A multi hidden recurrent neural network with a modified grey wolf optimizer

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Abstract

Identifying university students’ weaknesses results in better learning and can function as an early warning system to enable students to improve. However, the satisfaction level of existing systems is not promising. New and dynamic hybrid systems are needed to imitate this mechanism. A hybrid system (a modified Recurrent Neural Network with an adapted Grey Wolf Optimizer) is used to forecast students’ outcomes. This proposed system would improve instruction by the faculty and enhance the students’ learning experiences. The results show that a modified recurrent neural network with an adapted Grey Wolf Optimizer has the best accuracy when compared with other models.

Introduction

In education management, student performance prediction and classification systems are important tools. They warn students who did not perform well or those with at risk performance and assist students in averting and overcoming most of the problems they face in meeting their objectives. Yet, there are challenges in gauging students’ performance, since academic performance depends on various elements, such as demographics, personalities, education background, psychological issues, academic progress and other environmental variables [1].

Statistical methods, data mining, and machine learning techniques are used for extracting useful information related to educational data. This is known as ‘educational data mining’ (EDM) [2]. EDM uses academic databases and constructs several techniques for identifying unique patterns [3, 4] to benefit academic planners in educational institutions by identifying ways to improve the process of decision-making.

Academic performance research studies mostly have been carried out using classification and prediction methods. The task of classification is regarded as a process of determining a model in which data are classified into categories [5]. Neural networks are part of machine learning and are regarded as one the best means of modeling classification problems that imitate human neural activity. The basic concept of neural networks was first proposed in 1943 [6]. It is worth mentioning that various classes of neural networks have been developed, such as feed-forward networks [7], radial basis function (RBF) networks [8], Kohonen self-organizing networks [9], spiking neural networks [10], and recurrent neural networks [11].