

RISHAV SEN

Nashville, TN · rishav.sen@vanderbilt.edu · rishavsen1.github.io · Google Scholar · LinkedIn · GitHub

I develop uncertainty-aware optimization and decision-making methods for electrified mobility and energy systems, with emphasis on EV-grid coordination, online control, and data-driven infrastructure operations.

EDUCATION

Ph.D., Electrical & Computer Engineering

2021 – Present

Vanderbilt University, Nashville, TN

Advisor: Prof. Abhishek Dubey (SCOPE Lab, Institute for Software Integrated Systems)

Research: Stochastic Optimization, MPC, RL, Multi-Agent Systems for Energy & Autonomous Mobility

B.Tech., Electronics & Communication Engineering

2016 – 2020

Heritage Institute of Technology, Kolkata, India

PUBLICATIONS

Accepted Papers

- [1] **R. Sen**, F. Liu, J.P. Talusan, A. Pettet, Y. Suzue, M. Bailey, A. Mukhopadhyay, A. Dubey. "CONSENT: A Negotiation Framework for Leveraging User Flexibility in Vehicle-to-Building Charging under Uncertainty." *25th Int. Conf. on Autonomous Agents and Multi-Agent Systems (AAMAS 2026)*. Accepted. [PDF]
- [2] **R. Sen**, A. Dubey, A. Mukhopadhyay, S. Samaranyake, A. Laszka. "MoveOD: Synthesizing Origin-Destination Commute Distribution from U.S. Census Data." *ACM/IEEE Int. Conf. on Cyber-Physical Systems (ICCPS 2026)*. Accepted. [arXiv]
- [3] **R. Sen**, Y. Zhang, F. Liu, J.P. Talusan, A. Pettet, Y. Suzue, A. Mukhopadhyay, A. Dubey. "Neuro-Symbolic V2B Controller with Value Function Approximation (P-V2B)." *ACM/IEEE Int. Conf. on Cyber-Physical Systems (ICCPS 2026)*. Accepted.

Published Papers

- [1] **R. Sen**, Y. Zhang, F. Liu, J.P. Talusan, A. Pettet, Y. Suzue, A. Mukhopadhyay, A. Dubey. "Online Decision-Making Under Uncertainty for Vehicle-to-Building Systems." *ACM/IEEE Int. Conf. on Cyber-Physical Systems (ICCPS 2025)*, pp. 20:1–20:12. [arXiv]
- [2] F. Liu, **R. Sen**, J.P. Talusan, A. Pettet, A. Kandel, Y. Suzue, A. Mukhopadhyay, A. Dubey. "Reinforcement Learning-based Approach for Vehicle-to-Building Charging with Heterogeneous Agents and Long Term Rewards." *24th Int. Conf. on Autonomous Agents and Multi-Agent Systems (AAMAS 2025)*, pp. 1345–1353. [Best Paper Award Finalist] [ACM DL]
- [3] **R. Sen**, A. Sivagnanam, A. Laszka, A. Mukhopadhyay, A. Dubey. "Grid-Aware Charging and Operational Optimization for Mixed-Fleet Public Transit." *27th IEEE Int. Conf. on Intelligent Transportation Systems (ITSC 2024)*, pp. 4172–4179.
- [4] J.P. Talusan, **R. Sen**, A. Pettet, A. Kandel, Y. Suzue, L. Pedersen, A. Mukhopadhyay, A. Dubey. "OPTIMUS: Discrete Event Simulator for Vehicle-to-Building Charging Optimization." *IEEE Int. Conf. on Smart Computing (SMARTCOMP 2024)*, pp. 223–230.
- [5] S. Khaleghian, H. Neema, M. Sartipi, T. Tran, **R. Sen**, A. Dubey. "Calibrating Real-World City Traffic Simulation Model Using Vehicle Speed Data." *IEEE Int. Conf. on Smart Computing (SMARTCOMP 2023)*, pp. 303–308.
- [6] **R. Sen**, T. Tran, S. Khaleghian, P. Pugliese, M. Sartipi, H. Neema, A. Dubey. "BTE-Sim: Fast Simulation Environment For Public Transportation." *IEEE Int. Conf. on Big Data (IEEE BigData 2022)*, pp. 2886–2894.
- [7] **R. Sen**, A.K. Bharati, S. Khaleghian, M. Ghosal, M. Wilbur, T. Tran, P. Pugliese, M. Sartipi, H. Neema, A. Dubey. "E-Transit-Bench: Simulation Platform for Analyzing Electric Public Transit Bus Fleet Operations." *13th ACM Int. Conf. on Future Energy Systems (e-Energy 2022)*, pp. 532–541.

