

Yuhao Ding

(Updated on 08/03/2018)

- Education**
- University of California, Berkeley** Berkeley, CA
Ph.D. student in Industrial Engineering and Operations Research August 2018-now
- University of Michigan, Ann Arbor** Ann Arbor, MI
Master of Science in Electrical and Computer Engineering September 2016-April 2018
- GPA: 4.0/4.0
 - Coursework: Probabilities and Random Processes, Linear Systems Theory, Trajectory Optimization, Transportation Data Analysis, Linear Feedback Control, Stochastic Control, Reinforcement Learning
- Technische Universität Darmstadt** Darmstadt, Germany
Exchange student in Electrical Engineering and Information Technology September 2015-June 2016
- Fully funded by China Scholarship Council (CSC)
 - Coursework: Practical Application of Mechatronics, Research Lab, German Language
- Nanjing University of Aeronautics and Astronautics** Nanjing, China
Bachelor of Engineering in Aircraft Power Engineering September 2012-June 2016
- GPA: **93/100**; Ranking: 1/294; Honor Graduate
 - Coursework: Electronic Technology, Electrical Technique, Automatic Control Theory, C++, Software Technology Basis, Engineering Thermodynamics, Heat Transfer, Fluid Mechanics
- Experience**
- University of Michigan, Electrical and Computer Engineering** Ann Arbor, USA
May 2018- August 2018
- Research Assistant
 - Advisor: Prof. Demosthesis Teneketzis
- University of Michigan, Aerospace Engineering** Ann Arbor, USA
September 2017- April 2018
- Research Assistant
 - Advisor: Prof. Ilya Kolmanovsky, Dr. Subramanya Nagesh Rao
- University of Michigan, Electrical and Computer Engineering** Ann Arbor, USA
February 2017- April 2018
- Research Assistant
 - Advisor: Prof. Necmiye Ozay, Dr. Farshard Harirchi
- TU Darmstadt, Control Systems and Mechatronics Lab** Darmstadt, Germany
October 2015-April 2016
- Research Assistant
 - Advisor: Prof. Ulrich Konigorski, Dr. Zhongyi Gong
- Nanjing University of Aeronautics and Astronautics** Nanjing, China
Sep 2014-July 2015
- Research Assistant
 - Advisor: Prof. Jinlei Xu
- Georgia Institute of Technology, Advanced Manufacturing Lab** Atlanta, GA
July 2014-August 2014
- Research Assistant
 - Advisor: Prof. Chuck Zhang, Dr. Kan Wang
- Publication**
- Y. Ding**, F. Harirchi, S.Z. Yong, E. Jacobsen, N. Ozay. [Optimal Input Design for Affine Model Discrimination with Applications in Intention-Aware Vehicles](#). 9th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), Porto, Portugal, April 2018
- K. Singh, **Y. Ding**, N. Ozay, S.Z. Yong. Optimal Input Design for Uncertain Affine Model Discrimination. Proc. 6th IFAC Conference on Analysis and Design of Hybrid Systems (ADHS), Oxford, UK, July 2018.
- Projects**
- Adaptive Control of Partial Observable Markov Decision Process(POMDP)**
- **Goals:** Design a control sequence such that the loss function is asymptotically minimized.
 - **Approach:** Convert the POMDP to belief-state MDP and study the adaptive control of MDP with general state space.
 - **Challenges:** Design of the control sequence which could minimize the regret of the adaptive control problem with the partial observation.

Deep Reinforcement Learning for Autonomous Vehicles

- **Goals:** Designed a simulated traffic environment to test and verify the various control algorithms for autonomous vehicles
- **Approach:** Using Level-k game theory to simulate the traffic environment and using double DQN to design high-level control strategy for the fully autonomous vehicles
- **Challenges:** Implementation and stabilization of deep reinforcement learning, and reward design.

