A Machine Learning Approach to Identify the Key Factors Affecting Correct Stream Selection and To Predict Suitable Subject Streams for Advanced Level Students in Sri Lanka

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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is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources).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.

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ABSTRACT

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Education plays a vital role in shaping the economic growth and sustainable development of a nation. It is not only a measure of a country's intellectual wealth but also a determining factor in its future progress. In Sri Lanka, education is provided free of charge by the government from primary school through university, ensuring equal access for all students. Within this framework, the General Certificate of Education (Ordinary Level*)* – G.C.E. (O/L) and the General Certificate of Education (Advanced Level) – G.C.E. (A/L) examinations represent two critical milestones in the academic journey. The G.C.E. (A/L) examination, in particular, serves as the gateway to higher education and university admission, marking a pivotal stage in shaping students' academic and professional futures. At the end of the O/L stage, students are required to select a subject stream such as *Science, Arts, Commerce, or Technology* to pursue during their A/L studies. This choice has a lasting impact, as it directly determines the student's educational direction and career opportunities. However, many students make this crucial decision based on external influences, such as parental pressure, peer comparison, or limited guidance, rather than through a clear understanding of their academic strengths, personal interests, or long-term career aspirations. Consequently, this often leads to dissatisfaction, stream switching, or even discontinuation of studies. To address this issue, it is essential to adopt a data-driven approach that considers multiple factors, including students' O/L examination performance, inborn talents, extracurricular activities, and preferred professional fields. This research introduces a machine learning-based model the *Subject Stream Prediction System*—designed to recommend the most suitable A/L subject stream for students. The proposed system not only predicts the optimal subject stream but also provides additional guidance by suggesting potential career paths, relevant educational qualifications, and technical skills aligned with the student's profile. Four supervised machine learning algorithms K-Nearest Neighbors (KNN), Decision Tree, Random Forest, and Support Vector Machine (SVM)were trained and evaluated to develop the predictive model, ensuring the highest possible accuracy and reliability.

Keywords –Machine Learning Algorithm, Subject Stream, Prediction System

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