The Construction of a Boolean Competitive Neural Network Using Ideas from Immunology

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Abstract

The immune system is capable of recognizing and responding to micro-cells and molecules that can not be perceived by our sensory mechanisms that send stimuli to the brain, performing an accessory role for nervous cognition. A great advantage of the immune system over the nervous system, is the existence of several well-established theories that reasonably explain immune functions, allowing us to develop more accurate models. In this work, we show that some immune theories can be successfully applied to the development of neural network architectures. A novel neural network is presented, with the main features of competitive learning, automatic generation of the network structure and binary representation of the connection strengths (weights). The proposed network was applied to two simple real-world problems and a binary character recognition task. The results show that the network is a promising tool for solving problems that are inherently binary, and also that the immune system provides a new paradigm to search for neural network architectures.

Keywords: Immune System, Clonal Selection, Competitive Neural Networks, Pattern Recognition.