

2013 Computing in Cardiology Conference

(CinC 2013)

**Zaragoza, Spain
22-25 September 2013**

Pages 1-626



**IEEE Catalog Number: CFP13CAR-POD
ISBN: 978-1-4799-0885-1**

Computing in Cardiology 2013
Zaragoza, Spain

Table of Contents

1: Rosanna Degani Young Investigator Award Chairs Peter Macfarlane
Willem Dassen

Prediction of Sudden Cardiac Death in Chronic Heart Failure Patients by Analysis of Restitution Dispersion 1

Julia Ramírez, Ana Mincholé, Juan Bolea, Pablo Laguna, Esther Pueyo

Fluid-structure Interaction Analysis of Representative Left Coronary Artery Models with Different Angulations 5

Jingliang Dong, Zhonghua Sun, Kiao Inthavong, Jiyuan Tu

Improved Electrocardiographic Detection of Hyperacute Ischemia by Difference Vector Analysis 9

C Cato ter Haar, Arie C Maan, Martin J Schalijs, Cees A Swenne

Semi-automated Detection and Quantification of Aortic Atheromas from Three-Dimensional Transesophageal Echocardiography 13

Concetta Piazzese, Wendy Tsang, Miguel Sotaquira, Roberto M Lang, Enrico G Caiani

2-1: Software Platforms Chairs Jocelyne Fayn
Álvaro Alesanco

LightWAVE: Waveform and Annotation Viewing and Editing in a Web Browser 17

George B Moody

eLab: A Web-based Platform to Perform HRV Analysis and Store Cardiac Signals 21

Óscar Barquero-Pérez, Teresa Quintanilla, José García-Muñoz, Cristina Soguero-Ruiz, Mark R Wilby, Manuel de la Rosa, Miguel Cabañas, Iván González, Roberto Bravo, Arcadi García-Alberola, José Luis Rojo-Álvarez

Seamless Integration of Watermarks in DICOM Images 25

Óscar J Rubio, Álvaro Alesanco, José García

An Interactive Digital Platform for Arterial Wave Intensity Analysis 29

John L Tassone, Ashraf W Khir

A Cardiovascular Patient Follow-up System using Twitter and HL7 33

Jesús Daniel Trigo, Aitor Eguzkiza, Miguel Martínez-Espronedada, Luis Serrano

2-2: Electrophysiological Modeling	Chairs	José Maria Ferrero Antonio Zaza
---	--------	------------------------------------

Computational Modeling of Human Fetal Normal Sinus Rhythm and Arrhythmia		37
Alan P Benson, Adam Bleakley, Sam Hodgson, Arun V Holden, Nikki Pelech, Ebrahim Palkhi, Eleftheria Pervolaraki, Catherine Whitfield		
HCN and SCN5A Channel Mutations: Implications for Impaired Atrioventricular Nodal Conduction in a Heterogeneous Computer Model of Whole Mouse Heart		41
Simon J Castro, Michael A Colman, Sanjay Kharche, Ruoxi Wang, Henggui Zhang		
Modeling the Influence of High Fibroblast Level on Arrhythmia Development and Obstructed Depolarization Spread		45
Sándor M Szilágyi, László Szilágyi, Béat Hirsbrunner		
Heterogeneous Electrical Remodeling of the Failing Heart Modulates the Arrhythmogenic Substrate		49
Juan F Gomez, Karen Cardona, Lucia Romero, Javier Saiz, Beatriz Trenor		
Kalman Filter Based Estimation of Ionic Concentrations and Gating Variables in a Cardiac Myocyte Model		53
Laura M Munoz, Niels F Otani		
Uncertainty Visualization in Forward and Inverse Cardiac Models		57
Brett M Burton, Burak Erem, Kristin Potter, Paul Rosen, Chris R Johnson, Dana H Brooks, Rob S Macleod		

2-3: Ventricular Repolarization	Chairs	Roberto Sassi Esther Pueyo
--	--------	-------------------------------

Exploring QT Variability Dependence from Heart Rate in Coma and Brain Death on Pediatric Patients		61
Rute Almeida, Marta João Silva, Ana Paula Rocha		
Comparing the Relationship between QT/RR Slope and Basal QTc in LQT1 Patients and Healthy Subjects		65
Josef Halamek, Pavel Jurak, Pavel Leinveber, Vlastimil Vondra, Jean-Philippe Couderc		
QT Interval Analysis in Electrograms of Isolated Guinea Pig Hearts Treated with Haloperidol		69
Petr Veselý, Josef Halánek, Tibor Stračina, Lenka Krejčírová, Marie Nováková		
Comparative Analysis of Short-Term Variability of RR and QT Intervals for the Assessment of Autonomic Nerve Activity		73
Yi Zhu, Xiaolin Yang, Zhigang Wang, Yi Peng		

The Linear Dependence of Ventricular Repolarization Variability on Heart Rate Variability in Head-Down Bed Rest Studies 77
 Juan Bolea, Enrico G Caiani, Pablo Laguna, Rute Almeida

2-4: Heart Rate Variability: Fetal and Adult Chairs Riccardo Barbieri
 Andreas Voss

Fetal Heart Rate Pattern in Prenatal Diagnosis - Fetal Autonomic Brain Age Score 81
 Dirk Hoyer, Uwe Schneider

Subspace Detection of the Impulse Response Function from Intrapartum Uterine Pressure and Fetal Heart Rate Variability 85
 Philip A Warrick, Emily F Hamilton

Increased Instability of Heartbeat Dynamics in Parkinson's Disease 89
 Riccardo Barbieri, Luca Citi, Gaetano Valenza, Maria Guerrisi, Stefano Orsolini, Carlo Tessa, Stefano Diciotti, Nicola Toschi

Assessment of Fetal Development using Multiscale Multifractal Analysis of Heart Rate Variability 93
 Jan Gierałtowski, Dirk Hoyer, Uwe Schneider, Jan J Zebrowski

Time-series Network Analysis for Detecting Cardiac Autonomic Neuropathy using RR Interval Data 97
 Chandan Karmakar, Ahsan Khandoker, Herbert Jelinek, Marimuthu Palaniswami

3-1: Cardiorespiratory Coupling Chairs Jean-Marc Vesin
 Giandomenico Nollo

Quantification of Cardiorespiratory Coupling in Acute Schizophrenia Applying High Resolution Joint Symbolic Dynamics 101
 Steffen Schulz, Karl-Juergen Baer, Haueisen Jens, Andreas Voss

Analysis of Cardio-respiratory Dynamics during Mental Stress using (Partial) Time-Frequency Spectra 105
 Devy Widjaja, Michele Orini, Elke Vlemincx, Sabine Van Huffel

Cardiorespiratory Coherence Analysis of Abnormal Heart Rate Responses during Deep Breathing 109
 Urban Wiklund, Amir Kadkhodae, Kennet Anderson

Information Decomposition of Short-Term Cardiovascular and Cardiorespiratory Variability	113
Luca Faes, Alessandro Montalto, Giandomenico Nollo, Daniele Marinazzo	
Influence of Respiration in the Very Low Frequency Modulation of QRS slopes and Heart Rate Variability in Cardiomyopathy Patients	117
David Hernando, Alejandro Alcaine, Esther Pueyo, Pablo Laguna, Michele Orini, Andrés Arcentales, Beatriz Giraldo, Andreas Voss, Antonio Bayés-Genís, Raquel Bailón	
Estimating Respiratory Frequency from Heart Rate Variability during Treadmill Exercise Testing	121
Edgar F Sierra-Alonso, LinaM Sepúlveda-Cano, Raquel Bailón-Luesma, Pablo Laguna, Germán Castellanos-Domínguez	
3-2: Ventricular Arrhythmias and Cardiac Arrest	Chairs
	Juan Pablo Martínez Cees Swenne
<hr/>	
Probabilistic Classification Approaches for Cardiac Arrest Rhythm Interpretation during Resuscitation	125
Ali Bahrami Rad, Trygve Eftestøl, Jan Terje Kvaløy, Unai Ayala, Jo Kramer-Johansen, Kjersti Engan	
A New Algorithm to Diagnose during Chest Compressions: Effects on Cardiopulmonary Resuscitation Delivery	129
Unai Ayala, Unai Irusta, Jesús Ruiz, Digna González-Otero, Erik Alonso, Jo Kramer-Johansen, Trygve Eftestøl	
Increase of QRS Duration as a Predictor of Impending Ventricular Fibrillation during Coronary Artery Occlusion	133
Alba Martín-Yebra, Marina Demidova, Pyotr Platonov, Pablo Laguna, Juan Pablo Martínez	
Dependency of T-Wave Alternans Predictive Power for the Occurrence of Ventricular Arrhythmias on Heart Rate	137
Laura Burattini, Sumche Man, Cees A Swenne	
Risk Stratification for Arrhythmic Sudden Cardiac Death in Heart Failure Patients using Machine Learning Techniques	141
George Manis, Stavros Nikolopoulos, Petros Arsenos, Konstantinos Gatzoulis, Polychronis Dilaveris, Christodoulos Stefanadis	
Deceleration Capacity Alterations before Non Sustained Ventricular Tachycardia Episodes in Post Myocardial Infarction Patients	145
Petros Arsenos, George Manis, Stavros Nikolopoulos, Konstantinos Gatzoulis, Polychronis Dilaveris, Christodoulos Stefanadis	

