

Healthcare-SignNet: Advanced Video Classification for Medical Sign Language Recognition Using CNN and RNN Models

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Abstract : Sign Language Recognition (SLR) is the process of interpreting and translating sign language into spoken or written language using technological systems. It involves recognizing hand gestures, facial expressions, and body movements that makeup sign language communication. The primary goal of SLR is to facilitate communication between hearing- and speech-impaired communities and those who do not understand sign language. Due to the increased awareness and greater recognition of the rights and needs of the hearing- and speech-impaired community, sign language recognition has gained significant importance over the past 10 years. Technological advancements in the fields of Artificial Intelligence and Machine Learning have made it more practical and feasible to create accurate SLR systems. This paper presents a distinct approach to SLR by framing it as a video classification problem using Deep Learning (DL), whereby a combination of Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) has been used. This research targets the integration of sign language recognition into healthcare settings, aiming to improve communication between medical professionals and patients with hearing impairments. The spatial features from each video frame are extracted using a CNN, which captures essential elements such as hand shapes, movements, and facial expressions. These features are then fed into an RNN network that learns the temporal dependencies and patterns inherent in sign language sequences. The INCLUDE dataset has been enhanced with more videos from the healthcare domain and the model is evaluated on the same. Our model achieves 91% accuracy, representing state-of-the-art performance in this domain. The results highlight the effectiveness of treating SLR as a video classification task with the CNN-RNN architecture. This approach not only improves recognition accuracy but also offers a scalable solution for real-time SLR applications, significantly advancing the field of accessible communication technologies.

Keywords : sign language recognition, deep learning, convolution neural network, recurrent neural network

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