

Kazi Ashik Islam

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EDUCATION

University of Virginia, School of Engineering and Applied Science August 2019 – December 2025

PhD Computer Science

Research Focus: Computational tools for public policy and decision-making as it relates to the complex challenges in large-scale disaster management and infrastructure development.

University of Virginia, School of Engineering and Applied Science

May 2023

MCS Computer Science

GPA: 4.0 / 4.0

Relevant Coursework: Machine Learning, Graph Mining, Topics in Learning and Game Theory.

Bangladesh University of Engineering and Technology

September 2017

BSc Computer Science

GPA: 3.86 / 4.0

Major: Artificial Intelligence.

WORK EXPERIENCE ([Linkedin](#))

Postdoctoral Research Associate, Oak Ridge National Laboratory, Oak Ridge, TN, USA.

April 2026 – To Date

- *Designing and formalizing sub-quadratic attention mechanisms with structured hierarchical memory, targeting efficient training and sublinear-memory decoding.*

Graduate Research Assistant, Biocomplexity Institute, Charlottesville, VA, USA.

August 2019 – April 2026

- Conducted research on designing computational frameworks that leverage simulation, optimization, and data-driven techniques to enhance urban resilience.

Graduate Teaching Assistant, University of Virginia, Charlottesville, VA, USA.

August 2020 – May 2024

- Served as Teaching Assistant for four semesters across three courses: Algorithmic Economics (CS 4501), Cloud Computing (CS 4740), and Discrete Mathematics (CS 2102).
- Provided academic support through office hours, fostering collaborative learning environments.
- Assisted students in understanding complex concepts in algorithmic economics, cloud computing, and discrete mathematics.

PhD Research Intern, Pacific Northwest National Laboratory, Richland, WA, USA (Remote).

June 2024 - May 2025

- Developed a framework using LLMs to automatically extract structured metadata from Environmental Impact Statement (EIS) documents; contributing to the public release of [NEPATEC2.0 dataset](#).
- Developed a benchmark dataset and an evaluation framework to assess the performance of existing RAG systems in the scientific domain of Catalysis.

Software Engineer, Dingi Technologies Limited, Dhaka, Bangladesh.

September 2017 - June 2019

- Designed and developed systems for: live traffic prediction, vehicle tracking, location-based search, navigation.
- Implemented backend functionalities (e.g., designing database, data-pipeline, APIs) for the above projects.
- Deployed live APIs on AWS to serve web and mobile applications.

Publications ([Google Scholar](#))

[1] Kazi Ashik Islam, Zakaria Mehrab, Mahantesh Halappanavar, Henning Mortveit, Sridhar Katragadda, Derek Loftis, and Madhav Marathe. **Towards High Resolution Probabilistic Coastal Inundation Forecasting from Sparse Observations**. Proceedings of the 40th Annual AAAI Conference on Artificial Intelligence (AAAI), Vol. 40, No. 45, pp. 38607-38615. 2026.

- Developed a masked conditional diffusion model that is trained on physics-based hydrodynamic simulations but performs real-time coastal inundation forecasting from sparse sensor observations.
- Achieved up to 62% performance improvement over state-of-the-art spatiotemporal forecasting methods at 95% sparsity levels, demonstrating superior performance for large-scale high-resolution forecasting tasks.

[2] Kazi Ashik Islam, Aparna Kishore, Rounak Meyur, Swapna Thorve, Da Qi Chen, H. Vincent Poor, and Madhav Marathe. **CHARGE-MAP: An Integrated Framework to Study Multi-criteria EV Charging Infrastructure Expansion Problem.**

Proceedings of the National Academy of Sciences, 122.51 (2025): e2514184122.

- Designed a modular data-driven framework for efficiently expanding the EV charging infrastructure.
- Estimated EV charging demand by utilizing an Agent-based model that simulates the mobility of EV adopters.
- Optimized the placement of new charging stations and chargers using mathematical optimization.

[3] Sai Munikoti*, Dan Nally*, Sai Dileep Koneru*, Siddhartha Shankar Das*, Kaustav Bhattacharjee*, Kazi Ashik Islam*, et al. **NEPATEC v2.0: Standardized Metadata and Text Corpus of National Environmental Policy Act Documents.** Pacific Northwest National Laboratory (PNNL) [Technical Report](#), 2025. (*equal contribution)

- Developed an LLM-based framework to automatically extract structured metadata from Environmental Impact Statement (EIS) documents. Utilized the DsPy framework for auto prompt optimization.
- Expert validation on 179 EIS documents showed consistently high extraction quality, with mean evaluation scores ranging from 4.34 to 4.96 out of 5.0 (median 5.0) across all metadata attributes.

