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Dr. Giovanni Beltrame

Correspondence language: English
Sex: Male
Date of Birth: 9/19
Canadian Residency Status: Permanent Resident
Permanent Residency Start Date: 2013/06/15
Country of Citizenship: Italy

Contact Information

The primary information is denoted by (*)

Address

Mailing

GIGL
C.P. 6079, succ. Centre-ville
Montréal Quebec H3C 3A7
Canada

Primary Affiliation (*)

École Polytechnique - GIGL
2900, boul. Édouard-Montpetit
Campus de l'Université de Montréal
Montréal Quebec H3T 1J4
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Dr. Giovanni Beltrame

Language Skills

Language	Read	Write	Speak	Understand
English	Yes	Yes	Yes	Yes
French	Yes	Yes	Yes	Yes
Italian	Yes	Yes	Yes	Yes

Degrees

2003/3 - 2006/10
Doctorate, Doctor of Philosophy, Computer Engineering, Politecnico di Milano
Degree Status: Completed

2001/9 - 2002/7
Master's Thesis, Master of Technology - Masters, Embedded System Design, CEFRIEL
Degree Status: Completed

1996/9 - 2002/7
Master's Equivalent, Laurea (Bachelor + Master of Science), Computer Engineering, Politecnico di Milano
Degree Status: Completed

2000/3 - 2001/5
Master's Thesis, Master of Science (M.Sc.) - Masters, Computer Science and Electrical Engineering, University of Illinois at Chicago
Degree Status: Completed

Credentials

2014/1
Ing., Ordre des Ingenieurs du Quebec

2009/6
Certified NASA/ESA instructor, European Astronaut Centre

2002/10
Engineer, Ordine degli Ingegneri di Milano

Recognitions

2018/9
IEEE Gold Medal Nominee - Montreal Section (Canadian dollar)
IEEE
Distinction

2018/9
DARS 2016 Best Paper Candidate (Canadian dollar)
Int. Symp. on Distributed Autonomous Robotic Systems
Distinction

2018/8	Nanjing City Prize for Robotics Innovation - 1,500 (United States dollar) City of Nanjing Prize / Award
2014/10	Best poster candidate International Astronautical Congress Distinction
2012/9	Sloan Research Fellowship Nominee École Polytechnique de Montréal Distinction
2008/10	Best Paper Candidate International Conference on Hardware-Software Codesign Distinction
2008/1	Best Paper Candidate Asia and South Pacific Design Automation Conference Distinction
2006/8 - 2008/8	ESA Research Fellow - 150,000 (Euro) European Space Agency Prize / Award
2002/7	Dean's Thesis Commendation - 0 Politecnico di Milano Distinction

User Profile

Researcher Status: Researcher

Research Interests: High-performance data systems for aerospace, design methodologies for adaptive and self-optimizing systems, optimization, artificial intelligence, robotics, and space systems in general.

Research Specialization Keywords: Computer Aided Design, Computer Architecture, Design, Hardware-Software Codesig, Image processing, Modeling, Multi-processor Systems, Simulation

Disciplines Trained In: Computer Engineering and Software Engineering

Research Disciplines: Computer Engineering and Software Engineering

Areas of Research: Computer Architecture, Integrated Circuits, Micro and Nanoelectronics, Robotics and Automation

Fields of Application: Communication and Information Technologies, Transport

Employment

2016/6	Associate Professor Computer and Software Engineering, École Polytechnique de Montréal
2017/8 - 2018/8	Visiting Professor Wilhelm-Schickhard Institute for Computer Science, Eberhard Karls Universität Tübingen
2011/10 - 2016/5	Assistant professor Computer and Software Engineering, École Polytechnique de Montréal
2009/12 - 2011/9	Postdoctoral Fellow Génie électrique et génie informatique, École Polytechnique de Montréal
2006/8 - 2009/12	Microelectronics Design And Validation Engineer Technical Research Centre, European Space Agency

