

## Imtiaz Ahmed

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### Education

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- **Ph.D. in Industrial Engineering**, Texas A&M University 2020  
Dissertation: *Unsupervised Anomaly Detection of High Dimensional Data Embedded in Low Dimensional Manifold*  
Advisor: Prof. Yu Ding
- **M.Sc. in Industrial & Production Engineering**, BUET 2014  
Thesis: *Development of an Inventory Model for Two Suppliers with Random Capacity Considering Supply Disruption*  
Advisor: Prof. Abdullahil Azeem
- **B.Sc. in Industrial & Production Engineering**, BUET 2012  
Thesis: *Performance Evaluation of Economic Statistical Design of Control Chart for Multiple Assignable Causes using Genetic Algorithm*  
Advisor: Prof. Abdullahil Azeem

### Research Interests

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My research advances data science, machine learning, and systems informatics on the methodological front, with applications in smart manufacturing, materials, energy, smart health, and object tracking. Key areas of methodological interest include:

- **Sequential Learning Frameworks:** Bayesian optimization, multi-armed bandits, and reinforcement learning for decision-making under uncertainty and resource constraints.
- **Foundation Models for Image-Based Segmentation:** Semi-supervised and prompt-driven approaches for defect detection and real-time image analytics.
- **Early Disease Prediction:** Data augmentation and intelligent imputation for robust predictive health modeling.
- **Unsupervised Learning of High-Dimensional Streaming Data:** Anomaly detection and clustering methods for real-time and high-dimensional systems.
- **Spatio-Temporal Modeling:** Algorithms for tracking and predictive analytics over time and space.

### Honors and Awards

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- Finalist, SME NAMRC 53 Student Research Competition, 2025\*
- Finalist, SME NAMRC 52 Student Research Competition, 2024\*
- Finalist, INFORMS QSR Division Data Challenge Competition, 2024\*

- Third Place, INFORMS Conference-Wide Poster Competition, Seattle, 2024\*
- Finalist, IISE QCRE Division Data Challenge Competition, 2023\*
- Winner, INFORMS Conference-Wide Poster Competition, Indianapolis, 2022\*
- Winner, INFORMS Conference-Wide Poster Competition, Seattle, 2019
- Best Poster, Texas A&M Conference on Energy, College Station, TX, 2019
- Winner, QCRE Best Student Paper Competition, IISE Annual Conference & Expo, Orlando, FL, 2019
- Selected Participant, Foundation of Data Science Summer School, Georgia Tech, 2019
- Winner, BUET Alumni Association Award (Top Undergraduate), Academic Class 2006–07
- Winner, BUET Dean’s List Award, 2008–2011

\*Team led by a student from my research group

## Publications

### Journal Articles (Published)

- [J1] Raihan, A.S.\*, Islam, F., Liu, Z., Das, S., Ahmed, I., 2026. Hybrid temporal modeling and generative augmentation for imbalanced multivariate time series anomaly detection in engineering systems. *Journal of Computing and Information Science in Engineering*, pp.1–23.
- [J2] Raihan, A.S.\*, Liu, Z., Bhuiyan, T.H., Ahmed, I., 2026. CA-SMART: An active learning framework for accelerating materials discovery under resource constraints. *Applied Soft Computing*, 115463.
- [J3] Brothers, T., Adhikari, K., Ramazani, M., Ahmed, I., Al-Mamun, M.A., 2026. Synthetic data-augmented machine learning for 30-day readmission prediction in patients with chronic conditions: a retrospective real-world study. *BMJ Open*, 16(4), e108273.
- [J4] Haque, T.\*, Syed, M.A.B., Jeong, B., Bai, X., Mohan, S., Paul, S., Ahmed, I., Das, S., 2026. Towards efficient real-time video motion transfer via generative time series modeling. *Multimedia Tools and Applications*, 85(2), p.51.
- [J5] Era, I.Z.\*, Ahmed, I., Liu, Z., Das, S., 2025. An unsupervised approach towards promptable porosity segmentation in laser powder bed fusion by segment anything. *npj Advanced Manufacturing*, 2(1), p.10.
- [J6] Shahbazi, M.A.\*, Al-Mamun, M.A., Brothers, T., Ahmed, I., 2025. A machine learning framework for identifying phenotypes in chronic kidney disease. *Healthcare Analytics*, 100425.
- [J7] Ramazani, M.\*, Brothers, T., Ahmed, I., Al-Mamun, M.A., 2025. Synthetic data-driven early prediction framework for acute kidney injury in patients receiving vancomycin and ceftazidime/avibactam. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*.
- [J8] Choudhury, A., Shahsavar, Y., Ahmed, I., Al-Mamun, M.A., Elkefi, S., 2025. Exploring patient-centered perspectives on suicidal ideation: A mixed-methods investigation in gastrointestinal cancer care. *Cancers*, 17(15), 2460.

