



Project participants:

Consortium GARR (IT), CNR (IT), Consorzio COMETA (IT), Fatebenefratelli (IT), University San Raffaele (IT), University of Genoa (IT), University of Foggia (IT), Fondazione SDN (IT), MAAT France (FR), Imperial College (UK), Uniwersytet Warszawski (PL), Centre Hospitalier Universitaire de Toulouse (FR), Alzheimer Europe (LU)

EC Call: FP7-INFRA-2010-2 - VRC

Contract n: RI-261593

Project type: CP-CSA

Duration: 24 months

Total budget: 2.580.558 €

EC Funding: 2.399.998 €

Valeria Ardizzone, valeria.ardizzone@garr.it, Fulvio Galeazzi, fulvio.galeazzi@garr.it, Federica Tanlongo, federica.tanlongo@garr.it
on behalf of DECIDE Consortium

Progetto DECIDE:

un esempio d'infrastruttura al servizio della comunità biomedica

Why Alzheimer's disease?

Why "early diagnosis"?

Why e-Infrastructures?

...before we get to the "how" and "what"



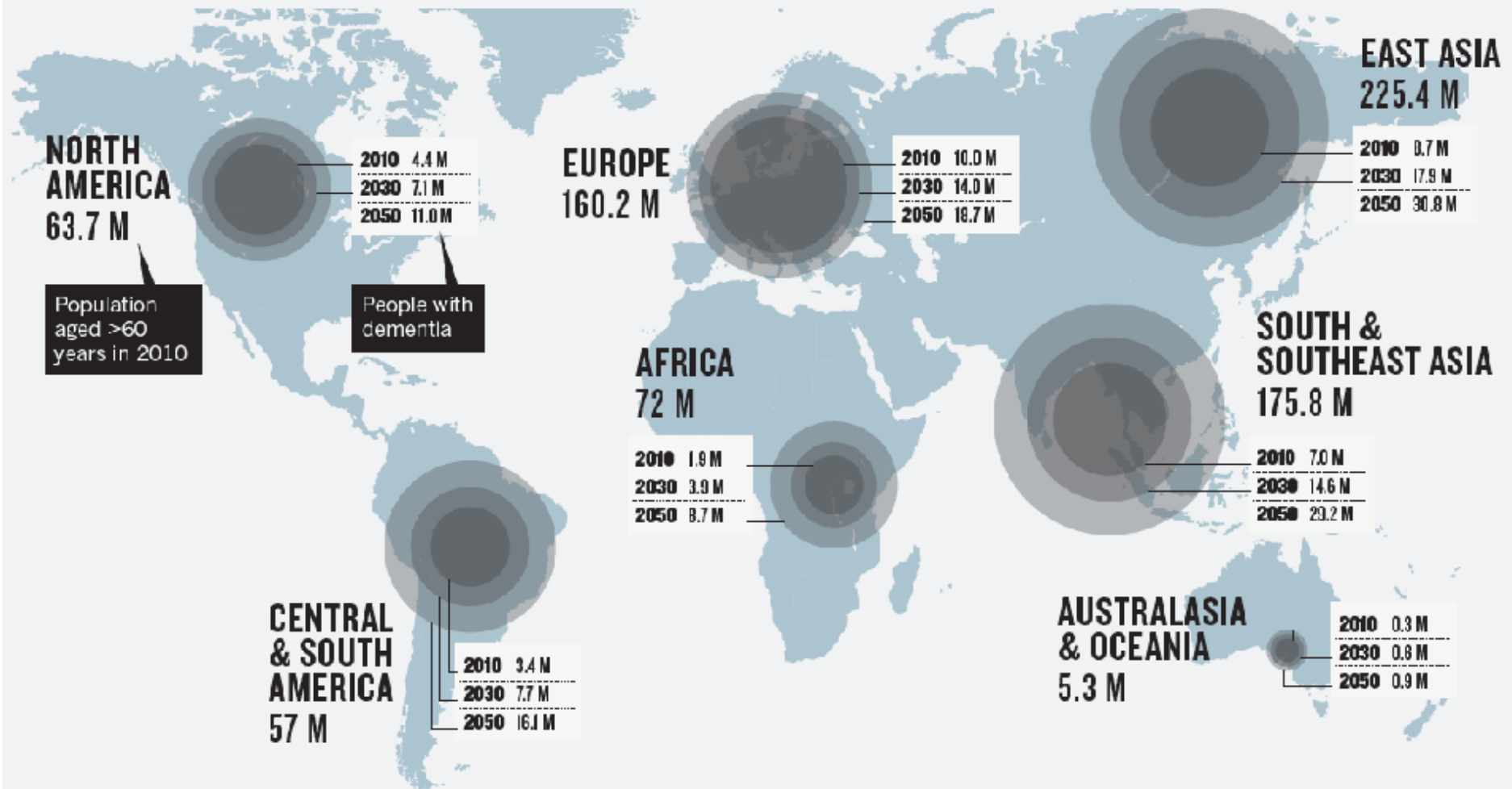
A problem for our age

BY ALISON ABBOTT

NATURE | VOL 475 | 14 JULY 2011

ESTIMATED GROWTH OF DEMENTIA

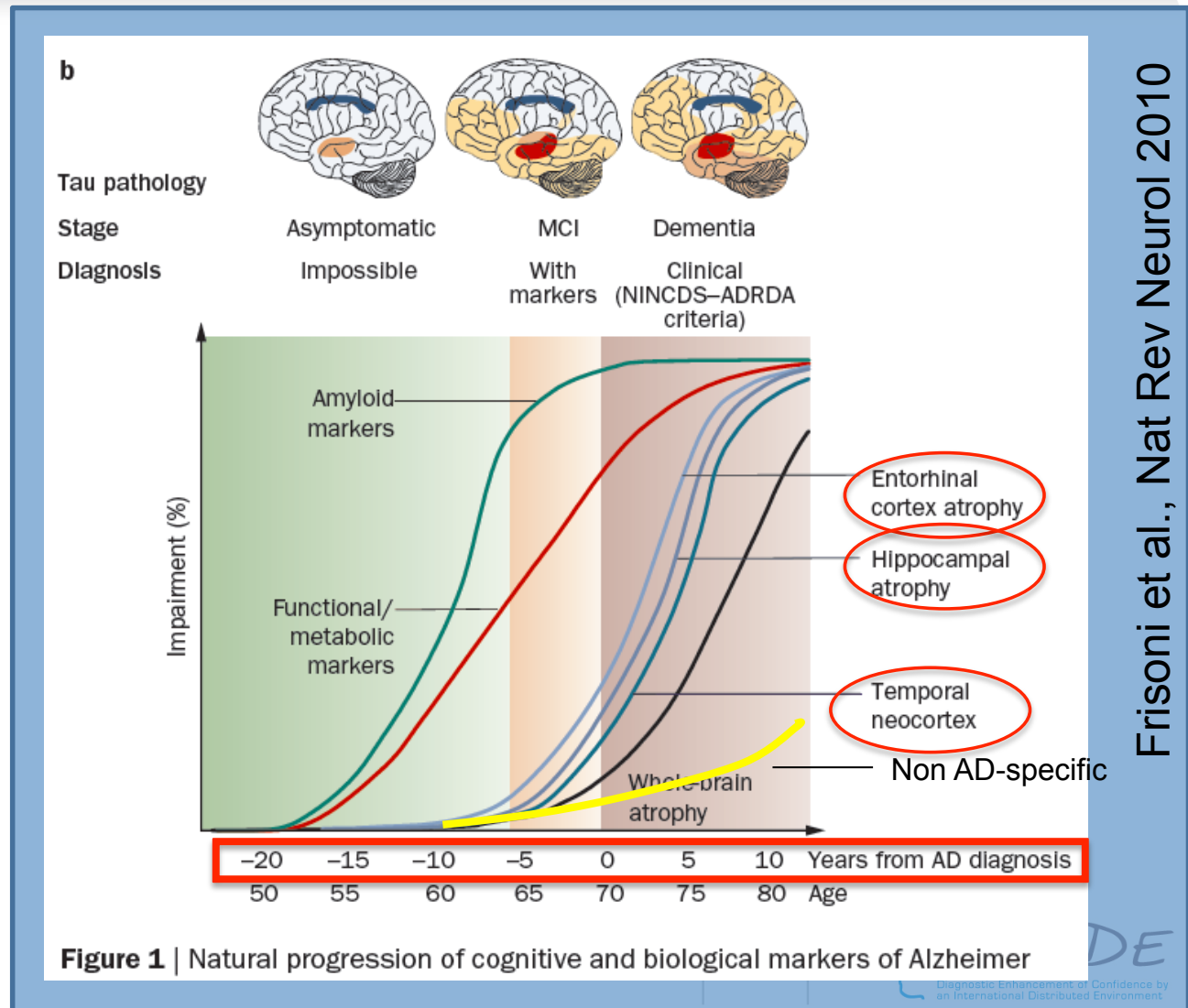
The number of people with dementia will roughly double every 20 years, with the biggest increases in developing countries.



Early diagnosis of Alzheimer's disease

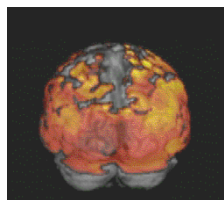
New diagnostic criteria were issued in 2010-2011 by European Federation of Neurological Societies and National Institute on Aging.

Major step forward: moving away from clinical symptoms, to the real underpinning of the disease.



