

Buyun Liang

MSc Student in CS @ UMN

✉ liang664@umn.edu

🏠 buyunliang.org

🎓 [Google Scholar](#)

🐙 [GitHub](#)

EDUCATION

University of Minnesota, Twin Cities

M.Sc in Computer Science

Minneapolis, MN, USA

Jun 2020 - Jun 2023 (expected)

- GPA: 4.0/4.0

- Research Focus: Constrained Optimization & Robustness in Deep Learning (Advisor: Prof. Ju Sun)

University of Minnesota, Twin Cities

M.Sc in Materials Science (Ph.D. Track)

Minneapolis, MN, USA

Sep 2018 - Aug 2020

- GPA: 3.66/4.0 | GPA of Machine Learning related courses : 4.0/4.0

- Research Focus: Monte Carlo & Molecular Dynamics Simulation (Advisor: Prof. J. Ilja Siepmann)

Nanjing University

B.Sc in Physics (Elite Program)

Nanjing, Jiangsu, China

Sep 2014 - Jul 2018

- GPA: 89.6/100 | Rank: 11/159

PUBLICATIONS

- [1] **Buyun Liang**, Hengyue Liang, Tim Mitchell, Ying Cui, Ju Sun. *Constrained Optimization in Machine and Deep Learning with NCVX and Its Practical Tricks*. In preparation for IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI). [[slides](#)][[website](#)]
- [2] Hengyue Liang, **Buyun Liang**, Ying Cui, Tim Mitchell, Ju Sun. *Optimizers Matter in Adversarial Robustness*. In preparation for IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI). [[slides](#)]
- [3] **Buyun Liang**, Ryan de Vera, Hengyue Liang, Tim Mitchell, Ying Cui, Qizhi He, Ju Sun. *On optimization and Optimizers in Neural Structural Optimization*. In preparation for International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2023).
- [4] Bhargav Joshi[†], **Buyun Liang**[†], Taihui Li[†], Roger Rusack[†], Ju Sun[†]. *Using Neural Networks to Predict Radiation Damage to Lead Tungstate Crystals at the CERN LHC*. In preparation for Nature Machine Intelligence. ([†] Equal contributors) [[paper](#)]
- [5] **Buyun Liang**, Tim Mitchell, Ju Sun. *NCVX: A General-Purpose Optimization Solver for Constrained Machine and Deep Learning*. Submitted to NeurIPS Workshop on Optimization for Machine Learning (OPT 2022). [[paper](#)]
- [6] Hengyue Liang, **Buyun Liang**, Ying Cui, Tim Mitchell, Ju Sun. *Optimization for Robustness Evaluation beyond ℓ_p Metrics*. Submitted to International Conference on Acoustics, Speech, and Signal Processing (ICASSP 2023) & NeurIPS Workshop on Optimization for Machine Learning (OPT 2022). [[paper](#)]
- [7] **Buyun Liang**, Tim Mitchell, Ju Sun. *NCVX: A User-Friendly and Scalable Package for Nonconvex Optimization in Machine Learning*. Submitted to Journal of Machine Learning Research. [[paper](#)]
- [8] J. Ilja Siepmann, Jingyi L. Chen, **Buyun Liang**, Krishnan Mahesh. *Effect of Non-Condensable Gas on the Thermophysical Properties of Bubbly Water and on Bubble Collapse Dynamics Probed by Molecular Simulations*. 33rd Symposium on Naval Hydrodynamics, Osaka, Japan, 18-23 October 2020. [[paper](#)]

RESEARCH EXPERIENCE

NCVX: A General-Purpose Solver for Constrained Deep Learning

Apr 2021 - Present

Graduate Research Assistant. Advisors: Prof. Ju Sun, Prof. Tim Mitchell, Prof. Ying Cui

- Created a software package for constrained optimization problem in machine & deep learning. See papers [5] & [7] for the software announcement and constrained deep learning examples.
- Provided practical tricks to speed up convergence of PyGRANSO and benchmarked the performance of PyGRANSO on constrained deep learning problems. See paper [1] for experimental details.
- Created and maintained a website <https://ncvx.org> for detailed documentation and tutorials.

On Optimization and Optimizers in Adversarial Robustness

Dec 2021 - Dec 2022

Graduate Research Assistant. Advisors: Prof. Ju Sun, Prof. Tim Mitchell, Prof. Ying Cui

- Proposed an algorithmic framework blends PyGRANSO with a constraint-folding technique and benchmarked its performance on robustness evaluations. See paper [2] & [6] for details.
- Experimented PyGRANSO on robustness evaluation problems beyond the standard ℓ_p norms, and explored the implications of solution patterns. See paper [2] for detailed discussion.

Neural Structural Optimization with General Physical Constraints

Aug 2022 - Dec 2022

Graduate Research Assistant. Advisors: Prof. Ju Sun, Prof. Qizhi He, Prof. Tim Mitchell, Prof. Ying Cui

- Customized PyGRANSO to solve general constrained optimization in neural structural optimization, which usually involves nonlinear physical constraints. See paper [3] for detailed experiments.

Machine Learning for High Energy Physics

May 2022 - Oct 2022

Graduate Research Assistant. Advisors: Prof. Ju Sun, Prof. Roger Rusack

- Applied sequence-to-sequence model with teacher forcing strategy to predict laser response in ECAL crystals. See paper [4] for detailed architectures and experimental results.

Monte Carlo & Molecular Dynamics Simulation for Multi-Phase Flow

Nov 2018 - Aug 2020

Graduate Research Assistant. Advisor: Prof. J. Ilja Siepmann

- Simulated multi-phase systems via Gibbs Ensemble Monte Carlo methods, and performed molecular dynamics simulations to calculate physical properties. See paper [8] for details.

PROFESSIONAL SERVICE

Conference Reviewer for Artificial Intelligence and Statistics (AISTATS)

Nov 2022

Conference Reviewer for Computer Science and Application Engineering (CSAE)

Aug 2022

TEACHING EXPERIENCE

Elementary Computational Linear Algebra (University of Minnesota, TA)

Spring 2022

Intro to the Science of Engineering Materials (University of Minnesota, TA)

Spring 2019

HONORS AND AWARDS

- UMII Seed Grant Awards, University of Minnesota 2021
- Erling A. Dalaker Fellowship, University of Minnesota 2019
- Outstanding Graduate, Nanjing University 2018
- Aegon-Industrial Fund Management Company Scholarship, Top 2%, Nanjing University 2017
- National Scholarship, Top 2%, Ministry of Education of China 2016
- Elite Program Scholarship $\times 3$, Top 4%, Nanjing University 2015, 2016, 2017