Shengjun(Daniel) **Zhang**

Research Assistant · Control · Optimization · Statistical Learning

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Shengjun(Daniel) Zhang

"There is nothing more practical than a good theory."

Education

UNT (University of North Texas) — *Denton, Texas, U.S.A*

Ph.D. Major in Electrical Engineering — *Jan. 2018 - present*

- Minor in Business Management

NYU (New York University) — *New York, New York, U.S.A*

M.S. in Electrical Engineering — *Jan. 2015 - Jan. 2017*

- Robotic Control

CAU (China Agricultural University) — *Beijing, China*

B.S. in Automation of Honors Program with *Cum Laude* — *Sep. 2010 - Jul. 2014*

- Control Theory

Research Interests

Artificial Intelligence Statistical Learning, Machine Learning, Reinforcement Learning

Optimization Convex Optimization, Non-convex Optimization, Distributed Optimization

Power System DERs with Transactive Approaches

Professional Experience

University of North Texas. — *Denton, Texas, U.S.A*

Research/Teaching Assistant — *Jan. 2018 - present*

- Cyber-Physical Energy System Laboratory, Department of Electrical Engineering.
- Supervisor: Dr. Colleen Bailey & Dr. Tao Yang.

Huazhong University of Science and Technology. — *Wuhan, China*

Visiting Researcher — *May 2018 - Jul. 2018*

- Key Laboratory of Image Processing and Intelligent Control of Education Ministry, School of Artificial Intelligence and Automation.
- Supervisor: Dr. Ye Yuan.

Zhejiang University. — *Hangzhou, China*

Visiting Researcher — *Jul. 2018 - Jul. 2018*

- Group of Networked Sensing and Control, College of Control Science and Engineering.
- Supervisor: Dr. Junfeng Wu.

New York University. — *New York, New York, U.S.A*

Research Assistant — *Jan. 2016 - Jul. 2016*

- Control/Robotics Research Laboratory, Tandon School of Engineering.
- Supervisor: Dr. Farshad Khorrami.

Research & Projects

Sparse PCA via Zeroth-order Optimization Approach

UNT

Research Dissertation *Sep.2019 - Present*

- Applying zeroth-order optimization techniques to Sparse PCA problem.
- Develop new zeroth-order optimization algorithm to solve Sparse PCA problem.
- Compare proposed zeroth-order algorithm with existing zeroth-order algorithms and first-order algorithms.
- Develop stochastic zeroth-order algorithm for Sparse PCA problem.

Obstacle Avoidance and Navigation Utilizing Proximal Policy Optimization

UNT

Research Project *Oct. 2019 - Present*

- Utilizing PPO, a reinforcement learning approach, to guide a TurtleBot to avoid obstacles.
- Compared PPO approach with DDPG and DQN in simulation on ROS platform.
- This work has been accepted by 2020 SPIE Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications II.

Robust Optimization with Event Triggered Communication.

UNT

Research Project *Feb. 2019*

- Minimize a global cost function formed by a sum of local convex cost functions in a distributed way.
- Develop a robust algorithm over an undirected and connected network.
- The proposed algorithm is arbitrarily initialized unlike the exsiting algorithms.

Analyzing Distributed Optimization Algorithms via IQC.

UNT

Research Project *Nov. 2018*

- Investigate the convergence rate of distributed push-pull based optimization algorithms in directed graph networks.
- Present a unified framework based on integral quadratic constaints (IQCs) from robust control theory.
- Formulate convergence analysis problems into a semidefinite program (SDP).
- This work has been accepted by the 15th IEEE International Conference, and is in **Best Student Paper Shorten List**.

Nonlinear System Identification via Sparse Bayesian Learning.

UNT

Course Project *Oct. 2018 - Dec. 2018*

- Reimplement *Sparse Bayesian Learning Algorithm*, proposed in *A Sparse Bayesian Approach to The Identification of Nonlinear State-space Systems*.
- Apply such an algorithm to identify a pendulum model.

Applying Q-Learning to a 4 $\times$ 4 Tic-Tac-Toe.

UNT

Course Project *Mar. 2018 - May 2018*

- Implement Q-learning algorithm to a 4 $\times$ 4 Tic-Tac-Toe game.

