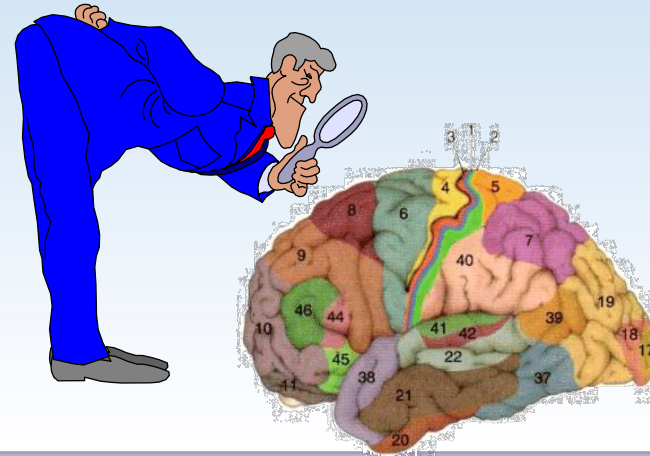


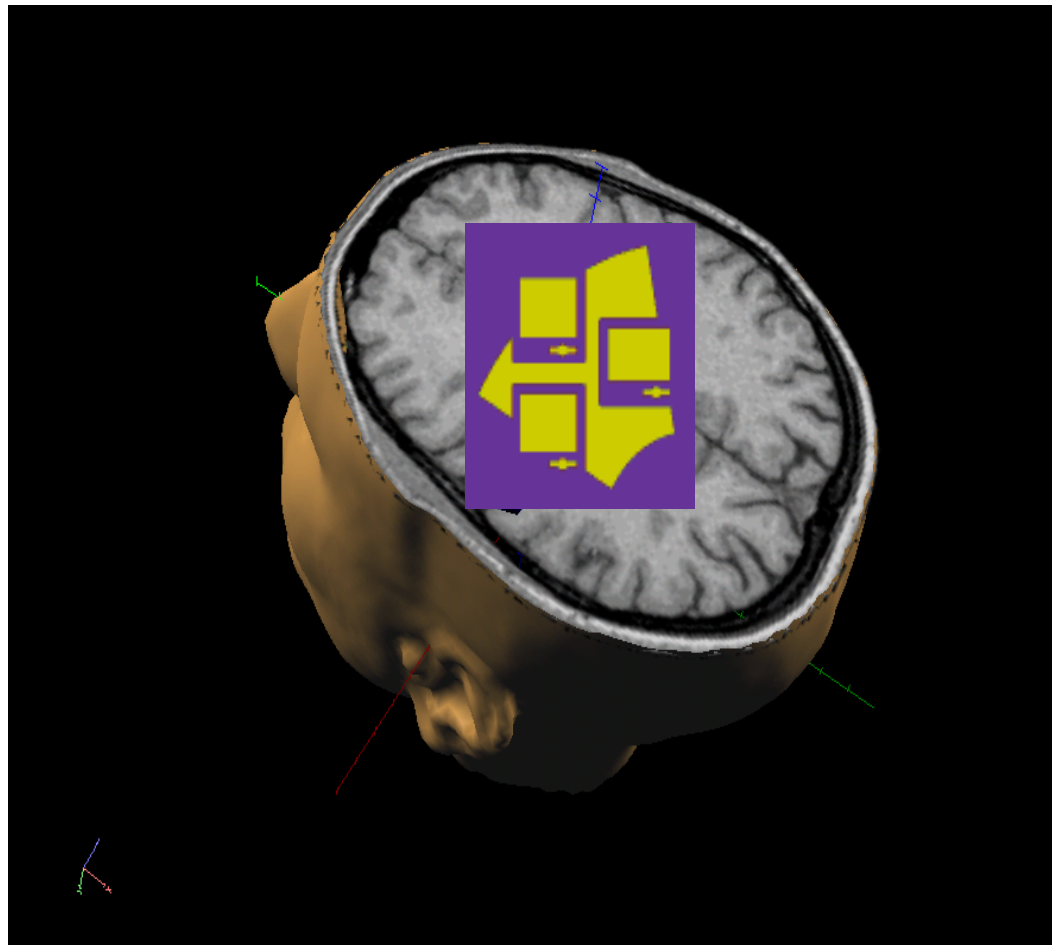
Networks of Cognition, People and Computers against Alzheimer's disease: an Italian idea from European to Regional scale (DECIDE)

Claudio Babiloni on behalf of DECIDE Consortium

IRCCS San Raffaele Pisana, Rome
University of Foggia

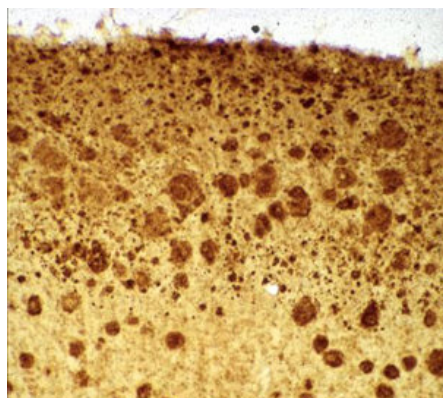
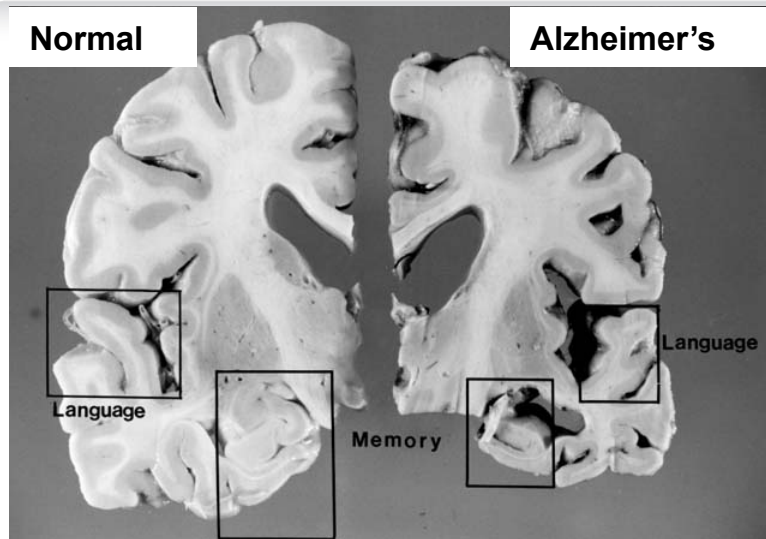


NETWORKS OF NEURONS FOR COGNITION. Higher brain functions depend upon the **rapid creation and dissolution** of ever changing synchronous thalamo-cortical cell assemblies (neural networks)



Stam CJ, de Bruin EA. Scale-free dynamics of global functional connectivity in the human brain. Hum Brain Mapp. 2004 Jun;22(2):97-109.

