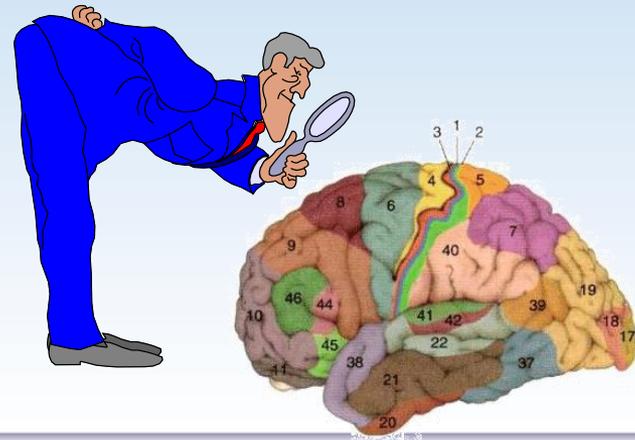


## Networks of Cognition, People and Computers against Alzheimer's disease: an Italian idea from European to Regional scale (DECIDE)

*Claudio Babiloni on behalf of DECIDE Consortium*

IRCCS San Raffaele Pisana, Rome  
University of Foggia



# An Italian idea goes to Europe: the **DECIDE** project

## Public

### Patient Group:

Alzheimer Europe

### Academic Institutions:

- **GARR** (Co-coordinator), Rome
- University of Milan Vita-Salute San Raffaele, Italy
- COMETA, Catania, Italy
- CNR of Milan, Italy
- **University of Foggia, Italy**
- University of Genova, Italy
- University of Warrsaw, Poland
- Imperial College, London UK
- Centre hospitalier universitaire de Toulouse, Toulouse - France

## Private

### Small and Medium Enterprises (SMEs):

- IRCCS Fatebenefratelli  
Brescia, Italy
- IRCCS SDN Naples, Italy
- MAAT G, Geneve, Ch



**EC Call: FP7-INFRA-2010-2 – VRC**  
“Neurodegenerative disorders”  
2008

Contract n: RI-261593 \_ Project type:  
CP-CSA

Duration: 30 months (September  
2010- February 2013)

Coordinator: GARR

Total cost: € 2.4 M €

# Overview of DECIDE diagnostic service

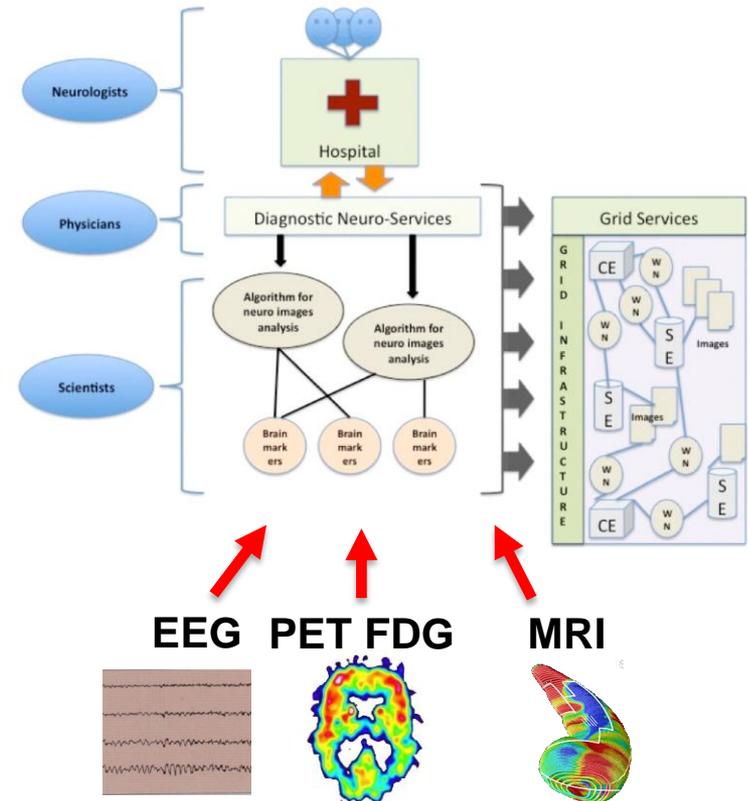
Provide the Neuroscientific and Medical community with a dedicated e-Infrastructure relying on GÉANT, EGI and NeuGrid

