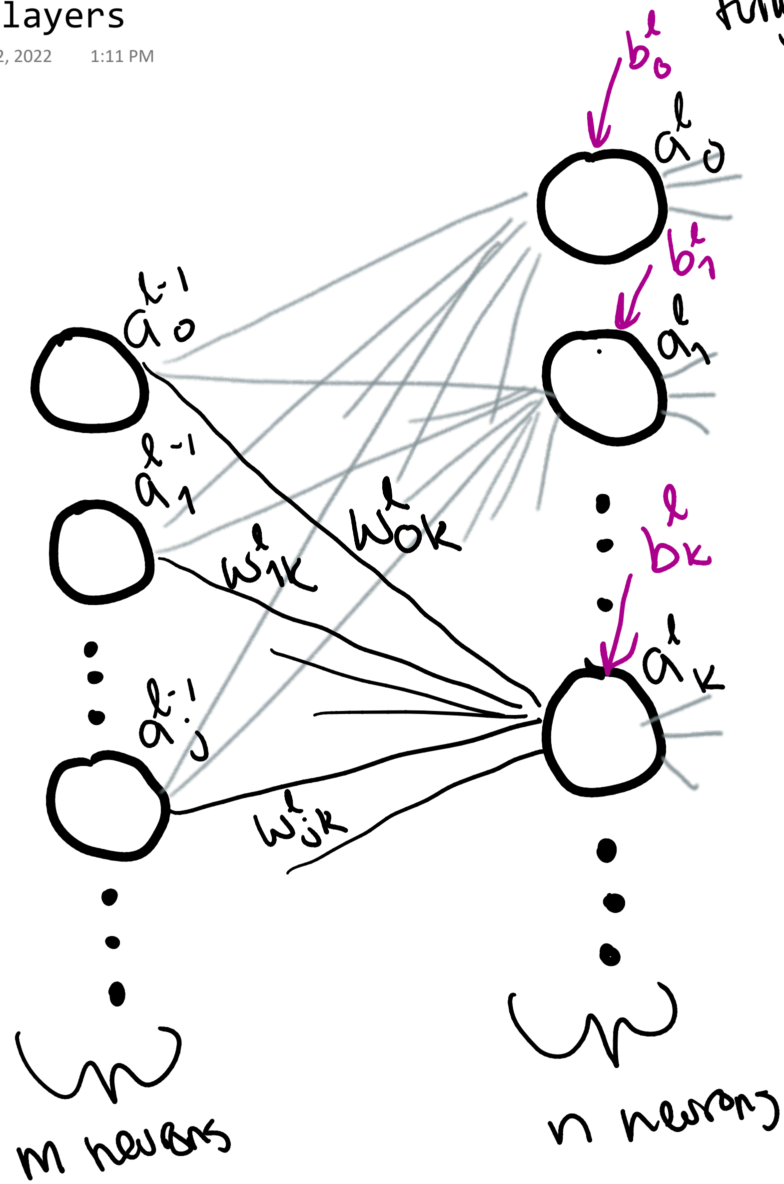




Neuron layers

Friday, December 2, 2022 1:11 PM

fully connected



$$W = \begin{bmatrix} w_{00} & w_{01} & \cdots & w_{0n} \\ w_{10} & & & \vdots \\ w_{20} & & & \vdots \\ \vdots & & & \vdots \\ w_{m0} & \cdots & \cdots & w_{mn} \end{bmatrix}$$

