Vanshaj Khattar

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Research Interests

My research interests lie at the intersection of **machine learning**, **optimization** and **control**. I am interested in how we can develop **trustworthy** learning algorithms for real-world applications that are **safe**, **explainable**, and can continually adapt to **non-stationarity**.

Education

Virginia Polytechnic Institute and State University (Virginia Tech) *Blacksburg, VA*
PH.D. ELECTRICAL ENGINEERING *August 2021 - May 2026*
- Advisor: Dr. Ming Jin

Virginia Polytechnic Institute and State University (Virginia Tech) *Blacksburg, VA*
MS ELECTRICAL ENGINEERING *August 2019 - May 2021*
- Advisor: Dr. Azim Eskandarian

Delhi Technological University *New Delhi, India*
B.TECH ELECTRICAL AND ELECTRONICS ENGINEERING *August 2014 - May 2018*
- CGPA: 8.09/10.0

Experience

National Renewable Energy Lab (NREL) *Golden, Colorado*
PHD INTERN IN ML FOR POWER SYSTEMS *June 2024 - August 2024*
- Mentors: Yiyun Yao and Fei Ding
- Worked on critical load restoration problem for microgrids that can adapt to uncertain topologies. Developed a hierarchical graph-reinforcement learning-based solution that can restore the critical loads under topology changes.
- One conference paper and one journal paper under preparation **(Preprint)**

Publications

CONFERENCE AND WORKSHOP PUBLICATIONS

Sel, B., Al-Tawaha, A., **Khattar, V.**, Jia, R. and Jin, M., "Algorithm of thoughts: Enhancing exploration of ideas in large language models". **(ICML 2024)**

Khattar, V.*, Lin, T.*, Huang. Y*, Jia, R., Hong, J., Liu C, Vincentelli, A and Jin, M., "CausalPrompt: Enhancing LLMs with Weakly Supervised Causal Reasoning for Non-Language Applications". **(ICLR 2024 Workshop Paper)**

Khattar, V. and Jin, M., "Optimization Solution Functions as Deterministic Policies for Offline Reinforcement Learning". (American Control Conference) **(ACC 2024)**

Khattar, V. and Jin, M., "Zero-day Attack Detection in Digital Substations using In-Context Learning". **(SmartGridComm 2024)**

Khattar, V., Ding, Y., Sel, B., Lavaei, J. and Jin, M., "A CMDP-within-online framework for Meta-Safe Reinforcement Learning". In The Eleventh International Conference on Learning Representations (**ICLR 2023 Spotlight**) .

Khattar, V. and Jin, M., "Winning the CityLearn challenge: adaptive optimization with evolutionary search under trajectory-based guidance". In Proceedings of the (**AAAI 2023**).

Jin, M., **Khattar, V.**, Kaushik, H., Sel, B. and Jia, R., "On solution functions of optimization: universal approximation and covering number bounds". In Proceedings of the (**AAAI 2023**).

Meimand, M., **Khattar, V.**, Yazdani, Z., Jazizadeh, F., Jin, M., "TUNEOPT: An Evolutionary Reinforcement Learning HVAC System Controller For Tuning Energy-Comfort Optimization Formulations". (**BuildSys 2023**).

Khattar, V. and Eskandarian, A., "Stochastic predictive control for crash avoidance in autonomous vehicles based on stochastic reachable set threat assessment". **(IMECE 2021)**.

Khattar, V. and Eskandarian, A., "Reactive online motion re-planning for crash mitigation in autonomous vehicles using bezier curve optimization". ASME (**IMECE 2020**).

Valluru, S.K., Singh, M., Singh, M. and **Khattar, V.,**, "Experimental validation of PID and LQR control techniques for stabilization of cart inverted pendulum system". In IEEE International Conference on (**RTEICT 2018**).

Journal Publications

Khattar, V. and Eskandarian, A., "Stochastic reachable set threat assessment for autonomous vehicles using trust-based driver behavior prediction". SAE International Journal of Connected and Automated Vehicles. Paper link.

Technical Skills

Programming languages. Python, C, MATLAB, HTML

Frameworks. PyTorch, Tensorflow, cvxpy, NumPy, Pandas, Scikit-learn

Awards & Scholarships

2023	**AAAI 2023 travel scholarship.**, AAAI	*$ 750*
2022	**Member of the winning team ROLEVT at CityLearn challenge 2021.(ROLEVT team)**,	*$ 1500*
2021	**Second position in 2021 Torgersen Graduate Student Research Excellence Award for MS Oral presentation. (Link)**, Virginia Tech	*$ 500*

Outreach and Service

Conference reviewer: *1)* AISTATS 2022, 2023, 2024, 2025; *2)* ICLR 2025; *3)* CDC 2024; *4)* TIDMWFM workshop 2024

Co-organized a workshop on Trustworthy Interactive Decision-Making with Foundation Models at IJCAI 2024. (Link)

Safe RL for Smart Grids tutorial at SmartGridComm 2024 conference. (Link)

Selected Talks and Presentations

Fall, 2024. *Tu*. PEC Conference at Virginia Tech. Spring, 2023. *Offline Actor-Critic with Optimization Policies for Demand Response and Urban Energy Management*. PEC Conference at Virginia Tech.

Spring, 2022. *Winning the CityLearn Challenge with Optimization as RL Policies*. PEC Conference at Virginia Tech.

Fall, 2022. *Trustworthy Reinforcement Learning.* Presented to 150+ undergraduates in the undergraduate engineering research seminar, Fall 2022

Fall 2021. *Zeroth-Order Implicit Reinforcement Learning for Distributed Control Systems*. Southeast Control Conference 2021, Virginia Tech.

Web features

Fall, 2023. *Featured as a Spotlight at Sanghani Center for Artificial Intelligence and Data Analytics, Virginia Tech. (Link)*

Ongoing research projects

- **The role of interaction frequency in non-stationary bandit learning** Studying the role of interaction frequency in non-stationary bandit settings and designing the algorithms that can adapt the interaction frequency for more efficient learning in non-stationary settings.