Deploy a secure and user-friendly service for the early diagnosis and research on dementia and other brain diseases linking large distributed DBs of multi-modal neuro-images

Validate the e-Infrastructure and the service with real patient cases

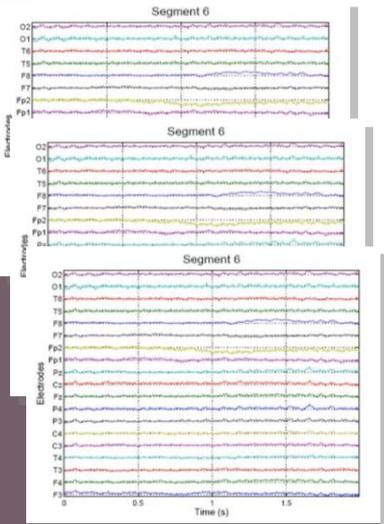
Propose a business model to ensure the sustainability of the infrastructure after the end of the project and facilitate its extension to new communities and pathologies

Disseminate the results and provide training programmes promoting the adoption of the DECIDE infrastructure and service



# GridEEG application

## GridDATALOAD



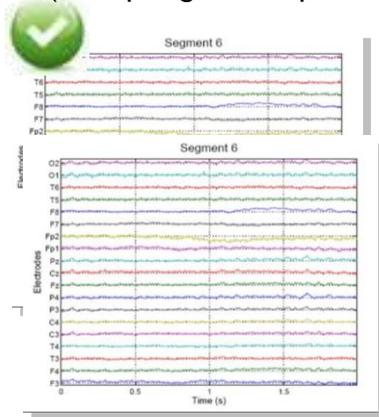
nameEEGtrials.txt

(2-sec EEG epochs in ASCII format)

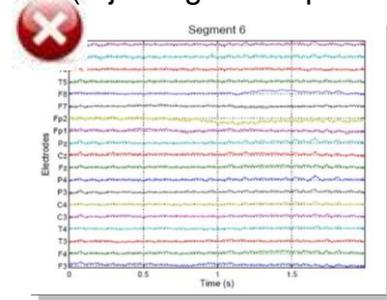
Data upload

## GridEEGQUALITY

(accepting EEG epochs)

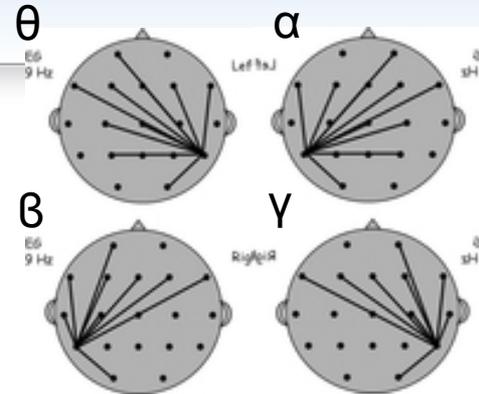


(rejecting EEG epochs)



