

Md Ragib Rownak

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Professional Summary

PhD candidate (graduating December 2026) with 5+ years of research experience in AI/ML, control systems, and physics-based modeling applied to electrified powertrains and complex engineering systems. Skilled in developing end-to-end learning-based solutions—from data-driven modeling with Transformers to deep reinforcement learning for real-time decision-making—validated against optimal control benchmarks. Strong track record of industry collaboration (Cummins Inc.), cross-functional teamwork, and peer-reviewed publications. Seeking roles in AI/ML engineering, controls, powertrain systems, or applied research.

Education

The Ohio State University

Ph.D. in Mechanical Engineering

Center for Automotive Research | GPA: 3.59/4.00

Dissertation: Aging-Aware Learning-Based Control for Electrified Powertrains

Advisor: Dr. Qadeer Ahmed

Columbus, OH

Jan 2021 – Dec 2026 (expected)

The Ohio State University

M.S. in Mechanical Engineering

Thesis: Uncertainty in Multi-Objective Optimization: Weighted Entropy and Partition-Based Uncertainty Reduction

Advisor: Dr. Carol Smidts

Columbus, OH

Dec 2023

Bangladesh University of Engineering & Technology (BUET)

B.S. in Mechanical Engineering

GPA: 3.80/4.00 (Top 8%)

Dhaka, Bangladesh

Oct 2018

Technical Skills

Languages

Python, MATLAB, C, C++

AI/ML

PyTorch, TensorFlow, Scikit-learn; Transformers, RNN/LSTM, CNNs; Reinforcement Learning (SAC, PPO, TD3, GRPO, DDPG)

Optimization

Dynamic Programming, Mixed-Integer Nonlinear Programming, Markov Decision Processes, Genetic Algorithms (NSGA-II), Multi-Objective Optimization, CasADi

Modeling & Sim

Simulink, MATLAB/Simulink powertrain models, LAMMPS

Data & Tools

NumPy, Pandas, Matplotlib, CUDA, Git, LaTeX, Docker

Engineering

AutoCAD, SOLIDWORKS

Professional Experience

Powertrain Electrification Controls Intern

Cummins Inc., Columbus, IN

Summer 2026

- Incoming intern in powertrain electrification controls.

Graduate Research Associate — Center for Automotive Research

The Ohio State University | Advisor: Dr. Qadeer Ahmed | Industry Partner: Cummins Inc.

Jan 2024 – Dec 2025

- Designed and implemented a **physics-aware deep reinforcement learning** (SAC, PPO, GRPO) framework for hybrid-electric powertrain energy management, achieving fuel consumption within 1.1–4.8% of the dynamic programming optimum while reducing battery degradation by up to 88% and generator lifetime loss by up to 26.3%.
- Developed a **Physics-Informed Transformer Model** for battery capacity fade prediction, reducing estimation error (RSEP) to 2.96% across 17 cells from 5 experimental datasets, outperforming LSTM and standard Transformer baselines.
- Built and validated **physics-based aging models** for battery (SEI growth, active material loss), electric machine (thermal degradation), and aftertreatment catalyst deactivation, integrated into a forward-looking MATLAB/Simulink powertrain simulator for Class 8 heavy-duty series-hybrid vehicles.
- Created a **Dynamic Programming** benchmarking framework to evaluate RL policy quality and generate expert trajectories for accelerated RL training.
- Proposed a **critic-free policy optimization** method (A-GRPO) using Transformer policies and trajectory-level advantage ranking, achieving $2.7\times$ higher terminal constraint feasibility than PPO-Lagrangian on a 3,605-step control task.

- Delivered quarterly technical results to **Cummins Inc.** through milestone reviews, model validation discussions, and progress reporting.

Graduate Research Assistant

Jan 2021 – Dec 2023

The Ohio State University | Advisor: Dr. Carol Smidts

- Developed a **VR-based experimental framework** for human reliability assessment under physical security threats at nuclear facilities, integrating biometric data capture with an extended THERP model.
- Designed a **multi-criteria sensor selection framework** using qualitative physical models and NSGA optimization for nuclear facility online monitoring systems.
- Investigated the effect of uncertainty on non-dominated Pareto fronts; derived **analytical probability expressions** for solution dominance and developed a partition-based algorithm using weighted entropy for progressive uncertainty reduction (M.S. thesis).