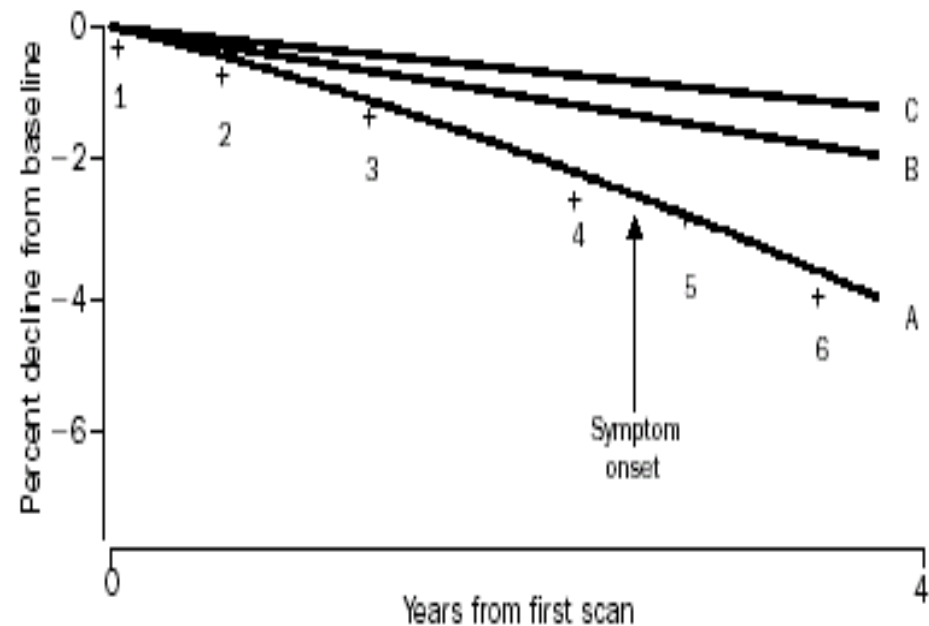
DISRUPTION OF NEURAL NETWORKS FOR COGNITION. In **Alzheimer's disease**, a lot of neurons and synapses are lost, particularly in the entorhinal cortex and hippocampus which are involved in memory and language functions



**Extracellular Aβ
plaques**

**Intracellular
tangles**

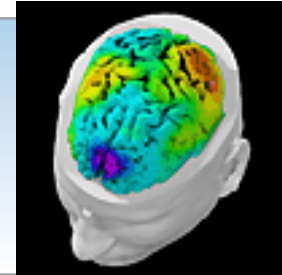
Fox, Lancet (2004)



—Over 4 million Europeans (EU27) have Alzheimer's

- In EU27 the total cost of Alzheimer's disorders (2008) was estimated to more than 100 billion Euro

Which instrumental markers for **early diagnosis** of AD? The neuroimaging way



Normal elderly (Nold)



Mild cognitive impairment (MCI)



AD



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

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



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

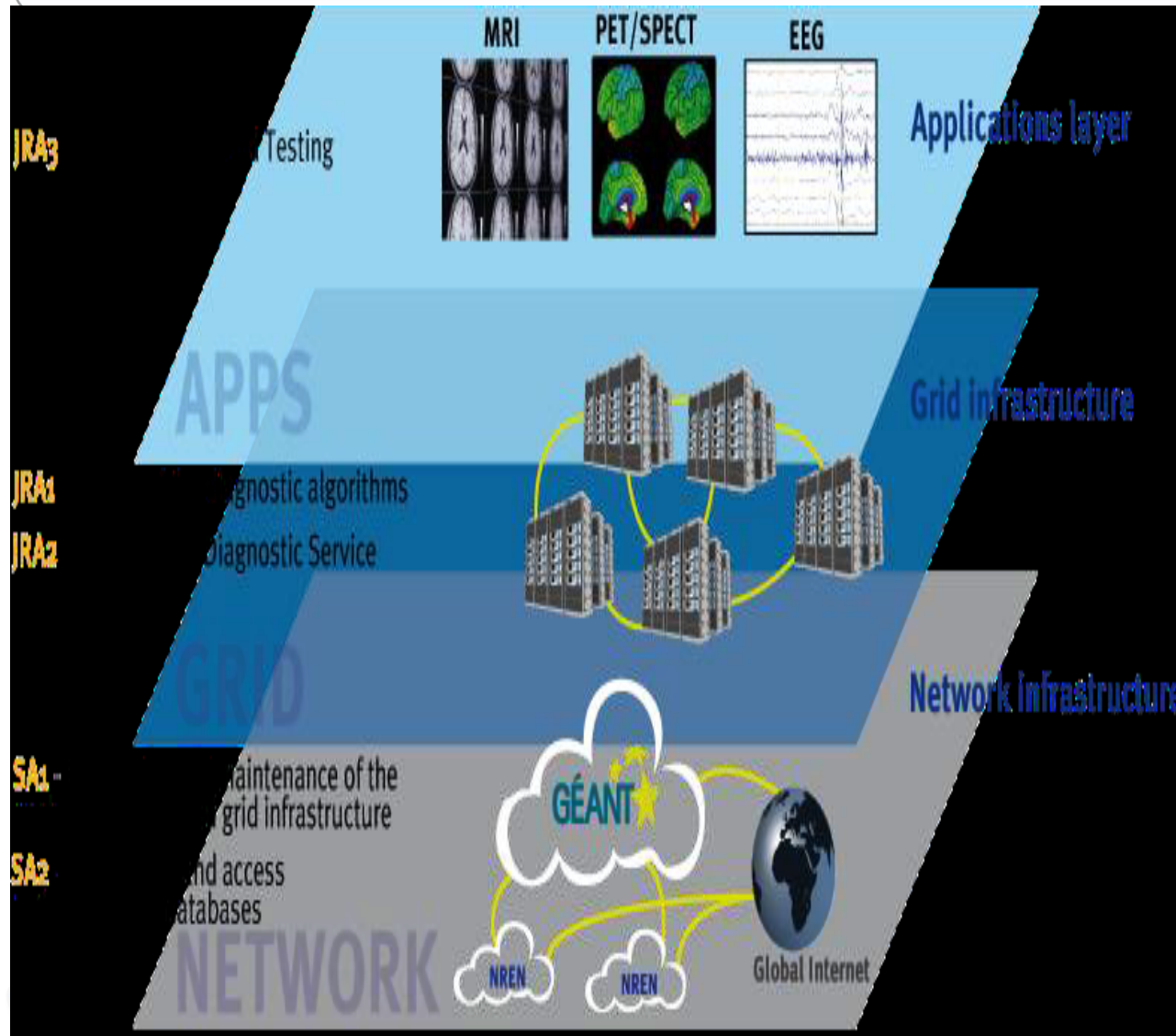
Contract n: RI-261593 _ Project type:
CP-CSA

Duration: 30 months (September
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Coordinator: GARR

Total cost: € 2.4 M €

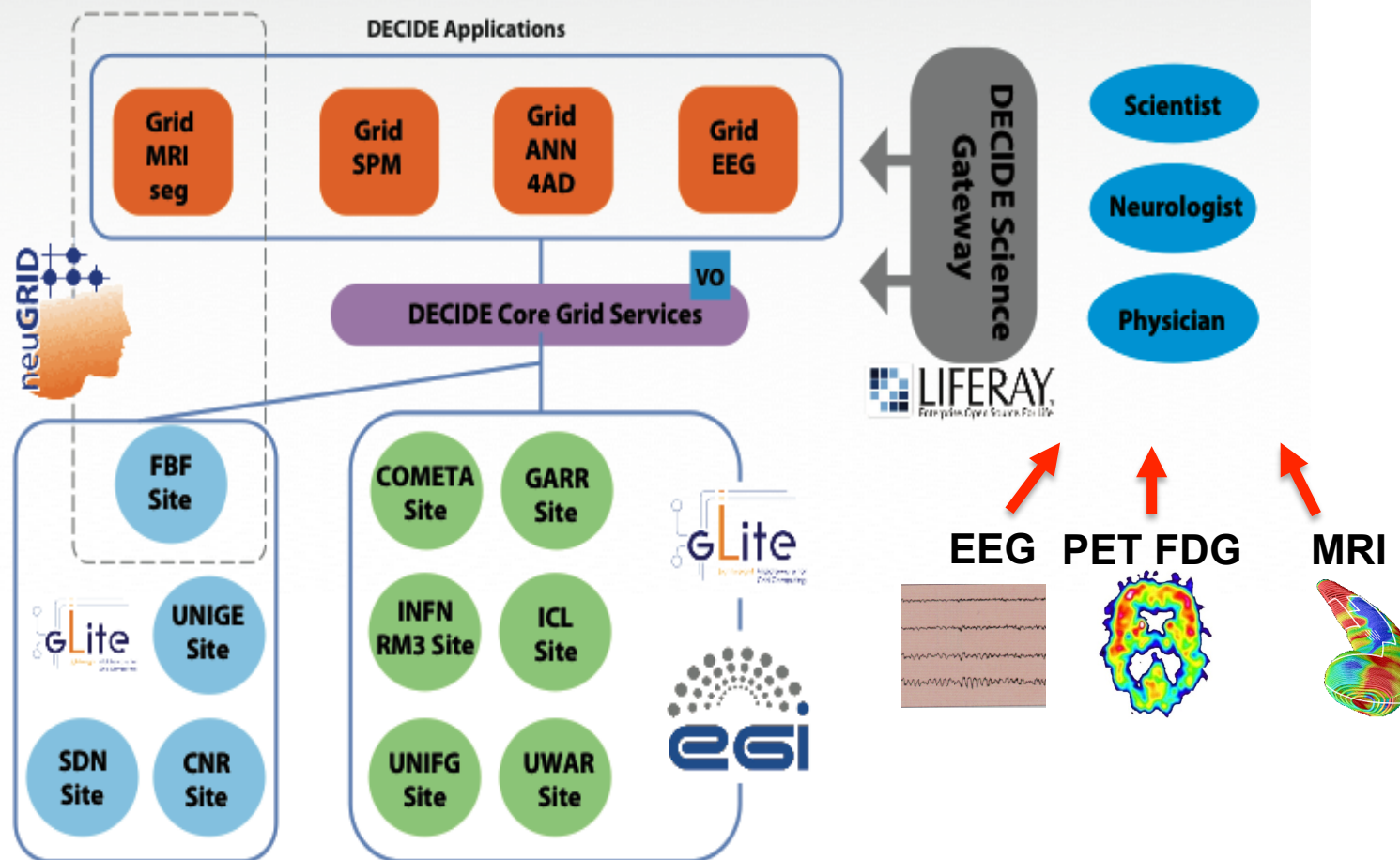
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High-level interface (Science gateway)

