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| Title | An Enhanced Ensemble Deep Neural Network Approach for Elderly Fall Detection System Based on Wearable Sensors | | |
| Author(s) Name | Michael Vassallo Mohammad, Zabir, Arif Reza Anwary, Muhammad Firoz Mridha, Md Sakib Hossain Shovon | | |
| Contact Email(s) | firoz.mridha@aiub.edu | | |
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| Abstract |  |
| Fatal injuries and hospitalizations caused by accidental falls are significant problems among the elderly. Detecting falls in real-time is challenging, as many falls occur in a short period. Developing an automated monitoring system that can predict falls before they happen, provide safeguards during the fall, and issue remote notifications after the fall is essential to improving the level of care for the elderly. This study proposed a concept for a wearable monitoring framework that aims to anticipate falls during their beginning and descent, activating a safety mechanism to minimize fall-related injuries and issuing a remote notification after the body impacts the ground. However, the demonstration of this concept in the study involved the offline analysis of an ensemble deep neural network architecture based on a Convolutional Neural Network (CNN) and a Recurrent Neural Network (RNN) and existing data. It is important to note that this study did not involve the implementation of hardware or other elements beyond the developed algorithm. The proposed approach utilized CNN for robust feature extraction from accelerometer and gyroscope data and RNN to model the temporal dynamics of the falling process. A distinct class-based ensemble architecture was developed, where each ensemble model identified a specific class. The proposed approach was evaluated on the annotated SisFall dataset and achieved a mean accuracy of 95%, 96%, and 98% for Non-Fall, Pre-Fall, and Fall detection events, respectively, outperforming state-of-the-a | |