Yatong Bai

Optimization and Deep Learning

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EDUCATION

Ph. D. and M. S, University of California, Berkeley *Aug 2020 – Aug 2025 (Expected)*

- M. S. obtained in May 2022. GPA: 4.00 / 4.00
- Study Areas: Deep learning (especially robustness), Optimization, Control.
- Advisor: Somayeh Sojoudi.
- Activities: Graduate Student Instructor (GSI) for Spring and Fall 2022 "IEOR 160: Nonlinear and Discrete Optimization". Presenter at ACC 2022, INFORMS 2021 and MOPTA 2021 conferences. See publications for details.
- Courses: Convex optimization and algorithms, Deep neural networks, Statistical learning theory, Deep reinforcement learning, Advanced control systems, Theoretical statistics.

B. S., Georgia Institute of Technology *Aug 2016 – Aug 2020*

- Double major in computer engineering and mechanical engineering. GPA: 4.00 / 4.00
- Courses: Machine learning, Computer vision, Signals and systems, Embedded systems, Computer architecture.

PUBLICATIONS

Efficient Global Optimization of Two-layer ReLU Networks: Adversarial Training and Quadratic-time Algorithms

Yatong Bai, Tanmay Gautam, and Somayeh Sojoudi. In *SIAM Journal on Mathematics of Data Science*, 2022. arxiv.org/abs/2201.01965

- 2021 INFORMS Data Mining Best Paper Competition (Student Track) Runner-up (2nd out of 48 papers).
- Develop efficient algorithms for the convex training formulation and prove their polynomially improved complexities.

Practical Convex Formulation of Robust One-hidden-layer Neural Network Training

Yatong Bai, Tanmay Gautam, Yu Gai, and Somayeh Sojoudi. In *American Control Conference*, 2022. arxiv.org/abs/2105.12237

- Develop efficient convex programs that train robust one-hidden-layer ReLU neural networks via adversarial training.
- Build simulations in MATLAB and Python (PyTorch & CvxPy) and demonstrate the improvements on datasets including CIFAR-10.

Avoiding the Accuracy-Robustness Trade-off of Classifiers via Local Adaptive Smoothing

Yatong Bai, Brendon G. Anderson, and Somayeh Sojoudi. Preprint.

- The theoretically disciplined "adaptive smoothing" method leverages adversary detectors to help classifiers treat benign and attacked inputs differently, thereby improving the accuracy-robustness trade-off.

EXPERIENCE (For Berkeley experiences please see publications)

Scale AI, Machine Learning Research Intern *San Francisco, CA, May 2022 – Aug 2022*

- Research on proposing a dataset with 15 million image-caption pairs and processing its captions with various language models.
- Apply supervised and self-supervised image classification, object detection, image reconstruction, and generation methods (in PyTorch) to provide benchmarks on the dataset. Apply dimension reduction methods (UMAP) to visualize the embedding clustering.
- Use the above results to characterize the distribution shift of our data from existing datasets. Preprint paper to be available soon.

Georgia Institute of Technology Undergraduate Student Researcher

TINKER Group, RoboMed Group, Meaud Research Group, GT Off-road *Jan 2018 – Jan 2020*

- Use the Gem5 computer architecture simulator (C++) to build trace files based on the ARM binary files compiled from the SPEC2017 benchmark.
- Build Graphical User Interfaces (GUIs) for a cochlear dynamics simulator. The GUIs control simulations, process data, and display results.

Senior design project: Avionics and test stand controller for a "Monocopter" aircraft

- Implement the avionics of a novel unmanned "Monocopter" and a PID-controlled testbed using C++; develop a Windows C# GUI for them.
- The avionics filters noisy magnetometer readings to accurately recover aircraft heading and controls the actuators accordingly.

Honda Aircraft Company, Intern *Greensboro, NC, May 2019 – Aug 2019*

- Conduct dynamic simulations of flap linkages in MSC ADAMS and evaluate the stress, deflection, and kinematics via Finite Element (FEA).
- Define the flap skew & asymmetry warning thresholds and design the flap control logic in MATLAB.

Tesla, Inc., Intern *Palo Alto, CA, May 2018 – Aug 2018*

- Implement scripts that convert simulation models between different tolerance stack-up (GD&T) simulators.

AWARDS

INFORMS Data Mining Best Paper Competition (Student Track) Runner-up *Oct 2021*
UC Berkeley Graduate Division Block Grant Fellowship *April 2021*
Georgia Tech School of ECE Roger P. Webb ECE Senior Scholar Awards *April 2021*

SKILLS: Python (PyTorch, CvxPy), MATLAB, LaTeX, C, C++, R, Java, cloud computing (Google Colab, MS Azure, AWS EC2).