3-3: Challenge IChairs Roger Mark
Joachim Behar

Noninvasive Fetal ECG: the PhysioNet/Computing in Cardiology Challenge 2013	149
Ikaro Silva, Joachim Behar, Reza Sameni, Tingting Zhu, Julien Oster, Gari D Clifford, George B Moody	
Cancellation of the Maternal and Extraction of the Fetal ECG in Noninvasive Recordings	153
Ivaylo Christov, Iana Simova, Roger Abächerli	
Extracting the R-Wave Position from an FECG Record using Recognition of Multi-channel Shapes	157
Filip Plešinger, Pavel Jurák, Josef Haláček	
Advanced Maternal ECG Removal and Noise Reduction for Application of Fetal QRS Detection	161
Jukka A Lipponen, Mika P Tarvainen	
Fetal QRS Detection and RR Interval Measurement in Noninvasively Registered Abdominal ECGs	165
Christoph Maier, Hartmut Dickhaus	
Noninvasive Fetal QRS Detection using a Linear Combination of Abdomen ECG Signals	169
Or Perlman, Amos Katz, Yaniv Zigel	
Fetal ECG Extraction From Abdominal Recordings using Array Signal Processing	173
Masoumeh Haghpanahi, David A Borkholder	
Advanced Signal Processing Techniques for Fetal ECG Analysis	177
Jakub Kuzilek, Lenka Lhotska	
Fetal QRS Complex Detection using Semi-Blind Source Separation Framework	181
Fatemeh Razavipour, Masoumeh Haghpanahi, Reza Sameni	
Fetal QRS Complex Detection Based on Three-Way Tensor Decomposition	185
Mohammad Niknazar, Bertrand Rivet, Christian Jutten	
Fetal Electrocardiogram R-peak Detection using Robust Tensor Decomposition and Extended Kalman Filtering	189
Mahsa Akhbari, Mohammad Niknazar, Christian Jutten, Mohammad B Shamsollahi, Bertrand Rivet	
Maternal Signal Estimation by Kalman Filtering and Template Adaptation for Fetal Heart Rate Extraction	193
Fernando Andreotti, Maik Riedl, Tilo Himmelsbach, Daniel Wedekind, Sebastian Zaunseder, Niels Wessel, Hagen Malberg	

Spatial Filtering and Adaptive Rule Based Fetal Heart Rate Extraction from Abdominal Fetal ECG Recordings	197
Minnan Xu-Wilson, Eric Carlson, Limei Cheng, Srinivasan Vairavan	
A Robust Framework for Noninvasive Extraction of Fetal Electrocardiogram Signals	201
Marzieh Fatemi, Mohammad Niknazar, Reza Sameni	
Noninvasive Fetal QRS Detection Using Echo State Network	205
Mantas Lukoševičius, Vaidotas Marozas	

3-4: Novel Technologies I Chairs Luca Mainardi
Sheri Prucka

Relative Peripheral Blood Volume Changes in Response to Ventricular Premature Beats during Dialysis	209
Eglė Grigonytė, Eduardo Gil, Pablo Laguna, Leif Sörnmo	
Probabilistic Modeling of the Oxygen Saturation Pattern for the Detection of Anomalies During Clinical Interventions	213
Diego Martín-Martínez, Pablo Casaseca-de-la-Higuera, Marcos Martín-Fernández, Carlos Alberola-López	
Determining Heart Activity Present in the Pressure Sensors of a Dialysis Machine	217
Mattias Holmer, Eglė Grigonytė, Kristian Solem, Bo Olde, Frida Sandberg, Leif Sörnmo	
Empirical Mode Decomposition Based Real-Time Blood Pressure Delineation and Quality Assessment	221
Vladimir Ostojic, Tatjana Loncar-Turukalo, Dragana Bajic	
Detection of Glaucoma based on the Analysis of Cardiovascular Signals	225
Andreas Voss, Katharina Witt, Eva Koch, Matthias Fuest, Niklas Plange	
Waving at the Heart: Implementation of a Kinect Based Real-Time Interactive Control System for Viewing Cineangiogram Loops During Cardiac Catheterization Procedures	229
Bart Suelze, Robin Agten, Philippe B Bertrand, Thijs Vandenryt, Ronald Thoelen, Pieter Vandervoort, Lars Grieten	

4-1: Echocardiography Chairs Enrico Caiani
Alfredo Hernandez

Quantitative Characterization of Mitral Annulus and Leaflets from Transesophageal 3D Echocardiography	233
Miguel Sotaquira, Laura Fusini, Mauro Pepi, Roberto M Lang, Enrico Caiani	

Dynamic Registration of Multiple-view US and MRI for the Characterization of Hypertrophic Cardiomyopathy	237
Julián Betancur, Antoine Simon, Frédéric Schnell, François Tavard, Erwan Donal, Alfredo I Hernández, Mireille Garreau	
3D Evaluation of Tricuspid Annulus Morphology in Patients with Pulmonary Hypertension	241
Federico Veronesi, Karima Addetia, Claudio Lamberti, Roberto Lang, Victor Mor-Avi	
Evaluation of Computed Tomography to Ultrasound 2D Image Registration for Atrial Fibrillation Treatment	245
Zulma L Sandoval, Jean-Louis Dillenseger	
Early Detection of Cardiotoxicity in Chemotherapy-Treated Patients from Real-time 3D Echocardiography	249
Cinzia Lorenzini, Cristiana Corsi, Michele Aquilina, Andrea Casasei Gardini, Andrea Rocca, Luca Frassinetti, Emanuela Scarpi, Dino Amadori, Claudio Lamberti	
Comparison of 2D and 3D Echocardiographic Measurement of Mitral-Aortic Angle	253
Federico Veronesi, Enrico G Caiani, Cristiana Corsi, Claudio Lamberti	
4-2: Mobile and Remote Monitoring	Chairs Enno van der Velde José García
<hr/>	
SleepAp: An Automated Obstructive Sleep Apnoea Screening Application for Smartphones	257
Joachim Behar, Aoife Roebuck, Mohammed Shahid, Jonathan Daly, Andre Hallack, Niclas Palmius, JR Stradling, Gari D Clifford	
Long-term Effect of Telecare on Patients Chronic Diseases	261
Masatsugu Tsuji, Yuji Akematsu	
Vital Signs Monitoring using a New Flexible Polymer Integrated PPG Sensor	265
Kian Davoudi, Moein Shayegannia, Bozena Kaminska	
Technical Verification of applying Wearable Physiological Sensors in Ubiquitous Health Monitoring	269
Eliasz Kańtoch	
Proposal of Real-Time Echocardiogram Transmission Dased on Visualization Modes with WiMAX Access	273
Eva Cavero, Alvaro Alesanco, Ljiljana Trajkovic, Constantinos Pattichis, Jose Garcia	
Context-aware Cardiac Monitoring for Early Detection of Heart Diseases	277
Abdur Rahim Mohammad Forkan, Ibrahim Khalil, Zahir Tari	

A Multi-step Approach for Non-invasive Fetal ECG Analysis	281
Maurizio Varanini, Gennaro Tartarisco, Lucia Billeci, Alberto Macerata, Giovanni Pioggia, Rita Balocchi	
Noninvasive Fetal ECG Estimation Based on Linear Transformations	285
Mariano Llamedo, Alba Martín-Yebra, Pablo Laguna, Juan Pablo Martínez	
A Wavelet-Based Method for Assessing Fetal Cardiac Rhythms from Abdominal ECGs	289
Rute Almeida, Hernâni Gonçalves, Ana Paula Rocha, João Bernardes	
PhysioNet/CinC Challenge 2013: A Novel Noninvasive Technique to Recognize the Fetal QRS Complexes from Noninvasive Fetal Electrocardiogram Signals	293
Ali Ghaffari, Seyyed Abbas Atyabi, Mohammad Javad Mollakazemi, Mohammad Niknazar, Maryam Niknami, Ali Soleimani	
Non Invasive FECG Extraction from a Set of Abdominal Sensors	297
Joachim Behar, Julien Oster, Gari D Clifford	
Multi Stage Principal Component Analysis Based Method for Detection of Fetal Heart Beats in Abdominal ECGs	301
Robertas Petrolis, Algimantas Krisciukaitis	
An Algorithm for the Analysis of Foetal ECGs from 4-channel Non-invasive Abdominal Recordings	305
Costanzo Di Maria, Wenfeng Duan, Marjan Bojarnejad, Fan Pan, Susan King, Dingchang Zheng, Alan Murray, Philip Langley	
Systematic Methods for Fetal Electrocardiographic Analysis: Determining the Fetal Heart Rate, RR Interval and QT Interval	309
Chengyu Liu, Peng Li	
A Robust Algorithm for Fetal QRS Detection using the Non-invasive Maternal Abdomen ECGs	313
Martin Kropf, Robert Modre-Osprian, Günter Schreier, Dieter Hayn	
Non-invasive Fetal Multilead RR Interval Determination from Maternal Abdominal Recordings: the Physionet/CINC Challenge 2013	317
Vito Starc	
Identification of Fetal QRS Complexes in Low Density Non-Invasive Biopotential Recordings	321
Alessia Dessì, Danilo Pani, Luigi Raffo	
Fetal ECG Detection in Abdominal Recordings: a Method for QRS Location	325
Rui Rodrigues	

