Chandreyee Bhowmick

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Nashville, TN, USA

Research Focus

- Distributed machine learning including federated learning and peer-to-peer learning.
- Multi-agent reinforcement learning, Graph machine learning.
- Resilient, private and secure machine learning.
- Control of cyber-physical and multi-agent systems.

Research Experience

- **Vanderbilt University** *January 2021 - Present*
  Graduate Research Assistant Nashville, USA
  - Designed resilient distributed machine learning algorithms, including federated and peer-to-peer paradigms, to improve attack-robustness and scalability.
  - Extended resilience techniques to multi-agent reinforcement learning and federated graph machine learning systems.
  - Multiple conference and journals papers, including a best paper award.
- **Amazon Web Services (AWS)** *May 2022 - August 2022*
  Applied Scientist Intern Herndon, USA
  - Developed reinforcement learning algorithms to optimize battery scheduling for renewable energy systems.
  - Applied reinforcement learning to supply chain management to optimize order timing and quantities, enhancing operational efficiency.
- **Missouri University of Science & Technology** *January 2017 - December 2019*
  Graduate Research Assistant Rolla, USA
  - Implemented resilient control algorithms for stochastic networked control systems under adversarial cyber-attacks.
  - Developed novel attack detection and mitigation schemes for both linear and nonlinear systems, ensuring robust performance in uncertain environments.
- **Indian Institute of Technology Kanpur** *July 2014 - June 2016*
  Graduate Researcher Kanpur, India
  - Designed distributed estimation and control algorithms for multi-agent systems to track random targets in formation.
  - Explored various formation shapes and implemented state estimation techniques for accurate target tracking.

Education

- **Vanderbilt University** *Jan 2021 - Present*
  Ph.D. in Electrical and Computer Engineering Nashville, USA
  - GPA: 4.0/4.0
- **Vanderbilt University** *Jan 2021 - May 2024*
  Masters' (in passing) in Electrical and Computer Engineering Nashville, USA
  - Grade: 4.0/4.0
- **Indian Institute of Technology Kanpur** *July 2014 - June 2016*
  M. Tech in Electrical Engineering Kanpur, India
  - GPA: 9.75/10.0
- **Jadavpur University** *June 2009 - May 2013*
  Bachelor of Electrical Engineering (Hons.) Kolkata, India
  - GPA: 8.11/10.0

Honors and Awards

- **Best Paper Award** at the IEEE International Conference on Distributed Computing and Artificial Intelligence (DCAI) 2024.
- **ML&Sys Rising Star 2023**, Google campus, Sunnyvale, CA, USA.
- **CPS Rising Star 2023**, University of Virginia Link Lab, Charlottesville, VA, USA.
- Student travel award to attend IEEE International Conference on Trust, Privacy and Security in Intelligent Systems and Applications (TPS-ISA) 2024.
- Selected as a student volunteer at the International Conference for High Performance Computing, Networking, Storage, and Analysis (SuperComputing 2024).
- Mark of excellence in coursework by receiving A* grade during M.Tech and Ph.D. studies.
- Highest CPI in the class (9.75/10) during the M.Tech program.
- Rank of 167 among 141799 candidates (99.88 percentile) in Graduate Aptitude Test in Engineering (GATE).
- 4 year scholarship by MHRD (Ministry of Human Resource and Development), India, 2009-2013.
- Rank of 323 out of 100000 applicants (99.68 percentile) in 2007 West Bengal Joint Entrance Exam (WBJEE), India.

Publications

Journal Articles

1. **Chandreyee Bhowmick** and Xenofon Koutsoukos (2025). **Improved Resilience in Distributed Peer-to-peer Learning Using Loss-Based Adaptive Aggregation**. Under review.
2. **Chandreyee Bhowmick** and Xenofon Koutsoukos (2025). **Improving Resilient Aggregation Against Model Poisoning Attacks Using Efficient Trimming**. Under review.
3. **Chandreyee Bhowmick**, Jiani Li, and Xenofon Koutsoukos (2025). **Adaptive Aggregation Based Resilient Learning for Distributed Actor-Critic Algorithms**. Under review at *Journal of Autonomous Agents and Multi-Agent Systems (JAAMAS)*, Springer.
4. Haifeng Niu, **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2019). **Attack Detection and Approximation in Nonlinear Networked Control Systems using Neural Networks**. In *IEEE Transactions on Neural Networks and Learning Systems*, Vol. 31, Issue 1, pp. 235-245.
5. Haifeng Niu, Avimanyu Sahoo, **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2019). **An Optimal Hybrid Learning Approach for Attack Detection in Linear Networked Control Systems**. In *IEEE/CAA Journal of Automatica Sinica*, Vol. 6, Issue 6, pp. 1404-1416.
6. Arindam Mondal, **Chandreyee Bhowmick**, Laxmidhar Behera, and Mo Jamshidi (2017). **Trajectory Tracking by Multiple Agents in Formation with Collision Avoidance and Connectivity Assurance**. In *IEEE Systems Journal*, Vol. 12, no. 3, pp. 2449-2460.