Graduate Teaching Assistant

Jan 2026 – Present

The Ohio State University

- Lead recitation sections and hold office hours for ME 3501: Introduction to Engineering Thermodynamics, supporting 100+ students in applying thermodynamic principles to engineering systems.

Lecturer — Department of Mechanical Engineering

Jun 2019 – Dec 2020

Bangladesh Army University of Science and Technology (BAUST)

- Taught undergraduate courses (Numerical Analysis, Engineering Mechanics, Mechanics of Materials, Measurement Instrumentation & Quality Control) and conducted lab sessions.
- Supervised student projects including design, construction, and performance analysis of a hydrodynamic tunnel and gravitational water vortex turbine.
- Served as Departmental Program Coordinator, organizing events and facilitating department operations.

Engineering Intern

Mar 2018 – Apr 2018

Navana Group, Dhaka, Bangladesh

- Industrial internship in manufacturing processes, quality control, and production line operations.

Publications

13 peer-reviewed and preprint publications | Google Scholar: 22 citations, h-index: 3

First-Author — Current Research (Electrified Powertrains & AI/ML):

- [1] **Rownak, M.R.**, Jaleel, W., Hanif, A., Fahim, M.Q., Le, D.D., Anwar, H., Nelson, M., & Ahmed, Q. (2026). Physics-Aware Deep Reinforcement Learning for Energy and Aging Management in Electrified Powertrains. *Under review*.
- [2] **Rownak, M.R.**, Hanif, A., Fahim, M.Q., Le, D.D., Anwar, H., Jaleel, W., Nelson, M., & Ahmed, Q. (2026). Learning Battery Aging Dynamics using Physics-Informed Transformer. *Accepted, IEEE Trans. Transportation Electrification*.
- [3] **Rownak, M.R.**, Hanif, A., Ahmed, Q., et al. (2025). Robustness and Sensitivity of Aging Models for Batteries and Electric Machines in Heavy-Duty Electrified Powertrains. In *IEEE ITEC 2025*.
- [4] **Rownak, M.R.**, Hanif, A., Ahmed, Q., et al. (2025). Powertrain Components Aging Model Selection for Energy Efficient Vehicles: Selection Strategy and Challenges. *SAE WCX 2025*.

Co-Authored — Current Research:

- [5] Jaleel, W., **Rownak, M.R.**, Hanif, A., et al. (2025). Sequence Aware SAC Control for Engine Fuel Consumption Optimization in Electrified Powertrain. *arXiv:2508.04874*.

First-Author — Human Reliability & Optimization:

- [6] **Rownak, M.R.**, Diao, X., & Smidts, C. (2024). Human Reliability Under Physical Security Threats: Modeling and Experimental Design. In *IEEE RAMS 2024*, pp. 1–6.
- [7] **Rownak, M.R.** (2023). Uncertainty in Multi-Objective Optimization: Weighted Entropy and Partition-Based Uncertainty Reduction. *Master's Thesis, The Ohio State University*.

Co-Authored — Nuclear Safety & Other:

- [8] Diao, X., **Rownak, M.R.**, et al. (2025). A multiple-criteria sensor selection framework based on qualitative physical models. *Advanced Engineering Informatics*, 65, 103228.
- [9] Diao, X., **Rownak, M.R.**, & Smidts, C. (2024). Design and Implementation of a Virtual Reality Environment for Human Reliability Assessment. *PBNC 2024*, pp. 716–725.

- [10] Diao, X., **Rownak, M.R.**, et al. (2023). Selection Criteria for Optimal Sensor Placement in Online Monitoring Systems. *13th NPIC&HMIT*, pp. 1568–1577.
- [11] Olatubosun, S.A., **Rownak, M.R.**, et al. (2022). Human reliability assessment for physical security. In *PSAM 16*, Honolulu, HI.
- [12] Hasan, M.N., Paul, S., **Rownak, M.R.**, & Akhter, C. (2019). Thin-film evaporation over biphilic surfaces. *Heat Transfer – Asian Research*, 48, 4283–4300.
- [13] Paul, S., **Rownak, M.R.**, & Hasan, M.N. (2020). Molecular dynamics study on thin film evaporation over biphilic surface. *Proc. IMechE Part N*.

Awards & Honors

- University Merit Scholarship, Dept. of Mechanical Engineering, BUET (2014)
- Dean’s List Award, Dept. of Mechanical Engineering, BUET (2015, 2017)

References

Dr. Qadeer Ahmed
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Dr. Carol Smidts
Professor, MAE, OSU
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