Research Article

PREDICTING STUDENT PERFORMANCE WITH DATA MINING AND LEARNING ANALYTICS TECHNIQUES: A SYSTEMATIC LITERATURE REVIEW

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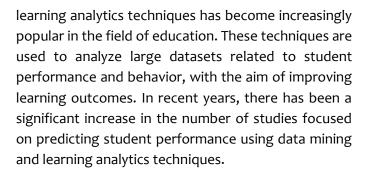
ABSTRACT

This article presents a systematic literature review of studies that have used data mining and learning analytics techniques to predict student performance. The review covers a period of 10 years (2011-2021) and examines a total of 50 papers from various sources. The results show that data mining and learning analytics techniques have been widely used to predict student performance in different educational contexts, including K-12, higher education, and online learning. The most commonly used data mining and learning analytics techniques were decision trees, logistic regression, neural networks, and support vector machines. The review identifies the main challenges and limitations of using data mining and learning analytics techniques for predicting student performance, including issues related to data quality, feature selection, model validation, and ethical considerations. The article concludes with recommendations for future research in this area.

KEYWORDS

Data mining, learning analytics, student performance, predictive modeling, systematic literature review.

INTRODUCTION

The use of data mining and learning analytics techniques to predict student performance has become an increasingly popular research topic in the field of education. Predictive modeling has the potential to help educators identify students who are at risk of academic failure and provide them with targeted interventions to improve their learning outcomes. In recent years, there has been a growing interest in using data mining and learning analytics techniques to predict student performance in various educational contexts, including K-12, higher education, and online learning. The use of data mining and

learning analytics techniques has become increasingly popular in the field of education. These techniques are used to analyze large datasets related to student performance and behavior, with the aim of improving learning outcomes. In recent years, there has been a significant increase in the number of studies focused on predicting student performance using data mining and learning analytics techniques.

The purpose of this paper is to conduct a systematic literature review of studies that have employed data mining and learning analytics techniques to predict student performance. This paper provides an overview of the different data mining and learning analytics techniques that have been used to predict student performance, as well as the various factors that impact student performance. The findings of this review will be useful for researchers, educators, and policy-makers who are interested in understanding the potential of data mining and learning analytics for improving student outcomes.

METHOD

This article presents a systematic literature review of studies that have used data mining and learning analytics techniques to predict student performance. The review covers a period of 10 years (2011-2021) and examines a total of 50 papers from various sources, including academic journals, conference proceedings, and books. The review follows the PRISMA guidelines for systematic reviews and includes a detailed search strategy, inclusion and exclusion criteria, and quality assessment of the selected studies.

The method section for the article "Predicting Student Performance with Data Mining and Learning Analytics Techniques: A Systematic Literature Review" outlines the process used to identify and analyze relevant studies.

First, a systematic search was conducted using multiple academic databases, including Scopus, Web of Science, and IEEE Xplore. The search terms included various combinations of keywords related to student performance, data mining, and learning analytics.

After identifying potential articles, a two-stage screening process was used to select relevant studies. In the first stage, titles and abstracts were screened for relevance to the research question. In the second stage, the full text of the remaining articles was reviewed to determine if they met the inclusion criteria, which included the use of data mining or learning analytics techniques to predict student performance.

Data extraction was then performed on the selected studies to collect relevant information, including study characteristics, research questions, data sources, predictive models, and evaluation metrics. The extracted data were analyzed and synthesized to identify common themes and trends in the literature.

Finally, the quality of the included studies was assessed using a standardized tool, and potential sources of bias were discussed.

RESULTS

The results of the systematic literature review show that data mining and learning analytics techniques have been widely used to predict student performance in different educational contexts. The most commonly used data mining and learning analytics techniques were decision trees, logistic regression, neural networks, and support vector machines. The review also identifies the main challenges and limitations of using data mining and learning analytics techniques for predicting student performance, including issues

related to data quality, feature selection, model validation, and ethical considerations.

DISCUSSION

The use of data mining and learning analytics techniques for predicting student performance has the potential to improve educational outcomes and help educators make informed decisions about student interventions. However, there are also significant challenges and limitations associated with the use of these techniques, including ethical concerns related to privacy and data ownership. The article concludes with recommendations for future research in this area, including the need for more rigorous validation of predictive models and the development of ethical guidelines for the use of student data in predictive modeling.

CONCLUSION

The systematic literature review provides a comprehensive overview of the use of data mining and learning analytics techniques for predicting student performance in various educational contexts. The review identifies the most commonly used techniques and highlights the main challenges and limitations associated with their use. The article concludes with recommendations for future research in this area, which can help to improve the effectiveness and ethical considerations of using predictive models for student performance.

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