

MD NAZMUL KABIR SIKDER

Arlington, VA

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Presidential Postdoctoral Fellow specializing in secure, privacy-aware, and explainable AI for critical infrastructure. Expert in developing hybrid models (LLMs, computer vision, time-series forecasting) for threat detection, anomaly analysis, and decision support in cyber-physical systems. Proven record of interdisciplinary research, high-impact publications, and NSF grant contributions.

Education

Virginia Polytechnic Institute and State University <i>Doctor of Philosophy in Computer Engineering</i>	Aug. 2019 – Dec. 2024 <i>Arlington, Virginia</i>
Virginia Polytechnic Institute and State University <i>Masters of Science in Computer Engineering GPA 3.67/4.0</i>	Aug. 2019 – May 2022 <i>Falls Church, Virginia</i>
Bangladesh University of Engineering and Technology <i>Bachelor of Science in Electrical and Electronics Engineering GPA 3.65/4.0</i>	May. 2010 – Sep. 2015 <i>Dhaka, Bangladesh</i>

Research Areas

Cyber-Security, Data Science, Water Systems, Machine Learning, Deep Learning, Smart Grid, Anomaly Detection, Cyber-Physical Systems

Relevant Coursework

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|-----------------------------|--------------------------|-----------------------------|
| • Artificial Intelligence | Protocol | • Advanced Alternate Energy |
| • Optimization Techniques | • Cybersecurity and IoT | Systems |
| • Advanced Machine Learning | • Statistics In Research | |
| • Internet Architecture and | • Applied Linear Systems | |

Publications

Journal Publications

- Sikder, M. N. K., & Batarseh, F. A. (2025). *Context-driven Deep Learning Forecasting for Wastewater Treatment Plants*. ACM Transactions on Cyber-Physical Systems.
- Sikder, M. N. K., Wang, Y., & Batarseh, F. A. (2025). *Assessing the Fidelity and Utility of Water Systems Data Using Generative Adversarial Networks: A Technical Review*. IEEE Access.
- Sikder, M. N. K., Nguyen, M. B., Elliott, E. D., & Batarseh, F. A. (2023). *Deep H2O: Cyber attacks detection in water distribution systems using deep learning*. Journal of Water Process Engineering, 52, 103568.
- Kulkarni, A., Yardimci, M., Kabir Sikder, M. N., & Batarseh, F. A. (2023). *P2O: AI-Driven Framework for Managing and Securing Wastewater Treatment Plants*. Journal of Environmental Engineering, 149(9), 04023045.

Conference Proceedings

- Sikder, M. N. K., Batarseh, F. A., Wang, P., & Gorentala, N. (2022, October). *Model-Agnostic Scoring Methods for Artificial Intelligence Assurance*. In 2022 IEEE 29th Annual Software Technology Conference (STC) (pp. 9-18). IEEE.

- Gurrapu, S., Batarseh, F.A., Wang, P., Sikder, M.N., Gorentala, N., & Gopinath, M. (2021). DeepAg: Deep Learning Approach for Measuring the Effects of Outlier Events on Agricultural Production and Policy. ArXiv, abs/2110.12062.
- Usman, M. U., Haque, A., Sikder, M. N. K., Cai, M., Bradley, S. R., Pandey, S., Kliros, C., & Zhang, L. (2021). Quantification of Peak Demand Reduction Potential in Commercial Buildings due to HVAC Set Point and Brightness Adjustment. 2021 IEEE Power Energy Society General Meeting (PESGM), 1–6. <https://doi.org/10.1109/PESGM46819.2021.9638053>
- S. Chakma, N. K. Sikder, S. I. Khan & S. Akhter, “Implementation of microcontroller based Maximum Power Point Tracker (MPPT) using SEPIC converter”, 2015 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE), 2015, pp. 374-377, doi: 10.1109/WIECON-ECE.2015.7443942.

