Ivan Papusha

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Education

California Institute of Technology · Pasadena, CA

- PhD, Control and Dynamical Systems, 2016
  Thesis: Robustness, Adaptation, and Learning in Optimal Control
  Advisor: Richard M. Murray

Stanford University · Stanford, CA

- MS, Electrical Engineering, 2011
- BS, Electrical Engineering (physics minor), 2011

Thomas Jefferson High School for Science and Technology · Alexandria, VA

- Advanced Studies Diploma, 2007

Positions held

Sr. Professional Staff · Space Exploration Sector, JHU/APL, Laurel, MD 2018–

Postdoctoral Fellow · Institute for Computational Engineering and Sciences, UT Austin, TX 2016–2018

Graduate Student Researcher · CDS Department, Caltech, Pasadena, CA 2011–2016

Research Analyst Intern · Prediction and Bidding Team, AOL Inc., Palo Alto, CA 2011

Researcher · AI Laboratory, Stanford University, Stanford, CA 2010

Researcher · Center for Integrated Systems, Stanford University, Stanford, CA 2009

Engineering Technician · Naval Research Laboratory, Washington, DC 2006, 2008

Teaching

Course Developer/Instructor · Caltech 2015

- CDS270–2: Mathematical Methods in Control and System Engineering, Spring 2015

Teaching Assistant · Stanford, Caltech 2010–2014

- CDS101/110a: Introductory Control Theory, Fall 2013, Fall 2014
- EE102b: Signal Processing and Linear Systems II, Spring 2011
- EE364a: Convex Optimization I, Winter 2011
- EE263: Linear Dynamical Systems, Fall 2010

Awards and activities

National Defense Science and Engineering Graduate Fellowship (NDSEG), 2012–2015
Caltech Powell Foundation Fellowship, 2011
AFCEA Scholarship, 2008–2010
Professional: IEEE member
Personal: STEM outreach, private pilot (in-training), scuba, rock climbing

Tools and expertise

Analysis: Matlab, Mathematica, CVX, Z3, NumPy/SciPy/pandas
Computer languages: C, C++ (modern), Python, Java, Hadoop, OpenMP, Fortran, Haskell (basic)
Machine learning: regression, classification, graphical models, dynamic programming, neural networks
Control: robust control, adaptive control, MPC, trajectory planning, hybrid systems, formal methods
Robotics: ROS, SolidWorks, microcontrollers, PCB, 3D printing, mill/shop
Circuit design: Verilog, ModelSim, Cadence, Eagle, SPICE
Space: STK, NASA/NAIF SPICE, code generation

Software

- AMNET: Python toolbox for affine multiplexing networks.
  `https://github.com/ipapusha/amnet`
- SYDAR: (Synthesis Done Approximately Right) approximate control synthesis for hybrid automata.
  `https://github.com/u-t-autonomous/sydar`
- BOXQP: primal-dual quadratic program solver for Matlab with explicit offline factorization analysis.
  `https://github.com/ipapusha/boxqp`
- PCPADMM: solver for the robust PCA problem via principal component pursuit.
  `http://ivanpapusha.com/code/pcp_admm.m`

Publications

[CJJ+17] M. Cubuktepe, N. Jansen, S. Junges, J.-P. Katoen, I. Papusha, H. A. Poonawala, and U. Topcu. *Sequential Convex Programming for the Efficient Verification of Parametric MDPs*, pp. 133–150. Springer, Apr. 2017. DOI: 10.1007/978-3-662-54580-5_8.

[FPMM16] S. S. Farahani, I. Papusha, C. McGhan, and R. M. Murray. Constrained autonomous satellite docking via differential flatness and model predictive control. In *IEEE Conference on Decision and Control (CDC)*, pp. 3306–3311. Dec. 2016. DOI: 10.1109/CDC.2016.7798766.

[FPT17] J. Fu, I. Papusha, and U. Topcu. Sampling-based approximate optimal control under temporal logic constraints. In *ACM International Conference on Hybrid Systems: Computation and Control (HSCC)*, pp. 227–235. Apr. 2017. DOI: 10.1145/3049797.3049820.

[HPB14] M. B. Horowitz, I. Papusha, and J. W. Burdick. Domain decomposition for stochastic optimal control. In *IEEE Conference on Decision and Control (CDC)*, pp. 1866–1873. Dec. 2014. DOI: 10.1109/CDC.2014.7039670.

[KWG+18] M. A. Kelly, D. Wu, A. Goldberg, I. Papusha, J. Wilson, J. Carr, J. Boldt, J. Greenberg, F. Morgan, S. Yee, A. Heidinger, and L. Mehr. Compact Midwave Imaging System (CMIS) for retrieval of Cloud Motion Vectors (CMVs) and Cloud Geometric Heights (CGHs). In *Proceedings of the SPIE*, vol. 10776. Oct. 2018. DOI: 10.1117/12.2324612.

[Pap16] I. Papusha. *Robustness, Adaptation, and Learning in Optimal Control*. Ph.D. thesis, California Institute of Technology, May 2016. DOI: 10.7907/Z9F18WPB.

[PFTM16] I. Papusha, J. Fu, U. Topcu, and R. M. Murray. Automata theory meets approximate dynamic programming: Optimal control with temporal logic constraints. In *IEEE Conference on Decision and Control (CDC)*, pp. 434–440. Dec. 2016. DOI: 10.1109/CDC.2016.7798307.

[PLM14] I. Papusha, E. Lavretsky, and R. M. Murray. Collaborative system identification via parameter consensus. In *American Control Conference (ACC)*, pp. 13–19. Jun. 2014. DOI: 10.1109/ACC.2014.6858938.

[PM15] I. Papusha and R. M. Murray. Analysis of control systems on symmetric cones. In *IEEE Conference on Decision and Control (CDC)*, pp. 3971–3976. Dec. 2015. DOI: 10.1109/CDC.2015.7402836.

[PTCL18] I. Papusha, U. Topcu, S. Carr, and N. Lauffer. Affine multiplexing networks: System analysis, learning, and computation. Apr. 2018. arXiv:1805.00164 [math.OC].

[PWT18] I. Papusha, M. Wen, and U. Topcu. Inverse optimal control with regular language specifications. In *American Control Conference (ACC)*, pp. 770–777. Jun. 2018. DOI: 10.23919/ACC.2018.8431646.

[WPT17] M. Wen, I. Papusha, and U. Topcu. Learning from demonstrations with high-level side information. In *International Joint Conference on Artificial Intelligence (IJCAI)*, pp. 3055–3061. Aug. 2017. DOI: 10.24963/ijcai.2017/426.