

ABSTRACT

Sign language is the main communication tool for the deaf community. However, limited understanding of sign language among the general public often creates barriers to effective communication. This study aims to develop a system that can detect hand movements in Indonesian Sign Language (SIBI) using a deep learning model based on Convolutional Neural Networks (CNN). The system is designed to recognize 26 alphabet letters and numbers in SIBI with an accuracy ranging from 93% to 96% for letters and numbers, and 90% to 94% for common words. In addition, the model is able to recognize five basic words: saya (I), kamu (you), dia (he/she), makan (eat), and tidur (sleep), to further support communication.

The system was implemented in Python using the TensorFlow framework, along with supporting libraries such as OpenCV, MediaPipe, scikit-learn, seaborn, and numpy for image processing, feature extraction, and model training. The dataset was collected independently using a laptop's built-in webcam, stored in .h5 format, and labeled with the help of Roboflow. Hardware used in this study consisted of a laptop with a GPU and an internal camera for data collection and testing.

Experimental results show that the system is capable of running in real time with 100% accuracy when tested separately on letters, numbers, and the five basic words. In combined mode, where letters, numbers, and words are recognized simultaneously, the system achieved an accuracy of about 97%. The final output is determined by the prediction with the highest confidence score. Although occasional errors occur due to similarities between certain gestures, the system remains stable and can be used as a tool to automatically translate sign language, thereby making communication between the deaf and the wider community more accessible.

Keywords: Indonesian Sign Language, hand gesture detection, deep learning, Convolutional Neural Network, MediaPipe, automatic sign language translator.