Multilayer Perceptron Summary and Implementation

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I. Introduction

A perceptron is a simple neuron which computes a value and thresholds it through an activation function. This neuron has the ability to learn from any given input and it's expected output using a simple iterative process of training. This training process alters the coefficients of a weighed symbolic vector, which weights are used to compute a desired output and the values of the vector variables are the given inputs. This approach came from mathematical interpretation a brain cell's behavior, and its *tout seule* implementation is limited to linearly separable problems.

II. Artificial Neural Network and Multilayer Perceptron

An artificial neural network, ANN, is an elements net. Those elements (neurons) which are connected one to each other. Those nodes are organized in layers. There are three main types of layers:

- Input layer: This layer is the one that receives the input data.
- Hidden layer: The output of the neurons in this layer is not visible.
- Output layer: This layer outputs the final values.

A **Multilayer Perceptron** MLP is a static artificial neural network architecture where each node in a layer is connected to every node in the next layer.
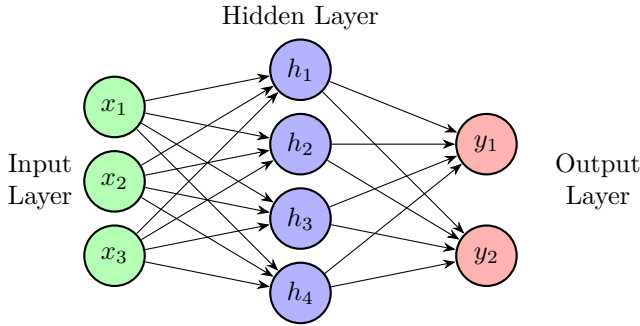
III. Backpropagation Algorithm

Backpropagation is an algorithm used to train an ANN, this algorithm is a generalization of the gradient descent algorithm following the steps below:

1. Initialize the weights of the network at small random values.
2. Forward computation $\forall i$-th training pair (x_i, o_i)
   - $\forall n$-th neuron and each k-th neuron input, compute the input and output
   $$v_{nk};\ o_{nk} = f(v_{nk})$$

3. Backward computation start computing from output layer
   - $\forall n$-th neuron and each k-th neuron input, update weights
   $$w_{nk} = w_{nk} + \Delta w_{nk}$$

References

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