

# EPILEPSIAE

## Evolving Platform for Improving Living Expectation of Patients Suffering from Ictal Events

The mission of EPILEPSIAE is to use Information and Communication Technologies to empower the epileptic patients to monitor their own risks and improve their safety in daily life, strengthening their social integration.

The project will have three main outputs: a large European Database on Epilepsy, a computational framework for research in seizure prediction (EpiLab) and a transportable device for seizure prediction and warning (Brainatics).

### The Database

An Oracle Database, well annotated, is being filled by the partners. Actually it has more than 200 patients from Paris, Freiburg and Coimbra. It includes all meta information about the patients, admissions, EEG events, data from all EEG and ECG channels, and imaging data. It has functionalities easing the manual input of data and further working is being done to allow the automatic downloading of the metadata and the EEG raw data from some data formats (such as trc and csv files).

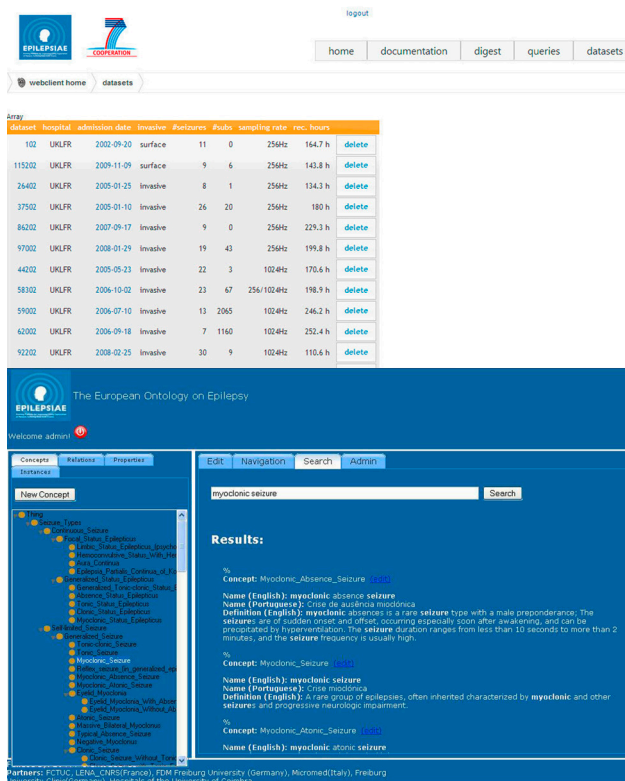


Fig.1 - (a) Database client for the database (b) The epilepsy ontology

Some semantic mining capabilities will be developed to support the use of the database. Actually an ontology has been developed, following the terminology of the ILAE (International League Against Epilepsy).

### The EpiLab

EpiLab offers the possibility to apply seizure predictions algorithms, together with a broader set of Electroencephalogram (EEG) and Electrocardiogram (ECG) features. It was developed in an object oriented approach, promoting the future easy incorporation of other methods. It performs streaming over MATFiles®, preventing from memory problems. EpiLab implements a four-step processing framework. In the first step data can be preprocessed, i.e. several filters can be applied to the data. After preprocessing, in the second step features can be extracted from EEG/ECG data. Features are grouped into three categories: EEG Univariate; EEG Multivariate, and ECG. On the third step EpiLab enables the application of feature reduction algorithms, such as principal component analysis and multidimensional scaling. The fourth and last step encompasses the application of prediction algorithms. Actually two classes of prediction algorithms are included: computational intelligence algorithms (neural networks, support vector machines, cellular

