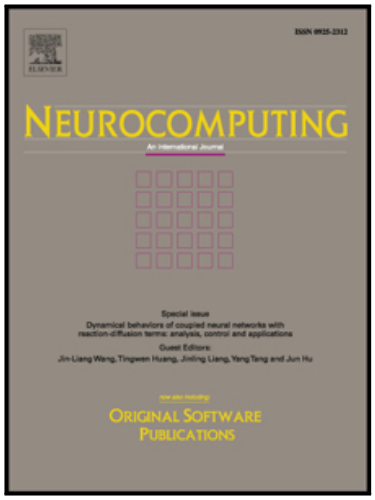
Communicated by Dr. G.-B. Huang

Accepted Manuscript



DMP-ELMs: Data and Model Parallel Extreme Learning Machines for Large-Scale Learning Tasks

Yuewei Ming, En Zhu, Mao Wang, Yongkai Ye, Xinwang Liu, Jianping Yin

PII: S0925-2312(18)31024-5
DOI: https://doi.org/10.1016/j.neucom.2018.08.062
Reference: NEUCOM 19910

To appear in: *Neurocomputing*

Received date: 4 February 2018
Revised date: 22 July 2018
Accepted date: 23 August 2018

Please cite this article as: Yuewei Ming, En Zhu, Mao Wang, Yongkai Ye, Xinwang Liu, Jianping Yin, DMP-ELMs: Data and Model Parallel Extreme Learning Machines for Large-Scale Learning Tasks, *Neurocomputing* (2018), doi: https://doi.org/10.1016/j.neucom.2018.08.062

DMP-ELMs: Data and Model Parallel Extreme Learning Machines for Large-Scale Learning Tasks

Yuewei Ming[a], En Zhu[a,*], Mao Wang[a], Yongkai Ye[a], Xinwang Liu[a], Jianping Yin[b,*]

[a] *College of Computer, National University of Defense Technology, Changsha 410073, China*
[b] *Dongguan University of Technology, Dongguan 523808, China*

Abstract

As machine learning applications embrace larger data size and model complexity, practitioners turn to distributed clusters to satisfy the increased computational and memory demands. Recently, several parallel variants of extreme learning machine (ELM) have been proposed, some of which are based on clusters. However, the limitation of computation and memory in these variants is still not well addressed when both the data and model are very large. Our goal is to build scalable ELMs with a large number of samples and hidden neurons, parallel running on clusters without computational and memory bottlenecks while having the same output results with the sequential ELM. In this paper, we propose two parallel variants of ELM, referred to as local data and model parallel ELM (LDMP-ELM) and global data and model parallel ELM (GDMP-ELM). Both variants are implemented on clusters with Message Passing Interface (MPI) environment. They both make a tradeoff between efficiency and scalability and have complementary advantages. Collectively, these two variants are called as data and model parallel ELMs (DMP-ELMs). The advantages of DMP-ELMs over existing variants are highlighted as follows: (1) They simultaneously utilize data and model parallel techniques to improve the parallelism of

*Corresponding author
Email address: enzhu@nudt.edu.cn (En Zhu), jpyin@dgut.edu.cn (Jianping Yin)