
I work on enabling **scalable multi-agent autonomy**, specifically in the presence of competitors and human operated systems. My research leverages diverse techniques from **optimization**, **control theory**, and **game theory** to develop theoretical frameworks and algorithms that scalably integrates autonomy into existing infrastructure. My work is motivated by robotics, urban transportation, and warehouse automation.

Education



University of Washington, Seattle, USA.

Ph.D. in Aeronautics and Astronautics Engineering,

MS in Aeronautics and Astronautics Engineering,

Advisors: Behçet Açıkmeşe, Pierre-Loïc Garoche

Expected 2022

March 2020



University of British Columbia, Vancouver, Canada.

B.A.Sc in Engineering Physics, Minor in Honours Mathematics.

Advisor: Elizabeth Croft

May 2017

Journal Articles

- [1] **Set-based Value Operators for Non-Stationary Markovian Environments.**
S.H.Q. Li, A. Adjé, P. Garoche, B. Açıkmeşe.
under review for Automatica
- [2] **Revisiting Disturbance Decoupling with Optimization Perspective.**
S. B. Sarsilmaz, S.H.Q. Li, and B. Açıkmeşe. .
under review for System & Control Letters
- [3] **Congestion-aware path coordination game with Markov decision process dynamics.**
S.H.Q. Li, D. Calderone, B. Açıkmeşe.
provisionally accepted 2022 IEEE Control System Letters (L-CSS)
- [4] **Adaptive Constraint Satisfaction for MDP Congestion Games: Application to Transportation Networks.**
S.H.Q. Li, Y. Yu, D. Calderone, N. Miguel, L. J. Ratliff, B. Açıkmeşe.
provisionally accepted for Automatica
- [5] **A Primal-Dual Approach to Markovian Network Optimization.**
Y. Yu, D. Calderone, S.H.Q. Li, L. J. Ratliff, B. Açıkmeşe.
2022 Automatica
- [6] **Bounding Fixed Points of Set-based Bellman Operator and Nash Equilibria of Stochastic Games.**
S.H.Q. Li, A. Adjé, P. Garoche, B. Açıkmeşe.
2020 Automatica
- [7] **Disturbance Decoupling For Gradient-based Multi-Agent Learning with Quadratic Costs.**
S.H.Q. Li, L. J. Ratliff, B. Açıkmeşe.
2020 IEEE Control System Letters (L-CSS)

Peer Reviewed Conference/Magazine Publications

- [1] **Re-Inventing the Food Supply Chain with IoT: A Data-Driven Solution to Reduce Food Loss.**
V. Ranganathan, P. Kumar, U. Kaur, S.H.Q. Li, T. Chakraborty, R. Chandra.
2022 IEEE Internet of Things Magazine
- [2] **Fixed Points of Set-based Bellman Operator.**
S.H.Q. Li, A. Adjé, P. Garoche, B. Açıkmeşe.
2020 International Federation of Automatic Control (IFAC) World Congress

- [3] **Sensitivity Analysis for Markov Decision Process Congestion Games.**
S.H.Q. Li, D. Calderone, L.J. Ratliff, B. Açıkmeşe.
 2019 IEEE Conference on Decision and Control (CDC)
- [4] **Tolling for Constraint Satisfaction in Markov Decision Process Congestion Games.**
S.H.Q. Li, Y. Yu, D. Calderone, L.J. Ratliff, B. Açıkmeşe.
 2019 IEEE American Control Conference (ACC)
- [5] **Robot Programming through Augmented Trajectories in Augmented Reality.**
 C.P. Quintero, **S.H.Q. Li**, M.K.X.J. Pan, W.P. Chan, H.F. M. Van der Loos, E. Croft.
 2018 IEEE International Conference on Intelligent Robots and Systems (IROS)
- [6] **Schematic Driven Silicon Photonics Design.**
 L. Chrostowski, Z. Lu, J. Flückiger, J. Pond, J. Klein, X. Wang, **S.H.Q. Li**, W. Tai, C. Kim, J. Ferguson, C. Cone.
 2016 Smart Photonic and Optoelectronic Integrated Circuits (SPIE) Proceedings

Workshop Publications

- [1] **Stochastic Supply Chain Games with Networked Information Flow.**
S.H.Q. Li, L.J. Ratliff, P. Kumar.
 2022 Workshop on Gamification and Multiagent Solutions for ICLR
- [2] **Robot programming through augmented trajectories.**
 C.P. Quintero, **S.H.Q. Li**, C. Shing, W.P. Chan, S. Sheikholeslami, H.F.M. Van der Loos, E. Croft.
 2018 Workshop on Virtual, Augmented, and Mixed Reality for HRI
- [3] **CAD-AR: An Intuitive Robotic Teaching Pendant for Skill-based Industrial Robot Programming.**
S.H.Q. Li, C. Shing, Y. Coady, H.F.M. Van der Loos, and E. Croft.
 2017 IEEE International Conference on Intelligent Robots and Systems (IROS) Workshop

Intellectual Property

- [1] **Reinforcement Learning Simulation of Supply Chain Graph.**
 Peeyush Kumar, Sarah H.Q.Li, Vaishnavi Ranganathan, Lillian J. Ratliff, Ranveer Chandra, Vishal Jain, Mike Bassani, Jeremy Reynolds.
under review | Indian Patent Office 202141048296.

