Md Nazmul Kabir Sikder

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Experienced Machine Learning expert and Ph.D. candidate in Computer Engineering, specializing in AI and cybersecurity for critical infrastructure. Proven track record in enhancing security and efficiency with ML solutions deployed in major U.S. facilities. Skilled in developing scalable AI models for real-time threat detection, committed to advancing data-driven technologies in high-stakes environments.

Technical Skills

Programming Languages: Python, C++, SQL — Proficient in software development and automation.
Machine Learning Frameworks: Keras, PyTorch, TensorFlow — Experienced in building and deploying scalable AI models.
Data Science Tools: Pandas, NumPy, Scikit-learn — Skilled in data manipulation, analysis, and Machine Learning operations.
DevOps & MLOps: Docker, Apache Airflow — Efficient in model deployment and workflow automation.
Big Data Frameworks: Apache Spark — Proficient in distributed data processing and analysis.
Utilities: Git, PyCharm Pro, Visual Studio Code, Jupyter Notebook, MATLAB — Advanced usage in project version control and data exploration.
Cloud Technologies: AWS, Azure, Google Cloud — Proficient in cloud services including SageMaker for ML deployment.
Cybersecurity Tools: OpenSSL, JWT, PyCrypto — Knowledgeable in securing data and communications in AI applications.

Ph.D. Research Experience

A3 Lab & Commonwealth Cyber Initiative [Website] **January 2021 – Present**
Graduate Research Assistant, Virginia Tech *Arlington, VA*

- Cyber-physical Attacks Detection: Led the development of advanced AI models, including High Confidence AutoEncoders (HCAE) and Generative Adversarial Networks, for threat detection in water supply systems. Focused on enhancing the efficacy and explainability of real-time cyber-physical threat detection methods.
- AI-based Decision Support System: Developed a mix of machine learning and deep learning models, including LSTM and GRU networks, to improve anomaly detection and forecast essential operational variables in SCADA systems, enhancing security and prediction accuracy.
- Context-aware AI Framework: Designed a framework that integrates external data to improve predictions and explanations of operational variables in water supply systems contextually, using the Temporal Fusion Transformer model.
- Precision Agriculture: Used Isolation Forest algorithms to create models that predict agricultural outputs, improving decision-making in precision agriculture with data-driven insights.
- AI Assurance Frameworks: Created deployable conceptual frameworks to ensure AI system reliability across explainability, fairness, and security, supporting deploying trustworthy AI applications in various domains.

Advanced Research Institute [Website] **August 2019 – December 2020**
Graduate Research Assistant, Virginia Tech *Arlington, VA*

- Building Energy Modeling: Led the development of 13 building models in SketchUp, integrating real-time data to validate and optimize energy load predictions using EnergyPlus, achieving energy savings.
- Demand Response Analysis: Conducted analyses to optimize the scheduling and operation of smart appliances, improving energy efficiency and flexibility and informing strategic energy management practices.

Professional Experience

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

- Developed and tested the Building Energy Management Open Source Software (BEMOSS) for IoT and smart grids, facilitating advanced load control and demand response management across devices with diverse communication technologies, including LoRa and Zigbee.

Grameenphone Ltd., Dhaka, Bangladesh | ***System Engineer*** **October 2015 – July 2019**

- Led the swift deployment of Dhaka's city-wide LTE network, setting records for speed within the technical team.
- Developed a Telegram BOT and implemented DWDM and IPBH router protection systems, enhancing remote network management and reliability.
- Created a C# billing tool and an energy-efficient fuel generator controller, significantly improving financial management and reducing operational costs.

Education

Virginia Polytechnic Institute and State University **Aug. 2019 – Present**
Doctor of Philosophy in Computer Engineering *Arlington, Virginia*
- Relevant Courses: Deep Learning, Reinforcement Learning, Optimization Techniques, Statistics in Research

Virginia Polytechnic Institute and State University **Aug. 2019 – May 2022**
Masters of Science in Computer Engineering *Falls Church, Virginia*
- Relevant Courses: Advanced Machine Learning, Network Architecture and Protocol, Cybersecurity and IoT, Applied Linear Systems

Bangladesh University of Engineering and Technology **May. 2010 – Sep. 2015**
Bachelor of Science in Electrical and Electronics Engineering *Dhaka, Bangladesh*

Awards / Recognitions

- Named among the best national water and AI researchers in Water Systems by The Water Research Foundation and winner of the *2022 Intelligent Water Systems Challenge* for developing AI-driven tools deployed in real-time operational settings at a major US wastewater treatment facility. [IWS Website]
- Awarded 2nd place for designing a line-following robot at the 2014 BUET contest.

Media Coverage

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

Selected Publications — [Google Scholar Link]

Journal Publications
- 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. [Journal][Github]
- 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.[Journal][Github]

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.[Conference][Github]
- 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.[Conference][Github]
- 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.[Conference]
- 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.[Conference]

Academic Book Chapters
- Sikder, M. N. K., & Batarseh, F. A. (2023). *Outlier detection using AI: a survey.* In AI Assurance (pp. 231-291). Academic Press.[Journal]
- 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.[Journal]

Poster Sessions 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.*[Technical Report]
- *Model-Agnostic AI Assurance Scoring Framework.* Sikder, M. N. K. & Batarseh, F.,SDSS Conference 2022.[Abstract]

Research Interest

- Data Science, Deep Learning, Machine Learning, Big Data

Visa & Employment Authorization

- Status: F-1 Visa (Ph.D. Candidate, expected graduation Fall 2024); self-petitioning for Green Card (NIW EB-2, in process). No sponsorship is required.