SpeakNow: AI-Powered Early Detection of Developmental Speech and Language Disorders in Children

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According to the National Institutes of Health, 1 in 14 children has Developmental Language Disorder (DLD). It interferes with language learning in children, delaying their academic and social development. While DLD is highly prevalent, many children are undiagnosed due to inaccessible diagnostic tools and a lack of awareness. This project aims to create a screening system that can detect signs of DLD and identify areas for targeted interventions. Four AI models (Random Forest, Autoencoder, Long Short Term Memory, and the novel architecture) were developed to analyze speech transcripts and identify DLD cases. The models were trained and tested on publicly available datasets with over 1,200 data samples spanning diverse demographics. The Random Forest model, which used a feature extraction approach, achieved the highest accuracy of 92%. The model also provided novel insights on which features are most relevant to identifying DLD, such as mean length of utterance, verb utterances, and word errors. Furthermore, the screening system can pinpoint areas of language that the child is struggling with, by comparing features for a DLD case with a Typical Development (TD) case distribution. A mobile app was created as a prototype for demonstrating the model. For future research, the app could be further validated and used as a routine screening in schools to support early detection of DLD. In addition, the app could provide resources for language skills needing improvement, leading to more effective interventions and early treatment.

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