

# INFORMATION FUSION HISTORY

X. Rong Li

## BEST PAPER AND BEST STUDENT PAPER AWARDS, FUSION 2004–2017

The Jean-Pierre Le Cadre Award is intended to recognize excellence among researchers and scientists in information fusion, which was the core motivation behind Jean-Pierre Le Cadre's career. The Jean-Pierre Le Cadre Award is given for the best paper of the annual International Conference on Information Fusion (FUSION) and often includes a signed copy of a recently published book in the area of information fusion.

The Tammy L. Blair Award is intended to encourage the involvement of young researchers and scientists in information fusion. It honors Tammy L. Blair's commitment to the International Society of Information Fusion. The Tammy L. Blair Award is given to recognize the best student papers at the annual International Conference on Information Fusion (FUSION) and includes cash prizes and travel grants. Awardees are often given a signed copy of a recently published book in the area of information fusion.

Both awards are managed by the organizing committee for the annual conference. Past recipients are summarized in the following.

### 2017

#### JEAN-PIERRE LE CADRE BEST PAPER AWARD

“Generalized Optimal Sub-Pattern Assignment Metric”

Abu Sajana Rahmathullah,<sup>1</sup> Angel Garcia-Fernandez,<sup>2</sup> Lennart Svensson<sup>3</sup>

<sup>1</sup>Zenuity AB, Sweden; <sup>2</sup>Aalto University, Finland; <sup>3</sup>Chalmers University of Technology, Gothenburg, Sweden

#### FIRST RUNNER-UP

“Target Motion Analysis with Unknown Measurement Noise Variance”

Branko Ristic,<sup>1,2</sup> Xuezhi Wang,<sup>1</sup> Sanjeev Arulampalam<sup>2</sup>

<sup>1</sup>RMIT University, Melbourne, Australia; <sup>2</sup>Defence Science and Technology, Australia

#### SECOND RUNNER-UP

“Maximum Likelihood Detection on Images”

Balakumar Balasingam,<sup>1</sup> Yaakov Bar-Shalom,<sup>2</sup> Peter Willett,<sup>2</sup> Krishna Pattipati

<sup>1</sup>University of Windsor, Canada; <sup>2</sup>University of Connecticut, Storrs, USA

#### TAMMY BLAIR BEST STUDENT PAPER AWARDS

“Dual-Satellite Source Geolocation with Time and Frequency Offsets and Satellite Location Errors”

Chao Liu,<sup>1</sup> Le Yang,<sup>1,2</sup> Lyudmila Mihaylova<sup>1</sup>

<sup>1</sup>University of Sheffield, United Kingdom; <sup>2</sup>Jiangnan University, People's Republic of China

#### FIRST RUNNER-UP

“Student- $t$  Process Quadratures for Filtering of Non-Linear Systems with Heavy-Tailed Noise”

Jakub Průher,<sup>1</sup> Filip Tronarp,<sup>2</sup> Toni Karvonen,<sup>2</sup> Simo Särkkä,<sup>2</sup> Ondřej Straka<sup>1</sup>

<sup>1</sup>University of West Bohemia, Pilsen, Czech Republic; <sup>2</sup>Aalto University, Finland

#### SECOND RUNNER-UP

“Gradient-Based Recursive Maximum Likelihood Identification of Jump Markov Non-Linear Systems”

Andre R. Braga,<sup>1</sup> Carsten Fritsche,<sup>2</sup> Fredrik Gustafsson,<sup>2</sup> Marcelo G. S. Bruno<sup>3</sup>

<sup>1</sup>Federal University of Ceara, Brazil; <sup>2</sup>Linköping University, Sweden; <sup>3</sup>Aeronautics Institute of Technology, Brazil

### 2016

#### JEAN-PIERRE LE CADRE BEST PAPER AWARDS

“Model-Based Data-Driven Approach for Sleep Apnea Detection”

Sandeep Gutta,<sup>1</sup> Qi Cheng,<sup>1</sup> Hoa Nguyen,<sup>2</sup> Bruce Benjamin<sup>1</sup>

<sup>1</sup>Oklahoma State University, Stillwater, USA; <sup>2</sup>Posts and Telecommunications Institute of Technology, Vietnam

#### FIRST RUNNER-UP

“A Structured Mean Field Approach for Existence-Based Multiple Target Tracking”

Roslyn A. Lau, Jason L. Williams

Defence Science and Technology Group, Australia

#### SECOND RUNNER-UP

“Real-Time Forecasting of an Epidemic Outbreak: Ebola 2014/2015 Case Study”

