

Cristian-Ioan Vasile

Curriculum Vitae

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Education

- 2016 **Visiting PhD Student**, *Laboratory for Information and Decision Systems (LIDS), Massachusetts Institute of Technology (MIT)*, Advisor: Sertac Karaman.
- 2012–2016 **PhD Candidate**, *Hybrid and Networked Systems Group, BU Robotics Lab, Division of Systems Engineering, College of Engineering, Boston University*, Advisor: Calin Belta. Systems Engineering, *GPA: 4.0/4.0*
- 2011–2015 **PhD**, *Department of Automatic Control and Systems Engineering, Politehnica University of Bucharest*, Advisor: Ioan Dumitrache. Control Engineering, *GPA: 10.00*
- 2009–2011 **Master**, *Department of Automatic Control and Systems Engineering, Politehnica University of Bucharest*. Intelligent Control Systems, *GPA: 10.00*
- 2005–2009 **Bachelor**, *Faculty of Automatic Control and Computers, Politehnica University of Bucharest*. Computer Science, focus on Embedded Systems, *GPA: 9.49*
- 2005–2010 **Certificate I & II**, *Department of Teacher Training, Politehnica University of Bucharest*. Pedagogical Studies – Level 1 (annex to bachelor diploma), *GPA: 10.00*
Pedagogical Studies Graduate Program – Level 2 (Advanced), *GPA: 10.00*

Research Experience

- 2016–current **Postdoctoral Associate**, *Professor Sertac Karaman, Laboratory for Information and Decision Systems (LIDS), Massachusetts Institute of Technology (MIT)*.
- 2016–current **Postdoctoral Associate**, *Professor Daniela Rus, Distributed Robotics Laboratory, Computer Science and Artificial Intelligence Laboratory (CSAIL), Massachusetts Institute of Technology (MIT)*.
- 2013–2016 **Research Assistant**, *Professor Calin Belta, Hybrid and Networked Systems (HyNeSs) Group, BU Robotics Lab, Boston University*.
- 2007–2012 **Volunteer Researcher**, *Professors Ioan Dumitrache and Cătălin Buiu, Laboratory of Natural Computing and Robotics, Politehnica University of Bucharest*.

Research Fellowships and Summer Schools

- Mar 11–18 2012 *Research Fellowship*, Faculty of Philosophy and Science in Opava, Silesian University in Opava, Czech Republic – reference: Prof PhD Jozef Kelemen
- Sep 5–7 2011 *First International School on Biomolecular and Biocellular Computing*, Osuna, Spain – awarded tuition, travel and accommodation grant – reference: Prof PhD Miguel A. Gutiérrez, [ISBBC2011](#)
- Sep 24 – Oct 1 2010 *Neural Dynamics Approaches to Cognitive Robotics*, Ruhr-Universität, Bochum, Germany – awarded tuition, travel and accommodation grant – reference: Prof PhD Gregor Schöner, [Neural Dynamics 2010](#)
- Jul 22–26 2010 *1st Cooperative Cognitive Control for Autonomous Underwater Vehicles*, Jacobs University, Bremen, Germany – awarded tuition and accommodation grant – reference: Prof PhD Kaustubh Pathak and Prof PhD Andreas Birk, [Co3-AUVs 2010](#)

Awards

- NSF Student Travel Award IEEE International Conference on Robotics and Automation (ICRA) 2014 in Hong Kong, China.
- SE PhD Student Travel Award Systems Engineering Division, Boston University: [22] IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2013 in Tokyo, Japan; [18] European Control Conference (ECC) 2015 in Linz, Austria.
- BU Dean’s Fellow 2012–2013, from the Division of Systems Engineering, College of Engineering, Boston University.
- Roberto Rocca Scholarship Merit-based award for academic excellence and leadership, national selection process, [Roberto Rocca Educational Program](#), TenarisSilcotub.
- Academic Scholarship Merit-based scholarship during my undergraduate and graduate studies (5.5 years), performance evaluated each semester.
- Award for Scientific Publication Awards for publication by the Romanian National Council of Scientific Research for the papers: [9], *Applied Soft Computing* journal; and [8], *BMC Bioinformatics*.
- 1st prize at Student Scientific Session 1st prize at Student Scientific Session in the Automatic Control and Systems Engineering section, Politehnica University of Bucharest, Romania, 2007 for the implementation of a vision system for a garbage collector robot and for the paper: “Ana Pavel, **Cristian Ioan Vasile**, *Artificial vision system of the ReMaster robot using the CMUCam2+ camera*”

