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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.

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## Education



UNIVERSITY OF WASHINGTON. Seattle, USA.

Ph.D. in Aeronautics and Astronautics Engineering,

Expected 2022

Advisor: Behçet Açıkmeşe



UNIVERSITY OF BRITISH COLUMBIA, Vancouver, Canada.

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

May 2017

Advisor: Elizabeth Croft

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## 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 Basani, Jeremy Reynolds.  
*under review* | Indian Patent Office 202141048296.

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## Internships

<b>Effect of information structure in multi-agent reinforcement learning</b> 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
<b>Optimization-based multi-disciplinary system design</b> 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
<b>Multi-thread motor interface firmware development</b> 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
<b>FPGA data transfer optimization</b> 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
<b>RADAR-SAT constellation mission (RCM)</b> 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.

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## 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)

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## 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 (S&CC).* 04/2019  
**Markovian Network Equilibrium.**  
*Additionally, all first authored conference/workshop papers were invited talks at the corresponding conference.*