Book Chapters

1. Haifeng Niu, Avimanyu Sahoo, **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2019). **Attack Detection and Estimation for Cyber-Physical Systems by using Learning Methodology**. In *Artificial Neural Networks for Engineering Applications*, pp. 107-126, Elsevier.

Conference Proceedings

1. Robert Canady, **Chandreyee Bhowmick**, and Xenofon Koutsoukos (2025). **Decentralized Learning using Hashgraph Consensus**. Under review.
2. **Chandreyee Bhowmick**, and Xenofon Koutsoukos (2024). **Resilient Federated Learning Using Trimmed-Clipping Aggregation**. In *2024 International Conference on Trust, Privacy and Security in Intelligent Systems, and Applications (TPS-ISA)*. IEEE.
3. **Chandreyee Bhowmick**, and Xenofon Koutsoukos (2024). **Resilient Peer-to-peer Learning based on Adaptive Aggregation**. In *2024 International Conference on Distributed Computing and Artificial Intelligence (DCAI)*. IEEE.
4. **Chandreyee Bhowmick**, Jiani Li, and Xenofon Koutsoukos (2023). **Adaptive Learning from Peers for Distributed Actor-Critic Algorithms**. In *2023 International Symposium on Distributed Computing and Artificial Intelligence*, pp. 54-64. Springer.

5. **Chandreyee Bhowmick**, Mudassir Shabbir, and Xenofon Koutsoukos (2022). **Attack-Resilient Multi-Agent Flocking Control Using Graph Neural Networks**. In *2022 Mediterranean Conference on Control and Automation (MED)*, pp. 300-305. IEEE.
6. **Chandreyee Bhowmick**, Mudassir Shabbir, Waseem Abbas, and Xenofon Koutsoukos (2022). **Resilient Multi-agent Reinforcement Learning Using Medoid and Soft-medoid Based Aggregation**. In *2022 International Conference on Assured Autonomy (ICAA)*, pp. 36-45. IEEE.
7. **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2020). **Availability-Resilient Control of Uncertain Linear Stochastic Networked Control Systems**. In *2020 American Control Conference (ACC)*, pp. 4016-4021. IEEE.
8. **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2019). **Detection and Mitigation of Attacks in Nonlinear Stochastic System Using Modified χ^2 Detector**. In *2019 Conference on Decision and Control (CDC)*, pp. 139-144. IEEE.
9. **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2019). **Detection of Sensor Attacks in Uncertain Stochastic Linear Systems**. In *2019 Conference on Control Technology and Applications (CCTA)*, pp. 706-711. IEEE.
10. Haifeng Niu, Avimanyu Sahoo, **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2019). **Attack Detection in Linear Networked Control Systems by Using Learning Methodology**. In *2019 Conference on Control Technology and Applications (CCTA)*, pp. 148-153. IEEE.
11. Haifeng Niu, **Chandreyee Bhowmick**, and Sarangapani Jagannathan (2018). **A Linear Matrix Inequality Based Attack Detection Approach for Networked Control Systems**. In *2018 Conference on Decision and Control (CDC)*, pp. 5470-5475. IEEE.
12. **Chandreyee Bhowmick**, Laxmidhar Behera, Amit Shukla, and Hamad Karki (2016). **Flocking Control of Multi-agent System with Leader-Follower Architecture Using Consensus Based Estimated Flocking Center**. In *2016 Annual Conference of the IEEE Industrial Electronics Society (IECON)*, pp. 166-171. IEEE.
13. **Chandreyee Bhowmick**, and Laxmidhar Behera (2016). **Tracking of A Random Target by Circular Pattern of Mobile Agents with a Leader**. In *2016 International Conference on Systems, Man, and Cybernetics (SMC)*, pp. 607-612. IEEE.
14. Akhilesh Raj, Abishalini Sivaraman, **Chandreyee Bhowmick**, and Nishchal K. Verma (2016). **Object Tracking with Movement Prediction Algorithms**. In *2016 International Conference on Industrial and Information Systems (ICIIS)*, pp. 285-290. IEEE.
15. **Chandreyee Bhowmick**, and Laxmidhar Behera (2015). **Tracking of a Randomly Moving Target by Flock of Multiple Agents Using Leader-Follower Approach**. In *2015 National Systems Conference (NSC)*, pp. 1-5. IEEE.