RL Safety: Avoiding Catastrophic States with Intrinsic Fear [\[PDF\]](#)

- **Goals:** Designed an algorithm to avoid visiting catastrophic states during deep reinforcement learning and thus to improve the RL safety.
- **Approach:** Vanilla DQN and DQN equipped with supervised intrinsic fear model
- **Challenges:** Implementation of supervised intrinsic fear model, choice of hyper parameters to stabilize DQN and how to guaranteed the optimality invariance

Papers Review: Decentralized Stochastic Control with Special Information Patterns [\[PDF\]](#)

- **Papers reviewed:** Ho and Chu, 1972; Yoshikawa, 1978; Witsenhausen, 1971; Varaiya and Walrand, 1978; Nayyar et al., 2011; Hsu and Marcus, 1982

Non-Asymptotic Intention Estimation for Vehicle Safety [\[Proposal\]](#)[\[Paper\]](#)[\[Vedio\]](#) [\[Poster\]](#)

- **Goals:** Designed optimal separating inputs that guarantee that the outputs of all the affine models with uncertain initial conditions and noise cannot be identical over a finite horizon. Applied this approach to driver intention discrimination in autonomous vehicle
- **Approach:** Robust optimization, bi-level optimization and mixed integer linear programming
- **Challenges:** Converted non-convex optimization problem to tractable mixed integer linear programming

A Multi-User Simulator for Testing Guardian, Intention Estimation & Autonomy Functions [\[Poster\]](#)

- **Goals:** Designed a human-in-the-loop driving simulator which would allow (1)observing human response to barrier function supervisor, (2)intention estimation and data collection and (3)autonomous driving testing
- **Simulator setup:** Logitech G920 Racing Wheel, Designed using MATLAB/Simulink, Drake
- **Challenges:** Incorporation of vehicle dynamic models

Model-free Optimal Control Based Automotive Control System Falsification [\[PDF\]](#)

- **Goals:** Traditional testing methods depend on developing test scenarios that cover as many cases as possible which can be time-consuming and may miss the potential failures due to the complexity of the system. Therefore, more advanced techniques which can fast and robustly compute the falsifying control input are needed.
- **Approach:** Pontryagin's Maximum Principle
- **Challenges:** Linearization of nonlinear dynamics and numerical simulation

Prediction of Uber Pickup Demands in New York City [\[PDF\]](#)

- **Goals:** Predicted the demand on Uber pickups in certain location and at certain time to help city regulator analyze the impact of Uber, and help Uber allocate and schedule its capacity to serve the demands better.
- **Approach:** Implemented and compared various classification methods (decision tree, random forest, SVM, NN, Naive Bayesian, K-nearest) and regression methods (NN)
- **Challenges:** Computational expense of SVM and multilayers NN. Availability of the dataset whose features have more connection toUber pickups

Modeling and Control Design for a Highly Dynamic Self-Propelled Driving Simulation [\[PPT\]](#)

- **Goals:** Conducted modeling works of electrical machines (PMSM and DC-Motor) and designed both high-level motion planning controller and low-level motor controller, and then co-simulated between CarMaker, Siemens NX and MATLAB/ Simulink
- **Approach:** Used MPC-based motion cueing algorithm to calculate nonlinearities of human perception and PID controller for electrical machines (PMSM and DC-Motor)
- **Challenges:** Coordination between high-level MPC controller and low-level PID controller.

Prediction of Phonon Thermal Conductivity by First Principle Calculation

- **Goals:** Calculated the thermal conductivity of new materials like graphene from the first principle
- **Approach:** First calculated second-order force constants by Phonopy and third-order force constant by supercell approach. Then, calculated the lattice thermal conductivity iteratively by ShengBTE
- **Challenges:** Understanding the concepts in solid state physics and quantum mechanics

Manufacturing of High Quality Bucky-tape with Aligned and Crosslinked Carbon Nanotubes

- Experimented on fabrication process and quality control

Airborne Testing Platform Design for Micro Power System of UAVs

- Conducted numerical simulation of model in Fluent to find a position which can maximize lift force and minimize air drag

Awards

DAAD scholarship, 2015

CSC scholarship, 2015-2016

Ford Motor Company, The Alan Mulally Leadership Scholarship(only winner in China), 2105

Chinese Aviation Electromechanical System Company, Excellent Scholarship, 2014

Chinese Mathematics Competition, 1st Prize, 2013

Chinese National Scholarship, 2013