**Wenhan (Winston) Cao**

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**RESEARCH INTERESTS**

My research interests are optimal control and estimation using Bayesian machine learning, with applications to autonomous vehicles and robots.

**EDUCATION**

**Tsinghua University, Beijing, China**

*Ph.D. Student, School of Vehicle and Mobility, September 2019-Now*

Supervisor: Dr. [Shengbo Eben Li](https://scholar.google.com/citations?user=Dxiw1K8AAAAJ&hl=en), Professor of Mechanical Engineering and Artificial Intelligence

Co-supervisor: Dr. [Chang Liu](http://www2.coe.pku.edu.cn/FACULTY/LIUCHANG/author/chang-liu-%E5%88%98%E7%95%85/index.html), Assistant Professor of Intelligent Robotics Systems

**The University of Manchester, Manchester, UK**

*Visiting Ph.D. Student, Department of Computer Science, January 2023-June 2024*

Supervisor: Dr. [Wei Pan](https://panweihit.github.io/), Senior Lecturer of Computer Science

**Technical University of Munich, Munich, Germany**

*Visiting Ph.D. Student, School of Computation, Information and Technology, September 2023-December 2023*

Supervisor: Dr. [Sandra Hirche](https://www.ce.cit.tum.de/en/itr/home/), Professor of Control and Optimization

**Beijing Jiaotong University, Beijing, China**

*Bachelor of Engineering, School of Electrical Engineering, September 2015-June 2019*

GPA ranking: 1/305

**SELECTED PAPERS**

**Wenhan Cao**, Shiqi Liu, Chang Liu, Zeyu He, Stephen S.-T. Yau & Shengbo Eben Li. *Convolutional Bayesian Filtering.* Submitted to IEEE Transactions on Automatic Control (Available at <https://arxiv.org/abs/2404.00481>).

**Wenhan Cao**, Chang Liu, Zhiqian Lan, Shengbo Eben Li, Wei Pan & Angelo Alessandri. *Robsut Bayesian Inference for Moving Horizon Estimation.* Provisionally Accepted by Automatica (Available at <https://arxiv.org/abs/2210.02166>).

Shiqi Liu, **Wenhan Cao**, Chang Liu, Tianyi Zhang & Shengbo Eben Li. *Convolutional Unscented Kalman Filter for Multi-Object Tracking with Outliers.* Accepted by IEEE Transactions on Intelligent Vehicles (Available at <https://arxiv.org/abs/2406.01380>).

**Wenhan Cao** & Wei Pan (2024). *Impact of Computation in Integral Reinforcement Learning for Continuous-Time Control.* In 2024 International Conference on Learning Representations (ICLR). **(Spotlight)**

**Wenhan Cao**, Alexandre Capone, Rishabh Yadav, Sandra Hirche & Wei Pan. *Computation-Aware Learning for Stable Control with Gaussian Process.* Accepted by Robotics: Science and Systems (RSS) 2024.

**Wenhan Cao**, Chang Liu, Zhiqian Lan, Yingxi Piao & Shengbo Eben Li (2023, May). *Generalized Moving Horizon Estimation for Nonlinear Systems with Robustness to Measurement Outliers.* In 2023 American Control Conference (ACC) (pp. 1614-1621). IEEE.

Jingliang Duan, **Wenhan Cao**, Yang Zheng & Lin Zhao (2023). *On the Optimization Landscape of Dynamic Output Feedback Linear Quadratic Control.* IEEE Transactions on Automatic Control. **(Regular Paper)**

**Wenhan Cao,** Jingliang Duan, Shengbo Eben Li, Chen Chen, Chang Liu, & Yu Wang. (2022, December). *Primal-Dual Estimator Learning Method with Feasibility and Near-Optimality Guarantees*. In 2022 IEEE 61st Conference on Decision and Control (CDC) (pp. 4104-4111). IEEE.

**Wenhan Cao**, Jianyu Chen, Jingliang Duan, Shengbo Eben Li & Yao Lyu. (2021). *Reinforced Optimal Estimator*. IFAC-PapersOnLine, 54(20), 366-373.

**HONORS & AWARDS**

*Student Best Paper Finalist of 2021 IFAC Modeling, Estimation and Control Conference,* Texas, USA, 2021

*National Scholarship*, Beijing, China, 2016

*The First Prize Scholarship*, Beijing, China, 2016 – 2018

**INVITED TALKS & CONFERENCES PRESENTATIONS**

*NANO filter: Bayesian Filtering with Natural Gradient Gaussian Approximation* at the Department of Astronomy, Tsinghua University, Beijing, China, hosted by Prof. [Zheng Cai](https://i.astro.tsinghua.edu.cn/~zcai/index.html), August 2024.

*Convolutional Bayesian Filtering* at the Department of Mathematical Sciences, Tsinghua University, Beijing, China, hosted by Prof. [Stephen Shing-Toung Yau](https://homepages.math.uic.edu/~yau/), February 2024.

*Generalized Moving Horizon Estimation for Nonlinear Systems with Robustness to Measurement Outliers* in 2023 American Control Conference, San Diego, CA, USA (Oral Presentation), May 2023.

*Learning-based state estimation methods* at the Technical University of Munich, Munich, Germany (Online Presentation), hosted by Prof. [Sandra Hirche](https://www.ce.cit.tum.de/en/itr/home/), February 2023.

*Primal-Dual Estimator Learning Method with Feasibility and Near-Optimality Guarantees* in 2022 IEEE 61st Conference on Decision and Control, Cancún, Mexico (Oral Presentation), December 2022.

*Reinforced Optimal Estimator* in 2021 IFAC Modeling, Estimation and Control Conference, Texas, USA (Oral Presentation), October 2021.

*Accelerated Inverse Reinforcement Learning with Randomly Pre-sampled Policies for Autonomous Driving Reward Design* in 2019 IEEE Intelligent Transportation Systems Conference, Auckland, New Zealand (Oral Presentation), October 2019.

**PROFESSIONAL SERVICES**

**Conference Reviewer:** CDC, ACC, L4DC, ICLR, AAMAS & IFAC NMPC

**Journal Reviewer:** TASE, TITS & RA-L