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AI-Driven Early Prediction of At-Risk Students Using Behavioral and Engagement Data: A Cross-Disciplinary Approach

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Abstract

Advancements in artificial intelligence (AI) have opened new possibilities for identifying at-risk students in higher education. While traditional models primarily rely on academic performance or demographic data and often focus on specific subjects, our approach only uses behavioral and engagement data from learning platform to offer a more comprehensive and cross-disciplinary solution. The study incorporates data from courses in four distinct academic divisions, all with examination and class sizes exceeding 80, totaling over 1 million rows of records. To capture nuanced patterns in student engagement across different courses and disciplines, feature engineering is used to develop innovative ranking indices and metrics. These indices enhance the predictive capabilities of the model by providing more granular insights into how students interact with the learning platform. Our AI model is capable of providing early predictions by the third week of a 13-week semester. By utilizing data from the initial three weeks, the prediction model achieves an overall accuracy rate above 80%, with predictions for subjects requiring higher engagement surpassing 90%. With early identification of at-risk students, institutions can proactively implement targeted support strategies, improving educational outcomes and retention rates. Moreover, the study emphasizes ethical AI application by exclusively using engagement data, ensuring privacy preservation and maintaining student trust. This study offers a scalable and responsible pathway for institutions to integrate AI technologies into education, paving the way for global advancements in student support systems.

Keywords: AI Prediction Model, Ethical AI, Feature Engineering, Higher Education, Ranking Indices