BO CHEN

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EDUCATION

University of Florida *May 2020 - May 2024*
Ph.D. - Mechanical Engineering

University of Florida *Aug. 2017 - May 2019*
MS - Aerospace Engineering

Northwestern Polytechnical University *Sep. 2013 - Jun. 2017*
BE - Detection, Guidance, and Control Technology

RESEARCH INTERESTS

Autonomy, Privacy, Optimization.

SKILLS

Privacy-Enhanced Technology: Differential Privacy.
Network Systems: Disease Spreading Networks, Graph-Based Multiagent Planning Systems.
Privacy Protections for Data: Numerical Data, Symbolic Data (e.g., text).
Private Learning Algorithms: Differentially Private Stochastic Gradient Descent, Federated Learning.
Programming Softwares: Python (TensorFlow, PyTorch, Opacus), MATLAB, CasADi.

PUBLICATIONS

- **B. Chen**, K. Leahy, A. Jones, and M. Hale, "Differential Privacy for Symbolic Systems with Application to Markov Chains", *Automatica*, 2022, Accepted; in press. [Link].
- **B. Chen**, C. Hawkins, M.O. Karabag, C. Neary, M. Hale, and U. Topcu, "Differential Privacy in Cooperative Multiagent Planning", in *Proceedings of the Conference on Uncertainty in Artificial Intelligence (UAI) 2023*. [Link].
- **B. Chen** and M. Hale, "The Bounded Gaussian Mechanism for Differential Privacy", 2022, Under review. [Link].
- **B. Chen**, C. Hawkins, K. Yazdani, and M. Hale, "Edge differential privacy for algebraic connectivity of graphs", in *Proceedings of the 60th IEEE Conference on Decision and Control (CDC)*, 2021, pp. 2764–2769. [Link].
- N.S. Raman, **B. Chen**, P. Barooah, "On energy-efficient HVAC operation with Model Predictive Control: A multiple climate zone study,", *Applied Energy*, 2022, Accepted; in press. [Link].
- C. Hawkins, **B. Chen**, K. Yazdani, and M. Hale, "Node and Edge Differential Privacy for Graph Laplacian Spectra: Mechanisms and Scaling Laws", 2022, Under review. [Link].
- N.S. Raman, K. Devaprasad, **B. Chen**, H.A. Ingley, and P. Barooah, "Model predictive control for energy-efficient HVAC operation with humidity and latent heat considerations", *Applied Energy*, 2020, Accepted; in press. [Link].
- B. Fallin, C. Hawkins, **B. Chen**, P. Gohari, A. Benvenuti, U. Topcu, M. Hale, "Technical Report: Differential Privacy for Stochastic Matrices Using the Matrix Dirichlet Mechanism", Under review. [Link].

PROFESSIONAL EXPERIENCE

Control, Optimization, and Robotics Engineering (CORE) Lab, Gainesville, FL *May 2020 - Present*
Graduate Research Assistant

- **Privacy in Disease Spreading Networks:** Developed differentially private mechanisms to protect participants' privacy by adding carefully calibrated noise to the weights and basic reproduction number (R_0) of networked SIS/SIR models. Tradeoffs between the level of privacy protections and precision of privatized R_0 were quantified.
- **Privacy in Symbolic Data:** Developed differentially private mechanisms for logically coherent text sentences. These novel mechanisms offer the capability to produce privacy-preserved sentences in which the logical flow between words is maintained. Analytical and empirical tradeoffs on Hamming distance between original sentences and privatized sentences are quantified, which provides insights into selecting an appropriate level of privacy protection.
- **Privacy in Data with Bounded Supports:** Developed a differentially private noise-adding mechanism for multivariate data with bounded supports. The proposed mechanism outperforms the existing mechanisms by achieving a reduction of around 35% in the variance of the introduced noise.

- **Privacy in Learning Algorithms:** Conducted experiments to compare the performance of differentially private machine/federate learning with multi-modal medical data.

Distributed Control of Energy Systems (DiCE) Lab, Gainesville, FL *Jan. 2019 - Apr. 2020*
Graduate Student Researcher

- **Optimization:** Developed a novel energy-efficient commercial building heating, ventilation, and air conditioning (HVAC) control algorithm. The additional energy savings due to the proposed controller over the baseline algorithm, which has been used in most of the commercial buildings in the US, is up to 30%.
- **Data Preprocessing and Analysis:** Retrieved outdoor weather data from public databases such as Weather Underground and National Solar Radiation Database, preprocessing it for simulations; Visualized data collected from components of HVAC systems and analyzed their power consumption, aiming to identify potential energy savings.

China National Cereals, Oils and Foodstuffs Corporation, Beijing, China *May 2018 – Aug. 2018*
Control Intern

- **Programming:** Developed Python programs to collect, store, and analyze various metrics received from a remote farm.

PRESENTATIONS

2023 Presented "Differential Privacy in Cooperative Multiagent Planning" at the poster section of The Conference on Uncertainty in Artificial Intelligence (UAI), Pittsburgh, PA, USA, Aug. 2023.

2023 Presented the talk "Differential Privacy for Symbolic Systems with applications to Markov Chains" at the 3rd Southeast Control Conference (SECC), Gainesville, Florida, Feb. 2023.

2021 Presented the talk "Edge Differential Privacy for Algebraic Connectivity of Graphs" at the 60th IEEE Conference on Decision and Control (CDC), Dec. 2021. (Virtual)

2021 Presented the talk "Differential Privacy for Symbolic Systems with applications to Markov Chains" as part of AFOSR Center of Excellence Review, Nov. 2021. (Virtual)