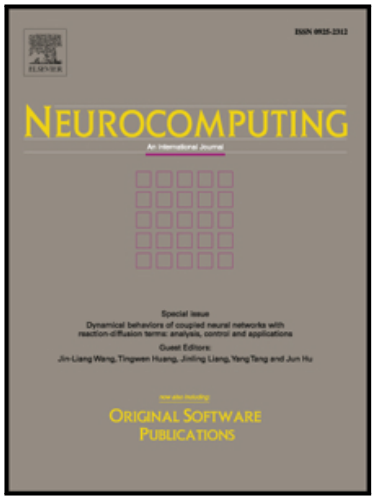
Communicated by Dr. G.-B. Huang

Accepted Manuscript



ELM based architecture for general purpose automatic weight and structure learning

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PII: S0925-2312(17)31539-4
DOI: 10.1016/j.neucom.2017.09.026
Reference: NEUCOM 18902

To appear in: *Neurocomputing*

Received date: 18 April 2017
Revised date: 20 August 2017
Accepted date: 8 September 2017

Please cite this article as: Douglas Coimbra de Andrade, Luís Gonzaga Trabasso, ELM based architecture for general purpose automatic weight and structure learning, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.09.026

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ELM based architecture for general purpose automatic weight and structure learning

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Abstract

Currently, neural networks deliver state of the art performance on multiple machine learning tasks, mainly because of their ability to learn features. However, the architecture of the neural network still requires problem-specific tuning and the long training times and hardware requirements remain an issue. In this work, the Multi-Scale Auto-Tuned Extreme Learning Machine (MSATELM) architecture is proposed, which does not require any manual feature crafting or architecture tuning and automatically learns structure and weights using an auto-tuned ELM as building block. It learns a simple model that achieves the required accuracy. The GPU implementation in OpenCL allows handling any number of samples while still delivering portable code and high performance. Results on MNIST, CIFAR-10 and UCI datasets demonstrate that this approach provides competitive results even though no problem-specific tuning is used.

Keywords: neural networks, machine learning, extreme learning machine

List of abbreviations:

- CNN - Convolutional Neural Network
- CPU - Central Processing Unit
- CUDA - Compute Unified Device Architecture, NVidia's GPU programming language
- DBN - Deep Belief Network
- DNN - Deep Neural Network
- DrELM - Deep Representation Learning via Extreme Learning Machine
- DSP - digital signal processor
- ELL - Ellpack-Itpack generalized diagonal format for storing sparse matrices

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