Multichannel Foetal Heartbeat Detection by Combining Source Cancellation with Expectation-weighted Estimation of Fiducial Points 329
Luigi Yuri Di Marco, Alberto Marzo, Alejandro Frangi

Fetal Heart Rate Discovery: Algorithm for Detection of Fetal Heart Rate from Noisy, Noninvasive Fetal ECG Recordings 333
Piotr Podziemski, Jan Gierałtowski

4-4: Ventricular Modelling: From Cell to ECG Chairs Johannes Struijk
Olaf Dössel

Validation of the V-index through Finite Element 2D Simulations 337
Roberto Sassi, Luca T Mainardi, Pablo Laguna, Jose F Rodriguez

Repolarization Variability Mechanisms and its Relation with Cardiac Arrhythmogenesis 341
Jose F Rodriguez, Roberto Sassi, Esther Pueyo, Luca Mainardi

Evaluating Body Surface ECG Differences of Simulated Long-QT Syndromes 345
Gunnar Seemann, Maider Alvarez de Eulate, Niko Konrad, Julian Maier, Mathias Wilhelms, David Keller, Olaf Dössel, Eberhard Scholz

Simulation of KCNJ2-linked Short QT Syndrome in Human Ventricular Tissue 349
Kuanquan Wang, Cunjin Luo, Wei Wang, Henggui Zhang, Yongfeng Yuan

Flattening of the Electrocardiographic T-wave is a Sign of Proarrhythmic Risk and a Reflection of Action Potential Triangulation 353
Tanveer A Bhuiyan, Claus Graff, Jørgen K Kanters, Morten B Thomsen, Johannes J Struijk

Computational Analysis of Head-Down Bed-Rest Effects on Cardiac Action Potential Duration 357
Elisa Passini, Alessandro Pellegrini, Enrico G Caiani, Stefano Severi

5-1: Electrophysiological Modelling Techniques

Computer Simulation of Purkinje Fibres from a Rabbit Model of Congestive Heart Failure 361
Jue Li, Sunil Jit Logantha, Joseph Yanni-Gerges, Xue Cai, Henggui Zhang, Halina Dobrzynski, George Hart, Mark Boyett

Simulation of Arrhythmia using Adaptive Spatio-temporal Resolution 365
Sándor M Szilágyi, László Szilágyi, Béat Hirsbrunner

Inverse Reconstruction of Epicardial Potentials Improves by Vectorcardiography and Realistic Potentials 369
Matthijs JM Cluitmans, Pietro Bonizzi, Joël MH Karel, Paul GA Volders, Ralf LM Peeters, Ronald L Westra

Automatic Parametrization Strategy for Cardiac Electrophysiology Simulations	373
Caroline Mendonça Costa, Elena Hoetzel, Bernardo Martins Rocha, Anton Prassl, Gernot Plank	

5-2: Ventricular Modelling

Realistic 3D Bidomain Model of Whole Heart Electrical Activity and ECG Generation	377
Siniša Sovilj, Ratko Magjarević, Nigel Lovell, Socrates Dokos	

Effects of Species-Dependent Differences in Action Potential Shape in Setting -Adrenergic-Stimulation Induced Current	381
Luca Sala, Bence Hegyi, Chiara Bartolucci, Claudia Altomare, Marcella Rocchetti, Gaspare Mostacciolo, Stefano Severi, Norbert Szentandrassy, Peter P Nanasi, Antonio Zaza	

A Comparison of Two Models of Human Ventricular Tissue: Simulated Ischaemia and Re-entry	385
Mitra Abbasi, Richard Clayton	

Modelling the Integrated Regulation Role of -Adrenergic Signaling and CaMKII in Human Myocyte Electrophysiological Properties	389
Ling Dai, Yunliang Zang, Dingchang Zheng, Ruyi Luo, Ling Xia	

5-3: Heart Rate Variability: Software and Implementation

A Software Toolkit for Nonlinear Heart Rate Variability Analysis	393
Constantino A García, Abraham Otero, Jesús Presedo, Xosé Vila, Paulo Félix	

Implementation of Heart Rate Variability Signal Processing into FPGA: System on-Chip Design	397
Shahab Rezaei, Sadaf Moharreri, Hossein Ajourloo, Siamak Salavatian	

VARVI: A Software Tool for Analyzing the Variability of the Heart Rate in Response to Visual Stimuli	401
Leandro Rodríguez-Liñares, Pedro Cuesta, Raúl Alonso, Arturo J Méndez, María J Lado, Xosé A Vila	

5-4: Heart Rate Variability: Methodology

Variability of Left Ventricular Ejection and Diastolic Times Obtained from Impedance Cardiography: A Comparison with Heart Rate Variability	405
Salvador Carrasco-Sosa, Alejandra Guillén-Mandujano	

A Modified Hilbert-Huang Algorithm to Assess Spectral Parameters in Intense Exercise	409
Rebeca Goya-Esteban, Óscar Barquero-Pérez, Elena Sarabia-Cachadiña, José Naranjo-Orellana, José-Luis Rojo-Álvarez	
Seismocardiograms return Valid Heart Rate Variability Measures	413
Alexandre Laurin, Andrew Blaber, Kouhyar Tavakolian	
Fast Detrending of Unevenly Sampled Series with Application to HRV	417
Valeria Villani, Antonio Fasano	

5-5: Heart Rate Variability: Information Measures

Higuchi's Fractal Complexity of RR and QT Interval Series during Transient Myocardial Ischemia	421
Rudys Magrans, Pedro Gomis, Pere Caminal, Andreas Voss	
On the Early Detection of Perinatal Hypoxia with Information-Theory based Methods	425
Ricardo Santiago-Mozos, Beatriz García-Vizueté, José María Lillo-Castellano, José Luis Rojo-Álvarez, Carlos Martín-Caballero	
Sample Entropy Parametric Estimation for Heart Rate Variability Analysis	429
M Aktaruzzaman, R Sassi	
Enhancing Scaling Exponents in Heart Rate by means of Fractional Integration	433
Argentina Leite, Ana Paula Rocha, Maria Eduarda Silva	
Indices of Symbolic Dynamic Distribution in Cardiac Patients	437
Giovanni D'Addio, Maria Romano, Roberto Maestri, Paolo Bifulco, Mario Cesarelli	
In-vivo and Ex-vivo HRV discrimination by Complex Correlation Measure	441
Oto Janoušek, Sara Francisco, Marina Ronzhina, Petr Veselý, Jana Kolářová, Ivo Provazník, Marie Nováková, Peter Scheer	
Fractal Behaviour of Heart Rate Variability Reflects Abnormal Respiration Patterns in OSAS Patients	445
Giovanni D'Addio, Agostino Accardo, Elisa Fornasa, Mario Cesarelli, Alberto DeFelice	
Non-Linear Dynamic Analysis of RR Signals in Patients with and without Excessive Daytime Sleepiness	449
Umberto Melia, Marc Guaita, Montserrat Vallverdú, Francesc Clariá, Pere Caminal, Cristina Embid, Isabel Vilaseca, Manel Salamero, Joan Santamaria	
Development of Fetal Heart Rate Dynamics before and after 30 and 35 Weeks of Gestation	453
Ahsan H Khandoker, Chandan Karmakar, Yoshitaka Kimura, Marimuthu Palaniswami	

5-6: Novel Techniques

- High Resolution 16-channel ECG Test Simulator for Online Digital-to-Analogue Conversion of Data from PC** 457
Tatyana Neycheva, Todor Stoyanov, Roger Abächerli, Ivaylo Christov
- A Comparison of Heartbeat Detectors for the Seismocardiogram** 461
Miguel Angel Garcia-González, Ariadna Argelagós-Palau, Mireya Fernández-Chimeno, Juan Ramos-Castro
- Electrical Impedance Tomography Vs. Whole Thoracic Impedance for Monitoring Lung Fluid Content in Congestive Heart Failure Patients** 465
Marina Arad, Shimon Abboud
- Improved Estimation of V-Index Based on Analytic Forms of Dominant T-Wave** 467
Luca Mainardi, Davide Di Donato, Denise Falcone, Roberto Sassi
- The Effect of Breathing on Stroke Volume Estimation in Patients with Implanted Cardiac Device using Parametric Electrical Impedance Tomography** 471
Muhammad Mhajna, Shimon Abboud
- Night and Day Changes in Heart Rate and Blood Pressure Fractal Dimensions from 24-hour Ambulatory Blood Pressure Monitoring Devices** 475
Andrea Faini, Gianfranco Parati, Marco Di Rienzo, Paolo Castiglioni
- On the Sparsest Representation of Electrocardiograms** 479
Roopak R Tamboli, Manas A Savkoor, Soumya Jana, Ramachandra Manthalkar
- The Effect of Automated Preprocessing of RR Interval Tachogram on Discrimination Capability of Heart Rate Variability Parameters** 483
Faezeh Marzbanrad, Herbert Jelinek, Ethan Ng, Mikhail Tamayo, Brett Hambly, Craig McLachlan, Slade Matthews, Marimuthu Palaniswami, Ahsan Khandoker
- Characterizing Complexity of Atrial Arrhythmias through Effective Dynamics from Electric Potential Measures** 487
Oriol Pont, Binbin Xu
- A Pilot Study of Photoplethysmographic Peripheral Pulse Transit Times in Paediatric Heart Transplant Recipients and Healthy Children** 491
Costanzo Di Maria, Emma Sharkey, Annette Klinge, Dingchang Zheng, Alan Murray, John O'Sullivan, John Allen