Branko Ristic,<sup>1</sup> Peter Dawson<sup>2</sup>

<sup>1</sup>RMIT University, Melbourne, Australia; <sup>2</sup>DST Group, Australia

#### TAMMY BLAIR BEST STUDENT PAPER AWARDS

“Approaches for Solving  $m$ -Best 3-Dimensional Dynamic Scheduling Problems for Large  $m$ ”

Lingyi Zhang,<sup>1</sup> David Sidoti,<sup>1</sup> Krishna R. Pattipati,<sup>1</sup> David Castañón<sup>2</sup>

## ISIF Awards

<sup>1</sup>University of Connecticut, Storrs, USA; <sup>2</sup>Boston University, Massachusetts, USA

### FIRST RUNNER-UP

“Sigma-Point Filtering for Nonlinear Systems with Non-Additive Heavy-Tailed Noise”

Filip Tronarp, Roland Hostettler, Simo Särkkä  
Aalto University, Finland

### SECOND RUNNER-UP

“Gyro-Aided Visual Tracking Using Iterative Earth Mover’s Distance”

Gang Yao, Mike Williams, Ashwin Dani  
University of Connecticut, Storrs, USA

## 2015

### JEAN PIERRE LE CADRE BEST PAPER AWARDS

“An Application of Interacting Multiple Model Tracking Method to Financial Modeling and Asset Allocation”

Shozo Mori,<sup>1</sup> Kuochu Chang,<sup>2</sup> Hajime Takahashi,<sup>3</sup> Chee-Yee Chong<sup>4</sup>

<sup>1</sup>Systems & Technology Research, USA; <sup>2</sup>Geoge Mason University, Fairfax, Virginia, USA; <sup>3</sup>Tottori University, Japan; <sup>4</sup>Independent Consultant, USA

### FIRST RUNNER-UP

“An Efficient Algorithm for Aircraft Conflict Detection and Resolution Using List Viterbi Algorithm”

Vesselin P. Jilkov, X. Rong Li, Jeffrey H. Ledet  
University of New Orleans, Louisiana, USA

### SECOND RUNNER-UP

“Trust Revision for Conflicting Sources”

Audun Jøsang,<sup>1</sup> Magdalena Ivanovska,<sup>1</sup> Tim Muller<sup>2</sup>  
<sup>1</sup>University of Oslo, Norway; <sup>2</sup>Nanyang Technological University, Singapore

### TAMMY BLAIR BEST STUDENT PAPER AWARDS

“Improvements in the Implementation of Log-Homotopy Based Particle Flow Filters”

Muhammad Altamash Khan, Martin Ulmke  
FKIE Fraunhofer, Germany

### FIRST RUNNER-UP

“Secure and Resilient Distributed Machine Learning under Adversarial Environments”

Rui Zhang, Quanyan Zhu  
New York University, USA

### SECOND RUNNER-UP

“Crowdsourcing with Multi-Dimensional Trust”

Xiangyang Liu,<sup>1</sup> He He,<sup>2</sup> John S. Baras<sup>3</sup>  
University of Maryland, College Park, USA

## 2014

### BEST PAPER AWARDS

“Deterministic Approximation of Circular Densities with Symmetric Dirac Mixtures Based on Two Circular Moments”

Gerhard Kurz, Igor Gilitschenski, Uwe Hanebeck  
Karlsruhe Institute of Technology, Germany

### FIRST RUNNER-UP

“Interacting Multiple Model Unscented Gauss-Helmert Filter for Bearings-Only Tracking with State-Dependent Propagation Delay”

Rong Yang,<sup>1</sup> Yaakov Bar-Shalom,<sup>2</sup> Jack Hong’an Huang,<sup>1</sup> Gee Wah Ng<sup>1</sup>

<sup>1</sup>DSO National Laboratories, Singapore; <sup>2</sup>University of Connecticut, Storrs, USA

### SECOND RUNNER-UP

“Improved Estimation of Conflict Probability for Aircraft Collision Avoidance”

Vesselin Jilkov, X. Rong Li, Jeffrey Ledet  
University of New Orleans, Louisiana, USA

### BEST STUDENT PAPER AWARDS

“Multi-Object Tracking Using Labeled Multi-Bernoulli Random Finite Sets”

Stephan Reuter,<sup>1</sup> Ba-Tuong Vo,<sup>2</sup> Ba-Ngu Vo,<sup>2</sup> Klaus Dietmayer<sup>1</sup>  
<sup>1</sup>Ulm University, Germany; <sup>2</sup>Curtin University, Bentley, Australia

