# Yilin Gu

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## EDUCATION

**The Chinese University of Hong Kong**, Hong Kong, China
PhD, System Engineering and Engineering Management (OR track) Aug. 2024 - Nov. 2028

- Advisor: Prof. Viet Anh Nguyen

**The Chinese University of Hong Kong, Shenzhen**, Shenzhen, China
M.S., Information Management and Business Analytics (IM track) Sept. 2021 - Nov. 2023

- GPA: 3.60/4.0, graduated with Distinction
- Advisor: Prof. Andre Milzarek

Visiting Student, Data Science (Applied Mathematics track) Nov. 2021 - Nov. 2023

- PhD-level Courses: Measure Theoretic Probability, Optimization Theory, Analysis of Algorithms

**Macau University of Science and Technology**, Macau, China
B.S., Business Analytics Sept. 2017 - June 2021
Visiting Student, Applied Mathematics and Data Science Sept. 2019 - June 2021

- GPA: 3.53/4.0, graduated with First Class Honor

## RESEARCH INTERESTS

**Methodology**:

- Optimization Theory: Distributionally robust optimization, Contextual optimization, Nonconvex-nonconcave minmax optimization, Finite-dimensional variational inequalities problem.
- Machine Learning Theory: Model-based data mining, Supervised representation learning, Adversarial learning, Numerical analysis, Information theory, Interpretability for machine learning.

**Application**: Analyzing and designing optimization algorithms and applying them to applications arising in supply chain management, machine learning, system engineering, etc.

**Research Statement**: [research statement]

## WORKING PAPER

### A. Variational Inequality and Minimax Problem

- **Yilin Gu**, Andre Milzarek (2024). Normal Map-Based Proximal Optimistic Gradient Descent Ascent Methods for Nonsmooth Nonconvex-Nonconcave Minmax Problem.
  - My three-hour presentation at EPFL: [video] [slides] [notebooks] [framework]
- **Yilin Gu**, Andre Milzarek (2024). Convergence of A Revised Foward-Backward-Foward Method for Nonsmooth Nonconvex-Nonconcave Minmax Problem. [page] [slides]

### B. DRO and Contextual Optimization

- **Yilin Gu**, Viet Anh Nguyen, Erick Delage (2024). End-to-End Kernel-based Separable Convex Contextual Optimization. [slides]
- **Yilin Gu**, Viet Anh Nguyen (2024). A Differentiable Top-K Bilevel Framework for Conditional Robust Optimization.
- **Yilin Gu** (2024). A Stochastic Distributionally Robust Fairness Framework for Constrained Data-driven Systems. [slides]

### C. Statistical Learning Theory

- **Yilin Gu**, Andre Milzarek, Yichen Yu, Xin Jin, and Ruiyun Xu (2024). Stepwise Prototype Optimization: Adaptive Multiple Vector Quantization Classification. [page] [code]

## ACADEMIC EXPERIENCE

**Shenzhen Research Institute of Big Data**, Shenzhen, China — June. 2022 - Jan. 2023
Research Associate, Institute of Fundamental Research

- Engaged in the fundamental mathematical optimization research project *"Higher Order-Type Methods for Structured and Stochastic Variational Inequalities"* supported by Shenzhen Research Institute of Big Data (SRIBD) Startup Fund JCYJ-AM20190601.
- Responsible for studying stochastic algorithm for nonsmooth nonconvex-nonconcave minmax problem under fewer assumptions. Through introducing weak Minty Variational Inequality and two-sided Polyak-Łojasiewicz condition, modified traditional minmax methods (eg. PPA, OGDA, EG, etc.) for finding stronger solutions under better complexity bound and convergence rate.
- Introduced normal mapping, converted the expectation of natural residual into an equivalent and better-solved nonlinear equation, and solved the equation with modified minmax methods to measure the convergence of these methods in nonconvex-nonconcave setting.

**Shenzhen Finance Institute**, Shenzhen, China — Jan. 2022 - June 2022
System Engineer Intern, Center on Blockchain and Intelligent Technology

- Engaged in the supply chain finance project of China Association of Small and Medium Enterprises (CASME), in which solved financial difficulties for startup manufacturing companies.
- Designed a specific financing approach called "Forage Finance" for YunQin Technology Company, a startup poultry company with financial difficulties in production resources.
- With blockchain technology, developed a supply chain finance and risk management information system for YunQin and related upstream and downstream companies in the poultry supply chain, from which successfully solved YunQin's financial problem in a low risk way.
- The YunQin project was scored as 5.00/5.00 by the advisor Mr. Shen Zhenyuan from CASME.

