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Vision Based Elderly Human Fall Detection System using MoveNet Pose Estimation and Hybrid CNN BiLSTM Architecture

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Abstract:

The increasing elderly demographic leads to major challenges in obtaining timely medical intervention after falls, which are one of the key causes of injury and hospitalization. Therefore, we present a robust and fast fall detection system that uses skeletal pose keypoints, extracted with the help of Google's MoveNet Thunder model, to build temporal sequences, and uses a hybrid deep learning model that leverages CNNs for spatial feature extraction and BiLSTM networks for modeling the motion dynamics. When evaluated using the URFD dataset, the proposed system achieved high levels of performance; specifically, our model achieved performance ratings of 95.80% accuracy, 93.90% precision, 94.78% recall, 93.75% specificity, and AUC of 0.9311. The proposed system offers a complete and end-to-end pipeline suitable for real-time healthcare or surveillance contexts, while providing high detection accuracy and practical deployability.

Keywords:

Computer Vision, Deep Learning, Elderly Care, Fall Detection.