2006/3 - 2006/8	Postdoctoral Fellow Electronics, Politecnico di Milano
2004/1 - 2004/11	Junior Engineer Central R&D, STMicroelectronics
2001/3 - 2003/3	Researcher Embedded Systems Design Area, CEFRIEL

Affiliations

The primary affiliation is denoted by (*)

(*) 2016/6	Associate Professor, Computer and Software Engineering, École Polytechnique de Montréal
2017/8 - 2018/8	Visiting Professor, Computer Science, University of Tübingen
2011/9 - 2016/6	Assistant professor, Génie électrique et génie informatique, École Polytechnique de Montréal

Research Funding History

Awarded [n=7]

Principal Investigator — A Symbiotic Human and Multi-Robot Planetary Exploration System, Grant, Operating

Funding Sources:

2017/5 - 2019/5	European Space Agency Network and Partnering Initiative Total Funding - 60,000 (Euro)

Principal Investigator — Maintenance and Control of Distributed Robot and Sensor Networks, Grant, Operating

Funding Sources:

2017/7 - 2020/7	Ministère de l'Éducation, du Loisir et du Sport (MELS) (Québec) Sous-Commission Mixte Québec-Italie Total Funding - 17,100 (Canadian dollar)

Principal Investigator — Development of Self-Adaptive Technology for Spacecraft, Grant, Operating

Funding Sources:

2016/12 - 2019/12	Canadian Space Agency (CSA) Total Funding - 493,500 (Canadian dollar)

Co-investigator : David Saussié; Fabio Cicoira; Sofiane Achiche

Principal Investigator — An Intelligent & Automated Mixed-Reality Training Ecosystem for Emergency Response, Grant

Funding Sources:

2017/5 - 2019/5	Quebec (CRIAQ) CARIC Maturing Technology Total Funding - 2,674,319 (Canadian dollar)

Principal Investigator — An IoT Platform for Disaster Response, Grant

Funding Sources:

2017/1 - 2018/12 CARIC
Maturing Technology
Total Funding - 3,080,375 (Canadian dollar)

Co-investigator : Mohamed Ibkhala; Pierre-Marjorique Léger;

Collaborator : Carlo Pinciroli

Principal Investigator A Software Ecosystem for Groups of Heterogeneous Autonomous Robots, Grant, Operating

Funding Sources:

2015/10 - 2018/10 Natural Sciences and Engineering Research Council of Canada (NSERC)
Strategic Grants
Total Funding - 364,500 (Canadian dollar)

Co-investigator : Bram Adams

Principal Investigator Methodologies and Architectures for Probabilistic Real-Time Systems, Grant, Operating

Funding Sources:

2013/5 - 2019/5 Natural Sciences and Engineering Research Council of Canada (NSERC)
Discovery Grants
Total Funding - 174,000 (Canadian dollar)

Completed [n=8]

Principal Investigator Swarm Robotics Laboratory, Grant, Infrastructure

Funding Sources:

2016/1 - 2016/12 Natural Sciences and Engineering Research Council of Canada (NSERC)
Total Funding - 150,000 (Canadian dollar)

Co-applicant : Bram Adams

Co-investigator Domain Specific Language Integration for Hardware-Aware Software Generation, Grant

Funding Sources:

2013/5 - 2016/5 Natural Sciences and Engineering Research Council of Canada (NSERC)
CRD
Total Funding - 139,500 (Canadian dollar)

Co-investigator : El-Mostapha Aboulhamid;

Principal Investigator : Gabriela Nicolescu

Principal Investigator Task Allocation for Swarms of Unmanned Aerial Vehicles, Grant

Funding Sources:

2016/4 - 2016/10 Natural Sciences and Engineering Research Council of Canada (NSERC)
Engage Grants
Total Funding - 25,000 (Canadian dollar)

Principal Investigator Swarm Robotics Programming Language: Adaptation to Real Robots, Grant

Funding Sources:

2015/12 - 2016/5 Pleiades Robotics
Total Funding - 12,500 (Canadian dollar)

