

ABSTRACT

In many instances, programming education is non-personalized and has left so many learners without much interest or not being proficient enough to reach the programming level of proficiency. Most of these traditional approaches give way more attention to correction mistakes instead of personalized assignments for every learning difference. In contrast, most online modern coding websites always use one work for all regardless of differing levels of proficiency by just ignoring the need to give different works for the slow, medium, and fast learners.

This research work suggests a new hybrid learning methodology using machine learning to classify types of learners based on their contribution to code and performance in tasks. The system will automatically recommend individualized coding projects based on the examination of the criteria such as accuracy, error patterns, and performance, matched to the ability of each learner. It applies advanced techniques in machine learning such as Random Forest, XGBoost, and Adaptive Ensemble Classification Weighting (AECW) algorithm to make performance prediction, manage the difficulty of jobs, and effectively balance classes. These models are also appraised using other metrics, such as accuracy, precision, recall, and F1-score.

The research clearly demonstrates that ensemble methods improve both the predictive accuracy and task adaptability without causing overfitting. It not only enhances the outcome of learning but also helps instructors practically understand students' performance. This is a step to transform the process of programming education using scalable, data-driven techniques with predictive analytics integrated with adaptive task sequencing.