Publications

Journal Articles

- [1] **Cristian Ioan Vasile**, Derya Aksaray, and Calin Belta. Time Window Temporal Logic. *Theoretical Computer Science*, page (submitted). [link](#).
- [2] **Cristian Ioan Vasile**, Mac Schwager, and Calin Belta. Translational and Rotational Invariance in Networked Dynamical Systems. *IEEE Transactions on Control of Network Systems*, page (accepted), January 2017. [doi:10.1109/TCNS.2017.2648499](https://doi.org/10.1109/TCNS.2017.2648499).
- [3] Kevin Leahy, Dingjiang Zhou, **Cristian Ioan Vasile**, Konstantinos Oikonomopoulos,

Mac Schwager, and Calin Belta. Persistent Surveillance for Unmanned Aerial Vehicles Subject to Charging and Temporal Logic Constraints. *Autonomous Robots*, 40(8):1363–1378, December 2016. doi:10.1007/s10514-015-9519-z.

- [4] Ana Brândușa Pavel and **Cristian Ioan Vasile**. Identifying cancer type specific oncogenes and tumor suppressors using limited size data. *Journal of Bioinformatics and Computational Biology*, 14(6):1–16, October 2016. doi:10.1142/S0219720016500311.
- [5] **Cristian Ioan Vasile**, Ana Brândușa Pavel, and Ioan Dumitrache. Improving the universality results of Enzymatic Numerical P Systems. *International Journal of Computer Mathematics (special issue: Membrane Computing)*, 90(4), February 2013. if=0.589, doi: 10.1080/00207160.2012.748897.
- [6] **Cristian Ioan Vasile**, Ana Brândușa Pavel, Ioan Dumitrache, and Gheorghe Păun. On the Power of Enzymatic Numerical P Systems. *Acta Informatica*, 49(6):395–412, September 2012. if=0.809, doi:10.1007/s00236-012-0166-y.
- [7] Cătălin Buiu, **Cristian Ioan Vasile**, and Octavian Arsene. Development of membrane controllers for mobile robots. *Information Sciences*, 187:33–51, March 2012. if=2.833, doi:10.1016/j.ins.2011.10.007.
- [8] Ana Brândușa Pavel and **Cristian Ioan Vasile**. PyElph – a Software Tool for Gel Images Analysis and Phylogenetics. *BMC Bioinformatics*, 13(9), January 2012. if=3.03, doi:10.1186/1471-2105-13-9 (Open Access).
- [9] **Cristian Ioan Vasile** and Cătălin Buiu. A software system for collaborative robotics applications and its application in particle swarm optimization implementations. *Applied Soft Computing*, 11(8):5498–5507, December 2011. if=2.084, doi:10.1016/j.asoc.2011.05.009.
- [10] **Cristian Ioan Vasile** and Alexandru Constantinescu. On the quotient criterion. *Gazeta Matematică*, CX(9):420–422, 2005. in Romanian.

Conference Articles

- [11] **Cristian Ioan Vasile**, Jana Tumova, Sertac Karaman, Calin Belta, and Daniela Rus. Minimum-violation sLTL motion planning for mobility-on-demand. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages –, Singapore, May 2017. link.
- [12] Francisco Penedo Álvarez, **Cristian Ioan Vasile**, and Calin Belta. Language-Guided Sampling-based Planning using Temporal Relaxation. In *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, pages –, San Francisco, CA, USA, December 2016. link.
- [13] **Cristian Ioan Vasile**, Kevin Leahy, Eric Cristofalo, Austin Jones, Mac Schwager, and Calin Belta. Control in Belief Space with Temporal Logic Specifications. In *IEEE Conference on Decision and Control (CDC)*, page (accepted), Las Vegas, NV, USA, December 2016. link.
- [14] Eric Cristofalo, Kevin Leahy, **Cristian Ioan Vasile**, Eduardo Montijano, Mac Schwager, and Calin Belta. Vision-based Mobile Sensing for GPS-deprived Control with Temporal