- [J9] Raihan, A.S.\*, Harper, A., Era, I.Z., Al-Shebeeb, O., Wuest, T., Das, S., Ahmed, I., 2025. A data-efficient sequential learning framework for melt pool defect classification in laser powder bed fusion. *Journal of Manufacturing Processes*, 145, pp.201–210.
- [J10] Al-Mamun, M.A., Jeun, K.J., Brothers, T., Asare, E.O., Shawwa, K., Ahmed, I., 2025. Evaluating the kidney disease progression using a comprehensive patient profiling algorithm: A hybrid clustering approach. *PLOS ONE*, 20(7), e0310749.
- [J11] Raihan, A.S.\*, Islam, F., Nimbarte, A., Ahmed, I., 2025. Drivers and barriers in the carbon-neutrality journey of SMEs in developed economies—insights from a systematic review and bibliometric study. *Journal of Environmental Assessment Policy and Management*, 27(03), 2530002.
- [J12] Hejazi, S., Gholampour Kargar, A., Ravanshad, S., Ziaee, A., Emadzadeh, M., et al., Ahmed, I., 2025. Impact of COVID-19 on mucormycosis presentation and laboratory values: A comparative analysis. *PLOS ONE*, 20(5), e0321897.
- [J13] Syed, M.A.B.\*, Hasan, M.R., Chowdhury, N.I., Rahman, M.H., Ahmed, I., 2025. A systematic review of time series algorithms and analytics in predictive maintenance. *Decision Analytics Journal*, 100573.
- [J14] Asru, A.S., Khosravi, H., Ahmed, I., Azeem, A., 2025. From automation to autonomy in smart manufacturing: A Bayesian optimization framework for modeling multi-objective experimentation and sequential decision making. *The International Journal of Advanced Manufacturing Technology*, 137(9–10), pp.5027–5044.
- [J15] Khosravi, H.\*, Raihan, A.S., Islam, F., Nimbarte, A., Ahmed, I., 2025. A comprehensive approach to CO<sub>2</sub> emissions analysis in high-human-development-index countries using statistical and time series approaches. *Sustainability*, 17(2).
- [J16] Era, I.Z.\*, Zhou, F., Raihan, A.S., Ahmed, I., Abul-Haj, A., Craig, J., Das, S., Liu, Z., 2025. In-situ melt pool characterization via thermal imaging for defect detection in directed energy deposition using vision transformers. *Journal of Manufacturing Processes*, 145, pp.11–21.
- [J17] Raihan, A.S.\*, Khosravi, H., Bhuiyan, T.H., Ahmed, I., 2024. An augmented surprise-guided sequential learning framework for predicting the melt pool geometry. *Journal of Manufacturing Systems*, 75, pp.56–77.
- [J18] Ahmed, I., Bukkapatnam, S.T., Botcha, B., Ding, Y., 2024. Toward futuristic autonomous experimentation—a surprise-reacting sequential experiment policy. *IEEE Transactions on Automation Science and Engineering*.
- [J19] Khosravi, H.\*, Olajire, T., Raihan, A.S., Ahmed, I., 2024. A data-driven sequential learning framework to accelerate and optimize multi-objective manufacturing decisions. *Journal of Intelligent Manufacturing*, pp.1–26.
- [J20] Roy, S.\*, Ahmed, I., Saldanha, J., Medini, K., Wuest, T., 2024. Bottleneck management through strategic sequencing in smart manufacturing systems. *Smart and Sustainable Manufacturing Systems*, 8(1), pp.59–82.
- [J21] Bhuiyan, T.H., Walker, V., Roni, M., Ahmed, I., 2024. Aerial drone fleet deployment optimization with endogenous battery replacements for direct delivery of time-sensitive products. *Expert Systems with Applications*, 252, p.124172.

