Md Zahidul Islam

Assistant Professor, SIUC

Email | Personal Website | Google Scholar | LinkedIn

Education

Ph.D. in Electrical Engineering Jan 2021 - Aug 2025
New York University (NYU) New York, NY

- **Degree Transfer**: Transferred to NYU from UMASS Lowell with my advisor, Dr. Yuzhang Lin, in Fall 2023.
- **Research Focus**: Situation-Aware Resilience of Cyber-Physical Power Systems
- **Relevant Courses**: Power System Operation & Control, Wireless Communication, Deep Learning, Smart Power Distribution and Distributed Energy Resources, Reinforcement Learning, Communication Network Design, and Network Security

M.S. in Electrical Engineering Oct 2017 - Jan 2021
Bangladesh University of Engineering and Technology (BUET) Dhaka, Bangladesh

- **Advisor**: Dr. Md. Shamim Reza

B.S. in Electrical and Electronic Engineering Feb 2013 - Sept 2017
Bangladesh University of Engineering and Technology (BUET) Dhaka, Bangladesh

Professional Experiences

Tenure-Track Assistant Professor, ECE Aug 2025 - Ongoing
Southern Illinois University Carbondale IL, USA

Research Assistant Jan 2021 - Aug 2025
New York University and University of Massachusetts Lowell NY and MA, USA

- Contributed to projects funded by the U.S. Department of Energy (DOE), National Science Foundation (NSF), and Office of Naval Research (ONR).
- Collaborated with faculty and fellow students on multidisciplinary research efforts.
- Supervised one master's student and two undergraduate students in research projects.
- Participated in writing a research proposal for the NSF Cyber-Physical Systems (CPS) program.

Research Intern, Optical Networking & Sensing, NEC LAB May 2024 - Aug 2024
NEC Laboratories America, Inc. NJ, USA

- Contributed to NEC's pilot projects focusing on power system fault localization using fiber-optic sensing technology.
- Analyzed and utilized real-world field data captured through Distributed Fiber Optic Sensing (DFOS) systems.
- Co-authored and submitted two Invention Records (IR) for potential patent applications.

Graduate Intern, Power Systems Engineering Center (PSEC), NREL May 2023 - Aug 2023
National Renewable Energy Laboratory (NREL) CO, USA

- Contributed to the DOE-funded Solar-HERO project, emphasizing Distribution System State Estimation (DSSE) to enhance system resilience and assess the impact of disasters on distribution networks.
- Investigated multi-rate, multi-sensor data integration for DSSE and validated findings on large-scale real-world feeders.
- Submitted the research outcomes to a top IEEE Transactions journal, currently under review.

Assistant Engineer, Network Operation and Customer Service. Nov 2019 - Jan 2021
Dhaka Power Distribution Company (DPDC) Dhaka, Bangladesh

- Managed multiple distribution feeders, focusing on improving reliability metrics such as SAIDI and SAIFI.
- Supervised control room operators to ensure efficient network operations.

Lecturer, Department of Electrical and Electronic Engineering Jan 2019 - May 2019
Daffodil International University Dhaka, Bangladesh

- Conducted classes and supervised laboratory sessions for the 'Computer Programming' course across three sections, with a total of 150 students.
- Delivered lectures for 'Electrical Properties of Materials' to two sections, covering a total of 100 students.
- Held office hours to provide targeted student support.
- Prepared and graded assignments, tests, mid-terms, and final exams for both courses.

IT & Cloud Engineer, Data Center IT Infrastructure Design Dec 2017 - Aug 2018
ZTE Corporation Bangladesh Ltd. Dhaka, Bangladesh

- Contributed to the first IV-tier national data center in Bangladesh.
- Validated the Deep Packet Inspection (DPI) system to strengthen network security and optimized the iCache service to enhance intranet speed.

Selected Research Projects

DOE CyberCARED: Northeast University Cybersecurity Center for Advanced and Resilient Energy Delivery (2025-Ongoing)

- Developing online attack detection and localization strategies considering cyber-physical parameter fusion.

High-resolution visibility of grid-edge networks with low-resolution sensors (2023-Ongoing)

- Developed a staggered sensor reporting technique with machine learning to ensure high-resolution network visibility.
- Introduced a novel observability metric to provide real-time grid visibility under practical operating conditions.
- Presented one paper in 2024 IEEE PESGM conference and two journal papers currently under review.
- Ongoing tasks: Developing control strategies for grid-edge resources exploiting the high-resolution network visibility.