[4] Kazi Ashik Islam, Zakaria Mehrab, Mahantesh Halappanavar, Henning Mortveit, Sridhar Katragadda, Derek Loftis, and Madhav Marathe. **Denoising Diffusion Probabilistic Models for Coastal Inundation Forecasting.** Proceedings of the 33rd ACM International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL), pp. 973-976. 2025.

- Developed a diffusion-based probabilistic spatiotemporal forecasting method for coastal inundation prediction.
- Demonstrated superior performance on Virginia Eastern Shore coastal inundation data, achieving up to 64% improvement over state-of-the-art baselines in prediction accuracy.

[5] Kazi Ashik Islam, Da Qi Chen, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **A scalable game-theoretic approach to Urban Evacuation Routing and Scheduling.** In Proceedings of the 2024 IEEE International Conference on Big Data (Big Data), pages 1775 – 1784, 2024.

- Formulated a strategic routing and scheduling game where players can choose their routes and schedule.
- Proved the existence of pure Nash equilibria and presented an efficient algorithm for finding such equilibria.
- Demonstrated the applicability of the algorithm in evacuation planning through experiments on two study areas.

[6] Kazi Ashik Islam, Da Qi Chen, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **Strategic routing and scheduling for evacuations.** In Proceedings of the 2024 International Conference on Autonomous Agents and Multiagent Systems, AAMAS-24, pages 2312 – 2314, 2024.

[7] Kazi Ashik Islam, Da Qi Chen, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **Simulation assisted optimization for large-scale evacuation planning with congestion-dependent delays.** In Proceedings of the Thirty-Second International Joint Conference on Artificial Intelligence, IJCAI-23, pages 5359–5367, 2023.

- Modeled the joint optimization of routing and scheduling problem as a mathematical program.
- Designed a solution method, utilizing Agent-based simulation and AI, that outperforms the state-of-the-art.

[8] Anna E. Brower, Balaji Ramesh, Kazi Ashik Islam, Henning S. Mortveit, Stefan Hoops, Anil Vullikanti, Madhav V. Marathe, Benjamin Zaitchik, Julia M. Gohlke, and Samarth Swarup. **Augmenting the social vulnerability index using an agent-based simulation of Hurricane Harvey.** Computers, Environment and Urban Systems, 105:102020, 2023.

- Designed an Agent-based model (ABM) of population evacuation during Hurricane Harvey.
- Computed multiple measures of exposure to hazards for the population. Utilized the measurements to augment the CDC/ATSDR Social Vulnerability Index (SVI).

- [9] *Kazi Ashik Islam*, Rounak Meyur, Aparna Kishore, Swapna Thorve, Da Qi Chen, and Madhav Marathe. **OptICS-EV: A data-driven model for optimal installation of charging stations for electric vehicles**. In International Conference on Computational Science, ICCS-23, pages 70–85, 2023.
- [10] *Kazi Ashik Islam*, Da Qi Chen, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **Towards optimal and scalable evacuation planning using data-driven agent-based models**. In Proceedings of the 2023 International Conference on Autonomous Agents and Multiagent Systems, AAMAS-23, pages 2397–2399, 2023.
- [11] *Kazi Ashik Islam*, Da Qi Chen, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **Incorporating fairness in large-scale evacuation planning**. In Proceedings of the 31st ACM International Conference on Information & Knowledge Management, CIKM-22, pages 3192–3201, 2022.
- [12] *Kazi Ashik Islam*, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **Data-driven agent-based models for optimal evacuation of large metropolitan areas for improved disaster planning**. In Proceedings of the 21st International Conference on Autonomous Agents and Multiagent Systems, AAMAS-22, pages 1639–1641, 2022.
- [13] *Kazi Ashik Islam*, Madhav Marathe, Henning Mortveit, Samarth Swarup, and Anil Vullikanti. **A simulation-based approach for large-scale evacuation planning**. In 2020 IEEE International Conference on Big Data (Big Data), pages 1338–1345, 2020.
- [14] Shadman Saqib Eusuf, *Kazi Ashik Islam*, Mohammed Eunus Ali, Sifat Muhammad Abdullah, and Abdus Salam Azad. **A web-based system for efficient contact tracing query in a large spatio-temporal database**. In Proceedings of the 28th International Conference on Advances in Geographic Information Systems, SIGSPATIAL-20, pages 473–476, 2020.
- [15] *Kazi Ashik Islam*, Ibraheem Muhammad Moosa, Jaiaid Mobin, Muhammad Ali Nayeem, and M. Sohel Rahman. **A heuristic aided stochastic beam search algorithm for solving the transit network design problem**. Swarm and Evolutionary Computation, 46:154–170, 2019.
- [16] Muhammed Mas-Ud Hussain, Goce Trajcevski, *Kazi Ashik Islam*, and Mohammed Eunus Ali. **Visualization of range-constrained optimal density clustering of trajectories**. In Advances in Spatial and Temporal Databases, SSTD-17, pages 427–432, 2017.
- [17] Muhammed Mas-ud Hussain, *Kazi Ashik Islam*, Goce Trajcevski, and Mohammed Eunus Ali. **Towards efficient maintenance of continuous MaxRS query for trajectories**. In Proceedings of the 20th International Conference on Extending Database Technology, EDBT-17, pages 402–413, 2017.

