

## Early Detection of Psychological Risk in Sri Lankan University Students through Interpretable Machine Learning Approach

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Psychological distress among university students in Sri Lanka is an increasing issue, which is compounded by academic, financial, and lifestyle issues. Traditional screening tools do not effectively predict the "At-risk" students early enough to help them be treated in time. This study will create interpretable machine learning model early binary classification of psychological risk among Sri Lankan university students using behavioral, demographic, and clinical indicators. This ML model will be able to identify whether a student is "At-risk" or "Not-at-risk" based on the behavioral, demographic, and clinically validated indicators. The survey data were obtained on 500 undergraduate students who represented various faculties and contained demographic factors, lifestyle behaviors, and results of the Depression, Anxiety and Stress Scale (DASS-21). The responses on DASS21 were converted to a binary risk label using clinical scoring guidelines, in which a moderate or greater severity on any of the subscales was a precursor of psychological risk. Several baseline models such as Logistic Regression, Support Vector Machine, Decision Tree and Gradient Boosting were trained and assessed on the basis of accuracy, precision, recall, F1-score, and ROC AUC. Logistic Regression exhibited the highest precision (90%) which is important in order to reduce false positives at the cost of screening mental health, as the regression showed the highest accuracy (84%) and AUC-ROC (90.8%). The critical predictors of psychological risk were severity of DASS-21, sleep disturbances, spending much time on the screen, and lack of social contact. Interpretable machine learning models especially the Logistic Regression are a feasible and scalable method of early psychological risk detection in universities. This instrument enables proactive, data-driven support for university counseling services in Sri Lanka.

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