An adaptive approach to detect epileptic convulsions in children using extreme value statistics.

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ABSTRACT

Nocturnal home monitoring of epileptic children is often not feasible due to the cumbersome manner of seizure detection with the standard method of video/EEG-monitoring. We propose a method for hypermotor seizure detection based on accelerometers that are attached to the extremities. Hypermotor seizures involve violent movements with the arms or legs, which increases the need for an alarm system as the patient can injure himself during the seizure.

In the literature, classification models are commonly estimated in a supervised manner. Such models are estimated using annotated examples. This annotation of data requires expert (neurologist) interaction and results therefore in a substantial cost in the estimation process of the seizure detection model. In this work we propose the use of an unsupervised approach for estimating seizure detection models. Our method does not require any annotation of data while obtaining state-of-the-art classification scores that are comparable to those of models estimated in a supervised manner. The unsupervised method can easily be adapted to facilitate continuous learning where performance increases over time. The proposed methodology is based on extreme value statistics.

Using this approach we were able to detect all hypermotor seizures in 5/7 patients with an average PPV of 45.52% over all patients.

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