Cyber-physical microgrids against High-Impact-Low-Probability (HILP) disturbances (2023-Ongoing)

- Proposed a cyber-physical reconfiguration of distribution systems for enhancing critical load supply during disasters.
- Designed an abstraction of cyber network and integrated it into the physical system to reduce complexity.
- Presented a paper at the IEEE SmartGridComm Conference, and another journal paper is currently under review.

Application of Large Language Models (LLM) in power systems (2024-Ongoing)

- Fine-tuned LLM using a custom loss function to solve grid reconfiguration tasks, marking the first work in the field.
- Supervised a Master's student on this project and published one paper to NAACL 2025, a top-tier conference venue.

Application of fiber optic sensing in power systems (May 2024-Sept 2024)

- Developed an integrated approach utilizing both grid and fiber sensing data for precise fault localization.
- Proposed a power-aware DFOS placement strategy for resilient network monitoring.
- Coauthored two invention records for patent submissions and published two conference papers to top conferences.

Resilient sensing and communication architecture design for power grid monitoring (2021-2023)

- Proposed a Wide Area Measurement System (WAMS) architecture for resilient monitoring of power systems.
- Introduced a routing algorithm for fast and resilient data transfer in WAMS, facilitating grid observability.
- Developed integer linear programming (ILP) and graph theory-based heuristic solutions.
- Published two papers in IEEE Transactions journals and presented one paper at 2023 IEEE ICC conference.

High-resolution load estimation with space deployment of high-reporting-rate smart meters (2021-2023)

- Proposed a deep learning-based method for estimating feeder load in real-time and high-resolution.
- Utilized second generation of smart metering technology, namely high-reporting-rate smart meters.
- Preprocessed data for performance improvement and post-processed data for anomaly suppression.

- Published one paper in Elsevier Applied Energy journal.

Machine learning methods for DDoS attack detection in smart grids (May 2022-Sept 2022)

- Explored CICIDS and KDDCup datasets for the DDoS attack.
- Used six different machine learning (ML) models for the detection purposes.
- Supervised two undergraduate student interns and presented one paper at 2022 MIT URTC conference.

Publications

Book Chapters

[**B1**] Y. Lin, V. M. Vokkarane, **M. Z. Islam**, and S. N. Edib, "Resilient Sensing and Communication Architecture for Microgrid Management," Microgrids: Theory and Practice, Wiley-IEEE Press, 2024.

Journal Papers

[**J1**] **M. Z. Islam**, Y. Lin, V. M. Vokkarane, "Observability-aware Resilient PMU Networking", IEEE Transactions on Power Systems, (early access).

[**J2**] **M. Z. Islam**, Y. Lin, V. M. Vokkarane, N. Yu, "Robust Learning-based Real-time Load Estimation Using Sparsely Deployed Smart Meters with High Reporting Rates", Applied Energy, Volume 352, 2023, 121964.

[**J3**] **M. Z. Islam**, S. N. Edib, V. M. Vokkarane, Y. Lin and X. Fan, "A Scalable PDC Placement Technique for Fast and Resilient Monitoring of Large Power Grids," in IEEE Transactions on Control of Network Systems, vol. 10, no. 4, pp. 1770-1782, Dec. 2023.

[**J4**] **M. Z. Islam**, Y. Lin, V. M. Vokkarane, and V. Venkataramanan, "Cyber-physical Cascading Failure and Resilience of Power Grid: A Comprehensive Review", Frontiers in Energy Research, 11, p.1095303.

[**J5**] **M. Z. Islam**, M. S. Reza, M. M. Hossain and M. Ciobotaru,"Accurate Estimation of Phase Angle for Three-Phase Systems in Presence of Unbalances and Distortions," in IEEE Transactions on Instrumentation and Measurement, vol. 71, pp. 1-12, 2022, Art no. 9001712.

[**J6**] **M. Z. Islam**, M. S. Reza, M. M. Hossain and M. Ciobotaru, "Three-Phase PLL Based on Adaptive Clarke Transform Under Unbalanced Condition," in IEEE Journal of Emerging and Selected Topics in Industrial Electronics, vol. 3, no. 2, pp. 382-387, April 2022.