- [J22] Khosravi, H.\*, Ahmed, I., Choudhury, A., 2024. Predicting suicidal ideation, planning, and attempts among the adolescent population of the United States. *Healthcare*, 12(13), pp.1262.
- [J23] Khosravi, H.\*, Farhadpour, S., Grandhi, M., Raihan, A.S., Das, S., Ahmed, I., 2024. Strategic data augmentation with CTGAN for smart manufacturing: Enhancing ML predictions of paper breaks in pulp-and-paper production. *Manufacturing Letters*, 41, pp.1312–1323.
- [J24] Raihan, A.S.\*, Khosravi, H., Das, S., Ahmed, I., 2024. Accelerating material discovery with a threshold-driven hybrid acquisition policy-based Bayesian optimization. *Manufacturing Letters*, 41, pp.1300–1311.
- [J25] Haque, T.\*, Syed, M.A.B., Das, S., Ahmed, I., 2024. Advancing marine surveillance: A hybrid approach of physics infused neural network for enhanced vessel tracking using automatic identification system data. *Journal of Marine Science and Engineering*, 12(11), p.1913.
- [J26] Rahman, A.\*, Russell, M., Zheng, W., Eckrich, D., Ahmed, I., N3C Consortium, 2024. SARS-CoV-2 infection is associated with an increase in new diagnoses of schizophrenia spectrum and psychotic disorder: A study using the US National COVID Cohort Collaborative (N3C). *PLOS ONE*.
- [J27] Shafie, M.R., Khosravi, H., Farhadpour, S., Das, S., Ahmed, I., 2024. A cluster-based human resources analytics for predicting employee turnover using optimized artificial neural networks and data augmentation. *Decision Analytics Journal*, 100461.
- [J28] Syed, M.A.B.\*, Ahmed, I., 2023. A CNN-LSTM architecture for marine vessel track association using automatic identification system (AIS) data. *Sensors*, 23, 6400.
- [J29] Khosravi, H.\*, Shafie, M.R., Hajiabadi, M., Raihan, A.S., Ahmed, I., 2023. Chatbots and ChatGPT: A bibliometric analysis and systematic review of publications in Web of Science and Scopus databases. *International Journal of Data Mining, Modelling and Management*, 16(2), pp.113–147.
- [J30] Ahmed, I., Jun, M., Ding, Y., 2022. A spatio-temporal track association algorithm for tracking marine vessels using automatic identification system data. *IEEE Transactions on Intelligent Transportation Systems*, 23(11), pp.20783–20797.
- [J31] Ahmed, I., Galoppo, T., Hu, X., Ding, Y., 2021. Graph regularized autoencoder and its application in unsupervised anomaly detection. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 44(8), pp.4110–4124.
- [J32] Ahmed, I., Hu, X., Acharya, M., Ding, Y., 2021. Neighborhood structure assisted non-negative matrix factorization and its application in unsupervised point anomaly detection. *Journal of Machine Learning Research*, 22(34), pp.1–32.
- [J33] Ahmed, I., Dagnino, A., Ding, Y., 2018. Unsupervised anomaly detection based on minimum spanning tree approximated distance measures and its application to hydropower turbine. *IEEE Transactions on Automation Science and Engineering*, 16(2), pp.654–667.
- [J34] Aziz, R.A., Paul, H.K., Karim, T.M., Ahmed, I., Azeem, A., 2018. Modeling and optimization of multilayer aggregate production planning. *Journal of Operations and Supply Chain Management*, 11(2), pp.1–15.
- [J35] Sultana, I., Ahmed, I., Azeem, A., Sarker, N.R., 2018. Economic design of exponentially weighted moving average (EWMA) chart with variable sampling interval at fixed times

