Shiping Shao

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Education

The Ohio State University   2017 – Current

Ph.D. student in Electrical and Computer Engineering

Thesis: Optimization and Market Design of Transportation Systems

Nanchang University   2010 – 2016

M.S. in Mechanical Engineering, B.S. in Automotive Engineering

Thesis: Design of a Vehicle Control System for Electric Vehicle based on AUTOSAR

Projects

Optimization, Pricing, and Learning in the Ridehailing Systems

- Pricing algorithm in a ride-sharing system
  - Designed a pricing policy that fairly allocates the cost of operation of a ridehailing system with asymmetric elastic demand
  - Demonstrated the robustness of the fair pricing policy under perturbation of the system parameters
- Reinforcement learning for optimal rebalancing policy
  - Developed a deep reinforcement learning algorithm to optimize the tradeoff between empty vehicle miles traveled and expected passenger waiting time in a ridehailing system
  - Demonstrated through Monte-Carlo simulations that the average empty vehicle miles travelled is reduced by 50% and average customer waiting time is reduced by 36% in comparison to the MaxWeight based rebalancing policy
- Monte-Carlo Simulator for Multimodal Transportation system
  - Designed a Monte Carlo simulator that computes the key quality of service metrics under different rebalancing algorithms for various modes in a multimodal transportation system
  - Ford Motor Company is considering filing a patent application for this simulator

Scheduling, Optimization, and Market Design of EV Charging

- Scheduling of Charging of EV in a Large Market
  - Designing a linear programming based scheduling algorithm to schedule charging of a large number of EVs in a city
  - Applying approximate dynamic programming with a function approximation for real-time computation and developing optimality and robustness guarantees

Development of Embedded System on EV

- Vehicle Control System
  - Developed a software architecture and multi-level CAN systems based on AUTOSAR that improves the modularity, scalability and re-usability of the vehicle control system
- Battery Management System
  - Designed a Kalman filter based algorithm to reduce the noise in the battery voltage measuring

Courses

- Mathematics: Theory of Probability (I & II), Discrete Stochastic Processes, Probability and Random Variables, Introduction of Real Analysis (I & II)
- Optimization: Reinforcement Learning, Mathematics of Data Science, Optimization for Static and Dynamic Systems, Game Theory and Mechanism Design
- Control: Nonlinear Systems Theory, State-Space Control Systems

Programming

- Languages: Python, MATLAB, C
- Platforms: Micro-controller, Simulink, Qt, Android

Publications

- S. Shao, A. Mittal, R. Twumasi-Boakye, and A. Gupta, "Pricing ride-hailing services with asymmetric demand and travel time in a linear city," *submitted to IEEE Transactions on Control of Networked Systems*, 2020.
- Y. Deng, S. Shao, A. Mittal, R. Twumasi-Boakye, J. Fishelson, A. Gupta, and N. Shroff "Incentive Design and Profit Sharing in Multi-modal Transportation Network," *accepted for presentation at Transportation Research Board*, 2021.
- Y. Deng, H. Chen, S. Shao, J. Tang, J. Pi, and A. Gupta, "Multi-Objective Vehicle Rebalancing for Ridehailing System using a Reinforcement Learning Approach," *submitted to Journal of Management Science and Engineering*, 2020.
- S. Shao, J. Huang, and M. Cao, "A High-voltage Collection Approach for Electric Vehicles Based on Data Fusion," *Qiche Gongcheng/Automotive Engineering*, 39(2), 2017.
- S. Shao, "Design of a Vehicle Control System for Electric Vehicle based on AUTOSAR," *Nanchang University*, Master thesis, 2016.