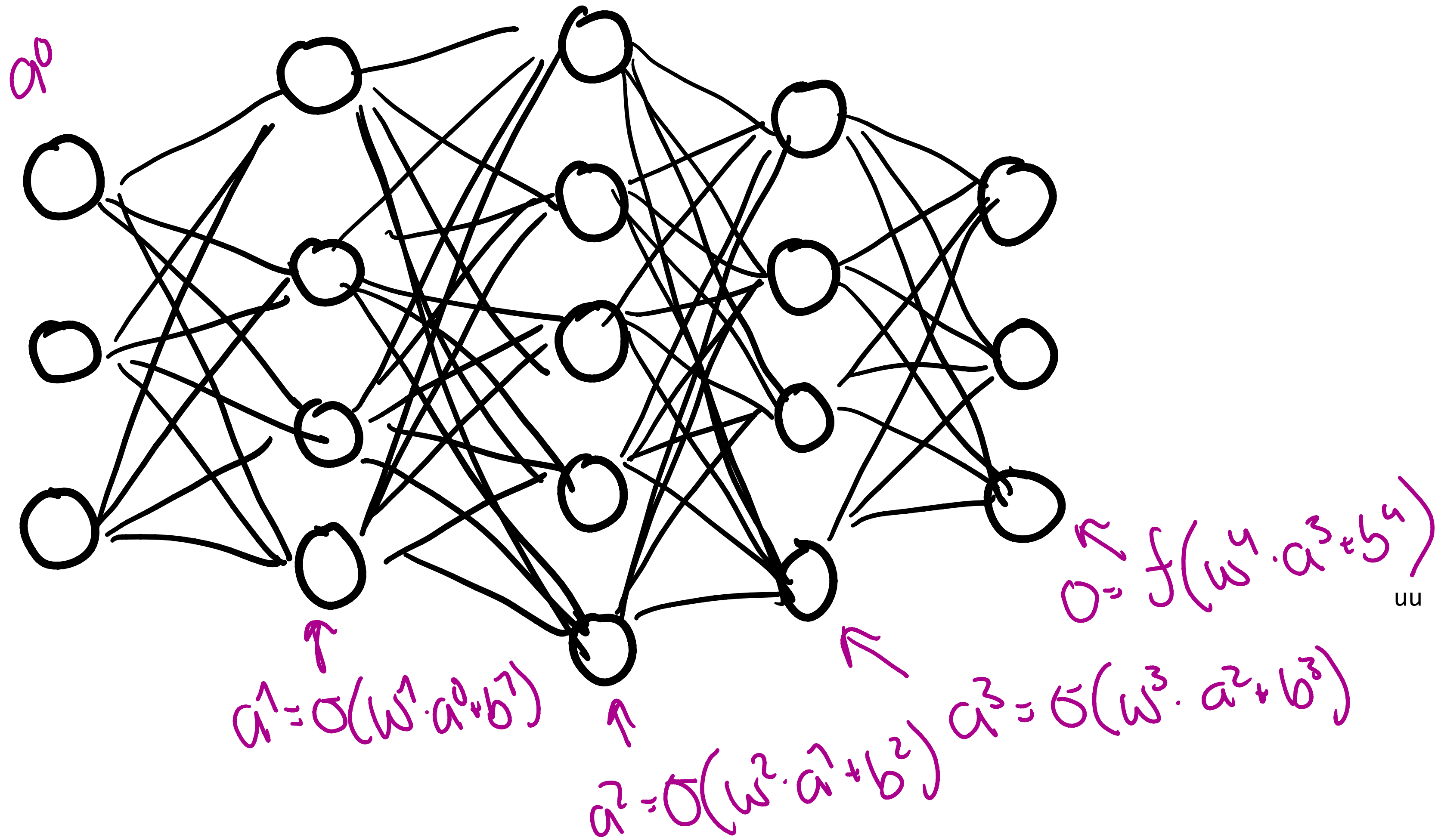
$$a_k^l = \sigma\left(\sum w_{ik}^l \cdot a_i^{l-1} + b_k^l \right)$$

↓ matrix notation

$$a^l = \sigma\left(W^l \cdot a^{l-1} + b^l \right)$$

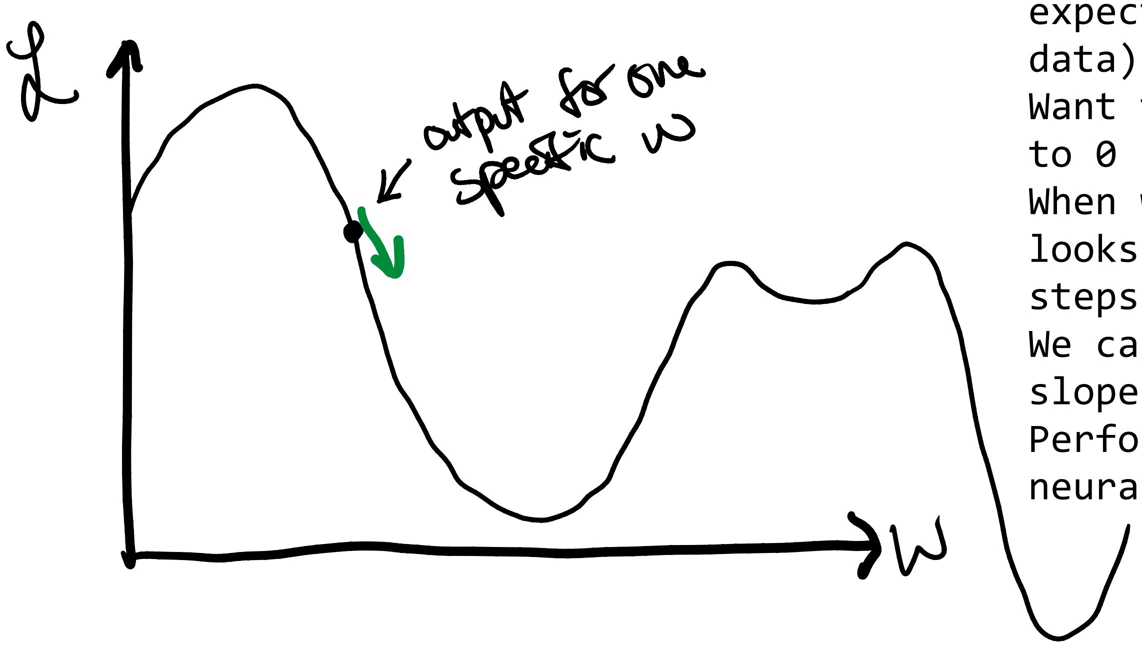
Neural net

Friday, December 2, 2022 1:14 PM



Gradient descent/backpropagation

Friday, December 2, 2022 1:16 PM



L is the loss function (error between expected/actual output of the training data)
Want to find weights that get it as close to 0 as possible
When we don't know what the global data looks like, we do this in small localized steps by following the slope
We can write down formulas for these slopes for a neural net
Performing such a gradient descent for a neural net is called "backpropagation"