2015/12 - 2016/5 Natural Sciences and Engineering Research Council of Canada (NSERC)
Engage Plus
Total Funding - 12,500 (Canadian dollar)

Principal Investigator Systèmes temps réel probabilistes sur architectures déterministes, Grant

Funding Sources:

2013/9 - 2014/9 Fondation de Polytechnique
Subvention jeune chercheur
Total Funding - 15,000 (Canadian dollar)

Principal Investigator Swarm Robotics Programming Language, Grant, Operating

Funding Sources:

2015/1 - 2015/7 Natural Sciences and Engineering Research Council of Canada (NSERC)
ENGAGE
Total Funding - 25,000 (Canadian dollar)

Principal Investigator Méthodologies et architectures pour systèmes embarqués auto-optimisants, Grant

Funding Sources:

2012/5 - 2014/5 Fonds Québécois de la Recherche sur la Nature et les Technologies (FQRNT)
New Researcher
Total Funding - 40,000 (Canadian dollar)

Principal Investigator High-performance Aerospace Data Systems, Grant

Funding Sources:

2012/4 - 2014/4 École Polytechnique de Montréal
PIED
Total Funding - 50,000 (Canadian dollar)

Under Review [n=3]

Principal Investigator Software Deployment Mechanisms for Large Robotic Networks, Grant, Operating

Funding Sources:

2018/5 - 2020/5 Fonds de recherche du Québec - Nature et technologies (FRQNT)
Team Grant
Total Funding - 177,000 (Canadian dollar)

Co-investigator : Bram Adams

Principal Investigator A Symbiotic Human-Robot Planetary Exploration System, Grant

Funding Sources:

2018/7 - 2020/7 Canadian Space Agency (CSA)
FAST 2018
Total Funding - 200,000 (Canadian dollar)

Principal Investigator Swarm Clothes, Grant, Operating

Funding Sources:

2018/5 - 2020/5 Fonds de recherche du Québec - Nature et technologies (FRQNT)
Audace
Total Funding - 100,000 (Canadian dollar)

Co-investigator : Ying Gao

Student/Postdoctoral Supervision

Bachelor's [n=9]

Principal Supervisor Afzal Ahmad (In Progress)
Student Degree Start Date: 2015/9
Thesis/Project Title: Spiri drone flight readiness

Principal Supervisor Disip Chaturvedi (In Progress)
Student Degree Start Date: 2015/9
Thesis/Project Title: Anomaly Detection in Swarm Robotics

Principal Supervisor Emir Belhaddad (In Progress)
Student Degree Start Date: 2015/9
Thesis/Project Title: BittyBuzz: a Buzz Virtual Machine for microcontroller systems

Principal Supervisor Anthony Dentinger (In Progress)
Student Degree Start Date: 2015/9
Thesis/Project Title: BittyBuzz: a Buzz Virtual Machine for microcontroller systems

Principal Supervisor Yixiu Liu (In Progress)
Student Degree Start Date: 2014/9
Thesis/Project Title: Wireless Robot Localization

Principal Supervisor Luke Ellison (In Progress)
Student Degree Start Date: 2014/9
Thesis/Project Title: Wireless Robot Localization

Principal Supervisor Darren Chan (In Progress)
Student Degree Start Date: 2014/9
Thesis/Project Title: A Library of Swarm Behaviors

Principal Supervisor Bianca Angotti (In Progress)
Student Degree Start Date: 2014/9
Thesis/Project Title: Swarm Robotics Playground

Principal Supervisor Naman Govil (Completed)
Student Degree Start Date: 2013/9
Thesis/Project Title: Radiation-tolerant FPGA architecture

Bachelor's Honours [n=10]

Principal Supervisor Ryan Cotsakis (In Progress)
Student Degree Start Date: 2016/9
Thesis/Project Title: Collaborative Transportation using Micro Aerial Vehicles

Principal Supervisor Adam Lee Brown (In Progress)
Student Degree Start Date: 2015/1
Thesis/Project Title: Consensus Agreement for Robot Swarms