Conference Papers

[**C1**] Y. Ding, **M. Z. Islam**, J. Shiau, A. D. Amico, Y. Tian, Z. Jiang, S. Ozharar, T. Wang, and Y. Lin, "Resilient DFOS Placement Strategy for Power Grid Monitoring: Integrating Fiber and Power Network Dependencies," 29th International Conference On Optical Fibre Sensors (OFS), Porto, Portugal, 25-30 May 2025.

[**C2**] **M. Z. Islam***, Y. Ding, Y. Tian, T. Wang, Y. Lin, "Integration of Fiber Optic Sensing and Sparse Grid Sensors for Accurate Fault Localization in Distribution Systems", 2025 IEEE Power & Energy Society General Meeting (PESGM), Austin, TX, USA, 2025 (accepted).

[**C3**] P. Christou, **M. Z. Islam***, Y. Lin, and J. Xiong, "LLM4DistReconfig: A fine-tuned large language model for power distribution network reconfiguration," 2025 Annual Conference of the Nations of the Americas Chapter of the ACL (NAACL), Albuquerque, New Mexico, USA, April 29–May 4, 2025 (accepted).

[**C4**] **M. Z. Islam**, W. Zhang, Y. Lin, "Learning-based Customer Voltage Visibility with Sparse High-Reporting-Rate Smart Meters," 2024 IEEE Power & Energy Society General Meeting (PESGM), Seattle, WA, USA, 2024, pp. 1-5.

[**C5**] **M. Z. Islam**, Y. Lin, V. M. Vokkarane, Y. Yao and F. Ding, "Cyber-Physical Reconfiguration for Disaster Resilience of Power Distribution Systems," 2023 IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm), Glasgow, United Kingdom, 2023, pp. 1-6.

[**C6**] **M. Z. Islam**, V. M. Vokkarane and Y. Lin, "PMU Network Routing for Resilient Observability of Power Grids," ICC 2023 - IEEE International Conference on Communications, Rome, Italy, 2023, pp. 4584-4590.

[**C7**] E. Meriaux, D. Koehler, **M. Z. Islam**, V. Vokkarane and Y. Lin, "Performance Comparison of Machine Learning Methods in DDoS Attack Detection in Smart Grids," 2022 IEEE MIT Undergraduate Research Technology Conference (URTC), Cambridge, MA, USA, 2022, pp. 1-5.

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Manuscripts Under Review

[U1] **M. Z. Islam**, Y. Lin, W. Zhang, "Smart Meter Scheduling for Data-Driven Granular Customer Voltage Visibility", IEEE Transactions on Smart Grid (under review).

[U2] **M. Z. Islam**, Y. Lin, V. M. Vokkarane, "Disaster-Resilient Cyber-Physical Distribution System Reconfiguration and Dynamic Networked Microgrid Formation under Intermittent Generation", IEEE Transactions on Industry Applications (under review).

[U3] **M. Z. Islam**, Y. Yao, F. Ding, Y. Lin, "Risk-Aware Measurement Synchronization and Recovery for DSSE with Heterogeneous Data Sources", IEEE Transactions on Instrumentation & Measurement (under review).

[U4] W. Zhang, Y. Lin, **M. Z. Islam**, H. Huang, "Neuro-Physics Hybrid State Estimation of Distribution System with Smart Meter Voltage Measurements", IEEE Transactions on Smart Grid (under review).

Services & Activities

Journal & Conference Reviewer: Reviewed for IEEE Transactions on Power Systems, IEEE Transactions on Smart Grid, IEEE transactions on Sustainable Energy, Reliability Engineering & Systems Safety, IEEE GLOBECOM conference, IEEE SmartGridComm conference, IEEE PES ISGT conference.

Outreach: Advanced Communication Network Laboratory Representative. Represented the ACNL lab and showcased its cutting-edge research on cyber-physical systems to middle and high school students, as well as their parents, as part of the UML outreach program.

Senator, Graduate Bangladeshi Student Association at UML (2022-2023): Represented the student body, communicated with the administration, participated in decision-making, and organized student programs.

Event Coordinator (2016-2017) and Advisor (2017-2021), Kazipur Math Festival: Organized annual math festivals for underrepresented students in remote areas of Bangladesh and provided mentorship for national math Olympiads.

Talks & Presentations

State Estimation: "State Estimation in Power Distribution Systems under Heterogenous Data Sources", (Aug'23). Hosted by Dr. Ben Kroposki at National Renewable Energy Laboratory.

Fault Localization: "Integrating Electric Point Sensors and Fiber Sensing for Fault Localization in Power Networks", (Aug'24). Hosted by Christopher White at NEC Laboratories America, Inc.

