JIACHEN LI

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EDUCATION

- **University of California, Berkeley (UC Berkeley), USA** *08/2016 – present*
  - Ph.D. candidate in Department of Mechanical Engineering; Research Advisor: Masayoshi Tomizuka
  - Graduate Student Researcher in Mechanical Systems Control Laboratory & Berkeley DeepDrive
  - Major: Controls; Minors: Machine Learning, Optimization.
- **Harbin Institute of Technology (HIT), China** *08/2012 – 07/2016*
  - B. Eng. in Automation, Honors School
  - Dissertation: A Novel Variable Selection Approach based on Partial Least Squares and Its Application in Process Control

RESEARCH INTERESTS

- Machine learning, artificial intelligence, optimization approaches and their applications to probabilistic behavior prediction, decision making and motion planning for intelligent systems such as autonomous vehicles and robotics.

RESEARCH AND PROJECTS

Mechanical Systems Control Laboratory & Berkeley DeepDrive, UC Berkeley

- **Topic: Interaction-Aware Probabilistic Behavior Prediction for On-Road Vehicles** *08/2017 – present*

  The research aims at recognizing driver behaviors and traffic situations as well as predicting future trajectories for multiple highly interactive agents jointly. The methodologies mainly cover probabilistic graphical models, deep learning, computer vision techniques and Bayesian theories.
  - Proposed and implemented a Deep Hidden Markov Model (DHMM) to recognize driver behaviors;
  - Proposed and implemented a generic hierarchical framework for interactive scene evolution prediction;
  - Proposed and implemented an adversarial learning framework for time-series prediction;
  - Proposed and implemented a generative neural system for multi-modal trajectory distribution learning.
- **Topic: Occluded Multi-Object Tracking and Motion Prediction** *08/2017 – present*

  The research aims at realizing accurate and robust tracking of surrounding traffic participants simultaneously in a uniform framework as well as handling partial or complete occlusions by incorporating learning-based behavioral models to make long-term motion prediction. The methodologies mainly covers sequential Monte Carlo, deep learning and probabilistic graphical models.
  - Proposed and implemented a constrained mixture sequential Monte Carlo (CMSMC) approach;
  - Proposed and implemented a generic tracking and trajectory prediction framework based on CMSMC;
  - Enhanced tracking and prediction performance under occlusions by incorporating learning-based deep generative models;
- **Topic: Solving Constrained Optimization Problems with Neural Networks** *09/2016 – 07/2017*

  The research aimed at incorporating soft constraints into neural networks to solve nonlinear optimization problems. The proposed approach was used to obtain future trajectories of the ego vehicle.
  - Proposed and implemented Constrained Policy Net (CPN) to solve nonlinear constrained optimization;
  - Utilized CPN to generate safe and feasible ego vehicle motions;

- **Topic: Decision Making via Deep Q-Net Based Inverse Reinforcement Learning** *08/2017 – 12/2017*

  The project aimed at enabling the autonomous vehicles to learn to make optimal lane keeping and lane change behaviors in highway scenarios from expert demonstrations, which can generate collision-free, feasible and smooth trajectories. The methodologies mainly cover deep (inverse) reinforcement learning.

  - Solved optimization problems to obtain optimal expert demonstrations;
  - Incorporated the deep Q-Network as the reinforcement learning step in IRL framework;

Research Institute of Intelligent Control and System, Harbin Institute of Technology (HIT)

- **Topic: A Novel Variable Selection Approach for Eliminating Redundant Information** *07/2014 – 02/2016*

  The research aimed at proposing a novel variable selection approach based on modified partial least squares (PLS) regression, which is applied in process control to eliminate redundant information.

  - Modified the canonical PLS regression and reduced the computational cost of the algorithm;
  - Proposed a novel variable selection approach based on modified PLS regression;
  - Applied the variable selection approach to a numerical and practical industrial process and tested the validation and efficiency of the method;
  - Participated in the design of a variable selection aided residual generator;

COMPUTER SKILLS

- **Programming**: Python, C & C++, MATLAB;
- **Deep Learning Framework**: TensorFlow, PyTorch, Caffe;
- **Design & Simulation**: ROS, Multisim, AutoCAD, OrCAD;
- **Others**: LaTeX

SELECTED PUBLICATIONS

- **J. Li**, H. Ma, and M. Tomizuka, "Conditional Generative Neural System for Probabilistic Trajectory Prediction", submitted to *2019 IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*.
- **J. Li**, W. Zhan, Y. Hu, and M. Tomizuka, "Generic Tracking and Prediction Framework and Its Application to Autonomous Driving", submitted to *IEEE Transactions on Intelligent Transportation Systems*.
- **J. Li***, H. Ma*, and M. Tomizuka, "Interaction-aware Multi-Agent Tracking and Probabilistic Behavior Prediction via Adversarial Learning", submitted to *2019 IEEE International Conference on Robotics and Automation (ICRA)*.
- **J. Li**, H. Ma, W. Zhan, and M. Tomizuka, "Generic Probabilistic Interactive Situation Recognition and Prediction: From Virtual to Real", in *2018 IEEE International Conference on Intelligent Transportation Systems,* 2018.
- **J. Li**, W. Zhan, and M. Tomizuka, "Generic Vehicle Tracking Framework Capable of Handling Occlusions Based on Modified Mixture Particle Filter", in *2018 IEEE Intelligent Vehicles Symposium (IV),* pp. 936-942, 2018.
- W. Zhan, L. Sun, Y. Hu, **J. Li**, and M. Tomizuka, "Towards a Fatality-Aware Benchmark of Probabilistic Reaction Prediction in Highly Interactive Driving Scenarios", in *2018 IEEE International Conference on Intelligent Transportation Systems,* 2018.
- W. Zhan, **J. Li**, Y. Hu, and M. Tomizuka, "Safe and Feasible Motion Generation for Autonomous Driving via Constrained Policy Net", in *43rd Annual Conference of the IEEE Industrial Electronics Society,* pp. 4588-93, 2017.
- **J. Li**, C. Duan, and Z. Fei, "A Novel Variable Selection Approach for Redundant Information Elimination Purpose of Process Control", *IEEE Transactions on. Industrial Electronics*, vol. 63, no 3, pp. 1737-1744, 2016.

PROFESSIONAL EXPERIENCE

- *Reviewer***,** IEEE Transactions on Industrial Electronics, Intelligent Transportation Systems *01/2017 – present*
- *Graduate Student Researcher***,** MSC Lab, Berkeley DeepDrive**,** UC Berkeley *08/2016 – present*
- *Research Assistant,* Research Institute of Intelligent Control and Systems, HIT *08/2014 – 07/2016*
- *Teaching Assistant*, Automatic Control Theory, Introduction to Circuits, HIT *09/2014 – 01/2015*