MENGLONG LI

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EDUCATION

University of Illinois at Urbana-Champaign. Champaign, IL. 08/2016 - Present
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, data-driven decision making, game theory

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 Convexity 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.

- **S-Convexity and Gross Substitutability**, with Xin Chen
Under review of *Operations Research*

  – 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
Under review of *Management Science*

  – 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.

WORKING PAPERS

- **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 Multi-Category-Bundle Logit Model**, 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.

RELEVANT EXPERIENCE

University of Illinois at Urbana-Champaign. Champaign, IL. 08/2016 - Present
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.

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

- **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