

# Abdullah Al Maruf

## Curriculum Vitae

Postdoctoral Scholar  
Network Security Lab  
University of Washington, Seattle  
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### Research Interests

My research interest is in the analysis and provable design of complex cyber-physical systems and large-scale dynamical networks for attack-resilience, stability, safety, privacy and desired performance. My approach combines fundamental techniques from control theory, graph theory, optimization and learning. The proposed solutions are grounded on applications in energy systems, autonomous vehicle networks and smart building technologies.

### Education & Training

2021–Now **Postdoctoral Scholar**, Network Security Lab, Department of ECE  
**University of Washington**, Seattle, WA, United States  
Advisor: Prof. Radha Poovendran

2016–2021 **Ph.D.**, Electrical Engineering  
**Washington State University**, Pullman, WA, United States  
Advisor: Prof. Sandip Roy  
Dissertation title: Surgical Manipulation of the Modal Dynamics of Networks

2008–2014 **B.Sc.**, Electrical and Electronic Engineering  
**Bangladesh University of Engg. & Tech. (BUET)**, Dhaka, Bangladesh

### Experience

2022 **Course Instructor**, Spring 2022, University of Washington, Seattle, WA  
Role: Instruct and evaluate a class of 95 students for EE 241, a junior-level 2 credit course in Programming for Signal and Information Processing Applications using Python.

2016–2021 **Graduate Research Assistant**, Washington State University, Pullman, WA  
Role: Work and collaborate with graduate students, faculties and industrial partner to develop analysis and design methods of 'surgical' control and estimation in large-scale dynamical networks for privacy, stability and performance (funded by United States National Science Foundation and Schweitzer Engineering Laboratories).

2016–2021 **Graduate Teaching Assistant**, Washington State University, Pullman, WA  
Role: Assist course instructors and evaluate homeworks and exams in Signals and Systems, Digital Signal Processing I, Design Project Management undergraduate courses.

2018, 2019 **Ph.D. Intern (Summer)**, Pacific Northwest National Laboratory, Richland, WA  
Role: Develop algorithm for the decomposition of large-scale non-linear dynamical networks (funded by United States Department of Energy).

2015–2016 **Lecturer**, Daffodil International University, Dhaka, Bangladesh  
Role: Instruct and evaluate undergraduate-level classes on electrical circuits, linear systems, signal processing and power system analysis.

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## Peer-Reviewed Conference Publications

- [C1] **Maruf, Abdullah AI** and S. Roy, “Hammersley-Chapman-Robbins lower bounds on pole and residue estimates from impulse response data,” in *2017 IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, IEEE, 2017, pp. 323–327. DOI: 10.1109/GlobalSIP.2017.8308657.
- [C2] **Maruf, Abdullah AI** and S. Roy, “Tighter lower bounds on the error variance of pole and residue estimates from impulse response data: An expository example,” in *2017 IEEE 56th Annual Conference on Decision and Control (CDC)*, IEEE, 2017, pp. 965–970. DOI: 10.1109/CDC.2017.8263783.
- [C3] **Maruf, Abdullah AI**, S. Kundu, E. Yeung, and M. Anghel, “Decomposition of nonlinear dynamical networks via comparison systems,” in *2018 European Control Conference (ECC)*, IEEE, 2018, pp. 190–196. DOI: 10.23919/ECC.2018.8550418.
- [C4] **Maruf, Abdullah AI**, M. Ostadijafari, A. Dubey, and S. Roy, “Small-signal stability analysis for droop-controlled inverter-based microgrids with losses and filtering,” in *Proceedings of the Tenth ACM International Conference on Future Energy Systems*, 2019, pp. 355–366. DOI: 10.1145/3307772.3328310.
- [C5] **Maruf, Abdullah AI** and S. Roy, “Observability-blocking controllers for network synchronization processes,” in *2019 American Control Conference (ACC)*, IEEE, 2019, pp. 2066–2071. DOI: 10.23919/ACC.2019.8815317.
- [C6] **Maruf, Abdullah AI** and S. Roy, “Pole and residue estimation from impulse response data: New error bounding techniques,” in *2020 American Control Conference (ACC)*, IEEE, 2020, pp. 1514–1519. DOI: 10.23919/ACC45564.2020.9148018.
- [C7] **Maruf, Abdullah AI** and S. Roy, “Using feedback to block controllability at remote nodes in network synchronization processes,” in *2021 American Control Conference (ACC)*, IEEE, 2021, pp. 2473–2478. DOI: 10.23919/ACC50511.2021.9483131.
- [C8] **Maruf, Abdullah AI** and S. Roy, “Almost-surgical eigenstructure assignment for linear time invariant systems using state feedback,” in *2021 American Control Conference (ACC)*, IEEE, 2021, pp. 2479–2484. DOI: 10.23919/ACC50511.2021.9483361.
- [C9] **Maruf, Abdullah AI**, A. Dubey, and S. Roy, “Small-signal voltage stability analysis for droop controlled inverter-based microgrids: An algebraic graph theory perspective,” in *2021 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2021, pp. 01–05. DOI: 10.1109/PESGM46819.2021.9637961.

- [C10] A. Rajabi, B. Ramasubramanian, **Maruf, Abdullah AI**, and R. Poovendran, "Privacy-preserving reinforcement learning beyond expectation," in *IEEE Conference on Decision and Control (CDC)*, 2022, arXiv preprint arXiv:2203.10165.
- [C11] L. Niu, **Maruf, Abdullah AI**, A. Clark, J. S. Mertoguno, and R. Poovendran, "An analytical framework for control synthesis of cyber-physical systems with safety guarantee," in *IEEE Conference on Decision and Control (CDC)*, 2022, arXiv preprint arXiv:2204.00514.
- [C12] **Maruf, Abdullah AI**, L. Niu, A. Clark, J. S. Mertoguno, and R. Poovendran, "A compositional approach to safety-critical resilient control for systems with coupled dynamics," in *IEEE Conference on Decision and Control (CDC)*, 2022, arXiv preprint arXiv:2204.00512.

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## Journal Articles

- [J1] **Maruf, Abdullah AI** and S. Roy, "Observability-blocking control using sparser and regional feedback for network synchronization processes," *Automatica*, vol. 146, 2022. DOI: 10.1016/j.automatica.2022.110586.
- [J2] **Maruf, Abdullah AI**, L. Niu, A. Clark, J. S. Mertoguno, and R. Poovendran, "A timing-based framework for designing resilient cyber-physical systems under safety constraint," Under review at *ACM Transactions on Cyber-Physical Systems*, Submission date: August 28, 2022.

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## Awards and Honors

2022 **CPS Rising Star 2022**,

Inaugural workshop sponsored by Link Lab at UVA, Leidos and National Science Foundation for the selected 31 outstanding PhD students and postdocs who are interested in pursuing academic careers in cyber-physical systems (CPS) related areas.

2019 **Student Travel Grant**, e-Energy 2019

2020, 2021 **Student Registration Grant**, ACC 2020, ACC 2021

2008 **National Champion**, 6th Bangladesh Mathematical Olympiad

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## Professional Service: Reviewer

IEEE Transactions on Automatic Control (TAC)

IEEE Conference on Decision and Control (CDC)

IEEE American Control Conference (ACC)