MENGLONG LI

(+1) 217 305 0737 ⋄ ml21@mit.edu
Homepage: https://MenglongLi.com

EDUCATION

Massachusetts Institute of Technology. Cambridge, MA. 01/2021 - 01/2022
Institute for Data, Systems, and Society
Postdoctoral associate

University of Illinois at Urbana-Champaign. Champaign, IL. 08/2016 - 12/2020
Department of Industrial and Enterprise Systems Engineering
Ph.D. in Operations Research

University of Pierre and Marie Curie. Paris, France. 09/2014 - 06/2015
Department of Mathematics
M.S. in Mathematics

Tsinghua University. Beijing, China. 09/2010 - 07/2014
Department of Mathematical Sciences
B.S. in Mathematics

RESEARCH INTEREST

Inventory management, revenue management, discrete convex analysis, approximation algorithms, game theory, data-driven decision making

PUBLICATIONS

- $M^\natural$-Convexity and Its Applications in Operations, with Xin Chen.
  Operations Research, *forthcoming*

  – Provide a tool using $M^\natural$-convexity to derive nonincreasing optimal solutions and preservation properties in parametric maximization problems with submodular objective functions, together with some new fundamental properties of $M^\natural$-convexity. Its usefulness is demonstrated by two important inventory models in the literature.

- Discrete Convex Analysis and Its Applications in Operations: A Survey, with Xin Chen.
  Production and Operations Management, *forthcoming*

  – Review of applications of $L^\natural$-convexity and $M^\natural$-convexity in inventory management, revenue management, sharing economy, healthcare and economics.

WORKING PAPERS

- S-Convexity and Gross Substitutability, with Xin Chen
  Operations Research, *major revision*

  – Introduce a generalization of $M^\natural$-convexity referred to as S-convexity, and establish its properties, characterizations, nonincreasing optimal solutions result, and relationship with gross substitutability. Employ S-convexity to derive monotone comparative statics results for two classical inventory models.

- Asymptotic Optimality of Semi-Open-Loop Policies in Markov Decision Processes with Large Lead Times, with Xingyu Bai, Xin Chen, and Alexander L. Stolyar
  Management Science, *under review*

  - Provide a unified framework of analyzing asymptotic optimality of semi-open-loop policies in Markov decision processes (MDPs) with an immediate control and a delayed control. Employ this framework to prove asymptotical optimality of semi-open-loop policies in finite MDPs with fast mixing properties and uniformly bounded cost functions, constant-order policies in classical lost-sales inventory models with large lead times for divisible products, and bracket policies in the same inventory model for indivisible products.

- Allocation of COVID-19 Vaccines Under Limited Supply, with Xin Chen, David Simchi-Levi, and Tiancheng Zhao

  - Study vaccine allocation policies to various age groups when limited supply is available over time. Use epidemic data from New York City to calibrate an age-structured model that captures the disease dynamics within and across various age groups. Derive the optimal static policies under different objectives and evaluate several dynamic policies.

- Assortment Optimization Under a Logit Model with Multiple Categories, with Xin Chen and Tiancheng Zhao.

  - Study an assortment optimization problem of a discrete choice model where each customer chooses a bundle consisting of products from multiple categories, and develop its approximation algorithms with constant ratio guarantees.

- Decentralized Pricing and Capacitated Assortment Planning in an Online Marketplace Using Personalized Commission Fee Policy, with Xin Chen and Ebrahim Arian.

  - Study a joint assortment and commission fee optimization problem of an online platform with competing retailers. Develop characterizations and efficient algorithms for the platform's optimal assortment and commission fee policy.

RELEVANT EXPERIENCE

University of Illinois at Urbana-Champaign. Champaign, IL. 08/2016 - 12/2020
Research Assistant. Supervisor: Xin Chen

- Established properties of $M^\natural$-convex functions, and employed them to simplify the complicated analysis of prevalent operations models in the literature including a multi-product dynamic stochastic inventory model, a discrete choice model, an assemble-to-order inventory model and a portfolio contract model.
- Proposed a generalization of $M^\natural$-convexity referred to as S-convexity, and established properties of S-convex functions on continuous spaces. Utilized S-convexity to derive monotone comparative statics results for two classical inventory models.
- Proposed an 0.5-approximation algorithm for an assortment optimization problem under a two-category bundle logit model when one category has two products.
- Established the asymptotic optimality of a bracket policy for a lost-sales inventory model with integral random demand and discrete replenishment.
- Proposed a FPTAS for a joint assortment and pricing problem with fixed costs.

Shanghai University of Finance and Economics. Shanghai, China. 07/2015 - 06/2016
Visiting Student. Supervisor: Simai He

- Simulated three online advertisement allocation algorithms in MATLAB and achieved a 10% revenue increase over a greedy algorithm.

INDUSTRIAL PROJECTS

Inventory Management of Unattended Vending Shelves Operated by Shunfeng. Champaign, IL. 10/2018 - 03/2019
Supervisor: Xin Chen

- Helped Shunfeng to predict the demand of each product on their unmanned shelves in several cities of China. Raised R^2 scores of weekly and monthly predictions to 0.868 and 0.877, respectively.
- Proposed a new data-driven inventory replenishment policy which outperforms Shunfeng's current policy in multiple criterion including inventory level, inventory turnover, number of replenishment and out-of-stock rate.

TALKS

- **Allocation of COVID-19 Vaccines under Limited Supply**
  UIUC ISE Graduate Seminar 2020
- **Substitutability, $M^\natural$-Convexity and Their Applications**
  MSOM Conference 2018
- **$M^\natural$-Convexity and Its Applications in Operations**
  UIUC Gies College of Business Brown Bag Seminar 2019
  Informs Annual Meeting 2019
  POMS Conference 2019
  Informs Annual Meeting 2018

PROFESSIONAL SERVICES

- Reviewer for Production and Operations Management
- Session Chair for 2018 MSOM Conference

AWARD RECOGNITION

- **William A. Chittenden II Award** 2020
- **YinzOR Poster Competition Third Place** 2019
- **UIUC ISE Department Travel Poster Presentation First Place** 2019
- **Alibaba Global Mathematics Competition Excellence Award** 2018
- **Fondation Sciences Mathmatiques de Paris Program scholarship** 2014 - 2015
- **China National Grants** 2013
- **China National Grants** 2011
- **China Mathematical Olympiad Silver Award** 2010
- **National High School Mathematics League First Prize** 2009

TECHNICAL SKILLS

Python, R, MATLAB, C++, Latex, Mathematica