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2) Sign In

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Once you receive the email informing you that your request of registration to the DECIDE Science Gateway

At the bottom right, there is a small DECIDE logo and the tagline "Diagnostic Enhancement of Confidence by an International Distributed Environment".

Science Gateway: applications

DECIDE Science Gateway | DECIDE Home | Project | Documents | Technical Wiki

DECIDE
Diagnostic Enhancement of Confidence by
an International Distributed Environment

DECIDE Science Gateway

- Home
- Applications
 - GridANN4ND
 - GridEEG
 - GridMRISeg
 - GridSPM
- Run
 - Manage Repository
- Grid Services
- User Support

My Workspace

- Jobs
- JobsMap
- Data
- Help

GridSPM - Set Parameters

Grid SPM

Welcome to the Grid SPM DECIDE service. You are running the service in physician mode.

Purpose

This service allows the statistical analysis of SPECT and PET cerebral images through the Statistical Parameter Mapping (SPM) system. The use of the service is allowed to certified and authorized users.

The workflow of the service consists into:

1. Data upload step: your PET/SPECT images have to be submitted to the system via the upload form.
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3. Statistical procedures (statistical test using Generalized Linear Model) are applied on normalized and smoothed PET/SPECT images in order to obtain a statistical parametric map for the effect of interest. A report in PDF format is generated, consisting of maps showing the effect of interest overlapped and co-registered on a standard anatomical template. You will be allowed to download this report.

How to run the analysis

Please upload your patient's data, choosing the appropriate file. Images have to be submitted both in DICOM and Interfile format. DICOM and Interfile format have to be archived together in .tgz format.

Follow the information on [normal subjects](#) to follow up your analysis and retrieve results.

Normal subjects filter selection

Please select:

Please, note that currently filters are not applied due to the reduced number of normal subjects. Controls are shown for training purpose.

Upload here your SPM data archive

Select your SPM data archive in .zip or .tgz format:

SPM-PHY Matlab Release 1.0 (2015-03/28 19:48)

This is an service

Minimal user interaction

DECIDE
Diagnostic Enhancement of Confidence by
an International Distributed Environment

Science Gateway: job submit



The screenshot shows the DECIDE Science Gateway interface. At the top, a navigation bar includes links for DECIDE Science Gateway, DECIDE Home, Project, Documents, and Technical Wiki. The main header features the DECIDE logo, which consists of a stylized head profile with a brain-like pattern, and the text "DECIDE Diagnostic Enhancement of Confidence by an International Distributed Environment".

On the left side, there is a sidebar menu titled "DECIDE Science Gateway" with the following options:

- > Home
- > Applications
 - > GridANN4ND
 - > GridEEG
 - > GridMRISeg
 - > GridSPM
- > Run
 - > Manage Repository
- > Grid Services
- > User Support

Below the sidebar, there is a "My Workspace" section with buttons for Jobs, JobsMap, Data, and Help.

The main content area displays a message: "GridSPM - GRID Job submitted". Below this, it states: "Your request has been recorded". A sub-header "Behind the scene" follows, with a note: "Those information are reported only for Demo purpose." The final line of text in the main area reads: "Uploaded archive: /tmp/upload_00000304.zip Session id: 4k24ptnjojn29eh7gr1es5mbbu Job id: n.a. (async)".

At the bottom of the page, there is a footer with the text "This is an ... service" and logos for the European Union and other partners.

Science Gateway: job list

DECIDE Science Gateway | DECIDE Home | Project | Documents | Technical Wiki

DECIDE
Diagnostic Enhancement of Confidence by
an International Distributed Environment

Menu

- > Home
- > Applications
- > Grid Services
- > User Support

My Workspace

- Jobs
- JobsMap
- Data
- Help

MyJobs

Active Jobs List | Done Jobs List

The table below shows the status of your jobs.
Statuses are automatically updated every 5 minutes so there is no need to reload this page more frequently.

Copy | Print | Save | Search:

Show 10 entries

Application Name	User Description	Started on (UTC)	Status
GridSPM	GridSPM Matlab Job 2012-05-21-002909	2012-05-20 22:29:19.0	SUBMITTED
GridSPM	GridSPM Matlab Job 2012-05-21-002816	2012-05-20 22:28:16.0	SUBMITTED
GridSPM	GridSPM Matlab Job 2012-05-21-002732	2012-05-20 22:27:32.0	RUNNING
GridANN4ND	GridANN4ND Job 2012-03-29-162350	2012-03-29 14:23:51.0	

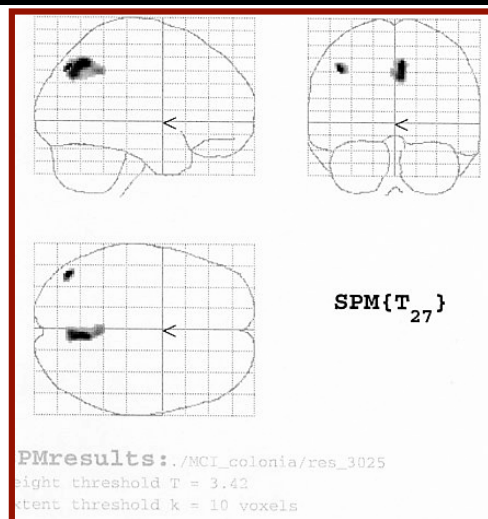
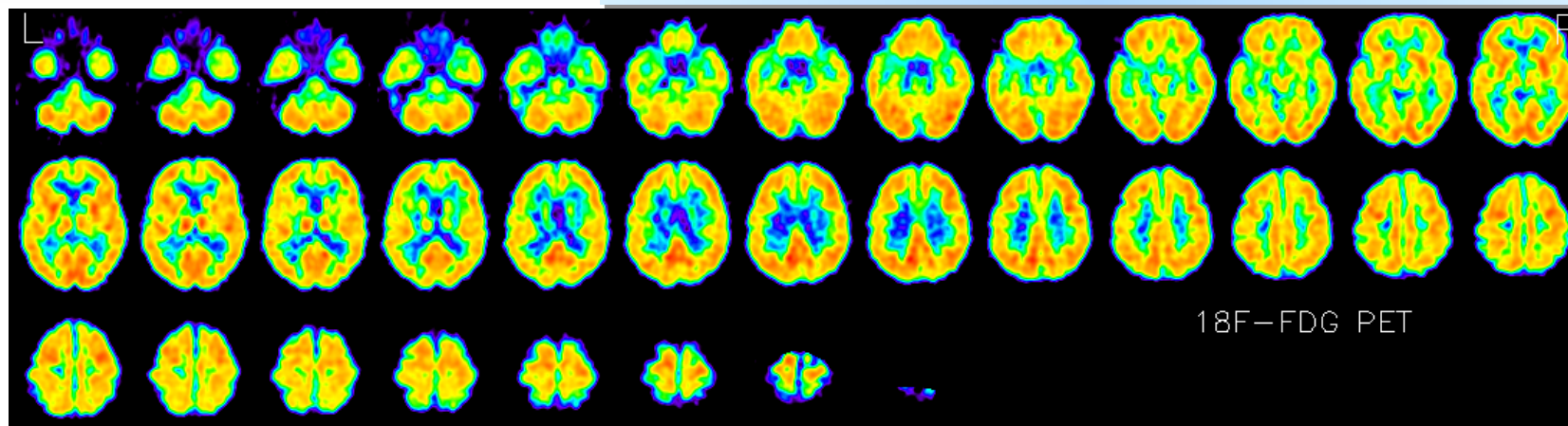
Showing 1 to 4 of 4 entries