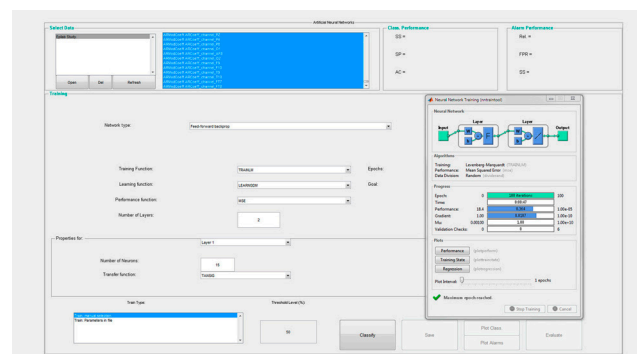
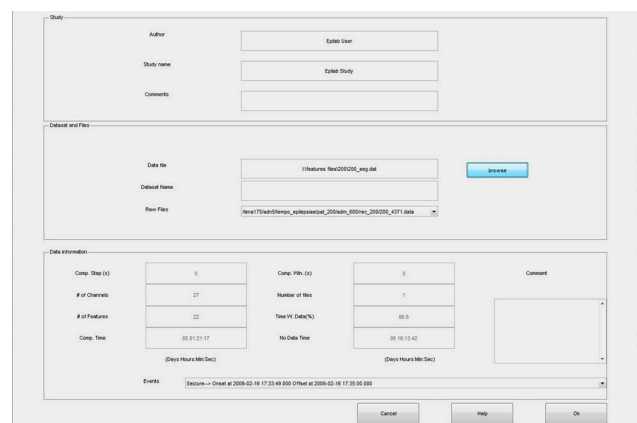


Fig. 2 - The EpiLab. (a) Opening a study (b) Seizure prediction algorithms available

neural networks), and circadian multivariate measures algorithms. It has also a statistical seizure analyzer. Using EpiLab an extensive study with 70 patients has been made, showing very promising results in seizure prediction, although extensive improvements are still needed in predictors development and training.

## The Brainatics

Brainatics is being developed by the industrial partner: the Micromed Italian company. It integrates a high speed, high number of channels, low power EEG recorder (LTM-EU), a state-of-the-art acquisition interface for data link over cable (BQPCle), the set-up of a wide area, low-power wireless connection for monitoring purposes, the development of a software suite to manage the acquisition and the data.

The Brainatics has been delivered to the clinical partners (University Hospitals of Paris, Freiburg and Coimbra) and the first experiments in clinics are scheduled for the end of 2011.

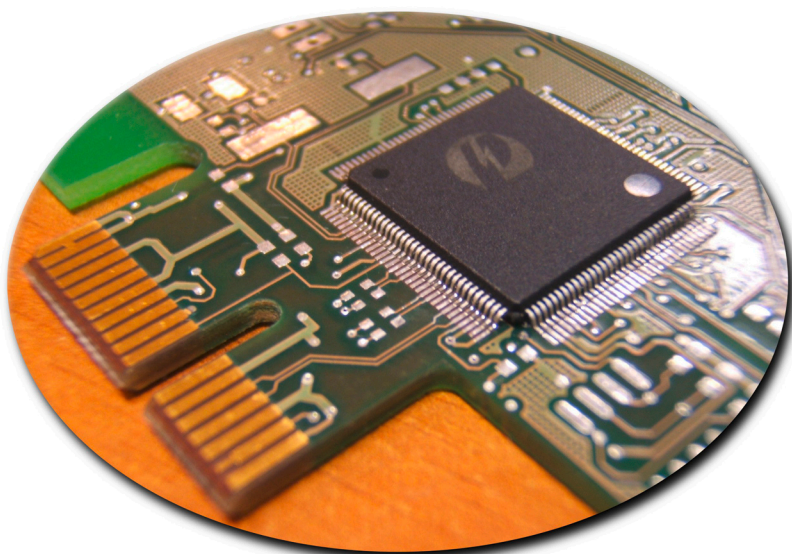
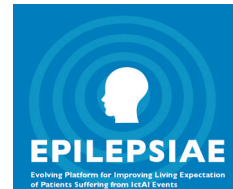


Fig. 3 – The Brainatics (a) The BQPCle interface (b) The EU-LTM prototype



### EPILEPSIAE

**Evolving Platform for Improving Living Expectation of Patients Suffering from IctAI Events**

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- Albert-Ludwigs-Universitaet Freiburg (Germany)
- Universitätsklinikum Freiburg (Germany)
- Micromed S.p.A. (Italy)
- Hospitais da Universidade de Coimbra (Portugal)

**Timetable:** from January 2008 to December 2010

**Total cost:** € 4,150,000

**EC funding:** € 2,920,000

**Instrument:** STREP

**Project Identifier:** ICT- 2007-211713

**Contract type:** Information and Communication Technologies CP Collaborative Project

#### KEYWORDS

Biomedical informatics, Medical databases, Signal processing, Wearable medical systems, Clinical applications