Markers of the disease

BRAIN AMYLOIDOSIS



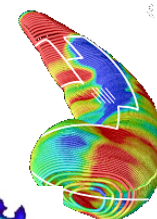
**Amyloid deposits:
amyloid PET**



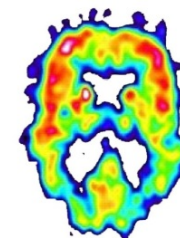
**Biochemistry:
CSF Abeta42**

NEURODEGENERATION

**Structure:
MR hippo volumetry**



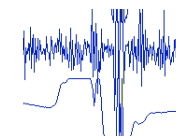
**Function:
FDG PET**



**Biochemistry:
CSF tau**



**Neurophysiology:
EEG**



DECIDE in a Nutshell

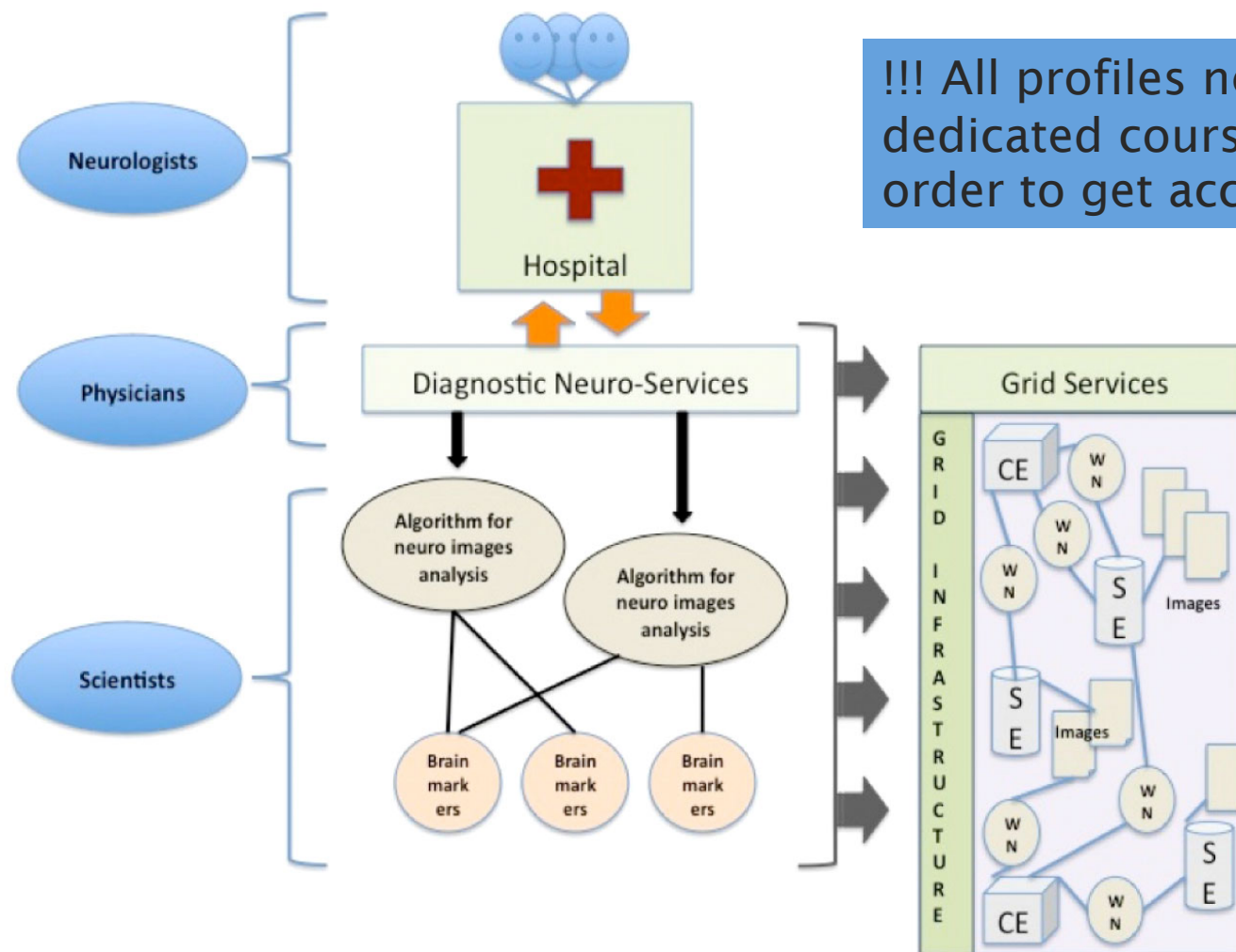
- Creation of a **e-Infrastructure and service dedicated to research and early diagnosis**
 - Currently focusing on **AD** and other neurodegenerative diseases
 - AD is one of **EU's greatest challenges** for the next few years
- Intended not only for research purposes, but for the exploitation into clinical practice**
- Started on: **1st September 2010**
- Duration: **24 Months (going to be extended to 30)**
- Co-ordinated by **GARR, the Italian R&E network, COMETA has the technical coordination**
- Scientific Coordination by the **neuGRID Principal Investigator**
- Involves **13 European Partners + European NoE of research and healthcare centres specialised on AD + the European network of patient advocate societies**

DECIDE Objectives

- Bring to the physicians' fingertips a dedicated, powerful e-Infrastructure
 - relying on GÉANT (network), EGI (computing) and NeuGrid (inspiring idea)
- Deploy a secure and user-friendly **service for helping making early diagnosis**
 - Linking large distributed DBs of multi-modal neuro-images
 - Providing **accurate, quantitative** information
 - Assisting users all along the way
- To **validate** the e-Infrastructure and the service with **real patient cases**

DECIDE end-users

☛ Different user profiles with different workflows and authorization levels.