### FIRST RUNNER-UP

“A New Probability Distribution for Simultaneous Representation of Uncertain Position and Orientation”

Igor Gilitschenski,<sup>1</sup> Gerhard Kurz,<sup>1</sup> Uwe Hanebeck,<sup>2</sup> Simon J. Julier<sup>1</sup>

<sup>1</sup>Karlsruhe Institute of Technology, Germany; <sup>2</sup>University College London, United Kingdom

### SECOND RUNNER-UP

“Sensor Control for Multi-Object Tracking Using Labeled Multi-Bernoulli Filter”

Amirali K. Gostar, Reza Hoseinnezhad, Alireza Bab-Hadiashar  
RMIT University, Melbourne, Australia

## 2013

### BEST PAPER AWARDS

“Recursive Fusion of Noisy Depth and Position Measurements for Surface Reconstruction”

Gerhard Kurz, Uwe Hanebeck  
Karlsruhe Institute of Technology, Germany

**FIRST RUNNER-UP**

“Traffic Knowledge Discovery from AIS Data”

Giuliana Pallotta, Michele Vespe, Karna Bryan  
NATO Centre for Maritime Research and Experimentation, La Spezia, Italy

**SECOND RUNNER-UP**

“A New Approach for Doppler-Only Target Tracking”

Giorgio Battistelli,<sup>1</sup> Luigi Chisci,<sup>1</sup> Claudio Fantacci,<sup>1</sup> Alfonso Farina,<sup>2</sup> Alessandro Graziano<sup>2</sup>  
<sup>1</sup>DINFO, Università di Firenze, Florence, Italy; <sup>2</sup>Selex ES, Rome, Italy

**BEST STUDENT PAPER AWARDS**

“Distributed Emitter Tracking Using Random Exchange Diffusion Particle Filters”

Stiven S. Dias,<sup>1</sup> Marcelo G. S. Bruno<sup>2</sup>  
<sup>1</sup>Embraer Defense & Security, Brazil; <sup>2</sup>Instituto Tecnológico de Aeronáutica Divisão de Engenharia Eletrônica, Brazil

**FIRST RUNNER-UP**

“Recursive Estimation of Orientation Based on the Bingham Distribution”

Gerhard Kurz,<sup>1</sup> Igor Gilitschenski,<sup>1</sup> Simon Julier,<sup>2</sup> Uwe D. Hanebeck<sup>1</sup>  
<sup>1</sup>Karlsruhe Institute of Technology, Germany; <sup>2</sup>University College London, United Kingdom

**SECOND RUNNER-UP**

“High Level Information Fusion through a Fuzzy Extension to Multi-Entity Bayesian Networks in Vehicular Ad-Hoc Networks”

Keyvan Golestan, Fakhri Karray, Mohamed S. Kamel  
University of Waterloo, Canada

**2012****BEST REGULAR PAPER AWARDS**

“On Conservative Fusion of Information with Unknown Non-Gaussian Dependence”

Tim Bailey,<sup>1</sup> Simon Julier,<sup>2</sup> Gabriel Agamennon<sup>1</sup>  
<sup>1</sup>University of Sydney, Australia; <sup>2</sup>University College London, United Kingdom

“Modeling Extreme Events in Spatial Domain by Copula Graphical Models”

Hang Yu,<sup>1</sup> ZhengChoo,<sup>1</sup> Wayne Isaac Uy,<sup>1</sup> Justin Dauwels,<sup>1</sup> Philip Jonathan<sup>2</sup>  
<sup>1</sup>Nanyang Technological University, Singapore; <sup>2</sup>Shell Technology Centre, United Kingdom

“Measure of Nonlinearity for Stochastic Systems”

X. Rong Li  
University of New Orleans, Louisiana, USA

**BEST STUDENT PAPER AWARDS**

“Particle Filter Divergence Monitoring with Application to Terrain Navigation”

Achille Murangira,<sup>1</sup> Christian Musso,<sup>1</sup> Igor Nikiforov<sup>2</sup>  
<sup>1</sup>Onera, France; <sup>2</sup>Université Technologique de Troyes, France

“On the Reduction of Gaussian Inverse Wishart Mixtures”

Karl Granstrom,<sup>1</sup> Umut Orguner<sup>2</sup>  
<sup>1</sup>Linköping University, Sweden; <sup>2</sup>Middle East Technical University, Ankara, Turkey

“An Efficient Particle Filter for Multi-Target Tracking Using an Independence Assumption”