First | Previous | 1 | Next | Last

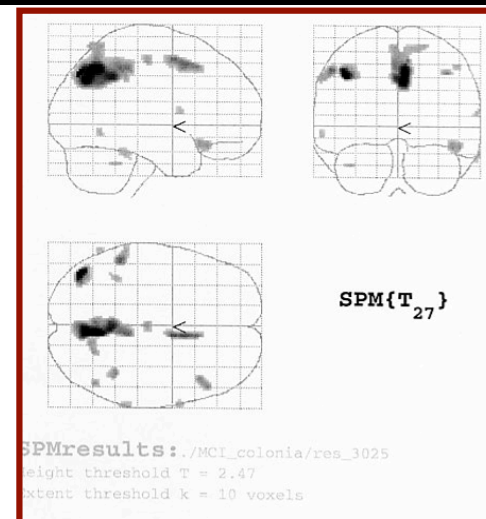
This is an service

GridSPM application

aMCI ID: C03025 | Age: 82 | MMSE: 25 | CVLT: 4



$p = 0.001$



$p = 0.01$

GridMRISeg application



*Physician
& patient's
info*

General info

Date¹: Thu Sep 6 14:36:20 CEST 2012
Physician: Girolamo Savonarola, MD
Patient ID: abbecedario
Age: 74 Sex: M

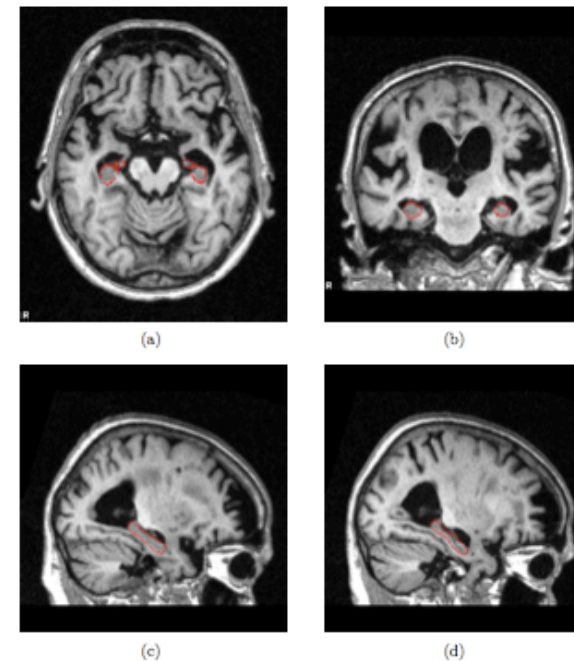
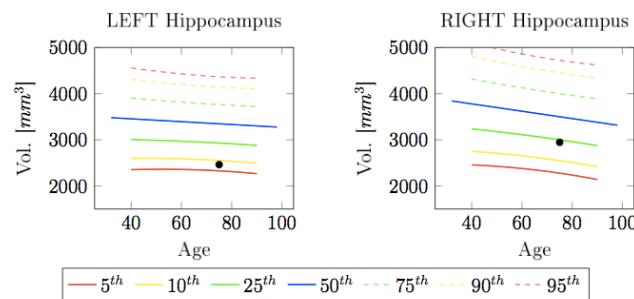
*Volumes
(Fs/Stats @
ICBM
reference
space)
&
Predictive
Intervals*

ACM-AdaBoost¹ Results

Model: DECIDE Standard Model²

Left Volume: 2462 mm³

Right Volume: 2945 mm³

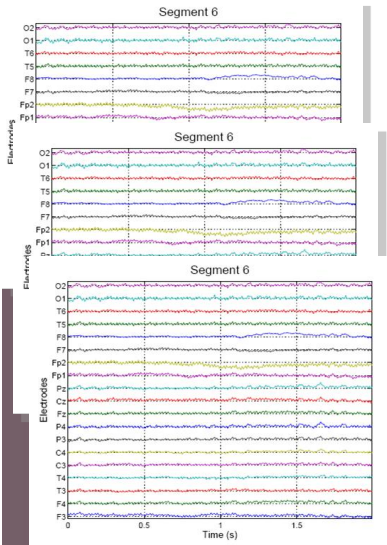


*Patient's
Registration
&
Hippocampi
segmentations*

Figure 1: Segmentation of the brain scan registered to the ICBM-152 template. The letter "R" identifies the Right direction. (a) Axial view. (b) Coronal view. (c) Sagittal view centered on the Right Hippocampus. (d) Sagittal view centered on the Left Hippocampus.

GridEEG application

GridDATALOAD



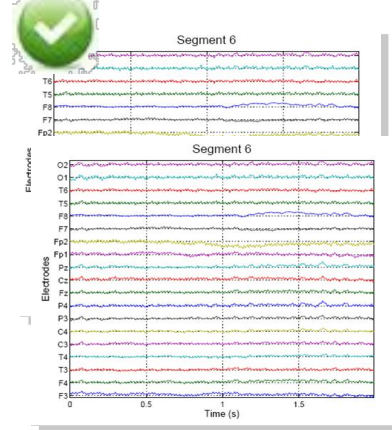
nameEEGtrials.txt

(2-sec EEG epochs in ASCII format)

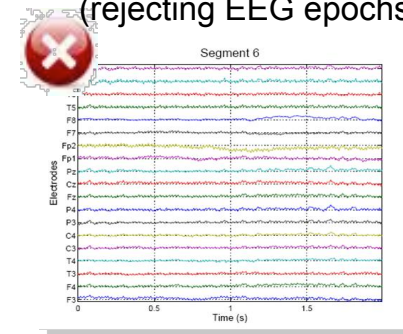
Data upload

GridEEGQUALITY

(accepting EEG epochs)

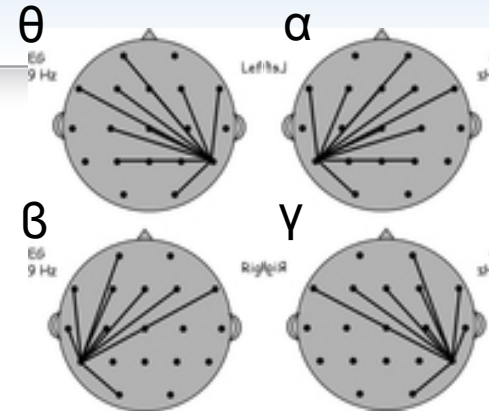


(rejecting EEG epochs)



