**SIGN LANGUAGE TRANSLATOR**

**Abstract**

Communication between deaf and hearing individuals can be challenging when sign language skills are not shared. This challenge is especially significant in everyday situations such as schools, hospitals, and public services, where professional interpreters are often unavailable. To address this barrier, we developed a real-time, web-based American Sign Language (ASL) fingerspelling translator that can work on any modern computer with a standard webcam, without the need for specialized hardware or software installation.

The system combines MediaPipe Hands for fast and accurate 3D hand landmark detection with a lightweight Convolutional Neural Network (CNN) trained on the ASL Alphabet dataset containing over 87,000 labeled images across 29 classes (A–Z, plus SPACE, DELETE, and NOTHING). The deep learning model, deployed in TensorFlow.js, runs entirely in the web browser, ensuring high privacy because no video data is sent to a server. Advanced techniques such as temporal smoothing and confidence filtering are applied to stabilize predictions, maintaining real-time performance with under 100 ms delay and up to 30 frames per second.

In user testing with ten deaf participants performing 2,000 trials, the translator achieved an average accuracy of 95.4% in real-world settings. The simplicity of deployment, low cost, and privacy-preserving nature make this approach suitable for a wide range of accessibility applications in education, healthcare, and public communication.

In conclusion, this project demonstrates that AI-powered, browser-based tools can deliver accurate and fast sign language translation without expensive infrastructure, offering a powerful step toward more inclusive human–computer interaction and improved accessibility for the global Deaf community.