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Binding AI for differently abled child protection through a multimodal approach to early abuse detection and intervention in Sri Lanka: 'Rekawarana'

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Background: Child abuse remains a critical concern in Sri Lanka, with statistics from the National Child Protection Authority indicating over 10,000 reported cases annually over the past decade. Children with disabilities are among the most at risk, often facing significant barriers in communicating experiences of abuse due to physical, cognitive, or social challenges. Despite the presence of support systems, underreporting and delayed detection remain persistent issues, particularly within these vulnerable groups.

Method: To address this gap, the study introduces 'Rekawarana', an AI-powered mobile application to detect and monitor signs of abuse in children with disabilities through multimodal data analysis. The research problem focuses on improving early detection and timely intervention using advanced technological methods tailored for inclusivity and accessibility. The system integrates Natural Language Processing (NLP) to analyze text messages, social media interactions, and voice inputs for signs of distress or abusive language. Computer vision algorithms process images and video footage to detect physical indicators such as bruises or scars. Additionally, behavioural data from wearable devices-such as heart rate and stress levels-are analyzed to identify patterns of emotional distress. A hybrid AI model, combining supervised and unsupervised learning, ensures adaptability and improved accuracy over time.

Results: During beta testing with simulated scenarios and anonymized datasets, 'Rekawarana' demonstrated promising performance, achieving approximately 70% accuracy in identifying indicators of abuse. The system effectively flagged behavioral anomalies-such as social withdrawal and abrupt changes-with high sensitivity. Its integration into simulated response workflows significantly enhanced the speed of case prioritization and intervention.

Conclusions: 'Rekawarana' presents a novel approach to child protection by integrating AI with social welfare goals. It addresses a significant gap in traditional detection systems, offering a scalable, real-time solution for identifying abuse. Ethical considerations-including privacy, algorithmic fairness, and dataset inclusivity-are carefully acknowledged, with future efforts aimed at broader deployment and strengthened collaboration with child welfare stakeholders.

Keywords: Handicapped children, artificial intelligence (AI), Rekawarana, multimodal data analysis, real-time abuse detection.