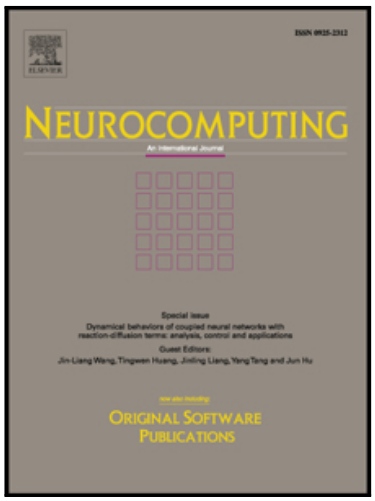

Financial Time Series Prediction Using $\ell_{2,1}$RF-ELM

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Financial Time Series Prediction Using $\ell_{2,1}$RF-ELM

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Abstract

Financial time series forecasting is a complicated task because the behaviour of investors can be influenced by lots of tiny and unpredictable factors. In this paper, in order to maximize the return of capital and manage liquidity risk effectively, an $\ell_{2,1}$-norm and Random Fourier Mapping based Extreme Learning Machine($\ell_{2,1}$ RF-ELM) is applied to the problem of financial time series prediction. The advantages of ELM in efficiency and generalization performance over traditional fuzzy neural network(FNN) algorithms have been demonstrated on a wide range of problems from different fields, thanks to the integration of $\ell_{2,1}$-norm, the $\ell_{2,1}$ RF-ELM is able to automatically prune the irrelevant and redundant hidden neurons to form a more discriminative and compact hidden layer. The performance of the $\ell_{2,1}$RF-ELM is compared with other hidden layer enforcement algorithms, two long-term time series data sets, including TianChi and BCS, are used for this comparison. The performance of the $\ell_{2,1}$RF-ELM was comparable to those of other widely used machine learning techniques like support vector machines (SVM), artificial neural networks (ANN) and other popular ELM method. The experiments demonstrate favorable prediction results of the $\ell_{2,1}$RF-ELM in terms of annualized return, prediction error and running time. In addition, we also find that the underlying rules of the correlation between cash inflow and outflow that can help us improve accuracy, which is valuable for financial institutions to predict the trend of liquidity.

Keywords: Extreme learning machine, Financial time series, Neural Network, $\ell_{2,1}$RF-ELM

1. Introduction

In recent years, the field of financial time series analysis has attracted substantial attention. Representative achievement is the 2003 Nobel price won by