

Education

- Sept,2015– **PhD**, *University of Michigan*, Ann Arbor, Michigan, USA, 4/4.
Dec,2019 Electrical Engineering: System
Thesis title: Correct-By-Construction Fault-Tolerant Control
Committee Members: Prof. Necmiye Ozay, Prof. Jessy Grizzle, Prof. Stéphane Lafortune, Prof. Jing Sun
- Sept,2013– **M.Sc.**, *University of Michigan*, Ann Arbor, Michigan, USA, 4/4.
2015 Electrical Engineering: System
- Sept,2009– **B.Sc.**, *Shanghai Jiao Tong University*, Shanghai, China, 3.6/4.
Aug,2013 Electrical and Computer Engineering

Experience

- March,2020– **Postdoctoral Researcher**, Dept. of EECS, University of Michigan.
Present Mentor: Prof. Necmiye Ozay.
I participated in preparing one research proposals to the Multidisciplinary University Research Initiatives (MURI) program. I supervised one master student and one undergraduate student supported by Summer Undergraduate Research in Engineering (SURE) program.
- Sept,2019– **Graduate Student Instructor**, Dept. of EECS, University of Michigan.
Dec,2019 I was the graduate student instructor of EECS 560, linear system theory. My obligations include leading the discussion session, holding office hours and designing exam problems.
- May,2015– **Graduate Student Research Assistant**, Dept. of EECS, University of Michigan.
Dec,2019 Supervisor: Prof. Necmiye Ozay.
During my Ph.D study, I was involved in several projects, including: "fault tolerant controls for thermal management" (sponsor: Ford Motor Co.), "run-time anomaly detection and mitigation in information-rich cyber-physical systems" (sponsor: NASA), "parameter synthesis and requirement analysis for cyber-physical control system design" (sponsor: ARC). I participated in preparing a research proposal to NSF, and supervised one undergraduate student supported by the African Undergraduate Research Adventure (AURA) program.
- May,2017– **Intern**, *Ford Motor Company*, Product Development, Dearborn.
Aug,2017 I was a summer intern at Ford Motor Company in 2017. The work focused on developing mixed integer quadratic programming solvers tailored for hybrid MPC, and supervising hybrid MPC with correct-by-construction switching protocols.
- May,2016– **Intern**, *Ford Motor Company*, Product Development, Dearborn.
Aug,2016 I was an summer intern at Ford Motor Company in 2016. My duties included developing fuel cell thermal model, and applying formal methods to design correct-by-construction controller for a fuel cell thermal management system.
- Sept,2014– **Homework Grader**, *Dept. of EECS, University of Michigan*.
Sept,2018 I graded homework for EECS551 (Matrix Methods for Signal Processing) in fall semester 2014, EECS 560 (Linear System Theory) in winter semester 2015, and EECS 598 (Hybrid System, now EECS 563) in fall semester 2016 and fall semester 2018.

Publications

Journals

- [1] Liren Yang and Necmiye Ozay. Scalable zonotopic under-approximation of backward reachable sets for uncertain linear systems. *IEEE Control System Letters*, (under review).
- [2] Liren Yang and Necmiye Ozay. Synthesis-guided adversarial scenario generation for gray-box feedback control systems with sensing imperfections. *ACM Transactions on Embedded Computing Systems (ESWEEK-TECS special issue)*, 2021 (accepted).
- [3] Ruochen Niu, Syed Hassaan, Liren Yang, Zeyuan Jin, and Sze Zheng Yong. Model discrimination of switched nonlinear systems with temporal logic-constrained switching. *IEEE Control System Letters*, 1:151–156, January 2021.
- [4] Liren Yang, Amey Karnik, Benjamin Pence, Md Tawhid Bin Waez, and Necmiye Ozay. Fuel cell thermal management: Modeling, specifications and correct-byconstruction control synthesis. *IEEE Transactions on Control Systems Technology*, 28(5):1638–1651, September 2020.
- [5] Liren Yang, Oscar Mickelin, and Necmiye Ozay. On sufficient conditions for mixed monotonicity. *IEEE Transactions on Automatic Control*, 64(12):5080–5085, December 2019.
- [6] Glen Chou*, Yunus E. Sahin*, Liren Yang*, Kwesi J. Rutledge, Petter Nilsson, and Necmiye Ozay. Using control synthesis to generate corner cases: A case study on autonomous driving. *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 37(11):2906–2917, September 2018. *Equal contribution.