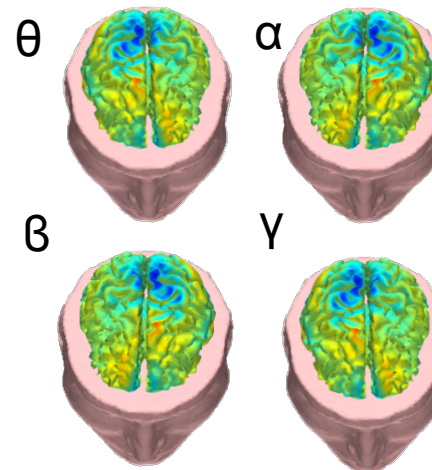
Preprocessing
artifact detection

GRidDTF/COHERENCE



Model order, Frequency resolution

GRidEEGSOURCE

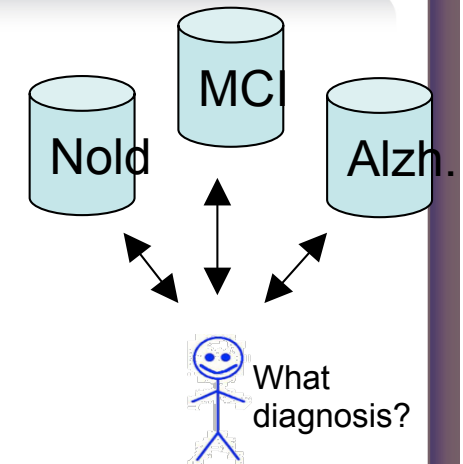


Window, Frequency resolution,...

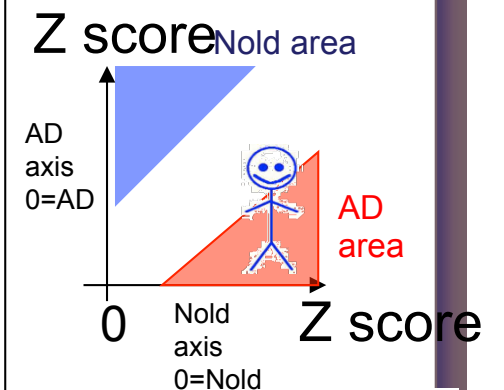
Processing & markers

GridEEGSTAT

reference EEG databases



nameEEGreport.pdf



Statistics &
send report

Overview of DECIDE diagnostic service

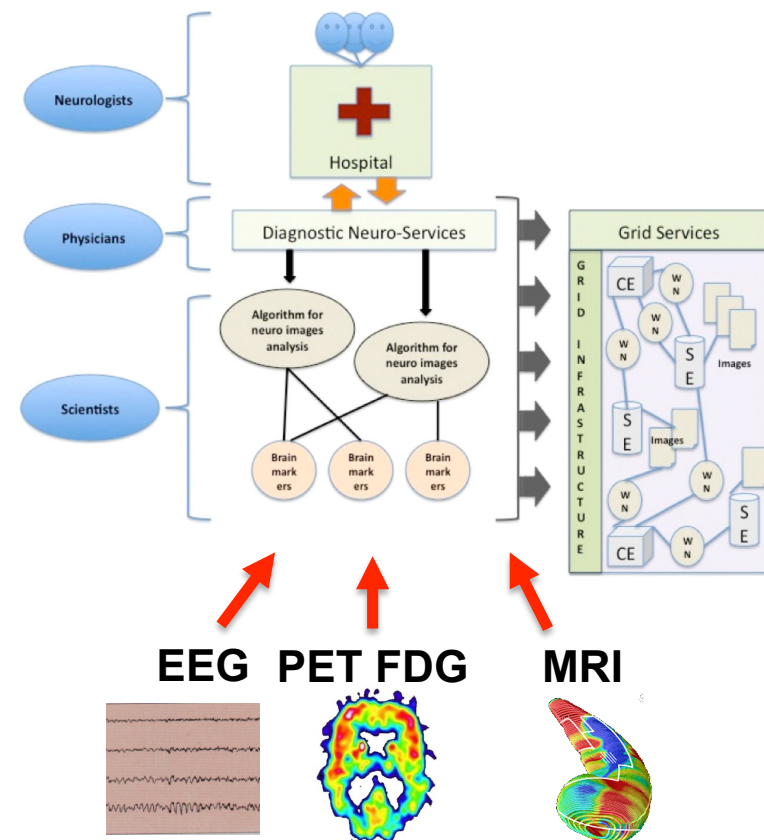
Provide the Neuroscientific and Medical community with a dedicated e-Infrastructure relying on GÉANT, EGI and NeuGrid

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



An Italian idea goes to Europe: the DECIDE project

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EC Call: FP7-INFRAS-2010-2 – VRC
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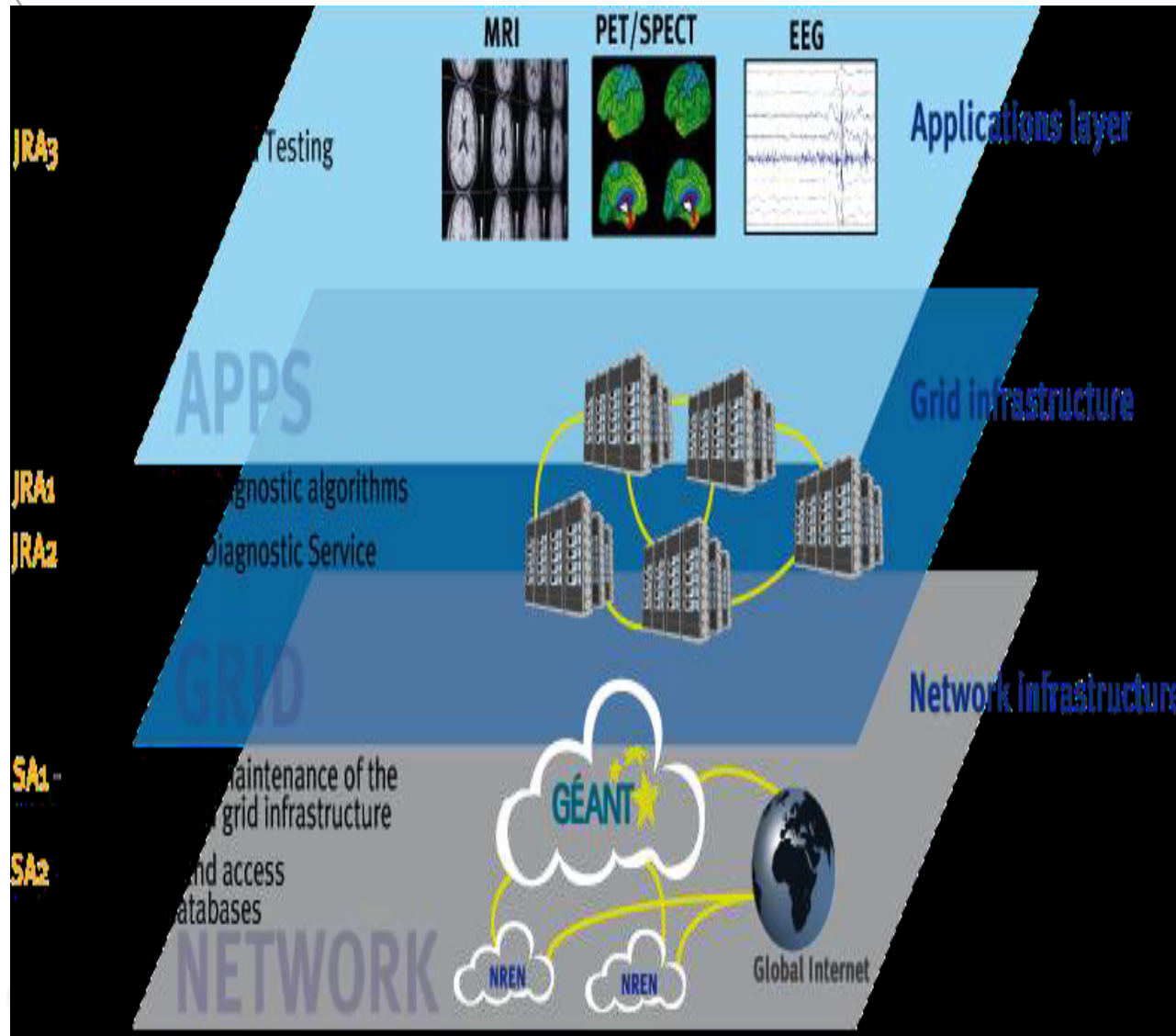
Contract n: RI-261593 _ Project type:
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Total cost: € 2.4 M €

