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Abstract

Introduction
Sign language is a crucial communication method for the deaf and hard-of-hearing community, yet many individuals who do not know sign language face challenges in interacting with sign language users. This communication barrier can lead to social isolation and limited accessibility in various settings, including workplaces, healthcare, and education. The goal of our capstone project, *SignTalk*, is to bridge this gap by developing an AI-powered mobile application that translates sign language into text in real-time and helps users learn American Sign Language (ASL) through an integrated ASL video library.

Methodology
To develop this solution, we first collected and processed sign language datasets, including research articles and interview insights, to build a robust training set. We incorporated OpenCV for real-time hand tracking and TensorFlow Lite for efficient on-device inference. The app is developed using React Native and Python to ensure smooth integration with both iOS and Android devices. Using deep learning models, we optimized sign recognition for real-time performance on mobile devices while implementing an extensive ASL library for reference. The mobile application was designed with an intuitive UI/UX, integrating AI models to enhance usability. Additionally, system integration testing crucial role in refining the system for better accuracy and accessibility.

Results
Our prototype successfully recognizes and translates a predefined set of ASL signs with high accuracy. The real-time translation capability not only facilitates communication between non-signers and the deaf community but also enables both groups to learn ASL interactively. Early usability testing and user feedback have demonstrated promising results, with positive responses regarding ease of use and translation speed. Additionally, the ASL library provides a structured and accessible way for users to learn sign language at their own pace.

Conclusion
SignTalk addresses a significant accessibility challenge by making sign language translation more accessible through mobile technology. The application has the potential to improve inclusivity in various sectors, fostering better communication between deaf and hearing individuals. Future work will focus on expanding the model's vocabulary,

improving real-time accuracy, and incorporating multi-language support to enhance usability for a broader audience.