RESEARCH EXPERIENCE

Vanderbilt University, SCOPE Lab | Graduate Research Assistant Nashville, TN · Aug 2021 – Present

Advisor: Prof. Abhishek Dubey · Topics: Stochastic Optimization, MPC, RL, Multi-Agent Systems, Energy-CPS

- **Stochastic Scenario Generation:** Designed population-level generative pipelines (GMMs, Poisson processes, stratified importance sampling) producing Monte Carlo scenario sets for online V2B controllers; over-represents joint high-load/high-EV-demand tail events to improve real-time robustness.
- **Data-Driven & Physics-Informed Forecasting:** Developed day-ahead building load forecasting using XGBoost and zero-shot Salesforce Moirai time-series foundation model; integrated DOE EnergyPlus simulations calibrated with ASHRAE occupancy schedules and NASA POWER weather data.
- **Online Optimization under Uncertainty:** Designed rolling-horizon controllers (MC-MPC, MCTS, Sample Average

Approximation) for EV charging and transit scheduling; achieved performance within 1.6% of omniscient MILP oracles across 12 months of live operational data.

- **Long-Horizon & Hierarchical Planning:** Embedded a neural Value Function into MILP via McCormick envelopes and SOS2-constrained piecewise-linear surrogates; designed Stackelberg-style hierarchical MILP for multi-level fleet scheduling, reducing energy costs by 14% and GHG emissions by 10 tons on CARTA's mixed fleet (Chattanooga, TN).
- **Incentive Design & Multi-Agent Negotiation:** Designed a strategy-proof negotiation mechanism (voluntary participation, incentive compatibility) formulated as an SMDP; improved user V2B participation by 8% over state-of-the-art; calibrated with stated-preference surveys and logit-based choice functions.
- **Safe & Constraint-Aware Reinforcement Learning:** Developed teacher-student policy guidance for DDPG agents and domain-specific action masking for hard operational constraints (SoC bounds, charger limits); achieved zero constraint violations on field-scale building data.
- **Open-Source Simulation Tooling:** Architected city-scale simulation testbeds (E-Transit-Bench, BTE-Sim, OPTIMUS digital twin) and the MoveOD demand synthesis pipeline fusing US Census and traffic data; tools adopted by 3+ academic institutions.
- **Cross-Institutional Collaborations:** Led research collaborations spanning Cornell University, Pennsylvania State University, CARTA (Chattanooga, TN), Nissan, Carrier, and CenterPoint Energy.

Nissan North America Inc. | *Research Intern, Connected Energy & Data Analytics* Santa Clara, CA · Jun – Sep 2023

- **Cost Optimization:** Reduced peak demand charges by 15% on real commercial building loads by engineering a V2B power-flow optimization pipeline.
- **Probabilistic Demand Modeling:** Mined 500K+ vehicle telematics records to build agent-level generative models of EV behavior (ZINB, Beta regression, Weibull AFT); integrated into OPTIMUS digital twin for policy validation.
- **Simulation Platform:** Extended V2B simulation framework with vehicle-to-home (V2H) capabilities for digital twin modeling of household energy demand.

OpenMinds Inc. | *NextGen Leaders Fellow, Energy Systems* Remote, United States · May 2025 – Jan 2026

- **Scenario Modeling & Forecasting:** Built grid reliability vs. operational efficiency quantification strategies for battery-enabled heat pump deployment with Carrier and CenterPoint Energy (TX) using XGBoost and Gaussian Mixture Models.
- **Multi-Stakeholder Deployment Analysis:** Quantified up to \$100M in projected 10-year savings from demand flexibility and peak-shifting strategies in the ERCOT (TX) market, modeling interactions among TDUs, REPs, and end customers.
- **Decision-Support Dashboard:** Developed an analytic dashboard translating complex model outputs into actionable operational insights for energy planning stakeholders.

