Training Feedforward Multilayer Interval Artificial Neural Networks

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Ever since the mid-1980's, artificial neural networks have been applied to solve various application problems such as pattern recognition, classification, control, and decision making with imprecise input data. An artificial neural network (ANN) is an information-processing paradigm inspired by the way of human brain processes information. It is composed of a large number of highly interconnected processing elements that are analogous to neurons and are tied together with weighted connections that are analogous to synapses. Training ANNs is similar to learning in biological systems involves adjustments to the synaptic connections that exist between the neurons. Through exposure to a trusted set of input/output data, an ANN adjusts its connection weights (synapses). These connection weights store the knowledge necessary to solve application problems. Therefore, training ANNs is the most critical part of their applications.

In this presentation, we specifically report our work on applying interval methods in supervised training of multilayer feedforward ANNs. We will review the related basic concepts of artificial neural networks at the beginning. Through analyzing the mathematical model of training multilayer feedforward ANNs, we categorize the training problem into two types. Since data sets that used to train a neural network are usually imprecise, they should be better represented with intervals rather than real numbers. Therefore, we have interval valued neural networks. Finally, we will report our result that training a interval weighted multilayer feedforward artificial neural network can be reliably solved by currently available interval algorithms and software packages.