

# Bhathiya Rathnayake

📍 Baltimore, MD

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🔗 Publications

LinkedIn

🌐 My Website

## EDUCATION

### University of California San Diego

*PhD in Electrical Engineering (Intelligent Systems, Robotics, & Control), GPA: 3.85/4.0*

**Jul 2022 – Jun 2025**

*San Diego, CA*

### Rensselaer Polytechnic Institute

*MS in Computer & Systems Engineering, GPA: 3.89/4.0*

**Jan 2020 – May 2022**

*Troy, NY*

### University of Peradeniya

*BSc in Electrical & Electronic Engineering, GPA: 3.65/4.0*

**Jan 2014 – Oct 2017**

*Sri Lanka*

## SKILLS

**Control Systems:** Non-linear Control, Hybrid Systems Control, Adaptive Control, Model Predictive Control

**Electrical Engineering:** Inverter-based Resource (IBR) Control, Power Systems, Power Electronics, Analog Circuits

**Data Science:** Probabilistic Modeling, Statistical Methods

**Scientific Machine Learning:** TensorFlow, Keras, PyTorch, Scikit-learn

**Coding Languages:** Matlab/Simulink, Python

**Application Areas:** Energy Systems, Traffic Flow, Water Systems, Natural Gas Systems

## AWARDS

- ROSEI Postdoctoral Fellowship 2025 - Ralph O'Connor Sustainable Energy Institute, Johns Hopkins University
- Robert Skelton Systems and Control Best Ph.D. Dissertation Award 2025 - University of California San Diego

## RESEARCH EXPERIENCE

### Johns Hopkins University

**Jul 2025 – Present**

*Baltimore, MD*

*ROSEI Postdoctoral Fellow — Focus: Power Systems, Inverter-based Resources, Safety-Critical Control*

- Developing safety-critical control frameworks for inverter-dominated power systems to guarantee operational constraints on voltage, frequency, and current
- Designing decentralized and distributed controllers to ensure scalability and minimal communication among inverter-based resources
- Modeling and controlling power systems using hybrid systems formulations to incorporate both continuous dynamics and discrete events; integrating event-triggered control strategies to reduce communication overhead
- Investigating physics-informed AI techniques and data-driven approaches for black-box modeling and real-time safe control of renewable-rich grids

### University of California San Diego

**Jul 2022 – Jun 2025**

*San Diego, CA*

*Graduate Student Researcher — Focus: PDEs, Event-triggered Control, Traffic/Water Systems*

- Solved the global exponential stability problem for linear parabolic & hyperbolic PDEs under event-triggered control with dynamic triggering, addressing a problem that had **remained unsolved for 7 years**
- Developed the **first** periodic event-triggered and self-triggered control strategies for parabolic & hyperbolic PDEs with industrial applications in traffic control and water management in reservoirs
- Simulated traffic and water systems to validate the developed control algorithms
- Documented results in research articles published in IEEE Transactions on Automatic Control (IEEE TAC) & Automatica

### Los Alamos National Laboratory

**Jul 2024 - Aug 2024**

*Remote Internship*

*Graduate Intern (remote) — Focus: Estimation and Control of Gas Flow in Pipeline Networks*

- Developed observers and controllers for gas pipeline networks subject to uncertainties
- Simulated gas flow in pipelines to validate the developed control algorithms
- Documented results in a research paper published in the proceedings of the American Control Conference (ACC) 2025

<b>Rensselaer Polytechnic Institute</b>	<b>Apr 2020 - May 2022</b>
<i>Graduate Research Student — Focus: PDEs, Event-triggered Control, 3D Printing</i>	<i>Troy, NY</i>
<ul style="list-style-type: none"> <li>◦ Developed event-triggered boundary control strategies for physics-based model of melting processes (Stefan problem) and reaction-diffusion processes with applications in 3D printing</li> <li>◦ Documented results in research articles published in IEEE TAC, Automatica, &amp; International Journal of Control</li> </ul>	
<b>Sri Lanka Technological Campus</b>	<b>Jan 2018 - Jul 2019</b>
<i>Research Assistant — Focus: Hyperspectral Image Analysis</i>	<i>Sri Lanka</i>
<ul style="list-style-type: none"> <li>◦ Developed graph-based blind source separation algorithms for unmixing of hyperspectral images</li> <li>◦ Documented results in a research article published in IEEE Transactions on Geoscience and Remote Sensing</li> </ul>	
<b>University of Peradeniya</b>	<b>Jan 2017 - Oct 2017</b>
<i>Undergraduate Research Student — Focus: Robotics and Control</i>	<i>Sri Lanka</i>
<ul style="list-style-type: none"> <li>◦ Developed a <b>5-DOF underwater robotic vehicle (URV)</b> and performed system modeling and parameter identification</li> <li>◦ Designed MIMO sliding mode controllers to address trajectory tracking and path following control of the URV</li> <li>◦ Documented results in a research paper published in an IEEE conference</li> </ul>	