- Logic Specifications. In *International Symposium on Experimental Robotics (ISER)*, pages –, Tokyo, Japan, October 2016. [link](#).
- [15] Curtis Madsen, Prashant Vaidyanathan, **Cristian Ioan Vasile**, Rachael Ivison, Junmin Wang, Calin Belta, and Douglas Densmore. Utilizing Signal Temporal Logic to Characterize and Compose Modules in Synthetic Biology. In *International Workshop on Biodesign Automation (IWBDA)*, pages 25–26, Newcastle University, Newcastle upon Tyne, UK, August 2016. [link](#).
- [16] Derya Aksaray, **Cristian Ioan Vasile**, and Calin Belta. Dynamic Routing of Energy-Aware Vehicles with Temporal Logic Constraints. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 3141–3146, Stockholm, Sweden, May 2016. [doi:10.1109/ICRA.2016.7487481](https://doi.org/10.1109/ICRA.2016.7487481).
- [17] Giuseppe Bombara, **Cristian Ioan Vasile**, Francisco Penedo Alvarez, Hirotohi Yasuoka, and Calin Belta. A Decision Tree Approach to Data Classification using Signal Temporal Logic. In *Hybrid Systems: Computation and Control (HSCC)*, pages 1–10, Vienna, Austria, April 2016. [doi:10.1145/2883817.2883843](https://doi.org/10.1145/2883817.2883843).
- [18] **Cristian Ioan Vasile**, Mac Schwager, and Calin Belta. SE(N) Invariance in Networked Systems. In *European Control Conference (ECC)*, pages 186–191, Linz, Austria, July 2015. [doi:10.1109/ECC.2015.7330544](https://doi.org/10.1109/ECC.2015.7330544).
- [19] **Cristian Ioan Vasile** and Calin Belta. An Automata-Theoretic Approach to the Vehicle Routing Problem. In *Robotics: Science and Systems Conference (RSS)*, pages 1–9, Berkeley, California, USA, July 2014. [link](#).
- [20] Kevin Leahy, Dingjiang Zhou, **Cristian Ioan Vasile**, Konstantinos Oikonomopoulos, Mac Schwager, and Calin Belta. Provably Correct Persistent Surveillance for Unmanned Aerial Vehicles Subject to Charging Constraints. In *International Symposium on Experimental Robotics (ISER)*, pages –, Marrakech/Essaouira, Morocco, June 2014. [link](#).
- [21] **Cristian Ioan Vasile** and Calin Belta. Reactive Sampling-Based Temporal Logic Path Planning. In *IEEE International Conference on Robotics and Automation (ICRA)*, pages 4310–4315, Hong Kong, China, June 2014. [doi:10.1109/ICRA.2014.6907486](https://doi.org/10.1109/ICRA.2014.6907486).
- [22] **Cristian Ioan Vasile** and Calin Belta. Sampling-Based Temporal Logic Path Planning. In *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pages 4817–4822, Tokyo, Japan, November 2013. [doi:10.1109/IROS.2013.6697051](https://doi.org/10.1109/IROS.2013.6697051).
- [23] Ana Brândușa Pavel, **Cristian Ioan Vasile**, and Ioan Dumitrache. Robot localization implemented with enzymatic numerical P systems. In *Proc. of the Living Machines 2012: The International Conference on Biomimetic and Biohybrid Systems*, volume 7375 of *Lecture Notes in Computer Science*, pages 204–215, Barcelona, Spain, July 2012. Springer Berlin Heidelberg. [doi:10.1007/978-3-642-31525-1_18](https://doi.org/10.1007/978-3-642-31525-1_18).
- [24] **Cristian Ioan Vasile**, Ana Brândușa Pavel, and Ioan Dumitrache. Improving the universality results of Enzymatic Numerical P Systems. In *Proc. of the 10th Brainstorming Week on Membrane Computing*, pages 215–228, Seville, Spain, February 2012. [link](#).

