Shengjun(Daniel) Zhang

Ph.D. Student
Department of Electrical Engineering
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Education

2018/01–Present **Ph.D., Electrical Engineering**, *University of North Texas*, Denton.
2015/01–2017/01 **M.S. Electrical Engineering**, *New York University*, New York.
2010/09–2014/07 **B.S., *Automation of Honors Program***, *China Agricultural University*, Beijing.

Research Interests

- Machine Learning and Optimization
- Reinforcement Learning
- Power System (DERs with transactive approaches)
- Distributed Control and Optimization with Communication Constraints

Professional Experience

2018/01–Present **Research/Teaching Assistant**, *Cyber-Physical Energy System Laboratory*, Department of Electrical Engineering, University of North Texas.
Supervisor: Dr. Tao Yang

2017/05–2017/07 **Visiting Researcher**, *Key Laboratory of Image Processing and Intelligent Control of Education Ministry*, School of Artificial Intelligence and Automation, Huazhong University of Science and Technology.
Supervisor: Dr. Ye Yuan

2017/07–2017/07 **Visiting Researcher**, *Group of Networked Sensing and Control*, College of Control Science and Engineering, Zhejiang University.
Supervisor: Dr. Junfeng Wu

2016/01–2016/07 **Research Assistant**, *Control/Robotics Research Laboratory*, Tandon School of Engineering, New York University.

Research & Projects

2019/02–Present **Robust Optimization with Event Triggered Communication**.
we consider the distributed optimization problem, whose objective is to minimize a global cost function formed by a sum of local convex cost functions. We develop a robust algorithm for solving the distributed optimization problem over an undirected and connected network. Unlike the existing zero-gradient-sum algorithms which require special initializations, the proposed algorithm, is arbitrarily initialized. This work has been submitted to the 58^{th} IEEE Conference on Decision and Control and is under review.

2018/09–Present **Analyzing Distributed Optimization Algorithms via IQC**.
We investigate the convergence rate of distributed push-pull based optimization algorithms, which are applied for a directed graph network. We present a unified framework based on integral quadratic constaints (IQCs) from robust control theory and formulate convergence analysis problems into a semidefinite program (SDP). Our method derives numerical upper bounds on convergence rates of the algorithms that we analyzed and improves the exsiting bounds. We illustrate the versastility of our proposed framework using several different existing distributed optimization algorithms. The framework that we discuss is a powerful tool for choosing algorithm. This work has been accepted by the 15$^{\text{th}}$ IEEE International Conference on, and will be extended to analyze convex and non-convex cost functions.

2018/10–2018/12 **Nonlinear System Identification via Sparse Bayesian Learning**.
In this project, I mainly reimplemented the *Sparse Bayesian Learning Algorithm*, proposed in *A Sparse Bayesian Approach to The Identification of Nonlinear State-space Systems* and applied it to identify a pendulum model, also, I used a deep learning approach to verify the results.

2018/03–2018/05 **Applying Q-Learning to a 4 $\times$ 4 Tic-Tac-Toe**.
Reinforcement learning is essential for applications where there is no single correct way to solve a problem. In this project, I show that reinforcement learning is very effective at learning how to play the game Tic-Tac-Toe, despite the high-dimensional state. The agent is not given information about what the blocks or grids look like - it must learn these representations and directly use the reward and Q-values to develop an optimal strategy. The Q-agent uses basic Q-Learning algorithm, and shows that it is able to achieve super-human performance. This project could be extended to higher dimensional Tic-Tac-Toe games.

2016/01–2016/07 **UGV Integrated Mobile Platform**.
Modeled the UGV integrated mobile platform and simulated it via V-rep. Implemented SLAM and control algorithms on the integrated mobile platform to make the UGV platform run and avoid obstacles automatically.

Honors & Awards

2018, 2019 College of Engeering Dean Tuition Scholarship

2018, 2019 Toulouse Graduate School Scholarship

2012 The 2$^{\text{nd}}$ prize in the Physics Experiment Competition of colleges in Beijing

Certifications

2016 Machine Learning by Stanford University on Coursera.
Instructor: Andrew Ng, license: NNBCAXYFA2HK.

Supervision Experiences

MS Students

2018/07–2018/11 Kelvin Darden, MS student, project on load shedding in Smart Grid.
First placement: engineer, Electric Reliability Council of Texas (ERCOT), Texas.

Teaching Experiences

Teaching Assistant

Fall 2018–Present EENG 2620 Signals and Systems

Fall 2018 EENG 5940 Control and Optimization for Power Systems

Professional Activities

Member

- IEEE Studnet Member
- IEEE Young Professionals

Journal Reviewer

- IET Control Theory and Applications
- Neurocomputing

Conference Reviewer

- IEEE Conference on Decision and Control (CDC)
- IEEE International Conference on Control and Automation (ICCA)
- Chinese Control Conference (CCC)

Publication

Preprints and Working Papers

1. W. Du, X. Yi, **S. Zhang**, J. George, and T. Yang. "Distributed Proportional-Integral Optimization Algorithms with Event-triggered Communication", submitted to *the 58th IEEE Conference on Decision and Control*, under review.
2. **S. Zhang**, X. Yi, J. George, and T. Yang. "Computational Convergence Analysis of Distributed Optimization Algorithms for Directed Graphs", *the 15th IEEE International Conference on Control and Automation*, to appear.
3. X. Yi, **S. Zhang**, T. Yang, J. Wu, and K. H. Johansson. "Distributed Online Convex Optimization with Long Term Coupled Constraints", submitted to *the 38th Chinese Control Conference*, under review.

Journal Articles

1. Y. Chen, J. Lin, Q. Jiang, Q Chen, **S. Zhang**, and L. Li. "A Magnetic Nanoparticle Based Nucleic Acid Isolation and Purification Instrument for DNA Extraction of *Escherichia Coli* O157: H7", *Journal of Nanoscience and Nanotechnology*, vol. 16, pp. 2296-2300, 2016.

Conference Proceedings

1. J. Wu, **S. Zhang**, T. Yang, L. Shi and H. Wang. "Distributed Economic Dispatch over Networks with Markovian Communication Losses", *Proceedings of the 37th Chinese Control Conference (CCC)*, Wuhan, China, 2018.