Bibek Poudel

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Education

University of Tennessee	Knoxville, TN
Ph.D. in Computer Science; GPA: 3.83/4.0	*2023 – Present*
University of Memphis	Memphis, TN
M.S. in Computer Science; GPA: 4.0/4.0	*2019 – 2023*

Experience

- **Graduate Research Assistant** *2023 – Present*
  Fluidic City Lab & Center for Transportation Research (CTR), University of Tennessee
  - Conducted research funded by NSF and CTR, on **computer vision in autonomous cars** and **reinforcement learning in robotics and multi-agent systems**, resulting in **5 peer reviewed publications in conferences like ICRA and IROS**.
  - Current research (*Two in preparation*):
    - Implemented RL agents that optimize urban environments for both pedestrians (design mid-block uncontrolled crosswalks) and vehicles (control traffic signal timing), **reducing both pedestrian and vehicle travel time by up to 38%**.
    - Developed a robotic wheelchair with human-in-the-loop RL to balance the user's physical exertion and mobility needs. **Delayed fatigue onset and reduced the average frequency of propulsion by 33%** in a 10-user study.

- **Graduate Research Assistant** *2019 – 2023*
  Department of Computer Science, University of Memphis
  - Conducted research on adversarial machine learning and real-time optimal control, resulting in **3 peer reviewed papers**.
  - Created and delivered **6 lectures** and **17 programming assignments** in graduate and undergraduate AI and ML courses. Topics include deep learning architectures (CNN, AutoEncoder, Transformer) and algorithms such as Proximal Policy Optimization.

Projects

- **Edunotes.ai** *In Development*
  - A web app that transcribes lectures in real-time and generates organized notes, enabling students to focus on lecture content over manual note-taking. Features include flashcards, hover-to-explain topics, and lecture Q&A.

- **DocuMint: Documentation Generation using Small Language Models (SLMs)** *2024*
  - Created a finetuning dataset of 100k function, docstring pairs. **CodeGemma docstring generation accuracy improved by 14%**.
  - Benchmarked accuracy, conciseness, and clarity of SLMs such as Llama 3 and **released the dataset & model in HuggingFace**.

- **BarterBaron** *2022*
  - Engineered an eBay-like commerce platform based on barter system, with features like chat, search, and user authentication.
  - **Recognized with "Best project in the class" award** at graduate-level Software Engineering course.

- **Robustness to Input Corruptions in Steering Angle Prediction** *2022*
  - Adapted self-supervised learning on Honda dataset (100,000 images) to predict steering angle without using labels.
  - Evaluated the robustness of the ResNet50 model on **9 different corruptions** including adversarial attacks such as FGSM and PGD.

Skills

- **Databases & Programming Languages**: MySQL, MongoDB, Python, C++, Java.
- **Data Science**: Data Cleaning, Exploration, Visualization and Analysis with NumPy, Scikit-learn, Pandas, Matplotlib & Seaborn.
- **Machine Learning/AI**: Model building, training, and validation (PyTorch, TensorFlow, Keras) for Supervised Deep Learning (CNNs, Transformers). Reinforcement Learning (Gymnasium) with algorithms such as Deep Networks and Proximal Policy Optimization.
- **Tools & Engineering**: Virtualization (Conda, Venv), Version Control (Git, GitHub), and Experiment Tracking (Weights & Biases).
- **LLMs**: Fine-tuning (LoRA) and Quantization of Pre-trained models (HuggingFace) for NLP tasks (text generation, classification).

Publications

- **B. Poudel**, W. Li, K. Heaslip. (*2024*). "EnduRL: Enhancing Safety, Stability, and Efficiency of Mixed Traffic Under Real-World Perturbations via Reinforcement Learning". *IEEE IROS 2024*
- M. Villarreal, **B. Poudel**, R. Wickman, Y. Shen, W. Li. (*2024*). "AutoJoin: Efficient Adversarial Training for Robust Maneuvering via Denoising Autoencoder and Joint Learning". *IEEE IROS 2024*
- M. Villarreal, **B. Poudel**, J. Pan, W. Li. (*2024*). "Mixed Traffic Control and Coordination from Pixels". *IEEE ICRA 2024*
- **B. Poudel**, W. Li, S. Li. (*2024*). "CARL: Congestion-Aware Reinforcement Learning for Imitation-based Perturbations in Mixed Traffic Control". *IEEE CYBER 2024*
- M. Villarreal, **B. Poudel**, W. Li. (*2023*). "Can ChatGPT Enable Intelligent Transportation Systems? The Case of Mixed Traffic Control via Reinforcement Learning". *IEEE ITSC 2023*
- **B. Poudel***, Thomas Watson*, W. Li. (*2022*). "Learning to Control DC Motor for Micro-mobility in Real Time with Reinforcement Learning". *IEEE ITSC 2022*