Boyang Xu

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Education

Arizona State University, Arizona | *Ph.D. in Data Science* — Expected Jul 2027

Northeastern University, Massachusetts | *M.S. in Electrical and Computer Engineering* — Jun 2022

University of Jinan, China | *B.S. in Optoelectronic Information Science* — Jun 2020

Research Experience

- **Path-Coupled Bellman Flows (ICML in progress)** — Tempe, AZ
  Project Leader, Arizona State University — *2025 – 2026*
  - **Project Leading**: Led a research team to develop a continuous-time *distributional reinforcement learning (DRL)* framework, integrating the state of the art *generative model, e.g., flow matching* with Bellman equations to improve the learning accuracy of value function distribution while reducing the variance.
  - **Algorithm Innovation**: Formulated a shared-noise coupling mechanism and a novel λ-parameterized control variate, mathematically enforcing Bellman consistency while significantly reducing training variance.
  - **Implementation & Performance Benchmarking**: Engineered a high-performance JAX training pipeline with custom explicit Euler ODE solvers, achieving state-of-the-art distributional accuracy and stability on complex OGBench and D4RL continuous control tasks.
- **Multi-Modal Generative Modeling (Best paper in IEEE CASE 2025)** — Tempe, AZ
  Core Contributor, Arizona State University — *2024 – 2025*
  - **Cross-Modal Architecture**: Co-developed an uncertainty-aware framework jointly modeling discrete fault events and continuous time-series via a Transformer Hawkes Process and iTransformer with cross-modal co-attention mechanism.
  - **Dual-Decoder Simulation**: Architected a generative pipeline utilizing a Conditional Latent Diffusion Model for sensor forecasting and Score Matching for high-fidelity event prediction.
  - **Real-World Deployment**: Deployed and evaluated the framework on large-scale industrial datasets, delivering robust uncertainty quantification for long-horizon iterative system simulations.
- **Cost-Aware Bayesian Optimization for Post-Disaster Prediction and Planning** — Tempe, AZ
  Project Leader, Arizona State University — *2024 – 2025*
  - **Adaptive Sampling Framework**: Designed a cost-aware Bayesian Optimization framework with level-set estimation to optimize dynamic routing and active sampling for autonomous agents (e.g., UAVs) under resource constraints.
  - **Deep Surrogate Modeling**: Developed an Ordinal Deep Kernel Gaussian Process (ODGP) that captures complex spatial-feature dependencies through deep neural embeddings while managing ordinal severity scales.
  - **Acquisition Optimization**: Formulated a custom acquisition function dynamically balancing uncertainty exploration, boundary exploitation, and travel costs, yielding time-efficient estimations in simulated disaster scenarios.

Selected Publications

- **Boyang Xu**, Qing Zou, Hao Yan. "Path-Coupled Bellman Flows for Distributional Reinforcement Learning." *ICML 2026*, in progress. 01/2026
- Jiayu Huang, **Boyang Xu**, Yongming Liu, Hao Yan. "Multi-modal Generative Modeling of Event Sequence and Time Series for Solar PV Systems." *IEEE CASE 2025.* 08/2025
- **Boyang Xu**, Yunyi Kang, Xinyu Zhao, Hao Yan, Feng Ju. "Partially Observable Markov Decision Process Framework for Operating Condition Optimization Using Real-Time Degradation Signals." *Journal of Quality Technology.* 08/2025
- **Boyang Xu**, Mostafa Reisi Gahrooei, Mohammad Ilbeigi, Hao Yan. "Adaptive Sampling for Automated Post-Disaster Rapid Damage Assessment via Level-Set Cost-Aware Bayesian Optimization." *Expert Systems with Applications*, in progress. 08/2025

Honors and Awards

- Best Conference Paper Award, IEEE CASE 2025, for "Multi-modal Generative Modeling of Event Sequences and Time Series for Solar PV Systems." 08/2025
- Finalist, DAIS Division Best Student Paper Competition, IISE 2023 Annual Conference. 06/2023

Skills

- **Programming**: Python, PyTorch, JAX
- **Research Areas**: Reinforcement Learning (RL), Multi-agent RL, Distributional RL, Generative Models (Diffusion/Flow Matching), Markov Decision Process (MDP), Uncertainty Quantification, Control and Planning