Principal Supervisor Alvaro Cano (In Progress)
Student Degree Start Date: 2013/9
Thesis/Project Title: Range and bearing sensor for flying robots

Principal Supervisor Roger Cano (In Progress)
Student Degree Start Date: 2013/9
Thesis/Project Title: Communication System for a CubeSat

Principal Supervisor Miguel Molina (In Progress)
Student Degree Start Date: 2013/9
Thesis/Project Title: Formation Flying for Drones

Principal Supervisor Prakash Hemani (Completed)
Student Degree Start Date: 2012/9
Thesis/Project Title: FPGA Scrubber

Principal Supervisor Vedant (Completed)
Student Degree Start Date: 2012/9
Thesis/Project Title: MIST Lab Orbital Fault Injector

Principal Supervisor Ismail Ben Ali Ouriaghli (In Progress)
Student Degree Start Date: 2012/1
Thesis/Project Title: Graphical Representation of Markov Decision Problems on the Android Platform

Principal Supervisor Mikaël Capelle (Completed)
Student Degree Start Date: 2009/9
Thesis/Project Title: Auditory Orientation Aid for Astronauts

Principal Supervisor Deboleena Roy (Completed)
Student Degree Start Date: 2009/1
Thesis/Project Title: Radiation-tolerant FPGA architecture

Master's non-Thesis [n=2]

Principal Supervisor Mohammed Amine Kennich (In Progress)
Student Degree Start Date: 2017/1
Thesis/Project Title: GPU-accelerated 3D reconstruction from monocular images

Principal Supervisor Maxime Barthelemy (In Progress)
Student Degree Start Date: 2014/9
Thesis/Project Title: Automatic Thermal Controller Generation for Satellites

Master's Thesis [n=8]

Principal Supervisor Paul Gravrand (In Progress)
Student Degree Start Date: 2017/9
Thesis/Project Title: Automated battery swapping for UAVs

Principal Supervisor Benjamin Ramtoula (In Progress)
Student Degree Start Date: 2017/9
Thesis/Project Title: Semantic environment interpretation for multi-robot systems

Principal Supervisor Lucas Meyer (Completed)
Student Degree Start Date: 2017/1
Thesis/Project Title: Modelling networks of robotic systems

Co-Supervisor Luca Siligardi (In Progress)
Student Degree Start Date: 2016/9
Thesis/Project Title: Connectivity Maintenance with Fallible Robots

Co-Supervisor	Marco Minelli (Completed) Student Degree Start Date: 2015/9 Thesis/Project Title: Modelling and Control of Distributed Robotic Networks
Principal Supervisor	Pierre-Yves Lajoie (In Progress) Student Degree Start Date: 2014/9 Thesis/Project Title: Multi-robot Simultaneous Localization and Mapping
Principal Supervisor	Hassan Answar (Completed) Student Degree Start Date: 2014/1 Thesis/Project Title: Probabilistic Hardware for Real-Time Systems
Principal Supervisor	Sami Riahi (Completed) Student Degree Start Date: 2012/1 Thesis/Project Title: A measurement plaftorm for thermal model validation

Doctorate [n=15]