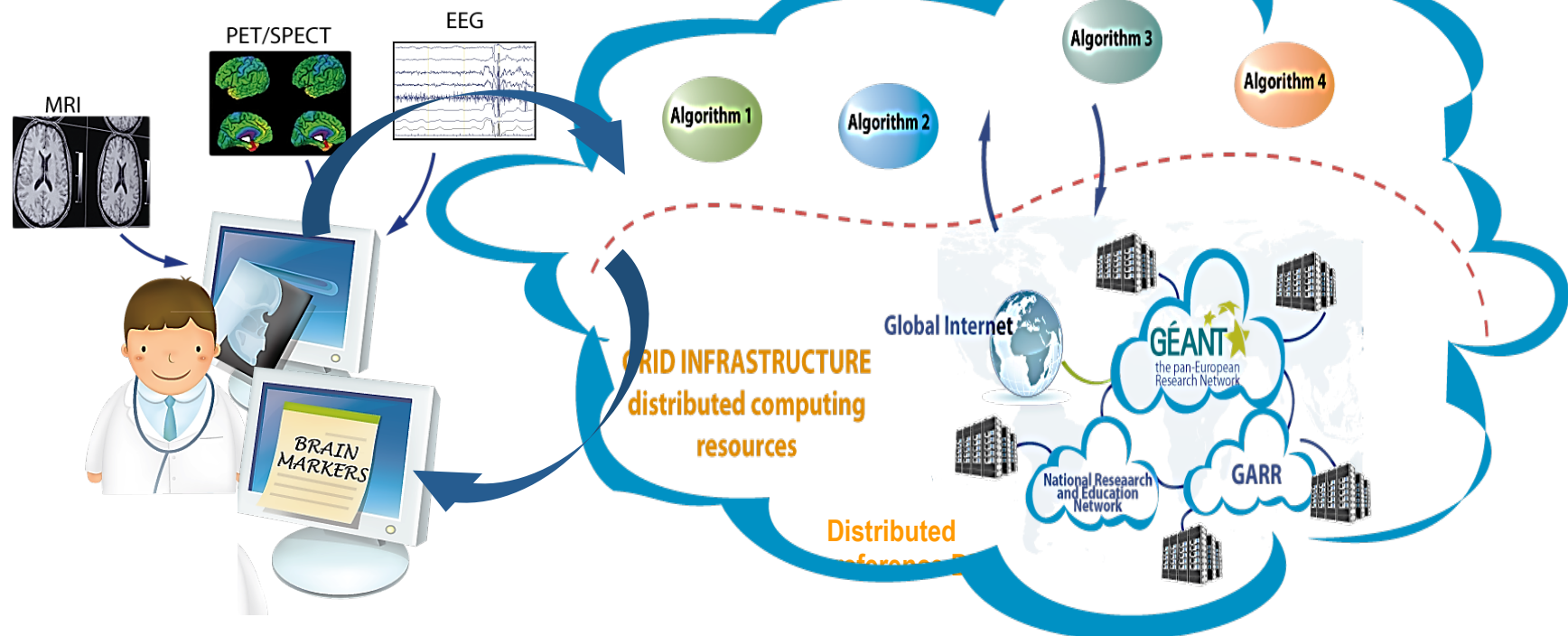


!!! All profiles need to attend a dedicated course and qualify in order to get access to the system

The DECIDE Service Concept



- Masking complexity from the end user
- Web interface for ease of use and access from everywhere