- (VSIFT) scheme incorporating Taguchi loss function. *International Journal of Industrial & Systems Engineering*, 29(4), pp.428–452.
- [J36] Ahmed, I., Sultana, I., Azeem, A., 2016. Development of an inventory model for two suppliers with random capacity considering supply disruption. *International Journal of Logistics and Systems Management*, 26(1), pp.57–84.
- [J37] Sultana, I., Ahmed, I., Azeem, A., 2015. An integrated approach for multiple criteria supplier selection combining Fuzzy Delphi, Fuzzy AHP and Fuzzy TOPSIS. *Journal of Intelligent and Fuzzy Systems*, 29(4), pp.1273–1287.
- [J38] Ahmed, I., Sultana, I., Paul, S.K., Azeem, A., 2014. Performance evaluation of control chart for multiple assignable causes using genetic algorithm. *International Journal of Advanced Manufacturing Technology*, 70, pp.1889–1902.
- [J39] Sultana, I., Ahmed, I., Paul, S.K., Chowdhury, A.H., 2014. Economic design of X-bar control chart using genetic algorithm and simulated annealing algorithm. *International Journal of Productivity and Quality Management*, 14(3), pp.352–372.
- [J40] Ahmed, I., Sultana, I., 2014. A literature review on inventory modeling with reliability consideration. *International Journal of Industrial Engineering Computations*, 5(1), pp.169–178.
- [J41] Sultana, I., Ahmed, I., 2014. A state of art review on optimization techniques in just-in-time. *Uncertain Supply Chain Management*, 2(1), pp.15–26.
- [J42] Ahmed, I., Sultana, I., Paul, S.K., Azeem, A., 2013. Employee performance evaluation: A fuzzy approach. *International Journal of Productivity and Performance Management*, 62(7), pp.718–734.
- [J43] Bhuiyan, T., Ahmed, I., 2013. Optimization of cutting parameters in turning process. *SAE International Journal of Materials and Manufacturing*, 7(1), pp.233–239.

\* Student (PhD/MS) first author

### Book Chapters

- [B1] Ahmed, I., Raihan, A.S., 2024. Machine learning techniques for sustainable industrial process control. In *Computational Intelligence Techniques for Sustainable Supply Chain Management* (pp.141–176). Academic Press, Elsevier.
- [B2] Ahmed, I., Raihan, A.S., 2024. Spatiotemporal data analysis: A review of techniques, applications, and emerging challenges. In *Multimodal and Tensor Data Analytics for Industrial Systems Improvement*, pp.125–166. Springer.

### Refereed Conference Proceedings

- [C1] Al-Mamun, M., Brothers, T., Jeun, K.J., Ahmed, I., 2024. CO194 Evaluating the clinical phenotypes associated with progression to chronic kidney disease using an unsupervised machine learning approach. *Value in Health*, 27(6), p.S54.
- [C2] Shahbazi, M.A.\*, Brothers, T., Mbous, Y., Ahmed, I., Al-Mamun, M., 2023. MSR12 Identifying the patterns of clinical phenotypes impacting kidney disease progression: A latent class analysis approach. *Value in Health*, 26(6), pp.S279–S280.

- [C3] Raihan, A.S.\*, Ahmed, I., 2023. A Bi-LSTM autoencoder framework for anomaly detection—a case study of a wind power dataset. In *Proceedings of the 19th IEEE International Conference on Automation Science and Engineering (CASE)*, Auckland, New Zealand, pp.1–6.
- [C4] Syed, M.A.B.\*, Ahmed, I., 2023. Multi model LSTM architecture for track association based on automatic identification system data. *Proceedings of the IISE Annual Conference & Expo 2023*.
- [C5] Raihan, A.S.\*, Ahmed, I., 2023. Guiding the sequential experiments in autonomous experimentation platforms through EI-based Bayesian optimization and Bayesian model averaging. *Proceedings of the IISE Annual Conference & Expo 2023*.
- [C6] Islam, F.\*, Raihan, A.S., Ahmed, I., 2023. Applications of federated learning in manufacturing: Identifying the challenges and exploring the future directions with Industry 4.0 and 5.0 visions. *Proceedings of the 8th North American International Conference on Industrial Engineering and Operations Management*, Houston, TX.
- [C7] Ahmed, I., Galoppo, T., Ding, Y., 2019. O-LoMST: An online anomaly detection approach and its application in a hydropower generation plant. *Proceedings of the 15th IEEE International Conference on Automation Science and Engineering (CASE 2019)*.
- [C8] Ahmed, I., Dagnino, A., Bongiovi, A., Ding, Y., 2018. Outlier detection for hydropower generation plant. *Proceedings of the 14th IEEE International Conference on Automation Science and Engineering (CASE 2018)*.