- [25] **Cristian Ioan Vasile**, Ana Brândușa Pavel, Ioan Dumitrache, and Gheorghe Păun. Numerical P Systems. In *Proc. of the 10th Brainstorming Week on Membrane Computing*, pages 26–29, Seville, Spain, February 2012. [collective paper](#): Research Topics in Membrane Computing: After CMC 12, Before BWMC 10, Eds. Gheorghe M., Paun Gh., Perez-Jimenez M.J.
- [26] **Cristian Ioan Vasile**, Pavel Pavel, Ana Brândușa, Ioan Dumitrache, and Jozef Kelemen. Implementing obstacle avoidance and follower behaviors on Koala robots using Numerical P Systems. In *Proc. of the 10th Brainstorming Week on Membrane Computing*, pages 207–214, Seville, Spain, February 2012. [link](#).
- [27] Cătălin Buiu, Ana Brândușa Pavel, **Cristian Ioan Vasile**, and Ioan Dumitrache. Perspectives of using membrane computing in the control of mobile robots. In *Proc. of the Beyond AI - Interdisciplinary Aspect of Artificial Intelligence Conference*, pages 21–26, Pilsen, Czech Republic, December 2011. [link](#).
- [28] **Cristian Ioan Vasile**, Ana Brândușa Pavel, and Cătălin Buiu. Integrating human swarm interaction in a distributed robotic control system. In *Proc. of the IEEE 7th Annual IEEE Conference on Automation Science and Engineering (CASE)*, pages 743–748, Trieste, Italy, August 2011. [doi:10.1109/CASE.2011.6042493](https://doi.org/10.1109/CASE.2011.6042493).
- [29] **Cristian Ioan Vasile**, Ana Brândușa Pavel, and Cătălin Buiu. Chidori - a bio-inspired cognitive architecture for collective robotics applications. In *Proc. of the IFAC Workshop on Intelligent Control Systems*, pages 52–57, Sinaia, Romania, September 2010. [link](#).
- [30] Ana Brândușa Pavel, **Cristian Ioan Vasile**, and Cătălin Buiu. Cognitive vision system for an ecological mobile robot. In *Proc. of the 13th International Symposium on System Theory, Automation, Robotics, Computers, Informatics, Electronics and Instrumentation (SINTES)*, volume 1, pages 267–272, Craiova, Romania, October 2007. [link](#).

Books & Chapters

- [31] Kevin Leahy, Dingjiang Zhou, **Cristian Ioan Vasile**, Konstantinos Oikonomopoulos, Mac Schwager, and Calin Belta. Provably correct persistent surveillance for unmanned aerial vehicles subject to charging constraints. In M. Ani Hsieh, Oussama Khatib, and Vijay Kumar, editors, *Experimental Robotics*, volume 109 of *Springer Tracts in Advanced Robotics*, pages 605–619. Springer International Publishing, 2016. isbn: 978-3-319-23777-0, [link](#).
- [32] Ana Brândușa Pavel, **Cristian Ioan Vasile**, and Ioan Dumitrache. *Membrane computing in robotics*, volume 4 of *Topics in Intelligent Engineering and Informatics (special issue: Beyond Artificial Intelligence)*, pages 125–136. Springer, 2013. isbn-13: 978-3642344213.
- [33] Ana Brândușa Pavel, **Cristian Ioan Vasile**, and Cătălin Buiu. *Biomathematics and Bioinformatics – Concepts and Applications*. Editura Universitară, Bucharest, Romania, 2011. isbn: 978-606-591-178-9, in Romanian.
- [34] Cătălin Buiu, Ana Brândușa Pavel, and **Cristian Ioan Vasile**. *Cognitive Robots – Bio-inspired Applications*. Editura Universitară, Bucharest, Romania, 2010. isbn: 978-973-749-835-9, in Romanian.