5-7: Health Informatics

- Design and Testing of a Cardiac Monitor for Home Care** 495
Yaniesis Lorenzo-Costa, Ronny Guardarrama-Mieres, Rene Gonzalez-Fernandez

Neural Network Approach to Incomplete Data Applied to Assessing Cardiac Health	499
Joanna Grabska-Chrzastowska	
Clair-DB: A Standardized Departmental Research Database	503
Enno T van der Velde, Thekla Jansen, Victoria Delgado, Douwe Atsma	
Biometric Personal Identification System using the ECG Signal	507
Emna Rabhi, Zied Lachiri	

5-8: ECG Measurement

Measurement of Noise in ECG Signals to Improve Automatic Delineation	511
Loriano Galeotti, Lars Johannesen, Jose Vicente, David G Strauss	
Detection of P Wave in Electrocardiogram	515
Rene Gonzalez-Fernandez, Martha Rivero-Varona, Gisela Montes de Oca-Colina	
Detection of Electrode Interchange in Precordial and Orthogonal ECG Leads	519
Irena Jekova, Vessela Krasteva, Roger Abächerli	
Noncontact Sensing of Electrocardiographic Potential and Body Proximity by In-bed Conductive Fabrics	523
Kei Ito, Yutaka Fukuoka, Gert Cauwenberghs, Akinori Ueno	
Suppression of Impulsive Noise using Adaptive Filters	527
Shankar Gupta, Ramchandra Manthalkar, Suhas Gajre	

5-9: Miscellaneous ECG

The Effect of Precordial Lead Displacement on P-wave Morphology in Body Surface Potential Mapping	531
Michał Kania, Hervé Rix, Małgorzata Ferencic, Dariusz Janusek, Roman Maniewski	
Analysis of Spatial Variability for the Development of Reduced Lead Body Surface Maps	535
Frederique J Vanheusden, Xin Li, Gavin S Chu, Tiago Paggi de Almeida, G André Ng, Fernando S Schlindwein	
An Artificial Model of the Electrocardiogram during Paroxysmal Atrial Fibrillation	539
Julien Oster, Gari D Clifford	
Effects of Heart Orientation on Isolated Heart Electrograms	543
Marina Ronzhina, Veronika Olejníčková, Oto Janoušek, Jana Kolářová, Marie Nováková, Ivo Provazník	

Load Dependent Changes of Cardiac Depolarization and Repolarization during Exercise ECG Test	547
Ivaylo Christov, Giovanni Bortolan, Iana Simova	
Isolated Rabbit Hearts – Database of EGs and MAP Signals	551
Jana Kolarova, Marie Novakova, Marina Ronzhina, Oto Janousek, Petr Veselý, Veronika Olejnickova, Ivo Provaznik	

5-10: Cardiac Imaging

Classification of Delayed Enhancement Scar Islands by Means of their Local Subendocardial Transmurality	555
Susana Merino-Caviedes, Lucilio Cordero-Grande, Teresa Sevilla, Teresa Pérez, Marcos Martín-Fernández, Carlos Alberola-López	
A Software Tool for the Computation of Arterial Pulse Wave Velocity from Flow-sensitive 4D MRI Data	559
Johann Drexler, Hanieh Mirzaee, Andreas Harloff, Markus Hüllebrand, Anja Hennemuth, Horst Hahn	
Registration and Fusion of Contrast-Enhanced MRI Myocardial Substrate Maps and X-ray Angiograms	563
Juan E Ortuño, Esther Pérez-David, Ángel Arenal, Javier Bermejo, Andrés Santos, María J Ledesma-Carbayo	
Toward Temporal Fiber	567
Matthew Ozon, Marc Robini, Pierre Croisille, Carole Frindel, Yue-Min Zhu	
Computational Mesh as a Descriptor of Left Ventricular Shape for Clinical Diagnosis	571
Pablo Lamata, Merzaka Lazdam, Anna Ashcroft, Adam Lewandowski, Paul Leeson, Nic Smith	
Regional Comparison of Left Ventricle Systolic Wall Stress Reveals Intraregional Uniformity in Healthy Subjects	575
Soo-Kng Teo, Si-Yong Yeo, May-Ling Tan, Chi-Wan Lim, Liang Zhong, Ru-San Tan, Yi Su	
3D Bilateral Filtering of Cardiac DT-MRI Data	579
Tomasz Pieciak	

6-1: Myocardial Ischemia

Chairs Roger Abächerli
Olle Pahlm

Tuning a Real-Time Detector of Transient Cardiac Ischemic Episodes on the Long-Term ST Database according to the Annotation Protocol B	583
Lacramioara Dranca, Alfredo Goñi, Arantza Illarramendi	

Automated Detection of the Culprit Artery from the ECG in Acute Myocardial Infarction	587
Elaine N Clark, Yama Fakhri, M Abdul Waduud, Maria Sejersten, Peter Clemmensen, Peter W Macfarlane	
Morphologic Features of the ECG for Detection of Stress-Induced Ischemia	591
Mariano Llamedo, Juan Pablo Martínez, Mariano Albartal, Daniel Romero, Esther Pueyo, Pablo Laguna	
High resolution ECG Changes in Survivors of Out-of-Hospital Cardiac Arrest during and after Mild Therapeutic Hypothermia	595
Martin Rauber, Dušan Štajer, Marko Noč, Todd T Schlegel, Vito Starc	
T-Wave Alternans Identification in Routine Exercise ECG Tracings: Comparison of Methods	599
Silvia Bini, Sumche Man, Cees A Swenne, Laura Burattini	
T-wave Alternans Predicts ICD Discharge in MADIT II Patients with Elevated Resting Heart Rate	603
Violeta Monasterio, Juan Pablo Martínez, Scott McNitt, Pablo Laguna, Arthur J Moss, Wojciech Zareba, Jean-Philippe Couderc	

6-2: Clinical Electrophysiology	Chairs	José Luis Rojo Álvarez Omar Escalona
--	--------	--

Non-Invasive Epicardial Imaging of Human Ventricular Fibrillation	607
John R Fitz-Clarke, John L Sapp, B Milan Horáček	
Dynamic Changes in Intracardiac Resistance as a Predictive Marker during Internal Cardioversion of Atrial Fibrillation	611
Philip Richard Walsh, Omar Jacinto Escalona, Vivek Kodoth, Noel Camilo Castro, David McEneaney, Ernest Lau, Ganesh Manoharan	
Wavelet-Based Electrogram Onset Identification for Ventricular Electroanatomical Mapping	615
Alejandro Alcaine, David Soto-Iglesias, David Andreu, Juan Fernández-Armenta, Antonio Berruezo, Pablo Laguna, Oscar Camara, Juan Pablo Martínez	
Nonlinear Characteristics of Ventricular Fibrillation Depend on Myocardial Infarction Locations	619
María González-González, Óscar Barquero-Pérez, Cristina Soguero-Ruiz, Juan José Sánchez-Muñoz, José Luis Rojo-Álvarez, Arcadi García-Alberola	

Analyzing Electrical Patterns in an Experimental Swine Model of Dyssynchrony and CRT **623**

David Soto-Iglesias, Nicolas Duchateau, Constantine Butakoff, David Andreu, Juan Fernández-Armenta, Antonio Berruezo, Marta Sitges, Oscar Camara

6-3: Cardiac MRI Chairs **Cristiana Corsi**
Trygve Eftestøl

Automated MRI-Based Biventricular Segmentation Using 3D Narrow-Band Statistical Level-Sets **627**

Giacomo Tarroni, Davide Marsili, Federico Veronesi, Cristiana Corsi, Amit Patel, Victor Mor-Avi, Claudio Lamberti

Automatic Segmentation of the Epicardium in Late Gadolinium Enhanced Cardiac MR Images **631**

Kjersti Engan, Valery Naranjo, Trygve Eftestøl, Stein Ørn, Leik Woie

Assessment of the Fibrotic Myocardial Tissue Mechanics by Image Processing **635**

Lucilio Cordero-Grande, Teresa Sevilla, Ana Revilla, Marcos Martín-Fernández, Carlos Alberola-López

Automatic Detection of Myocardial Perfusion Defects using Object-based Myocardium Segmentation **639**

Teodora Chitiboi, Anja Hennemuth, Lennart Tautz, Paul Stolzmann, Olivio Donati, Lars Linsen, Horst Hahn

Relationship between Cardiac Imaging Data and Simultaneous Physiological Measurements **643**