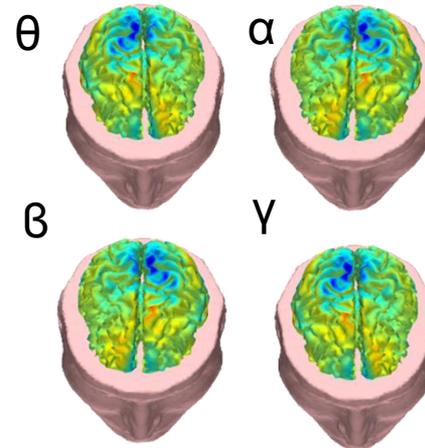
Preprocessing  
artifact detection

## GRidDTF/COHERENCE



Model order, Frequency resolution

## GRidEEGSOURCE

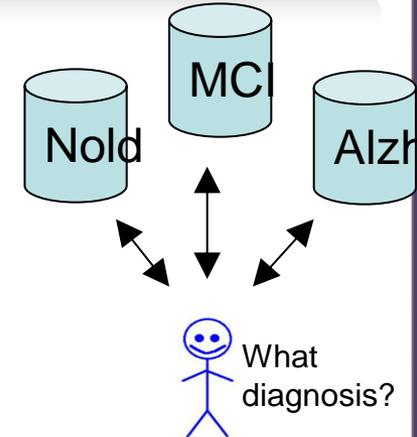


Window, Frequency resolution,...

