Muhammad Sohel Rana
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EDUCATION

Ph.D. in Mathematics (Data Science Track), jointly with the Department of Computer Science and Engineering, University of Texas at Arlington, 2026

- ◇ Dissertation: *Neighborhood Embeddings and Scalable Learning for Optimal Transport and Unbalanced Optimal Transport*
- ◇ Advisor: Dr. Keaton Hamm

M.S. Mathematics, Western Kentucky University - 2017

- ◇ Supervisor: Dr. Mark Robinson

M.S. Applied Mathematics, Dhaka University - 2008

B.S. Mathematics, Dhaka University - 2007

- ◇ Project supervisor: Dr. Mohammad Ferdows

EMPLOYMENT

June 2023 – Present Graduate Research Assistant, University of Texas at Arlington
Sep 2022 – May 2023 Graduate Teaching Assistant, University of Texas at Arlington
Jan 2022 – Aug 2022 Lecturer, North South University, Bangladesh
Sep 2019 – May 2021 Graduate Teaching Assistant, University of Texas at Arlington
Sep 2015 – Dec 2017 Graduate Teaching Assistant, Western Kentucky University
July 2012 - August 2015 Senior Officer, Pubali Bank Limited, Bangladesh
Jan 2012 - June 2012 Math Teacher, Bangladesh International School and College, Bangladesh
Jan 2011 - Dec 2011 Math Teacher, Bangladesh International Tutorial, Bangladesh

RESEARCH EXPERIENCE

Graduate Research Assistant
University of Texas at Arlington
June 2023 – Present

- ◇ Conduct research in machine learning and data science with emphasis on optimal transport, unbalanced optimal transport, and scalable learning methods.
- ◇ Developed geometry-aware dimensionality reduction methods using Wasserstein and Hellinger–Kantorovich distances for high-dimensional datasets.
- ◇ Proposed scalable recovery methods for large Wasserstein distance matrices using Nyström approximation and matrix completion techniques.
- ◇ Applied methods to image, biomedical, and text datasets including MNIST, Fashion-MNIST, and MedMNIST.

- ◇ Collaborated on interdisciplinary projects involving federated learning, privacy-preserving machine learning, and data quality challenges.
- ◇ Co-supervised undergraduate and master's students on research projects involving machine learning, optimal transport, and data analysis.
- ◇ Guided students in literature review, implementation of algorithms, experimental design, and presentation of research findings.

P U B L I C A T I O N S

Manuscripts under riview

- ◇ **Muhammad Rana**, and Keaton Hamm, Neighbor Embeddings Using Unbalanced Optimal Transport Metrics. Preprint (Submitted).
- ◇ **Muhammad Rana**, Phuong Trinh, Ryan Bui, and Keaton Hamm, On Wasserstein distance neighbor embeddings. (Submitted)
- ◇ Md Abul Hossain Mamun, **Muhammad Rana**. Factors Influencing women's total children ever born and current contraceptive use in urban and rural areas: Evidence from BDHS 2017-18. (Submitted)

Peer reviewed papers

- ◇ **Muhammad Rana**, Abiy Tasissa, HanQin Cai, Yakov Gavriyelov, and Keaton Hamm, *Recovering Wasserstein Distance Matrices from Few Measurements*. In *Proceedings of the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2026)*, Barcelona, Spain, 2026. (To appear)
- ◇ Md. Mehedi Hasan, Mohammad Abdul Halim, **Muhammad Sohel Rana**, Salma Yeasmin Jannaty, and M. J. Uddin. *Nanofluid natural convection in trapezoidal annuli: Comparative effects of triangular, circular, and square inner walls. International Journal of Thermofluids (Elsevier)*, 2025.
- ◇ Zahidur Talukder, **Muhammad Rana**, Keaton Hamm, and Mohammad Islam, Empowering Clients: Self-Adaptive Federated Learning for Data Quality Challenges. (Approximately 11 pages, IEEE EDGE 2025)

A W A R D S

- ◇ Mathematics Academic Excellence Scholarship (University of Texas at Arlington)
  - ⊙ Awarded yearly to graduate students who have demonstrated academic excellence (out of approximately 70 graduate students.)
- ◇ Dr. R. Glenn and Virginia Powers Scholarship (Western Kentucky University)
  - ⊙ Awarded to the best return graduate student (out of approximately 10 graduate students.)
- ◇ Honors results-based merit scholarship (University of Dhaka)
  - ⊙ Awarded to the best 2-3 students in the Mathematics department resident in Fazlul Huq Muslim Hall based on honors results.)