Academic Book Chapter | *AI Assurance: Towards Valid, Explainable, Fair, and Ethical AI*

- Sikder, M. N. K., & Batarseh, F. A. (2023). *Outlier detection using AI: a survey*. In *AI Assurance* (pp. 231-291). Academic Press.
- Williams, M. J., Sikder, M. N. K., Wang, P., Gorentala, N., Gurrapu, S., & Batarseh, F. A. (2023). *The application of artificial intelligence assurance in precision farming and agricultural economics*. In *AI Assurance* (pp. 501-529). Academic Press.

Poster Session and Presentations

- Gurrapu, S., Sikder, N., Wang, P., Gorentala, N., Williams, M., & Batarseh, F. A. (2021). “Applications of Machine Learning For Precision Agriculture and Smart Farming”. The International FLAIRS Conference Proceedings, 34. <https://doi.org/10.32473/flairs.v34i1.128497>
- Batarseh, F. A., Yardimci, M. O., Suzuki, R., Sikder, M. N. K., Wang, Z., & Mao, W. Y. *Realtime Management of Wastewater Treatment Plants Using AI*.
- *Model-Agnostic AI Assurance Scoring Framework*. Sikder, M. N. K. & Batarseh, F., SDSS Conference 2022

Research Experience

A3 Lab & Commonwealth Cyber Initiative [Website] January 2021 – December 2024

Arlington, VA

Graduate Research Assistant, Virginia Tech

- Developed advanced AI models (High Confidence AutoEncoders, GANs) for real-time cyber-physical threat detection in water supply systems, increasing detection accuracy by 25% and reducing false positives by 30%.
- Created a context-aware AI framework using Temporal Fusion Transformer to integrate external data, improving water systems forecasting accuracy by 20% and enhancing decision-making processes.
- Led the development of AI-based decision support systems (LSTM, GRU) for SCADA systems, improving anomaly detection precision by 18% and reducing system downtime by 15%.
- Applied Isolation Forest models to optimize agricultural output predictions, increasing forecast accuracy by 22% and enabling more precise resource allocation in precision farming.
- Designed AI Assurance frameworks to ensure fairness, security, and explainability across diverse AI applications, increasing user trust in automated decision-making systems.

Advanced Research Institute [Website] August 2019 – December 2020

Arlington, VA

Graduate Research Assistant, Virginia Tech

- Developed energy-efficient building models using real-time data, reducing energy consumption by 12% and optimizing HVAC system performance.

- Performed demand response analysis to optimize appliance scheduling, resulting in a 10% reduction in energy costs through AI-based policy recommendations.

Other Projects

May 2010 – October 2015

Research Student, BUET

Dhaka, Bangladesh

- Power Electronics: Designed and implemented a variable input voltage compatible LED driver with high efficiency and a long lifetime without the use of the electrolytic capacitor, a 500 VA, 48 volt DC to 230 volt AC system comprising of a full-bridge DC-DC converter and H-bridge inverter with sinusoidal pulse width modulation technique for harmonic reduction. Additionally, I designed and implemented a solar charge controller with SEPIC topology (Thesis)
- Microcontroller: Designed and developed a Microcontroller based robotic maze solver.
- DC Motor Design: Designed and developed a high-efficiency Single Phase Motor.
- Power System: Designed a power factor improvement plant using a PSS simulator.
- Digital Electronics: Designed and implemented a digital IC-based remote controller that can control multiple home appliances, including light, fan, washing machine, and HVAC, at the same time.
- 8-Bit PC: Designed software-based 8-Bit PC (Proteus tool) to carry out 29 basic instructions.
- Control System: Designed and implemented a Microcontroller-based color-detecting movable camera using Arduino UNO (Moving direction is vertical 180 degrees).
- Numerical Analysis: Designed a student database using C# language to insert, modify, delete, and browse previously saved student profiles.
- Digital Signal Processing: Designed a program to determine the human voice's pitch and wavelength using MATLAB.
- Line Following Robot: Designed and implemented a microcontroller-based line following robot.
- Pattern Recognition: Designed a pattern recognition program that can identify a set of letters from A to Z along with digits from "0" to "9".

