Buyun Liang

MSc Student in CS @ UMN

liang664@umn.edu buyunliang.org Buyun-Liang

EDUCATION

University of Minnesota, Twin Cities **Minneapolis, MN, USA**
M.Sc in Computer Science *Jun 2020 - Jun 2023 (expected)*

- GPA: 4.0/4.0
- Research direction: Constrained Optimization in Deep Learning; Robustness in Recognition

University of Minnesota, Twin Cities **Minneapolis, MN, USA**
M.Sc in Materials Science (Ph.D. Track) *Sep 2018 - Aug 2020*

- GPA: 3.66/4.0 | GPA of Machine Learning related courses : 4.0/4.0
- Research direction: Monte-Carlo and Molecular Dynamics Simulation in Computational Chemistry

Nanjing University **Nanjing, Jiangsu, China**
B.Sc in in Physics (Elite Program) *Sep 2014 - Jul 2018*

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

PUBLICATIONS

[1] **Buyun Liang**, Tim Mitchell, Ying Cui, Ju Sun. *NCVX: A General-Purpose Optimization Solver for Machine Learning, and Practical Tricks.* In preparation for IEEE Transactions on Pattern Analysis and Machine Intelligence, 2022. [**slides**][**website**]

[2] Hengyue Liang, **Buyun Liang**, Ying Cui, Tim Mitchell, Ju Sun. *On Optimization and Optimizers in Adversarial Robustness.* In preparation for IEEE Transactions on Pattern Analysis and Machine Intelligence, 2022. [**slides**]

[3] **Buyun Liang**, Tim Mitchell, Ju Sun. *NCVX: A User-Friendly and Scalable Package for Nonconvex Optimization in Machine Learning.* In submission to Journal of Machine Learning Research, 2022. [**paper**][**website**][**code**]

[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, 2022. [**slides**] [**website**][**code**] († Equal contributors)

[5] J. Ilja Siepmann, Jingyi L. Chen, **Buyun Liang**, Krishnan Mahesh (2020). *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 Optimization Solver for Machine Learning, and Practical Tricks.
Research Assistant. Advisors: Prof. Ju Sun, Prof. Tim Mitchell, Prof. Ying Cui *Dec 2021 - Present*

- Created multiple constrained machine/deep learning examples for PyGRANSO package.
- Achieved comparable solution quality as specialized SOTA solvers in multiple constrained, nonsmooth machine/deep learning problems. See [1] for more details.
- Provided practical tricks to speed up convergence of constrained optimization problems.

On Optimization and Optimizers in Adversarial Robustness
Research Assistant. Advisors: Prof. Ju Sun, Prof. Tim Mitchell, Prof. Ying Cui *Jan 2022 - Present*

- Provided a general tool to apply perturbation beyond the standard ℓ_p norms.
- Proposed an algorithmic framework blends PyGRANSO with a constraint-folding technique.
- Explored the implications of solution patterns on robustness evaluation. See [2] for more details.

Using Neural Networks to Predict Radiation Damage to Crystals at the CERN LHC.
Advisors: Prof. Ju Sun, Prof. Roger Rusack *May 2022 - Present*

- Applied LSTM and Seq2Seq model with teacher forcing strategy to make prediction for laser response in ECAL crystal. See [4] for more details.

NCVX: A User-Friendly and Scalable Package for Nonconvex Optimization in Machine Learning
Research Assistant. Advisors: Prof. Ju Sun, Prof. Tim Mitchell *May 2021 - Jan 2022*

- Proposed a software package for nonsmooth, nonconvex, constrained optimization problem.
- Improved GRANSO package by enabling auto-differentiation, GPU support and tensor inputs.
- Provided detailed documentation and examples for NCVX PyGRANSO. See [3] for more details.

Effect of Non-Condensable Gas on the Thermophysical Properties of Bubbly Water Probed by Molecular Simulations
Research Assistant. Advisor: Prof. J. Ilja Siepmann *Nov 2018 - Aug 2020*

- Applied Gibbs Ensemble Monte Carlo methods to simulate nitrogen-water mixture, and determined the nitrogen solubility in the stretched water phase. See [5] for more details.
- Performed molecular dynamics simulations to generate trajectories of particles in water-nitrogen mixture systems and calculated physical properties (e.g., pressure and viscosity) of systems.

PROFESSIONAL SERVICE

- Reviewer for The 6th International Conference on Computer Science and Application Engineering (CSAE 2022)

TEACHING EXPERIENCE

Elementary Computational Linear Algebra (CSCI 2033-001 & CSCI 2033-010)
Graduate Teaching Assistant. Instructors: Prof. Ju Sun, Prof. Carl Sturtivant *Jan 2022 - May 2022*

Introduction to the Science of Engineering Materials (MATS 2001 & 2002)
Graduate Teaching Assistant. Instructors: Prof. Jeff Schott, Dr.Renee Christensen *Jan 2019 - May 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)

ACADEMIC APPOINTMENTS

University of Minnesota, Twin Cities **Minneapolis, MN, USA**
Graduate Research Assistantship from CS&E *Jun 2021 - Jan 2022 & May 2022 - Present*
Graduate Teaching Assistantship from CS&E *Jan 2022 - May 2022*
Graduate Research Assistantship from CEMS *Sep 2018 - Aug 2020*