Bibek Poudel

Computer Science Ph.D. Student

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Visa status: F1 visa

Education

- **University of Tennessee, Knoxville** — 2023–Present
  Ph.D. in Computer Science
  Advisor: Prof. Weizi Li

- **University of Memphis** — 2019–2023
  M.S. in Computer Science, GPA: 4.0/4.0
  Advisor: Prof. Weizi Li

- **Tribhuvan University** — 2012–2017
  Bachelor of Engineering in Electronics and Communication
  Top 5% of the class in semesters 1, 2 & 3

Publications

- **B. Poudel**, W. Li, "Beyond Simulated Drivers: Evaluating the Impact of Real-World Car-Following in Mixed Traffic Control," *In Submission*

  Assessed the safety, efficiency, and stability of autonomous vehicles among real-world human driving behaviors. Trained an AV to maintain highest safety (TTC > 4 seconds) and stability (shockwave attenuation upto 97%).

- M. Villarreal, **B. Poudel**, J. Pan, W. Li, "Hybrid Traffic Control and Coordination from Pixels," *Preprint*

  Used local, bird's-eye view image observations for AVs demonstrating competitive and, in some cases, superior performance (upto 8% increase in average velocity in merging environment) compared to precise observations.

- M. Villarreal, **B. Poudel**, R. Wickman, Y. Shen, W. Li, "AutoJoin: Efficient Adversarial Training for Robust Maneuvering via Denoising Autoencoder and Joint Learning," *Preprint*

  Proposed a state-of-the-art data augmentation technique specific to perception in autonomous cars (via Computer Vision models such as ResNet50) against rain, snow, fog, frost, pixelation, and blur.

- M. Villarreal, **B. Poudel**, W. Li, "Can ChatGPT Enable ITS? The Case of Mixed Traffic Control via Reinforcement Learning," IEEE International Conference on Intelligent Transportation Systems (ITSC) 2023, *Article*

  Conducted a user study with 70 participants to determine the efficacy (with mixed results) of ChatGPT in assisting novices in Reinforcement Learning and Mixed Traffic Control.

- R. Wickman, **B. Poudel**, M. Villarreal, X. Zhang, W. Li, "Efficient Quality-Diversity Optimization through Diverse Quality Species," Genetic and Evolutionary Computation Conference (GECCO) 2023, *Article*

  Proposed a novel genetic algorithm that achieves state-of-the-art sample efficiency in simulated robotic environments while eliminating the need for predefined data structures.

- **B. Poudel**, T. Watson, W. Li, "Learning to Control DC Motor for Micromobility in Real Time with Reinforcement Learning," IEEE International Conference on Intelligent Transportation Systems (ITSC) 2022, *Article*

  Used Reinforcement Learning for real-time control (as quickly as 1 minute 35 seconds) of DC motors used in micro-mobility, relying solely on interactions with the hardware or simulation.

- **B. Poudel**, W. Li, "Black-box Adversarial Attacks on Network-wide Multi-step Traffic State Prediction Models," IEEE International Conference on Intelligent Transportation Systems (ITSC) 2021, *Article*

  Evaluated the adversarial robustness of state-of-the-art deep learning based city-scale traffic state prediction models to degrade their performance up to 54%.

Professional Experience

- **Research Assistant** — 2023–Present
  Department of Electrical Engineering and Computer Science, UTK

  Research: Safety, efficiency, and stability evaluation of autonomous vehicles in mixed traffic among real-world human driving behaviors. Application of reinforcement learning in novel areas of transportation autonomy.

- **Research Assistant**   2019–2023
  Department of Computer Science, U of M

  Research: Control and coordination of autonomous vehicles in mixed traffic, robustness evaluation of traffic state monitoring systems, and real-time control in micro-mobility systems.

  Concurrent Projects:
  1. "Robustness to Input Corruptions and Adversarial Examples in Steering Angle Prediction": Used self-supervised learning in steering angle prediction to enhance model robustness under conditions such as rain, snow, fog, frost, pixelation, and blur. *Read More.*
  2. "Latent Representation of Inputs: A Defense Against Adversarial Examples in Deep Q Networks": Used feature squeezing to improve the performance of a Deep Reinforcement Learning algorithm, DQN trained to play Atari Pong, under adversarial attacks. *Read More.*
  3. "Distributed Hyperparamter Tuning of Neural Networks": Parallelized grid search and random search hyperparameter tuning using Distributed Hash Table to accelerate the search by sharing computational resources across multiple nodes.
  4. "BarterBaron, A Commerce App Based on Barter System": Developed an ebay-like commerce platform using Ruby on Rails framework with features like chat, content search, and user authentication. *Demo.*

  Lectures: Delivered lectures to undergraduate and graduate courses on the following topics:
  1. "Introduction to Transformers", Machine Learning Spring 2023. *Slides.*
  2. "Optimization and Stochastic Gradient Descent", Artificial Intelligence Spring 2023, Machine Learning Spring 2023, Intro to Neurocomputing Fall 2020 and Fall 2021. *Slides.*
  3. "Introduction to Adversarial Machine Learning", Intro to Neurocomputing Fall 2021. *Slides.*

  Assignments: Developed and conducted coding assignments for graduate AI and ML courses, on topics including Convolutional Neural Networks, Reinforcement Learning algorithms, and finetuning of Transformers.

  Teaching Assistance: Courses covered include Software Engineering, Database Systems, Artificial Intelligence, Data Mining, Machine Learning, and Advanced Machine Learning.

Technical Skills

- **Data Analysis:** Proficient in the data analysis pipeline including data cleaning, exploration, visualization, and statistical analysis. Skilled in NumPy, Scikit-Learn, Pandas, Matplotlib, and Seaborn.
- **Modeling and Frameworks:** Proficient in building, training, and validating machine learning models, utilizing frameworks such as PyTorch, TensorFlow, and Keras (with GPU acceleration). Experience with HuggingFace.
- **Experimentation:** Skilled in virtualization tools like Conda and Venv. Proficient in managing and distributing experiments across multiple systems, and in experiment tracking and visualization with Weights & Biases.
- **Languages and OS:** Skilled in Python, C++, and LaTeX. Experienced with Linux (including shell scripting, software installations, package management), MacOS, and Windows.
- **Design and Hardware:** Proficient with Adobe Illustrator and the Sketch app. Experienced in hardware programming with Arduino.

Awards & Honors

- Travel Grant, Department of Electrical Engineering and Computer Science, UTK, 2023
- Travel Grant, Department of Computer Science, U of M, 2021
- "Best project in the class" award for BarterBaron, Software Engineering, U of M,
- Merit based scholarship, TU.

Personal Interests

- **Hobbies:** Gardening, Cooking, Movies, and Swimming
- **Languages:** English, Nepali, and Hindi