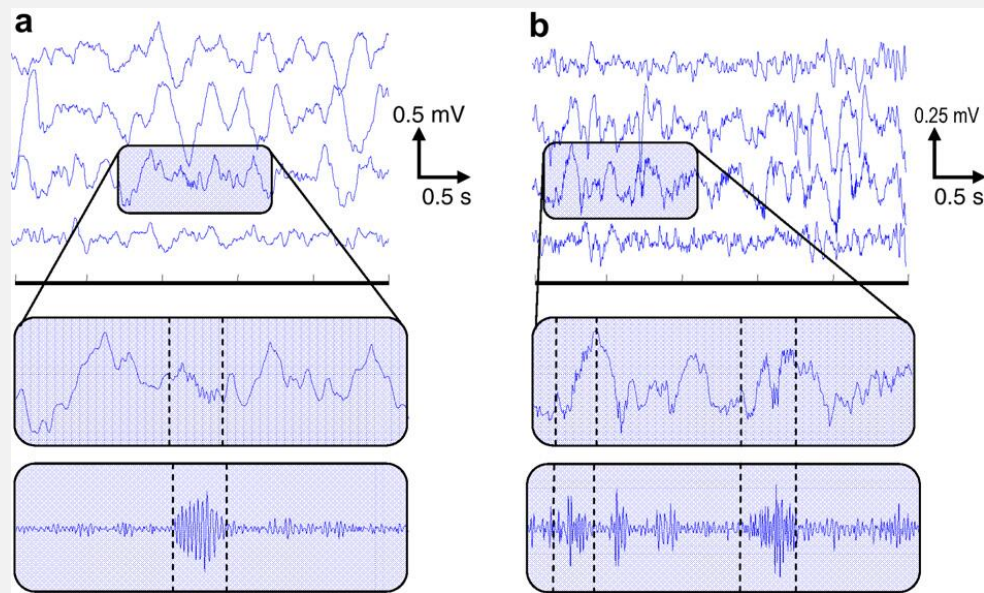


Background

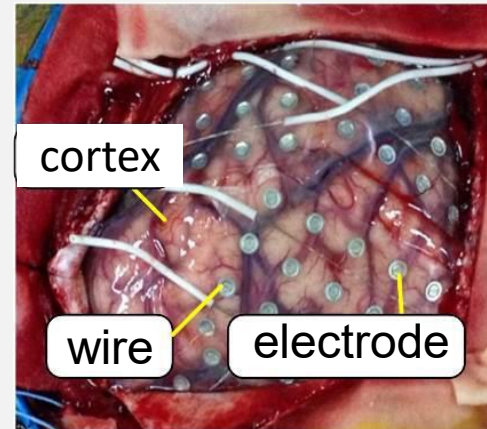


Q: What is the importance of HFO signal ?

A: HFO has its clinical significance in the treatment of epilepsy.

Data preparation

Data Acquisition



Initial HFOs Detection

Short Time Energy (STE):

