Implementing a Convolutional Neural Network for Malaria diagnosis

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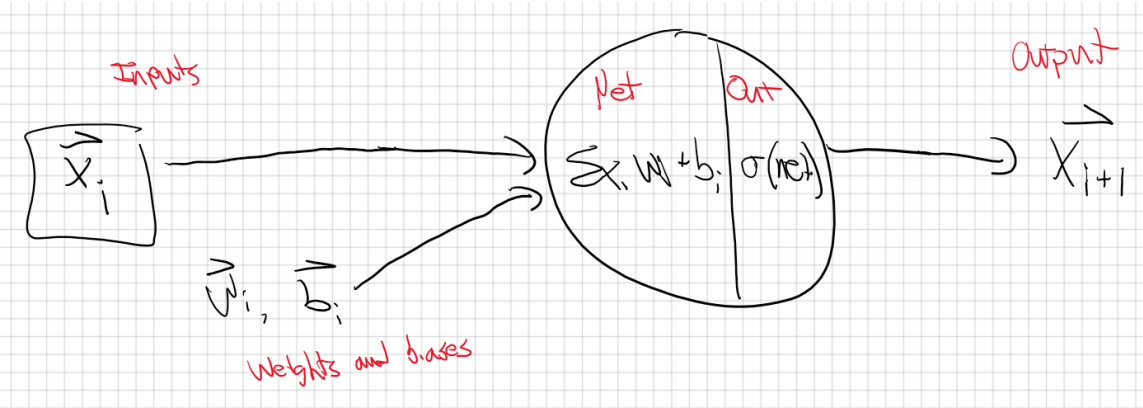
First Submission: December 2021

1 Topic

2 Personal Engagement

3 Background



This diagram shows the basic form of the perceptron, the building block of a neural network. It takes an input vector, transforms it by a set of random weights, and then adds random biases. This linear combination $\Sigma x_i w_i + b$ is then processed by an activation function (usually the sigmoid function $\sigma(x) = \frac{1}{1+e^{-x}}$). This is then taken as the output of the perceptron which can be fed as the input of one or more new perceptrons, each with their own set of random weights and biases. This is the feed-forward processing phase. Because all of the weights and biases are random in

this first phase, the final output of the model is nonsense.

In order to tune the weights and biases, the backpropgagation algorithm is used. We introduce an error function $E = \frac{1}{2}(\vec{y} - out)^2$ where $\vec{y}$ is the known correct output of the model. "Solving" the model corresponds to minimising this error function:

4 Solution

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} * \begin{bmatrix} 1 & 1 \\ -1 & -1 \end{bmatrix} \rightarrow \begin{bmatrix} 1 & 2 & 4 & 5 \\ 2 & 3 & 5 & 6 \\ 4 & 5 & 7 & 8 \\ 5 & 6 & 8 & 9 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 1 \\ -1 \\ -1 \end{bmatrix} = \begin{bmatrix} -6 \\ -6 \\ -6 \\ -6 \end{bmatrix} \rightarrow \begin{bmatrix} -6 & -6 \\ -6 & -6 \end{bmatrix}$$