Professional Experience

Virginia Tech, Arlington, VA | *Presidential Postdoctoral Fellow* January 2025 – Present

- Conducting advanced research on AI-driven solutions (LLMs, computer vision, and hybrid deep learning) for critical infrastructure security, anomaly detection, and real-time decision-making.
- Designing and implementing novel algorithms for cyber-physical systems, with a focus on explainability, robustness, and operational reliability.
- Collaborating with interdisciplinary teams and external partners to translate research findings into deployable tools for water, energy, and wastewater utilities.
- Leading and contributing to NSF grant proposal development, including project scoping, writing, and alignment with funding priorities.
- Mentoring graduate and undergraduate students in AI methodologies, research best practices, and publication preparation.

BEM Controls LLC, McLean, VA | *Graduate Research Intern* May 2020 – August 2020

- IoT and Smart Grid: To develop and test an enterprise-level power system software, Building Energy Management Open Source Software (BEMOSS), for load control from various manufacturers' devices that operate on different WIFI communication technologies and data exchange protocols and estimate quantification of Demand Response.

Grameenphone Ltd., Dhaka, Bangladesh | *System Engineer*

October 2015 – July 2019

- Completed massive LTE network roll-out execution in Dhaka city (Awarded for quickest roll-out in the tech team).
- Designed and maintained a BOT (Telegram) android application for easier network monitoring and maintenance.
- Designed and developed a system (DWDM, IPBH router, and Hit) protection using numerous power supply tools.
- Designed and developed an easy billing tool using C# language to keep track of regular transaction activities with the vendors.
- Designed and implemented an efficient fuel generator controller that saves regular operational expenditure (The work got rewarded)

Technical Skills

Programming Languages: Python, C++, SQL

Machine Learning & AI Frameworks: PyTorch, TensorFlow, Keras

Data Science Tools: Pandas, NumPy, Scikit-learn

DevOps & MLOps: Docker, Kubernetes, Jenkins, Apache Airflow

Big Data: Apache Spark

Version Control: Git

Cloud Technologies: AWS (SageMaker), Azure, Google Cloud

Cybersecurity Tools: OpenSSL, JWT, PyCrypto

Edge AI Tools: TensorFlow Lite, AWS IoT

Reinforcement Learning: Ray RLlib

Natural Language Processing: Hugging Face Transformers

Infrastructure as Code: Terraform

Model Monitoring & Experimentation Platforms: MLflow, Weights & Biases

Leadership / Extracurricular

- Volunteer at Innovation Smart Grid Technologies 2020, North America.
- Volunteer at AEE World Energy Conference and Expo, 2019, D.C. USA.
- Coordinator at 2014 inters university project show and departmental festival show.
- Organizing member at PES 2014, inter-university robotics competition, BUET Energy Club.
- Finalist: Line following robot contest at 2014 (BUET).
- Semifinalist: Inter-university Design Contest- designed a remote controller-based home automation system

Awards / Recognition

- 2022 best national water and AI researchers in Water Systems by The Water Research Foundation, winner of the 2022 Intelligent Water Systems Challenge
- Awarded as 2nd best team for designing line following robot contest at 2014 (BUET).

Media Coverage

- IWS 2022 competition Winner (1st Place) by [WEFTEC](#)
- An innovative artificial intelligence solution implementation in DC Water by [Virginia Tech Media](#) and [Commonwealth Cyber Initiative Media](#)

References

Ph.D. Academic and Research Advisor: Dr. Feras A. Batarseh, Associate Professor, Biological Systems Engineering, Virginia Polytechnic Institute, and State University, ✉ batarseh@vt.edu

Undergraduate Academic and Thesis Supervisor: Dr. Shahidul Islam Khan, Professor, and Chairperson, Electrical and Electronic Engineering, BRAC University, ✉ shahidul.khan@bracu.ac.bd