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FP7-Eu project "DECIDE"(Diagnostic Enhancement of Confidence by an International Distributed Environment): a national prototype of e-services for the assisted diagnosis of neurodegenerative functional studies

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Overview

Aim of DECIDE (Diagnostic Enhancement of Confidence by an International Distributed Environment) is to design, implement, and validate a GRID-based e-Infrastructure building upon neuGRID and relying on the Pan-European backbone GEANT and the NRENs. Over this e-Infrastructure, a service will be provided for the computer-aided extraction of diagnostic markers for Alzheimer's disease and schizophrenia from medical images. DECIDE will offer access to large distributed reference databases (850 and 2200 datasets from normal subjects and from neurological subjects, respectively), high computation and storage resources (more than 1000 CPU core processors and 70 Tbyte of storage) and intensive image processing tools. DECIDE will be open to the implementation of future algorithms based on other neuroimaging methods; in a longer-term perspective, the infrastructure could be extended to other research and diagnostic algorithms relating other diseases of the brain and other organ systems.

Impact

The potential impact for clinical use and research of the proposed e-Infrastructure will be on a large scale by enabling clinicians from hospitals with no access to sophisticated computational algorithms, resources, and large sets of reference images to carry out analyses remotely and efficiently. This will be reached by the use of a centralized user friendly web-Grid service. The service will be accessed by the medical community through a Science gateway portal.
The Project will define with National and European regulatory agencies protocols and rules for the qualification of experts enabled to use the service for clinical diagnostic purposes.
The DECIDE consortium strongly believes that a European, and even wider approach is needed to tackle the problem of AD and neurodegeneration in general. Furthermore the rapidly ageing of society, that Europe and other developed economies has to cope with, make the societal emergency of the phenomenon more dramatic and resource-consuming. In this perspective, the project consortium and pilot infrastructure should be regarded as an extensible, proof-of-concept, platform, whose usage should be extended to other communities in Europe.

Description of the work

The Project Objectives are:
• Provide the Neuroscientific and Medical community with a dedicated Grid-based e-Infrastructure building upon the FP7 e-Infrastructure neuGRID (www.neuGRID.eu) and relying on the Pan-European backbone GEANT and the NRENs; different competences and communities (neurological research, medical community, grid, networking) will be gathered, to implement the e-Infrastructure in an innovative way;
• Deploy on this e-Infrastructure a secure and user-friendly service for the early diagnosis and research on dementia and other brain diseases, and exploiting large distributed reference databases of multimodal neuroimages;
• Validate the e-Infrastructure and service through application to real patient cases (Alzheimer's Disease, neurodegenerative dementias) and validate the DECIDE model on cutting-edge diagnostic conditions (Schizophrenia);
• Propose a long-term vision for the sustainability of the e-Infrastructure and its extension to new communities; ethical issues related to the management and exploitation of sensitive patient clinical data will be specifically addressed as well as the business model for the wider exploitation of the service;
• Disseminate the results to promote the adoption of the DECIDE e-Infrastructure and service by the clinical community at large.

The planned tools will estract (i) diagnostic markers of established value in the medical community and might be used immediately in clinical settings, and (ii) markers currently in an earlier stage of validation, that will be brought forward by DECIDE.
The DECIDE applications will be implemented into a Grid middleware that will allow: (i) authorization and secure access to largely distributed databases for reference images, (ii) computationally intensive processing, (iii) image processing on patient images residing locally, compliant with the strict data-sharing hospital policies.

URL

www.eu-decide.eu

Conclusions

The implementation of the DECIDE infrastructure and service should be regarded not only as a step towards streamlining and enhancing confidence in early diagnosis of neurodegenerative pathologies, but as a concept that can be successfully extended to other pathologies and communities, not only in the field of neurology (i.e.for instance brain cancer), but to other organs as well (i.e.for example cardiology or traumatology). An International approach will be especially beneficial in view of such extension in scope, as it will help bringing together other groups who are working on the subject in different fields, sharing with them approaches and results, and making the best of the state of the art in this field.

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