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FAST COMPUTATIONAL APPROACH TO THE LEVENBERG-MARQUARDT ALGORITHM FOR TRAINING FEEDFORWARD NEURAL NETWORKS

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Abstract

This paper presents a parallel approach to the Levenberg-Marquardt algorithm (LM). The use of the Levenberg-Marquardt algorithm to train neural networks is associated with significant computational complexity, and thus computation time. As a result, when the neural network has a big number of weights, the algorithm becomes practically ineffective. This article presents a new parallel approach to the computations in Levenberg-Marquardt neural network learning algorithm. The proposed solution is based on vector instructions to effectively reduce the high computational time of this algorithm. The new approach was tested on several examples involving the problems of classification and function approximation, and next it was compared with a classical computational method. The article presents in detail the idea of parallel neural network computations and shows the obtained acceleration for different problems.

Keywords: feed-forward neural network, neural network learning algorithm, Levenberg-Marquardt algorithm, QR decomposition, Givens rotation.

1 Introduction

Currently, artificial intelligence (AI) is widely used both in science research and in industry. Among the issues of artificial intelligence, neural networks (NN) deserve special attention. Continually many researchers publish a lot of scientific papers about artificial intelligence [1, 2], especially about neural networks e.g. [3, 4, 5, 6, 7, 8, 9, 10, 11]. There are more and more advanced AI solutions and methods that are willingly used in industry and various products. Important areas of neural networks applications are health care and

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