EPILEPTIC SEIZURE DETECTION

CHALLENGES: Health, demographic change and well-being

PRODUCTIVE SECTOR: Healthcare and medical

PROBLEM DESCRIPTION

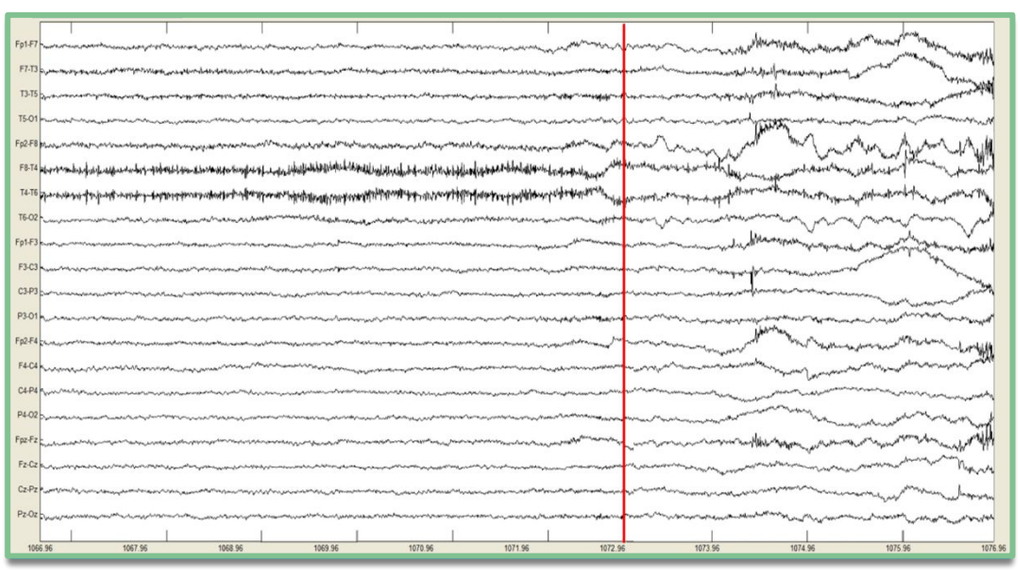
Exploration of the possibility of improvements in an emerging technology for the treatment of the epileptic patients resistant to medication (comprising 30% of all).

CHALLENGES AND GOALS

Forecasting epileptic seizures based on information extracted from highly complex patterns of brain electrical activity recorded via EEG or implantable thumbtack electrodes.

MATHEMATICAL AND COMPUTATIONAL METHODS

For the description of neuronal firing patterns self-exiting point processes or Hawkes processes are used, reflecting the assumed dynamics of neuronal firing. A new class of computationally tractable state-space models has been developed, and extensive computational experiments to test a maximum likelihood method both on simulated and real (animal and human) data have been carried out.



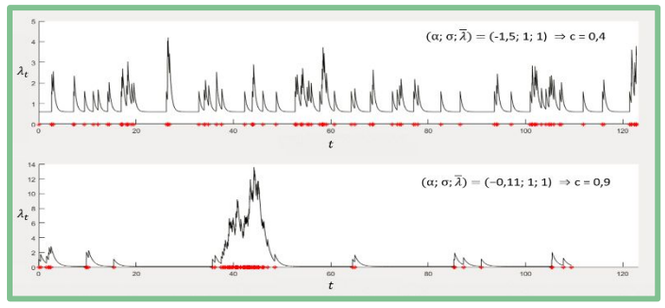
A 24 channel EEG with the red line indicating the onset of a seizure.

EPILEPTIC SEIZURE DETECTION

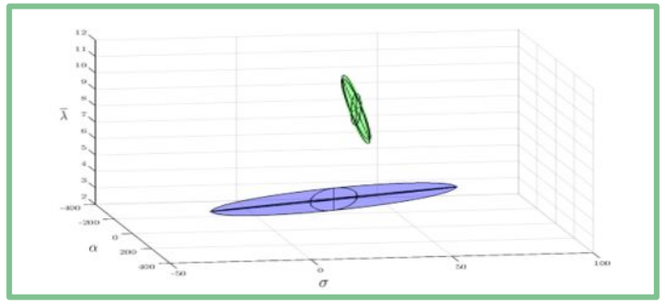
Results and Benefits

The partially published results of the project serve as mathematically rigorous and computationally tested components for future joint research and development in the area, reinforcing interest in future collaboration.

A viable link between the company and front-line mathematical technologies and services has been established.



Intensities of simulated Hawkes processes



Confidence ellipsoids for two Hawkes processes

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