Biomedical Imaging & Modelling
Biomedical Imaging & Modelling
“CISTIB is a biomedical imaging research centre devoted to the service of companies and the community. Since 2001 we have geared our knowledge towards increasing the competitive edge of companies in the medical technologies sector and towards improving patient healthcare.”

Alejandro F. Frangi, PhD.
Associate Professor at the Universitat Pompeu Fabra (UPF).
Director of CISTIB (Center for Computational Imaging and Simulation Technologies in Biomedicine).
Who we are

CISTIB at a glance

We are an international research and development centre within the UPF (Universitat Pompeu Fabra), leader in multimodal biomedical sensing and imaging.

Our activity has great clinical and social impact as we help to improve the quality of life of the citizens. They are at the centre of our medical technologies and complete healthcare cycle approach.

Our principle services

Research
Generation of new technical or clinical knowledge by means of innovative methods and systems.

Development
Construction of pre-competitive prototypes that materialize the results of the applied investigation and allow evaluating its practical viability.

Consultancy
Expert advice in the different areas of expertise of the centre including the analysis and interpretation of experimental and clinical information.

Training
Transfer of the knowledge generated in the current environment of the centre through regulated channels, such as the teaching of official courses at the UPF, or through less regulated channels such as in-house training.

* We have focused on the development of techniques in the area of computational image and modelling in biomedicine, with special emphasis on angiology, cardiology and the musculoskeletal system.

We are a multicultural team

50

Researchers

20

Nationalities

74% Men

26% Women

62% Europe

13% Asia

25% Americas

We are a multidisciplinary team

8

Different disciplines

46% PhD

36% MSc

4% BSc

4% Other

A multidisciplinary team, prepared to collaborate with researchers and clinicians.

Angiology
Medical specialty that studies the vessels within the circulatory and the lymphatic systems, including the anatomy of the blood vessels (as arteries, veins, capillaries) and that of the lymphatic ones, as well as their diseases.

Cardiology
Medical specialty within internal medicine that deals with disorders of the heart and the circulatory system.
During the last years our scientific production has continued to grow

We have published articles in the best scientific journals

- Nature Genetics.
- European Heart Journal.
- International Journal of Computer Vision.
- Journal of Hypertension.
- IEEE Transactions on Pattern Analysis and Machine Intelligence.
- Medical Image Analysis.

We focus on knowledge transfer

We work together with industry and healthcare professionals to centre our research on relevant topics that address existing needs in the market. This way, the results of our research can be more easily transferred to the market in the form of applications, products, patents or licenses etc. and can have a direct impact on the industrial and clinical sectors.

Our approach is centred on the patient

- Faster and more precise diagnoses
- Minimally invasive Treatments
- Reduced hospitalization periods
- Lower mortality rate
- Improved quality of life
- Increased life expectancy

Budget & funding sources 2005-2012

With our help Barcelona and Catalonia will be an innovation hub for the biomedical sector

“One of keys drivers for situating Barcelona and Cataluña as a hub for knowledge and attracting talent at an international level is the quality of the research carried out at CISTIB.”

Dr. Miquel Barceló
President, InnoPro Global Services, Barcelona, Spain.
## Who we target

<table>
<thead>
<tr>
<th></th>
<th>Diagnostic and Patient Care Service Providers</th>
<th>Prevention, Diagnostic and Therapeutic System Providers</th>
<th>Medical Technologies and Product Providers</th>
<th>Contracted Research Organisations (CROs)</th>
<th>ICT industry as applied to healthcare</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>Public and Private entities that deal directly with patients, including regional health care agencies. They seek to improve diagnoses and treatments by incorporating information technology (IT) to the healthcare sector. In particular, they aim to improve diagnosis and computer-aided interventional planning.</td>
<td>These are companies that develop biomedical signal and image capture systems with applications in prevention, diagnostics, treatment and monitoring for diverse illnesses and pathologies and who are interested in having computerised systems for image-based assessment, merging, modelling and surgical guidance.</td>
<td>These are companies developing new treatment strategies based on new medicines or medical devices. Medical images and their analysis have a vital role to play as mechanisms for planning, administering, monitoring, evaluating and conducting in silico tests for these new therapies.</td>
<td>Organizations whose mission it is to facilitate clinical testing in areas such as information flow management, public registration, legal and ethical issues etc. The pharmaceutical (medicines), medical implants and devices (medical technology) sectors are witnessing the growing influence of the image as a key element in these clinical tests.</td>
<td>ICT companies aim to develop methods, systems and platforms for storing, visualizing, transmitting, processing, analysing and assessing medical images and biosignals.</td>
</tr>
<tr>
<td><strong>Benefits offered by CISTIB</strong></td>
<td>We provide them with new tools for clinical investigation, diagnosis and treatment.</td>
<td>We help them to offer patients more advanced health care.</td>
<td>We improve efficient use of healthcare resources.</td>
<td>We improve the results of diagnosis, planning and administration of treatment.</td>
<td>Experience in biomedical information systems and advanced analysis of biomedical imaging and signals.</td>
</tr>
</tbody>
</table>
Our 5 strategic business segments

At CISTIB we centre our activity on 5 medical technologies related strategic segments.