Principal Supervisor	Hassan Fouad (In Progress) Student Degree Start Date: 2018/4 Thesis/Project Title: Energy-oriented swarm robotics
Principal Supervisor	Marcel Kaufmann (In Progress) Student Degree Start Date: 2017/9 Thesis/Project Title: Multi-robot planetary exploration
Co-Supervisor	Nathalie Majcherczyk (In Progress) Student Degree Start Date: 2016/9 Thesis/Project Title: Connectivity Maintenance in Robotic Networks
Principal Supervisor	Vivek Shankar Varadharajan (In Progress) Student Degree Start Date: 2016/9 Thesis/Project Title: A Software Ecosystem for Swarm Robotics
Principal Supervisor	Yanjun Cao (In Progress) Student Degree Start Date: 2016/9 Thesis/Project Title: A Software Ecosystem for Swarm Robotics
Co-Supervisor	Guannan Li (In Progress) Student Degree Start Date: 2016/9 Thesis/Project Title: Progressive Shape Formation using Robot Swarms
Principal Supervisor	Majda Moussa (In Progress) Student Degree Start Date: 2014/9 Thesis/Project Title: Android Application Security
Principal Supervisor	Imane Hafnaoui (In Progress) Student Degree Start Date: 2014/1 Thesis/Project Title: Real-time Systems Optimization
Principal Supervisor	Chao Chen (Completed) Student Degree Start Date: 2014/1 Student Degree Received Date: 2017/6 Thesis/Project Title: Probabilistic Real-Time Systems
Co-Supervisor	Rabeh Ayari (In Progress) Student Degree Start Date: 2013/1 Thesis/Project Title: Hardware-Aware Code Generation

Principal Supervisor	Jacopo Panerati (Completed) Student Degree Start Date: 2012/9 Student Degree Received Date: 2017/5 Thesis/Project Title: Methodologies and architectures for self-optimizing systems
Academic Advisor	Roberta Piscitelli (Completed) Student Degree Start Date: 2010/1 Thesis/Project Title: Design Space Exploration for Lifetime Optimization
Co-Supervisor	Olfat El-Mahi (Completed) Student Degree Start Date: 2010/1 Thesis/Project Title: Embedded Systems Verification through Constraint Programming
Co-Supervisor	Alain Fourmigue, (Completed) Student Degree Start Date: 2009/9 Thesis/Project Title: Fast Thermal Simulation Models
Co-Supervisor	Chiara Sandionigi (Completed) Student Degree Start Date: 2009/1 Thesis/Project Title: Fault-tolerant FPGA reconfiguration

Post-doctorate [n=8]

Principal Supervisor	Christophe Trouillefou (Completed) Student Degree Start Date: 2018/7 Thesis/Project Title: A miniaturized incubator for biology experiments on a CubeSat
Principal Supervisor	Fang Wu (Completed) Student Degree Start Date: 2018/1 Thesis/Project Title: A swarming platform for disaster response
Principal Supervisor	Leandro Lustosa (Completed) Student Degree Start Date: 2018/1 Thesis/Project Title: Control of multi-UAV systems
Principal Supervisor	Jacopo Panerati (Completed) Student Degree Start Date: 2017/9 Thesis/Project Title: A Symbiotic Human-Robot Planetary Exploration System
Co-Supervisor	Ahmed Chekkouri (Completed) Student Degree Start Date: 2017/1 Thesis/Project Title: Mobile ad-hoc networks
Principal Supervisor	Ivan Svogor (Completed) Student Degree Start Date: 2017/1 Thesis/Project Title: Swarm Robotics Programming
Principal Supervisor	David St-Onge (Completed) Student Degree Start Date: 2016/9 Thesis/Project Title: Design of an Interface for the Intuitive Control of a Unmanned Air Vehicle fleet in Emergency Situations
Principal Supervisor	Luca Giovanni Gianoli (Completed) Student Degree Start Date: 2016/6 Thesis/Project Title: Ad-Hoc Networking for Unmanned Aerial Vehicles

1 Most Significant Contributions

Swarm Robotics [28], [29], [7], [12], [13], [17], [43], [18], [44], [51] Dr. Beltrame and his colleagues have recently developed the Buzz [17], [43] programming language, dedicated to self-organizing swarms of heterogeneous robots, which is available as open source (http://the.swarming.buzz), including a compiler toolchain and runtime support. The project was so successful that it attracted substantial media interest. Quoting MIT Technology Review: "That's interesting work that has the power to become a technology amplifier". Buzz is now being assessed by several companies and university groups for use in swarm robotics projects. Buzz also integrated a system to allow a swarm of robots to agree on a set of (key,value) pairs. This system enables a form of information sharing that is an asset for coordination in complex environments, such as globally optimized task allocation [51]. Taking inspiration from the environment mediated communication of social insects, we call the system Virtual Stigmergy. Virtual Stigmergy can work in a wide variety of running conditions including heavy packet loss, and can cope with random motion trajectories, and can also be applied to other domains, such as cloud computing. Other significant contributions using Buzz were related to long term autonomy [28], [13] and progressive deployment of large swarms [12], [44].

