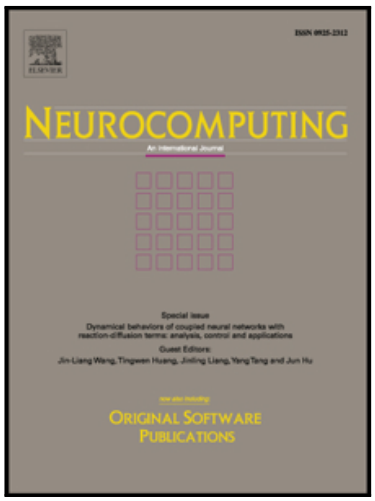

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Towards an optimal kernel extreme learning machine using a chaotic moth-flame optimization strategy with applications in medical diagnoses

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Abstract

This study proposes a novel learning scheme for the kernel extreme learning machine (*KELM*) based on the chaotic moth-flame optimization (*CMFO*) strategy. In the proposed scheme, *CMFO* simultaneously performs parameter optimization and feature selection. The proposed methodology is rigorously compared to several other competitive *KELM* models that are based on the original moth-flame optimization, particle swarm optimization, and genetic algorithms. The comparison is made using the medical diagnosis problems of Parkinson's disease and breast cancer. And the proposed method has successfully been applied to practical medical diagnosis cases. The experimental results demonstrate that, compared to the alternative methods, the proposed method offers significantly better classification performance and also obtains a smaller feature subset. Promisingly, the proposed *CMFOFS-KELM*, can serve as an effective and efficient computer aided tool for medical diagnosis in the field of medical decision making.

Keywords: Kernel extreme learning machine; Parameter optimization; Feature selection; Improved moth-flame optimization; Medical diagnosis

1 Introduction

As a new learning algorithm for single hidden layer feed-forward neural networks, the extreme learning machine (*ELM*) [1] has the ability to learn rapidly, has very few tuning parameters, and does not require the selection of input weights and hidden biases. Since its introduction, it has been used to address a variety of practical problems including cancer diagnosis [2], paraquat poisoning diagnosis [3], prediction of overweight status [4], face recognition [5], image quality