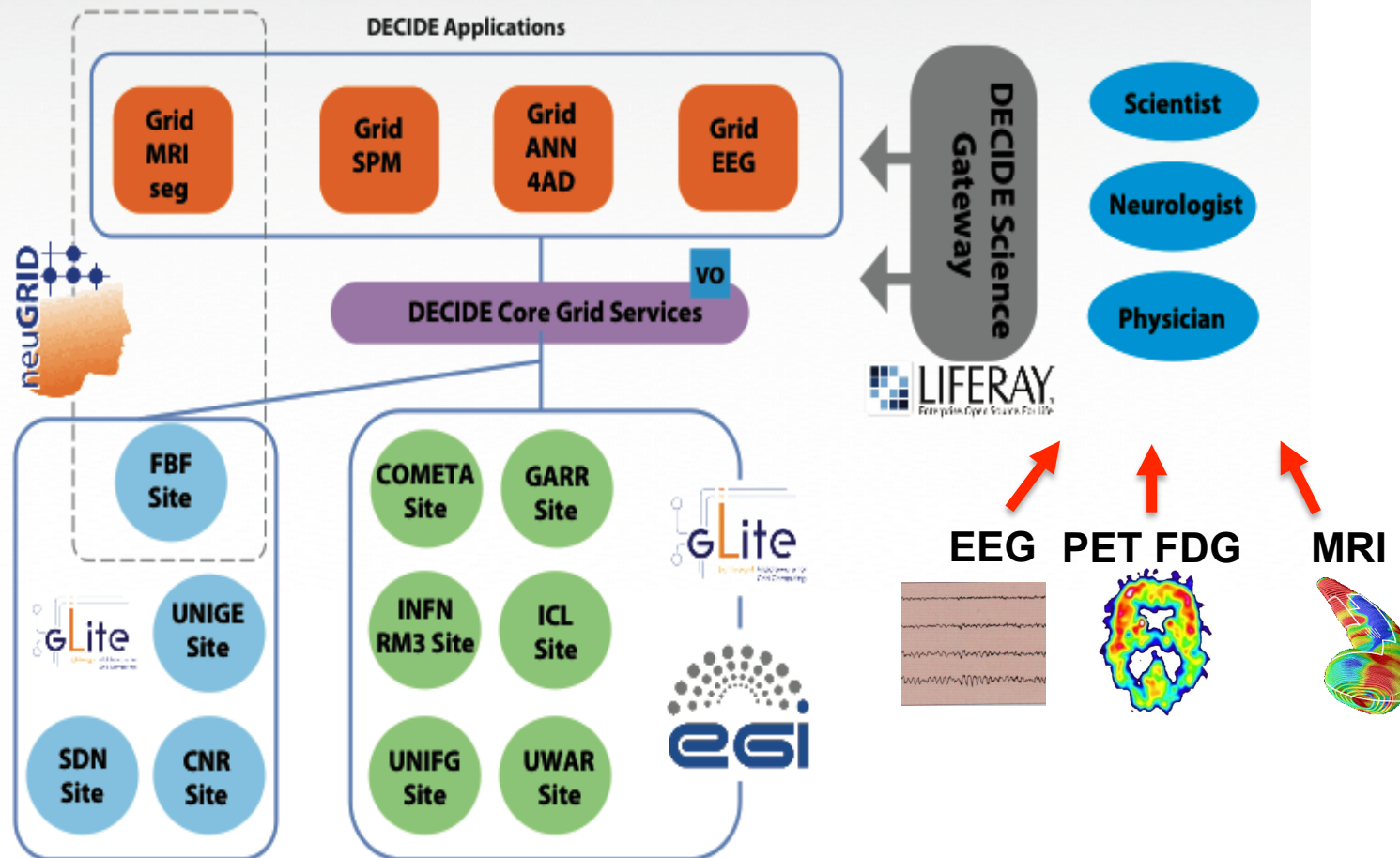
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Applications for extracting **imaging markers** (structural MRI, resting state PET/SPECT, resting state EEG data)

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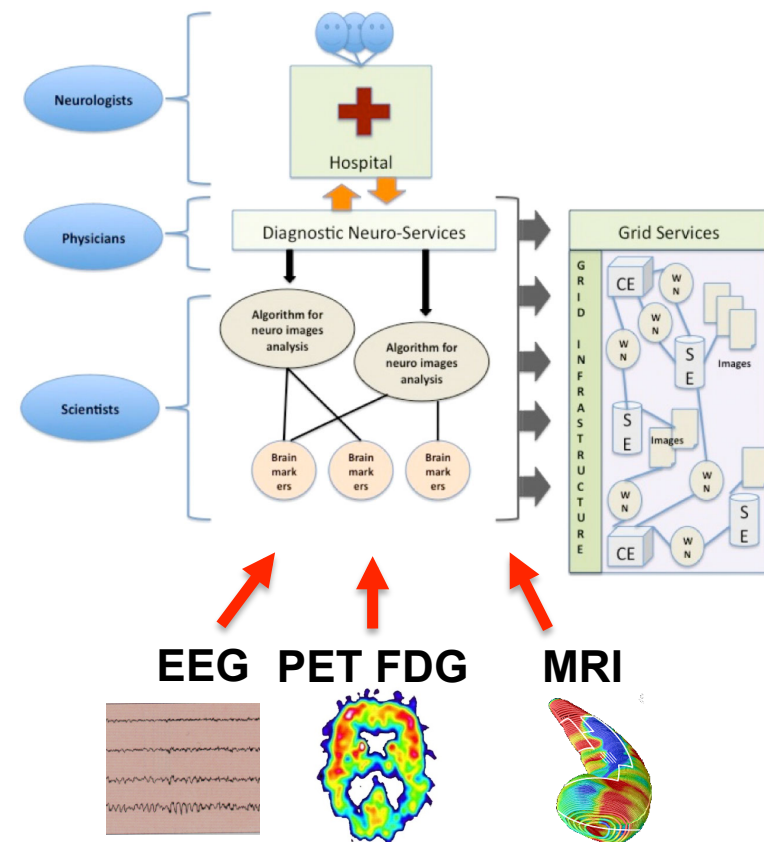
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Science Gateway: applications

DECIDE Science Gateway | DECIDE Home | Project | Documents | Technical Wiki

DECIDE
Diagnostic Enhancement of Confidence by
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DECIDE Science Gateway

- Home
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My Workspace

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Upload here your SPM data archive

Select your SPM data archive in .zip or .tgz format:

SPM-PHY Matlab Release 1.0 (2015-03/28 19:48)

This is an service

Minimal user interaction

DECIDE
Diagnostic Enhancement of Confidence by
an International Distributed Environment

Science Gateway: job submit



DECIDE Science Gateway DECIDE Home Project Documents Technical Wiki

DECIDE
Diagnostic Enhancement of Confidence by
an International Distributed Environment

DECIDE Science Gateway

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My Workspace

- Jobs
- JobsMap
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GridSPM - GRID Job submitted

Your request has been recorded

Your GridSPM analysis has been successfully sent to the DECIDE computing infrastructure. Check the status of your analysis at this link