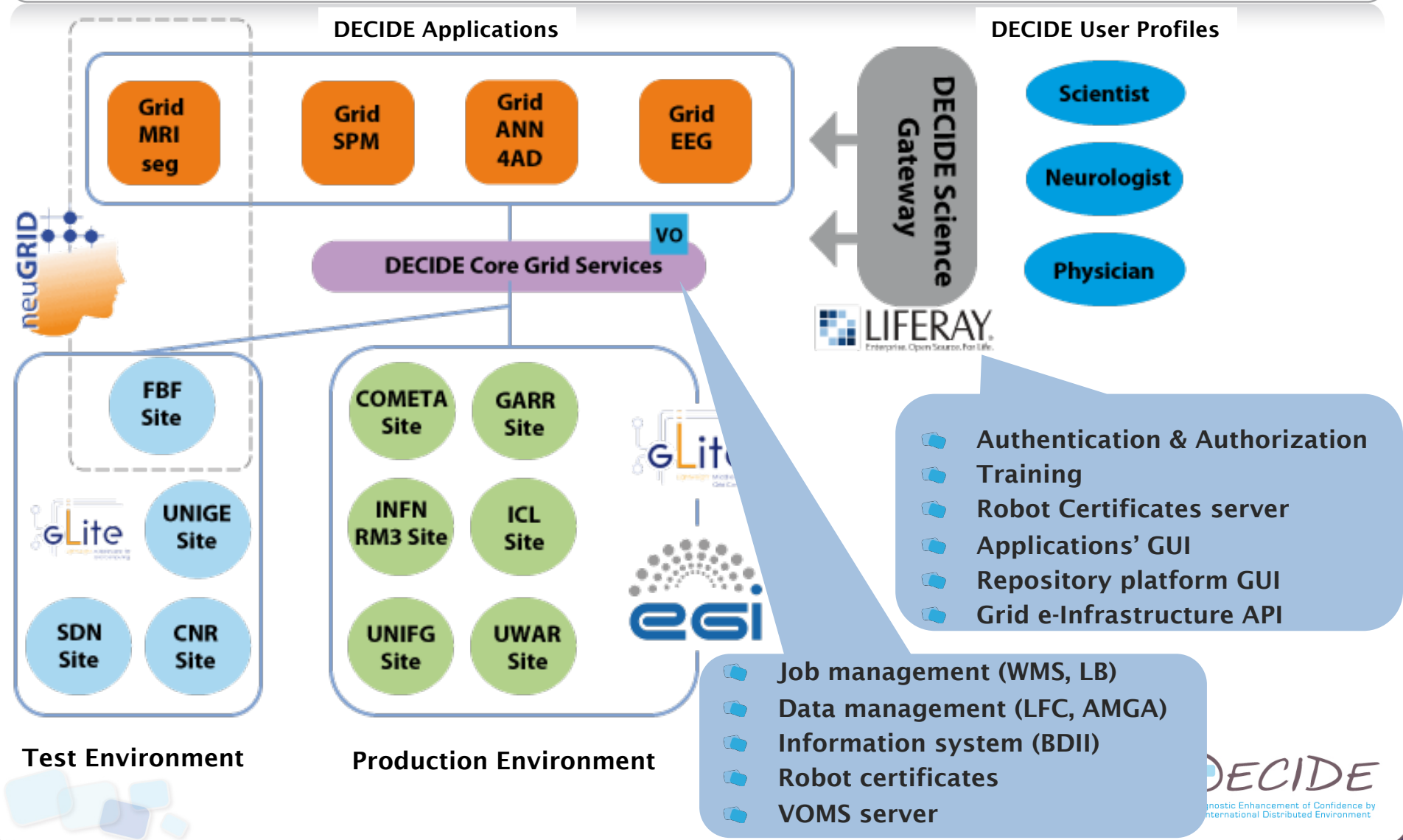


- Multiple **quantitative** algorithms for research and diagnosis
- Secure exploitation of large multimodal reference databases of normal subjects and patients






Grid technology and Science Gateway

- Grid technology is used behind the scenes:
 - Fine-grained authorization control
 - Sharing of reference datasets while preserving ownership
- The DECIDE Science Gateway makes the Grid usable by non-ICT users
 - Identity federations, for authentication: authorization handled separately
 - Based on robot certificates, no personal certificates involved
 - Simplifies job handling (no .jdl, minimized interactions)

DECIDE e-Infrastructure Architecture



DECIDE Applications

-  **GridSPM:** specifically designed for SPECT and PET neurological clinical images provides an SPM analysis for the early diagnosis of Alzheimer Disease
-  **GridEEG:** implements EEG processing algorithms with the aim of detecting early symptoms of Alzheimer Disease and distinguishing different forms of degenerative impairment
-  **GridANN4AD:** concerns the analysis of PET biomarkers in Neurological and Psychiatric Disorders and provides a classification of suspected patients through an Artificial Neural Network
-  **GridMRISeg:** implements an automatic algorithm for the subcortical segmentation of MRI brain images for hippocampal volume estimation, using the auto context model (ACMAboost) developed by LONI;
-  **GridGDI:** is devoted to the analysis of 1.5T T1-weighted volumetric brain structural MR images. The purpose is to provide a robust and reliable index called "Global Disease Index" (GDI) in support of early clinical diagnosis of mild and prodromal Alzheimer's Disease (AD) patients.

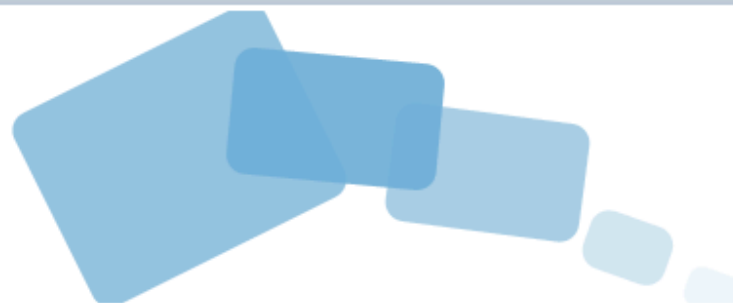
Diagnostic
Application

Research
Application

Research
Application

Diagnostic
Application

Diagnostic
Application



☰ DECIDE Science Gateway

[> Home](#)[> Applications](#)[> GridANN4ND](#)[> GridEEG](#)[> GridMRISeg](#)[> GridSPM](#)[> GridGDI](#)[> Grid Services](#)[> User Support](#)[> Collaborate with us](#)

Applications

[Copy](#) [Print](#) [Save](#)Search: Show entries[First](#) [Previous](#) [1](#) [Next](#) [Last](#)

NAME	RUN PAGE	DOMAIN	MIDDLEWARE	INSTITUTION
GridANN4ND		Life Sciences	EMI-gLite	Imperial College London Medical Research Council
GridEEG		Life Sciences	EMI-gLite	UWAR UNIFG UNIROMA1 AFAR
GridGDI		Life Sciences	EMI-gLite	Consortium GARR INFN
GridMRISeg		Life Sciences	EMI-gLite	PLVOODSGDD
GridSPM		Life Sciences	EMI-gLite	CNR

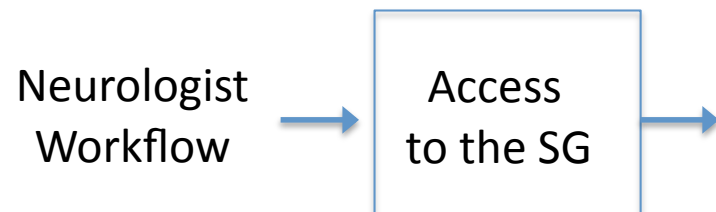
Showing 1 to 5 of 5 entries

[First](#) [Previous](#) [1](#) [Next](#) [Last](#)

This is a Service Provider of:



E-Services WORKFLOW



Select an Identity Provider

The Service you are trying to reach requires that you get authenticated. Please, choose from the list below the Federation and the Organisation you belong to.