\* Student (PhD/MS) first author

## Research Grants

### Funded

- **[P1] Novel Techniques to Enable Label-Free Defect Detection in Additive Manufacturing for Distributed Edge Computing Environments.**  
*Funding Agency:* Qualcomm    *Timeline:* 09/01/2025–08/31/2027    *Role:* Co-PI  
*Total Award:* \$110,000    *My Share:* \$55,000
- **[P2] Advancing West Virginia’s Manufacturing and Analytics Capacity through Professional Development and Networking.**  
*Funding Agency:* West Virginia Higher Education Policy Commission    *Timeline:* 10/09/2025–06/30/2026  
*Role:* PI    *My Share:* \$5,000
- **[P3] Self-Supervised Segmentation and Physics-Guided Diffusion Synthesis Using Vision Transformers for Quality Control in Laser Additive Manufacturing.**  
*Funding Agency:* National Artificial Intelligence Research Resource (NAIRR) Pilot (Computational Award)  
*Timeline:* 09/15/2025–09/14/2026    *Role:* PI    *My Share:* NCSA Delta GPU Allocation (1,200 GPU-hours)
- **[P4] A Novel and Integrated Approach to Enhance Adoption of Pollution Prevention Practices.**

*Funding Agency:* U.S. Environmental Protection Agency (EPA)    *Timeline:* 10/01/2022–09/30/2025

*Role:* Co-I    *Total Award:* \$574,996    *My Share:* \$123,511

- **[P5] Psychiatric Sequelae of COVID-19: Identifying Contributing Factors and Developing a Data-Driven Predictive Framework.**

*Funding Agency:* WVU Research and Scholarship Advancement (RSA) Committee

*Timeline:* 09/01/2023–08/31/2024    *Role:* PI    *My Share:* \$18,000

## Research Experience

- **Assistant Professor**, Dept. of Industrial & Management Systems Engineering, West Virginia University *2021–Present*
- **Postdoctoral Researcher & Graduate Research Assistant**, Dept. of Industrial & Systems Engineering, Texas A&M University *2015–2021*
- **Software Research Intern**, ABB Corporate Research, Raleigh, NC *2016–2017*
- **Faculty Member**, Dept. of Industrial & Production Engineering, BUET, Dhaka, Bangladesh *2012–2015*

## Teaching Experience

### West Virginia University

- IENG 581: Applied Machine Learning for Industrial Engineers Fall 2025
- IENG 481: Machine Learning for IE Fall 2025
- IENG 551: Quality & Reliability Engineering Spring 2022; Fall 2023; Fall 2025
- IENG 514: Design of Experiments Fall 2022; Fall 2024
- IENG 314: Advanced Analysis of Engineering Data Spring 2023; Spring 2024

### Texas A&M University

- Teaching Assistant, ISEN 614: Advanced Quality Control 2019

### BUET, Dhaka, Bangladesh

- Assistant Professor: 5 theory and 3 laboratory courses (>700 enrolled students) 2014–2015
- Lecturer: 2 theory and 6 laboratory courses (>1,500 enrolled students) 2012–2014

### Adjunct Positions, Dhaka, Bangladesh

- Adjunct Lecturer, Stamford University (Industrial Management) 2014
- Adjunct Lecturer, Northern University (Industrial Management) 2014
- Adjunct Lecturer, Daffodil University (Business System Engineering) 2013–2014
- Adjunct Lecturer, State University (Quantitative Techniques in Business Decisions) 2012–2013