Voltage Estimation: "Learning-based Customer Voltage Visibility with Sparse High-Reporting-Rate Smart Meters", (Nov'24). Presented at 2024 IEEE PESGM Conference.

Resilience & Restoration: "Disaster Resilience and Service Restoration in Distribution Systems", (Nov'24). Hosted by Dr. Yuzhang Lin at NYU.

Forecasting in Power Systems: "Learning-based Voltage and Demand Forecasting in Power Systems, (Jan'24)." Hosted by Power Lab at NYU.

Sensor Networking: "Resilient Sensor Networking in Power Systems", (Feb'23). Hosted by ACNS Lab at UMass Lowell.

Cybersecurity: "Cybersecurity in Smart Grids", (Dec'22). Hosted by Dr. Tricia Chigan at UMass Lowell.

Honors & Awards

Travel Grant: Awarded for participation in the 2024 IEEE PESGM Conference.

Research Excellence Award 2023: Awarded for outstanding Master's research at BUET, Dhaka.

Course Certification: Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning by DeepLearning.AI

GIS and SCADA Certification: Received recognition for outstanding performance among 50 renowned power system engineers nationwide, awarded by the Bangladesh Power Management Institute in 2020.

Certificate of Excellence as Event Coordinator: Recognized for successfully coordinating the Kazipur Math Festival in 2017.

BUET Duke of Edinburgh Award: Received at BUET in 2016.

Bangladesh National Math Olympiad: Runner-up in 2010.

Industry Engagement

US NAVFAC EXWC Microgrid Academy Training: Completed a comprehensive day-long training program focused on microgrid modeling using XENDEE software, exploring real-world Navy microgrid case studies. Gained hands-on expertise in designing resilient microgrid systems optimized for naval operations.

Con Edison Utility in New York City: Engaged in an on-site visit to Con Edison's distribution network, gaining firsthand exposure to the layout and functionality of primary and secondary feeders. Observed operational challenges within the underground distribution system and explored opportunities for collaboration.

Selected Academic Projects

Voltage Regulation in Power Distribution Systems: Formulated voltage regulation as a quadratic optimization problem using the LinDistFlow model and solved it with the Gurobi solver. Developed strategies to regulate system voltages by optimizing reactive power from DERs (wind and PV) and tap positions of voltage regulators, considering dynamic constraints such as tap step limits, reactive power limits, and voltage deviation minimization metrics (Dec'24)

5G Coverage Estimation: Tested and predicted 5G network coverage in indoor and outdoor environments. Project details are available here (Apr'24)

Distribution Network Reconfiguration: Implemented **Reinforcement Learning** algorithms, e.g., PPO, A2C, and TRPO, to reconfigure power distribution systems and maximize load supply during disaster. Project details are available at this link (Dec'23)

Reinforcement Learning (RL) Applications: Implemented tabular and function approximation-based RL algorithms in Python for solving classical problems, utilizing the OpenAI Gym environment. All the implemented algorithms can be found here (Dec'22)

Secure Instant Messenger (IM): Developed a secure Instant Messenger (IM) with built-in RSA encryption algorithm, supporting multiple users. Demonstrated a special case with a GUI featuring two clients and one server, where the server facilitates secure message exchange between clients. The project is available at this link (Apr'22)

DES (Data Encryption Standard) Algorithm: Implemented DES algorithm from scratch along with two working modes, namely, ECB (Electronic Code Book) and CBC (Cipher Blocker Chaining). The feature of the program is that it can encrypt and decrypt messages and any type of documents e.g., text, image. Project details are available at this link (Apr'22)

Reliable Data Transfer Protocol: Developed an application-layer network protocol based on UDP (User Datagram Protocol) for server-client communication. Incorporated TCP-like features such as a 3-way handshake, flow control, and congestion control to enhance reliability and performance. Available at this link (Dec'21)

Power Flow analysis algorithm: Developed a Power Flow analysis algorithm based on backward/forward sweep concept for a given radial distribution system in MATLAB (Apr'21)

Technical Skills

Programming Languages: MATLAB, Python, C, C++.

Machine Learning, Deep Learning Frameworks: Scikit-learn, TensorFlow, PyTorch, Keras, Ray.

Simulation Tools: OpenDSS, Simulink, RT-LAB(OPAL-RT), PSS/E, PSpace, CYME PSAF, NS-3.