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Neural Network based Risk Detection for Dyslexia and Dysgraphia in Sinhala Language Speaking Children

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Abstract : The educational system faces a significant concern with regards to Dyslexia and Dysgraphia, which are learning disabilities impacting reading and writing abilities. This is particularly challenging for children who speak the Sinhala language due to its complexity and uniqueness. Commonly used methods to detect the risk of Dyslexia and Dysgraphia rely on subjective assessments, leading to limited coverage and time-consuming processes. Consequently, delays in diagnoses and missed opportunities for early intervention can occur. To address this issue, the project developed a hybrid model that incorporates various deep learning techniques to detect the risk of Dyslexia and Dysgraphia. Specifically, Resnet50, VGG16, and YOLOv8 models were integrated to identify handwriting issues. The outputs of these models were then combined with other input data and fed into an MLP model. Hyperparameters of the MLP model were fine-tuned using Grid Search CV, enabling the identification of optimal values for the model. This approach proved to be highly effective in accurately predicting the risk of Dyslexia and Dysgraphia, providing a valuable tool for early detection and intervention. The Resnet50 model exhibited a training accuracy of 0.9804 and a validation accuracy of 0.9653. The VGG16 model achieved a training accuracy of 0.9991 and a validation accuracy of 0.9891. The MLP model demonstrated impressive results with a training accuracy of 0.99918, a testing accuracy of 0.99223, and a loss of 0.01371. These outcomes showcase the high accuracy achieved by the proposed hybrid model in predicting the risk of Dyslexia and Dysgraphia.

Keywords : neural networks, risk detection system, dyslexia, dysgraphia, deep learning, learning disabilities, data science
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