Talks and Presentations

- "Resilient Federated Learning Using Trimmed-Clipping Aggregation", IEEE Conference on Trust, Privacy and Security in Intelligent Systems, and Applications (TPS-ISA). *October 2024*
  Washington DC, USA
- "Resilient Peer-to-peer Learning based on Adaptive Aggregation", International Conference on Distributed Computing and Artificial Intelligence (DCAI). *June 2024*
  Salamanca, Spain
- "Adaptive Learning in Distributed Actor-Critic Algorithms", MLCommons Rising Stars Workshop. *August 2023*
  Sunnyvale, USA
- "Adaptive Learning from Peers for Distributed Actor-Critic Algorithms", International Conference on Distributed Computing and Artificial Intelligence (DCAI). *July 2023*
  Guimarães, Portugal
- "How to Flock When There's a Bad Bird?", Vanderbilt 3MT Competition. *April 2022*
  Nashville, USA
- "Resilient Multi-agent Reinforcement Learning Using Medoid and Soft-medoid Based Aggregation", IEEE International Conference on Assured Autonomy (ICAA). *March 2022*
  Virtual
- "Availability-Resilient Control of Uncertain Linear Stochastic Networked Control Systems" IEEE American Control Conference (ACC). *July 2020*
  Denver, USA
- "Tracking of a Randomly Moving Target by Flock of Multiple Agents Using Leader-Follower Approach", IEEE National Systems Conference (NSC). *December 2015*
  Delhi, India

POSTERS

- "Resilient Distributed Actor-Critic Algorithms", MLCommons Rising Stars Workshop. *August 2023*
  Sunnyvale, USA
- "Adaptive Learning from Peers for Distributed Actor-Critic Algorithms", CPS Rising Stars Workshop. *May 2023*
  Charlottesville, USA
- "Adaptive Learning from Peers for Distributed Actor-Critic Algorithms", Annual ECE Day at Vanderbilt University. *April 2023*
  Nashville, USA
- "Attack-Resilient Multi-Agent Flocking Control Using Graph Neural Networks", Annual ECE Day at Vanderbilt University. *April 2022*
  Nashville, USA

TEACHING EXPERIENCE

Missouri University of Science and Technology

- Instructor, EE3321 Control Systems Laboratory *January – December 2019*
  Led hands-on experiments in control systems, applying theoretical concepts to practical systems such as servo and tank systems. Utilized MATLAB and Simulink for simulation and implemented real prototypes for testing and validation.

Indian Institute of Technology Kanpur

- Teaching Assistant, EE671A Neural Networks *January – May 2016*
  Responsible for grading and helping students in this course covering neural network architectures, system identification, and practical applications across various domains.
- Teaching Assistant, EE653A Digital Control *July – December 2015*
  Responsible for grading and helping students in this course on discrete-time systems, Z-transform methods, compensator design, state-space models, Kalman filtering, and parameter estimation.

VOLUNTEERING EXPERIENCE

- Volunteer at the 2025 National Science Foundation's (NSF) Cyber-Physical Systems (CPS) Principal Investigators' (PI) Meeting *March 2025*
  Nashville, USA
- Student Volunteer at the 2024 Supercomputing Conference (SC24) *November 2024*
  Atlanta, USA
- Volunteer at the 2024 National Science Foundation's (NSF) Cyber-Physical Systems (CPS) Principal Investigators' (PI) Meeting *March 2024*
  Nashville, USA
- Volunteer at the 2023 National Science Foundation's (NSF) Foundational Research in Robotics (FRR) - National Robotics Initiative (NRI) Principal Investigators' (PI) Meeting *May 2023*
  Arlington, USA
- Volunteer at the 2022 National Science Foundation's (NSF) Cyber-Physical Systems (CPS) Principal Investigators' (PI) Meeting *November 2022*
  Arlington, USA
- Volunteer at the 2022 National Science Foundation's (NSF) Smart and Connected Communities Virtual Organization (SCCVO) Principal Investigators' (PI) Meeting *October 2022*
  Arlington, USA

Mentoring Experience

Vanderbilt University

- Imran I. Mohammed, Master's student in Computer Science *Fall 2023*
  Topic: Federated Learning Using Autoencoders
- Chandrakantha Sruthi Pappu, Master's student in Data Science *Fall 2023*
  Topic: Multi-modal Federated Learning

Professional Services

Journal Paper Reviewer

- IEEE Transactions on Systems, Man, and Cybernetics (SMC): Systems
- IET Control Theory & Applications
- IEEE Transactions on Automatic Control
- IEEE Systems Journal
- IEEE Communications Letters
- Journal of the Franklin Institute
- Transactions on Network Science and Engineering (TNSE)

Conference Paper Reviewer

- IEEE Conference on Decision and Control (CDC)
- European Control Conference (ECC)
- Mediterranean Conference on Control & Automation
- Indian Control Conference (ICC)

Additional Information

Professional Memberships:

- Institute of Electrical and Electronics Engineers (IEEE), Membership ID: 95600784
- Women in CyberSecurity (WiCyS), Membership ID: 82853014
- ACM SIGHPC, Membership ID: 4648301

Languages:

- English (Professional working proficiency)
- Bengali (Native or bilingual proficiency)
- Hindi (Advanced proficiency)
- Spanish (Basic proficiency)