

# BOYA HOU

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## ACADEMIC APPOINTMENT

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**University of Illinois Urbana-Champaign**

Since October 2024

Postdoctoral Research Associate

Advisor: Maxim Raginsky, Olgica Milenkovic

## EDUCATION

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**University of Illinois Urbana-Champaign**

2024

PhD in Electrical and Computer Engineering

Advisor: Subhonmesh Bose

Committee: Subhonmesh Bose, Maxim Raginsky, Rayadurgam Srikant, Tamer Basar, Umesh Vaidya

**University of Illinois Urbana-Champaign**

2019

Master of Engineering in Electrical and Computer Engineering

**Zhejiang University**

2019

Bachelor of Engineering in Electrical Engineering

## RESEARCH INTERESTS

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My research seeks to redefine modeling for intelligent systems by unifying modern machine learning with the rigor of systems and control theory, with an emphasis on applications in power systems and biology. Drawing on tools from statistical learning theory, operator theory, systems and control theory, I develop theoretical frameworks and computational methods for data-driven learning and control of complex dynamical systems. Active thrusts include:

- An operator-theoretic perspective for learning and representing nonlinear dynamical systems;
- Behavioral approach to modeling and control of systems beyond linearity;
- Analysis and control of spatially coupled network RNA velocity models;
- Preparing power grids for electrified transportation.

## PUBLICATIONS AND PREPRINTS

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### Monograph

- [1] **B. Hou**, S. Bose, N. Dahlin, U. Vaidya. Kernel Method for Learning Dynamical Systems. To be submitted to Foundations and Trends® in Machine Learning. Sample chapters will be available on my website, full monograph in preparation.

## Published Journal Articles

- [2] J. Lee, B. Hamzi, **B. Hou**, H. Owhadi, G. Santin, U. Vaidya. *Kernel Methods for the Approximation of the Eigenfunctions of the Koopman Operator*. Physica D: Nonlinear Phenomena, 2025.
- [3] A. Reddy Ramapuram Matavalam, **B. Hou**, H. Choi, S. Bose, U. Vaidya. *Data-Driven Transient Stability Analysis Using the Koopman Operator*. International Journal of Electrical Power and Energy Systems, 2024.
- [4] **B. Hou**, A. Reddy Ramapuram Matavalam, S. Bose, U. Vaidya. *Propagating Uncertainty Through System Dynamics in Reproducing Kernel Hilbert Space*. Physica D: Nonlinear Phenomena. Special issue: Topics at the Interface of Machine Learning and Dynamical Systems, 2024.
- [5] **B. Hou**, S. Bose, L. Marla and K. Haran. *Impact of Aviation Electrification on Airports: Flight Scheduling and Charging*. IEEE Transactions on Intelligent Transportation Systems, 2023.

## Published Conference Proceedings

- [6] **B. Hou**, S. Sanjari, N. Dahlin, S. Bose, U. Vaidya. *Sparse Learning of Dynamical System in Reproducing Kernel Hilbert Space: An Operator-Theoretic Approach*. In Proceedings of the Fortieth International Conference on Machine Learning (ICML), 2023.
- [7] **B. Hou**, S. Sanjari, N. Dahlin, S. Bose. *Compressed Decentralized Learning of Conditional Mean Embedding Operators in Reproducing Kernel Hilbert Space*. In Proceedings of the 37th Association for the Advancement of Artificial Intelligence (AAAI) Conference on Artificial Intelligence, 2023.
- [8] **B. Hou**, S. Bose and U. Vaidya. *Sparse Learning of Kernel Transfer Operators*. In Proceedings of Asilomar Conference on Signals, Systems, and Computers, 2021.
- [9] **B. Hou**, S. Bose, and K. Haran. *Powering Electric Aircraft at O'Hare Airport: A Case Study*. In Proceedings of IEEE Power and Energy Society General Meeting, 2020.

## Workshops & Non-Archival Venues

- [10] **B. Hou**, M. Raginsky, A. Pandey, O. Milenkovic. *Multi Network RNA Velocity*. National Institute for Theory and Mathematics in Biology (NITMB) MathBio Convergence Conference, 2025.
- [11] **B. Hou**, A. Reddy Ramapuram Matavalam, S. Bose, U. Vaidya. *Propagating Uncertainty Through System Dynamics in Reproducing Kernel Hilbert Space*. Late breaking poster paper at American Control Conference (ACC), 2023.