PROJECTS ([GitHub](#))

Traffic Simulation

- Designed a scalable and modular queuing network simulation system to simulate traffic flows.
- Analyzed large-scale evacuation scenarios (~6 million evacuees) in the Houston metropolitan area to find efficient routing strategies.

Traffic Prediction

- Developed a system to predict live traffic condition on the roads using high velocity (about half a million data points per hour) anonymized car GPS data.
- Created a data-pipeline to handle the high-velocity and large volume of GPS data.
- Implemented state of the art machine learning algorithm to match GPS-tracks to road-network.

Navigation & Location-based Search

- Extracted data from OpenStreetMap to construct a road-network of Bangladesh.
- Developed a system to answer navigational queries such as finding route from A to B.
- Designed a system to answer location-based search queries e.g., searching for POIs, roads, regions.

- Applied spatial-indexing techniques to speed-up query processing.

Academic Course Projects

- *NYC Taxi Demand Prediction*: Applied machine and deep learning models to predict taxi demand in New York City from taxi trip record data. Models applied: Convolutional Neural Networks (CNN), Graph Convolutional Networks (GCN), Graph Attention Networks (GAT).
- *Super-resolution with GAN*: Designed a step-by-step tutorial to explain the use of Generative Adversarial Networks for the super-resolution task.
- *Bangla Hand-written Character Recognition*: Applied machine learning models for recognizing hand-written Bangla characters from smart-watch motion sensor data. Models Applied: CNN, LSTM.
- *Checkers Playing AI Agent*: Implemented a checkers playing AI agent. Applied the Minimax algorithm with alpha-beta pruning and depth-limited search for selecting the moves played by the agent.
- *Semi-autonomous Obstacle Avoider*: Built a four-wheel car that can automatically avoid obstacles in its way using an ultrasonic sensor. Utilized a Raspberry Pi for sensor data analysis and car movement control.
- *Simplified Automated Quadcopter*: Programmed an AVR micro-controller to control simple movements (e.g., up, forward, down) of a quadcopter. Programmed the micro-controller to generate precise signals, which were sent to the flight control board of the quadcopter.

SKILLS

Programming Languages	Python, C/C++, Java.
Machine Learning Framework	PyTorch, TensorFlow.
LLM Framework	LlamaIndex, LangChain, DSPy.
Optimization Framework	Gurobi.
Database	PostgreSQL, ElasticSearch.
GIS	PostGIS, QGIS, ArcGIS.
Web Framework	Django.
Cloud & Infrastructure	AWS EC2, RDS, API Gateway, Bedrock.

HONORS AND AWARDS

- Carlos and Esther Farrar Fellowship Award, School of Engineering and Applied Science, University of Virginia, 2023 - 2024.
- Best demonstration paper award at International Symposium on Spatial and Temporal Databases (SSTD), 2017.
- Dean's List Scholarship, Bangladesh University of Engineering and Technology.
- University Merit List Scholarship, Bangladesh University of Engineering and Technology.