SONGYANG HAN

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EDUCATION

University of Connecticut (UCONN) **Storrs, USA**
PhD in *Computer Science and Engineering* Supervisor: Prof. Fei Miao ***Aug. 2018-Present***

- GPA: **4.0/4.0**
- Core courses: *Algorithms, Formal Methods, Machine Learning, Advanced Computer Network, Optimal & Model Predictive Control, Deep Reinforcement Learning, Cryptography*

Shanghai Jiao Tong University (SJTU) **Shanghai, China**
(*University of Michigan-SJTU Joint Institute*) ***Sep. 2015-Mar. 2018***
M.S. in *Electrical and Computer Engineering* Supervisor: Prof. Chengbin Ma

- GPA: **3.96/4.0 Ranking: 1/20**
- Core courses: *Game Theory, Data Mining, Engineering Optimization, Methods of Applied Mathematics I, Probability and Random Process, Mechatronic Systems Design, New Energy System*

Nanjing University (NJU) **Nanjing, China**
B.Eng. in *Automation* ***Sep. 2011-Jun. 2015***

- GPA: **4.44/5.0 Ranking: 1/34**
- Core courses: *Principles of Automatic Control, Modern Cybernetics, Operations Research, C++, Data Structure, Database, Computer Vision, Computer Network, Signals and Systems, Digital Signal Processing, Circuit Analysis, Analog Circuit, Digital Circuit, Principles of Microcomputer*

RESEARCH EXPERIENCE

University of Connecticut
Research Assistant, supervised by Prof. Fei Miao ***Aug. 2018-Present***

- Design an algorithm to exploit the advantages raised by the extended sensing capability of connected autonomous vehicles (CAVs) through beneficial information sharing.
- Analyze quantum key distribution protocols through a game theoretic framework to show improved noise tolerance and secure communication rate assuming adversaries are "rational".
- Design an integrated information sharing and multi-agent reinforcement learning framework for the behavior planning of connected autonomous vehicles to improve traffic efficiency and safety.
- Study the fundamental properties of the robust multi-agent RL problem under adversarial state perturbations. We define the concept of robust perfect Nash equilibrium and prove its existence.
- Design a stable and efficient reward reallocation algorithm to motivate cooperation for multi-agent reinforcement learning assuming all agents are self-interested.

Reinforcement Learning for Autonomous Driving
Research Internship, Baidu USA Apollo team ***May 2020-Aug. 2020***

- Summarize exiting reinforcement learning methods and the state-of-art deep learning methods used in autonomous driving.
- Write a design document for single and multi-agent RL, distributed learning, algorithm architecture and interface, and a prototype design.
- Implement RL algorithms for autonomous vehicle's planning on the Apollo platform.

Energy Management of Photovoltaic Based Charging Station
Team member, collaborating with State Grid Corporation of China ***Sep. 2016-Mar. 2018***

- Model photovoltaic cells and randomized irradiance profile.
- Design distributed energy management approach to control the charging power of electric vehicles, which can accelerate the charging process and protect the privacy information of electric vehicles.

Energy Management of Battery/Super Capacitor Hybrid System
Team Leader*,* collaborating with Nippon Chemi-Con Corporation, Japan ***Dec. 2016-Apr. 2017***

- Improve the energy management approach of a hybrid energy storage system in a novel topology.
- Improve the system efficiency without the help from special alternator like MAZDA i-ELoop.

Dynamic Systems Control Laboratory, UM-SJTU Joint Institute
Research Assistant*,* supervised by Prof. Chengbin Ma ***Sep. 2015-Mar. 2018***

- Design a flexible energy management approach to handle the uncertainties of weather and sizing in an isolated microgrid, which would not be influenced dramatically by different weather conditions.
- Design and fabricate high efficient bidirectional DC/DC converters to conduct and validate energy management approaches in a downsized system.
- Build a hardware testbed to study reconfigurable energy systems.

3D Laser Processing Based on Computer Vision ***May 2013-Dec. 2014***
Team Leader, sponsored by National Undergraduate Training Programs for Innovation and Entrepreneurship

- Combine a camera and structured light to model a feather in 3D, which rebuilt the feather's shape.
- Successfully extract the feather stroke with image processing methods, including Hough transform.

