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Deep Convolutional Network Approach in Spike Train Analysis of Physiotherapy Movements

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Abstract. Classifying gestures or movements nowadays have become a demanding business as the technologies of sensors have risen. This has enchanted many researchers to actively and widely investigate within the area of computer vision. Physiotherapy is an action or movement in restoring someone's to health where they need continuous sessions for a period of time in order to gain back the ability to cope with daily living tasks. The rehabilitation sessions basically need to be monitored as it is essential to not just keep on track with the patients' progression, but as well as verifying the correctness of the exercises being performed by the patients. Therefore, this research intended to classify different types of exercises by implementing spike train features into deep learning. This work adopted a dataset from UI-PRMD that was assembled from 10 rehabilitation movements. The data has been encoded into spike trains for spike patterns analysis. Spike train is the foremost choice as features that are hugely rewarding towards deep learning as they can visually differentiate each of the physiotherapy movements with their unique patterns. Deep Convolutional Network then takes place for classification to improve the validity and robustness of the whole model. The result found that the proposed model achieved 0.77 accuracy, which presumed to be a better result in the future.

Keywords: Convolutional Neural Network, Spike Train, Rehabilitation, Deep Learning.

1 Introduction

Physiotherapy, also known as physical therapy, is an ongoing treatment for those who struggle with serious illnesses, such as stroke, Parkinson's, post – surgeries, etc. This therapy is extremely helpful in order for the patients to cope with their daily living tasks due to their movement's impairment. The assessment movements usually will be prescribed according to the patient's condition within their own pace as the movement for a patient may not be equally adequate for others [1]. Furthermore, the patients need to be monitored while performing the movements so that they execute correct movements and their progression can be tracked by medical experts. However, lack of experts makes physiotherapy session to be delayed and cause discomfort to the