M A U Shariff

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RESEARCH INTERESTS

Applied AI and machine learning systems: LLM-powered applications, agentic AI and workflow automation, and end-to-end ML pipelines, from large-scale data engineering to model training, evaluation and deployment. Primary application domain: network operations, including traffic characterization and forecasting, anomaly-aware modeling, federated and privacy-preserving learning across network operators, and LLM-driven agents for autonomous network management.

EDUCATION

Ph.D. in Computer Science Aug 2023 to present
University of Nebraska–Lincoln *Lincoln, NE, USA*

- Dissertation: *From Transformers to Large Language Models: A Unified AI Framework for Predictive and Agentic Network Operations* (expected July 2028)
- Advisor: Dr. Byrav Ramamurthy. Committee: Dr. Lisong Xu, Dr. Sasitharan Balasubramaniam, Dr. Herman Batelaan
- GPA: 3.92/4.00

M.S. in Computer Science Aug 2023 to Aug 2025
University of Nebraska–Lincoln *Lincoln, NE, USA*

- Thesis: *Traffic Prediction for Research and Education Networks: Anomaly-aware Deep Learning and Benchmarking*. Received the School of Computing Master's Thesis Award
- Advisor: Dr. Byrav Ramamurthy. Committee: Dr. Lisong Xu, Dr. Sasitharan Balasubramaniam
- GPA: 4.00/4.00

B.Sc. in Computer Science and Engineering Jan 2017 to Mar 2021
Port City International University *Chattogram, Bangladesh*

- Thesis: *A Bangladeshi Regional Dialects Identification using a Novel GLDNN Hybrid Model*
- CGPA: 3.99/4.00

Selected graduate coursework: Introduction to Machine Learning; Computer Vision; Honors: Generative AI; Computer Vision and Machine Learning; Cybersecurity for Big Data, Cloud and Cryptocurrencies; Internet Systems and Programming; Operating Systems Principles; Design and Analysis of Algorithms; Automata, Computation and Formal Languages; Queueing Models for Computer Systems and Networks (seminar).

RESEARCH EXPERIENCE

Graduate Research Assistant Jun 2024 to present
Network Research Group (NetGroup), School of Computing, University of Nebraska–Lincoln *Lincoln, NE*

Advisor: Dr. Byrav Ramamurthy. Research with the group since April 2024.

- **REN traffic forecasting and anomaly-aware benchmarking** (NSF OAC-2322369). Built an out-of-core Dask ETL pipeline that turns 314 million Internet2 NetFlow records (10 backbone routers, 57 days, 13.7 billion packets) into model-ready time series within a 60 GB memory limit. Benchmarked six model families, from SARIMA to TiDE and PatchTST, across 960 experimental configurations; TiDE reduced forecasting error by 30 to 42% over statistical baselines, and a new anomaly-integration strategy improved robustness by 3.3%. [C2, C3, C6, T1]
- **Cross-operator federated learning.** Built a 20-client federation over 10 Internet2 backbone routers and 10 CESNET3 institutions, with a regional ISP held out as an unseen network. Showed that federated training is statistically equivalent to centralized pooling (equivalence test, $\pm 5\%$ bound, $p = 0.020$) and that its benefit is uneven: backbone clients gain a median 9.2% versus 1.9% for campus clients ($p = 0.0003$). Released the full pipeline on GitHub and Zenodo. [C1]