- [35] Ana Brândușa Pavel and **Cristian Ioan Vasile**. *Cognitive Robots – Concepts, Architectures, Applications*, chapter II: Robots with cognitive vision. Case study – ReMaster One robot, pages 35–97. Editura Universitară, Bucharest, Romania, 2008. isbn: 978-973-749-443-6, in Romanian.

Posters

- [36] Prashant Vaidyanathan, Evan Appleton, Curtis Madsen, **Cristian Ioan Vasile**, Alan Pacheco, Iman Haghighi, Nicholas Roehner, Rachael Ivison, Junmin Wang, Yash Agarwal, Zachary Chapasko, Calin Belta, and Douglas Densmore. Genetic Systems Engineering. In *8th International Workshop on Bio-Design Automation*, page Poster, Newcastle upon Tyne, UK, August 2016. [link](#).
- [37] **Cristian Ioan Vasile** and Calin Belta. Reactive Sampling-Based Temporal Logic Path Planning. In *5th Workshop on Formal Methods for Robotics and Automation*, page Poster, Berkeley, CA, USA, July 2014. [link](#).
- [38] **Cristian Ioan Vasile**, Ana Brândușa Pavel, Octavian Arsene, Nirvana Popescu, and Cătălin Buiu. Human-swarm interface design and new control techniques for swarms autonomous mobile robots. In *Proc of the 4th International Conference on Cognitive Systems (CogSys)*, page Poster, ETH Zurich, Switzerland, January 2010. [link](#).

PhD thesis

Title *Motion Planning and Control: a Formal Methods Approach*
Advisor Prof PhD Calin Belta

PhD thesis

Title *Distributed Control for Multi-Robot Systems*
Advisor Prof PhD Ioan Dumitrache

Master thesis

Title *Chidori Architecture – Distributed Control for Multi-robot Systems, (Grade 10.00)*
Advisor Prof PhD Cătălin Buiu

Bachelor thesis

Title *Software system for collaborative robotics applications, (Grade 10.00)*
Advisor Prof PhD Cătălin Buiu

Talks and demonstrations

Talks

- Jan 13 2017 Motion Planning and Control with Temporal Logic Specifications, UC Berkeley.
Dec 16 2016 Control in Belief Space with Temporal Logic Specifications, Zoox.
Nov 22 2016 Sampling-based Motion Planning and Control with Temporal Logic Specifications, KTH.
Dec 8 2015 Temporal Logic Planning and Inference, Distributed Robotics Laboratory, MIT.

- Sep 5 2011 “Membrane Controllers for Mobile Robots” at the First International School on Biomolecular and Biocellular Computing, Osuna, Spain – reference: Prof PhD Miguel A. Gutiérrez, [ISBBC2011](#)
- Jun 18 2011 “Modeling and simulation of human HIV-1 gp120 envelope glycoprotein” at the IBM High Performance Scientific Computing Workshop, Bucharest, Romania
- Nov 10 2010 “Particle Swarm Optimization and its applications in collaborative robotics” at the Laboratory of Natural Computing and Robotics
- Demonstrations**
- Feb 19–20 2011 “Chidori Architecture – Distributed Swarm Control System and User Interface” poster and stand at the Artificial Intelligence – Multi-Agent Systems (AI-MAS) [Winter Olympics](#), Politehnica University of Bucharest, Bucharest, Romania

Membership and Community Service

- Membership** IEEE Student Member, IEEE RAS Member, EuCogIII member, Founding member of Romanian Robotics Education Initiative (RREI)
- Reviewer** International Journal of Robotics Research, IEEE Robotics and Automation Letters, Autonomous Robots, IEEE Transactions on Automation Science and Engineering, IEEE Transactions on Control of Network Systems, IEEE Transactions on Automatic Control, IEEE Control Systems Letters, Theoretical Computer Science Journal, Discrete Event Dynamic Systems, AIAA Journal of Guidance, Control, and Dynamics, IEEE Transactions on NanoBioscience, Applied Soft Computing Journal, Sensors Journal, Robotics: Science and Systems Conference (RSS 2016), IEEE International Conference on Robotics and Automation (ICRA 2015, 2016, 2017), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2016, 2017), International Workshop on the Algorithmic Foundations of Robotics (WAFR 2016), ACM International Conference on Hybrid Systems: Computation and Control (HSCC 2016, 2017), IEEE Conference on Decision and Control (CDC 2014, 2015, 2016, 2017), IFAC Workshop on Distributed Estimation and Control in Networked Systems (NecSys 2015), IFAC Workshop on Intelligent Control Systems (WICS 2010)
- Organizer** RSS Workshop on The What without the How: Specifying Planning Problems in Robotics (Cambridge, MA, USA, 2017)
IFAC Workshop on Intelligent Control Systems (Sinaia, Romania, 2010)
- Judge** CEESA First Tech Challenge robotics competition, American International School of
Advisor Bucharest, April 2011 and March 2012

