Predictive Modeling for Identifying Early Warning Signs of Underperformance in Vocational Education

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I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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DECLARATION

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Sri Lanka Institute of Information Technology or to any other institution for assessment for any other purpose.

Sign: …….....

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ABSTRACT

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MSc. in Information Technology

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Vocational education is vital for developing a skilled workforce that meets national economic and social demands. However, high dropout rates and underperformance challenge this sector, often due to limited monitoring tools that capture early warning signs in practical, skill-based environments. This study addresses these challenges by developing a predictive model to identify at-risk students in vocational education, utilizing several machine learning techniques including Logistic Regression, Decision Trees, Random Forest, and Neural Networks to provide actionable insights for educators and administrators. Among these, Random Forest emerged as the most practical and effective model, especially after applying transfer learning to adapt academic datasets to vocational contexts. The research addresses key questions: identifying early indicators of underperformance, evaluating predictive techniques suited to vocational settings, and establishing model accuracy and reliability for real-world application. By analyzing indicators such as attendance, assessment scores, and student engagement, the model enables early interventions, contributing to improved retention and academic outcomes. Integrated into a Training Management System (TMS), this predictive model demonstrates a practical approach to supporting student success. This research contributes to educational data mining by showcasing how predictive analytics and transfer learning can enhance vocational education, thereby strengthening workforce readiness and employability

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