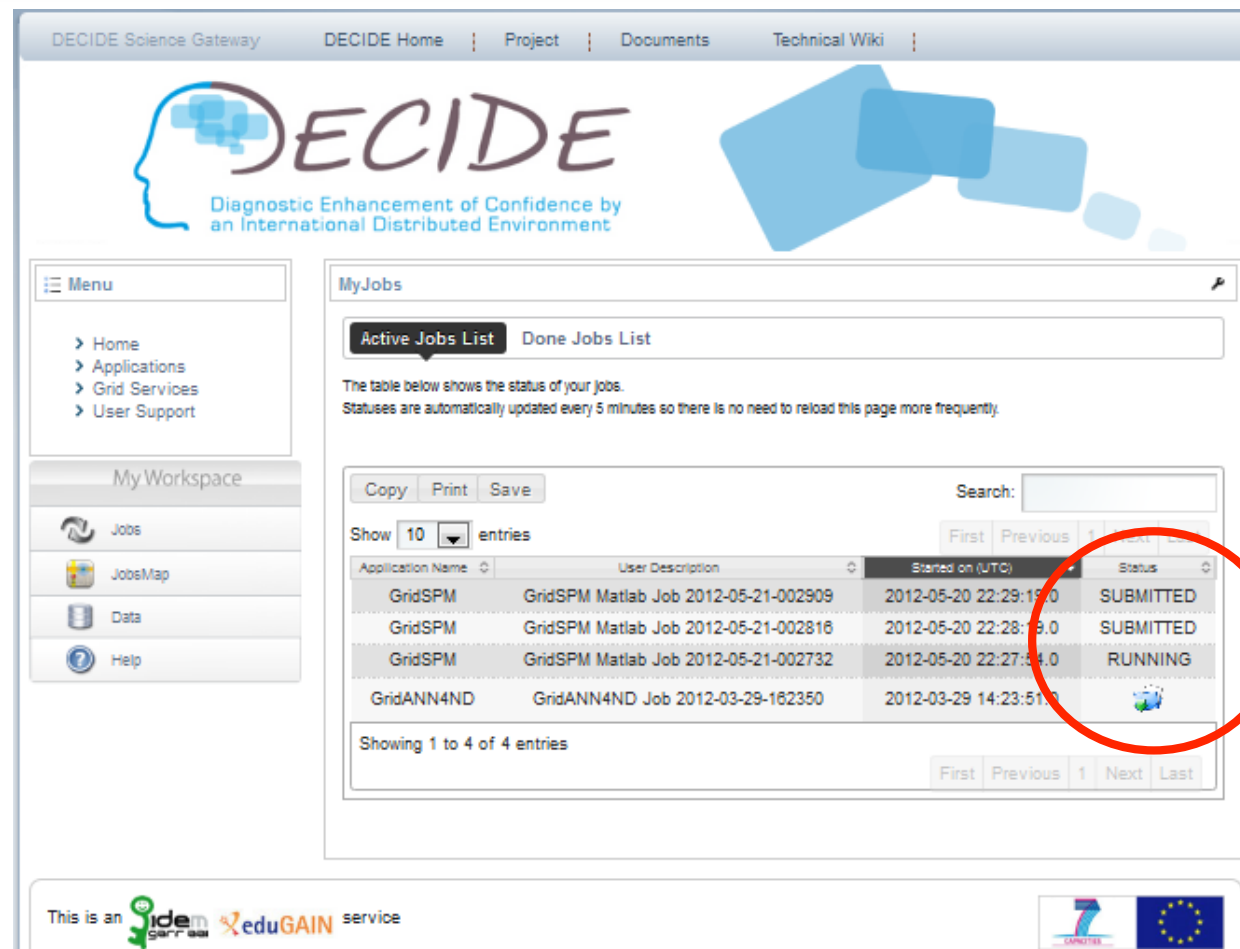
Behind the scene

Those information are reported only for Demo purpose.

Uploaded archive: /tmp/upload_00000304.zip Session id: 4k24ptnjojn29eh7gr1es5mbbu Job id: n.a. (async)

This is an  OpenStack service

Science Gateway: job list



DECIDE Science Gateway | DECIDE Home | Project | Documents | Technical Wiki

DECIDE
Diagnostic Enhancement of Confidence by
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Menu

- > Home
- > Applications
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MyJobs

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Show 10 entries

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GridSPM	GridSPM Matlab Job 2012-05-21-002732	2012-05-20 22:27:32.0	RUNNING
GridANN4ND	GridANN4ND Job 2012-03-29-162350	2012-03-29 14:23:51.0	

Showing 1 to 4 of 4 entries

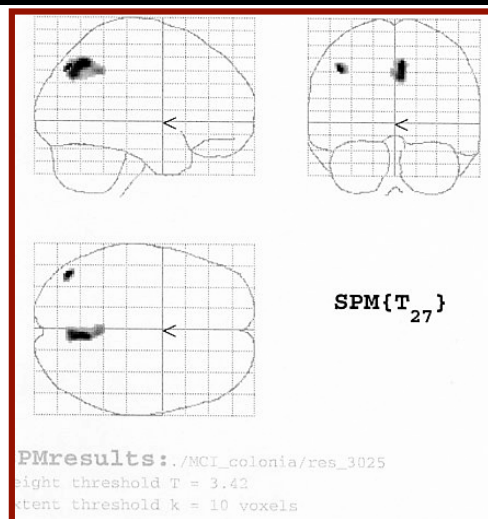
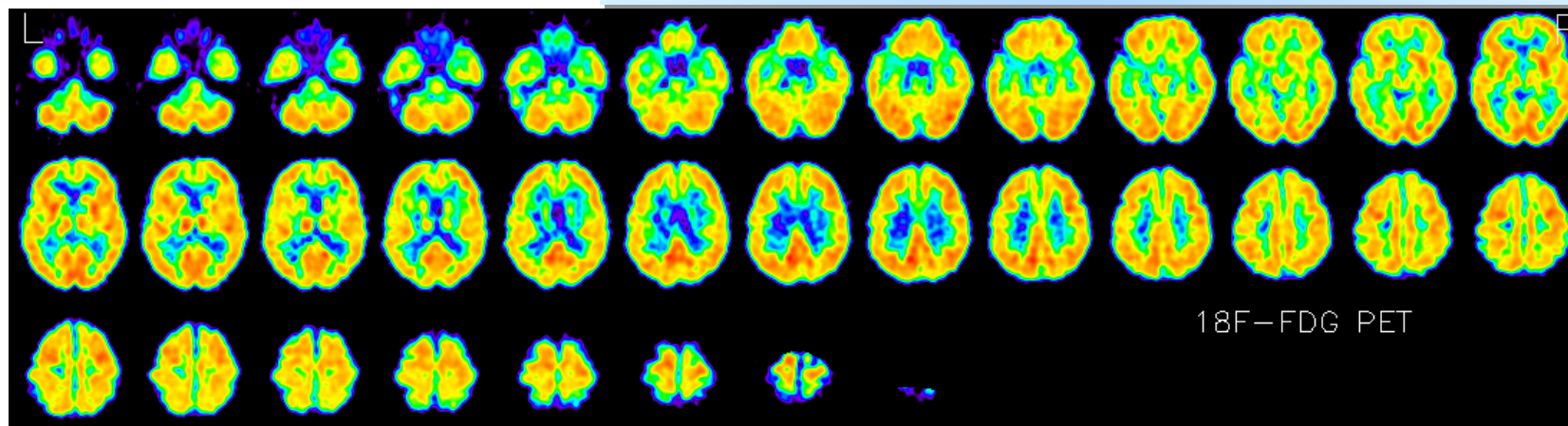
First | Previous | 1 | Next | Last