One of our main differentials is that we employ transversally all of our services in each one of the strategic segments. This is possible thanks to the multidisciplinary team that makes up CISTIB.

Multimodal Diagnostic Methods & Systems

Definition

These are computer-aided image diagnostic systems for comprehending a clinical problem, selecting the proper modalities, optimizing image-acquisition protocols, developing computerized assessment methods and integrating multimodal imaging, clinical assessment of methods and training.

Example Project

CDTEAM

CDTEAM’s goal was structured around two strategic lines: the first is based on support technology for Molecular Medicine, and more specifically, molecular imaging and biotechnological methods associated with pharmaceutical development. The second focuses on Diagnosis Technology and Therapeutic Planning based on multi-modal medical imaging.

Testimonial

“We have worked with CISTIB for a number of years now on various national and international projects with the objective of improving the diagnosis and treatment of cerebral aneurysms and cardiac illnesses.”

Dr. Josep Mª Piqué
Assistant Director, Hospital Clinic de Barcelona, Spain.

Benefits offered by CISTIB

🔍 We can converse bilingually in clinical and technological terms thanks to our focus on bio-engineering with a view to clinical translation.

🔍 We carry out applied research in close collaboration with industry which requires diagnosis of clinical problems and the best, fastest and most precise course of treatment to follow.

🔍 We help the health service to make the most efficient use of its resources, providing support to professionals in the decision making process.

Collaborating Organisations

Alma IT Systems
www.alma3d.com

Boston Scientific
www.bostonscientific.com

CETIR Sant Jordi
www.cetir.es

Grid Systems
www.gridsystems.com

Hospital Clínica de Barcelona
www.hospitalclinic.org

Hospital Universitario Clínico San Carlos de Madrid
www.hcscl.es

IDI Instituto de Diagnóstico por la Imagen. Hospital Josep Trueta, Servicio de Radiología. www.gencat.net/ics/trueta

Neuroangiografía Terapéutica
Hospital General de Cataluña. www.capisanidad.es/hgc/

Philips Ibérica Sistemas Médicos
www.philips.es

Silicon Graphics
www.sgi.com

UDIAT Centre Diagnòstic
www.tauli.cat/tauli/cat/Lacorporacio/elscentres/UDIAT/default.htm
**Interventional Planning & Guidance Methods & Systems**

**Definition**

These are interventional planning systems for surgery and minimally invasive intervention covering a wide variety of aspects that help the physician to plan surgery or to guide him/her during patient operations. This includes aspects of multimodal integration, obtaining roadmaps for intraoperative navigation, registering of pre-op and intra-op information, localizing instruments and equipment in surgery, developing enhanced visual systems, systems for implanting virtual devices, integrating simulation technologies with interventional planning platforms, training simulators, etc.

**Example Project**

The euHeart project (www.euheart.eu) is a Large Scale Integrated Project from the 7FP designed to develop information technology tools to create cardiovascular models in-silico, specific to each patient. These tools provide greater understanding of the disease and optimize medical device implantation.

**Collaborating Organisations**

- Berlin Heart
  www.berlinheart.de
- HemoLab
  www.hemolab.nl
- Philips Cuidados de la Salud Ibérica
  www.philips.es
- Philips Healthcare
  www.philips.nl
- Philips Technologie Forschungslaboratorien
  www.research.philips.com
- Polydimensions
  www.polydimensions.de
- Volcano Europe
  www.volcanocorp.com

**Testimonial**

"The opportunity of collaboration with CISTIB is very relevant for us to optimize from the image acquisition to the image analysis and quantification to provide reliable biomarkers"

Casper Garos
Senior Director External Partnerships, Philips Healthcare - CTO Office
Philips Healthcare, Netherlands.

**Collaborating Organisations**

- Advanced Simulation & Design
  www.asd-online.com
- ANSYS Europe
  www.ansys.com
- B3C BioComputing Competence Centre
  www.b3c.it
- Grid Systems
  www.gridsystems.com
- IDAC Ireland
  www.idacireland.com
- NEC
  www.nec.co.jp
- BCC BioComputing Competence Centre
  Hospital General de Cataluña www.capiosanidad.es/hgc
- Philips Ibérica Sistemas Médicos
  www.philips.es
- William Cook Europe
  www.cook-iec.com

**Optimisation of Medical Devices & Implants**

**Definition**

These are methods for medical device modelling and the virtual implantation process, device selection techniques and customization of properties or settings, assistance in designing and assessing medical devices and implants through numerical simulations, image-based interdisciplinary surgery for developing devices and assessment using medical images.

**Example Project**

The @neurIST project (www.aneurist.org), is a Large Scale Integrated Project financed by the Sixth Framework Programme. The project sets a new paradigm for understanding cerebral aneurysms thanks to the integration of different computational systems. As overall coordinator, CISTIB has responsibility for developing part of this project which has brought together more than 30 European technological centres and companies, 3 centres in North America and 1 centre in New Zealand. This is an example of CISTIB’s possibilities and areas of activity as well as its network of contacts and the institution’s potential.