Processing & markers

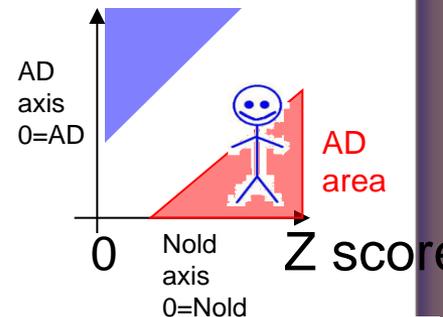
## GridEEGSTAT

reference EEG databases



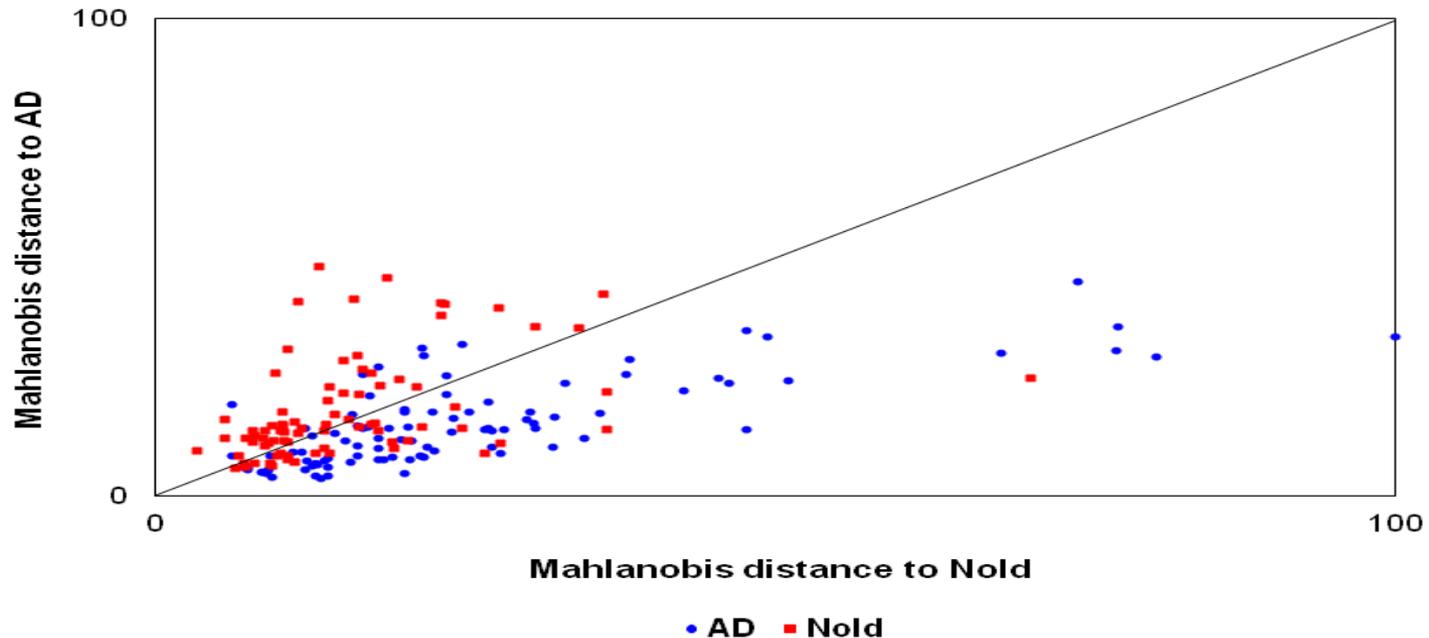
nameEEGreport.pdf

Z score<sub>Nold area</sub>



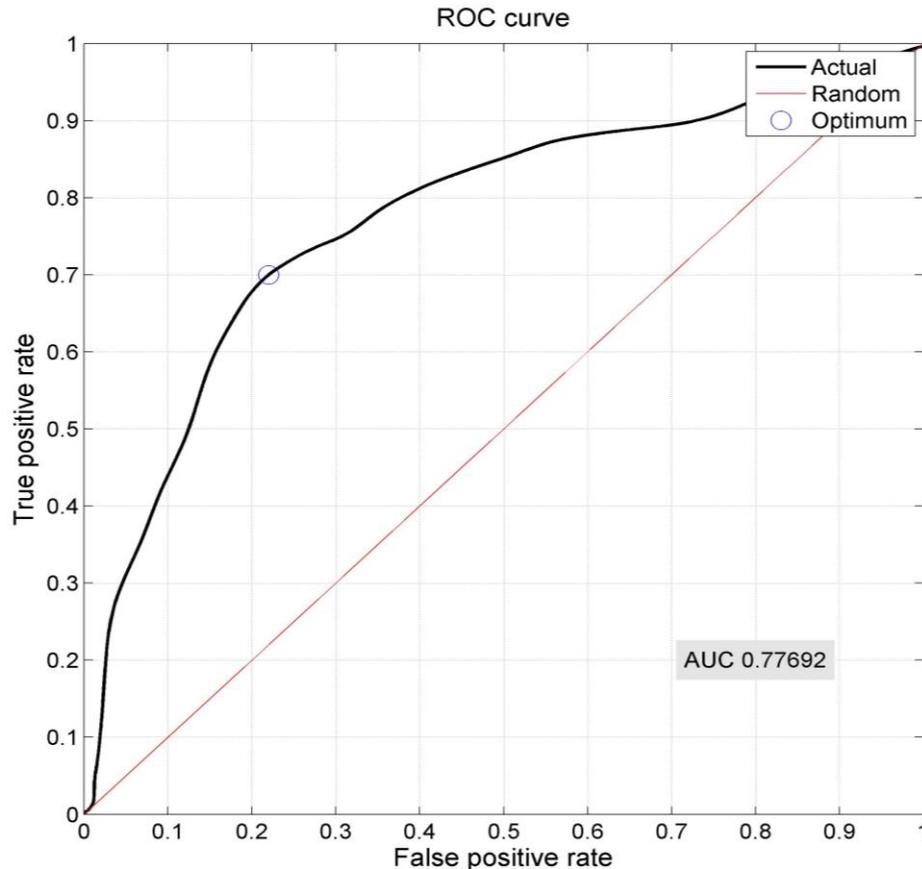
Statistics &  
send report

# Accuracy of benchmark EEG markers: mean Mahlanobis distance



*Bi-dimensional graph showing the distribution of all 82 Nold and 96 AD subjects of the Mahalanobis distance to the reference Nold and AD populations. The Mahalanobis distance was computed with reference to the mean values of the Nold (vertical axis) and AD (horizontal axis) populations within the 4-dimension space, namely 2 dimensions for the EEG spectral coherence (Fz-Pz at delta and alpha 1) and 2 dimensions for the LORETA source power (occipital delta and alpha 1). Ideally, the higher the Mahalanobis distance to a given population, the lower the probability to belong to that population. The Nold subjects are denoted by red squares, while the AD are denoted by blue circles.*

# Accuracy of benchmark EEG markers: results



Results about classification performance of the mentioned 4 EEG variables showed **80.2% of mean sensibility, 61.8% of mean specificity, and 71.8% of mean accuracy** over 100,000 classification rounds using “training” (80%) and “testing” (20%) sub-populations of AD and Nold datasets.

