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Model IA European MathIA Project

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Abstract

This paper presents the methodology and preliminary results of an Erasmus+ KA2 project that aims to leverage artificial intelligence to improve mathematics skills in secondary school students. The project fosters equity and diversity by addressing the needs of high-achieving students, those with learning difficulties, and those with special educational needs. Furthermore, it aims to support STEM educators by developing a resource bank for lesson planning and reducing students'test anxiety. We propose a methodology to build, evaluate, and validate machine learning classification models capable of predicting learning difficulties in mathematics among secondary school students. Data are being collected from secondary schools in the Region of Murcia, Colegio Vicente Medina, and from Tenerife, Colegio Mayco (Spain), charter schools with two secondary lines in each grade, as well as from partner institutions in Italy, such as Instituto Via Angelini, from Pavia, a public secondary school. The procedure for the design and development of the model is being carried out through an exam design with exercises designed by the secondary school teachers of each of the centres and with inter-judge validation. Once validated, it is being inserted into a database to be carried out through the Moodle platform and for the students of all the centres involved to have access to it. Once the data has been collected, it will be fed into the machine to obtain the first results and validate them, taking into account the variables of gender, response time, level of difficulty of each content and evaluation criteria according to the curriculum of this stage. Meanwhile, synthetic data sets have been generated with characteristics similar to the real data to allow a preliminary evaluation of the proposed model. The machine learning methodology covers data preprocessing, feature selection, imbalanced classification and rigorous evaluation and validation processes. Preliminary findings suggest that the proposed approach is promising for accurately identifying at-risk students and for obtaining results on the level of mathematical competence of each student, both to determine whether they are above, below, or above average for their age, which will ultimately contribute to personalized interventions and to improving educational outcomes.

Keywords

machine learning, AI, mathematical skills

Communication 1

Project MathIA: Imbalanced Classication for Diagnosing Learning and Cognitive Diferences in Mathematics Education

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