- **When federation pays off.** Derived a training-free pre-join score that lets a network operator predict, from its own traffic alone, whether joining a federation will lower its forecasting error. A performance model of windowed predictors explained why a first pre-registered hypothesis failed; the revised score, fixed before a third pre-registered study, ranked the gains of 200 later joiners (Spearman $\rho = 0.37$ for reconstruction and 0.28 for day-ahead forecasting). In its lowest quartile, joining raised the median operator's forecast error by 16.5% versus 3.2% in the highest. [S1]
- **Drift, transfer and explainability.** Extended the forecasting framework with concept-drift analysis, cross-dataset transfer to CESNET3, and SHAP explanations for network operators. [J1]
- **Forecast granularity.** Quantified how prediction lead time (1 to 24 hours) and aggregation window (5 minutes to 1 day) shape accuracy across four Internet2 routers. [P1]
- **Cross-layer optical network modeling** (NSF CNS-2413851, with IIT Madras). Created and maintain RONA, an open-source Python tool for regenerator and optical phase conjugator (OPC) placement in coherent WDM networks, evaluated on the RailTel India (19-node) and USNET (24-node) topologies. [P3]
- **Data caching for high-energy physics** (DOE DE-SC0024648). Started work on ML-based access prediction for Open Science Grid data-federation caches (XRootD and OSDF logs), with UNL's Holland Computing Center.
- **Proposal writing.** Contributed to writing a DOE EPSCoR State/National Laboratory Partnership pre-proposal with Argonne National Laboratory and Fermilab (*AI-Driven Cache-Aware Optimization of Globus Data Transfers with Distributed Edge Training over ESnet and FABRIC*) and an NSF CICI proposal (*Hi-Fi-Sci: A Distributed Trace-Driven Framework across Compute, Network and Storage Resources for High-Fidelity Science*).

Graduate Research Assistant May 2025 to present
Batelaan Lab, Department of Physics and Astronomy, University of Nebraska–Lincoln *Lincoln, NE*
Supervisor: Dr. Herman Batelaan. Supported by NSF PHY-2513170 (Coherent Electron Control). Funded appointments in Summer 2025 and the winter session (Dec 2025 to Jan 2026); collaboration ongoing.

- Lead the machine learning analysis for the "Quantum Musical Chairs" experiment, which seeks to observe the Pauli exclusion principle in free-electron beams.
- Designed the data pipeline and classifiers that separate the quantum Pauli-blockade signal from classical Coulomb repulsion in simulated electron-detector data, and wrote the group's computational strategy for scaling simulations into a training pipeline (June 2025). [A1]

Research Assistant Sep 2019 to Dec 2020
Deep Learning Research Lab, Port City International University *Chattogram, Bangladesh*
Advisor: Emam Hossain.

- Developed a hybrid GRU-LSTM model to forecast the air quality index for Dhaka and Chattogram, published in Springer's Advances in Intelligent Systems and Computing series. [C7]

PUBLICATIONS

Google Scholar: 91 citations (November 2026). Code for every paper is public at github.com/mahinshariff.

Journal Articles (Submitted)

[J1] **M. A. U. Shariff** and B. Ramamurthy, "Toward Trustworthy and Generalizable Traffic Forecasting for Research and Education Networks: A Scalable, Anomaly-Aware, and Explainable Framework," submitted to *IEEE Transactions on Network and Service Management (TNSM)*, Nov. 2026.

Conference Papers (Submitted)

[S1] **M. A. U. Shariff** and B. Ramamurthy, "A Training-Free Pre-Join Score for Federated Learning on Network Telemetry: How Persistence Shapes the Gain," submitted to *IEEE International Conference on Communications (ICC 2027)*, Oct. 2026.

Conference and Workshop Papers

[C1] **M. A. U. Shariff** and B. Ramamurthy, "Who Benefits from Federation? Heterogeneous Gains in Cross-Operator Network Traffic Representation Learning," in *Proc. 13th International Workshop on Innovating the Network for Data-Intensive Science (INDIS 2026)*, held with SC26, Chicago, IL, Nov. 2026. Accepted as a regular paper. Artifact: doi:10.5281/zenodo.22844434.

[C2] **M. A. U. Shariff** and B. Ramamurthy, "Engineering a 5-Phase Operational Framework for Research Network Analytics: A Scalable Deployment Architecture for High-Velocity Traffic," in *Proc. 32nd IEEE International Symposium on Local and Metropolitan Area Networks (LANMAN 2026)*, Tempe, AZ, Jun. 2026. doi:10.1109/LANMAN69841.2026.11623630.

[C3] **M. A. U. Shariff** and B. Ramamurthy, "Enhancing Anomaly Resilience in Research Networks: A Large-Scale Forecasting Benchmark for Dynamic Security Baselining," in *Proc. 2026 IEEE Silicon Valley Cybersecurity Conference (SVCC)*, San Jose, CA, Jun. 2026. **Best Paper Award.** doi:10.1109/SVCC69905.2026.11642401; arXiv:2608.05605.

