Agent Based Solution for

Artificial Neural Network Optimisation

P.S.M. Dharmakeerthi

119155J

Faculty of Information Technology

University of Moratuwa

January 2014

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Dissertation submitted to the Faculty of Information Technology, University of Moratuwa, Sri Lanka for the partial fulfilment of the requirements of the Degree of MSc in Artificial Intelligence

January 2014

Declaration

I declare that this dissertation does not incorporate, without acknowledgment, any material previously submitted for a Degree or a Diploma in any University and to the best of my knowledge and belief, it does not contain any material previously published or written by another person or myself except where due reference is made in the text. I also hereby give consent for my dissertation, if accepted, to be made available for photocopying and for interlibrary loans, and for the title and summary to be made available to outside organizations.

Name of Student: P.S.M. Dharmakeerthi Signature of Student

Date:

Supervised by

Name of Supervisor: Prof. Asoka S. Karunananda Signature of Supervisor

Date:

Dedication

This thesis is dedicated to

my mother , father

and my beloved wife Ranmalee

for their sacrifice and unwavering confidence.

Standing by me burning the midnight oil many times.

Acknowledgement

This thesis is a result of cumbersome work of much dedication and commitment where I was assisted, accompanied and guided by several good hearted people. I would like to take this opportunity to extend my sincere thanks and appreciation to my supervisor Prof. Asoka S. Karunananda for all the support and for being a pillar of strength throughout this research project. I am grateful to all my lecturers and teachers for sharing their invaluable knowledge, experience and the words of advises which no doubt will improve the quality of my life. The support extended by the staff of the Faculty of Information Technology, University of Moratuwa is highly appreciated. Special word of thanks to my team mates and the management of Cambio Healthcare Systems Pvt Ltd, for all the support and understanding. I also express my sincere thanks to my friends in MSc in AI batch. The unlimited support extended by my friend Woshan Srimal is remembered with much gratitude. Special thanks to my wife Ranmalee, our parents and nangi for their understanding, endless patience, encouragement, unconditional love and support. I offer my heartfelt regards to one and all who have supported me in any aspect for the successful completion of the project.

Abstract

Artificial neural networks are highly used in the areas of pattern recognition, feature extraction, function approximation, scientific classification, control systems, noise reduction and prediction. Feed-forward and back-propagation neural networks are the most commonly used artificial neural networks. Many researchers face difficulties when selecting a proper ANN architecture and training parameters. The manual ANN training process is not the best practical solution because it is a much time consuming task. Also most of the people conduct the manual process in an ad-hoc manner without having a proper knowledge about artificial neural networks. At the end of this research project a multi-agent system: MASAnnt (Multi Agent System for Artificial Neural Network Training) was developed to automate the neural network training for feed-forward and back-propagation neural network. Interaction among agents enables emergence of quality training sessions which cannot be archived by an ad-hoc training sessions conducted by humans. It is straight forward to recognize training parameters such as number of hidden layers, number of neurons in each hidden layer, momentum, learning rate, Emax (Error goal) and activate function of an ANN as a set of agents. Inherent features of agents including coordination, communication and negotiation are able to mimic the ANN optimizing and training process by manipulating theses parameters. Our experiments show that the more rational results can be obtained from the system with both simple data sets like XOR as well as with real life data sets. We can conclude that the neural network optimization and training tasks are successfully accomplished by the agent based approach by analysing the results of the evaluation.

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