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Mathematics Anxiety and Its Effect on Cognitive Load: A Predictive Model

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ABSTRACT

Mathematics anxiety is a significant psychological barrier that affects students' academic performance and cognitive efficiency. Understanding its impact on cognitive functions is necessary for developing effective interventions. The aim is to study the relation among mathematics anxiety, cognitive factors (verbal working memory and visuospatial working memory) and behavioral factors (sleeping hours) to develop a predictive model for mathematics anxiety using cognitive factors and behavioral factors. A sample of 557 middle school students was analyzed using Linear Regression, Support Vector Regression (SVR), Random Forest, and XGBoost. The performance of the models was evaluated using R^2, RMSE, and MAE. Linear Regression model was found to be the most effective model (R^2=0.520), followed by SVR (R^2=0.494). SHAP analysis revealed that sleeping hours play a critical role in reducing mathematics anxiety. These findings help in understanding and predicting mathematics anxiety in educational context using machine learning.

Keywords: Mathematics Anxiety, Cognitive Factors, Behavioral Factors, Machine Learning, Predictive Modeling