Conferences

- [7] Liren Yang and Necmiye Ozay. Safety control synthesis for systems with missing measurements. In *7th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS)*, 2021.
- [8] Liren Yang and Necmiye Ozay. Efficient control synthesis with imperfect information. In *Decision and Control (CDC), 59th Annual Conference on*. IEEE, 2020.
- [9] Liren Yang, Denise Rizzo, Matthew Castanier, and Necmiye Ozay. Parameter sensitivity analysis of controlled invariant sets via value iteration. In *Proceedings of American Control Conference (ACC)*, 2020.
- [10] Zexiang Liu, Liren Yang, and Necmiye Ozay. Scalable computation of controlled invariant sets for discrete-time linear systems with input delays. In *Proceedings of American Control Conference (ACC)*, 2020.
- [11] Liren Yang and Necmiye Ozay. Fault detectability analysis of switched affine systems with linear temporal logic constraints. In *Decision and Control (CDC), 58th Annual Conference on*. IEEE, 2019.
- [12] Liren Yang and Necmiye Ozay. Tight decomposition functions for mixed monotonicity. In *Decision and Control (CDC), 58th Annual Conference on*. IEEE, 2019.

- [13] Liren Yang, Amey Karnik, and Necmiye Ozay. Quickly finding recursively feasible solutions for mpc with discrete variables. *IEEE Conference on Control Technology and Applications (CCTA)*, 2019.
- [14] Liren Yang, Xiafan Cui, Al-Thaddeus Avestruz, and Necmiye Ozay. Correct-by-construction control synthesis for buck converters with event-triggered state measurement. *Proceedings of American Control Conference (ACC)*, 2019.
- [15] Liren Yang and Necmiye Ozay. Fault-tolerant output-feedback path planning with temporal logic constraints. In *Decision and Control (CDC), 57th Annual Conference on*. IEEE, 2018.
- [16] Liren Yang and Necmiye Ozay. Provably-correct fault tolerant control with delayed information. In *Decision and Control (CDC), 56th Annual Conference on*. IEEE, 2017.
- [17] Liren Yang and Necmiye Ozay. Robustification and parametrization of switching controllers for a class of set invariance problems. *IFAC World Congress*, 2017.
- [18] Liren Yang, Amey Karnik, Benjamin Pence, Md Tawhid Bin Waez, and Necmiye Ozay. Fuel cell thermal management: Modeling, specifications and correct-by-construction control synthesis. In *Proceedings of American Control Conference (ACC)*, 2017.
- [19] Liren Yang, Necmiye Ozay, and Amey Karnik. Synthesis of fault tolerant switching protocols for vehicle engine thermal management. In *Proceedings of American Control Conference (ACC)*, 2016.

Technical Reports

- [20] Liren Yang and Necmiye Ozay. A note on some sufficient conditions for mixed monotone systems. Technical report, University of Michigan, Department of EECS, 2017. Available at <http://hdl.handle.net/2027.42/136122>.

Awards

Honorable Mention, ECE Graduate Student Instructor, Fall 2019 Term.

Seminar and Talks

"Synthesis-guided Adversarial Example Generation for Gray-box Autonomous Systems with Sensing Imperfections", IEEE Verification of Autonomous Systems Seminar Series, March 4, 2021.

Professional Service

Journal Reviewer, Automatica, IFAC Nonlinear Analysis: Hybrid Systems (NAHS), IEEE Control Systems Letters (L-CSS), International Journal of Control.

Conference Reviewer, IEEE Conference on Decision and Control (CDC), IEEE Conference on Control Technology and Applications (CCTA), Multi-conference on Systems and Control (MSC), American Control Conference (ACC), International Conference on Cyber-Physical Systems (ICCPS), International Conference on Embedded Software (EMSOFT).

2415 Lancashire Drive, Apt 2A – MI48105 – USA

☎ +1 7347096586 • ✉ yliren@umich.edu

Conference Program Committee, 24th ACM International Conference on Hybrid System: Computation and Control (HSCC).

Skills

Language, Chinese Mandarin: Native Speaker, English: Proficient.

References

Dr. Necmiye Ozay, *Associate Professor, Electrical Engineering and Computer Science*, University of Michigan.

Email: necmiye@umich.edu

Dr. Jing Sun, *Michael G. Parsons Collegiate Professor of Naval Architecture and Marine Engineering*, University of Michigan.

Email: jingsun@umich.edu

Dr. Stéphane Lafortune, *N. Harris McClamroch Professor of Electrical Engineering and Computer Science*, University of Michigan.

Email: stephane@umich.edu

Dr. Brent Gillespie, *Professor, Mechanical Engineering*, University of Michigan.

Email: brentg@umich.edu