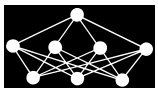

PREDICTING THE PERFORMANCE MEASURES OF A 2-DIMENSIONAL MESSAGE PASSING MULTIPROCESSOR ARCHITECTURE BY USING MACHINE LEARNING METHODS

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Abstract: 2-dimensional Simultaneous Optical Multiprocessor Exchange Bus (2D SOME-Bus) is a reliable, robust implementation of petaflops-performance computer architecture. In this paper, we develop models to predict the performance measures (i.e. average channel utilization, average channel waiting time, average network latency, average processor utilization and average input waiting time) of a message passing architecture interconnected by the 2D SOME-Bus by using Multilayer Feed-forward Artificial Neural Network (MFANN), Support Vector Regression (SVR) and Multiple Linear Regression (MLR). OPNET Modeler is used to simulate the message passing 2D SOME-Bus multiprocessor architecture and to create the training and testing datasets. Using 10-fold cross validation, the performance of the prediction models have been evaluated using several performance metrics. The results show that the SVR model using the radial basis function kernel (SVR-RBF) yields the lowest prediction error among all models.

Key words: *Support vector regression, neural networks, multiprocessors, message passing*

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1. Introduction

With high computing power of parallel computers, it is now possible to address many applications that were until recently beyond the capability of conventional computing techniques [15]. Message passing environments are considered the most popular programming methods for parallel computers. Their flexibility permits to parallelize all types of applications (client-server, data-parallel, embarked and real-time systems etc.). Message passing is easy to understand, portable, interoperable, and effective. The principle of message passing rests on tasks cooperation through

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