Site Bai

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Education

- **Purdue University** Jan. 2021 – Dec. 2025 (Exp.)
  Ph.D. in Computer Science (Machine Learning / Optimization) *Grade: 3.9/4.0*
  M.S. (along the way) in Statistics & Computer Science May. 2024 (Exp.)
- **Xi'an Jiaotong University (XJTU)** Sep. 2016 – Jun. 2020
  B.E. in Computer Science (Qian Xuesen Honors College) *Grade: 85.7/100*
  Exchange Experiences: University of California, Berkeley and National University of Singapore
  Selected Awards: "Siyuan" Scholarship; National 2nd Prize in Mathematical Contest in Modeling of China (top 3%)

Publication

[1] **S. Bai**, B. Bullins. Federated Composite Saddle Point Optimization, *ICLR 2024*. [PDF]
[2] **S. Bai**, C. Ke, J. Honorio. Dual Convexified Convolutional Neural Networks, *TMLR 2024*. [PDF]
[3] H. Zhang, **S. Bai**, X. Lan, D. Hsu, N. Zheng. Hindsight Trust Region Policy Optimization, *IJCAI 2021*. [PDF]
[4] H. Zhang, X. Lan, **S. Bai**, X. Zhou, Z. Tian, N. Zheng. ROI-based Robotic Grasp Detection for Object Overlapping Scenes, *IROS 2019*. [PDF]
[5] H. Zhang, X. Lan, **S. Bai**, L. Wan, C. Yang, N. Zheng. A Multi-task Convolutional Neural Network for Autonomous Robotic Grasping in Object Stacking Scenes, *IROS 2019*. [PDF]

Projects

▷ Department of Computer Science, Purdue Advisor: Prof. Brian Bullins

- **Optimization & Federated Learning | Federated Composite Saddle Point Optimization**
  - Proposed the first distributed optimization algorithm for min-max problems with non-smooth structure-inducing regularization
  - Derived convergence rate, **wrote the optimizer with PyTorch**, and conducted distributed learning experiments with FedLab
  - Applied the optimizer to the **universal adversarial training** on l_1**-regularized logistic regression** with real-world data
  - Achieved **faster convergence and better structure** (e.g. solution with more sparsity) than (projected) gradient-descent-ascent

- **Optimization & Deep Learning Theory | Dual Convexified CNNs** Advisor: Prof. Jean Honorio
  - Proposed an optimization procedure for convexified convolutional neural networks (CCNN, a type of CNNs with lower Rademacher-complexity generalization error) based on **conjugate duality, trace norm subdifferential, SVD and KKT condition**
  - Achieved higher test accuracy than the primal CCNN by avoiding ambiguous kernel-matrix factorization with the kernel trick
  - Implemented the dual learning of CCNN from scratch using MATLAB (e.g. convolution and pooling as matrix multiplication)

▷ Institute of Artificial Intelligence and Robotics, XJTU Advisor: Dr. Hanbo Zhang, Prof. Xuguang Lan

- **Deep Reinforcement Learning | Hindsight Trust Region Policy Optimization**
  - Proposed a deep reinforcement learning algorithm that improves **sample efficiency** in environments with **sparse reward**;
  - Applied goal-conditioned policy with **(weighted) importance sampling** to learn with both succeeded samples and failed ones.
  - Proposed a Quadratic KL constraint with **math-provable variance reduction** to stabilize training;
  - Implemented experiments with PyTorch on games with image input and robot motion planning simulation in OpenAI Gym.

- **Robot Vision | Robotic Grasping for Object Stacking Scenes**
  - Proposed a multi-task ConvNet grasping system, including grasp detection that extracts features from Region of Interest (ROI), and visual manipulation relationship reasoning for object stacking scenes;
  - Deployed on a real Baxter robot to spatial-orderly grasp a target from a pile with high success rates.

Professional Techniques

Programing Laguages: Python, MATLAB (Proficient); Shell script, C/C++, R, Java, SQL, HTML (Used in courses/projects);
Packages / Tools: PyTorch, NumPy, Matplotlib, Linux Command, Git (Proficient); scikit-learn, Pandas, Slurm, TensorFlow, OpenAI Gym, ROS, Gazebo (Used in courses/projects).

Selected Courses

Machine Learning (ML): Statistical ML, ML Theory, Computer Vision, Data Mining, Artificial Intelligence, etc.;
Math & Statistics: Convex Optimization, Probability, Mathematical Statistics, Computational Statistics, Multivariate Analysis;
Computer Science: Database, Machine Structure, Operating Systems, Networks, etc.

Teaching & Academic Service

Purdue CS571 Artificial Intelligence	TA (Fall 23)
Purdue CS182 Foundations of Computer Science (Discrete Mathematics)	TA (Spring 23)
Purdue CS251 Data Structures and Algorithms	TA (Fall 21, Spring 22, Fall 22)

• AISTATS 2023	Program Committee
• NeurIPS 2023	Reviewer
• ICLR 2024	Reviewer
• ICML 2024	Reviewer