Mahfuz Ahmed Anik

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Education

Industrial and Production Engineering, *(2020 – 2025)*
Shahjalal University of Science and Technology, Sylhet, Bangladesh.
CGPA: 3.80; CGPA (last two semesters – 4-1 & 4-2): 3.93

Research Interests

⇒ **AI and Machine Learning for Intelligent Healthcare Systems:** Exploring AI and ML applications in healthcare delivery, diagnosis, and patient care, including decision support, risk stratification, imaging, and resource optimization—emphasizing LLMs and agent-based frameworks for clinical text understanding and human-AI collaboration.

⇒ **Digital Twins and AI/LLM-Agent Enhanced Manufacturing and Smart Systems Control:** Researching the integration of Digital Twins with Large Language Models (LLMs) and AI agents to enable intelligent automation and decision-making in manufacturing and production systems. Exploring smart system control through real-time data fusion, simulation, and predictive analytics in cyber-physical environments.

⇒ **Advanced Manufacturing with Artificial Intelligence and Machine Learning:** Applying AI/ML techniques to enhance manufacturing processes, including quality control, anomaly detection, process optimization, and autonomous operations. Investigating reinforcement learning and adaptive systems for dynamic control in industrial settings.

⇒ **AI-Powered Supply Chain and Transportation Systems:** Focusing on intelligent optimization of logistics, inventory management, and transportation systems using AI. Research includes route planning, demand forecasting, and sustainability-driven decision-making in supply chains.

Experience

- **Industrial Attachment** Walton Hi-Tech Industries PLC *[Link]* May 2025
  Worked under the Process Development Department of the Electrical Appliance Products (EAP) Unit, focusing on manufacturing process optimization for LED lights, fans, and switch sockets.
  Gained hands-on experience in production line analysis, quality control systems, Lean tools (KANBAN, 5S, PDCA), and proposed data-driven process improvements aligned with industrial standards.
- **Research Assistant,** Computational Intelligence and Operations Laboratory (CIOL) *[Link]* Sept 2024 – Present
  A non-profit, community-driven virtual research lab focused on advancing AI and ML applications in industrial systems, NLP, and interdisciplinary domains.
  I engaged in research involving applications of machine learning and deep learning, with a focus on NLP. Participated in multiple NLP shared tasks, securing positions in international competitions. Currently working on projects related to Agentic AI and clinical text summarization, and contributing to community outreach through seminars and workshops.
- **Content Representative (Part-time),** Shabash Fakibaj (LLC) *[Link]* Dec 2022 – January 2025
  A global educational organization supporting Bangladeshi students in pursuing graduate studies abroad through accessible guidance and resources.
  I assisted with the coordination of team schedules to ensure timely project delivery, and managed content planning and publishing for LinkedIn in alignment with the organization's outreach strategy.
- **Executive Member,** RoboSUST February 2020 – February 2021
  The robotics club of SUST, fostering student interest and innovation in robotics across all departments. I gained hands-on experience with Arduino and basic robotics; participated in a line-following robot competition and LaTeX training sessions. Explored foundational concepts in robotics and team-based technical projects.
- **Organizer,** Graduate Development Network (GDN-SUST) March 2020 – February 2021
  An organization at SUST dedicated to organizing seminars and workshops on corporate grooming and career development.I contributed to organizing university-wide seminars and development programs, facilitating communication between speakers, attendees, and teams to ensure smooth coordination.

Publications

[**NAACL'25W**] Mahfuz Ahmed Anik, Abdur Rahman, Azmine Toushik Wasi, Md Manjurul Ahsan. **Preserving Cultural Identity with Context-Aware Translation Through Multi-Agent AI Systems**. LM4UC Workshop at NAACL 2025. [PDF] [Code]

[**NAACL'25W**] Mahfuz Ahmed Anik, Md. Iqramul Hoque, Wahid Faisal, Azmine Toushik Wasi, Md Manjurul Ahsan. **Akatsuki-CIOL@DravidianLangTech 2025: Ensemble-Based Approach Using Pre-Trained Models for Fake News Detection in Dravidian Languages**. DravidianLangTech Workshop at NAACL 2025. [PDF] [Code]

[**ACL'25W**] Md. Iqramul Hoque, Mahfuz Ahmed Anik, Abdur Rahman, Azmine Toushik Wasi. **CIOL at SemEval-2025 Task 11: Multilingual Pre-trained Model Fusion for Text-based Emotion Recognition**. SemEval Workshop at ACL 2025. [PDF] [Code]

[**ICLR'25W**] Azmine Toushik Wasi, Mahfuz Ahmed Anik. **Pathway-Attentive GAN for Interpretable Biomolecular Design**. ML for Genomics Explorations Workshop, ICLR 2025. [PDF]

[**ICLR'25W**] Azmine Toushik Wasi, Mahfuz Ahmed Anik, Riashat Islam. **Risks and Safety Considerations for Foundation Model-based Autonomous Agents' Interaction with the Environment**. Foundation Models in the Wild Workshop, ICLR 2025. [PDF]

[**NAACL'25W**] Md. Iqramul Hoque, Mahfuz Ahmed Anik, Azmine Toushik Wasi. **CIOLat CLPsych 2025: Using Large Language Models for Understanding and Summarizing Clinical Texts**. [PDF] CLPsych Workshop at NAACL 2025.

