

ABSTRAK

Bahasa Isyarat Indonesia (BISINDO) merupakan sarana komunikasi utama bagi penyandang tunarungu. Meskipun demikian, BISINDO masih belum dipahami secara luas oleh masyarakat umum sehingga komunikasi sederhana kerap mengalami hambatan. Penelitian sebelumnya telah menerapkan CNN dan LSTM dalam pengenalan bahasa isyarat, seperti Altiarika dan Sari (2023) yang menggunakan CNN dan LSTM serta Utomo et al. (2024) yang menggunakan MediaPipe dan LSTM, tetapi integrasi fitur visual MobileNetV2, *landmark* tangan, dan pemodelan *temporal* LSTM untuk pengenalan kata BISINDO berbasis aplikasi *mobile* masih belum banyak dikembangkan. Penelitian ini bertujuan mengembangkan aplikasi pendeteksi *gesture* tangan BISINDO berbasis *mobile native* Android sebagai media bantu komunikasi awal antara masyarakat umum dan penyandang tunarungu. Metode yang digunakan menggabungkan *Convolutional Neural Network* (CNN) berarsitektur MobileNetV2 sebagai ekstraktor fitur visual dan *Long Short-Term Memory* (LSTM) untuk mempelajari pola gerakan secara *temporal*. Dataset dikumpulkan secara mandiri berupa 255 video dari 15 kelas kata BISINDO. Tahap pengembangan meliputi pra-pemrosesan data, deteksi tangan menggunakan MediaPipe, pembentukan *Landmark Mask* dan *Region of Interest* (ROI), ekstraksi fitur visual dan *landmark*, pembentukan *sequence*, pelatihan, serta evaluasi model. Model kemudian dikonversi ke TensorFlow Lite dan diintegrasikan ke aplikasi Android bernama Sindoraku. Evaluasi pada data uji memperoleh *accuracy* 96,01% dengan *macro average precision*, *recall*, dan F1-Score masing-masing 96%. Aplikasi diuji melalui *Black Box Testing* dan dihasilkan seluruh fitur berjalan sesuai rancangan, pengujian performa dihasilkan deteksi *real-time* dengan *latency* rata-rata 249 ms per *frame* atau 3,1 fps dan memori 258 MB, serta *User Acceptance Testing* terhadap 15 responden yang memperoleh indeks penerimaan 90,97% dengan kategori “Sangat Layak”. Dengan demikian, aplikasi layak digunakan sebagai media bantu pengenalan *gesture* BISINDO dasar.

Kata Kunci: Bahasa Isyarat Indonesia, CNN, LSTM, MobileNetV2, Mobile.

ABSTRACT

Indonesian Sign Language (BISINDO) serves as the primary means of communication for individuals who are deaf or hard of hearing. However, it is not yet widely understood by the general public, which often leads to barriers in everyday communication.. Previous studies have applied CNN and LSTM in sign language recognition, such as Altiarika and Sari (2023) using CNN and LSTM and Utomo et al. (2024) using MediaPipe and LSTM, but the integration of MobileNetV2 visual features, hand landmarks, and LSTM-based temporal modeling for BISINDO word recognition in a mobile application is still rarely developed. This study aims to develop a native Android mobile application for detecting BISINDO hand gestures as an initial communication aid between the general public and deaf individuals. The method combines a Convolutional Neural Network (CNN) with the MobileNetV2 architecture as a visual feature extractor and Long Short-Term Memory (LSTM) to learn temporal movement patterns. The dataset was collected independently as 255 hand-gesture videos from 15 BISINDO word classes. The development stages include data preprocessing, hand detection using MediaPipe, Landmark Mask and Region of Interest (ROI) formation, visual and landmark feature extraction, sequence formation, training, and model evaluation. The model was then converted to TensorFlow Lite and integrated into an Android application named Sindoraku. Evaluation on the test data achieved 96.01% accuracy, with a macro average precision, recall, and F1-Score of 96% each. The application was evaluated through Black Box Testing and the result all features worked as designed, performance testing and the result real-time detection with an average latency of 249 ms per frame or 3.1 fps and 258 MB memory usage, and User Acceptance Testing with 15 respondents, which obtained an acceptance index of 90.97% with Very Feasible category. Therefore, the application is feasible as a learning aid for basic BISINDO gesture recognition.

Keywords: CNN, Indonesian Sign language, LSTM, MobileNetV2, Mobile.