Wenfeng Duan, Dingchang Zheng, Christopher Eggett, Philip Langley, Alan Murray

Measuring the Degree of Fibrosity in Myocardial Scars from Late Gadolinium-Enhanced Cardiovascular Magnetic Resonance Images **647**

Frode Måløy, Leik Woie, Trygve Eftestøl, Kjersti Engan, Stein Ørn

6-4: Novel Techniques Chairs **Eduardo Gil**
Piotr Augustyniak

Simultaneous Registration of ECG and Cardiac Motion by a Single Esophageal Probe **651**

Thomas Niederhauser, Sergio Sánchez Martínez, Andreas Haeberlin, Thanks Marisa, Josef Goette, Marcel Jacomet, Rolf Vogel

Electrocardiogram Derived Respiration from QRS Slopes: Evaluation with Stress Testing Recordings	655
Jesús Lázaro, Alejandro Alcaine, Daniel Romero, Eduardo Gil, Pablo Laguna, Leif Sörnmo, Raquel Bailón	
Bayesian Voting of Multiple Annotators for Improved QT Interval Estimation	659
Tingting Zhu, Alistair EW Johnson, Joachim Behar, Gari D Clifford	
Feasibility of Impedance Cardiography to Assess Hemodynamic Changes and Fluid Loss Related to Pleural Drainage	663
Mark Ulbrich, Jens Muehlsteff, Matthias Zink, Steffen Leonhardt, Marian Walter	
High-Power Current Source with Real-Time Arbitrary Waveforms for In Vivo and In Vitro Studies of Defibrillation	667
Ilija Uzelac, Mark Holcomb, Ronald S Reiserer, Flavio H Fenton, John P Wikswo	
Using Piezoelectric Sensor for Continuous-Contact-Free Monitoring of Heart and Respiration Rates in Real-Life Hospital Settings	671
Tal Klap, Zvika Shinar	

7-1: Ischemia Modelling	Chairs	Peter Macfarlane Henggui Zhang
--------------------------------	--------	-----------------------------------

Computing Ischemic Regions in the Heart: On the Use of Internal Electrodes	675
Ola Marius Lysaker, Bjørn Fredrik Nielsen, Samuel Wall	
Observability of Ischemia and the Need for Patient Specific Geometrical Models in Inverse ECG	679
Glenn T Lines, Marius Lysaker, Bjørn F Nielsen	
Effect of RyR2 Refractoriness and Hypercalcemia on Calcium Overload, Spontaneous Release, and Calcium Alternans	683
Enric Alvarez-Lacalle, Angelina Peñaranda, Inma R Cantalapiedra, Leif Hove-Madsen, Blas Echebarria	
Avoiding the Inverse Crime in the Inverse Problem of Electrocardiography: Estimating the Shape and Location of Cardiac Ischemia	687
Carlos Eduardo Chávez, Felipe Alonso-Atienza, Diego Álvarez	
Ionic Mechanisms of Variability in Electrophysiological Properties in Ischemia: A Population-based Study	691
Ana Mincholé, Sara Dutta, John Walmsley, Blanca Rodriguez	
Recent Human Ventricular Cell Action Potential Models Under Varied Ischaemic Conditions	695
Sara Dutta, Ana Mincholé, T Alexander Quinn, Blanca Rodriguez	

7-2: Modelling Electrophysiology Chairs Yoram Rudy
Ralf Köhler

Effect of Gap Junction Uncoupling on Spatial Dispersion of Action Potential Duration at Sites of Abrupt Tissue Expansion	699
Marjorie Letitia Hubbard, Craig S Henriquez	
A Steklov-Poincaré Approach to Solve the Inverse Problem in Electrophysiology	703
Nejib Zemzemi	
Identification of Ablation Sites in Atrial Flutter by Causal Method	707
Miguel Rodrigo, Alejandro Liberos, Andreu M Climent, Maria S Guillem	
Computational Probabilistic Quantification of Pro-arrhythmic Risk from Scar and Left-to-Right Heterogeneity in the Human Ventricles	711
Mikael Wallman, Alfonso Bueno-Orovio, Blanca Rodriguez	
Volumetric Imaging of Cardiac Current Sources using Lp-Norm Regularization	715
Azar Rahimi, Jingjia Xu, John R Fitz-Clarke, Linwei Wang	
Characterize the Causal Interactions Between Depolarization and Repolarization Temporal Changes in Unipolar Electrograms	719
Michele Orini, Luca Citi, Ben M Hanson, Peter Taggart, Pier D Lambiase	

7-3: Atrial Fibrillation Detection and Prediction Chairs José Millet
Valentina Corino

Application of the Preoperative ECG to Predict Cox Maze Surgery Mid-term Outcome	723
Antonio Hernández, Raúl Alcaraz, Fernando Hornero, José Joaquín Rieta	
Combination of Clinical and Electrocardiographic Indices to Predict Cox-Maze Surgery Outcome at Discharge	727
Antonio Hernández, Raúl Alcaraz, Fernando Hornero, José Joaquín Rieta	
Open Source Java-based ECG analysis Software and Android app for Atrial Fibrillation Screening	731
Julien Oster, Joachim Behar, Roberta Colloca, Qichen Li, Qiao Li, Gari D Clifford	
Dynamic Risk Assessment of the Onset of Paroxysmal Atrial Fibrillation	735
Claudia Vega, Irene Garcia, Juan Jiménez	
A Noise-Adaptive Method for Detection of Brief Episode Paroxysmal Atrial Fibrillation	739
Andrius Petrėnas, Leif Sörnmo, Vaidotas Marozas, Arūnas Lukoševičius	
Real Time Detection of Atrial Fibrillation using a low-power ECG Monitor	743
Greg Hayes, Paul D Teal	

7-4: Multivariate Cardiovascular Signal Modelling and Analysis

Chairs Philip de Chazal
Olivier Meste

Comparing Model-free and Model-based Transfer Entropy Estimators in Cardiovascular Variability	747
Alessandro Montalto, Daniele Marinazzo, Dimitris Kugiumtzis, Giandomenico Nollo, Luca Faes	
Correlations between Spectral Measures of Baroreflex Sensitivity Variability and HRV during Supine Position, Paced Breathing, Standing and Exercise	751
Salvador Carrasco-Sosa, Alejandra Guillén-Mandujano	
Association of Ankle Brachial Pressure Index with Heart Rate Variability in a Rural Screening Clinic	755
Herbert F Jelinek, Daswin De Silva, Frada Burstein, Andrew Stranieri, Kinda Khalaf, Ahsan H Khandoker, Hayder Al-Aubaidy	
Granger Causality Analysis of Baroreflex in Obese Children and Adolescents	759
Michal Javorka, Ingrid Tonhajzerova, Barbora Czippelova, Zuzana Turianikova, Lenka Chladekova, Kamil Javorka	
Comparison of Baroreflex Sensitivity Gain during Mild Lower Body Negative Pressure in Presence and Absence of Long Duration Bed Rest	763
Guadalupe Dorantes-Mendez, Manuela Ferrario, Giuseppe Baselli, Philippe Arbeille, J Kevin Shoemaker, Danielle K Greaves, Richard L Hughson, Federico Aletti	
Echocardio-variability - Low and High Frequency Beat-to-beat Variability in Echocardiographic Signals	767
Amanda Albano, Sandra Gustavsson, Per Lindqvist, Urban Wiklund, Christer Grönlund	

8-1: ECG Measurement

Chairs Shen Luo
Arie Maan

Use of Dominant T-Wave to Reduce T-Wave Offset Location Uncertainty	771
Corrado Giuliani, Angela Agostinelli, Laura Burattini	
ECGlab: User Friendly ECG/VCG Analysis Tool for Research Environments	775
Jose Vicente, Lars Johannesen, Lorian Galeotti, David G Strauss	
An Interactive Tool for the Evaluation of ECG Visualisation Formats	779
Elizabeth S Martin, Dewar D Finlay, Chris D Nugent, Raymond R Bond, Cathal J Breen	
Ultra-high-frequency ECG Measurement	783
Pavel Jurák, Josef Halámek, Pavel Leinveber, Vlastimil Vondra, Ladislav Soukup, Petr Veselý, Josef Šumbera, Karel Zeman, Libuse Martinakova, Tereza Jurakova, Miroslav Novák	

Coherence-Based Measure of Instantaneous ECG Noise 787
Piotr Augustyniak

Improved Respiration Rate Estimation using a Kalman filter and Wavelet Cross-Coherence 791
Alistair EW Johnson, Sharath Choletti, Timothy G Buchman, Gari D Clifford

8-2: Cardiac Mechanics Chair Dingchang Zheng

Characterization of Patients with Different Ventricular Ejection Fractions using Blood Pressure Signal Analysis 795
Andres Arcentales, Andreas Voss, Pere Caminal, Antonio Bayés-Genís, Maria Teresa Domingo, Beatriz F Giraldo

Empirical Mode Decomposition for Respiratory and Heart Rate Estimation from the Photoplethysmogram 799
Ainara Garde, Walter Karlen, Parastoo Dehkordi, J Mark Ansermino, Guy A Dumont