SELECTED PUBLICATIONS

- **Songyang Han**, Shanglin Zhou, Jiangwei Wang, Lynn Pepin, Caiwen Ding, Jie Fu, Fei Miao. *Safe and Efficient Behavior Planning and Control For Connected Autonomous Vehicles: A Multi-Agent Reinforcement Learning Approach.* In IEEE Transactions on Intelligent Transportation Systems. (Under review)
- **Songyang Han**, Sanbao Su, Sihong He, Shuo Han, Haizhao Wang, Fei Miao. *Robust Multi-Agent Reinforcement Learning Under Adversarial State Perturbations.* In IEEE Transactions on Neural Networks and Learning Systems. (Under review)
- Yukun Yuan, Meiyi Ma, **Songyang Han**, Desheng Zhang, Fei Miao, John Stankovic, Shan Lin. *DeResolver: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services.* In ACM Transactions on Cyber-Physical Systems, 2022.
- **Songyang Han**, He Wang, Sanbao Su, Yuanyuan Shi, Fei Miao. *Stable and Efficient Shapley Value-Based Reward Reallocation for Multi-Agent Reinforcement Learning of Autonomous Vehicles.* In 2022 IEEE International Conference on Robotics and Automation (ICRA), Philadelphia, USA, May 2022.
- Yukun Yuan, Meiyi Ma, **Songyang Han**, Desheng Zhang, Fei Miao, John Stankovic, Shan Lin. *DeResolver: A Decentralized Negotiation and Conflict Resolution Framework for Smart City Services.* In 12th ACM/IEEE International Conference on Cyber-Physical Systems, Nashville, USA, May 2021. (**Best paper award**)
- **Songyang Han**, Walter O. Krawec, Fei Miao. *A Game Theoretic Security Framework for Quantum Cryptography: Performance Analysis and Application.* Quantum Information Processing 19.10 (2020): 1-24.
- **Songyang Han**, Jie Fu, Fei Miao. Exploiting Beneficial Information Sharing Among Autonomous Vehicles. In 2019 IEEE 58th Conference on Decision and Control (CDC), Nice, France, Dec. 2019.

- Shuangke Liu, Ming Liu, **Songyang Han**, Xinen Zhu, Chengbin Ma. *Tunable Class-E2 DC-DC Converter with High Efficiency and Stable Output Power for 6.78 MHz Wireless Power Transfer*. IEEE Transactions on Power Electronics 33.8 (2018): 6877-6886.
- **Songyang Han**, He Yin, Amro Alsabbagh, Chengbin Ma. *A Flexible Distributed Approach to Energy Management of an Isolated Microgrid*. In 2017 IEEE 26th International Symposium on Industrial Electronics (ISIE), Edinburgh, Scotland, June 2017.
- **Songyang Han**, Xianzhong Zhou, Chunlin Chen. *Path Planning for Multi-robot Systems Using PSO and Critical Path Schedule Method*. In 2016 IEEE 13th International Conference on Networking, Sensing, and Control (ICNSC), Mexico City, Mexico, April 2016.

SKILLS

Standardized Tests: TOEFL iBT: 107
Programming: Python, C/C++, MATLAB, LabVIEW, SQL
Tools: LaTeX, Linux, Git, CARLA, NI myRIO, NI CompactRIO, Arduino, PIC, Altium Designer, Multisim, AutoCAD

HONOR & AWARDS

- Predoctoral Research Fellowship, University of Connecticut ***May 2022***
- First Place Award, 8th Annual Graduate Poster Competition, University of Connecticut ***Mar. 2022***
- Predoctoral Research Fellowship, University of Connecticut ***May 2021***
- Best Paper Award, 12th ACM/IEEE International Conference on Cyber-Physical Systems ***May 2021***
- Cigna Graduate Fellowship, University of Connecticut ***Aug. 2020***
- Predoctoral Research Fellowship, University of Connecticut ***May 2020***
- Postgraduate Academic Excellence Scholarship, Shanghai Jiao Tong University ***Oct. 2016***
- Guanghua Scholarship, Shanghai Jiao Tong University ***Dec. 2015***
- Outstanding Graduates of Nanjing University ***May 2015***
- National Endeavor Fellowship, 3 times, Nanjing University ***Dec. 2012-Dec. 2014***
- Outstanding Winner of Educational Robot Competition in China, Chinese Association for Artificial Intelligence ***Nov. 2014***
- Meritorious Winner of 2014 MCM, the Consortium for Mathematics and Its Applications ***May 2014***
- Outstanding Students of Nanjing University, 2 times, Nanjing University ***Nov. 2012-Nov. 2013***

SERVICE EXPERIENCE

Reviewer,

- IEEE Transactions on Industrial Informatics
- IEEE Transactions on Neural Networks and Learning Systems
- The 43rd Annual Conference of the IEEE Industrial Electronics Society (IECON 2017)
- The 58th Conference on Decision and Control (CDC 2019)
- The 2020 American Control Conference (ACC 2020)
- The 59th Conference on Decision and Control (CDC 2020)
- The 2021 American Control Conference (ACC 2021)
- 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2020)
- 2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021)
- 2022 IEEE International Conference on Robotics and Automation (ICRA 2022)