

**FIMH** **2019** BORDEAUX



**FUNCTIONAL IMAGING AND  
MODELING OF THE HEART  
6-8 june 2019**

University of Bordeaux - Victoire, France

**PROGRAM**



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# Editorial

FIMH 2019 is the 10th International Conference on Functional Imaging and modeling of the Heart. FIMH 2019 provides a unique forum for the discussion of the latest developments in the areas of functional cardiac imaging as well as computational modeling of the heart.

The topics of the conference included (but were not limited to) advanced cardiac imaging and image processing techniques, construction of computational meshes from images, myocardial tissue characterization and perfusion, computational fluid dynamics, forward and inverse problems in electrophysiology, cardiac growth, computational physiology and biomechanics of the heart, parameterization of mathematical models from data, as well as the pre-clinical and clinical applicability of these methods.

We hope that all the contributions along with the keynotes will act to accelerate progress in the important areas of functional imaging and modeling of the heart. We also hope that the event will motivate fruitful discussion during the conference.

Yves Coudière - Valéry Ozenne - Ed Vigmond - Nejib Zemzemi

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## June 5 – Wednesday - *IHU Liryc*

### 9:00 - 16:30 – Consortium for ECG imaging: Satellite Conference and Workshop

#### **The Future of ECGI: Engineers meet Clinicians - Clinicians meet Engineers**

Program available here: <http://www.ecg-imaging.org/community/events/cei-symposium-2019>  
more information p.8

### *16:30 - 17:00 – Opening session at the Electrophysiology and Heart Modeling Institute*

**Liryc** see more on <https://vimeo.com/265751391>

### 17:00 - 17:30 – Welcome/Lecture by Pr. Pierre Jaïs

M.D. Centre Hospitalier Universitaire de Bordeaux, Deputy Director of the Liryc.

### 17:30 - 19:30 – Opening reception and lab visits

Facilities include ep lab, imaging platform, optical mapping platform, working heart setup.

## 08:30-9:00 - Opening session

### 09:00-10:00 – Keynote 1

## Image-based modeling for the clinical management of patients with cardiac arrhythmias: are we there yet?

Dr. Hubert Cochet, Professor of Medicine and Radiology, IHU Liryc, Univ. Bordeaux, CHU Bordeaux, and Inserm U1045.

### 10:00 – 10:40 – Oral Session 1: Clinical application

- **FR-Net: Joint Reconstruction and Segmentation in Compressed Sensing Cardiac MRI:** Qiaoying Huang, Dong Yang, Jingru Yi, Leon Axel, Dimitris Metaxas.
- **3D Coronary vessel tree tracking in x-ray projections:** Emmanuelle Poulain, Grégoire Malandain, Régis Vaillant.

### 10:40 - 11:10 – Coffee break

### 11:10 – 12:30 – Oral Session 2: Registration & cardiac motion

- **Left Ventricular Shape and Motion Reconstruction through a Healthy Model for Characterizing Remodeling after Infarction:** Mathieu De Craene, Paolo Piro, Nicolas Duchateau, Pascal Allain, Eric Saloux.
- **GRÖMeR: A Pipeline for Geodesic Refinement of Mesh Registration:** Jake Bergquist, Wilson Good, Brian Zenger, Jess Tate, Rob MacLeod.
- **Domain adaptation via dimensionality reduction for the comparison of cardiac simulation models:** Nicolas Duchateau, Gerardo Kenny Rumindo, Patrick Clarysse.
- **Analysis of Three-chamber View Tagged Cine MRI in Patients with Suspected Hypertrophic Cardiomyopathy:** Mikael Kanski, Teodora Chitiboi, Lennart Tautz, Anja Hennemuth, Dan Halpern, Mark Sherrid, Leon Axel.

### 12:30 - 13:30 – Lunch

### 13:30-14:30 – Keynote 2

## Patient-specific hemodynamics simulations for interventional planning of congenital and acquired cardiac diseases

Dr. Irène Vignon-Clémentel, Senior research scientist at Inria, Research center of Paris.