Federation

eduGAIN (Global)
IDEM-GARR (Italy)
GrIDP (catch-all)
All IDPs

Organisation

Biblioteca Nazionale Braidense
CASPUR
CILEA
CINECA
CNR
CNR Area della Ricerca di Bari
CNR Area della Ricerca di Bologna
CNR Ceris
CNR Istituto di Fisiologia Clinica
CNR Istituto di Informatica e Telematica

Select

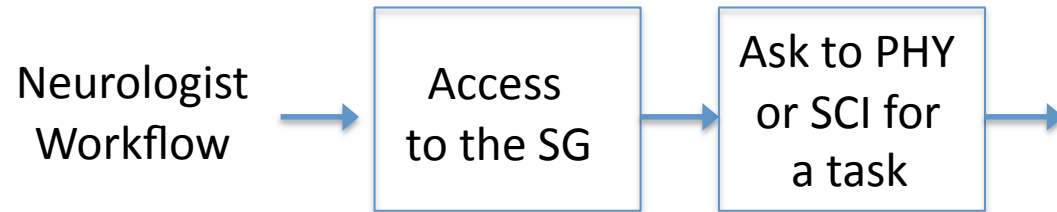
Remember for session ⇅

In case of problems, please send an email to credentials-admin@ct.infn.it with their description.

Do not bookmark this page! After login you will be redirected to the web page containing the service of the portal you wanted to use.



E-Services WORKFLOW



DECIDE SESSION MANAGER portlet

New Session

Patient data

Patient identifier

Age

Male

Female

Comment

Session type

Basic

Advanced

Requested applications

Grid EEG

Grid SPM

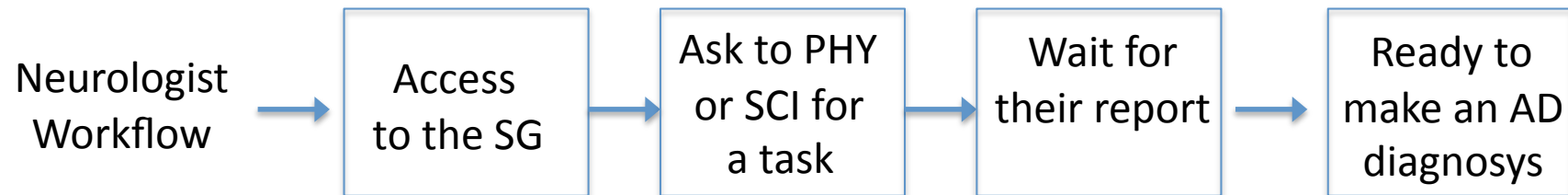
Grid ANN

- Please select -
- LATO-HSR GIGLIO CEFALU'
- Consiglio Nazionale delle Ricerche**
- National Research Council Institute of Clinical Physiology
- AO Niguarda Milan
- GARR
- SDN Istituto di Ricerca Diagnostica e Nucleare
- COMETA
- UNIGE
- Universita' degli Studi di Milano
- Istituto di Ricovero e Cura a Carattere Scientifico
- AZIENDA OSPEDALIERA SAN GERARDO
- Istituto Fate Beni Fratelli
- Associazione Fatebenefratelli per la ricerca
- Università degli Studi di Foggia
- National Institute of Nuclear Physics
- Catania
- Please select -
- Please select -

