

Suyun Liu

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RESEARCH INTERESTS

Continuous Optimization, (Fair) Machine Learning, Multi-Criteria Optimization, Stochastic Optimization

EDUCATION BACKGROUND

Lehigh University, Bethlehem, PA

Ph.D. Candidate in Industrial and Systems Engineering Aug. 2017 – Present
Advisor: Professor Luis Nunes Vicente

Hong Kong University of Science and Technology, HongKong, China

M.Phil. in Industrial Engineering and Logistics Management Sep. 2015 – Jul. 2017
Advisor: Professor Ajay Joneja
Thesis: A New Adaptive Slicing Algorithm Based on Contour Reconstruction in 3D Printing

Beijing Jiaotong University, Beijing, China

B.Eng. in Industrial Engineering Sep. 2011 – Jul. 2015
Thesis Advisor: Professor Wensheng Xu
Thesis: Resources Monitoring Tool for the Software Platform on Ulteo Remote Virtual Desktop

ACADEMIC EXPERIENCE

Research Assistant

Lehigh University, Bethlehem, PA Aug. 2017 – Present

- Stochastic Optimization Algorithms for Smooth Multi-Objective Optimization
- Fairness and Accuracy Trade-offs in Supervised Machine Learning
- Fair k -means Clustering Algorithms
- Stochastic Smooth Bi-level Optimization for Hyperparameters Tuning
- Mixed Integer Nonlinear Optimization and Deep Learning

Hong Kong University of Science and Technology, Hong Kong, China Aug. 2015 – Jul. 2017

- Adaptive Contour Reconstruction Algorithms in Layered Manufacturing System
- Parameter Tuning of 3D Printing Process via Computational Geometry

PAPERS

- [1] **S. Liu** and L. N. Vicente. (2022). *Convergence rates of the stochastic alternating algorithm for bi-objective optimization*. (submitted)
- [2] **S. Liu** and L. N. Vicente. (2022). *A stochastic alternating balance k -means algorithm for fair clustering*. to appear in Computational Management Science.
- [3] **S. Liu** and L. N. Vicente. (2022). *Accuracy and Fairness Trade-offs in Machine Learning: A Stochastic Multi-Objective Approach*. to appear in Computational Management Science.
- [4] **S. Liu** and L. N. Vicente. (2021). *The stochastic multi-gradient algorithm for multi-objective optimization and its application to supervised machine learning*. Annals of Operations Research, 1-30.

CONFERENCES, WORKSHOPS & TALKS

- [1] INFORMS Annual Meeting 2021: Virtual. *A Stochastic Alternating Balance k-Means Algorithm for Fair Clustering.* (presentation)
- [2] MOPTA 2021: Lehigh University, Bethlehem, PA. *A Stochastic Alternating Balance k-Means Algorithm for Fair Clustering.* (presentation and session chair of Fairness in ML and optimization)
- [3] INFORMS Annual Meeting 2020: Virtual. *Accuracy and Fairness Trade-offs in Machine Learning: A Stochastic Multi-Objective Approach.* (presentation)
- [4] INFORMS Annual Meeting 2019: Seattle, WA. *The Stochastic Multi-Gradient Algorithm for Multi-Objective Optimization and its Application to Supervised Machine Learning.* (presentation)
- [5] MOPTA 2019: Lehigh University, Bethlehem, PA. *The Stochastic Multi-Gradient Algorithm for Multi-Objective Optimization and its Application to Supervised Machine Learning.* (presentation)
- [6] 12th Annual Machine Learning Symposium: New York, NY. (attendance)
- [7] DIMACS/MOPTA 2018: Lehigh University, Bethlehem, PA. (summer school and conference attendance)
- [8] MOPTA 2017: Lehigh University, Bethlehem, PA. (attendance)

INDUSTRIAL INTERNSHIPS

Amazon, San Francisco, California

Applied Scientist Intern at Alexa Local Information Team Sep. 2021 – Dec. 2021

- Conducted optimization in geographically supplemental language models for enhancing local POIs recognition performance in the hybrid and end-to-end Automatic Speech Recognition (ASR) systems
- Designed a generic data pre-processing and optimization pipeline and developed a learn to rank heuristic algorithm for fine-tuning weights in local language models built with customized local POIs

Autodesk, San Francisco, California

Machine Learning Engineering Intern at AutoCAD Machine Learning Team Jul. 2021 – Aug. 2021

- Conducted command sequences n-gram analysis to facilitate curated macro promotion, trained word2vec and GloVe language models to identify similar command sequences (NLP)
- Designed convolutional neural network autoencoder for geometry embedding and geometry block recommendations. Achieved more than 90% accuracy in the top two nearest geometries

SAS Institute Inc., Cary, North Carolina

Graduate Intern in Analytics R&D / Scientific Computing Group May. 2020 – Aug. 2020

