# Aheer Sravon

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## SUMMARY

Machine Learning Engineer specializing in Graph Neural Networks (GNNs) for fraud detection, distributionally robust optimization, and reinforcement learning for competitive dynamics. Published IEOM 2024 conference paper on GNN-based fraud detection achieving 0.81 AUC on IEEE-CIS dataset; authored preprint on variance-based DRO framework outperforming benchmarks on CIFAR-10-C and Waterbirds; developed RL pricing simulations with Q-learning, PSO, PPO, and DQN agents replicating theoretical equilibria. Delivered 2.89M BDT annual cost savings through industrial optimization at AKIJ Textile Mills. Expert in PyTorch, PyTorch Geometric, Gymnasium, and scalable ML deployment.

## SKILLS

- **Machine Learning:** PyTorch, TensorFlow, Scikit-learn, Graph Neural Networks

- **Programming:** Python, R, MATLAB, C/C++, Bash Scripting, Lua Scripting (Neovim), SQL

- **Specialized:** Distributionally Robust Optimization, Convolutional Neural Network, Operations Research, Statistical Analysis

## LANGUAGES

- **English** – Professional Working Proficiency | IELTS Academic Band 7.0/9.0 (Listening: 7.5, Reading: 7.0, Writing: 7.5, Speaking: 6.5)

- **Bengali** – Native Speaker

- **Japanese** – Elementary Conversational Proficiency

## RESEARCH WORKS & PROJECTS

### Fraud Detection using Graph Neural Networks
Jan 2024 – Jan 2025

*Machine Learning & Graph Neural Networks | Published*  *Python, PyTorch Geometric, Scikit-learn*

- Published conference paper at IEOM 2024 presenting novel GNN-based fraud detection framework formulated as node classification on transaction graphs (DOI: 10.46254/BA07.20240105)

- Implemented GNN architecture with attention mechanisms and message passing for credit card fraud detection on IEEE-CIS dataset, achieving 0.81 AUC on highly imbalanced data (3.5% fraud rate)

- Constructed heterogeneous graph connecting transaction nodes to entity nodes (cards, addresses, devices, email domains) exploiting topological features to detect fraud rings, demonstrating superior accuracy, precision, and recall compared to traditional methods

### Adaptive Framework for Robust Neural Network Generalization Under Distribution Shift
Aug 2025 – Nov 2025

*Deep Learning Research | Preprint: arXiv:2511.05568 | Submitted to Conference*  *Python, PyTorch, NumPy*

- Developed variance-based Distributionally Robust Optimization framework improving neural network robustness to distribution shifts by dynamically assigning per-sample robustness budgets

- Implemented efficient water-filling algorithm with $O(B \log B)$ complexity per batch, eliminating need for group labels through unsupervised learning

- Achieved superior performance on CIFAR-10-C and Waterbirds benchmarks while maintaining competitive clean data accuracy, with manuscript currently under peer review

### Pricing Competition Simulation Using RL and Optimization Agents
Jun 2025 – Nov 2025

*Reinforcement Learning & Optimization | Under Review*  *Python, Gymnasium, NumPy, Matplotlib*

- Developed duopolistic pricing game simulations across logit, Hotelling, and linear demand models to analyze AI-driven market dynamics and competitive equilibrium strategies

- Implemented Q-learning, PSO, PPO, and DQN agents modeling competitive strategies with and without AR(1) demand shocks, performing ablation studies on memory and simultaneous moves

• Conducted experiments analyzing agent interactions, equilibrium prices, profits, and markups across 5-seed runs, replicating theoretical benchmarks with manuscript currently under peer review

## Transforming Retail Supply Chain Management: SARIMA vs LSTM vs FBPROPHET        Jun 2025 – Nov 2025
*Time Series Forecasting & Comparative Analysis | Under Review*

• Developed time series forecasting models using SARIMA, SARIMAX, LSTM, CNN-LSTM, and Prophet to predict daily retail sales (cups sold), incorporating seasonality and exogenous variables like weekdays
• Implemented data preprocessing pipelines, hyperparameter optimization via grid search and early stopping, recursive forecasting for test periods, and future predictions with diagnostic visualizations
• Performed comparative evaluation across models using MAE, RMSE, and MAPE metrics on validation and test sets, analyzing performance in retail supply chain contexts with manuscript currently under peer review

## From Laboratory to Ledger: Bridging the Deployment Gap in Credit Card Fraud Detection        Jun 2025 – Nov 2025
*Systematic Review & Analysis | Under Review*

• Conducted a systematic review of 76 recent studies (2020-2025) to examine the "deployment-performance paradox" in credit card fraud detection, revealing that 72% focus on algorithmic improvements while only 13% address operational, regulatory, and business constraints
• Identified critical gaps across four dimensions: real-time processing (4% of studies), interpretability (7%), cost-sensitive evaluation (0%), and production integration (3%), alongside emerging challenges in privacy-preserving detection and adversarial robustness
• Introduced the Deployment Readiness Framework, a six-dimensional evaluation model covering performance, interpretability, latency, cost-effectiveness, scalability, and regulatory compliance, with actionable recommendations to shift research toward deployment-ready solutions

## Supply Chain Inventory Simulation for Perishable Goods        Dec 2024 – Feb 2025
*Discrete-Event Simulation*        *Python, SimPy, Pandas*