Self-adaptive systems [42], [62], [50], [21], [57], [61] Self-adaptive computing addresses the challenge of programming modern and future computer systems that must meet conflicting goals (e.g. high performance with low energy consumption). A Self-adaptive computer is capable of adapting its behavior and resources to automatically find the best way to accomplish a given goal in changing environmental conditions and demands. Such capability benefits a broad spectrum of computer systems from embedded systems to supercomputers. We have developed frameworks and algorithms to support self-adaptivity in embedded systems, recognized by a best poster candidate award at IAC 2014. We have also developed a programming language for self-organizing robot swarms that attracted the attention of the media, as well as a methodology for data sharing in variable robot swarms.

Modeling and Simulation of Real-Time and Embedded Systems [8], [31], [33], [11], [15], [37], [38], [41] Dr. Beltrame's contributions to the domain consist of new methodologies that improve the verification of complex real-time embedded systems, reducing simulation times by orders of magnitude. The impact of this research is shown by the high number of citations, two best paper candidate awards from the prestigious ASP-DAC and CODES-ISSS, and from the inclusion of the ideas stemming from this research in the widely-adopted SystemC TLM 2.0 standard.

Thermal Analysis of Integrated Circuits [16], [52], [56], [59], [0] Due to their compact structure, three-dimensional integrated circuits (3D ICs) present thermal dissipation issues. Integrated microchannels are emerging as a viable solution to dissipate the heat flux generated by 3D ICs. Several models have been proposed in literature to study different microchannel designs, but generally with low simulation performance. Our approach reports a 100x speedup compared with state-of-the art models, while maintaining the same level of accuracy.

Fault-tolerant Systems [10], [31], [39], [40], [42], [58] Advances in semiconductor manufacturing have made it possible to build ever smaller, faster, and lower-power transistors. However, because these trends reduce the critical charge Q_c required to disrupt a transistor at run-time, systems are more prone to incorrect behaviour. We have developed systems an methodologies to trade off fault-tolerance and lifetime of electronic devices. The results show that we can effectively predict and increase the lifetime and fault-tolerance of electronic devices by acting at the design stage.

2 Activities and Contributions

2.1 Committee membership

- Government Forum chair, IEEE/RSJ International Conference on Robotics and Automation (ICRA) 2017
- Sponsorship chair for the NASA/ESA Adaptive Hardware and Systems Conference 2017
- General chair for the NASA/ESA Adaptive Hardware and Systems Conference 2015
- Chair of the 2015 De Vinci undergraduate award committee
- Computer and Software Engineering Graduate Studies committee at Polytechnique Montreal (2013-2016)
- Evaluator for the ReSMiQ scholarships (2016-2017)
- External reviewer for NSERC Discovery Grants (2014-2018)
- Team leader of the Automation Group for the European Space Agency's SpaceshipEAC project
- Member of the Conseil de Direction of the APEP (Polytechnique's professors' union)
- Member of the De Vinci Prize evaluation committee 2012-2014, president 2015
- Program co-chair for FETCH 2012 and local organization co-chair for FETCH 2011
- Local organization chair for MPSoC 2012
- Member of the industrial advisory board for the Multi-Core Execution of Hard Real-Time Applications (MERASA) FP7 project (2008-2010)
- Member of the ARTEMIS evaluation board for the European Uninon (2008-2009)
- Member of eight Tender Evaluation Boards (TEBs) for the European Space Agency (2007-2009)
- Special session chair for AHS 2009-2011
- Program committee member for: EWSN 2016-2018, SAC 2016-2018, DATE 2005-2009, DATE 2015-2017, CODES-ISSS 2014-2017, AHS 2008-2017, FETCH 2011-2012, ERDIAP 2011, GLS-VLSI 2011-2017, VLSI-SOC 2012-2017, SOCC 2012-2017, HLDVT 2012, ISPA 2015
- Reviewer (number of papers in brackets) for **Journals:** IEEE Trans. on Computers (2), IEEE Trans. on CAD (8), IEEE Trans. on VLSI (4), ACM Transactions on Architecture and Code Optimization (2), ACM Trans. on Embedded Computing Systems (7), ACM Trans. on Emerging Computing Technologies (3), Embedded Systems Letters (3), IET Computers & Digital Techniques (4), Journal of System Architecture (2), Journal of Design Automation (3), SPIE Journal of Electronic Imaging (1), Elsevier SIMPAT (2)
- Reviewer for **Conferences:** DAC, DATE, CODES-ISSS, GLS-VLSI, HLDVT, CASES, AHS, ESTIMEDIA, FETCH, VLSI-SOC, NEWCAS, SOCC, RSP
- Committee member (including 6 chair positions) for 14 Master theses and 11 PhD theses