[C4] **M. A. U. Shariff**, "A Novel Hybrid GLDNN Architecture for Bangla Dialect Identification," in *Data Science, AI and Applications (ICDSAIA 2025)*, Dhaka, Bangladesh, Jul. 2025, Communications in Computer and Information Science, vol. 2682, Springer, pp. 75–91. doi:10.1007/978-3-032-11352-8_6.

[C5] M. S. Ahamed, K. M. N. Hossain, **M. A. U. Shariff**, I. U. Haque, S. M. Hridita, and M. A. Talha, "AI-Driven Multilayered Cybersecurity Intelligence Framework for Critical Infrastructure Protection," in *Data Science, AI and Applications (ICDSAIA 2025)*, Dhaka, Bangladesh, Jul. 2025, Communications in Computer and Information Science, vol. 2681, Springer, pp. 31–45. doi:10.1007/978-3-032-11335-1_3.

[C6] **M. A. U. Shariff**, V. S. S. L. Karanam, and B. Ramamurthy, "Traffic Prediction for Research and Education Networks using an Ensemble GRU-LSTM with Varying Lead Times," in *Proc. IEEE International Conference on Communications Workshops (ICC Workshops 2025), DDINS Workshop*, Montreal, Canada, Jun. 2025, pp. 1676–1681. doi:10.1109/ICCWorkshops67674.2025.11162466.

[C7] E. Hossain, **M. A. U. Shariff**, M. S. Hossain, and K. Andersson, "A Novel Deep Learning Approach to Predict Air Quality Index," in *Proc. International Conference on Trends in Computational and Cognitive Engineering (TCCE 2020)*, Advances in Intelligent Systems and Computing, vol. 1309, Springer, 2021, pp. 367–381. doi:10.1007/978-981-33-4673-4_29.

Book Chapter

[B1] K. Begum, M. M. Rashid, and **M. A. U. Shariff**, "Comparative Study of Big Data Visualization Tools and Techniques," Chapter 16 in *Applied Informatics for Industry 4.0*, N. Siddique, M. S. Arefin, J. Wall, and M. S. Kaiser, Eds. Boca Raton, FL: CRC Press (Taylor & Francis), 2023, pp. 188–199. doi:10.1201/9781003256069.

Conference Abstracts

[A1] A. K. Uppath Mohanan, R. Puente, M. Rioux, R. Syed, A. Mahmood, **M. A. U. Shariff**, B. Ramamurthy, K. Uiterwaal, and H. Batelaan, "Towards Observation of Quantum Degeneracy in Electron Beams via Variation of Pulse Width," poster, *57th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics (DAMOP 2026)*, Providence, RI, Jun. 2026.

Thesis

[T1] **M. A. U. Shariff**, "Traffic Prediction for Research and Education Networks: Anomaly-aware Deep Learning and Benchmarking," M.S. thesis, School of Computing, University of Nebraska–Lincoln, Aug. 2025. Available at UNL Digital Commons.

In Preparation

[P1] **M. A. U. Shariff**, V. S. S. L. Karanam, and B. Ramamurthy, "Empirical Analysis of Traffic Forecasting Sensitivity to Lead, Lag, and Aggregation Windows in Research and Education Networks," for *IEEE Transactions on Network Science and Engineering (TNSE)*.

[P2] **M. A. U. Shariff** and B. Ramamurthy, "Forecasting the Pulse of Science: Tackling Traffic Prediction Challenges in Research & Education Networks," for *IEEE Communications Magazine*.

[P3] B. Hu, M. Krishna, **M. A. U. Shariff**, D. Venkitesh, and B. Ramamurthy, "Integrated Physical Layer Modeling and OPC Deployment Analysis for Coherent WDM Networks," for *Journal of Optical Communications and Networking (JOCN)*.

