

Health-e-Child

The Health-e-Child project aims at developing an integrated healthcare platform for European paediatrics, providing seamless integration of traditional and emerging sources of biomedical information.

Objectives of the project

The goal of Health-e-Child is to become the universal biomedical knowledge repository and communication conduit for the future, a common vehicle by which all clinicians will access, analyse, evaluate, enhance and exchange biomedical data of all forms. It will be an indispensable tool in their daily clinical practice, decision making and research. It will be accessible at any time and from anywhere, and will offer a friendly, multi-modal, efficient and effective interaction and exploration environment. Pivotal to this outlook are Health-e-Child's breakthroughs in personalised medicine through integrated disease modelling, knowledge discovery and decision support.

Fashioned around three paediatric diseases with at least partly unknown causes, classification and/or treatment

outcomes - heart diseases (right ventricular overload [RVO], cardiomyopathies), inflammatory diseases (juvenile idiopathic arthritis [JIA]), and brain tumours (gliomas), Health-e-Child is

“The core of Health-e-Child revolves around biomedical information analysis for the advancement of personalised medicine”

building the enabling tools and services that improve the quality of care and reduce its cost by increasing efficiency, through:

- Integrated disease models,
- Database-guided decision support systems,
- Cross modality information fusion and data mining for knowledge discovery.

Key to the Health-e-Child system is the establishment of multi-site, vertical, and longitudinal integration of biomedical data, information and knowledge delivered via a

Gridbased platform, supported by robust tools for search, optimisation and matching processes.

The core of Health-e-Child revolves around its efforts dedicated to meeting the challenges entailed in biomedical information analysis for the advancement of personalised medicine.

Project Description

The following are a few examples of Health-e-Child's ongoing research activity.

Disease Modelling in Cardiology

Health-e-Child's research goals are:

- identifying significant parameters for subtypes of cardiomyopathies that could lead to indications for additional genetic tests,
- adapting generic models to clinical data to extract patient-specific high level discriminative features for decision support and knowledge discovery, and
- validating new measurements for diagnosis.

Decision Support in Cardiology

The project is currently developing tools for:

- monitoring RVO and decision support based on similarity search on specified features and association rules extraction.
- The prediction of whether atrial septal defect (ASD) will close by itself or will become larger, thereby precluding trans-catheterisation.

Knowledge Discovery in Rheumatology

Applied to JIA, Health-e-Child focuses on:

- identifying gene variant combinations (haplotypes) correlated with particular diseases (bones/joints erosion)
- comparing the presence of different proteins in fluid at different stages of the disease to discover behaviour of cells close to fluid

Scenario

A child is born in a family in which there was an occurrence of idiopathic Dilated Cardiomyopathy (DCM). Her biomedical record is cohesively integrated. It is shared through a coherent view at different clinical sites. An intelligent classification algorithm combines the generative and the discriminative models in an optimal way and confirms an increased risk of DCM. Imaging data show left ventricle enlargement. An intelligent retrieval system for examining similar cases helps the doctor. A prevention/treatment plan especially fitted for her genomic or proteomic profile and existing symptoms is suggested.

- improving current classification of JIA subtypes, and identifying homogeneous groups of clinical features elaborating explicit criteria for the early prediction of disease outcome/evolution
- developing image-based methods which rapidly indicate the capacity of drugs to stop/slow down disease evolution (automatic suggestion of drug prescriptions)
- analysing correlation between genomic, proteomic, clinical and image data, establishing a candidate gene set (responsible for bone remodelling) for study.

Knowledge Discovery in Brain Tumours

The priority research goals of Health-e-Child in this area are:

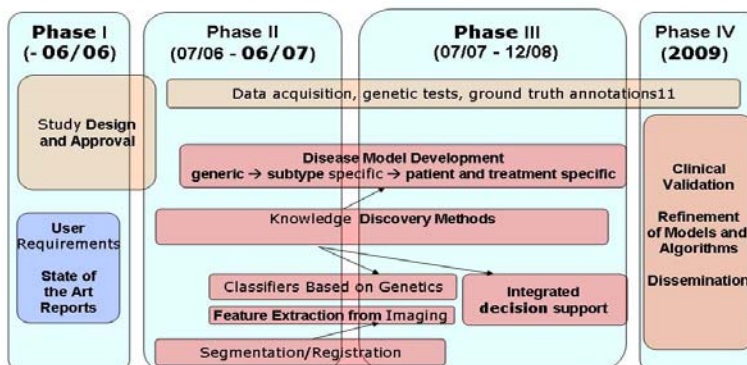
- verifying the diagnosis/categorization of low-grade gliomas
- correlating clinical, imaging, and genomic data
- correlating prognosis with tumour origin site
- defining prognosis (e.g., correlations with spectroscopy)
- suggesting treatment strategies
- predicting outcome
- providing more precise classification of diseases
- detecting correlations between age and outcome and between genetics and outcome
- elaborating meta-analyses of published findings.

Expected Results & Impacts

Health-e-Child will have substantial impact on:

- **Strategy:** Enhancing level and quality of medical services offered in Europe, advancing medical research, improving competitiveness in the area of medical service provision, facilitating the adoption of new policies in member state.
- **Technology:** Bringing forward information-based medical technology and integrating mostly separate areas, i.e., vertical information integration, advanced medical querying, Grid infrastructures, disease modelling, medical imaging, knowledge discovery and data mining, and decision support.
- **Society and economy:** Improving the success rate in resolving difficult medical cases, saving children's lives. Furthermore, such improved medical decision making will often result in lowering medical cost and/or treatment duration.

Clinical and Application Roadmap



Health-e-Child

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