$$E^*(t) = \frac{1}{N} \sum_{k=t-N+1}^t x^2(k)$$

$$E_0 = E_{av} + k * SD$$

Manually Labeling



Method

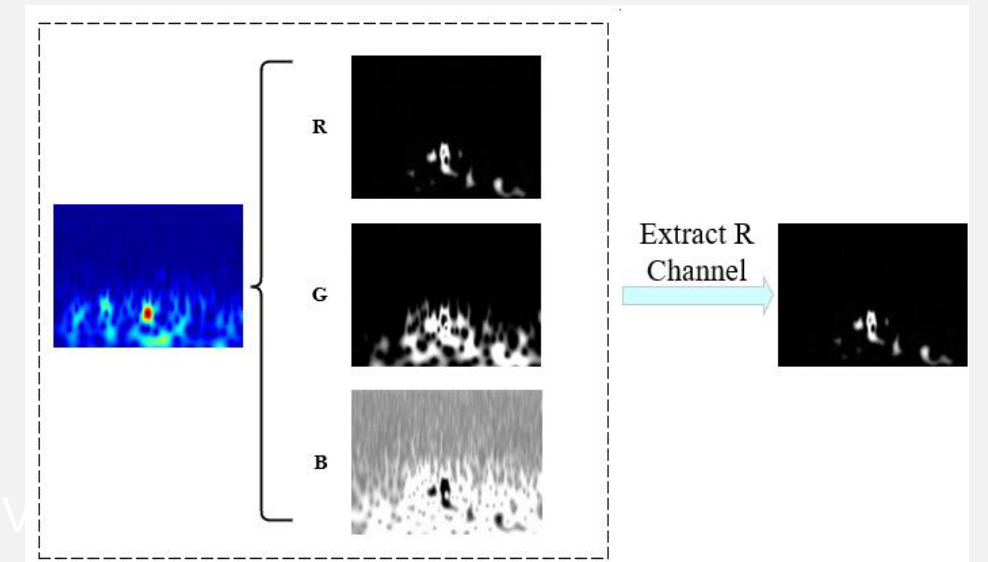
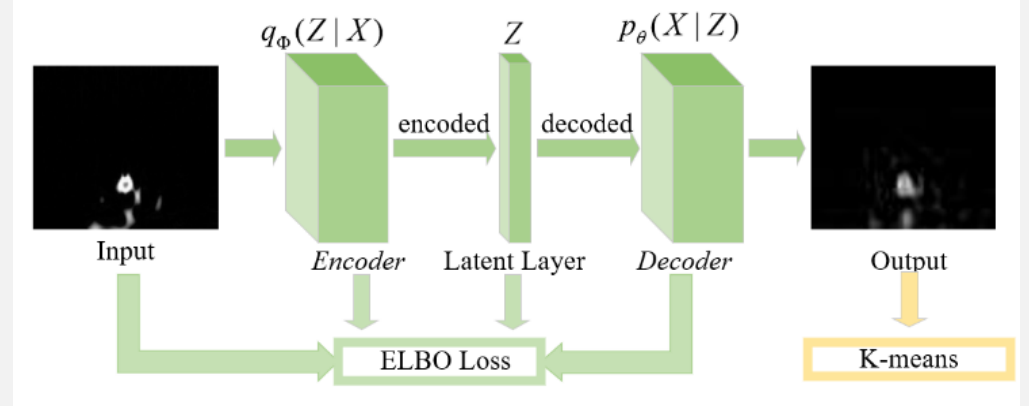
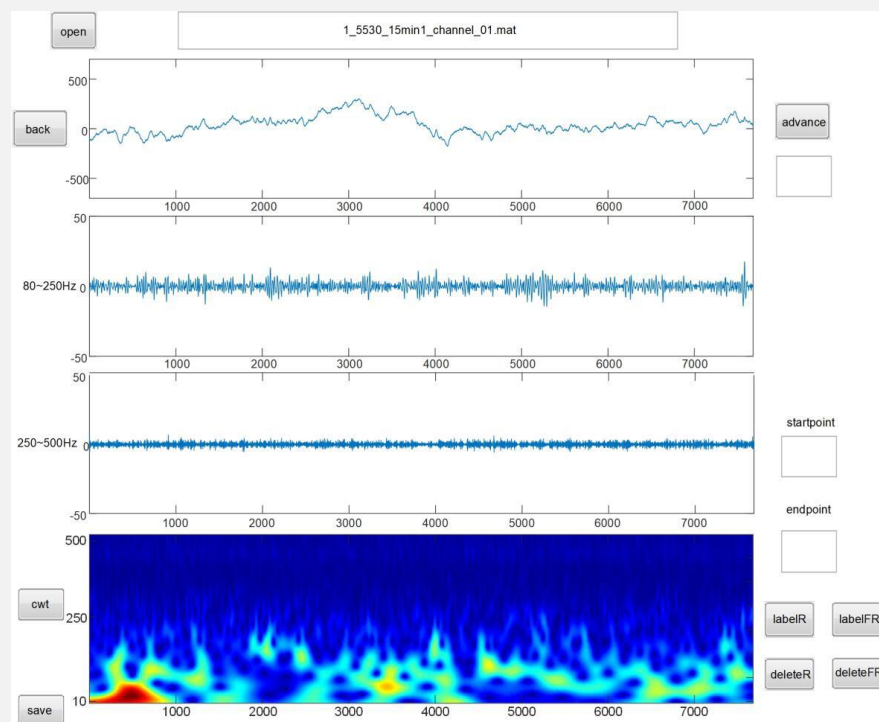


Diagram of extracting red channel from TFM.



