

Curriculum Vitae

Talha Siddique

Postdoctoral Research Associate
 Center for Coastal and Ocean Mapping/NOAA-UNH Joint Hydrographic Center
 University of New Hampshire
 Durham, NH

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SUMMARY

- Postdoctoral research associate, with a Ph.D. in Computer Engineering, and a research focus on developing autonomous Machine Learning (ML)/Deep Learning (DL) systems for on-device signal processing, complemented by a proven track record of publications in peer-reviewed journals and conferences.
- Strong analytical background in Computer Science and Computational Economics, with proficiency in Python, C/C++, and a demonstrated ability to quickly adapt to new programming languages and environments.
- Specialization in remote sensing, robust embedded/edge ML/DL and AI applications, with expertise in designing custom optimization algorithms for resource-constrained devices (MCUs and SoCs) using Bayesian ML, sensor fusion, and the TensorFlow framework.

EDUCATION

University of New Hampshire, Durham, NH Aug 2019 – Jan 2025
 Ph.D. Electrical and Computer Engineering

Remote Sensing Lab

Advisor: Dr. MD Shaad Mahmud

Dissertation Title: *Robust Edge Machine-Learning For The Real-Time Processing And Prediction of Geomagnetic Anomalies and Geomagnetically Induced Currents (GICs)*

University of New Hampshire, Durham, NH Aug 2017 – Jul 2019
 Master of Science in Natural Resources: Environmental Economics

Bioeconomics Lab and Artificial Intelligence Research Group

Advisors: Dr. Shadi Atallah and Dr. Marek Petrik

Thesis Title: *Agrobiodiversity for Pest Management: An Integrated Bioeconomic Simulation and Machine Learning Approach*

BRAC University, Dhaka, Bangladesh Sep 2012 – Dec 2016
 Bachelor of Science in Computer Science

Thesis Advisor: Dr. Amitabha Chakrabarty

Thesis Title: *Automated Farming Prediction*

EXPERIENCE

Center for Coastal and Ocean Mapping/NOAA-UNH Joint Hydrographic Center, Durham, NH Feb 2025 – Present

Supervisor: Dr. Brian Calder

Postdoctoral Research Associate

- Conduct independent research focused on integrating robust machine learning models with seafloor acoustic data to investigate environmental variability, including real-time processing.
- Leverage expertise in signal processing and remote sensing to develop innovative tools for analyzing seafloor scatter and sediment properties.
- Collaborate with the CCOM team and external partners to enhance research outcomes and integrate advanced data modeling approaches.
- Assist with the preparation of annual progress reports, conference papers, and journal articles.

University of New Hampshire, Durham, NH Aug 2020 – Jan 2025
 Remote Sensing Lab

Advisor: Dr. MD Shaad Mahmud

Ph.D. Research Assistant

- Developed a ML-enabled magnetometer system aimed at predicting geomagnetically induced current (GIC).
- The implemented system reduced the setup and operating cost to under \$100, compared to the standard \$3000 fluxgate magnetometers, and eliminated the requirement for one year's worth of data by enabling real-time baseline correction.
- Engineered and deployed embedded machine learning models using TensorFlow-Lite for integration with microcontrollers like the Raspberry Pi 2040, and developed custom loss functions and optimization algorithms, enhancing robust on-device inference in resource-constrained environments.
- Implemented various offline Bayesian deep learning architectures to accurately assess model and data uncertainties, employing advanced TensorFlow and PyTorch techniques.
- Authored and led multiple peer-reviewed journal and conference papers, including publications in IEEE.
- Contributed to a National Science Foundation (NSF)-funded project, working on the forefront of ML research and application in space weather prediction.

University of New Hampshire, Durham, NH

Aug 2019 – Jul 2020

Teaching Assistant – Department of Computer Science

- Facilitated undergraduate programming laboratory courses, specifically "Introduction to Java-I" and "Introduction to Java-II," managing classroom environments of about 20 students per class.
- Designed and conducted engaging tutorial sessions aimed at enhancing the programming skills of undergraduate students.
- Assessed and graded a variety of programming assignments, ensuring fair and constructive feedback for student development.

University of New Hampshire, Durham, NH

Aug 2017 – Jul 2019

Bioeconomics Lab and Artificial Intelligence Group**Advisors: Dr. Shadi Atallah and Dr. Marek Petrik**

M.S. Research Assistant

- Developed environmental strategies using reinforcement learning in R, predicting optimal pest control policies.
- Utilized Bayesian statistics to effectively manage uncertainties in predictive modeling environments.
- Implemented an agent-based model platform, to simulate the agricultural environment in focus.
- Reviewed extensive literature and presented research findings at various academic conferences.
- Contributed to a United States Department of Agriculture (USDA) funded collaborative project, and developed an ML-enabled agricultural decision support tool.

SKILLS AND CERTIFICATIONS

Technical Skills/Software: Python, C/C++, Embedded C/C++, Java, MATLAB, SQL, R, CUDA/GPU, Linux Shell/Bash, Git, LaTeX, AnyLogic, Visual Studio/Eclipse, TensorFlow/TensorFlow-Lite/TensorFlow-Lite Micro, PyTorch, Jupyter Notebook, Anaconda, Arduino/Raspberry Pi, ARM Processor-Based Microcontroller Unit (MCU)/System-on-Chip (SoC) Programming, Edge/Embedded Machine Learning, TinyML, Deep Learning, Reinforcement Learning, Mathematical Optimization, Algorithm Design, Agent-Based Simulation Modelling.

Certifications: Responsible Conduct of Research and Scholarly Activity Certificate of Training, University of New Hampshire, Durham, NH, USA (2018).

Languages: English (Fluent), Bengali (Native).