P R E S E N T A T I O N S

Invited talks

- ◇ Empowering Clients: Self-Adaptive Federated Learning for Data Quality Challenges - Teatime event, Division of data science, University of Texas at Arlington, Arlington, TX, February 21, 2025.
- ◇ Optimal Transport-Based Dimensionality Reduction - CodEx student/postdoc series mini-conference 2025 (virtual), May 27, 2025

Poster Presentations

- ◇ Recovering Wasserstein Distance Matrices from Few Measurements, Discover 2026 Student Research Symposium, University of Texas at Arlington, April 2026.

TEACHING EXPERIENCE

UNIVERSITY OF TEXAS AT ARLINGTON

Graduate Teaching Assistant

MATH 1426, Calculus I - Fall 2019
MATH 2425, Calculus II - Sprint 2020, Fall 2020, Spring 2021, Fall 2022, Spring 2023
STATS 1308, Elementary Statistical Analysis - Summer 2020

NORTH SOUTH UNIVERSITY

Lecturer
Spring 2022

- ◇ MATH 116, PreCalculus (2 Sections): Developed lecture materials, assignments, final and midterm exams, and rubrics for grading from scratch. Delivered lectures to 80 students and received strong student evaluation from students (4.45 (very good) out of 5). Guided graduate teaching assistant for the courses.
- ◇ MATH 120, Calculus and Analytic Geometry-I (2 sections) Designed all instructional materials, assessment, and grading criteria for the course. Instructed and delivered lectures to a group of 80 students and achieved highly favorable feedback from the students about instructor (4.05 (very good) out of 5). Help the graduate teaching assistant to grade the homework assignments and grading policy.

Summer 2022

- ◇ MATH 116, Pre-Calculus (3 Sections) Mentored 120 students, developed all the questions for exams aligned with course objective and difficulty level. Guided graduate teaching assistant to grade homework assignments and grade policy.
- ◇ MATH 120, Calculus and Analytic Geometry-I (2 sections) Guided a cohort of 80 students, proctored all the exams, and handled the final grading submission.

WESTERN KENTUCKY UNIVERSITY

Graduate Teaching Assistant

MATH 136, Calculus I, Fall 2015
MATH 137, Calculus II, Spring 2016, Fall 2016, Spring 2017, Fall 2017

INDUSTRY EXPERIENCE

Senior Officer, Pubali Bank Limited, Bangladesh
June 2012 – July 2015

- ◇ Managed client portfolios and assisted in retail banking operations.
- ◇ Collaborated with loan and advance teams on loan disburse and recovery.

ACADEMIC SERVICES

Volunteering Experience

- UTA Calculus Bowl (2020, 2021, 2023, 2024): Assisted with a playoff-style quiz competition focused on precalculus and calculus concepts for student teams.

Peer Review Activities

- Peer Reviewer, American Journal of Undergraduate Research (AJUR), 2026.

TECHNICAL SKILLS

Languages

- ◇ **Languages:** Python, LaTeX, Mathematica, C, Fortran
- ◇ **Tools:** Numpy, Pandas, scikit-learn, keras, Pytorch, Tensorflow, NLTK, Matplotlib, PostgreSQL
- ◇ **Expertise:** Computer vision, NLP, Manifold learning techniques, supervised and unsupervised machine learning, Numerical Analysis

References

Dr. Keaton Hamm
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University of Texas at Arlington
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Dr. Mohammad Atiqul Islam
Assistant Professor
Department of Computer Science
University of Texas at Arlington
Email: mislam@uta.edu

Dr. Hristo V. Kojouharov
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Dr. Zahidur Talukder
Assistant Professor
Mathematics and Computer Science
Texas Lutheran University
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Dr. Ruth Gornet
Associate Professor
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