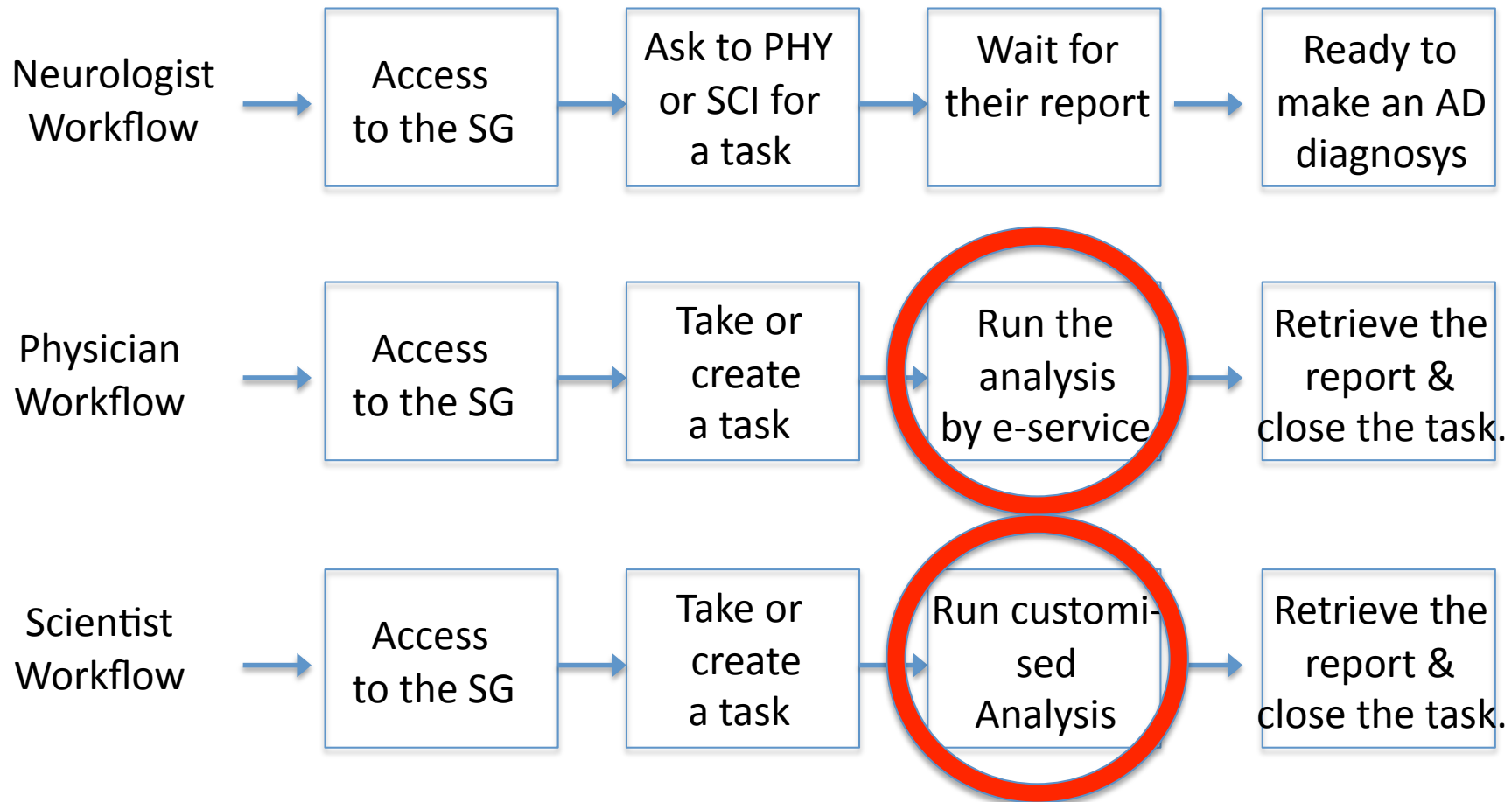
Save

Cancel

E-Services WORKFLOW



E-Services WORKFLOW



Science Gateway: Physician application

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.
2. The system automatically performs a pre-processing/QC step: submitted PET/SPECT images underwent a process of spatial normalization to a template, in order to be co-registered in the same stereotaxic space, as the normal subject images. Normalized PET/SPECT images have to be convolved with a Gaussian kernel in order to reduce artefacts due to noise dependency and to improve spatial normalization.
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

convolved with a Gaussian kernel in order to reduce artefacts due to noise dependency and to improve spatial normalization.

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 [this page](#) 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.

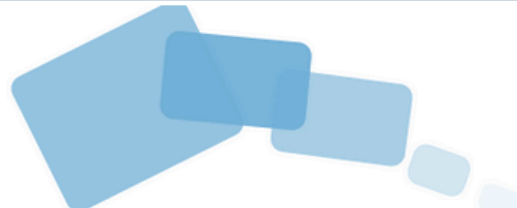
Upload here your SPM data archive

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

SPM-PHY Matlab Release 1.0 (2012-03/28 19:48)

This is an service

CONTACT | ABOUT | CONTACT | SUPPORT



DECIDE Science Gateway x

- > Home
- > Applications
 - > GridANN4ND
 - > GridEEG
 - > GridMRISeg
 - > GridSPM
 - > Physician
 - > **Scientist**
 - > Manage Repository
 - > GridGDI
 - > test
- > Grid Services
- > User Support
- > Collaborate with us

MyWorkspace ⁺ MYWORK

- Jobs
- JobsMap
- Data
- Help

GridSPM Scientist - Set Parameters

Grid SPM - Scientist mode

Welcome to the Grid SPM DECIDE

Purpose

This service allows the statistical Mapping (SPM) system. The use of the service is allowed

The workflow of the service consists of:

1. Data upload step: your PET/SPECT data is uploaded in DICOM and Interfile format.
2. The system automatically performs a process of spatial normalization, as the normal subject template is used as the reference Gaussian kernel in order to perform the normalization.
3. Statistical procedures (statistical parametric mapping) are performed on the smoothed PET/SPECT images. A report in PDF format is generated and registered on a standard archive.

How to run the analysis

Please upload your patient's data in DICOM and Interfile format. DICOM and Interfile format have to be archived together in .tgz format.

Follow the information on screen in order to follow-up your analysis and retrieve results.

- JobsMap
- Data
- Help

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 screen in order 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.

Analysis parameters

Please note: currently some parameters cannot be selected. Default value is shown for your information.

Interpolation method:

Smoothing (FWHM in mm):

Define the contrast Name:

Define the contrast Type:

Corrected height threshold?

Set threshold (T or p value):

Threshold extent (voxels):

Upload here your SPM data archive

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

Nessun file selezionato





DECIDE Science Gateway

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

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)

