Predicting students' performance in English and Mathematics using data mining techniques

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Abstract

This study attempts to predict secondary school students' performance in English and Mathematics subjects using data mining (DM) techniques. It aims to provide insights into predictors of students' performance in English and Mathematics, characteristics of students with different levels of performance, the most effective DM technique for students' performance prediction, and the relationship between these two subjects. The study employed the archival data of students who were 16 years old in 2019 and sat for the Malaysian Certificate of Examination (MCE) in 2021. The learning of English and Mathematics is a concern in many countries. Three main factors, namely students' past academic performance, demographics, and psychological attributes were scrutinized to identify their impact on the prediction. This study utilized the Orange software for the DM process. It employed Decision Tree (DT) rules to determine the characteristics of students with low, moderate, and high performance in English and Mathematics subjects. DT and Naïve Bayes (NB) techniques show the best predictive performance for English and Mathematics subjects, respectively. Such characteristics and predictions may cue appropriate interventions to improve students' performance in these subjects. This study revealed students' past academic performance as the most critical predictor, as well as a few demographics and psychological attributes. By examining top predictors derived using four different classifier types, this study found that students' past Mathematics performance predicts their MCE English performance and students' past English performance predicts their MCE Mathematics performance. This finding shows students' performances in both subjects are interrelated.

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