PUBLICATIONS AND ORAL PRESENTATIONS**Peer-Reviewed Journal Papers**

- T. Siddique and M. S. Mahmud, "Physics-Enhanced TinyML for Real-Time Detection of Ground Magnetic Anomalies," in IEEE Access, vol. 12, pp. 25372-25384, 2024.
doi: 10.1109/ACCESS.2024.3362346.

- T. Siddique and M. S. Mahmud, "Ensemble deep learning models for prediction and uncertainty quantification of ground magnetic perturbation," *Frontiers in Astronomy and Space Sciences*, vol. 9, 2022. doi: 10.3389/fspas.2022.1031407.
- T. Siddique, M. S. Mahmud, A. M. Keese, C. M. Ngwira, and H. Connor, "A survey of uncertainty quantification in machine learning for space weather prediction," *Geosciences*, vol. 12, no. 1, Article 27, 2022. doi: 10.3390/geosciences12010027.

Peer-Reviewed Conference Papers

- T. Siddique and M. S. Mahmud, "A Surrogate Tiny Machine Learning Model of Variational Autoencoder for Real-Time Baseline Correction of Magnetometer Data," in *2024 International Conference on Computing, Networking and Communications (ICNC)*, pp. 579-583, 2024. doi: 10.1109/ICNC59896.2024.10556237.
- T. Siddique and M. S. Mahmud, "Real-Time Machine Learning Enabled Low-Cost Magnetometer System," in *2022 IEEE Sensors*, pp. 1-4, 2022. doi: 10.1109/SENSORS52175.2022.9967170.
- M. F. Yousuf, T. Siddique, and M. S. Mahmud, "iBUG: AI Enabled IoT Sensing Platform for Real-time Environmental Monitoring," in *2022 IEEE 31st Microelectronics Design & Test Symposium (MDTS)*, pp. 1-7, 2022. doi: 10.1109/MDTS54894.2022.9826935.
- T. Siddique and M. S. Mahmud, "Classification of fNIRS Data Under Uncertainty: A Bayesian Neural Network Approach," in *2020 IEEE International Conference on E-health Networking, Application & Services (HEALTHCOM)*, pp. 1-4, 2021. doi: 10.1109/HEALTHCOM49281.2021.9398971.
- T. Siddique, J. L. Hau, S. Atallah, and M. Petrik, "Robust pest management using reinforcement learning," in *The Multi-disciplinary Conference on Reinforcement Learning and Decision Making*, 2019.
- T. Siddique, D. Barua, Z. Ferdous, and A. Chakrabarty, "Automated farming prediction," in *2017 Intelligent Systems Conference (IntelliSys)*, pp. 757-763, 2017. doi: 10.1109/IntelliSys.2017.8324214.

Workshop/Oral Presentations

- T. Siddique and M.S. Mahmud, "Advancing Real-Time GIC Analysis and Prediction with Autonomous Magnetometer Systems Using Machine Learning," in *AGU Fall Meeting Abstracts*, vol. 2023, no. NG13B-0606, Dec. 2023.
- T. Siddique and M.S. Mahmud, "An Array of Low-Cost Machine Learning-Enabled Magnetometer Systems For Real-Time GIC Analysis and Prediction," in *AGU Fall Meeting Abstracts*, vol. 2022, no. SM32C-1734, Dec. 2022.
- T. Siddique and M.S. Mahmud, "A Bayesian Ensemble Machine Learning Approach for Prediction of Geomagnetically Induced Currents (GICs) With Uncertainty Quantification," in *Proceedings of the 2nd Machine Learning in Heliophysics*, p. 19, Mar. 2022.
- T. Siddique, M.S. Mahmud, and A. Keese, "Uncertainty Quantification and Optimal Time Domain Estimation for Geomagnetic Storm Prediction: A Bayesian Ensemble Machine Learning Approach," in *AGU Fall Meeting Abstracts*, Dec. 2021.
- T. Siddique, S. Atallah, and M. Petrik, "A simulation-based machine learning framework for robust pest management policies in an apple orchard," in *Northeastern Agricultural and Resource Economics Association (NAREA) Annual Conference*, 2019.
- T. Siddique, S. Atallah, and M. Petrik, "Optimal farm spatial configuration for increased pest resilience: A bio-economic application to apple orchards," in *Association of Environmental and Resource Economists (AERE) at Southern Economic Association (SEA) Annual Conference*, 2018.

GRANTS

Title: SitS: FroSen: Novel soil frost sensing systems for tracking freeze -thaw cycles and their implications for ecosystem carbon and nutrient dynamics

Source: USDA Award

Role: Ph.D. Research Assistant

Dates: Aug 2024 – Present

Title: Collaborative Research: Harnessing Big Data to Improve Understanding and Predictions of Geomagnetically Induced Currents

Source: NSF Award

Role: Ph.D. Research Assistant

Dates: Aug 2020 – July 2024

Title: Harnessing chemical ecology to address agricultural pest and pollinator priorities

Source: USDA NIFA Award

Role: M.S. Research Assistant

Dates: Aug 2017 – July 2019

MISCELLANEOUS

Journal Reviewer

- IEEE Internet of Things (IoT) Journal
- IEEE Access Journal

Student Membership

- Vice President: Administration, Bangladeshi Students' Association at The University of New Hampshire (BSA UNH)
- Student Member, American Geophysical Union (AGU).

Awards and Achievements

- Vice Chancellor's Award For Discipline, BRAC University, Dhaka, Bangladesh (2013).
- The Daily Star Certificate of Excellence For General Certificate of Education (GCE) Advanced-Level Examination (2010).
- The Daily Star Certificate of Excellence For General Certificate of Education (GCE) Ordinary-Level Examination (2008).

REFERENCES

Available on request