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# BIMCV: Synergy between Peta Bytes of data in population medical imaging, computer aided diagnosis and AVR

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Keywords. Medical Biobank, Population Imaging, EuroBioimaging, data mining

## Introduction

According to the definition of ESR Working Group on Imaging Biobanks, "Imaging Biobanks are defined as organised databases of medical images and associated imaging biomarkers (radiology and beyond) shared among multiple researchers that should be linked to a biorepository", and which short and mid-term objectives are:

- To monitor the existing imaging biobanks in Europe .
- To promote the federation of imaging biobanks in Europe.
- To elaborate a white paper on imaging biobanks.

The main objective of the BIMCV node "Medical Imaging Databank of the Valencia Region" is to set up an infrastructure with mass storage capacity (through GIMD - The project from the Regional Ministry of Health in the Valencia Region, figure 1) and high throughput computational modelling capabilities. The aim is to transform the Medical Imaging Databank of the Valencia Region into an area for the natural development of imaging-assisted medical-decision systems (SADI), having as main objective that BIMCV becomes an environment for translational innovation for

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healthcare interventions and management. The whole approach is based on the Cloud CEIB architecture (de la Iglesia et al., 2011; Salinas et al., 2012).

Finally, we want to validate different visualisation techniques. The visualisation of complex medical imaging data such as functional connectivity is nowadays a challenge. Some authors described a stereoscopic method to view neuroradiological 3-D images (Rojas et al., 2014). We propose augmented virtual reality approaches for visualisation, being Google Glass one of the selected devices, which represent a good example of the potential of new technologies applicable to Healthcare and Image Biomarkers.

### 1. Methods

BIMCV is the first initiative of its kind raised in our Spanish National Health System; its structure will facilitate open translational research with a sufficiently representative sample population. The system architecture has been developed by the Regional Ministry for Health (CS) through the Centre of Excellence for Biomedical Imaging of the CS (http://ceib.san.gva.es) and has been evaluated by independent experts as future EuroBioImaging node platform (http://www.eurobioimaging.eu), who have reviewed the scientific excellence of the proposed research skills and group activity (de la Iglesia et al 2011-2013, Salinas, JM, et al, 2011-2013).

The overall objective is to launch an infrastructure capable of massive storage and computationally intensive modelling, supporting clinicians, researchers and users, and converting BIMCV in a tool for research and development assistance for health management.

#### 2. Results

In this context we propose several Use-Cases for demonstrating the BIMCV capabilities. In the case of use of Brain topic, we pretend to model and improve the characterisation of structural alterations in patients with neurological disease, which will allow us to better understand the pathology and to obtain structural imaging biomarkers related to cognitive impairment. In the use case of breast cancer (BC), we plan to test Pattern Recognition, Machine Learning and Computer Vision techniques to discriminate between different types of tissue and to quantify them. (Llobet et al., 2014, M. Pollan et al., 2013). Finally, with Augmented Virtual Reality, we prove the viability of incorporating these techniques into clinical practice. For this purpose, a software application will be develop based on Rojas's prototype (Rojas et al., 2014).

### 3. Discussion

With this project, we aim at: Putting up a structure with massive storage capacity and intensive process capabilities. Ensuring quality criteria in terms of image and associated data and provide high performance computing resources for post-processing of medical population image data.

Preparing the databases, structuring and anonymising the information, including both medical imaging and clinically-relevant biological data extracted from the medical records associated with the use case considered.

Application of techniques such as virtual and augmented reality as a new way to display the results through devices: Googles Glass, smartphones, android tablets, IPads.