Artificial intelligence system, based on mjn-SERAS algorithm, for the early detection of seizures in patients with refractory focal epilepsy: a cross-sectional pilot study

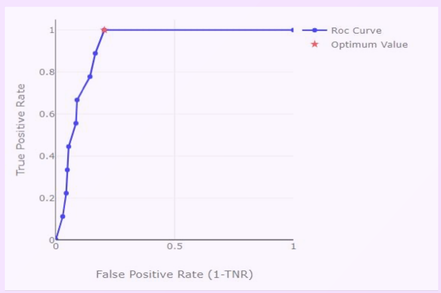
INTRODUCTION

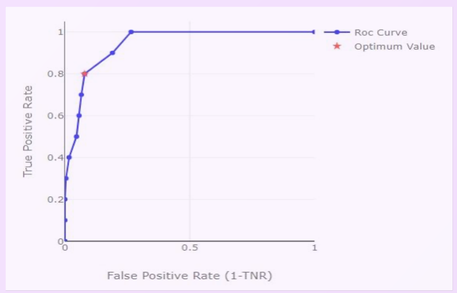
This study aims to determine **whether an AI algorithm developed by MJN Neuroserveis can detect seizures early using patient-specific data** to create a personalized mathematical model based on EEG training.

ROC CURVE

mjn-Seras algorithm individualized ROC curve for seizure detection in two patients. Red point represents the optimal compromise between sensitivity Vs specificity.

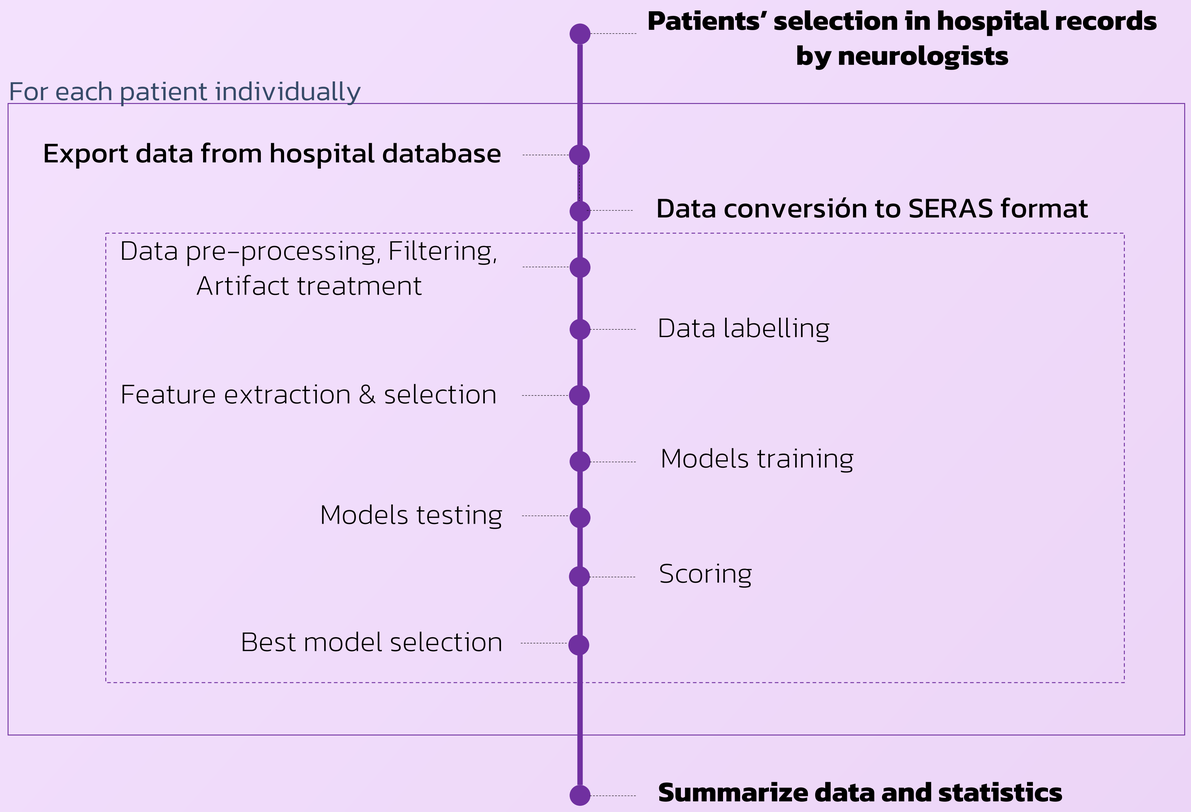
ROC, receiver operating characteristic
TNR, True Negative Rate.





METHODS

The study is retrospective and cross-sectional, observational, and multicenter. The sensitivity and specificity of the AI algorithm were analyzed using a **dataset of 49 patients with refractory focal epilepsy who underwent video-EEG monitoring lasting from 3 to 5 days**. The algorithm identified preictal and interictal patterns from EEG data and was compared to a senior epileptologist's evaluation as a gold standard. Individual mathematical models were trained using this feature dataset.



RESULTS

The results of the study are:

1,963 hours
of EEG recordings analysed

39.26 average
hours per patient

119 seizures
used to train the algorithm

309 seizures
captured and validated by epileptologists

188 seizures
used for split testing

10
false negatives

94.7%
sensitivity of the automated AI algorithm

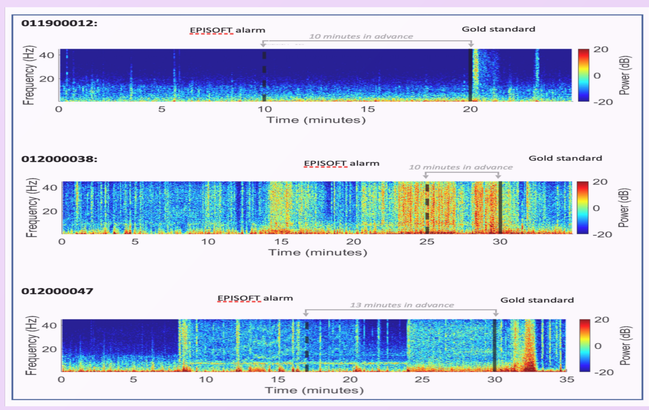
22
false positives

92.2%
specificity of the automated AI algorithm

0.55/24 hours
false positive rate in patient –independent model

CONCLUSIONS

This patient-specific AI algorithm for early seizure detection **shows promising results in terms of sensitivity and false positive rate**. Although the algorithm requires high computational requirements on specialized servers in the cloud for training and computing, its computational load in real-time is low, allowing its implementation on embedded devices for online seizure detection.



Selected spectrograms of three study subjects. The dotted line shows the time of alarm identified by AI and the solid line the onset of seizure with current standard.

AUTHORS

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