Interests

- Robotics** formal methods, path planning, swarm robotics, distributed and decentralized control
- Control** correct-by-construction control strategies, temporal logics, sampling based algorithms,
engineering incremental computing
- Other** bioinformatics, graph coloring

Teaching Experience

2011–2012 **Teaching Assistant**, *Politehnica University of Bucharest*.

Laboratory Classes:

- Robotics and Virtual Reality (Spring 2012);
- Control Engineering (Spring 2012);
- Programming real-time applications (Spring 2012);
- Diagnosis and Decision Techniques (Spring 2012);
- Artificial Intelligence (Fall 2011).

2010–2011 **Associate Teaching Assistant**, *Politehnica University of Bucharest*.

Laboratory Classes:

- Robotics and Virtual Reality (Spring 2010, Spring 2011);
- Control Engineering (Spring 2011);
- Cognitive Robotics (winter 2010);
- Intelligent Multi-agent Systems for Ambient Assistance (winter 2010).

2009–2010 **Volunteer Teaching Assistant**, *Politehnica University of Bucharest*.

Laboratory Classes:

- Robotics and Virtual Reality (Spring 2009);
- Microprocessor Based Design (Spring 2009, Spring 2010).

Projects

Current

- 2016– Temporal Logic Planning for Support by Fire Operations in Uncertain and Adversarial Environments
- 2013– Persistent Vehicle Routing Problem with Temporal Logic and Charging Constraints
- 2013– Sampling-Based Motion Planning for Stochastic Systems with Distribution Temporal Logic
- 2012– Reactive Sampling-Based Path Planning with Temporal Logic Specifications
- 2015– Compositional Signal Temporal Logic with Applications to Synthetic Biology
- 2014– Translational and Rotational Invariance in Networked Systems
- 2015– Data-driven Inference of Temporal Logic Specifications
- 2014– Time Window Temporal Logic
- 2014– Bio-Electrical Cell Networks
- 2012– Hybrid Numerical P Systems. Controllers with Time-Varying Structure
- 2011– [PyElph](#) – open source software tool for gel image analysis and phylogenetics

Finished

- 2009–2012 Chidori: a distributed multi-agent control architecture for multi-robot systems using JADE
- 2009–2011 Robot controllers modeled with Numerical P Systems (NPS) and Enzymatic NPS
- 2009–2010 PSO-based search algorithm of a target in unknown environments
 - 2009 Software package for working with Khepera and e-puck robots
 - 2009 Fuzzy filters for noise reduction in images
 - 2008 Design and construction of an autonomous robot (JBot)

- 2008 Compiler for the Cool didactic programming language
- 2008 Development of a ssh client for the Android platform
- 2008 Didactic processor on a FPGA, Spartan3E
- 2006–2007 ReMaster project of designing and constructing an autonomous service robot
- 2006–2007 Artificial vision system of the ReMaster robot using the CMUCam2+ camera

Skills

Computer skills

Programming languages C, Java, Python, Matlab, PHP, SQL, Frameworks ANTLR, MPI, wxPython, matplotlib
Bash

Languages

Romanian **native language**

English **Advanced**

TOEFL Score: 111 – R:30, L:30, S: 23, W: 28

German **Advanced**

German Certificate “Zertifikat Deutsch”, Goethe Institute (98%)

Other skills

- Driving license – category B
- Artistic – violin and music theory, 9.95/10 in national examination “Capacitate” (2001)