## PUBLICATIONS

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### Journals

- (1) **B. Rathnayake** and M. Diagne, “Global exponential stabilization of  $2 \times 2$  linear hyperbolic PDEs via dynamic event-triggered backstepping control,” *Automatica*, vol. 183, p. 112617, 2026
- (2) E. Somathilake, **B. Rathnayake**, and M. Diagne, “Output feedback periodic event-triggered and self-triggered control of coupled  $2 \times 2$  linear hyperbolic PDEs,” *Automatica*, vol. 179, p. 112433, 2025
- (3) P. Zhang\*, **B. Rathnayake\***, M. Diagne, and M. Krstic, “Performance-barrier event-triggered PDE control of traffic flow,” *IEEE Transactions on Automatic Control*, vol. 70, no. 9, pp. 5720 - 5735, 2025 (\*equal contributions)
- (4) **B. Rathnayake**, M. Diagne, J. Cortes, and M. Krstic, “Performance-barrier event-triggered control of a class of reaction-diffusion PDEs,” *Automatica*, vol. 174, p. 112181, 2025
- (5) **B. Rathnayake** and M. Diagne, “Observer-based periodic event-triggered and self-triggered boundary Control of a class of parabolic PDEs,” *IEEE Transactions on Automatic Control*, vol. 69, no. 12, pp. 8836 - 8843, 2024
- (6) **B. Rathnayake** and M. Diagne, “Observer-based event-triggered boundary control of the one-phase Stefan problem,” *International Journal of Control*, vol. 97, no. 12, pp. 2975-2986, 2024
- (7) **B. Rathnayake**, M. Diagne, and I. Karafyllis, “Sampled-data and event-triggered boundary control of a class of reaction-diffusion PDEs with collocated sensing and actuation,” *Automatica*, vol. 137, p. 110026, 2022
- (8) **B. Rathnayake**, M. Diagne, N. Espitia, and I. Karafyllis, “Observer-based event-triggered boundary control of a class of reaction-diffusion PDEs,” *IEEE Transactions on Automatic Control*, vol. 67, no. 6, pp. 2905 – 2917, 2022
- (9) E. M. M. B. Ekanayake, H. M. H. K. Weerasooriya, D. Y. L. Ranasinghe, S. Herath, **B. Rathnayake**, G. M. R. I. Godaliyadda, M. P. B. Ekanayake, and H. M. V. R. Herath, “Constrained nonnegative matrix factorization for blind hyperspectral unmixing incorporating endmember independence,” *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, vol. 14, pp. 11853 - 11869, 2021
- (10) **B. Rathnayake**, E. M. M. B. Ekanayake, K. Weerakoon, G. M. R. I. Godaliyadda, M. P. B. Ekanayake, and H. M. V. R. Herath, “Graph-based blind hyperspectral unmixing via nonnegative matrix factorization,” *IEEE Transactions on Geoscience and Remote Sensing*, vol. 58, no. 9, pp. 6391-6409, 2020