My Workspace



Jobs



JobsMap



Data



Help



Menu

- › Home
- › Applications
- › Grid Services
- › User Support

MyWorkspace



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

First Previous 1 Next Last

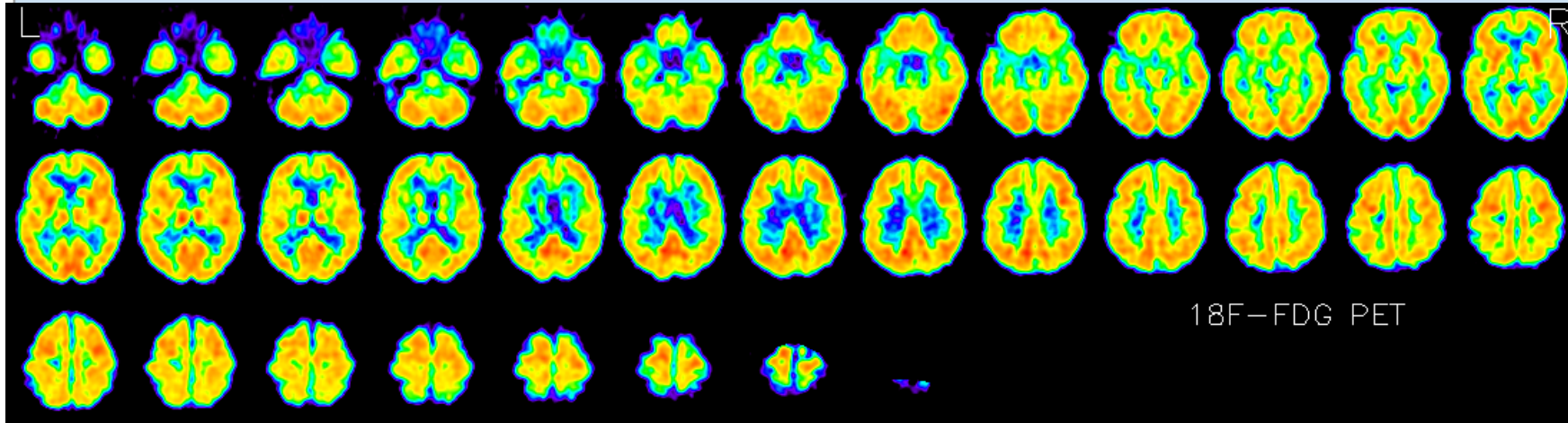
Application Name	User Description	Started on (UTC)	Status
GridSPM	GridSPM Matlab Job 2012-05-21-002909	2012-05-20 22:29:19.0	SUBMITTED
GridSPM	GridSPM Matlab Job 2012-05-21-002816	2012-05-20 22:28:19.0	SUBMITTED
GridSPM	GridSPM Matlab Job 2012-05-21-002732	2012-05-20 22:27:54.0	RUNNING
GridANN4ND	GridANN4ND Job 2012-03-29-162350	2012-03-29 14:23:51.0	

Showing 1 to 4 of 4 entries

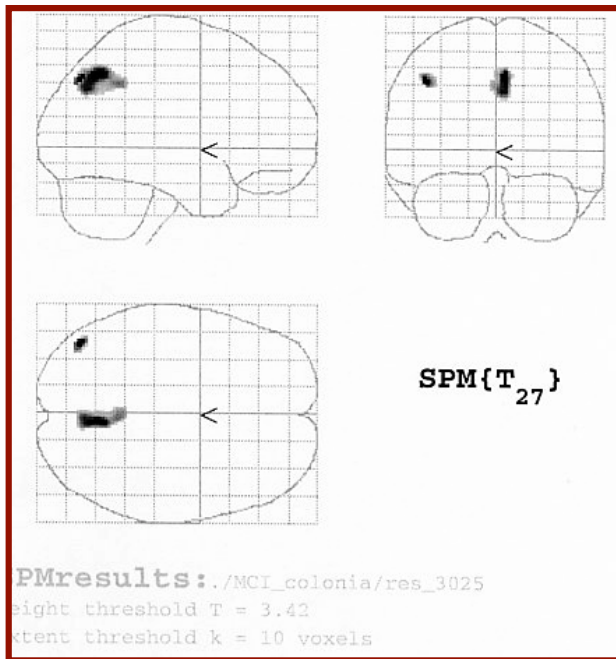
First Previous 1 Next Last

aMCI

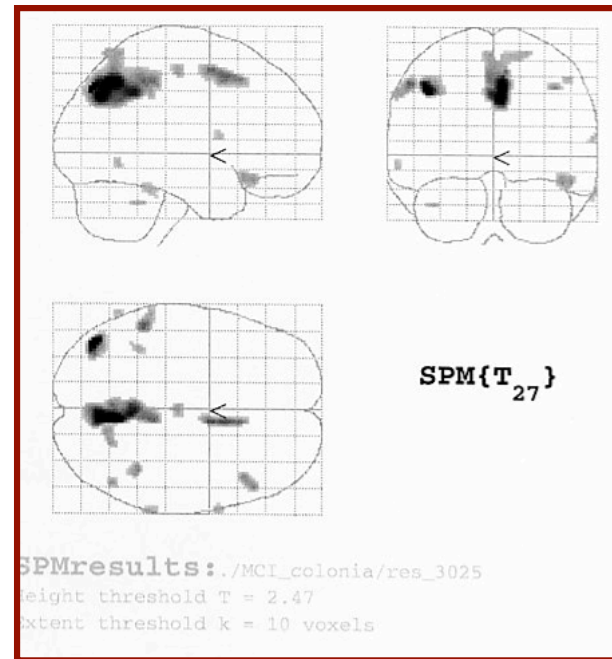
ID: C03025 | Age: 82 | MMSE: 25 | CVLT: 4



GridSPM report



p = 0.001



p = 0.01



Summarizing...

- DECIDE applications portfolio is perfectly in line with recent diagnostic guidelines on Alzheimer's disease
- DECIDE has the potential to dramatically change clinicians' daily practice, providing **secure, accurate, easy-to-use service**
 - Applications carefully tuned so they can run unattended, with minimal user interaction
 - Training programme is available,
 - Technical and clinical helpdesk are available, after the training

*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