Study on the Linear Relation Between Chest Compression Depth and the Fluctuation Caused in the Thoracic Impedance Acquired by Defibrillation Pads 803
Erik Alonso, Digna González-Otero, Elisabete Aramendi, Sofía Ruiz de Gauna, Jesús Ruiz, Unai Ayala, James Russell

A Simple Impedance-Based Method for Ventilation Detection During Cardiopulmonary Resuscitation 807
Digna González-Otero, Erik Alonso, Jesús Ruiz, Elisabete Aramendi, Sofía Ruiz de Gauna, Unai Ayala, Jo Kramer-Johansen, Trygve Eftestøl

The Influence of Cardiac Trabeculae on Ventricular Mechanics 811
Marta Serrani, Maria Laura Costantino, Roberto Fumero

8-3: Cardiac Computed Tomography Chairs Alan Murray Victor Mor-Avi

Automatic Right Ventricle Segmentation in CT Images using a Novel Multi-Scale Edge Detector Approach 815
Sofia Antunes, Caterina Colantoni, Anna Palmisano, Antonio Esposito, Sergio Cerutti, Giovanna Rizzo

3D Analysis of Myocardial Perfusion from Vasodilator Stress Computed Tomography: Can Accuracy Be Improved by Iterative Reconstruction? 819
Victor Mor-Avi, Nadjia Kachenoura, Nicole M Bhave, Benjamin H Freed, Michael Vannier, Karin Dill, Roberto M Lang, Amit R Patel

Extracting Myofibre Orientation from Micro-CT Images: An Optimisation Study 823
Haibo Ni, Simon J Castro, Robert S Stephenson, Jonathan C Jarvis, Tristan Lowe,
George Hart, Mark R Boyett, Henggui Zhang

Mitral Valve Regurgitation: Assessment with Dual Source Computed Tomography 827
Liping Yao, Kun Sun, Xin Yang, Sun Cheng, Linwei Yu, Ming Liu

**Multi-Parametric Model of the Heart from CT Images to Guide Ventricular
Tachycardia Ablation** 831
Sofia Antunes, Daniele Tresoldi, Caterina Colantoni, Anna Palmisano, Antonio Esposito,
Sebastiano Colombo, Giuseppe Maccabelli, Paolo della Bella, Sergio Cerutti,
Giovanna Rizzo

8-4: Ventricular Cell-Tissue Modelling Chair Stefano Severi

**Combined Action Potential- and Dynamic-Clamp for Accurate Computational
Modeling of the Kinetics of Cardiac IKr Current** 835
Chiara Bartolucci, Claudia Altomare, Marco Bennati, Simone Furini, Antonio Zaza,
Stefano Severi

**Extracellular Calcium and L-Type Calcium Current Inactivation Mechanisms: a
Computational Study** 839
Elisa Passini, Stefano Severi

IKr Impact on Repolarization and its Variability Assessed by Dynamic-Clamp 843
Claudia Altomare, Luca Sala, Chiara Bartolucci, Gaspare Mostacciuolo, Stefano Severi,
Antonio Zaza

**Deactivation of Per-Arnt-Sim Domain Mutation Increases the Proarrhythmic Risk of
Dofetilide** 847
Rodolfo Gonzalez, Edgar Cardenas, Alain Manzo, Fernando Martinez, Julio Gomis,
Javier Saiz

Validation of a Computational Model of Cardiac Defibrillation 851
Jean Bragard, Jorge Elorza, Elizabeth M Cherry, Flavio H Fenton

**Population of Human Ventricular Cell Models Calibrated with in vivo Measurements
unravels Ionic Mechanisms of Cardiac Alternans** 855
Xin Zhou, Alfonso Bueno-Orovio, Michele Orini, Ben Hanson, Martin Hayward,
Peter Taggart, Pier D Lambiase, Kevin Burrage, Blanca Rodriguez

9-1: Clinical Aspects of Electrocardiography	Chairs	Paul Kligfield Guy Carrault
---	--------	--------------------------------

Detection of Sleep Apnoea in Infants using ECG and Oximetry Signals	859
Gregory Cohen, Philip de Chazal	
Detection of Epileptic Seizures by Means of Morphological Changes in the ECG	863
Carolina Varon, Katrien Jansen, Lieven Lagae, Sabine Van Huffel	
Evaluation of the Relation Between Changes in R-wave Amplitude and LV Mass and Dimensions in a Model of “Reversed Hypertrophy”	867
Enrico G Caiani, Angelo Auricchio, Mark Potse, Rolf Krause, Alessandro Pellegrini, Roberto M Lang, Pierre Vaïda	
Cardiac Repolarization Analysis: Immediate Response	871
Josef Halamek, Pavel Jurak, Eleonora Tobaldini, Nicola Montano, Pavel Leinveber	
Atrial Fibrillation Classification Method for Patients with Different Pharmacological or Surgical Therapies	875
Nuria Ortigosa, Antonio Galbis, Carmen Fernández, Guillermo Ayala, Óscar Cano, Ana Andrés	
Towards Standardization of Non-invasive Atrial Fibrillation Substrate Complexity Quantification: Effect of Choice of ECG-leads and Complexity Measure on Prediction of Pharmacological Cardioversion	879
Stef Zeemering, Theo Lankveld, Harry Crijns, Ulrich Schotten	

9-2: Vascular Mechanics	Chairs	José F Rodriguez Elisabete Aramendi
--------------------------------	--------	---

Effect of Pre-measurement Relaxation Time on Manual Blood Pressure Measurement	883
Dingchang Zheng, Fan Pan, Alan Murray	
Pulse Transit Time and Pulse Width as Potential Measure for Estimating Beat-to-Beat Systolic and Diastolic Blood Pressure	887
Adriana Arza, Jesús Lázaro, Eduardo Gil, Pablo Laguna, Jordi Aguiló, Raquel Bailon	
Exploring the Stationary Wavelet Transform Detail Coefficients for the Detection and Identification of the S1 and S2 Heart Sounds	891
Nuno Marques, Rute Almeida, Ana Paula Rocha, Miguel Coimbra	
Effect of Stethoscope Position on Auscultatory Blood Pressure Measurement	895
Fan Pan, Dingchang Zheng, Alan Murray	
Influence of Intraluminal Thrombus Topology on AAA Passive Mechanics	899
Fabian Riveros, Giampaolo Martufi, T Christian Gasser, Jose F Rodriguez	

9-3: 3D Atrial Modelling

Chairs

Javier Saiz
Felipe Atienza

-
- Approximate Entropy Can Localize Rotors, but not Ectopic Foci during Chronic Atrial Fibrillation - a Simulation Study** 903
Andrés Orozco-Duque, Juan P Ugarte, Catalina Tobón, Javier Saiz, John Bustamante
- 3-Dimensionality in Determining the Stability of Atrial Fibrillation** 907
Ali Gharaviri, Sander Verheule, Nico HL Kuijpers, Ulrich Schotten
- Cell Repolarization Variability Modulates Atrial Fibrillation Dynamics in 3D Virtual Human Atria** 911
Carlos Sanchez, Alfonso Bueno-Orovio, Esther Pueyo, Blanca Rodriguez
- Body Surface Potential Propagation Maps During Macroreentrant Atrial Arrhythmias. A Simulation Study** 915
Alejandro Liberos, Jorge Pedrón-Torrecilla, Miguel Rodrigo, José Millet, Andreu M Climent, María S Guillem
- Computational Simulation and Analysis of 3D Body Surface Potential Patterns Generated by Common Atrial Arrhythmias** 919
Ana Ferrer, Rafael Sebastian, Jose F Rodriguez, Catalina Tobón, María Guillem, Eduardo J Godoy, Javier Saiz
- Influence of Three-Dimensional Fibrotic Patterns on Simulated Intracardiac Electrogram Morphology** 923
Matthias W Keller, Armin Luik, Mohammad Soltan Abady, Gunnar Seemann, Claus Schmitt, Olaf Dössel

9-4: Sensor Technology and Heart Rate Analysis

Chairs

Beatriz Giraldo
Urban Wiklund

-
- Sensitivity of a Wearable Bioimpedance Monitor to Changes of Thoracic Fluid Content in Heart Failure and Hypertension Patients** 927
Silviu Dovancescu, Azam Torabi, Thato Mabote, Jennifer Caffarel, Emile Kelkboom, Ronald Aarts, Erik Korsten, John Cleland
- Modeling of Motion Artifacts in Contactless Heart Rate Measurements** 931
Tobias Wartzek, Christoph Brüser, Thomas Schlebusch, Christian Brendle, Susana Santos, Anna Kerekes, Kurt Gerlach-Hahn, Sören Weyer, Katrin Lunze, Christoph Hoog-Antink, Steffen Leonhardt
- Photoplethysmography-Based Ambulatory Heartbeat Monitoring Embedded into a Dedicated Bracelet** 935
Simon Arberet, Mathieu Lemay, Philippe Renevey, Josep Solà, Olivier Grossenbacher, Daniela Andries, Claudio Sartori, Mattia Bertschia

