|  |  |  |  |
| --- | --- | --- | --- |
| Title | Secure Your Steps: A Class-Based Ensemble Framework for Real-Time Fall Detection using Deep Neural Networks | | |
| Author(s) Name | Md Mohsin Kabir, Jungpil Shin, MF Mridha | | |
| Contact Email(s) | firoz.mridha@aiub.edu | | |
| Published Journal Name | IEEE Access | | |
| Type of Publication | Journal | | |
| Volume | 11 | Issue |  |
| Publisher | IEEE | | |
| Publication Date | 2023/6/26 | | |
| ISSN | 2169-3536 | | |
| DOI | [10.1109/ACCESS.2023.3289402](https://doi.org/10.1109/ACCESS.2023.3289402) | | |
| URL | <https://ieeexplore.ieee.org/abstract/document/10162189> | | |
| Other Related Info. |  | | |
|  | | | |

|  |  |
| --- | --- |
| Abstract |  |
| Falls represent a significant public health concern, particularly concerning vulnerable populations such as older adults. Accurate detection and classification of falls are critical for timely interventions that can prevent injuries and enhance the quality of life of these individuals. This work proposes a class ensemble approach based on convolutional neural networks and long short-term memory networks for three-class classifications of falling processes (non-fall, pre-fall, and fall) using accelerometer and gyroscope data. The research is conducted on the SisFall and UMAFall datasets, the publicly available dataset of annotated video recordings of falls and non-falls. This approach leverages convolutional neural networks for robust feature extraction from the accelerometer and gyroscope data. In addition, long short-term memory networks model the falling process’s temporal dynamics. The proposed approach has demonstrated state-of-the-art performance in detecting falls, with accuracy rates of 96.45% and 96.12% and precision scores of 98.12% and 97.45% in identifying pre-fall and fall states, respectively. | |