

# Buyun Liang

MSc Student in CS @ UMN

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📷 Buyun-Liang

## 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 direction: Constrained Optimization in Deep Learning; Robustness in Recognition

### University of Minnesota, Twin Cities

M.Sc in Materials Science

Minneapolis, MN, USA

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

B.Sc in Physics (Elite Program)

Nanjing, Jiangsu, China

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*. In submission to Nature Machine Intelligence, 2022.
- [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

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**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

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**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

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- 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)

## ACADEMIC APPOINTMENTS

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**University of Minnesota, Twin Cities**

Graduate Research Assistantship from [CS&E](#)

Graduate Teaching Assistantship from [CS&E](#)

Graduate Research Assistantship from [CEMS](#)

**Minneapolis, MN, USA**

Jun 2021 - Jan 2022 & May 2022 - Present

Jan 2022 - May 2022

Sep 2018 - Aug 2020