Is Cross-sample Entropy a Valid Measure of Synchronization between the Sequences of RR Interval and Pulse Transit Time?	939
Chengyu Liu, Dingchang Zheng, Peng Li, Lina Zhao, Changchun Liu, Alan Murray	
Physiological Feature Analysis in Heart Rate Turbulence using LASSO Model	943
Óscar Barquero-Pérez, Rebeca Goya-Esteban, Carlos Figuera, Inmaculada Mora-Jiménez, Arcadi García-Alberola, José Luis Rojo-Álvarez	

10-1: ECG Signal Processing

A Real Time ECG Preprocessing System Based on ADS1298	947
Daniel Campillo, Ronny Guardarrama, Rene Gonzalez, Jorge Rodriguez, Daniel Jimenez	
ECGlib: Library for Processing Electrocardiograms	951
Lars Johannesen, Jose Vicente, Loriano Galeotti, David G Strauss	
A Switching Feature Extraction System for ECG Heartbeat Classification	955
Philip de Chazal	
Cepstrum Feature Selection for the Classification of Sleep Apnea-Hypopnea Syndrome based on Heart Rate Variability	959
Antonio Gabriel Ravelo-García, Juan Luis Navarro-Mesa, Eduardo Hernández-Pérez, Sofía Martín-González, Pedro Quintana-Morales, Iván Guerra-Moreno, Gabriel Juliá-Serdá	
Enhanced Turning Point Algorithm for the Visualization and Printing of Long Term ECG Curves	963
Sándor Hargittai	
Proposed New Requirements for Testing and Reporting Performance Results of Arrhythmia Detection Algorithms	967
John Wang	
Automatic Classification of Arrhythmic Heartbeats using the Linear Prediction Model	971
Chun-Cheng Lin, Weichih Hu, Chun-Min Yang	

10-2: Health Informatics

Webbase Online Consulting System for Quasi Real Time Consultations of Cardiac Images	975
Csaba Jenei, Tamás Ivánfai, Bálint Kőszegi, Zsolt Kőszegi	
An HTML5-based ECG Viewer	97
Jesús D Trigo, Miguel Martínez-Espronedada, Aitor Eguzkiza, Luis Serrano	
Portable Platform Independent Patient Monitoring	983
Rogier J Barendse, Teus B van Dam, Stefan P Nelwan	

10-3: Heart Rate Variability in Disease

Heart Rate Asymmetry in Aortic Valve Stenosis Patients	987
Monika Petelczyc, Olga Lipińska, Ewa Orłowska-Baranowska, Rafał Baranowski, Jan Jacek Żebrowski	
Analysis of Heart Rate Variability in Elderly Patients with Chronic Heart Failure during Periodic Breathing	991
Beatriz F Giraldo, Joan P Téllez, Sergio Herrera, Salvador Benito	
Age Related Changes in Variability of Short-Term Heart Rate and Diastolic Period	995
Peng Li, Chengyu Liu, Xin Sun, Yongai Ren, Chang Yan, Zhonghan Yu, Changchun Liu	
Validation of the Use of Heart Rate Variability Measurements during Meal Intake in Humans	999
Sebastian Päßler, Alexander Noack, Rüdiger Poll, Wolf-Joachim Fischer	
Combining HRV Features for Automatic Arousal Detection	1003
Jerome Foussier, Pedro Fonseca, Xi Long, Berno Misgeld, Steffen Leonhardt	
OSAS Severity is Associated to Decreased Heart Rate Turbulence Slope	1007
Giovanni D'Addio, Mario Cesarelli, Maria Romano, Alberto De Felice	
Obstructive Sleep Apnea in a Rat Model: Effects of Anesthesia on Autonomic Evaluation from Heart Rate Variability Measures	1011
Raimon Jané, Jesús Lazaro, Puy Ruiz, Eduardo Gil, Daniel Navajas, Ramon Farré, Pablo Laguna	
Pulse Rate Variability in Children with Disordered Breathing during Different Sleep Stages	1015
Parastoo Dehkordi, Ainara Garde, Walter Karlen, David Wansley, J Mark Ansermino, Guy A Dumont	
Detection of Cardiac Autonomic Neuropathy using Linear Parametric Modeling of QT dynamics	1019
Mohammad Hasan Imam, Chandan Karmakar, Ahsan Khandoker, Herbert Jelinek, Marimuthu Palaniswami	
A New Methodology for Nonlinear Heart Function Analysis: Studying Just the Beat Morphology	1023
Constantino A García, David G Márquez, Abraham Otero, Jesús Presedo, Paulo Félix	
Heart Rate Variability Associated with Different Modes of Respiration during Zen Meditation	1027
Masaki Hoshiyama, Asagi Hoshiyama	
Aging of ECG Characteristics over a Five Years Period	1031
Neus Carmona, Juan Carlos Rúa-Seoane, Jorge Elorza, Edurne Sáenz de Pipaón, Carmen Palacios, Jean Bragard	

Discrimination of Heart Arrhythmia using Novel Features in Heart Rate Phase Space	1035
Sadaf Moharreri, Shahab Rezaei, Siamak Salavatian	

10-4: Atrial Fibrillation

Study on the Optimal Use of Generalized Hurst Exponents for Noninvasive Estimation of Atrial Fibrillation Organization	1039
---	-------------

M Julián, R Alcaraz, JJ Rieta

Point Process Modeling of R-R Interval Dynamics during Atrial Fibrillation	1043
---	-------------

Marianna Meo, Vicente Zarzoso, Olivier Meste, Decebal G Latcu, Nadir Saoudi, Riccardo Barbieri

A Support Vector Machine Approach for Reliable Detection of Atrial Fibrillation Events	1047
---	-------------

Roberta Colloca, Alistair EW Johnson, Luca Mainardi, Gari D Clifford

Measures of Right Atrial Organization as a Means to Select Candidates for Sinus Rhythm Restoration by Catheter Ablation	1051
--	-------------

Andrea Buttu, Andrei Forclaz, Patrizio Pascale, Philippe Maury, Anne Rollin, Jean-Marc Vesin, Etienne Pruvot

Different Definitions of Complex Fractionated Atrial Electrograms do not Concur with Clinical Perspective	1055
--	-------------

Tiago Paggi de Almeida, João Salinet, Gavin S Chu, G André Ng, Fernando S Schlindwein

New Method of Assessing Cycle Lengths Human Atrial Fibrillation	1059
--	-------------

Adam Quotb, Guillaume Attuel, Carole Pomier, Yuki Komatsu, Pierre Jäis, Méléze Hocini, Michel Haissaguerre, Rémi Dubois

10-5: Atrial Modelling

The Ionic Expression Gradients affect Paroxysmal Atrial Fibrillation Dynamic: A Simulation Study	1063
---	-------------

Catalina Tobón, Karen Cardona, Sandeep V Pandit, José Jalife, Omer Berenfeld, Javier Saiz

Frequency Dependency of Pacing Determinants of an IK1-mediated Rotor Drift in the Posterior Left Atrial Wall toward the Pulmonary Veins	1067
--	-------------

Conrado J Calvo, Makarand Deo, Sharon Zlochiver, José Millet, Omer Berenfeld

Modeling Calcium Dynamics in Human Atria	1071
---	-------------

Inmaculada R Cantalapiedra, Carlos Lugo, Angelina Peñaranda, Leif Hove, Blas Echebarria

Diagnosis of Atrial Ectopic Origin from Body Surface ECG: Insights from 3D Virtual Human Atria and Torso 1075

Erick Andres Perez Alday, Michael Alan Colman, Tim D Butters, Jonathan Higham, Daniele Giacopelli, Philip Langley, Henggui Zhang

Paroxysmal Atrial Fibrillation Caused by Interaction of Pacemaker Waves and Reduced Excitability: Insights from the Bueno-Orovio Model Adapted to Atria 1079

Claudia Lenk, Frank M Weber, Martin Bauer, Mario Einax, Gunnar Seemann, Philipp Maass

10-6: Ventricular Arrhythmia

Effects of Physical Exercise and Glibenclamide in Local Activation Waves During Ventricular Fibrillation 1083

Juan Caravaca, Antonio J Serrano-López, Emilio Soria-Olivas, Manuel Bataller, Alfredo Rosado-Muñoz, Luís Such-Belenguer, Juan F Guerrero

Temporal Evolution of Spatial Regularity in Ventricular Fibrillation Modified by Physical Exercise 1087

Juan Caravaca, Antonio J Serrano-López, Emilio Soria-Olivas, Manuel Bataller, Alfredo Rosado-Muñoz, Luís Such-Belenguer, Juan F Guerrero

Performance of Heart Rhythm Analysis during Chest Compressions in Out-of-Hospital Cardiac Arrest 1091

Vessela Krasteva, Irena Jekova, Todor Stoyanov, Sarah Ménétré, Jean-Philippe Didon

Towards the Selection of Patients requiring ICD Implantation by Automatic Classification from Holter Monitoring Indices 1095

Charles-Henri Cappelaere, Rémi Dubois, Pierre Roussel, Oliver Baumann, Amel Amblard, Gérard Dreyfus

10-7: Cardiac Mechanics

The Effect of the Sensor Position of the Pressure Wire Distal to a Coronary Stenosis on the Calculated Fractional Flow Reserve 1099

Balázs Tar, Sándor Bakk, Zoltán Béres, János Santa, Péter Polgár, Shengxian Tu, Zsolt Kőszegi