2.2 Invited Talks

- "How do you program 1000 robots?", 2016-2017, multiple locations: University of Bonn, University of Illinois at Urbana-Champaign, McGill University, Max Planck Institute, Fraunhofer Institute, Cork University of Technology, University of Tübingen, Polytechnique Montreal, Concordia University, Politecnico di Milano, Tutorial at ICRA'17 in Singapore
- "Effects of Online Fault Detection Mechanisms on Probabilistic Timing Analysis", FETCH'17, Mont Tremblant, Canada
- "Engineering the Internet-of-Things: Devices and Applications", McGill University, 2017, Canada
- "Microprocessor Thermal Modelling and Validation", ETCMOS'16, Montreal, Canada
- "Microprocessor Thermal Modelling and Validation", MIFI'16, Dresden, Germany
- "Trading Off Lifetime, Fault-tolerance, and Power Consumption in Real-time MPSoC", MPSoC'15, Cali-

fornia, USA
- "A Review of Multi-Objective Design Space Exploration Algorithms", McGill IML Seminars, 2017, Canada
- "An Introduction to IPython Notebook", 3rd PLOW, Canada
- "An Orbit-specific Fault-injector to Assess Fault-mitigation Strategies in Space FPGAs", SEFUW'14, NL
- "Efficient Device Lifetime Estimation via Design Space Pruning", MPSoC'14, France
- "Accélération de l'exploration de l'espace de conception pour la fiabilité ", FETCH'14, Canada
- "Accelerating Design Space Exploration for Reliability with Design Space Pruning", CASA'13, Canada
- "Self-Adaptive Computing for Many-Core Processors", MPSoC'13, Japan
- "Techniques et outils novateurs pour la conception de systèmes embarqués pour le domaine aérospatial", Colloque ReSMIQ, Canada, 2013
- "SEE Laser Testing of Integrated Circuits", Canadian Space Agency, Canada, 2012
- "Decision-Theoretic Design Space Exploration", Politecnico di Milano, Italy, 2010
- "Decision-Theoretic Exploration of Multi-Processor Platforms", FETCH'10, 2010
- "An Introduction to Computer Networks", McGill University, Canada, 2010
- "ADLs: Processor Modeling and Simulation", Northeastern University, USA, 2010
- "Decision-theoretic Exploration of Multi-Processor Platforms", MPSoC'10, Japan
- **Keynote:** "The Rise of System Level Simulation", RAPIDO'09, Cyprus
- "Writing Linux Device Drivers", LinuxDay 2006, Italy, 2006
- "Analysis and Optimization of MPSoC platforms", Ecole thématique conception faible consommation de système temps réel (ECOFAC workshop), France, 2006

