071: Predicting Deep Brain Stimulation Outcomes Using Intra-Operative Stimulation Test Data

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Deep Brain Stimulation (DBS) is an effective treatment for movement disorders. Optimizing stimulation parameters remains, however, a trial-and-error process. Data-driven models leveraging Probabilistic Mapping have shown promise in predicting DBS outcomes, yet current studies rely on chronic stimulation data. This study explores the feasibility of using intra-operative stimulation test data for DBS effect prediction.

Probabilistic volumes of beneficial and adverse effects were computed from intra-operative stimulation test data of 65 patients (23 with Essential Tremor + 42 with Parkinson's Disease). A prediction dataset was generated including clinical, morphological and stimulation features along with features derived from probabilistic maps and simulated Volumes of Tissue Activated. Three machine learning models (Adaboost, Support Vector Classifier and Naïve Bayes) were implemented to predict stimulation effects in a classification task. The models were validated in a leave-one-out cross-validation and their performances were compared.

All the developed models were able to predict DBS outcome classes. The best predictive performance was achieved by the Adaboost model with a maximum balanced accuracy of 0.71 on 3 classes. These results show that intra-operative stimulation test data can predict DBS effects with a similar approach and comparable accuracy to post-operative monopolar review data