HONORS, AWARDS AND GRANTS

Awards

- Best Paper Award, 2026 IEEE Silicon Valley Cybersecurity Conference (SVCC) 2026

- School of Computing Master's Thesis Award, University of Nebraska–Lincoln (sole recipient) 2025 to 2026
- Chancellor Gold Medal (department topper), Port City International University 2021
- 5th place, Inter-University Programming Contest 2019
- Runner-up, Software Development and PCIU Hackathon 2018
- ACM ICPC Online Preliminary Contest (completed the regional phase) 2018

Fellowships and Research Grants

- Mary E. and Elmer H. Dohrmann Fellowship in Computer Science, UNL ($2,500) 2026 to 2027
- Milton E. Mohr Graduate Fellowship, College of Engineering, UNL ($1,000) 2026 to 2027
- IEEE Computational Intelligence Society Graduate Student Research Grant 2025
  $4,000 (the maximum award) for *Advancing AI for Educational Infrastructure: Robust Traffic Prediction and Benchmarking for Research and Education Networks*

Travel Grants

- IEEE Computer Society Student Travel Grant, IEEE LANMAN 2026 ($650) 2026
- NSF Travel Grant, AgWireless'26, ARA Wireless Living Lab, Iowa State University ($2,000) 2026
- NSF Travel Grant, AraFest'25, ARA Wireless Living Lab, Iowa State University ($2,000) 2025
- UNL Graduate Student Travel Award ($500) 2025
- NSF Travel Grant, AraFest'24, ARA Wireless Living Lab, Iowa State University ($1,800) 2024

TALKS AND PRESENTATIONS

Paper Presentations

- "Who Benefits from Federation?" INDIS 2026 at SC26, Chicago, IL (scheduled) Nov 2026
- "Engineering a 5-Phase Operational Framework for Research Network Analytics," IEEE LANMAN 2026, Tempe, AZ Jun 2026
- "Enhancing Anomaly Resilience in Research Networks," IEEE SVCC 2026, San Jose, CA (Best Paper Award) Jun 2026
- "A Novel Hybrid GLDNN Architecture for Bangla Dialect Identification," ICDSAIA 2025, Dhaka, Bangladesh Jul 2025

Poster Presentations

- "Forecasting Bursty Network Traffic on Commodity Hardware," AgWireless'26, Iowa State University, Ames, IA Aug to Sep 2026
- "Traffic Prediction for Research and Education Networks using an Ensemble GRU-LSTM with Varying Lead Times" (poster version of [C6]), AraFest'25, Iowa State University, Ames, IA Sep 2025

TEACHING EXPERIENCE

Graduate Teaching Assistant Aug 2023 to Aug 2024; Aug 2026 to present
School of Computing, University of Nebraska–Lincoln *Lincoln, NE*

- **Fall 2026.** CSCE 443/843 Cybersecurity for Big Data, Cloud and Cryptocurrencies: design the lab assignments and quizzes, lead the weekly lab session, and grade. CSCE 953 Optical Communication Networks: grade and give a guest lecture.
- **Fall 2023 to Summer 2024.** CSCE 310 Data Structures and Algorithms (78 students in Fall 2023; 140 students across two sections in Spring 2024; 25 students in Summer 2024): led recitations, lecturing and working through problems with students, and graded coursework. SOFT 162 Software Engineering Fundamentals (30 students, Summer 2024).

Guest Lectures

- CSCE 953 Optical Communication Networks, "Learning from the Internet2 Backbone," UNL Sep 14, 2026
- CSCE 952 Advanced Computer Networks, UNL Oct 2025
- CSCE 310 Data Structures and Algorithms, UNL Spring 2024

Coding Instructor and Teacher Consultant (remote, part-time) May 2022 to Jun 2023
Codingal *Bengaluru, India*

- Taught Python, AI and data science to K-12 students; led webinars, masterclasses and training workshops.

Earlier Teaching, Port City International University 2017 to 2021

- Undergraduate lab teaching assistant for the Object-Oriented Programming, Database Management Systems, and Data Structures and Algorithms labs and the Software Engineering project course.
- Private tutor to 23 students over five years (to 2022).