Diagrammatic Reasoning with Interactive P-V Curves 1103

Marc Cavazza, Fred Charles

Analysis of Seismocardiogram Capability for Prediction of Mild to Moderate Hemorrhage: Preliminary Results 1107

Kouhyar Tavakolian, Guy A Dumont, Andrew P Blaber

Haemodynamic Parameters for Assessment of Orthostatic Intolerance in Older People	1111
Fernando García-Salmerón, Richard B Reilly, Lisa Cogan, José Millet, Raquel Cervigón	

10-8: Electrophysiology

Hurst Exponent for the Analysis of Atrial Fibrillation Recurrence after Ablation Procedures	1115
Raquel Cervigón, Javier Moreno, Julián Pérez-Villacastín, José Millet, Francisco Castells	
Experimental Study of Arrhythmia due to Mild Therapeutic Hypothermia after Resuscitation of Cardiac Arrest	1119
Binbin Xu, Oriol Pont, Gabriel Laurent, Sabir Jacquir, Stéphane Binczak, Hussein Yahia	
Spectral and Nonlinear Analysis in Surgical Ventricular Fibrillation	1123
Francisco Javier Pulido-Hidalgo, Óscar Barquero-Pérez, Cristina Soguero-Ruiz, José Luis Rojo-Álvarez, Juan José Sánchez-Muñoz, Arcadi García-Alberola	
Classification of Inverse Solutions to Two Dipoles	1127
Jana Svehlikova, Michal Teplan, Milan Tysler	
Clustering of Re-entry Close to Scar Boundaries in Ventricular Tissue during Simulated Ventricular Fibrillation	1131
Sathyavani Malyala, Richard H Clayton	
A Machine Learning Regularization of the Inverse Problem in Cardiac Electrophysiology Imaging	1135
Nejib Zemzemi, Remi Dubois, Yves Coudiere, Olivier Bernus, Michel Haissaguerre	

10-9: Cardiac Imaging

Automatic Detection of Mitral Annulus in Echocardiography based on Prior Knowledge and Local Context	1139
Wei Song, Wei Xu, Xin Yang, Liping Yao, Kun Sun	
Role of 3D Echocardiography Derived Color-Coded Parametric Models of the Mitral Valve in Differential Diagnosis of Prolapse and Billowing	1143
Karima Addetia, Lynn Weiner, Ivan S Salgo, Roberto M Lang, Victor Mor-Avi	
Vendor-Independent Software for Rapid Comprehensive Assessment of Changes in Left Ventricular Function During Serial Echocardiographic Studies	1147
Gillian Murtagh, Victor Mor-Avi, Wendy Tsang, Nicole M Bhave, Brent DeManby, Eric Kruse, Megan Yamat, Roberto M Lang, Jeanne M DeCara	
Multivariate Classification of Cardiac Autonomic Function and Echocardiographic Abnormalities	1151
Gabriel Granåsen, Urban Wiklund	

Development of Fetal Cardiac Intervals Throughout 16 to 41 Weeks of Gestation 1155
Faezeh Marzbanrad, Yoshitaka Kimura, Kiyoe Funamoto, Rika Sugibayashi, Miyuki Endo,
Takuya Ito, Marimuthu Palaniswami, Ahsan Khandoker

**Non-Photorealistic Volume Visualization with Color Distance Gradient and Two-Level
Volume Rendering** 1159
Yong Xia, Libing Zeng, Kuanquan Wang

11-1: ECG Signal Processing Chairs Luca Faes
Joel Xue

**QRS Delineation Algorithms Comparison and Model Fine Tuning for Automatic
Clinical Classification** 1163
Antonio Casañez-Ventura, Francisco-Javier Gimeno-Blanes, José-Luis Rojo-Álvarez,
José-Antonio Flores-Yepes, Juan-Ramón Gimeno-Blanes, José-María López-Ayala,
Arcadi García-Alberola

**ECG Baseline Wander Removal and Impact on Beat Morphology: A Comparative
Analysis** 1167
Antonio Fasano, Valeria Villani

Baseline Wander Removal in ECG and AHA Recommendations 1171
Antonio Fasano, Valeria Villani

**New Computer Program for detecting 12 Lead ECG Misplacement using a 3D Kinect
Camera** 1175
Peter M van Dam, Arie C Maan, Niek HJJ van der Putten, Nico Bruining, Arnold WA Dijk,
Michael Laks

11-2: Physiological Atrial Modelling Chairs Maria S
Guillem
Gunnar Seemann

**Hyperpolarization-Activated ‘Pacemaker Current’ — a Funny Current in Models of
SA Nodal Pacemaker Cells** 1179
Ronald Wilders, Arie O Verkerk

Accuracy of Non-invasive Frequency Estimation during Atrial Fibrillation 1183
Jorge Pedrón-Torrecilla, Alejandro Liberos, José Millet, Andreu M Climent,
Maria S Guillem

Influence of Transmural Slow-Conduction Zones on the Long-Time Behaviour of Atrial Arrhythmia: a Numerical Study with a Human Bilayer Atrial Model 1187
 Simon Labarthe, Edward Vigmond, Yves Coudière, Jacques Henry, Hubert Cochet, Pierre Jais

11-3: Atrial Fibrillation Physiology Chairs Leif Sörnmo
 Rob MacLeod

Recording and Identification of Cardiac Neuron Activity in the Right Atrium Ganglionated Plexus 1191
 Siamak Salavatian, Alain Vinet, Eric Beaumont, J Andrew Armour, Jeffrey L Ardell, Vincent Jacquemet

Modification of Atrioventricular Node Conduction Increases RR Variability but not RR Irregularity nor Atrial Fibrillation Rate in Atrial Fibrillation Patients 1195
 Valentina DA Corino, Fredrik Holmqvist, Luca T Mainardi, Pyotr G Platonov

Generalized Hurst Exponents as a Tool to Estimate Atrial Fibrillation Organization from the Surface ECG 1199
 M Julián, R Alcaraz, JJ Rieta

Spectral Analysis of Blood Pressure Variability in Atrial Fibrillation: the Effect of Tilting 1203
 Valentina DA Corino, Luca T Mainardi, Federico Lombardi

11-4: Intravascular Imaging Chair Nico Bruining

Computer-Assisted Quantitative Analysis of New Interventional Treatment Methods 1207
 Giulia Paoletti, Francesco Prati, Sebastiaan de Winter, Ronald Hamers, Nico Bruining

Computer-Assisted Quantitative Evaluation of Coronary Stent Platforms by Different Intracoronary Imaging Methods 1211
 Elżbieta Pociask, Klaudia Proniewska, Nico Bruining

Automatic Stent Segmentation in IOCT images Using Combined Feature Extraction Techniques and Mathematical Morphology 1215
 Matheus Cardoso Moraes, Diego Armando Cardona Cárdenas, Sérgio Shiguemi Furuie

11-5: Prediction of Hypotension and Blood Pressure Variability Chairs Frida Sandberg
Raquel Bailón

- Cross-Entropy of Systolic Blood Pressure - Pulse Interval: Automatic Threshold and its Reliability** 1219
Tamara Ceranić, Tatjana Lončar-Turukalo, Branislav Milovanović, Nina Japundžić-Žigon, Dragana Bajić
- Prediction of Intradialytic Hypotension Based on Oxygen Saturation Variations** 1223
Claudia Perazzini, Piergiorgio G Bolasco, Luca Corazza, Michele Tramonti, Elena Mancini, Antonio Santoro, Stefano Severi
- Prediction of Intradialytic Hypotension using PPG and ECG** 1227
Frida Sandberg, Raquel Bailón, David Hernando, Pablo Laguna, Juan Pablo Martínez, Kristian Solem, Leif Sörnmo
- Heart Rate Variability Analysis for the Prediction of Hypotension during Spinal Anesthesia in Programmed Cesarean Surgery and its Relation with Fetal Cord Acid-base Equilibrium** 1231
José M Remartínez, Raquel Bailón, Eva M Rovira, Juan Bolea, Pablo Laguna, Augusto Navarro

12: Plenary Chairs Pablo Laguna
George Moody

- Non-invasive Location of Re-entrant Propagation Patterns during Atrial Fibrillation** 1235
Miguel Rodrigo, Andreu M Climent, Alejandro Liberos, Jorge Pedrón-Torrecilla, José Millet, Francisco Fernández-Avilés, Felipe Atienza, Omer Berenfeld, Maria S Guillem
- Computational Modelling of LQT1 in Human Induced Pluripotent Stem Cell Derived Cardiomyocytes** 1239
Michelangelo Paci, Jari Hyttinen, Stefano Severi
- Drug Effect Evaluation during Permanent Atrial Fibrillation using an AV-node Model** 1243
Frida Sandberg, Valentina DA Corino, Sara Reinvik Ulimoen, Steve Enger, Arnljot Tveit, Luca T Mainardi, Pyotr Platonov, Leif Sörnmo
- Online Apnea-Bradycardia Detection using Recursive Order Estimation for Auto-regressive Models** 1247
Di Ge, Alain Beuchée, Guy Carrault, Patrick Pladys, Alfredo Hernández