Evaluating Machine Learning Techniques for Activity Classification in Smart Home Environments

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Abstract : With the widespread adoption of the Internet-connected devices, and with the prevalence of the Internet of Things (IoT) applications, there is an increased interest in machine learning techniques that can provide useful and interesting services in the smart home domain. The areas that machine learning techniques can help advance are varied and ever-evolving. Classifying smart home inhabitants’ Activities of Daily Living (ADLs), is one prominent example. The ability of machine learning technique to find meaningful spatio-temporal relations of high-dimensional data is an important requirement as well. This paper presents a comparative evaluation of state-of-the-art machine learning techniques to classify ADLs in the smart home domain. Forty-two synthetic datasets and two real-world datasets with multiple inhabitants are used to evaluate and compare the performance of the identified machine learning techniques. Our results show significant performance differences between the evaluated techniques. Such as AdaBoost, Cortical Learning Algorithm (CLA), Decision Trees, Hidden Markov Model (HMM), Multi-layer Perceptron (MLP), Structured Perceptron and Support Vector Machines (SVM). Overall, neural network based techniques have shown superiority over the other tested techniques.

Keywords : activities of daily living, classification, internet of things, machine learning, prediction, smart home