**Collaborating Organisations**

- Berlin Heart
  www.berlinheart.de
- HemoLab
  www.hemolab.nl
- Philips Cuidados de la Salud Ibérica
  www.philips.es
- Philips Healthcare
  www.philips.nl
- Philips Technologie Forschungslaboratorien
  www.research.philips.com
- Polydimensions
  www.polydimensions.de
- Volcano Europe
  www.volcanocorp.com
- IDAC Ireland
  www.idacireland.com
- NEC
  www.nec.co.jp
- BCC BioComputing Competence Centre
  Hospital General de Cataluña www.capiosanidad.es/hgc
- Philips Ibérica Sistemas Médicos
  www.philips.es
- William Cook Europe
  www.cook-iec.com

**Testimonial**

"CISTIB is one of the key driving forces in the European health technology scene. We started to collaborate some years ago on a specific project, and we slowly developed our collaboration to the point where now we are planning the convergence of some of our key software tools. Working with CISTIB is pure fun, guaranteed!"

Dr. Marco Viceconti
Research Director, Laboratorio di Tecnologia Medica. Istituto Ortopedico Rizzoli, Bologna, Italy.

**Benefits offered by CISTIB**

- We help to design and evaluate medical devices and implants through modelling and simulation techniques which in turn result in a direct benefit for industry in the medical technology sector.
- We help personalize medical devices and implants according to the patient’s characteristics.
High Throughput Image Analysis in testing the Effectiveness of New Medicines

**Definition**
This involves the development of high throughput image analysis systems. These systems allow for quantification of structural and functional evolution of cells, tissues and organs using multimodal image analysis.

**Example Project**
cvREMOD
Convergencia de Tecnologías Médicas para la Gestión Integral del Remodelado Cardiovascular.
cvREMOD is a recent success in our laboratory. CISTIB and Grupo Hospitalario Quirón formed a vast multi-sector consortium in order to improve results in transfer of basic and applied research to the Health Technology industry. The scientific goal of cvREMOD is to use new imaging and modelling technologies to quantify and comprehend cardiovascular remodelling mechanisms and, thus, help in:


**Collaborating Organisations**
- AB Biotics Producciones Industriales de Microbiotas: www.ab-biotics.com
- Atos Origin: www.atosorigin.com
- Centro de Investigación Colaborativa ibioGUNE: www.cibigune.es
- Cetemmsa Technological Centre: www.cetemmsa.com
- Fundación ASCAMM: www.ascamm.com
- Fundación Hospital Clínic de Barcelona: www.fundacioclinic.org
- Fundación Doctor Peset: www.fundaciopeset.org
- Grupo Hospitalario Quirón: www.quiron.es

**Testimonial**
“CISTIB’s multidisciplinary and multicultural nature in research projects makes it one of the strategic partners in Grupo Hospitalario Quirón’s bid for innovation through the development, validation and implementation of technology in the healthcare sector.”

Dr. Antonio Fernández Abós
Corporate Medical Director
Grupo Hospitalario Quirón
Barcelona, Spain.

**Benefits offered by CISTIB**
- We develop robust and reliable biometric systems for developing large scale population studies for drug effectiveness trials (e.g. in clinical trials Phase II to IV)
- We promote technology transfer to industry by continuously tracking market needs and by providing solutions to meet those needs through our applied research
- We help the pharmaceutical industry with drug effectiveness testing through the development of image analysis systems.

**Biomedical Information Management and Systems**

**Definition**
These are systems for managing biomedical information such as patient data, whether in terms of primary or original data (e.g. medical histories, radiological information, etc.); secondary or derivative data from analysis and exploitation; or even metadata associated with patient’s genetic or therapeutic information.

**Example Project**
RICORDO
Researching Interoperability using Core Reference Databases and Ontologies.
RICORDO for the Virtual Physiological Human is a European project from the 7FP in coordination with the VPH Network of Excellence (NoE) and ELIXIR projects, the RICORDO plan aims to:

1. Identify properties in common among VPHDMs / 2. Apply unique standard descriptor identifiers (IDs) to these properties / 3. Set up communal methodologies for the local annotation of VPHDMs using these standard IDs

A core set of Reference Databases and Ontologies (CORDO) will bring together well established biological dictionaries to provide a communal space of stable identifiers (IDs).

**Collaborating Organisations**
- European Bioinformatics Institute: www.ebi.ac.uk
- Danmarks Tekniske Universitet: www.dtu.dk
- The University of Auckland: www. Auckland.ac.nz
- Medical Research Council: www.mrc.ac.uk

**Testimonial**
“Our close working relationship with CISTIB, who are at the leading edge of technical and technological infrastructure development, is key to the translation of ‘Virtual Physiological Human’ science into real clinical application.”

Dr. Rod Hose
Professor, University of Sheffield, United Kingdom.

**Benefits offered by CISTIB**
- We give technological support to the various Catalan health system’s key players in their efforts to digitalize their information and its later exploitation.
- We use the information obtained to develop innovative information management systems.
- We develop systems which integrate computer assisted services, image diagnosis systems and surgical planning methods for healthcare centres and hospitals.