### Conference Proceedings

- (1) **B. Rathnayake** and M. Diagne, “Observer-based event-triggered control of  $2 \times 2$  linear hyperbolic PDEs with switching dynamic triggering,” accepted for presentation at the 2025 IEEE Conference on Decision and Control
- (2) **B. Rathnayake**, A. Zlotnik, S. Tokareva, and M. Diagne, “Setpoint tracking and disturbance attenuation for gas pipeline flow subject to uncertainties using backstepping,” in 2025 American Control Conference, IEEE, 2025, pp. 996-1001
- (3) **B. Rathnayake** and M. Diagne, “Sampled-data boundary control of a class of reaction- diffusion PDEs: A Lyapunov-based approach,” in 2025 American Control Conference, IEEE, 2025, pp. 2426-2431
- (4) E. Somathilake, **B. Rathnayake**, and M. Diagne, “Output feedback periodic event-triggered control of coupled  $2 \times 2$  linear hyperbolic PDEs,” in 2025 American Control Conference, IEEE, 2025, p. 990-995
- (5) P. Zhang, **B. Rathnayake**, M. Diagne, and M. Krstic, “Performance-barrier periodic event-triggered PDE control of traffic flow,” in 2024 IEEE Conference on Decision and Control, IEEE, 2024, pp. 4947–4954
- (6) **B. Rathnayake**, M. Diagne, J. Cortes, and M. Krstic, “Performance-barrier-based event-triggered boundary control of a class of reaction-diffusion PDEs,” in 2024 American Control Conference, IEEE, 2024, pp. 5313–5319

- (7) P. Zhang, **B. Rathnayake**, M. Diagne, and M. Krstic, “Performance-barrier-based event-triggered boundary control of congested ARZ traffic PDEs,” IFAC-PapersOnLine, vol. 58, no. 10, pp. 182–187, 2024
- (8) **B. Rathnayake** and M. Diagne, “Self-triggered boundary control of a class of reaction-diffusion PDEs,” in 2023 IEEE Conference on Decision and Control, IEEE, 2023, pp. 6887–6892
- (9) **B. Rathnayake** and M. Diagne, “Periodic event-triggered boundary control of a class of reaction-diffusion PDEs,” in 2023 American Control Conference, IEEE, 2023, pp. 1800–1806
- (10) **B. Rathnayake** and M. Diagne, “Observer-based periodic event-triggered boundary control of the one-phase Stefan problem,” IFAC-PapersOnLine, vol. 56, no. 2, pp. 11 415–11 422, 2023
- (11) **B. Rathnayake** and M. Diagne, “Event-based boundary control of the stefan problem: A dynamic triggering approach,” in 2022 IEEE Conference on Decision and Control, IEEE, 2022, pp. 415–420
- (12) **B. Rathnayake** and M. Diagne, “Event-based boundary control of one-phase stefan problem: A static triggering approach,” in 2022 American control conference, IEEE, 2022, pp. 2403–2408
- (13) **B. Rathnayake**, M. Diagne, and I. Karafyllis, “Sampled-data boundary control of a class of reaction-diffusion PDEs with collocated sensing and actuation,” in 2021 IEEE Conference on Decision and Control, IEEE, 2021, pp. 434–441
- (14) **B. Rathnayake**, M. Diagne, N. Espitia, and I. Karafyllis, “Event-triggered output-feedback boundary control of a class of reaction-diffusion PDEs,” in 2021 American Control Conference, IEEE, 2021, pp. 4069–4074
- (15) E. Ekanayake, **B. Rathnayake**, E. Ekanayake, A. Rathnayake, H. Herath, G. Godaliyadda, and M. Ekanayake, “Enhanced hyperspectral unmixing via non-negative matrix factorization incorporating the end member independence,” in 2019 IEEE International Geoscience and Remote Sensing Symposium, IEEE, 2019, pp. 2256–2259
- (16) **B. Rathnayake**, K. Weerakoon, G. Godaliyadda, and M. Ekanayake, “Toward finding optimal source dictionaries for single channel music source separation using nonnegative matrix factorization,” in 2018 IEEE Symposium Series on Computational Intelligence, IEEE, 2018, pp. 1493–1500
- (17) **B. Rathnayake**, K. Weerakoon, G. Godaliyadda, and M. Ekanayake, “A robust control paradigm for path following of an underwater robotic vehicle,” in 2018 International Conference on Computer Science & Education, IEEE, 2018, pp. 1–6.

## REVIEW SERVICES

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- IEEE Transactions on Automatic Control
- Automatica
- IEEE Transactions on Cybernetics
- Systems & Control Letters
- International Journal of Control
- Conference on Decision and Control (CDC)- 2021, 2022, 2023, 2024
- American Control Conference (ACC)- 2025
- European Control Conference (ECC)- 2025