### 14:30 - 15:30 – Oral Session 3: Patient specific mechanical Modeling

- **Mesh based approximation of the left ventricle using a controlled shrinkwrap algorithm:** Faniry Razafindrazaka, Katharina Vellguth, Franziska Degener, Simon Suendermann, Titus Kühne.
- **A simple multi-scale model to evaluate left ventricular growth laws:** Emanuele Rondanina, Peter Bovendeerd.
- **Minimally-invasive estimation of patient-specific end-systolic elastance using a biomechanical heart model:** Arthur Le Gall, Fabrice Vallée, Dominique Chapelle, Radomir Chabiniok.

### 15:30-16:00 – Poster Session 1

- **Development of a CFD-Model of the Epicardial Vasculature:** Johannes Martens, Sabine Panzer, Jeroen Van den Wijngaard, Maria Siebes, Laura Schreiber.
- **Transcriptomic approaches to modelling long term changes in human cardiac electrophysiology:** Furkan Bayraktar, Alan Benson, Arun Holden, Eleftheria Pervolaraki.
- **Modeling Cardiac Growth: an Alternative Approach:** Nick van Osta, Loes van der Donk, Emanuele Rondanina, Peter Bovendeerd.
- **Virtual Catheter Ablation of Target Areas Identified from Image-Based Models of Atrial Fibrillation:** Aditi Roy, Marta Varela, Henry Chubb, Rob MacLeod, Jules Hancox, Tobias Schaeffter, Mark O'Neill, Oleg Aslanidi.
- **Comparing subjects with reference populations - a visualization toolkit for the analysis of aortic anatomy and pressure distribution:** Sahar Karimkeshteh, Lilli Kaufhold, Sarah Nordmeyer, Lina Jarmatz, Andreas Harloff, Anja Hennemuth.
- **EP-Net: Learning Cardiac Electrophysiology Models for Physiology-based Constraints in Data-Driven Predictions:** Ibrahim Ayed, Nicolas Cedilnik,patrick gallinari, Maxime Sermesant.
- **Pipeline to build and test robust 3D T1 mapping-based heart models for EP interventions: preliminary results:** Mengyuan Li, Maxime Sermesant, Sebastian Ferguson, Fumin Guo, Jennifer Barry, Xiuling Qi, Peter Lin, Matthew Ng, Graham Wright, Mihaela Pop.
- **On sampling spatially-correlated random fields for complex geometries:** Simone Pezzuto, Alessio Quaglino, Mark Potse.
- **Cardiac displacement tracking with data assimilation combining a biomechanical model and an automatic contour detection:** Radomir Chabiniok, Gautier Bureau, Alexandra Groth, Jaroslav Tintera, Juergen Weese, Dominique Chapelle, Philippe Moireau.
- **Solution to the unknown boundary tractions in myocardial material parameter estimations:** Anastasia Nasopoulou, David Nordsletten, Steven Niederer, Pablo Lamata.

### 16:00 - 17:00 – Oral Session 4: Parametrisation of models

- **Model-based indices of early-stage cardiovascular failure and its therapeutic management in Fontan patients:** Bram Ruijsink, Konrad Zugaj, Kuberan Pushparajah, Radomir Chabiniok.
- **Maximal conductances ionic parameters estimation in cardiac electrophysiology multiscale modelling:** Yassine Abidi, Julien Bouyssier, Moncef Mahjoub, Nejib Zemzemi.
- **Large Scale Cardiovascular Model Personalisation for Mechanistic Analysis of Heart & Brain Interactions:** Jaume Banus Cobo, Marco Lorenzi, Oscar Camara, Maxime Sermesant.

June 7 – Friday

09:00-10:00 – Keynote 3

## Electromechanical wave imaging for noninvasive and direct mapping of arrhythmia in 3D

Dr. Elisa E. Konofagou, Professor of Biomedical Engineering and Radiology at Columbia University, Head of the Ultrasound Elasticity Imaging Laboratory (UEIL).

10:00 - 10:40 – Oral Session 5: Modeling for EP procedure

- Fully Automated Electrophysiological Model Personalisation Framework from CT Imaging: Nicolas Cedilnik, Josselin Duchateau, Pierre Jaïs, Hubert Cochet, Maxime Sermesant.
- Tissue drives lesion: computational evidence of interspecies variability in cardiac radiofrequency ablation: Argyrios Petras, Massimiliano Leoni, Jose M. Guerra, Johan Jansson, Luca Gerardo Giorda.