• Developed multi-echelon supply chain simulation (1 source, 2 DCs, 4 retailers) managing 6 perishable mango varieties with EOQ/ROP replenishment and truckload optimization
• Implemented Weibull-based transit deterioration, FIFO inventory aging, and substitution logic tracking service levels and cost metrics over 40-day simulation period
• Contributed to design, debugging, and metrics implementation for undergraduate thesis on perishable goods logistics, optimizing stockout and holding costs

## Industrial Attachment: Textile Manufacturing Optimization        Jun 2024 – Jul 2024
*Statistical Analysis & Operations Research*        *Python, R, ggplot2*

• Performed statistical analysis on fabric rejection data and conducted efficiency studies across 327 Picanol, Toyota, and Rapier looms, achieving 90.39% average loom performance
• Developed optimized power consumption plan reducing operational costs by 2.89 million BDT annually through downtime reduction and equipment automation
• Applied Pareto analysis to identify major fabric defects and provided actionable recommendations improving safety and productivity at AKIJ Textile Mills

## Optimizing Coal Transportation in India        Oct 2023 – Dec 2023
*Operations Research & Linear Programming*        *R, ggplot2*

• Optimized coal transportation from 7 mines to 10 thermal power plants using linear programming and transportation algorithm, minimizing logistics costs via Indian Railways
• Calculated transportation costs from actual Google Maps distances applying Russell's approximation method and optimality analysis
• Determined minimum total transportation cost of 57,013.72 million rupees, validated through both R programming and manual calculations for India's energy infrastructure

## Customer Churn Analysis and Retention Strategy Optimization        Aug 2024 – Sep 2024
*Data Analytics & Machine Learning*        *R, RStudio, ggplot2*

• Analyzed customer churn dataset using univariate, bivariate, and correlation analyses to identify contract type, monthly charges, and tenure as top churn predictors
• Conducted survival analysis and feature importance studies revealing higher churn rates in month-to-month contracts and fiber optic internet customers
• Segmented customers into risk cohorts providing actionable retention strategies to reduce churn and improve customer lifetime value through data-driven decision-making

## EXPERIENCE

**Industrial Engineering Intern**                                         June 2024 – July 2024

*AKIJ Textile Mills Ltd.*                                         *Golora, Manikganj, Bangladesh*

- Performed statistical analysis on fabric rejection data across 327 Picanol, Toyota, and Rapier looms, conducting efficiency studies that identified major defects using Pareto analysis and achieved 90.39% average loom performance
- Developed optimized power consumption plan reducing operational costs by 2.89 million BDT annually through downtime reduction, loom optimization, and equipment automation strategies
- Evaluated complete fabric production process including winding, warping, sizing, drawing, and weaving operations, providing actionable recommendations for enhanced safety, productivity, and ergonomics

## EDUCATION

**Bangladesh University of Engineering and Technology**                                         Dhaka, Bangladesh

*B.Sc. in Industrial and Production Engineering, CGPA: 3.15/4.00*                                         *2020 – 2025*

- **Undergraduate Thesis:** Fraud Detection: A Graph Theoretical Approach Using Graph Neural Networks (Published at IEOM 2024, DOI: 10.46254/BA07.20240105)
- **Relevant Coursework:** Computer Programming Techniques (4.0/4.0), Computer Programming Techniques Sessional (4.0/4.0), Probability & Statistics (3.75/4.0), Operations Research (3.0/4.0)
- **Academic Achievements:** Completed 161.75 credits; Strong performance in technical courses including Electrical Machines (3.75/4.0), Engineering Economy (4.0/4.0), Thermodynamics (4.0/4.0)

## STANDARDIZED TEST SCORES

**Graduate Record Examination**

*Quantitative Comparison 163/170, Verbal 154/170*                                         *November, 2025*

**IELTS Academic**

*Band 7.0/9.0 (Listening: 7.5, Reading: 7.0, Writing: 7.5, Speaking: 6.5)*                                         *October, 2025*

## CERTIFICATIONS

- **Mathematics for Machine Learning** – Imperial College London (Coursera)
- **Combinatorics and Probability** – University of California San Diego (Coursera)
- **Python Data Structures** – University of Michigan (Coursera)
- **Using Python to Access Web Data** – University of Michigan (Coursera)
- **Programming Fundamentals** – Duke University (Coursera)
- **Writing, Running, and Fixing Code in C** – Duke University (Coursera)
- **Introduction to Data Analytics for Business** – University of Colorado Boulder (Coursera)
- **Excel Skills for Business: Essentials** – Macquarie University (Coursera)
- **Excel Skills for Business: Intermediate I** – Macquarie University (Coursera)

## REFERENCES

**Dr. Ferdous Sarwar**                                         Professor

*Department of Industrial and Production Engineering*                                         *Bangladesh University of Engineering and Technology*

- **Email:** ferdoussarwar@ipe.buet.ac.bd
- **Office Extension:** 6735
- **Relationship:** Thesis Supervisor

**Dr. Kais Bin Zaman**                                                    Professor

*Department of Industrial and Production Engineering*        *Bangladesh University of Engineering and Technology*

- **Email:** kaiszaman@ipe.buet.ac.bd
- **Office Extension:** 7013
- **Relationship:** Undergraduate Academic Advisor
- **Expertise:** Artificial Intelligence, Machine Learning, Operations Research, Uncertainty Quantification