

# Human Activity Recognition From Sensorised Patient's Data in Healthcare: A Streaming Deep Learning-Based Approach

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**Abstract.** Physical inactivity is one of the main risk factors for mortality, and its relationship with the main chronic diseases has experienced intensive medical research. A well-known method for assessing people's activity is the use of accelerometers implanted in wearables and mobile phones. However, a series of main critical issues arise in the healthcare context related to the limited amount of available labeled data to build a classification model. Moreover, the discrimination ability of activities is often challenging to capture since the variety of movement patterns in a particular group of patients (e.g. obesity or geriatric patients) is limited over time. Consequently, the proposed work presents a novel approach for Human Activity Recognition (HAR) in healthcare to avoid this problem. This proposal is based on semi-supervised classification with Encoder-Decoder Convolutional Neural Networks (CNNs) using a combination strategy of public labeled and private unlabeled raw sensor data. In this sense, the model will be able to take advantage of the large amount of unlabeled data available by extracting relevant characteristics in these data, which will increase the knowledge in the innermost layers. Hence, the trained model can generalize well when used in real-world use cases. Additionally, real-time patient monitoring is provided by Apache Spark streaming processing with sliding windows. For testing purposes, a real-world case study is conducted with a group of overweight patients in the healthcare system of Andalusia (Spain), classifying close to 30 TBs of accelerometer sensor-based data. The proposed HAR streaming

2 Authors Suppressed Due to Excessive Length

deep-learning approach properly classifies movement patterns in real-time conditions, crucial for long-term daily patient monitoring.