## Student Supervision (Chair or Co-Chair)

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### Graduated Students

- **Maryam Ramazani** (MS in IE, December 2025): *Synthetic Data-Driven Early Prediction Framework for Acute Kidney Injury*
- **Israt Zarin Era** (PhD in IE, July 2025; Co-chair with Dr. Zhichao Liu): *Towards Reliable Defect Detection in Laser Additive Manufacturing: AI-Driven Solutions for Domain-Specific and Interconnected Challenges*
- **Hamed Khosravi** (MS in IE, July 2025): *Attentive Optimism in the Face of Uncertainty: Balancing Exploration Exploitation in Multi-Armed Bandits*
- **Farzana Islam** (MS in IE, April 2024): *Data-Driven Approaches for Achieving Carbon Neutrality: Predictive Models for Reducing CO2 Emissions and Enhancing Industrial Sustainability*
- **Ahmed Shoyeb Raihan** (MS in IE, April 2024): *Prediction of Anomalous Events with Data Augmentation and Hybrid Deep Learning Approach*
- **Asif Rahman** (MS in IE, July 2024): *Changes in Psychiatric Diagnosis Associated With SARS-CoV-2 Infection and Predicting the Development of New Psychiatric Illness in COVID Patients: A Study Using the US National COVID Cohort Collaborative (N3C)*
- **Md Asif Bin Syed** (MS in IE, December 2023): *Spatio-Temporal Deep Learning Approaches for Addressing Track Association Problem Using Automatic Identification System (AIS)*
- **Tanjim Ahmed** (MS in IE, August 2023): *A Machine Learning Approach for Early Diagnosis of Transthyretin Amyloid Cardiomyopathy Among Heart Failure Patients*
- **Taofeeq Olajire** (MS in IE, August 2023): *Accelerating Manufacturing Decisions using Bayesian Optimization: An Optimization and Prediction Perspective*
- **Tasmiah Haque** (MS in IE, May 2023): *Physics Infused LSTM Network for Track Association Based on Marine Vessel Automatic Identification System Data*
- **Marzieh Amiri Shahbazi** (MS in IE, December 2022): *Developing Artificial Intelligence Tools to Investigate the Phenotypes and Correlates of Chronic Kidney Disease Patients in West Virginia*
- **Sayantee Roy** (MS in IE, December 2022; Co-chair with Dr. Thorsten Wuest): *Bottleneck Management through Strategic Sequencing in Smart Manufacturing Systems*

### Students in Progress

- Ahmed Shoyeb Raihan (PhD in IE)
- Tasmiah Haque (PhD in IE; Co-advising with Dr. Das)
- Md. Mushfiqur Rahman (PhD in IE)

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## Professional Development and Service

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### Professional Society Leadership

- Elected Council Member (2025–2027): INFORMS Data Mining Society
- Elected Director (2025–2027): IISE QCRE Division
- Track Chair: IISE Annual Conference & Expo 2026 (QCRE Track)
- INFORMS Ambassador (2024–2025)

### Workshops, Conferences, and Training Attended

- INFORMS Annual Meeting: 2017–2025
- IISE Annual Conference & Expo: 2019, 2020, 2021, 2022, 2024
- NAMRC 2024, Knoxville, TN
- IISE New Faculty Colloquium, 2022
- INFORMS Doctoral Colloquium, 2019
- Foundation of Data Science Summer School, Georgia Tech, 2019

### Invited Seminars and Conference Sessions

- Toward Adaptive, Self-Improving Sequential Learning Algorithms for Autonomous Manufacturing and Accelerated Material Discovery—IIE Virtual Seminar Series, University of Miami, 2025
- Toward Adaptive, Self-Improving Sequential Learning Algorithms for Autonomous Manufacturing and Accelerated Material Discovery—WVU AI Symposium, 2025
- Sequential Learning & Optimization under Uncertainty—INFORMS Annual Meeting, 2023
- Autonomous Manufacturing Platform for Accelerated Material Discovery: A “Surprise”-Guided Active Learning Approach—MSE Seminar Series, MAE Dept., WVU, 2022
- Physics-Based ML for Materials and Manufacturing Systems—INFORMS Annual Meeting, 2022
- Sequential Decision Making under Uncertainty—IISE Annual Conference & Expo, 2021
- Advanced Machine Learning Methods for Manufacturing Systems—INFORMS Annual Meeting, 2021

### Consultancy Experience

- Assessment of fire and electrical safety in RMG factories for International Labor Organization (ILO)
- Installing and inspecting capital machinery at Bashundhara Multi Papermill, Bangladesh

**Peer Reviewer**

- IEEE Transactions on Automation Science and Engineering
- IISE Transactions
- Technometrics
- Wind Energy
- Journal of Production Systems and Manufacturing Science
- Journal of Intelligent Manufacturing
- Sustainability
- Journal of Marine Science & Engineering
- Data
- INFORMS Journal of Data Science