**EEG Event Detection Using Deep Learning**

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Automated data wrangling for physiological signals commonly found in healthcare, such as electroencephalography (EEG) signals, requires identification and localization of events in time and/or space. Deep learning systems, which can achieve impressive levels of performance on such sequential data, require vast amounts of annotated data, often referred to as Big Data, to achieve high performance. Normalization of data with respect to annotation standards, recording environments, equipment manufacturers and even standards for clinical practice, must be accomplished for technology to be clinically relevant. Many decision support systems in healthcare could be successfully automated if such data resources existed. In this demonstration, we will introduce a high performance system for EEG event detection that enables keyword searches of a large archive of EEG signal data and can be used for automated data wrangling.

This baseline system integrates low-level event processing using hidden Markov models with higher-level event interpretation using deep learning. Self-training has been used to facilitate semi-automated annotation of training data. A supervector approach to feature extraction coupled with Principle Component Analysis has been used for spatial localization of key events such as seizures. A stacked denoising autoencoder has been used to postprocess event hypotheses and convert these into term hypotheses. A new term-based scoring process, popular in evaluation of audio-based keyword search systems, is introduced and compared to several existing evaluation methodologies. Several new research resources based on the TUH EEG Corpus, developed to enable this research, will also be introduced. A Python-based demonstration of an EEG visualization tool will be provided as well.

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