

## Lightweight Hybrid Convolutional and Recurrent Neural Networks for Wearable Sensor Based Human Activity Recognition

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**Abstract :** Non-intrusive sensor-based human activity recognition (HAR) is utilized in a spectrum of applications, including fitness tracking devices, gaming, health care monitoring, and smartphone applications. Deep learning models such as convolutional neural networks (CNNs) and long short term memory (LSTM) recurrent neural networks (RNNs) provide a way to achieve HAR accurately and effectively. In this paper, we design a multi-layer hybrid architecture with CNN and LSTM and explore a variety of multi-layer combinations. Based on the exploration, we present a lightweight, hybrid, and multi-layer model, which can improve the recognition performance by integrating local features and scale-invariant with dependencies of activities. The experimental results demonstrate the efficacy of the proposed model, which can achieve a 94.7% activity recognition rate on a benchmark human activity dataset. This model outperforms traditional machine learning and other deep learning methods. Additionally, our implementation achieves a balance between recognition rate and training time consumption.

**Keywords :** deep learning, LSTM, CNN, human activity recognition, inertial sensor

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