MASTER'S PROJECT (SUMMER 2016)

TOPIC: ***A Deep Learning Approach to Recognizing Human Activities Using Convolutional Neural Networks***

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ABSTRACT

Human activity recognition (HAR) is a classification task that identifies a person's physical activities based on motion sensor data collected from a wearable device, such as a mobile phone. There are many useful applications of HAR, including medical diagnosis and assisted living, security monitoring, entertainment, and human vehicle interaction. Conventional machine learning approaches like support vector machines (SVM), k-nearest neighbors (k-NN), and decision trees, require expertise in the problem domain to design hand-crafted discriminative features. Different from them, in this project, we propose a deep learning approach to automatically extracting important hidden features from raw data. In particular, we adopt convolutional neural networks for HAR, where the neurons in a convolutional layer are connected only to a subset of the neurons in its previous layer, through a set of shared weights called a filter. A filter serves as a small pattern recognizer which is moved across the entire space to find specific patterns. In our approach, we systematically developed the deep network structure and compared its performance with fully connected neural networks. We also studied the impacts of the number of filters on a network's system performance as well as the relationship between the sampling rate and the filter size. Our experimental results show that a convolutional neural network can achieve very high prediction accuracy, which is less likely to overfit due to its smaller number of parameters compared to a fully connected neural network. The results also show that the prediction accuracy of the network can be improved by selecting a reasonable number of filters as well as a suitable filter size.