Baiting Luo

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Education

Vanderbilt University, Tennessee — Aug 2021 – Present
Ph.D. in Computer Science
Advisor: Prof. Abhishek Dubey

Northwestern University, Illinois — Sept 2019 – June 2021
M.S. in Computer Engineering
Thesis: Sybil Attack Detection in VANET (Northwestern Best Thesis Award)
Advisor: Prof. Qi Zhu

Rensselaer Polytechnic Institute (RPI), New York — Sept 2015 – May 2019
B.S. in Computer Engineering
Dual Degree: Computer Science

Work Experience

Ph.D. Student and Research Assistant, **Advisor:** Prof. Abhishek Dubey — Aug 2021 – Present
Institute for Software Integrated Systems, Vanderbilt University

Research Topics: Decision Making under Uncertainty, Planning, Machine Learning, Online/Offline Reinforcement Learning, Heuristic Search, Autonomous Cyber-Physical Systems

- **Planning with Learned Action Models in High-Dimensional Environments:** Developed Latent Macro Action Planner for offline reinforcement learning, enabling efficient decision-making with sequence model in high-dimensional, stochastic environments by learning temporally extended actions.
- **Decision Making in Non-Stationary Environment:**
  - Proposed Adaptive Monte Carlo Tree Search for safe exploration and online adaptation to changing dynamics in model-based reinforcement learning tasks [paper][code].
  - Created NS-Gym toolkit for standardized evaluation of online decision-making algorithms in dynamically changing environments [code].
- **Runtime Safety Assurance of Autonomous Vehicles:**
  - Proposed Dynamic Simplex framework improving performance without compromising safety in autonomous systems through planning with multiple generative models in dynamic environments [paper] [code].
  - Developed advanced sampling techniques for high-risk scenario generation in AV testing [paper] [code].
  - Created an automated testing framework for adversarial conditions in AV simulations [paper] [code].
- **Multi-channel Psych:** Developed automated validation and testing systems for machine learning pipelines used in depression diagnosis and treatment prediction, including a common representation framework, integrated workflows, and a performance dashboard prototype for evaluating multi-modal biomarker models.

Research Assistant, **Advisor:** Prof. Qi Zhu — Mar 2020 – July 2021
Design Automation of Intelligent Systems Lab, Northwestern University

- **Securing Connected and Autonomous Vehicles:**
  - Developed hybrid GCN-RNN model to detect Sybil attacks in connected vehicle networks [paper].
  - Created dual cyber-physical blockchain framework for efficient security in large-scale vehicular networks [paper].

Publications

** indicates equal contribution*

Baiting Luo, Ava Pettet, Aron Laszka, Abhishek Dubey, Ayan Mukhopadhyay, "Scalable Decision-Making in Stochastic Environments through Learned Temporal Abstraction", (ICLR 2025).

Yunuo Zhang, **Baiting Luo**, Ayan Mukhopadhyay, Abhishek Dubey, "Observation Adaptation via Annealed Importance Resampling for Partially Observable Markov Decision Processes", (Submitted to ICAPS).

Nathaniel S. Keplinger, **Baiting Luo**, Iliyas Bektas, Yunuo Zhang, Kyle Hollins Wray, Aron Laszka, Abhishek Dubey, Ayan Mukhopadhyay, "NS-Gym: Open-Source Simulation Environments and Benchmarks for Non-Stationary Markov Decision Processes", (Submitted to IJCAI) [code]

Yunuo Zhang, **Baiting Luo**, Ayan Mukhopadhyay, Daniel Stojcsics, Daniel Elenius, Anirban Roy, Susmit Jha, Miklos Maroti, Xenofon Koutsoukos, Gabor Karsai, Abhishek Dubey, "Shrinking POMCP: A Framework for Real-Time UAV Search and Rescue", *IEEE International Conference on Assured Autonomy (ICAA 2024)*.

