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Supervised learning algorithm's role in flagging programming concepts that call for Information Technology teachers' attention

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Abstract

Programming syntax and concepts' complexity demands learners possess logical thinking and problem-solving skills to effectively write and complete code. In the context of Information Technology education in South Africa, teachers require a tool that can identify learners' performance in programming concepts and help them prevent misunderstandings. This research proposes a transformational approach that uses a machine learning algorithm to alert teachers of programming concepts that learners may struggle with. The study also investigates how Information Technology teachers shape learning experiences when teaching programming concepts, using a qualitative methodology involving semi-structured interviews with Information Technology teachers. The study employs Educational Data Mining and Learning Analytics as theoretical and conceptual frameworks to showcase the potential of supervised learning algorithms in using prior Information Technology results for significant improvements in learning and performance. The findings indicate that problem-based learning is a commonly used methodology among Information Technology teachers. The algorithm results reveal a high-performance forecasting model based on acceptable accuracy, actual positive rate, and false positive rate. The identified programming concepts that require focus include conditional statements, conceptualizing problems and designing solutions, debugging and exception handling, abstraction/pattern recognition, and differentiating between classes and objects. Overall, this research presents a valuable approach for leveraging a supervised learning algorithm to enhance Information Technology education by identifying and addressing programming concepts that learners struggle with.

Keywords: Programming, Information Technology, Machine learning, Educational Data Mining, Learning Analytics, Problem-based learning, Algorithms, Forecasting model.