10:40 - 11:10 – Coffee break

11:10 - 12:30 – Oral Session 6: Tissue Characterization

- Towards Automated Quantification of Atrial Fibrosis in Images from Catheterized Fiber-Optics Confocal Microscopy Using Convolutional Neural Networks: Chao Huang, Stephen Wasmund, Takanori Yamguchi, Nathan Knighton, Robert Hitchcock, Irina Polejaeva, Kenneth White, Nassir Marrouche.
- Synchrotron X-ray phase contrast imaging and deep neural networks for cardiac collagen quantification in hypertensive rat model: Hector Dejea, Christine Tanner, Radhakrishna Achanta, Marco Stampanoni, Fernando Perez-Cruz, Ender Konukoglu, Anne Bonnin.
- 3D High Resolution Imaging of Human Heart for Visualization of the Cardiac Structure: Kylian Haliot, Julie Magat, Valéry Ozenne, Emma Abell, Virginie Dubes, Laura Bear, Stephen H. Gilbert, Mark L. Trew, Michel Haissaguerre, Bruno Quesson, Olivier Bernus.
- Investigating the 3D local myocytes arrangement in the human LV mid-wall with the Transverse Angle: Shunli Wang, Iulia Mirea, François Varray, Wan-Yu Liu, Isabelle Magnin.

12:30 - 13:30 – Lunch

13:30-14:30 – Keynote 4

## Building the faith: validating computational models for clinical use

Dr. Richard A. Gray, Senior Research Biomedical Engineer at the FDA, Leader of the Computer Modeling Lab.

## 14:30 - 15:30 – Oral Session 7: EP inverse

- **Deep Learning Formulation of ECGI for Data-driven Integration of Spatiotemporal Correlations and Imaging Information:** Tania Bacoyannis, Julian Krebs, Nicolas Cedilnik, Hubert Cochet, Maxime Sermesant.
- **A Spatial Adaptation of the Time Delay Neural Network for Solving ECGI Inverse Problem:** Amel Karoui, Mostafa Bendahmane, Nejib Zemzemi.
- **Interpolating low amplitude ECG Signals Combined with Filtering According to International Standards Improves Inverse Reconstruction of Cardiac Electrical Activity:** Ali Rababah, Dewar Finlay, Laura Bear, Raymond Bond, Khaled Rjoob, James McLaughlin.

## 15:30-16:00 – Poster Session 2

- **A Computational Approach on Sensitivity of Left Ventricular Wall Strains to Geometry:** Luca Barbarotta, Peter Bovendeerd.
- **Validation of Equilibrated Warping–image registration with mechanical regularization–on SSFP, 3DTAG & 3DUS images** Lik: Chuan Lee, Martin Genet.
- **A numerical method for the optimal adjustment of parameters in ionic models accounting for restitution properties:** Jacob Pearce-Lance, Mihaela Pop, Yves Bourgault.
- **Standard quasi-conformal flattening of the right and left atria:** Marta Nuñez Garcia, Gabriel Bernardino, Ruben Doste, Jichao Zhao, Oscar Camara, Constantine Butakoff.
- **Interactive-Automatic Segmentation and Modelling of the Mitral Valve:** Patrick Carnahan, Olivia Ginty, John Moore, Andras Lasso, Mathew Jolley, Christian Herz, Mehdi Eskandari, Daniel Bainbridge, Terry Peters.
- **High-Resolution Ex Vivo Microstructural MRI After Restoring Ventricular Geometry via 3D Printing:** Tyler Cork, Luigi Perotti, Ilya Verzhbinsky, Michael Loecher, Daniel Ennis.
- **Model assessment through data assimilation of realistic data in cardiac electrophysiology:** Antoine Gérard, Yves Coudière, Annabelle Collin, Philippe Moireau, Gautier Bureau.
- **Model of Left Ventricular Contraction: Validation Criteria and Boundary Conditions:** Aditya Ponnaluri, Ilya Verzhbinsky, Jeffrey Eldredge, Alan Garfinkel, Daniel Ennis, Luigi Perotti.
- **End-diastolic and End-systolic LV morphology in the presence of cardiovascular risk factors: A UK Biobank study:** Kathleen Gilbert, Avan Suinesiaputra, Stefan Neubauer, Stefan Piechnik, Nay Aung, Steffen Petersen, Alistair Young.