Baiting Luo, Yunuo Zhang, Abhishek Dubey, Ayan Mukhopadhyay, "Act as You Learn: Adaptive Decision-Making in Non-Stationary Markov Decision Processes", *23rd International Conference on Autonomous Agents and MultiAgent Systems (AAMAS 2024)*. (Acceptance rate: 25%) (**Vanderbilt C.F. Chen Best Paper Runner-Up Award**) [code]

Ava Pettet, Yunuo Zhang, **Baiting Luo**, Kyle Wray, Hendrik Baier, Aron Laszka, Abhishek Dubey, Ayan Mukhopadhyay, "Decision Making in Non-Stationary Environments with Policy-Augmented Search", Extended Abstract in the *23rd International Conference on Autonomous Agents and MultiAgent Systems (AAMAS 2024)*. [code]

Baiting Luo, "Adaptive Decision-Making in Non-Stationary Markov Decision Processes", Doctoral Consortium in the *23rd International Conference on Autonomous Agents and MultiAgent Systems (AAMAS 2024)*.

Baiting Luo, Shreyas Ramakrishna, Ava Pettet, Christopher Kuhn, Gabor Karsai, Ayan Mukhopadhyay, "Dynamic Simplex: Balancing Safety and Performance in Autonomous Cyber Physical Systems", *14th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS 2023)*. (Acceptance rate: 25.6%) [code]

Shreyas Ramakrishna*, **Baiting Luo***, Christopher Kuhn, Gabor Karsai, Abhishek Dubey, "ANTI-CARLA: An Adversarial Testing Framework for Autonomous Vehicles in CARLA", *IEEE 25th International Conference on Intelligent Transportation Systems (ITSC 2022)*. [code]

Shreyas Ramakrishna, **Baiting Luo**, Yogesh Barve, Gabor Karsai, Abhishek Dubey, "Risk-Aware Scene Sampling for Dynamic Assurance of Autonomous Systems", *IEEE International Conference on Assured Autonomy (ICAA 2022)* [code]

Baiting Luo, Xiangguo Liu, Qi Zhu, "Credibility Enhanced Temporal Graph Convolutional Network Based Sybil Attack Detection On Edge Computing Servers", accepted by *32nd IEEE Intelligent Vehicles Symposium (IV 2021)*.

Xiangguo Liu, **Baiting Luo**, Ahmed Abdo, Nael Abu-Ghazaleh, Qi Zhu, "Securing Connected Vehicle Applications with An Efficient Dual Cyber-Physical Blockchain Framework", accepted by *32nd IEEE Intelligent Vehicles Symposium (IV 2021)*.

Awards and Honors

- Vanderbilt C.F. Chen Best Paper Runner-Up Award, 2024
- AAMAS Student Scholarship, 2024
- Vanderbilt University Graduate School Travel Grant, 2024
- Vanderbilt University Graduate School Travel Grant, 2023
- Northwestern Best MS Computer Engineering Thesis Award, 2021
- Dean's Graduate Fellowship, 2021
- Russell G. Hamilton Scholar, 2021

External Services

Conference (Sub-) Reviewer

- IEEE International Transportation Systems Conference (ITSC)
- International Conference on Neural Information Processing (ICONIP)

Journal Reviewer

- IEEE Transactions on Intelligent Vehicles
- ACM Transactions on Computing for Healthcare
- IEEE Internet of Things Journal

Program Committee Member

- Artifact Evaluation Committee, ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS)
- International Conference on Data Mining and Big Data (DMBD)

Core Coursework

Machine Learning, Advanced Machine Learning, Deep Learning, Advanced Deep Learning: Representation Learning, AI Programming, Reinforcement Learning, Design & Analysis of Algorithms, Data Structures, Computer Vision, Massively Parallel Programming w/ CUDA, Database Systems

Skills

Programming Languages: Python, C++, C, Java, SQL, LaTeX

Frameworks & Libraries: Scikit-Learn, PyTorch, TensorFlow, NumPy, Pandas, Mujoco