**Active Deep Learning-Based Annotation of Electroencephalography Reports for Cohort Identification**

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**SESSION TOPIC: Software Methods & Development**

The annotation of a large corpus of Electroencephalography (EEG) reports is a crucial step in the development of an EEG-specific patient cohort retrieval system. The annotation of multiple types of EEG-specific clinical concepts is challenging, especially when automatically performed on Big Data. To address this challenge, we developed a novel framework which combines the advantages of active and deep learning. Our Multi-task Active Deep Learning (MTADL) paradigm performs concurrently multiple identification tasks for: (1) EEG activities and their attributes, (2) EEG events, (3) medical problems, (4) medical treatments and (5) medical tests, along with their inferred forms of *modality* and *polarity*.

An important step of the MTADL paradigm was the design of the deep learning architectures capable to identify multiple forms EEG-specific clinical concepts. We experimented with two deep learning architectures. The first architecture aims to identify (1) the *anchors* of all EEG activities; as well as (2) the boundaries of all mentions of EEG events, medical problems, medical treatments and medical tests. The second architecture was designed to recognize multiple attributes considered for each EEG activity, as well as the type of the EEG-specific medical concepts. In addition, the second deep learning architecture identifies the modality and the polarity of EEG-specific concepts. The ability to learn jointly multiple types of concepts and attributes was made possible by the sampling mechanism used in the MTADL paradigm, based on the *rank combination* protocol, which combines several single-task active learning selection decisions into one.

Submitting Author’s Career Stage: Professor