TEACHING EXPERIENCE

Vanderbilt University | *Graduate Teaching Assistant — Embedded Systems* Nashville, TN · Aug – Dec 2021

- Supervised laboratory sessions for undergraduate students, guiding hands-on experiments in systems programming using C++.
- Instructed students through the full design cycle of an autonomous RC vehicle project, from embedded control logic through sensor integration and final demonstration.
- Managed laboratory duties including equipment setup, troubleshooting, and student evaluation.

Vanderbilt University | *Guest Lecturer — Artificial Intelligence* Nashville, TN · 2022

- Delivered a guest lecture on *Optimization Techniques in Artificial Intelligence* to graduate students, covering mathematical programming, MPC, and sequential decision-making formulations relevant to AI systems.

Vanderbilt University, SCOPE Lab | *Research Mentor* Nashville, TN · 2022 – Present

- Mentored 3 junior researchers on problem formulation using MDPs and MILPs, and on explainability using LLMs.

CONFERENCE PRESENTATIONS

- **Oral Presentation** — “Online Decision-Making Under Uncertainty for V2B Systems.” ICCPS 2025.
- **Oral Presentation** — “Grid-Aware Charging and Optimization for Mixed-Fleet Public Transit.” ITSC 2024.

- **Oral Presentation** — “BTE-Sim: Fast Simulation Environment for Public Transportation.” IEEE BigData 2022.
- **Oral Presentation** — “E-Transit-Bench: Simulation Platform for Electric Transit Bus Fleet Operations.” ACM e-Energy 2022.
- **Poster Presentation** — “MoveOD: Synthetic Demand & Mobility Pipeline.” INFORMS 2025 Annual Meeting (2nd Place).
- **PhD Forum Poster** — ACM/IEEE ICCPS (Best PhD Forum Poster Award).

AWARDS, GRANTS & RECOGNITION

- **Best Paper Award Finalist** — AAMAS 2025 (Top 5 of 900+ submissions, multi-agent systems)
- **2nd Place, Poster Competition** — INFORMS 2025 Annual Meeting (Top 2 of 300+ submissions, operations research)
- **Best PhD Forum Poster Award** — ACM/IEEE ICCPS (Best PhD Research Trajectory)
- **OpenMinds NextGen Leader 2025** — Energy & Climate Leadership, highly selective cohort from top 12 U.S. universities
- **Russell G. Hamilton Scholar** — Vanderbilt University (premier merit-based fellowship awarded to <2% of graduate students)

LEADERSHIP & ACADEMIC SERVICE

- **Research Mentoring:** Supervised 3 junior graduate researchers on MDP/MILP problem modeling and LLM-based explainability.
- **Cross-Institutional Collaboration:** Coordinated multi-institution research efforts spanning Cornell University, Pennsylvania State University, and industry partners (Nissan, Carrier, CenterPoint Energy).
- **Open-Source Contribution:** Released and maintained simulation toolkits (E-Transit-Bench, BTE-Sim, MoveOD) adopted by multiple academic research groups.
- **Reviewer:** Reviewed papers for ITSC, ICCPS, and the Metascience Novelty Indicators Challenge (UK).

ADDITIONAL INDUSTRY EXPERIENCE

Tata Consultancy Services | *Assistant Systems Engineer* Kolkata, India · Sep 2020 – Aug 2021

- Improved load times of enterprise dashboards by 20% using Angular; automated backend scheduling pipelines for Emirates Catering, reducing manual operations overhead.

TECHNICAL SKILLS

ML & Modeling: RL (DDPG, PPO, RLlib), PyTorch, Scikit-learn, Probabilistic Forecasting, Statistical & Scenario Modeling

Optimization: MILP (CPLEX, Gurobi), MPC / SMPC, MCTS, Sequential Decision-Making, Stackelberg Games, McCormick Envelopes, SOS2 Constraints, Piecewise-Linear Surrogates

Agentic AI: LLM APIs (Gemini Live, Claude, Codex), MCP Orchestration, RAG Pipelines

Data & Infrastructure: Python, C++, SQL, PySpark, AWS (EC2/S3/SageMaker), Docker, Git, Digital Twins (SUMO, GridLAB-D)

Web & Visualization: React, D3.js, JavaScript, Analytic Dashboards

REFERENCES

Available upon request. Primary referee: Prof. Abhishek Dubey, Vanderbilt University (abhishek.dubey@vanderbilt.edu).