*Mean ROC (receiver operating characteristic) curve illustrating the performance of the classifier using Mahalanobis distance of the individual EEG datasets from Nold and AD population reference values. **Area under curve (AUC) was of 0.78** (moderate classification performance; Swets, 1998). True positive rate indicates the probability of the correct classification of AD datasets (sensitivity), whereas false positive rate indicates the probability of the correct classification of Nold datasets (specificity). The horizontal axis indicates 1-false positive cases. Optimum values of the cut off optimizing sensitivity and specificity is plotted (circle).*

# The first expansion of DECIDE to Italian level: the project **GRID-CORE** for cognitive rehabilitation in AD and PD

## Public

### Academic Institutions:

- **GARR**, Rome
- University of Milan Vita-Salute San Raffaele, Italy
- - COMETA, Catania, Italy
- Catholic University of Rome Italy

## Private

### Small and Medium Enterprises (SMEs):

- **IRCCS San Raffaele Pisana**, Rome, Italy  
(Coordinator)



### Bando Ricerca Finalizzata: RF-2010-2319113

**“GRID-based System for the Evaluation of the effects of Cognitive Rehabilitation in Patients with Alzheimer’s Disease and Parkinson’s Disease” 2010**

Duration: 36 months (2013-2015)

Coordinator: IRCCS San Raffaele Pisana

Total cost: € 241.340 M €

# Aims and Impact

- Extend the DECIDE diagnostic service to additional 2 clinical units such as IRCCS San Raffaele Pisana of Rome (PISANA) and Catholic University of Rome (UNICAT)
- Develop new facilities/services of the DECIDE e-infrastructure to monitor disease progression and response to treatment and cognitive rehabilitation.
- Develop and validate new freeware procedures for cognitive rehabilitation in mild AD and PD with dementia patients based on touch screen technology to be used at home or care home by means of caregivers.

# The expansion of DECIDE to regional level (Puglia): the module MINDBRAIN of the project **SMART HEALTH** for AD

## Public

### Academic Institutions:

1. Consiglio Nazionale delle Ricerche, Italia
2. IRCCS Istituto Tumori Giovanni Paolo II, Bari Italy
3. Università di Bari "Aldo Moro", Bari, Italy. Sub-contractor **Università degli Studi di Foggia**, (UNIFG),
4. Centro Regionale ICT, Italy

## Private

### Small and Medium Enterprises (SMEs):

1. Beta 8.0 Technology S.r.l., Italy
2. CeRICT S.c.r.t, Italy
3. Cooperativa EDP La Traccia, Italy
4. HC Hospital Consulting S.p.A., Italy
5. Noemalife S.p.A., Italy,
6. IRCCS SDN, Napoli, Italy
7. Telbios S.p.A., Italy
8. Telecom Italia, Italy



### Bando Ricerca PON Smart Cities and Communities

#### "Smart health" 2012

Duration: 36 months (2013-2015)

Coordinator: IRCCS San Raffaele Pisana

Total grant for MINDBRAIN module:

€ 538.800,00 €



# Aims and Impact

- Extend the DECIDE diagnostic services for AD patients to University of Bari and Puglia clinical units
- Develop new facilities/services of the DECIDE e-infrastructure, allowing a multi-modal classification of EEG markers in AD patients
- Develop and validate new freeware procedures for collection and use for diagnostic purposes of data and information of the environmental risk factors (diet, motor exercise, socioeconomic factors)
- Daily use of expanded DECIDE facilities for early diagnosis of AD

**Thank you  
for your kind attention!**

Find more about DECIDE at [www.eu-decide.eu](http://www.eu-decide.eu)  
or contact us for questions and collaboration opportunities at  
[info@eu-decide.eu](mailto:info@eu-decide.eu)

