ARTIFICIAL NEURAL NETWORKS

Multilayer Perceptron

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Abstract — Content of this document describes simple and typical multilayer perceptron. Guides from neuron cell to full neural network mathematical model and shows implementation example with both network modeling and training.

Contents

1   Introduction

Many tasks involving mathematical models and equations cannot be solve by algorithm because of its complexity or limitations in computer calculations. Also such problems exist which are too difficult to be describe by math itself. Sometimes it is even not known if mathematical model exist.

Some of this tasks are trivial for humans and by simulating how the human brain works it is possible to create algorithm that is able to *learn* how to solve a problem. *Learning* mean that mathematical model modify itself in *learning process* to meet certain conditions defined by *training set*. What is *training set* and how *learning process* is done will be covered in next chapters.

Now it is necessary to point that the way brain works is not fully known. But to create simple model our today knowledge is sufficient enough. Structure and mechanism of single neuron is know so based on that mathematical model can be create. Such model is just a generalization of something very complex. Yet good enough to reach our goals and break the bounders of what computer is capable of.

Algorithms uses neural network approach are relativity easy to understand and write in compare to what they can achieve. They are also quite fast. Because of that they are very popular in the filed of machines learning and problem solving.

Popularity of this method has led to creation of many variants and approaches in neural networks field. There exist supervised and unsupervised learning methods, linear and recursive networks. Each approach can be implemented in many different ways.

In this paper the simplest approach with basic *Error Back Propagation* algorithm will be discussed. First the structure and function of single human neuron will be briefly discussed to show how mathematical model is created. After that will be shown how single neurons can be organized together in networks and then in layers. Finally the simplest model of *Multilayer Perceptron* will be discuss along with *Error Back Propagation* learning algorithm. At the end example implementation in *C#* will be presented both with hints, observations and conclusion.

2   Neuron

2.1   Cell

2.2   Model