2.3 Other contributions (non-academic, development, management)

- Supervisor for PolyOrbite, Polytechnique's team in the Canadian Satellite Design Challenge: 25 students designing a nanosatellite mission (2012-2017)
- Started a crowdfunded research project ("Auditory orientation aid for astronauts") to reduce astronaut microgravity adaptation times. Built a prototype (2013)
- Evaluated modifications to the NGMP procesor for Synaptic Labs (2012)
- Development of the ReSP (`http://resp-sim.googlecode.com`) system-level design platform, with a team of two Ph.D. and six graduate students (of different universities)
- Technical Officer (i.e. responsible for task definition, bid selection and activity management) for the "Hardware-Software Co-Simulation Validation Platform for System-on-Chip" (2009)
- Technical Officer for the "LEON2/3 SystemC Model Implementation" activity (2009)
- Technical Officer for the design of SystemC IPs for the ESA IP portfolio (2009)
- Co-supervisor of the R&D activity "Reliability-aware Design Methodologies for Embedded Systems on Multi-FPGA Platforms" (2009)
- Co-supervisor of the R&D activity "Integration of a LEON3 Processor with a DSP" activity (2009)
- On-Board Data Handling Expert in the JEP and JURA mission studies (2007-2008)
- Successfully obtained approval for an ESA Technology Research Program (TRP) project proposal (250K EUR) (2007)
- Board member for the definition of ESA's "Next Generation Space Microprocessor" (NGMP)
- System-level design of an integrated MPEG4 encoder for STMicroelectronics Canada (2004)
- Participated in the development of a system-level design platform, introducing power modeling and simulation in the system for STMicrolectronics Canada (2004)

3 Interruptions and delays

The European Space Agency is mainly a procurement agency: I could spend only a 20% of my time on research activities. I took a total of 12 weeks of paternity leave for the birth of my children in 2013 and 2015.

4 Patents and intellectual property rights

Declarations of Invention DIV-541 and DIV-592 related to "ICTherm : Simulateur thermique pour la conception de circuits intégrés", A. Fourmigue, G. Beltrame, and G. Nicolescu, Polytechnique Montréal, 2012-2013. Two novel methodologies for fast and accurate thermal simulation.
USPTO Patent Application 62/106,827 "System and Method for Thermal Modeling of Electronic Devices", 2015
USPTO Patent Application 61/931,106 "Systems and Method for Thermal Modelling of Electronic Devices", 2014

5 Publications and works (from January 1^{st}, 2013)

Articles in refereed journals

[1] Cao, Y., M. Li, I. Svogor, S. Wei, and **G. Beltrame**, "Dynamic range-only localization for multi-robot systems," *IEEE Access*, vol. 6, pp. 46 527–46 537, 2018.

[2] Hafnaoui, I., G. Nicolescu, and **G. Beltrame**, "Time is of the essence: Spreading information in interacting groups," *Nature Scientific Reports*, 2018, Undergoing 2nd revsion.

[3] Lajoie, P.-Y., S. Hu, **G. Beltrame**, and L. Carlone, "Modeling perceptual aliasing in slam via discrete-continuous graphical models," *Robotics and Automation Letters*, 2018, Under review.

[4] Moussa, M. and **G. Beltrame**, "On the robustness of consensus-based behaviors for robot swarms," *Swarm Intelligence*, 2018, Under review.

[5] Panerati, J., M. Minelli, C. Ghedini, L. Meyer, M. Kaufmann, L. Sabattini, and **G. Beltrame**, "Robust connectivity maintenance for fallible robots," *Autonomous Robots*, 2018.

[6] Panerati, J., N. Schwind, S. Zeltner, K. Inoue, and **G. Beltrame**, "Assessing the resilience of stochastic dynamic systems under partial observability," *PLOS ONE*, vol. 13, no. 8, pp. 1–21, Aug. 2018.

[7] Varadharajan, V. S., D. St-Onge, C. Guss, and **G. Beltrame**, "Over-The-Air updates for robotic swarms," *IEEE Software*, vol. 35, no. 2, pp. 44–50, 2018.

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