Zhe Du

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EDUCATION

University of Michigan-Ann Arbor

- Doctor of Philosophy, in Electrical and Computer Engineering **2017.09-Now**
  GPA: 4.0/4.0
  Advisors: Prof. Laura Balzano and Prof. Necmiye Ozay
- Master of Science, in Electrical and Computer Engineering **2015.09-2017.04**
  GPA: 4.0/4.0

Huazhong University of Science & Technology

- Bachelor of Engineering, in Electrical Engineering and Automation **2010.09-2014.06**
  GPA: 3.67/4.0

WORK EXPERIENCE

Graduate Student Research Assistant **2017.09-Now**
Supervisors: Prof. Necmiye Ozay and Prof. Laura Balzano

Graduate Student Instructor (EECS553: Machine Learning) **2022.09-Now**
Supervisor: Prof. Laura Balzano

Graduate Student Instructor (EECS545: Machine Learning) **2021.09-2021.12**
Supervisors: Prof. Clayton Scott and Prof. Alfred Hero

RESEARCH INTERESTS & TOPICS

Time-Varying Systems, System Identification, Data-Driven Control, Model Reduction, Clustering, Time Series Analysis, Perturbation Analysis, Non-asymptotic Statistical Analysis

Learning Time Series **2021.10-Now**
Supervisors: Prof. Necmiye Ozay and Prof. Laura Balzano

- Studied the estimation of time series models, e.g., ARX, ARMAX, from a single trajectory of data, under conditions such as unknown model orders or correlated process noise. The performances are provably guaranteed by finite-sample analysis.

Reduced-Order Modeling with Manifold Optimization **2022.01-Now**
Supervisors: Prof. Laura Balzano and Prof. Peter Seiler

- Working on data-driven reduced-order modeling for linear time-invariant systems. Proposed a novel approach that is based on the optimization over a subspace manifold.

Mode Reduction for Time-Varying Systems **2017.09-2022.06**
Supervisors: Prof. Laura Balzano and Prof. Necmiye Ozay

- Looked into the model complexity of time-varying systems incurred by the number of modes. Proposed a clustering-based method that constructs a reduced-mode system. The reduced system is provably close to the original system in terms of trajectory, stability properties, and optimal controller design.

Identification and Adaptive Control for Time-Varying Systems **2020.11-2021.06**
Supervisors: Prof. Samet Oymak, Prof. Laura Balzano, and Prof. Necmiye Ozay

- An algorithm for identifying Markov jump systems is proposed, based on which an adaptive quadratic control scheme is developed. The identification sample complexity and adaptive control performance guarantees are provided.

Robust Online Identification for Switched Systems **2016.09-2017.06**

Supervisors: Prof. Necmiye Ozay and Prof. Laura Balzano

- Considered the problem of learning switched systems (time series) from input-output data in an online fashion. A robust algorithm is proposed that can estimate both the model parameters as well as mode switching sequence.

PUBLICATIONS

- **Du, Zhe***, Zexiang Liu*, Jack Weitze, and Necmiye Ozay. "Sample complexity analysis and self-regularization in identification of over-parameterized ARX models." 2022 61th IEEE Conference on Decision and Control (CDC) (forthcoming). IEEE, 2022.
- **Du, Zhe**, Laura Balzano, and Necmiye Ozay. "Mode reduction for Markov jump systems." Mode reduction for Markov jump systems. IEEE Open Journal of Control Systems, 1:335-353, 2022.
- **Du, Zhe**, Necmiye Ozay, and Laura Balzano. "Clustering-based mode reduction for Markov jump systems." Learning for Dynamics and Control Conference. PMLR, 2022, pp. 689–701.
- **Du, Zhe***, Yahya Sattar*, Davoud Ataee Tarzanagh, Laura Balzano, Necmiye Ozay, and Samet Oymak. "Data-driven control of Markov jump systems: sample complexity and regret bounds." 2022 American Control Conference (ACC), 2022, pp. 4901-4908.
- **Du, Zhe***, Yahya Sattar*, Davoud Ataee Tarzanagh, Laura Balzano, Samet Oymak, and Necmiye Ozay. "Certainty equivalent quadratic control for Markov jump systems." 2022 American Control Conference (ACC), 2022, pp. 2871-2878.
- **Du, Zhe***, Yahya Sattar*, Davoud Ataee Tarzanagh, Laura Balzano, Necmiye Ozay, and Samet Oymak. "Identification and adaptive control of Markov jump systems: sample complexity and regret bounds." ICML Workshop on Reinforcement Learning Theory, 2021.
- **Du, Zhe***, Necmiye Ozay, and Laura Balzano. "Mode clustering for Markov jump systems." 2019 IEEE 8th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP). IEEE, 2019.
- **Du, Zhe***, Laura Balzano, and Necmiye Ozay. "A robust algorithm for online switched system identification." IFAC-PapersOnLine 51.15 (2018): 293-298.
- Ledva, Gregory S., **Zhe Du**, Laura Balzano, and Johanna L. Mathieu. "Disaggregating load by type from distribution system measurements in real time." In Energy Markets and Responsive Grids, pp. 413-437. Springer, New York, NY, 2018.

AWARDS

- CAMSAP 2019 Best Student Paper Award (3rd Place) **2019.12**