[**AAAI'25W**] Mahfuz Ahmed Anik, Abdur Rahman, Azmine Toushik Wasi, Md Manjurul Ahsan. **Social Impact of AI: Research, Diversity, and Inclusion Frameworks**. Short Papers and Posters Track, SIAI-ReDI 2025 at AAAI.[PDF]

[**CSCW'25P**] Wahid Faisal*, Azmine Toushik Wasi*, Drishti Sharma*, Mahfuz Ahmed Anik, Taki Hasan Rafi, Dong-Kyu Chae. **Knowledge Explorer: An Agentic AI Framework for Interactive, Personalized and Multilingual Learning Experience**. CSCW 2025 Posters (Track A). *Accepted – To appear at CSCW 2025.*

In-Progress Studies and In–Review Submissions

Mohsin Mahmud Topu*, Mahfuz Ahmed Anik*, Azmine Toushik Wasi, Md Manjurul Ahsan. **Graph-based Digital Twins for Pavement Health Monitoring and Maintenance**, *In Review*, *Advanced Engineering Informatics*,.

Azmine Toushik Wasi*, Mahfuz Ahmed Anik*, Abdur Rahman, Md. Iqramul Hoque, MD Shafikul Islam, MD Manjurul Ahsan. **Exploring Graph-based Digital Twins for Supply Chain Management and Optimization**, *In Review*, *Internet of Things* [PDF]

Mahfuz Ahmed Anik*, Azmine Toushik Wasi*, Abdur Rahman, MD Manjurul Ahsan. **Digital Twin-based Multi-Agent Framework for Understanding and Optimizing Smart Building HVAC Systems**, *In Review*, *Computers in Electrical Engineering* [PDF]

Mahfuz Ahmed Anik, Abdur Rahman, Md. Iqramul Hoque, Azmine Toushik Wasi, MD Shafikul Islam, Md Manjurul Ahsan, Dr. Mahathir Mohammad Bappy. **BioTwinMine: Digital Twin-Based Optimization of Biomining for Sustainable Rare Earth Element Production**, *Under Review*

Mahfuz Ahmed Anik*, Abdur Rahman, MD Shafikul Islam, Azmine Toushik Wasi, Md Manjurul Ahsan. **Digital Twin–Enabled Additive Manufacturing: A Systematic Review of Architectures, Integration Layers, and Operational Maturity**, *In Review*, *Journal of Manufacturing Processes.*

Azmine Toushik Wasi*, Sheikh Ayatur Rahman*, Mahfuz Ahmed Anik, Mostofa Rafid Uddin, Min Xu. **Examining Graph Neural Networks Capabilities in Binder Affinity Prediction**, *In Progress*

MD Shafikul Islam, Azmine Toushik Wasi, Mahfuz Ahmed Anik, Dr. Mahathir Mohammad Bappy. **Fracture Finder: Vertebral Fracture Localization for Spine X-ray Analysis**, *In Progress.*

Mahfuz Ahmed Anik, Abdur Rahman, Azmine Toushik Wasi, Dr. Abul Mukid Mohammad Mukaddes. **SleepSense: Predicting and Optimizing Sleep Quality Using Machine Learning.**, *In Progress.*

Projects

1. **Simulation of a Super Shop Using Arena Simulation Software**
   Modeled a super shop using Arena simulation software and analyzed customer flow, service time, and checkout efficiency to optimize operational parameters.
2. **Operations Management in a Retail Shop: Quantity Discount Model and Safety Stock Analysis**
   Collected real-time data from a retail shop and applied quantity discount and safety stock models to improve inventory management and cost efficiency.
3. **Design and Development of SUST IPE Logo using Laser Beam Machining (LBM)**
   Designed and fabricated the official SUST IPE logo using LBM, showcasing precision manufacturing techniques and creative branding through machining.

Technical and ML Modeling Skills

- **Languages:** Python, C, MATLAB
- **DS&ML Tools (Python):** NumPy, Pandas, Matplotlib, Seaborn, Scikit-learn, TensorFlow, PyTorch, LangChain, CrewAI.
- **Data Science Techniques:** EDA, Experiment Design, Hypothesis Testing, Sampling, Data-Driven Decision Making
- **Machine Learning Techniques:** Statistical ML Methods, Deep Learning, NLP, Computer Vision, Graph Neural Networks (GNNs), Agentic Decision-Making, Agentic LLMs, AI Reasoning, RAG.

Achievements

- 3rd Place at QCRE Data Challenge Competition (2025 IISE Annual Conference & Expo) [Link]
- Champion at Inter-Department Business Case Competition (IPE Association)
- Won 70% scholarship in ISCEA Global Supply Chain Case Competition 2023
- 2nd Runners Up, Sylhet Division Math Olympiad 2019 (Qualified for National Round)
- 9th Place, Sylhet Division Science Olympiad 2019

Professional Development & Training

- Deep Learning (Interactive Track, 68 hours) – Neuromatch Academy, July 2025 [Link]
- Industrial Training (Two-Week) – Bangladesh Industrial Technical Assistance Center (BITAC), Chittagong
- Industrial Attachment (One-Day) – Khadim Ceramics Limited, Sylhet
- Winter ML Bootcamp (Six-Week) – Computational Intelligence and Operations Lab (CIOL)
- Data Analyst in Python – Datacamp
- Supervised Machine Learning: Regression and Classification – Coursera

Reference

- **Dr. Md Manjurul Ahsan**, Research Asst. Professor, University of Oklahoma, ahsan@ou.edu
- **Dr. Abul Mukid Mohammad Mukaddes**, Professor, SUST, +8801777891684,mukaddes-ipe@sust.edu
- **Engr. Mohammed Abdul Karim**, Assistant Professor, SUST, +8801717093510, karim-ipe@sust.edu