- Improved Hidden Markov Models using Black-Box optimization solver instead of the multi-start mode (CASL)
- Proposed three promising tuning configurations and conducted numerical experiments for RS-AR models
- Saved 50-90% time in finding the best model and parameters while achieving the same or less AIC errors

Sinotrans Air Transportation Development Co., Ltd, Beijing China

Data Analyst Jul. 2014 – Sep. 2014

- Optimize the workflow of the Export department at North branch
- Collected and visualized operation data from the CA/BGS cargo consignment centers (MySQL, High charts)
- Conducted data analysis and lean improvement to identify bottlenecks and reduce idle time

COURSE PROJECTS

- [1] **Data Mining for Machine Learning Applications** 2019 Fall
Course: Mining of Large Datasets (ISE467)
Large-scale data processing and distributed computing, Clustering, Classification and Recommendation (Apache Spark, Python)
- [2] **Parallel Dijkstra's Shortest Path Algorithm** 2018 Fall
Course: Computational Methods in Optimization (ISE407)
Parallel Dijkstra's Algorithm Implementation for the Single Source Shortest Path Problem (C++, MPI)
- [3] **Preprocessing in Symphony** 2018 Spring
Course: Discrete Optimization (ISE418)
Evaluate and improve preprocessing module for Branch & Bound in Symphony (C++)
- [4] **Geometry Rendering, Lighting, and Shading** 2016 Fall
Course: Advanced Computer Graphics (COMP5411)
Manipulate geometry, design animation, and render 3D model (C++, HTML5)
- [5] **Resource Monitoring Platform for Remote Desktops** 2014 – 2015
Undergraduate Final Year Project
Design, develop and optimize a resource monitoring tool for the software resource platform based on Ulteo remote virtual desktop (PHP, Linux, Vmware workstation, Rank 1 in IE department)
- [6] **Daily Expenses Notebook** 2012 Fall
Course: Information Management System
Build a web system for recording and visualizing daily expenses (Java, MySQL, Apache Tomcat, High charts)
- [7] **Laboratory Facilities Web-based Management System** 2012 – 2013
University Innovative Training Program
Design and develop a Web-based monitoring and reservation system for university laboratory facilities management and maintenance (C#, FineUI, Awarded as a National-level Project)

TEACHING EXPERIENCE

Teaching Assistant

Lehigh University, Bethlehem, PA

- Introduction to Deterministic Optimization Models in Operations Research (ISE 240) Spring 2022
- Introduction to Deterministic Optimization Models in Operations Research (ISE 240) Fall 2018
- Introduction to Deterministic Optimization Models in Operations Research (ISE 240) Spring 2018
- Game Theory (ISE 358) Fall 2017
- Planning and Scheduling in Manufacturing and Services (ISE 419) Fall 2017

Hong Kong University of Science and Technology, Hong Kong, China

- Transportation System (IELM3901) Spring 2017
- Product Design and Lifecycle Management (IELM4170) Spring 2016
- Transportation System (IELM3901) Spring 2016

AWARDS & FELLOWSHIP

- **Ph.D. of the Year** 2019
- **Postgraduate Fellowship** 2015 – 2017
- **Outstanding Graduates** Jul. 2015
- **Siemens Scholarship** 2013 – 2014
- **National Motivational Scholarship** 2012, 2013
- **First Prize Academic Excellence Scholarship** 2012, 2013, 2014

RELATED COURSEWORK

- **Continuous Optimization:** Convex Analysis, Linear Programming, Nonlinear Optimization, Machine Learning, Neural Network and Deep Learning
- **Discrete Optimization:** Integer Programming, Models in Operations Research, Computational Geometry
- **Algorithm & Coding:** Mining of Large Datasets, Artificial Intelligence Data Fairness and Bias, Computational Methods in Optimization, Advanced Algorithm, Advanced Computer Graphics
- **Others:** Real Analysis, Stochastic Process, Statistics and Quality Management

SKILL SET

- Programming Languages: C/C++, Python, MATLAB, CASL, C#, MySQL, R, PHP, Java
- Software and Packages: TensorFlow, PyTorch, \LaTeX , MPI, AMPL, Gurobi, Couenne, XPRESS, CPLEX, Mathematica, SPSS, FlexSim, Auto CAD, CATIA

ACTIVITIES

- Vice President, INFORMS Lehigh University Student Chapter (INFORMS 2020 Honorable Mention) 2019 – 2020
- Member, INFORMS 2018 – present
- Web master, [Lehigh ISE OptML website](#) 2019 – present
- Member, Lehigh ISE OptML Group 2018 – present
- Student member, INFORMS Lehigh University Student Chapter 2017 – present
- Assistant of UNSCO chairs Prof. Jianzhong Cha 2013 – 2015