This is an   service

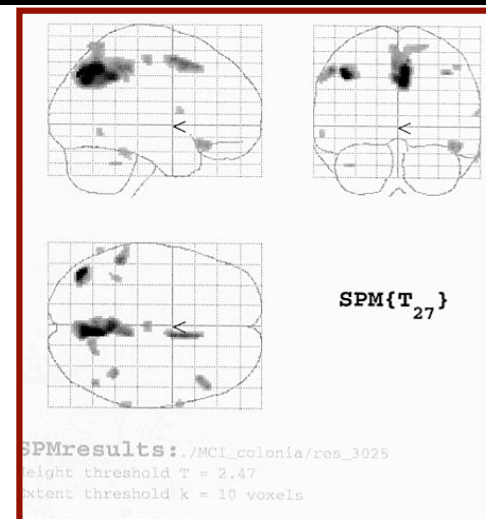
 

GridSPM application

aMCI ID: C03025 | Age: 82 | MMSE: 25 | CVLT: 4



p = 0.001



p = 0.01

GridMRISeg application



*Physician
& patient's
info*

General info

Date¹: Thu Sep 6 14:36:20 CEST 2012
Physician: Girolamo Savonarola, MD
Patient ID: abbecedario
Age: 74 Sex: M

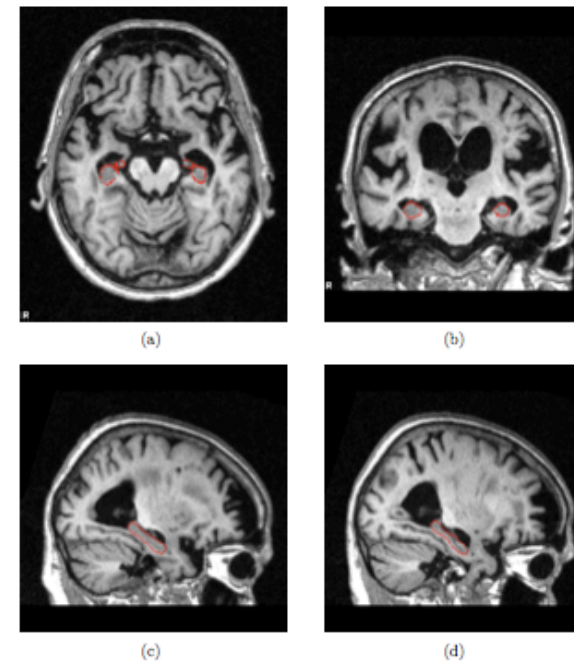
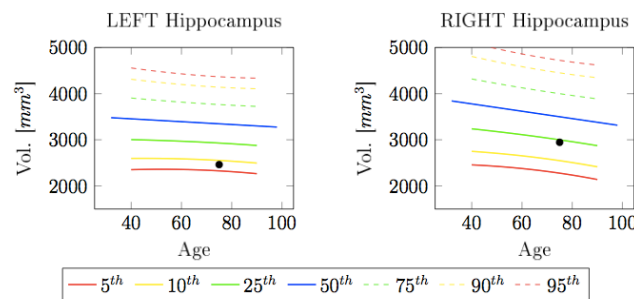
*Volumes
(Fs/Stats @
ICBM
reference
space)
&
Predictive
Intervals*

ACM-AdaBoost¹ Results

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Left Volume: 2462 mm³

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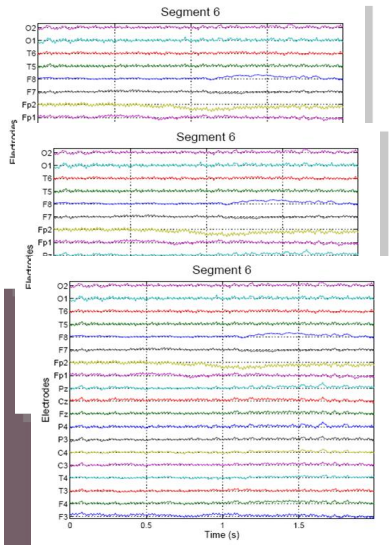


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Registration
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Hippocampi
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GridEEG application

GridDATALOAD



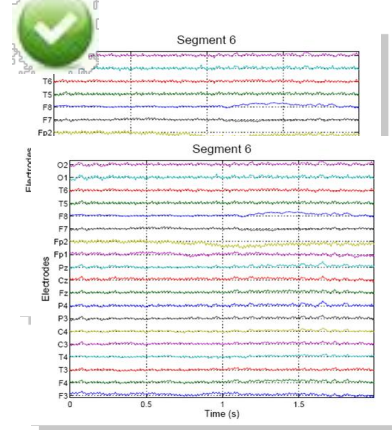
nameEEGtrials.txt

(2-sec EEG epochs in ASCII format)

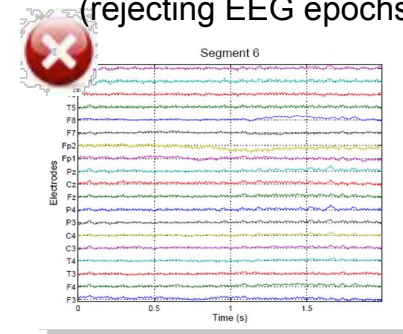
Data upload

GridEEGQUALITY

(accepting EEG epochs)

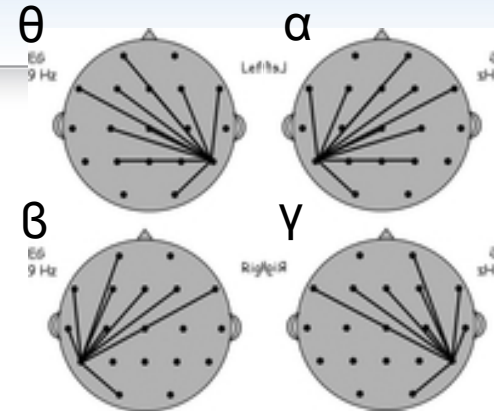


(rejecting EEG epochs)



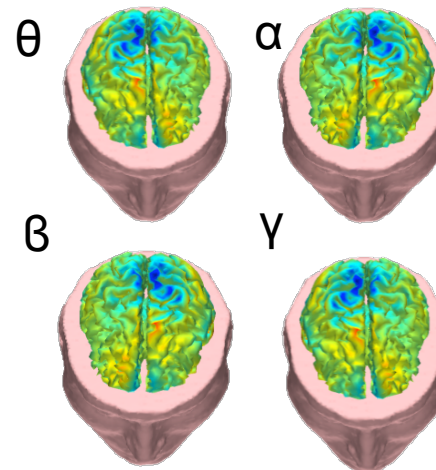
Preprocessing
artifact detection

GRidDTF/COHERENCE



Model order, Frequency resolution

GRidEEGSOURCE

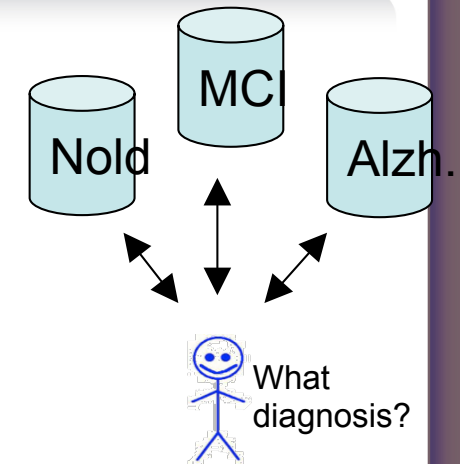


Window, Frequency resolution,...

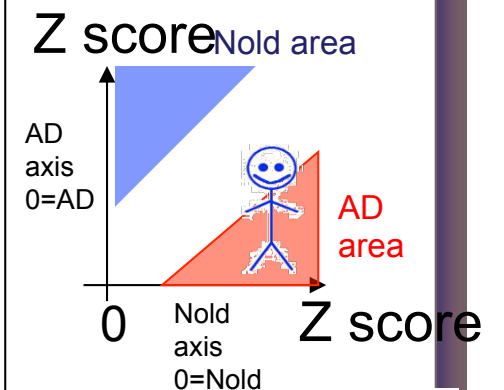
Processing & markers

GridEEGSTAT

reference EEG databases



nameEEGreport.pdf



Statistics &
send report

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 €

The expansion of DECIDE to regional level (Puglia): 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 cost: € 217.800,00 €



Thank you for your kind attention!

Find more about DECIDE at www.eu-decide.eu
or contact us for questions and collaboration opportunities at
info@eu-decide.eu