

琉球大学学術リポジトリ

教育分野におけるデータマイニングモデルと高校生の能力予測システムの開発

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Abstract

Title “Developing Educational Data Mining Models and Prediction Systems for Predicting High School Student Performance”

The challenging task in educational institutions is to enrich the quality of education by maximizing the high performance of students and minimizing the failure rate of poor-performing students. An effective solution to leverage this task is to know student learning patterns with highly influencing factors and get accurate early prediction of student learning outcomes at the timely stage for setting up policy for improvement. Educational data mining (EDM) is an emerging disciplinary field of data mining, statistics, and machine learning concerned with extracting useful knowledge and information for the sake of improvement in the education environment.

The study of this work is to propose developed techniques in EDM for predicting poor-performing students. A comparative study of prediction models was initially conducted. Subsequently, high performing models were developed to get higher performance. The study proposed the developed models of hybrid machine learning models and optimization of deep belief network. The hybrid random forest (Hybrid RF) and the improved deep belief network (IDBN) generate the most successful classification. For the context of intervention, improving the learning outcomes, and enhancing model performance, the study introduced a novel feature selection method named MICHI. The algorithm is the combination of mutual information and Chi-square algorithms based on the ranked feature scores is introduced to select a dominant set and improve performance of prediction models.

The developed prediction models are integrated in a designed web-based application, called academic performance prediction system (APPS). The system is designed for educational stakeholders and related individuals to give prediction of academic performance at the early stage for intervention. The evaluation in APPS was conducted. The designed APPS is reported to be helpful and useful for educational stakeholders such as teachers, educational administrators, and policymakers, and related individuals to improve academic performance in educational institutions. Related individuals and educational institutions can figure out the weak points, adapt teaching and learning methods, and give the effective intervention to make improvements. Therefore, overall learning quality and learning performance can be improved greatly and reduce the failure rate of poor-performing students.

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