OPEN-SOURCE SOFTWARE AND PROJECTS

- **who-benefits-federation.** Complete eight-stage pipeline, diagnostic tools and every metric table behind [C1]; GitHub release v1.0.0 archived on Zenodo (doi:10.5281/zenodo.22844434, CC BY 4.0).
- **RONA (Regenerator-OPC-Network-Analyzer).** Python tool for analyzing optical network paths and placing regenerators and optical phase conjugators. [P3]
- **REN forecasting benchmark.** Dask-optimized ETL over 314 million NetFlow records from 10 Internet2 routers and a benchmark of deep forecasting models with anomaly awareness. [C2, C3, T1]
- **REN-Traffic-Prediction-GRU-LSTM.** Preprocessing, models and analysis for [C6].
- **granularity-across-4-router.** Lead-time and aggregation-window study across four Internet2 routers. [P1]
- **Generative AI pipeline for medical data augmentation** (course project, CSCE 880 Honors: Generative AI, Fall 2025). Fine-tuned a VAE on 35,000 retinal images and used Stable Diffusion 3.5 with LoRA for targeted inpainting of diabetic-retinopathy lesions; the synthetic training pairs improved downstream segmentation generalization on clinical test sets.

PROFESSIONAL SERVICE

Reviewer (11 manuscripts)

- ACM Digital Threats: Research and Practice (DTRAP), 1 manuscript 2026
- IEEE Conference on Computer Communications (INFOCOM 2027), 1 paper 2026
- ACM Transactions on Computing for Healthcare, 2 manuscripts 2025
- IEEE Conference on Computer Communications (INFOCOM 2026), 3 papers 2025
- IEEE Symposium on Computers and Communications (ISCC 2025), 2 papers 2025
- IEEE 101st Vehicular Technology Conference (VTC2025-Spring), 1 paper 2025
- IEEE Wireless Communications and Networking Conference (WCNC 2025), 1 paper 2024

Judge

- Summer Research Symposium, Office of Graduate Studies, UNL Aug 2026
- CornHacks 2025, School of Computing hackathon, UNL Nov 2025
- Student Research Days, Undergraduate Poster Session, UNL Mar 2024
- CornHacks 2024, School of Computing hackathon, UNL Feb 2024

LEADERSHIP AND OUTREACH

President Jan 2026 to Dec 2026
Bangladesh Student Association, University of Nebraska–Lincoln *Lincoln, NE*

- Led a year of community programming: a Ramadan Iftar, Pahela Baishakh (Bengali New Year), the BSA sports competition and the signature Bangladesh Night, drawing hundreds of attendees across events; Bangladesh Night was the largest, with about 250 guests.

Member, Young Alumni Academy (2026 to 2027 cohort) 2026 to present
Nebraska Alumni Association *Lincoln, NE*

Undergraduate Leadership, Port City International University 2017 to 2021

- Organized two workshops on IoT and software development, and led a five-student undergraduate research group.

- Distributed COVID-19 relief to more than 150 families with a local youth club.

INDUSTRY EXPERIENCE

Assistant Programmer Apr 2021 to Jun 2023
Arena Web Security *Dhaka, Bangladesh*

- Ran the full software development lifecycle: gathered and prioritized requirements, wrote technical specifications, oversaw implementation, wrote and executed test cases, and monitored systems to find and report defects.

TECHNICAL SKILLS

- **Programming:** Python, C, Java, JavaScript, Bash; familiar with C++ and PHP.
- **Machine learning:** PyTorch, PyTorch Lightning, TensorFlow, Keras, scikit-learn, NeuralForecast; time-series forecasting (LSTM, GRU, N-BEATS, N-HiTS, TiDE, PatchTST, SARIMA, Prophet); anomaly detection (Isolation Forest, LOF); federated learning (FedAvg, FedProx); autoencoders; Transformers and LLMs; generative models (Stable Diffusion, VAE, LoRA); SHAP.
- **Data and systems:** Dask, Apache Parquet and PyArrow, pandas, NumPy, SciPy, Matplotlib; GPU computing on HPC clusters (Holland Computing Center); Linux; Docker; Git and GitHub; reproducible releases on Zenodo.
- **Databases and web:** MySQL, SQLite, MongoDB, Firebase; React, Node.js, HTML and CSS.
- **Other:** LaTeX, Jupyter; statistical testing (equivalence tests, Mann-Whitney U).

PROFESSIONAL MEMBERSHIPS

- IEEE Graduate Student Member (since 2025), with the IEEE Communications Society, IEEE Computational Intelligence Society and IEEE Computer Society.

REFERENCES

Dr. Byrav Ramamurthy
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