Internships

Effect of information structure in multi-agent reinforcement learning Microsoft Research, Redmond — Research for Industry Develop a game-theoretical model for agricultural supply chains with structured information-flow. Design learning objectives to reduce carbon mission and food waste in agricultural supply chains.	06/2021 - 09/2021
Optimization-based multi-disciplinary system design Loon, an Alphabet company — system engineering Develop an optimization-based algorithm to size stratospheric balloons. Explore data-driven methods to accelerate the balloon design process. Assist and conduct wind tunnel tests of stratospheric balloon prototypes.	05/2020 - 09/2020
Multi-thread motor interface firmware development Zaber Technologies Inc. — firmware intern Develop high-precision motor controllers with C++ on STM32 ARM MCU's for stepper/linear/servo actuators.	05/2016 – 12/2016
FPGA data transfer optimization Deutsches Elektronen Synchrotron (DESY) — research intern Optimize experimental data transfer speed to Gbs/second by resolving FPGA clock mis-synchronization. Implemented on CERN's Large Hadron Collider (LHC) for the detector Compact Muon Solenoid.	07/2015 – 08/2015
RADAR-SAT constellation mission (RCM) Macdonald, Dettwiler and Associates — software intern Develop scheduling algorithm for the RCM distributed satellite network using C++ and PostgreSQL.	05/2014 – 12/2014

Optimize visualization algorithms to load millions of SAR data points in seconds via Google Maps.

Honors & Awards

- Rising Stars, Academic Career Workshop in Cyber-physical systems. 2022
- Rising Stars, Academic Career Workshop in Aerospace Engineering. 2022
- Zonta International Amelia Earhart Fellowship (up to 35 recipients globally each year). 2020
- Outstanding Female Engineer Award University of Washington Society of Women Engineers. 2020
- Student Travel Award, IEEE Conference on Decision and Control 2019
- Aeronautics & Astronautics Top Scholar Award (one graduate student each academic year). 2017
- John Collison Memorial Scholarship in Mathematics (one undergraduate student each academic year). 2015
- Loran Provincial Scholar (Awarded to one high school student provincially each year). 2011
- President's Entrance Scholarship and Major Entrance Scholarship, University of British Columbia. 2011

Services

- Women in Aerospace UW 2021-2022
- UW Aeronautics and Astronautics Faculty Search Committee Student Representative 2020
- Volunteer at University District Food Bank and University of Washington Farm 2018-2019
- Sergeant-At-Arms, Walter Gage Toastmasters Club 2016
- Radio DJ, CFUV 101.9 FM Victoria, Canada 2010-2011

Review Activities

- IEEE Control System Letters (L-CSS)
- IEEE Transactions on Control and Networked Systems (TCNS)
- IEEE Transactions on Automatic Control (TAC)
- Automatica
- IEEE American Control Conference (ACC)
- IEEE Conference on Control Technology and Applications (CCTA)
- IEEE Conference on Decision and Control (CDC)
- Learning for Dynamics and Control Conference (L4DC)
- IFAC Conference on Networked Systems (NECSYS)

Invited Talks

1. *Seminar Talk, EPFL* 06/2022
Scalable multi-robot trajectory planning under stochastic demands.
2. *Rising Stars, University of Colorado, Boulder* 05/2022
Architecting co-existence: scalable integration of autonomy in shared spaces..
3. *Biotech Day, W.F. West High School* 05/2022
The game of life: how game theory affects our everyday lives.
4. *Oden Institute, University of Texas, Austin* 03/2022
Non-cooperative decision-making in cyber-physical systems: optimality, sensitivity, and robustness.
5. *Zonta International District 8 Fall Conference* 10/2021
Regulating and predicting societal-level behavior of autonomous multi-agent systems.
6. *Semiautonomous Seminar @ UC Berkeley* 09/2021
Adaptive Constraint Satisfaction for MDP Congestion Games: Application to Transportation Networks.
7. *Reinforcement Learning Reading Group @ Microsoft Research, Redmond* 09/2021
Information-Sharing in Actor-Critic Games: Application to Supply Chain Networks.
8. *Coffee talk - Advanced Concepts Team, European Space Agency* 03/2021
Incentivizing autonomous vehicles and spacecraft toward constraint satisfaction.

9. *EE 546: Optimization and Learning for Control, guest lecture* **02/2020**
Set-based dynamic programming for robust Markov decision processes.
10. *NSF Smart and Connected Communities (SCC).* **04/2019**
Markovian Network Equilibrium.
Additionally, all first authored conference/workshop papers were invited talks at the corresponding conference.