## SEMINAR AND TALKS

- **Global Management Challenge Workshop**, Macau University of Science and Technology
  - The Global Management Challenge (GMC) is a global strategic operation management competition that runs with a complex computer simulation system, in which each team runs different virtual company in the same market environment, and competes by developing and producing products that can better meet customer needs to maximize their investment performance.
  - In this workshop, I mainly taught the basic rules and insights of this competition, concepts and theory of operation management, strategic data-driven decision making, decision model building, the application of basic machine learning tools on data mining, etc.
  - As the workshop instructor, I held the workshop for 2 years (once a week), and successfully educated and trained over 600 students. Among all the students, one group of students won the world champion title, 12 groups participated the national final and won the first prize, and 46 groups won the second prize.

## TEACHING EXPERIENCE

Faculty of Innovation Engineering, Macau University of Science and Technology

- MATH-200: Numerical Computation (Undergraduate)
  - Teaching Assistant, 2021 Spring
- CS-482: Data Science (Undergraduate)
  - Teaching Assistant, 2020 Fall

School of Business, Macau University of Science and Technology

- BBAZ-16014: Operations Management (Undergraduate)
  - Teaching Assistant, 2021 Spring
- BBAZ-16011: Business Statistics (Undergraduate)
  - Teaching Assistant, 2020 Fall
- BBAZ-16001: Introduction to Management (Undergraduate)
  - Teaching Assistant, 2020 Spring

- Global Management Challenge Workshop (Graduate & Undergraduate)
  - Instructor, 2020 Fall
- Global Management Challenge Workshop (Graduate & Undergraduate)
  - Instructor, 2019 Fall

## INDUSTRY EXPERIENCE

**Guo Sheng Securities**, Nanchang, China — June 2019 - Sept. 2019
Financial Analyst, Securities Business Department

- Collated and analyzed user-related information, engaged in programming security data warehouse with MySQL, and updated and configured daily and weekly reports to databases for some core financial data such as stock price, yield, yield trend, etc.
- Engaged in the development of a basic intelligent investment decision-making model with investor counselors, applying neural network algorithms, such as RNN and LSTM, to predict daily yield, in order to use DQN algorithm to find the best investment solution for customers.

**Ascending Powers Co., Ltd.**, Shenzhen, China — June 2018 - May 2019
Deep Learning Intern, Big Data Department

- Worked in the Big Data Research & Development Team of Ascending Powers, which corporates with the Tsinghua University and Tsinghua-Berkeley Shenzhen Institute (TBSI), and is committed to instantiating the world's top research achievements and applying them to business.
- Designed a series of supply chain financing risk management (FRM) approaches, including inventory financing, receivables financing, etc. Correspondingly, estimated risk probabilities for each approach and provided intelligent interest rate model, applying multiple machine learning algorithms under co-training platform provided by TBSI multimedia big data laboratory.
- Engaged in the FRM project of the world largest P2P company LendingClub, which has been implemented with our AI-driven inventory financing approach and successfully decreased the bad loan rate by 48%, compared with last year.

## HONORS AND AWARDS

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| Dean's List of School of Management and Economics at CUHK-SZ | 2023 |
| AY21-22 Third Class Academic Excellence Scholarship | 2022 |
| Degree of B.S. in Business Analytics with First Class Honor (Top 5% + cGPA$\geq$3.50) | 2021 |
| 1st Prize (2nd Place) in the 40th Global Management Challenge (GMC), Macau Division | 2020 |
| AY19-20 2nd Prize of MUST Business School Undergraduate Research Award | 2020 |
| AY18-19 Dean's Honor List of MUST Business School (Top 5% + cGPA$\geq$3.70) | 2019 |
| AY18-19 3rd Prize of MUST Business School Undergraduate Research Award | 2019 |
| 2nd Prize in the 39th Global Management Challenge (GMC), Mainland China Division | 2019 |
| AY17-18 Dean's Honor List of MUST Business School (Top 5% + cGPA$\geq$3.70) | 2018 |
| 3rd Prize in the Guangdong-Hong Kong-Macau Innovation and Entrepreneurship Competition | 2018 |
| 2nd Prize in the 5th 'Creative Youth' Innovation and Entrepreneurship Competition | 2018 |

## SKILLS

**Programming**: Python, R, Matlab, MySQL, HTML, CSS, JavaScript, LaTeX.
**Machine Learning**: Linear & Logistic Regression, Clustering, SVM, Neural Network, Decision Tree, Ensemble Methods, Numerical Methods, Information Theory, Prototype Learning, Adversarial Learning, Reinforcement Learning, etc.
**Deep Learning**: Scikit-learn, Keras, Tensorflow, Pytorch.
**Optimization Theory**: Convexity and convex analysis, Convergence analysis, Gradient method, Newton's method and Gaussian/inexact/quasi-Newton methods, Acceleration and momentum techniques, Stochastic optimization, KKT conditions and optimality conditions, Projected and proximal methods, Alternating direction method of multipliers, Cubic Regularization, etc.
**Business Intelligence**: Spreadsheet, Tableau, BigQuery, Power BI.