## Preprints

- [12] **B. Hou**, S. Sanjari, A. Koppel, S. Bose. *Nonparametric Sparse Online Learning of the Koopman Operator*. Minor revision at SIAM Journal on Control and Optimization (SICON).
- [13] **B. Hou**, M. Raginsky. *A Behavioral Perspective on Subspace and Interpolation Methods for Simulation of Linear Time-Invariant Systems*. Under review at American Control Conference (ACC).
- [14] **B. Hou**, M. Raginsky, A. Pandey, O. Milenkovic. *Spatially-Coupled Network RNA Velocities: A*



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*Control Theoretic Perspective.* Under submission at Proceedings of the National Academy of Sciences (PNAS).

## Journal Articles in Preparation

(Preprints will be available on my website soon)

- [15] **B. Hou**, M. Raginsky. *A Behavioral Framework on Nonlinear Systems in Reproducing Kernel Hilbert Spaces.* To be submitted to IEEE Transactions on Automatic Control (TAC).

## AWARDS/HONORS

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- The NSF-Simons National Institute for Theory and Mathematics in Biology (NITMB) Early Career Travel Award, 2025.
- Best Poster Award, Power Systems Engineering Research Center (PSERC), Industry Advisory Board (IAB) Meeting, 2024.
- Rising Stars in EECS, Georgia Tech, 2023
- Mavis Future Faculty Fellows (MF3), UIUC, 2023-2024.
- M.A.Pai Scholarship, UIUC, 2023.
- Association for the Advancement of Artificial Intelligence (AAAI) Student Scholarship, 2023.
- The Second-place winner in the United States Association for Energy Economics (USAEE) Case Competition, 2019.
- UCLA Cross-disciplinary Scholars in Science and Technology (CSST) Scholarship, 2017.

## INVITED TALKS AND PRESENTATIONS

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### Multi Network RNA Velocity

- August 2025, the NSF-Simons National Institute for Theory and Mathematics in Biology (NITMB) MathBio Convergence Conference. (Talk)

### Nonparametric Learning of Dynamical Systems

- Invited speaker at the Operator Learning in Control workshop at the 64<sup>th</sup> IEEE Conference on Decision and Control, Rio de Janeiro, Brazil. (Unable to attend due to visa concerns).
- April 2025, UIUC, the 11th Midwest Workshop on Control and Game Theory. (Poster)
- December 2024, Power Systems Engineering Research Center (PSERC), Industry Advisory Board (IAB) Meeting. (Poster)
- October 2024, Cornell ORIE, Young Researcher's Workshop. (Poster)
- September 2024, Sandia National Laboratories, Sandia Machine Learning and Deep Learning (MLDL) Workshop. (Talk)
- July 2024, Fields Institute, the 4th Symposium on Machine Learning and Dynamical Systems. (Poster)



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- May 2024, Alan Turing Institute, Machine Learning and Dynamical Systems Seminar. (Talk)
- April 2024, Northwestern, the 10th Midwest Workshop on Control and Game Theory. (Poster)
- April 2024, UIUC, group meeting of Prof. R.Srikant and Prof. Carolyn Beck. (Talk)
- March 2024, MIT, group meeting of Prof. Navid Azizan. (Talk)
- Feb. 2024, Georgia Tech, Algorithms and Randomness Center (ARC) colloquium. (Talk)
- Nov. 2023, Georgia Tech, EECS Rising Stars Workshop. (Talk)
- Nov. 2023, University of Illinois, Urbana-Champaign, Grad Seminar in Special Topics. (Talk)

## TEACHING

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- Teaching Assistant, ECE 365 Data Science and Engineering, UIUC. Fall 2021
- Organized and taught weekly reading group on *Learning in Games and Mean Field Games*, with participants from Prof. Subhonmesh Bose's and Prof. Tamer Basar's groups. Fall 2023
- Organized and taught weekly reading group on *Functional and Operator-Theoretic Foundation of Learning*, joined by Prof. Umesh Vaidya (Clemson), Prof. Amarsagar Reddy Ramapuram Matavalam (AUS), Prof. Subhonmesh Bose and their students. Summer & Fall 2021

## ACADEMIC ACTIVITIES

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- Journal Reviewed: Journal of Machine Learning Research (JMLR), SIAM Journal on Control and Optimization (SICON), IEEE Transactions on Automatic Control (TAC), Applied Energy, Nonlinear Dynamics.
- Conference Reviewed: Program committee for the 40th Annual AAAI Conference on Artificial Intelligence (AAAI 26), Conference on Decision and Control (CDC), American Control Conference (ACC), Learning for Dynamics & Control Conference (L4DC).
- Visiting undergrad scholar, Henry Samueli School of Engineering, UCLA. July 2017-Sep. 2017

## TECHNICAL SKILLS

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**Programming:** Python, C, C++

**Applications:** OpenAI Gym, Matlab, Simulink, Sklearn, CVXPY.

## REFERENCES

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- Subhonmesh Bose, Associate Professor  
Department of Electrical and Computer Engineering  
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- Maxim Raginsky, Professor



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