Bibek Poudel

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Technical Expertise

- **Reinforcement Learning for Control Systems:** Applying Deep RL and Human-in-the-Loop techniques to solve complex, real-world problems in physical hardware, including robotic wheelchairs and DC motors for micromobility.
- **ML/Robotics Simulation & Development:** Proficient in building/ training agents in high-fidelity simulators like SUMO, IsaacLab and MuJoCo. Experienced in full development cycle with PyTorch, TensorFlow, Weights & Biases.

Research Experience

Fluidic City Lab & Center for Transportation Research, University of Tennessee 2023 – Present
Research Assistant – Reinforcement Learning (RL) and Robotics

- Developed a Deep RL framework to co-optimize urban street design (crosswalk placement) and traffic signal control, reducing pedestrian arrival times by 23% while cutting pedestrian wait times by 79% and vehicle delays by 65%.
- Engineered a robotic wheelchair with human-in-the-loop RL that adjusts assistance based on real-time heart rate, enabling users to maintain moderate activity for 72% longer while reducing muscle contractions by 42%.

Department of Computer Science, University of Memphis 2019 – 2023
Research Assistant – Real-time Control and Adversarial Machine Learning

- Applied sample-efficient Reinforcement Learning on position control of a DC motor (acting on steering wheel of a golf cart), achieving control policy learning under two minutes in simulation and 10 minutes in hardware.
- Conducted black-box adversarial attacks on state-of-the-art deep learning models for traffic flow prediction, degrading their performance by up to 54%.

Selected Publications

- **B. Poudel**, L. Zhu, W. Li, K. Heaslip, "DeCoR: Design and Control Co-Optimization for Urban Streets using Reinforcement Learning." *In Submission.*
- T. Wu, Y. Wu, **B. Poudel**, S. Meerza, R. Gore , W. Li, Z. Gao, C. Karatas, J. Liu, "VibRun: Real-time Unobtrusive Gait Analysis for Treadmill Running via Footstep Vibrations." *UbiComp* 2025
- **B. Poudel**, X. Wang, W. Li, L. Zhu, K. Heaslip, "Joint Pedestrian and Vehicle Traffic Optimization in Urban Environments using Reinforcement Learning." *IEEE IROS* 2025.
- A. Zahid, **B. Poudel**, D. Scott, J. Scott, S. Crouter, W. Li, S. Swaminathan, "PulseRide: A Robotic Wheelchair for Personalized Exertion Control with Human-in-the-Loop Reinforcement Learning." *IEEE/ACM CHASE* 2025.
- **B. Poudel**, W. Li, K. Heaslip, "EnduRL: Enhancing Safety, Stability, and Efficiency of Mixed Traffic Under Real-World Perturbations Via Reinforcement Learning." *IEEE IROS* 2024.
- M. Villarreal, **B. Poudel**, J. Pan, W. Li. "Mixed Traffic Control and Coordination from Pixels." *IEEE ICRA,* 2024.

*S*ee more in Google Scholar

Projects

- Cowrite.io Developed an AI assisted writing and collaboration tool for researchers. 10 + monthly active users.
- DocuMint: Led a team of 4 researchers to release a fine-tuning dataset (80 downloads/ month) to improve the quality of docs generated by coding LLMs, improved Google's CodeGemma model by upto 35%. arXiv · GitHub · HuggingFace
- Robustness in Autonomous Steering: Used self-supervised learning to improve robustness of computer vision models in steering angle prediction under disturbances to camera such as rain, snow, fog, frost, and blur. PDF · Video
- Defending game playing RL agents against attacks: Developed input feature squeezing as a defense against RL agents under adversarial attacks winning all games that would otherwise be lost. PDF

Education

Ph.D. in Computer Science 2023 – May 2026 (expected)
University of Tennessee, Knoxville

M.S. in Computer Science 2019 – 2023
University of Memphis GPA: 4.0/4.0

Honors & Awards

- Best paper award finalist: "Congestion-Aware Reinforcement Learning" paper in *IEEE CYBER* 2024 Conference
- Won Best project in the class award: BarterBaron in COMP 7012 Software Engineering, U of M, 2021