Wei Yi,<sup>1</sup> Mark Morelande,<sup>2</sup> Lingjiang Kong,<sup>1</sup> Jianyu Yang<sup>1</sup>  
<sup>1</sup>University of Electronic Science and Technology of China, China; <sup>2</sup>University of Melbourne, Australia

**2011****BEST STUDENT PAPER AWARD**

“Shape Tracking of Extended Objects and Group Targets with Star-Convex RHMs”

Marcus Baum, Uwe D. Hanebeck  
Karlsruhe Institute of Technology, Germany

**BEST PAPER AWARD**

“Histogram PMHT with Particles”

Sam Davey  
Defence Science and Technology Organisation, Australia  
School of Electrical and Electronic Engineering; The University of Adelaide, Australia

**2010****BEST PAPER AWARDS**

“Shooting Two Birds with Two Bullets: How to Find Minimum Mean OSPA Estimates”

Marco Guerriero,<sup>1</sup> Lennart Svensson,<sup>2</sup> Daniel Svensson,<sup>2</sup> Peter Willett<sup>3</sup>  
<sup>1</sup>Elettronica S.p.A, Italy; <sup>2</sup>Chalmers University of Technology, Gothenburg, Sweden; <sup>3</sup>University of Connecticut, Storrs, USA

**RUNNERS-UP IN BEST PAPER**

“Asynchronous Distributed Particle Filter via Decentralized Evaluation of Gaussian Products”

Boris N. Oreshkin, Mark J. Coates  
McGill University, Montreal, Quebec, Canada

“Improved SMC Implementation of the PHD Filter”

Branko Ristic,<sup>1</sup> Daniel Clark,<sup>2</sup> Ba-Ngu Vo<sup>3</sup>  
<sup>1</sup>DSTO, Australia; <sup>2</sup>Heriot-Watt University, Edinburgh, United Kingdom; <sup>3</sup>The University of Western Australia, Crawley

## ISIF Awards

### BEST STUDENT PAPER AWARDS

“Closed-Form Performance for Location Estimation Based on Quantized Data in Sensor Networks”

Yujiao Zheng, Ruixin Niu, Pramod K. Varshney  
Syracuse University, New York, USA

### RUNNERS-UP

“Selecting Classifiers by F-Score for Real-time Video Tracking”

Ingrid Visentini, Lauro Snidaro, Gian Luca Foresti  
University of Udine, Italy

“Joint PDF Construction for Sensor Fusion and Distributed Detection”

Steven Kay,<sup>1</sup> Quan Ding,<sup>1</sup> Darren Emge<sup>2</sup>  
<sup>1</sup>University of Rhode Island, Kingston, USA; <sup>2</sup>Edgewood Chemical Biological Center, USA

## 2009

### BEST PAPER AWARDS

“Distributed Compression and Fusion of Nonnegative Sparse Signals for Multiple-View Object Recognition”

Allen Y. Yang, Subhransu Maji, Kirak Hong, Posu Yan, S. Shankar Sastry  
University of California, Berkeley, USA

### FIRST RUNNER-UP

“Evaluating the Bayesian Cramér-Rao Bound for Multiple Model Filtering”

Lennart Svensson  
Chalmers University of Technology, Göteborg, Sweden

### SECOND RUNNER-UP

“Tracking of Multiple Contaminant Clouds”

Francois Septier, Avishy Carmi, Simon Godsill  
Cambridge University, United Kingdom

### BEST STUDENT PAPER AWARDS

“Multitarget Tracking via Joint PHD Filtering and Multiscan Association”

Federico Papi,<sup>1</sup> Giorgio Battistelli,<sup>1</sup> Luigi Chisci,<sup>1</sup> Stefano Morrocchi,<sup>1</sup> Alfonso Farina,<sup>2</sup> Alessandro Graziano<sup>2</sup>  
<sup>1</sup>Università di Firenze, Italy; <sup>2</sup>SELEX, Rome, Italy

### FIRST RUNNER-UP

“Distributed Estimation with Data Association: Is the Nearest Neighbor the Most Informative?”

