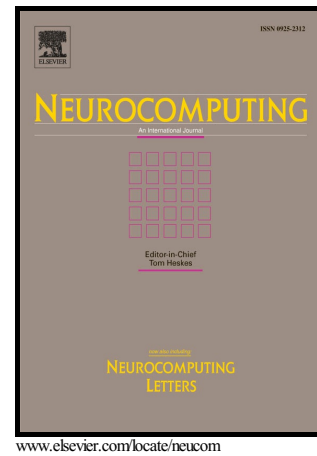


Author's Accepted Manuscript

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Lyes Saad Saoud, Reza Ghorbani, F. Rahmoune



PII: S0925-2312(16)31095-5
DOI: <http://dx.doi.org/10.1016/j.neucom.2016.09.060>
Reference: NEUCOM17589

To appear in: *Neurocomputing*

Received date: 13 March 2016
Revised date: 23 June 2016
Accepted date: 24 September 2016

Cite this article as: Lyes Saad Saoud, Reza Ghorbani and F. Rahmoune
Cognitive Quaternion Valued Neural Network and some applications
Neurocomputing, <http://dx.doi.org/10.1016/j.neucom.2016.09.060>

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Cognitive Quaternion Valued Neural Network and some applications

Lyes Saad Saoud ^a, Reza Ghorbani ^b, F. Rahmoune ^a

^aFaculty of sciences, University M'Hamed Bougara Boumerdès, 35000, Algeria

^bRenewable Energy Design Laboratory (REDLab), Department of Mechanical Engineering,
University of Hawaii at Manoa, Honolulu, HI, 96822, USA

Abstract

A Meta-cognitive Quaternion Valued Neural Network (Mc-QVNN) learning algorithm and its forecasting applications is proposed in this paper. The Mc-QVNN has two parts, the cognitive part that contains the QVNN and a meta-cognitive part, which self-regulates the learning algorithm. At each epoch, when the Mc-QVNN receives a new sample, the meta-cognitive part makes a decision about the manner, the time and the need to learn this sample or not. In this case, the algorithm deletes the unneeded samples and keeps just the necessary ones for learning. The meta-cognitive component makes the decision according to the quaternion magnitude and phases. Three forecasting problems, which are Mackey–Glass time series, Lorenz attractor and the real home's power in the city of Honolulu in Hawaii, USA, are taken to test the performance of the proposed algorithm. Comparison with other existing methods shows that the Mc-QVNN is promising for forecasting chaotic systems.

Keywords: Meta-cognitive, Quaternion-valued neural networks, forecasting, renewable energy.

1. Introduction

Nowadays, neural networks and fuzzy techniques have found a primordial place in literature [1-11]. The Quaternion-Valued Neural Networks (QVNNs), which are an extended form of

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