Chapter 11
A Comprehensive Study on Student Academic Performance Predictions Using Graph Neural Network

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ABSTRACT

Predicting student performance becomes tougher thanks to the big volume of information in educational databases. Currently, in many regions, the shortage of existing system to investigate and monitor the coded progress and performance isn't being addressed. First, the study on existing prediction methods remains insufficient to spot the foremost suitable methods for predicting the performance of scholars in many institutions. Second is because of the shortage of investigations on the factors affecting student achievements particularly courses within specified context. Therefore, a systematic literature review on predicting student performance by using data processing techniques is proposed to enhance student achievements. The objective of this work is to supply an outline on the info techniques to predict student performance. Previous studies have extensively reported on optimizing performance predictions to highlight risky students and promote the achievement of good students. There are also contributions that overlap with various research fields.

DOI: 10.4018/978-1-6684-6903-3.ch011

INTRODUCTION

Student performance is the most important indicator of educational progress in any country. Student performance at school is greatly influenced by gender, age, teachers, and student learning. Predicting student performance is of great interest to education. In other words, student achievement refers to the degree to which a student achieves both immediate and long-term learning goals (Yadav & Pal, 2012). Good academic performance is an integral part of a quality university based on rankings. As a result, if the institution has strong achievements and academic performance, their ranking will improve. From a student's perspective, academic excellence is one of the most important aspects valued by employers, so maintaining academic excellence increases employment opportunities (Shahiri et al., 2015).

Predicting and analysing student performance is important to help educators identify their weaknesses and improve their performance. Similarly, students can improve their learning activities and managers can improve their processes (Mueen et al., 2016; Ashraf et al., 2018). By predicting student performance in a timely manner, educators can identify poor-performing individuals and intervene early in the learning process to apply the necessary interventions. Graph Neural Network is a new approach with a large number of applications that can make predictions about the data (Kushwaha et al., 2020). Educational data mining, ML techniques and Neural network techniques aim to model and recognize meaningful hidden patterns and available information from the educational context (Salah et al., 2020). In addition, academia applies the graph neural networks approach to large datasets, representing different student characteristics as data points. These strategies benefit different disciplines by achieving different goals such as pattern extraction, behaviour prediction, and trend discovery (Marbouti et al., 2015), providing educators with the most effective learning methods. Allows you to track and monitor student progress.

In the Internet of Everything environment, graphs have a powerful ability to do this. Represents functional relationships between students in the context of education graph. The structure naturally exists among students. Traditional performance prediction method Unable to handle this type of graph structure and ability to harness its potential. The relationships between students are very limited. This study Predict student performance based on the Graph Neural Networks (Figure 1). Our study was primarily motivated by the lack of a systematic and comprehensive study to assess student performance predictions using a variety of Graph Neural Network models. Therefore, the main purpose of this work was to collect and summarize the key predictive functions and networks used to predict student performance.

Figure 1. Flow chart for basic student prediction model