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| Title | A customized ensemble machine learning approach: predicting students’ exam performance | | |
| Author(s) Name | Rasel Ahmed , Nafiz Fahad , Md Saef Ullah Miah , Kah Ong Michael Goh , Mufti Mahmud and M. Mostafizur Rahman | | |
| Contact Email(s) | saef@aiub.edu | | |
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| Abstract |  |
| Accurately predicting students’ exam performance is crucial for fostering academic success and timely interventions. This study addresses the significant challenge of predicting whether a student will pass or fail based on key factors such as study hours and previous exam scores. Using a dataset of 500 students sourced from Kaggle, we introduce a novel customized ensemble machine learning model, combining Random Forest (RF) and AdaBoost classifiers with a custom-weighted soft voting method (weights of 0.2 for RF and 0.8 for AdaBoost). The model’s hyperparameters were optimized via GridSearchCV with 10-fold cross-validation, ensuring robustness. The performance of the ensemble model was evaluated using metrics like Cohen’s Kappa, achieving superior predictive accuracy compared to baseline models. Our findings indicate that the proposed model not only improves prediction accuracy but also reduces prediction time, offering practical implications for educators and policymakers to design tailored interventions for at-risk students, ultimately enhancing educational outcomes. | |