







# **Epilepsy**

"Epilepsy is the commonest serious brain disorder, affecting up to 1% of the population worldwide"









## What is ARMOR?

"Advanced multi-paRametric Monitoring and analysis for diagnosis and Optimal management of epilepsy and Related brain disorders"









## **General Information**

- ARMOR project is partially funded under 7<sup>th</sup> Framework Programme (FP7)
- Call: FP7-ICT-2011-7 (STREP)
- Starting Date: 01/10/2011
- Duration: 36 months
- Project Coordinator: Sensing & Control Systems
   S.L.
  - Coordinator: Dr. Narcís Avellana
  - Scientific Coordinator: Prof. Vasileios Megaloikonomou









## **Overview**

ARMOR will design a more holistic, personalized, medically efficient and economical monitoring system for people with epilepsy.

Flexible monitoring optimized for each patient

Tested in several case-studies

Ambulatory monitoring tool for detecting premonitory signs

Feedback to the patient









## **Scenarios**

## Offline

# Online

#### **SCENARIO1**

Epilepsy or nonepileptic paroxysmal events (NEPE)

### **SCENARIO2**

Delineation of the clinical EEG expression of different types of epilepsy

#### **SCENARIO3**

Follow Up – Medication evaluation

### **SCENARIO5**

Research on local signs of idiopathic generalized epilepsy

### **SCENARIO6**

Pre-surgical evaluation

#### **SCENARIO7**

Nocturnal Seizure

#### **SCENARIO 4**

Protection from seizures

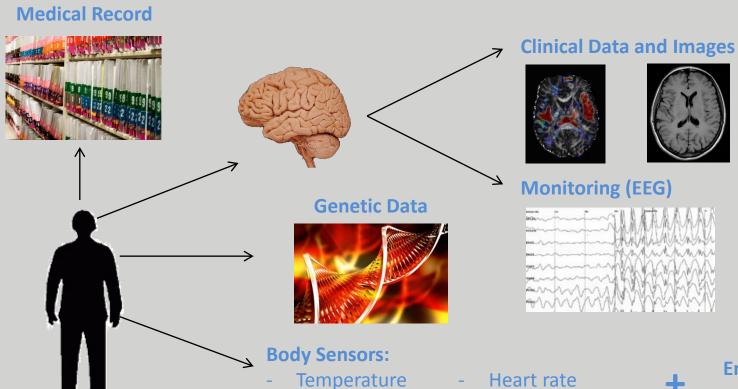








# **Multi-parametric Data Adquisition**



Blood pressure

EMG, EOG, GSR...









Accelerometer



**Environmental Sensors** 

## **ARMOR Sensors**

## **EEG-Sensor/EOG-Sensor**

Electroencephalography

#### **ECG Sensor**

Electrocardiogram

## **Activity Sensor**

3 Dimensional acceleration

sensors

### **GSR Sensor**

Galvanic Skin Response

### SPO2-Sensor

Saturation of peripheral

oxygen

## Respiration

### **EMG-Sensor**

Electrical activity produced

by skeletal muscles

## Context, environmental signals

Light and sound









# Multi-parametric Data Processing & Analysis (i)

Data Acquisition from Multiparametric Sensors

## **Data Storage**

- · Preprocessing sensor data
- Data and dimensionality reduction

#### **Data Fusion**

Keep sensor data appropriate for alerting

### **Streaming Data**

Adjustment real time prediction model parameters

Store results

### **Local Site**

#### **REAL TIME ANALYSIS**

- Real time decision support tool for advising the patient producing warnings, handling emergency situations
- Data mining
- Personalised analysis based on patient's profile

**Health Center** 

- Remote health monitoring system
- Medical Expertise
- Medical Database: Sensor measurement, patient profile and current status, already available related data from previous studies



### **Data Fusion**

Use stored data in large scale data analysis

### **Communication with DB**

- Modify patient's current status
- Store lab test's results

#### **OFFLINE ANALYSIS**

- Analysis of multiparametric sensor data in health centers
- Data fusion and correlation with imaging data, genetic data, etc.
- Lab tests to advance clinical knowledge in neuroscience and epileptology

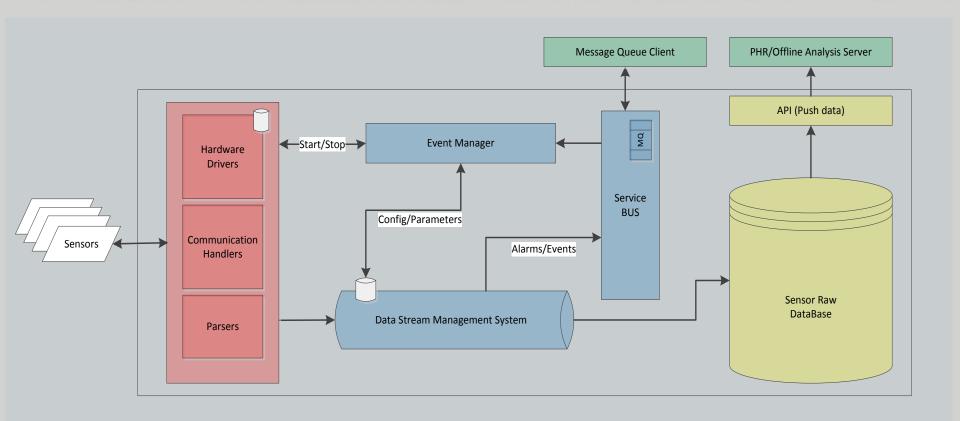








# Multi-parametric Data Processing & Analysis (ii)











# Multi-parametric Data Processing & Analysis (iii)

## Offline Data Processing & Analysis

## **Pre-Processing**

**Filtering** 

**Outlier Detection** 

Data Transformation

Summarization/ Feature Extraction

## **Analysis**

**Correlation Analysis** 

**Pattern Discovery** 

Detection of Epileptic Seizures

Detection of Events of Interest

**Data Fusion** 

Creation of models of different types of epilepsy

Support on Decision Making

Personalized Patient Health Profiles (PHPs)









# Multi-parametric Data Processing & Analysis (iv)

## Online Data Processing & Analysis

Online Analysis will incorporate all necessary processing techniques adopted to the streaming nature of the data, in order to perform real-time:

- Detection of Seizures
- •Detection of abnormal values (patient-specific) from several modalities like
  - Excessive tachycardia
  - Oxygen level excursions
- •Other possible emergency situations

Online Processing involves tasks such as:

- Preprocessing
- Data Fusion
- •Decision making which will be performed with respect to processing time and memory constraints.

Online analysis will involve results from offline analysis in order to adjust parameters according to each patient's personal profile.

Minimal Data Requirements (e.g. number of sensors) will be incorporated with respect to the medical expectations and the desired levels of accuracy









# **Expected Results**

INCREASE OUR UNDERSTANDING

2 MONITORING AND
ANALYSIS APPROACH

3 GUIDANCE OF DIAGNOSTIC WORKOUT

DETECT LIFE THREATENING SEAZURES









## Consortium



Sensing & Control Systems S.L



Karlsruher Institut fuer Technologie

**GERMANY** 



Technological Educational Institute of Mesolonghi GREECE



**University of Patras GREECE** 



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## **More Information**

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# Thank you for your attention







