TITLE :	Deep Learning-Based Approach for Sign Language Gesture Recognition With Efficient Hand Gesture Representation	YEAR
		2020

KEY CONTRIBUTION	THEORY
• Optimizing the level of C3D architecture knowledge transfer between human activity recognition and hand gesture recognition. • Presenting a hand gesture recognition system based on an optimized C3D architecture. The proposed system uses local and global configurations efficiently with more attention to the hand region. • Presenting a novel method for hand segmentation based on the openpose framework. • Optimizing two architectures for local features aggregation.	Addressing the modeling the hand gesture signal in a video should be slightly different than other video-based analysis for human activity recognition or event recognition in general by using both the local and global configurations of the hand gesture while giving more attention to the fingers' configuration and eliminating the most non-relevant features.

DEPENDENT VARIABLES
This study proposed a novel system for dynamic hand gesture recognition via a combination of multiple deep learning techniques. The proposed system represented the hand gesture using local hand shape features as well as global body configuration features, which is very efficient for complicated structured hand gestures of the sign language. The openpose framework was used in this study for hand region detection and estimation. A robust face detection algorithm and the body parts ratios theory were utilized for gesture space estimation and normalization. Two 3DCNN instances were used separately for learning the fine-grained features of the hand shape and the coarse-grained features of the global body configuration. MLP and autoencoders were utilized to aggregate and globalize the extracted local features and the SoftMax function was used for the classification. Furthermore, to reduce the training cost of the 3DCNN module, we investigated domain adaptation and conducted extensive experiments to optimize the level of knowledge transfer. The proposed system was evaluated on a real and challenging sign language dataset. The experimental results showed that the proposed system outperformed state-of-the-art methods in terms of recognition rate, demonstrating its effectiveness.

INDEPENDENT (AND HYPOTHESES)
King Saud University Saudi Sign Language (KSU-SSL) dataset

METHODS	ANALYSIS
• First method- locate the signers face using the Viola and Jones algorithm • Second method- crops and normalizes the hand region to focus more on finger configuration • Hand cropping and normalization method (openpose)- deep learning based framework for detecting 2D keypoints • Method to estimate a small square around the hand to be cropped	• Provide an algorithm to increase the accuracy of the frames to estimate the hand orientation • Pretrained C3D architecture with 8 convolutional layers, 5 pooling layers & 2 fully connected layers. • 2 techniques- MLP & autoencoder. (for feature fusion). The classification by SoftMax function. • 2 scenarios- signer-dependent & signer-independent

FINDINGS

- MLP & autoencoder architectures obtained comparable performance in the signer-dependent mode, while the performance of the MLP in the signer-independent mode was much better than that of the autoencoder.
- The system achieved the best recognition rate with both MLP and autoencoders in all the scenarios.
- There are some gestures that failed to be recognized due to misclassifications that were almost caused by hand blurring issues.
- The highest accuracy of 87.69% in the signer-independent scenario was achieved by the system with the MLP fusion

FUTURE RECOMMENDATION/GAP	REMARKS	
• lack in the single-modality systems that are tested on comprehensive sign language datasets of RGB frames only • utilize other strategies for temporal aspect modeling. We will perform extensive experiments to optimize the length of the input clip. We will also test the system for real-time hand gesture recognition.		• Know how engineers optimize deep learning. • The conclusion part of the paper describes everything about the paper.