BEYOND BACK PROPAGATION

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ABSTRACT

The back propagation algorithm was a great invention for the field of artificial intelligence. With it, it became possible to effectively train neural networks and for the field of deep learning to be conceivable. However it remains a highly complex process that consumes a large amount of processing power. There is need to come up with suitable algorithms that perform equally well or better than the back propagation algorithm. This paper presents just one alternative.

SPECIFICATION

It is clear that in a classification exercise, with a vanilla neural network, that all the features of the item to be classified produce an effect on the untrained network. It is just that that effect may not be the one we would like. That effect is namely the sequence of firing of the individual neurons in the network. During a classification exercise we would like all members of the same class to be identified correctly. This means placing a constraint on what input causes what neuron to fire. In back propagation with gradient decent, the weights of the individual neurons are adjusted .The new algorithm, will take the following form.
When classifying a cat in a computer vision classification exercise, we would first train the network to identify one cat successfully. This would be done using the normal back propagation algorithm. Once identified we record the sequence of the firings of the neurons in a matrix. Each value in the matrix would represent a neurons activity. If it fired, then a 1 is placed in the relevant field. If it did not then a 0 is placed instead.

Next we run a series of classification trials. Where we show the network different pictures of cats. Note that we will not be updating the weights of the neurons this time. Rather what we intend to do is record the sequence of firing of the network for each example into a matrix.

Once we have a large number of such matrices we create a mapping between them. This mapping will be the basis of the following. The mapping should be able to transform all the matrices found in the second part of the experiment into the matrix of the cat that the network was trained to correctly classify. With this mapping/function we are now able to classify correctly cats that were not a part of the exercise. This would take the form of running through the classification exercise, creating a matrix with the firings of the neurons , then we transform that matrix with the mapping/function we created and if it matches with the matrix of the first cat then we classify the object being classified as a cat.

Note that the success of the mapping will be judged by how objectively close to the matrix of the original cat the new objects matrix is after the transformation.