

Convolutional and Recurrent Neural Networks for Activity Recognition in Smart Environment

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Abstract. Convolutional Neural Networks (CNN) are very useful for fully automatic extraction of discriminative features from raw sensor data. This is an important problem in activity recognition, which is of enormous interest in ambient sensor environments due to its universality on various applications. Activity recognition in smart homes uses large amounts of time-series sensor data to infer daily living activities and to extract effective features from those activities, which is a challenging task. In this paper we demonstrate the use of the CNN and a comparison of results, which has been performed with Long Short Term Memory (LSTM), recurrent neural networks and other machine learning algorithms, including Naive Bayes, Hidden Markov Models, Hidden Semi-Markov Models and Conditional Random Fields. The experimental results on publicly available smart home datasets demonstrate that the performance of 1D-CNN is similar to LSTM and better than the other probabilistic models.

Keywords: Deep learning · Convolutional neural networks · 1D-CNN · LSTM · Activity recognition · Smart homes

1 Introduction

The advancement in sensing, networking and ambient intelligence technologies has resulted in emergence of smart environments and different services for a better quality of life and well being of the aging population. The aim are services providing comfort and security in their private space. Among them, the research in Smart Home (SH) has gained a lot of interest in the field of Ambient Assisted Living (AAL) technologies. The motivation behind the smart home research is the rapid increase in the world's aging population. According to the World Health Organization (WHO), the number of older people (aged 60 years or above) has