UGV Integrated Mobile Platform.

NYU

Research Project *Jan. 2016 - Jul. 2016*

- Modele the UGV integrated mobile platform and simulated it via V-rep.
- Implemente SLAM and control algorithms on the integrated mobile platform.

Honors & Awards

2020	**Third Place Graduate Student Poster Competition**, IEEE North Tech SAS	*Denton, Texas, U.S.A*
2019	**IEEE Outstanding Graduate Student**, IEEE local event	*Denton, Texas, U.S.A*
2019	**College of Engeering Dean Tuition Scholarship**, UNT	*Denton, Texas, U.S.A*
2019	**Toulouse Graduate School Scholarship**, UNT	*Denton, Texas, U.S.A*
2018	**College of Engeering Dean Tuition Scholarship**, UNT	*Denton, Texas, U.S.A*
2018	**Toulouse Graduate School Scholarship**, UNT	*Denton, Texas, U.S.A*
2012	**2nd prize**, Physics Experiment Competition of colleges	*Beijing, China*

Certifications

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

Mentoring

Kelvin Darden *UNT*

M.S. STUDENT *2018*

- Project on load shedding in Smart Grid.
- First placement: engineer, Oncor Electric Delivery.

Teaching Experiences

Spring '19 **EENG 2620 Signals and Systems,** Teaching Assistant *UNT*

Fall '18 **EENG 2620 Signals and Systems,** Teaching Assistant *UNT*

Fall '18 **EENG 5940 Control and Optimization for Power Systems,** Teaching Assistant *UNT*

Professional Activities

Member IEEE HKN, IEEE Studnet Member, IEEE Young Professionals

Journal Reviewer IET Control Theory and Applications
Neurocomputing
Automatica
International Journal of Robust and Nonlinear Control

Conference Reviewer IEEE Conference on Decision and Control (CDC)
American Control Conference (ACC)
IEEE International Conference on Control and Automation (ICCA)
Chinese Control Conference (CCC)

Publications

Journal Articles [1]

A Magnetic Nanoparticle Based Nucleic Acid Isolation And Purification Instrument for DNA Extraction of Escherichia coli O157: H7
Yahui Chen, Jianhan Lin, Qin Jiang, Qi Chen, Shengjun Zhang, Li Li
Journal of nanoscience and nanotechnology 16.3 (2016) pp. 2296–2300. American Scientific Publishers
2016

Conference Proceedings [4]

Exponential Convergence for Distributed Smooth Optimization Under the Restricted Secant Inequality Condition
Xinlei Yi, Shengjun Zhang, Tao Yang, Karl H Johansson, Tianyou Chai
21st IFAC World Congress *Berlin, Germany*
2020

Obstacle Avoidance and Navigation Utilizing Proximal Policy Optimization
Daniel Zhang, Colleen P. Bailey
SPIE Artificial Intelligence and Machine Learning for Multi-Domain Operations Applications II *California, United States*
2020

Event-Triggered Control for Consensus of Multi-Agent Systems with Nonlinear Output and Directed Topologies
Xinlei Yi, Shengjun Zhang, Tao Yang, Junfeng Wu, Karl Henrik Johansson
38th Chinese Control Conference (CCC) *Guangzhou, China*
2019

Computational Convergence Analysis of Distributed Optimization Algorithms for Directed Graphs
Shengjun Zhang, Xinlei Yi, Jemin George, Tao Yang
15th IEEE International Conference on Control and Automation (ICCA) *Edinburgh, Scotland*
2019

Preprint [3]

Extremal Region Analysis based Deep Learning Framework for Detecting Defects
Zelin Deng, Xiaolong Yan, Shengjun Zhang, Colleen P Bailey
arXiv preprint arXiv:2003.08525 (2020)
. 2020

Distributed Proportional-Integral Optimization Algorithms with Event-triggered Communication
Wen Du, Xinlei Yi, Shengjun Zhang, Jemin George, Tao Yang
2019

Linear Convergence of First- and Zeroth-Order Primal-Dual Algorithms for Distributed Nonconvex Optimization
Xinlei Yi, Shengjun Zhang, Tao Yang, Karl H Johansson, Tianyou Chai
arXiv preprint arXiv:1912.12110 (2019)

. 2019