

annotate the activities during recordings. Since expert actors were recorded instead of epilepsy patients, heart rate and breathing pattern reacted with a delay and caused by the physical activity related to simulated seizures, rather than an actual seizure. Thus, ECG and respiratory data was considered to assess the CRNTC+ framework scalability, but excluded from further analysis. Experimental set up is shown in Figure 4.



Figure 4 CRNT+ experimental setup (left: subset of sensors used to detect seizures events, right: sensors worn by the actor and connected to the framework).

### 2.6.2 Epilepsy study results

Approximately 40 min of continuous recording were acquired per participant. Data was segmented using a window size of 100 sa. Variance of the 3D accelerometers unit placed on both the upper arms and on the dominant wrist was analysed and used in a two-class classification (seizure against non-seizure). All analyses were performed using the CRNTC+ and a frame-based evaluation. First, to train an offline kNN classifier ( $k=3$ ), 500 samples per class were randomly selected from data from both actors. Remaining samples were used for testing. Subsequently, to test the feasibility of real-time seizure detection, the configuration was tested online. For practical application we considered that the system should alarm within one second from the start of a seizure. To satisfy the real-time constraint of the online evaluation, the training set needed reduction to 100 samples and only one sensor was used. The performance limiting factors for the real-time analysis were the Shimmer sensor data transmission and the classifier processing. The offline detection test using 3 accelerometers, showed a class specific accuracy of 74% for seizure event and 64% for non-seizure. For the one-sensor configurations, 72% and 59% was obtained for the upper left arm, 76% and 63% for the upper right arm, and 81% and 62% at the wrist, for seizure events and non-seizure times respectively. Subsequently, the right wrist sensor was chosen to test online recognition performances. Figure 5 summarizes the performance results. For the online recognition, the reduced training set resulted in a deteriorated performance, with 78% for seizure events and 55% for non-seizure times. After