## 16:00 - 17:00 – Oral Session 8: EP maps

- **Spatial Downsampling of Surface Sources in the Forward Problem of Electrocardiography:** Steffen Schuler, Jess Tate, Thom Oostendorp, Rob MacLeod, Olaf Doessel.
- **Fibrillation Patterns Creep and Jump in a Detailed Three-Dimensional Model of the Human Atria:** Mark Potse, Alain Vinet, Ali Gharaviri, Simone Pezzuto.
- **Correcting Undersampled Cardiac Sources in Equivalent Double Layer Forward Simulations:** Jess Tate, Steffen Schuler, Olaf Doessel, Rob MacLeod, Thom Oostendorp.

## 19:00 - 23:00 – Dinner at Cité du Vin

## 9:00 – 10:00 – Oral Session 9: Image segmentation and Deep learning

- **Ventricle surface reconstruction from CMR slices using deep learning:** Hao Xu, Ernesto Zacur, Jurgen Schneider, Vicente Grau.
- **SMOD - Data augmentation based on Statistical Models of Deformation to enhance segmentation in 2D cine cardiac MRI:** Jorge Corral Acero, Ernesto Zacur, Hao Xu, Rina Ariga, Alfonso Bueno-Orovio, Pablo Lamata, Vicente Grau.
- **An Adversarial Network Architecture Using 2D U-Net Models for Segmentation of Left Ventricle from Cine Cardiac MRI:** Roshan Reddy Upendra, Shusil Dangi, Cristian Linte.

10:00 – 10:30 – *Coffee break*

10:30-12:00

## A.I. for cardiac imaging and modeling

12:00-12:30 - Closing session

## Other events

### Wednesday 5, 9:00 – 16:30 – Consortium for ECG imaging: Satellite Conference and Workshop

#### The Future of ECGI: Engineers meet Clinicians – Clinicians meet Engineers

Preceding to FIMH, the Consortium for ECG Imaging is organizing a one-day workshop to improve the interaction between engineers and clinicians in the field of ECGI. This CEI satellite workshop will take place at the LIRYC institute amphitheater in Bordeaux. The format will include a mixture of clinical and engineering presentations as well as time for open discussion. Registration is free through the form below, and this website will continue to be updated with more information as we have it. Would you be planning on visiting FIMH, then surely consider joining this interesting workshop! We also welcome non-FIMH visitors, of course.

Registration is free through the form below, and this website will continue to be updated with more information as we have it. If you are planning on visiting FIMH, then consider joining this interesting symposium! We also welcome non-FIMH visitors, of course.

<http://www.ecg-imaging.org/community/events/cei-symposium-2019>

**Satellite Organization Committee: Matthijs Cluitmans – Laura Bear – Jess Tate – Brian Zenger**

Thursday 6, 17:00 – 17:30 – Bid and vote for FIMH 2021

Friday 7, 17:00 – 17:30 – Program committee meeting



# We enable healthcare providers to increase value



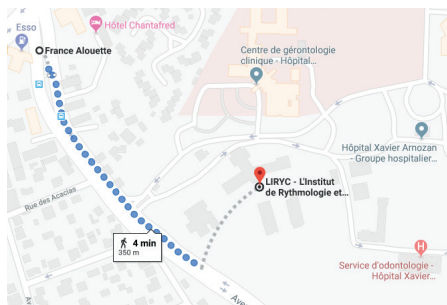
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## IHU Liryc

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Avenue de Haut Lévêque  
33600 Pessac  
Tram B : France Alouette



## Université de Bordeaux Campus Victoire

Place de la Victoire  
33000 Bordeaux  
Tram B : Victoire



## La Cité du Vin

Esplanade de Pontac  
134 quai de Bacalan  
33300 Bordeaux  
Tram B : La Cité du Vin

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