CVAE-based HFOs detector.

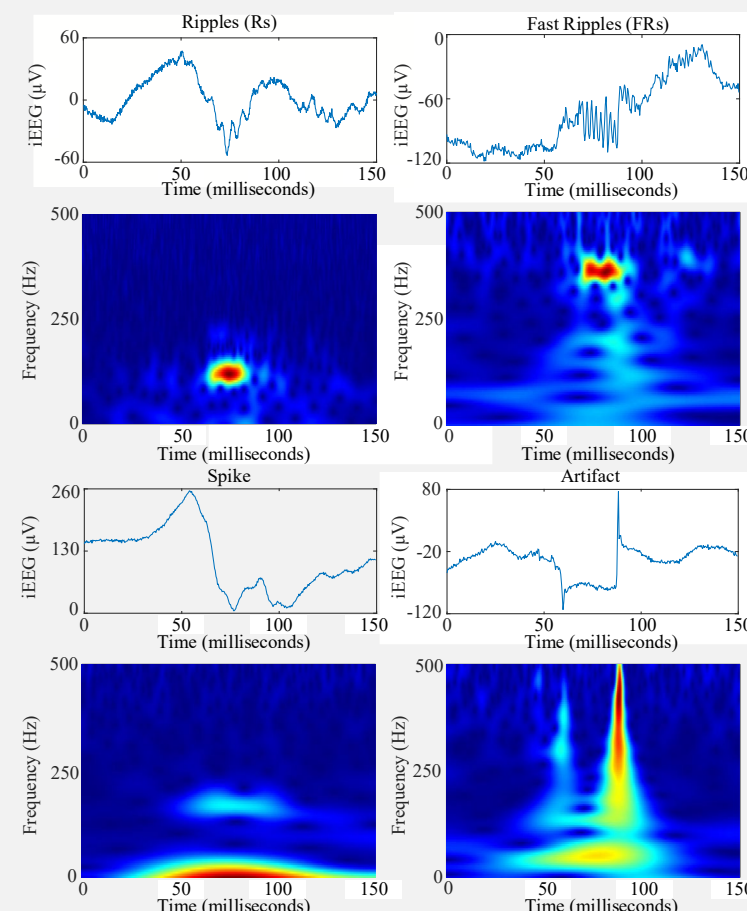
Motivation



Labeling process by experts

And there are many features selected by experts

Method



Experiments

Table 1. Statistical results of SC (Hz)

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Median	227.7	263.8	51.6	29.1
Mean	226.3	266.4	124.8	29.7

Table 2. The differences of procedure and performance comparison of clustering results of TFM, R-TFM, and reconstructed R-TFM

Dataset	Procedure		
	CWT	Extract red channel	CVAE
TFM	✓		
R-TFM	✓	✓	
Reconstructed R-TFM	✓	✓	✓
Clustering results of three datasets			
	ACC	SEN	SPE
TFM	80.13%	76.28%	82.68%
R-TFM	89.38%	82.99%	93.62%
Reconstructed R-TFM	92.85%	93.91%	92.14%

Table 3. Comparison of the proposed method with existing methods on the same dataset

Year	Methods	ACC	SEN	SPE
2012	RBF Neural Network [21]	79.64%	68.40%	87.08%
2017	RFB-SVM [9]	85.06%	83.80%	85.89%
2018	FCM Based EM-GMM [22]	82.93%	74.61%	88.44%
2019	2D-CNN [23]	91.26%	78.65%	99.62%
	Proposed CVAE	92.85%	93.91%	92.14%