

Comparative study of ensemble method vs deep learning on human activity recognition for elderly care

ABSTRACT

A drastic increase in healthcare demand has come from the explosive growth of the older population. The elderly are, on average, more vulnerable to health problems than other age groups. Unpredictable events, such as sudden falls, can be avoided with proper monitoring. Activity recognition can help people avoid potentially dangerous behaviours by aiding in the detection of unexpected events. Most of the existing approaches require complex sensors and environment setup, involve data filtering and noise removal steps, and most often the chosen learning models need to be tuned and carefully designed for optimal performance. This study emphasizes light implementation, fast training time, easy experimental setup, and minimal parameter tuning. Human activities are captured using smartphone sensors in this study. Students and senior residents from a local home care facility are among the volunteers for this study. The necessary data sets are obtained from the accelerometer sensor on the smartphone. To provide baseline performance, the traditional instance-based learning architectures k-Nearest Neighbors (kNN) and Support Vector Machine (SVM) are used. To represent the ensemble learning model, the Random Forest (RF) and XGBoost (XGB) are investigated. The Multilayer Perceptron (MLP) and Convolutional Neural Network (CNN) are the more advanced deep learning models used in this study (CNN). The results reveal that ensemble methods and deep learning models provide improved accuracy, with ensemble learning models outperforming deep learning models.