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# Identifying the first signs of Alzheimer's and dementia

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FEATURE | MAY 25, 2011 | BY ADRIAN GIORDANI

There is a new case of dementia every 24 seconds in Europe alone, according to Jean Georges, executive director of [Alzheimer Europe](#). Early diagnosis is the key to slowing progress of these and other degenerative brain diseases, and creating a database of brain scans is the first step.

Currently, three e-infrastructure projects – [DECIDE](#), [neuGRID](#) and [outGRID](#) - are working together to give the neuroscience community comprehensive and collaborative online platforms to enable better detection and analysis of neurodegenerative diseases.

DECIDE (Diagnostic Enhancement of Confidence by an International Distributed Environment), is a European e-infrastructure platform for neurologists, physicians and scientists. It offers a secure and user-friendly web portal and a comprehensive database of brain image scans, such as [Magnetic-Resonance-Imaging](#), and [EEG](#) scans. Users can access diagnostic tools to identify imaging markers.

"These markers are undetectable to the naked eye and can provide new clinical and scientific information to support early diagnosis of dementia," said Laura Leone, DECIDE project coordinator.

The image marking process is to identify disease development from 2D brain scans. Using human eyes alone is nigh impossible. Neuroscientists have to extrapolate various features, shapes and measurements from these 2D scans, using complex image processing techniques to create 3D brain simulations which they can study.

DECIDE makes this computational neuroscience easier and builds on work previously done by the neuGRID project. "NeuGRID is Europe's neuroscientific [virtual laboratory](#) for developing and testing new imaging markers" said David Manset, DECIDE's Service Area Coordinator.

During the three year neuGRID project, researchers archived 10,000 MRI scans and used image processing and statistical models to assess disease markers. The project extracted a promising biomarker to track Alzheimer's disease progression from the largest ever dataset of brain scans in just two weeks. "NeuGRID is the Google for Brain Imaging", says [Giovanni Frisoni](#), a senior neurologist.

While neuGRID is European focused, outGRID is its worldwide arm focused on creating a global virtual laboratory. This project is currently preparing a "grand challenge" analysis involving 'real' international laboratories and helping neuroscientists develop large-scale experiments.

## Early bird gets the worm

Currently, DECIDE's grid experts and application developers are integrating a SPM (statistical-parametric mapping) tool. It displays step-by-step progression of neurodegenerative disease and deterioration of the brain's grey matter and metabolism over time.

SPM compares individual 3D [FDG-PET](#) (Fludeoxyglucose-Positron Emission Tomography) brain scans of the patients with normal PET brain scans and infers statistical differences to highlight regions with metabolic defects. A neuroscientist can then visually identify disease patterns. The first prototype was [presented](#) at the [EGI User Forum](#) in Vilnius, Lithuania, in April.

Crucially, 'healthy patient' data is needed for more accurate results. But, this data is rare because it means exposing patients to radioactive material. Ethical regulations for this are stringent.

When complete, DECIDE will be a reference hub of over 3,000 datasets from healthy and disease-affected subjects. To support this scale of data, 1,000 CPU cores and 70 TBs of data storage will be used. The [EGI](#) (European Grid Infrastructure) will process and store all the data. The pan-European [GEANT](#) research network will link clinical institutions globally and enable sharing of information and execution of applications simultaneously via 10 Gbps (Gigabits-per-second) high-bandwidth connections.

Next, general standards need developing for image marker tests and quality control, as well as more clinical trials. With all this, the main goal is "the development of drugs that will arrest or delay neurodegeneration," Frisoni said.

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MRI scan of a human head. Image courtesy Wikimedia.

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