Buyun Liang

MSc Student in CS @ UMN

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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   *Sep 2018 - Aug 2020*

○ GPA: 3.66/4.0 | GPA of AI related courses : 4.0/4.0
○ Research direction: Monte-Carlo and Molecular Dynamics Simulation in Bubbly Water System

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 submission to IEEE Transactions on Pattern Analysis and Machine Intelligence, 2022.

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

[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.

[4] Bhargav Joshi, **Buyun Liang**, Taihui Li, Roger Rusack, Ju Sun. *Using LSTM to predict the Laser Response in ECAL Crystal.*

[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.

RESEARCH EXPERIENCE

NCVX: A General-Purpose Optimization Solver for Machine Learning, and Practical Tricks.
Research Assistant. Advisors: Prof. Ju Sun, Dr. Tim Mitchell, Prof. Ying Cui   *Dec 2021 - Present*

○ Solved multiple constrained, nonsmooth machine/deep learning problems by PyGRANSO.
○ Achieved comparable solution quality as specialized SOTA solvers. See [1] for more details.
○ Provided practical tricks to speed up convergence.

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

○ Applied various adversarial perturbations towards neural network models.
○ 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.

NCVX: A User-Friendly and Scalable Package for Nonconvex Optimization in Machine Learning
Research Assistant. Advisors: Prof. Ju Sun, Dr. 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.

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*

- Prepared and led three recitation/discussion sessions every week.
- Designed in-class quizzes, computational assignments, and exams.
- Helped students in office hours and Piazza.

SELECTED ACADEMIC PROJECTS

Using LSTM to predict the Laser Response in ECAL Crystal
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.

Robustness of Deep Learning in MRI Reconstruction
Advisor: Prof. Ju Sun   *Sep 2020 - Jan 2021*

- Baseline: Trained a U-Net model for MRI reconstructions from subsampled FastMRI dataset.
- Implemented an adversarial training strategy to improve network robustness against noisy data.

HONORS AND AWARDS

- UMII Seed Grant Awards, University of Minnesota (2021)
- Earling 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 X3, Top 4%, Nanjing University (2015, 2016, 2017)