Paolo Braca,<sup>1</sup> Marco Guerriero,<sup>2</sup> Stefano Marano,<sup>1</sup> Vincenzo Matta,<sup>1</sup> Peter Willett<sup>2</sup>  
<sup>1</sup>University of Salerno, Italy; <sup>2</sup>University of Connecticut, Storrs, USA

### SECOND RUNNER-UP

“Feature-Aided Localization of Ground Vehicles Using Passive Acoustic Sensor Arrays”

Vishal Chalapadi Ravindra,<sup>1</sup> Yaakov Bar-Shalom,<sup>1</sup> Thyagaraju Damarlay<sup>2</sup>

<sup>1</sup>University of Connecticut, Storrs, USA; <sup>2</sup>U.S. Army Research Laboratory, Adelphi, Maryland, USA

## 2008

### BEST PAPER AWARD

“Optimal Stationary Binary Quantizer for Decentralized Quickest Change Detection in Hidden Markov Models”

Cheng-Der Fuh,<sup>1</sup> Yajun Mei<sup>2</sup>  
<sup>1</sup>National Central University and Institute of Statistical Science Academia Sinica, Taiwan; <sup>2</sup>Georgia Institute of Technology, USA

### BEST STUDENT PAPER AWARD

“Improving Maritime Anomaly Detection and Situation Awareness through Interactive Visualization”

Maria Riveiro, Göran Falkman, TomZiemke  
University of Skövde, Sweden

## 2007

### BEST PAPER AWARD

“Gaussian Mixture Cardinalized PHD Filter for Ground Moving Target Tracking”

Martin Ulmke,<sup>1</sup> Ozgur Erdinc,<sup>2</sup> Peter Willett<sup>2</sup>  
<sup>1</sup>FGAN-FKIE, Germany; <sup>2</sup>University of Connecticut, Storrs, USA

### BEST STUDENT PAPER AWARD

“Fusion of One-Class Classifiers in the Belief Function Framework”

Astride Aregui,<sup>1,2</sup> Thierry Denoeux<sup>2</sup>  
<sup>1</sup>Suez Environnement-CIRSEE, France; <sup>2</sup>Université de Technologie de Compiègne Cedex, France

## 2006

### BEST PAPER AWARD

“Road Map Extraction Using GMTI Tracking”

Martin Ulmke, Wolfgang Koch  
FGAN-FKIE, Germany  
“A Track Before Detect Approach for Extended Objects”  
Yvo Boers, Johannes N. Driessen  
Thales, The Netherlands

### BEST STUDENT PAPER AWARD

“Closed Form PHD Filtering for Linear Jump, Markov Models”

Muhammad Adeel Pasha,<sup>1</sup> Ba-Ngu Vo,<sup>2</sup> Hoang Duong Tuan,<sup>1</sup> Wing-Kin Ma<sup>3</sup>

<sup>1</sup>New South Wales University, Sydney, Australia; <sup>2</sup>Melbourne University, Australia; <sup>3</sup>National Tsing Hua University, Taiwan

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## 2005

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### BEST PAPER AWARD

“A Performance Bound for Maneuvering Target Tracking Using Best-Fitting Gaussian Distributions”

Marcel Hernandez,<sup>1</sup> Branko Ristic,<sup>2</sup> Alfonso Farina<sup>3</sup>

<sup>1</sup>QintiQ Ltd., United Kingdom; <sup>2</sup>DSTO, Australia; <sup>3</sup>Alenia Marconi Systems, Italy

### BEST STUDENT PAPER AWARD

“Distributed Data Association for Multi-Target Tracking in Sensor Networks”

Lei Chen, Mujdat Cetin, Alan Willsky

Massachusetts Institute of Technology, Cambridge, USA

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## 2004

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### BEST PAPER AWARDS

“Decision Fusion in a Wireless Sensor Network with a Large Number of Sensors”

Ruixin Niu,<sup>1</sup> Pramod K. Varshney,<sup>1</sup> Michael Moore,<sup>2</sup> Dale Klamer<sup>2</sup>

<sup>1</sup>Syracuse University, New York, USA, <sup>2</sup>AlphaTech, USA

“Revisions and Extensions to the JDL Data Fusion Model II”

James Llinas,<sup>1</sup> Christopher Bowman,<sup>2</sup> Galina Rogova,<sup>3</sup> Alan Steinberg,<sup>4</sup> Ed Waltz,<sup>5</sup> Frank White<sup>6</sup>

<sup>1</sup>State University at Buffalo, New York, USA; <sup>2</sup>Consultant, Data Fusion & Neural Networks, USA; <sup>3</sup>Encompass Consulting, USA; <sup>4</sup>Utah State University Space Dynamics Lab, USA; <sup>5</sup>Advanced Information Systems, USA; <sup>6</sup>U.S. Navy SPAWAR Systems Center, USA

“Kalman Filter and Joint Tracking and Classification in the TBM Framework”

Philippe Smets,<sup>1</sup> Branko Ristic<sup>2</sup>

<sup>1</sup>Université libre de Bruxelles, Belgium; <sup>2</sup>DSTO, Australia