Lexiao Lai

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EDUCATION

The University of Hong Kong — Hong Kong
Bachelor of Science Major in Mathematics, Minor in Finance — Sept. 2015 - June 2019 (Expected)
cGPA: **3.83 /4.3**; Major GPA: **4.16/4.3**

University of Toronto — Toronto, Canada
HKUWW Undergraduate Student Exchange Programme
GPA: **4.0/4.0** — Sept. - Dec. 2017
GRE Mathematics Subject: **970** (99%)

RESEARCH INTERESTS

Optimization, Optimal Control, Financial Mathematics.

RESEARCH EXPERIENCE

Title: *Optimization problems in deep learning and artificial intelligence* — Sept. 2018 -
Supervisor: Prof. Xiaoming Yuan — Department of Mathematics, HKU
Objectives:
- Identify and solve optimization problems in deep learning and artificial intelligence.

Title: *Time-dependent Surveillance-Evasion Game* — June - Oct. 2018
Sponsored by Overseas Research Fellowship from Faculty of Science, HKU — Cornell University
Supervisor: Prof. Alexander Vladimirsky — Center of Applied Mathematics
Objectives:
- Find Nash Equilibrium in a time-dependent adversarial path-planning problem.

Achievements:
- Developed efficient algorithm to approximate Nash Equilibrium by scalarization-based method and nonsmooth convex optimization techniques.
- Implemented upwind scheme to solve time-dependent Hamilton-Jacobi-Bellman equation, and improved the accuracy with 8-pt stencil.
- Implemented fast algorithms for computation of visibility function and 3D interpolation.
- Designed and implemented the computation for multi-evader and anisotropic-observer extension.

Title: *Convergence Estimates for Value Iterations in Piecewise Deterministic Settings* — June 2018-
Sponsored by Overseas Research Fellowship from Faculty of Science, HKU — Cornell University
Supervisor: Prof. Alexander Vladimirsky — Center of Applied Mathematics
Objectives:
- Provide upper bounds for performance degradation due to early stopping in value iteration process when solving piecewise deterministic Hamilton-Jacobi-Bellman Equation.

Achievements:
- Provided an upper bound for convergence rate in value iteration process.

Title: *Gradient Schemes in Convex Optimization: Adaptive Restart Improvements and Applications*
Jan. - May 2018
Supervisor: Dr. Zheng Qu — Department of Mathematics, HKU
Objectives:
- Analyze the convergence with adaptive restart first-order schemes in convex optimization.
- Test Adaptive Restart Schemes in nonsmooth optimization problems.

Achievements:
- Estimated the convergence rate when applying Nesterov's accelerated gradient descent schemes with adaptive restart improvement to optimize convex quadratic functions.
- Tested the improvement of adaptive restart for generalized gradient methods (FISTA) through numerical experiments.

Title: *Assessing Portfolios Containing Various Assets in the World Market* June - July 2017
Sponsored by Summer Research Fellowship at Faculty of Science, HKU
Supervisor: Dr. Siu Pang Yung Department of Mathematics, HKU
Objectives:

- Test on different active management strategies.
- Investigate the effect of diversification in stock investments, with computer simulations based on stocks in Hong Kong and U.S. stock Market.

Achievements:

- Discovered from the simulations of investment strategies that active management can be beneficial in stock investments.
- Justified the positive effects of diversification based on Hong Kong and U.S. stocks.

AWARDS & HONOURS

- **Outstanding Winner** of *Mathematical Contest in Modelling* 2017
  (Top 13 winners out of 8843 teams)
  Organized by COMAP Inc.
- Ranked **134** out of 4638 in *78th William Putnam Mathematical Competition* 2017
  Organized by *Mathematical Association of America*
- Doris Chen Undergraduate Project Prize 2018
  Awarded by *Department of Mathematics, The University of Hong Kong*
  To recognise research outputs and excellent performance in project courses in Mathematics by undergraduate students majoring in Mathematics.
- Liu Ming-Chit Prize in Mathematics 2018
  Awarded by *Department of Mathematics, The University of Hong Kong*
  A student in Mathematics who has completed his/her 2nd or 3rd year of study, on the recommendation of the Head of Mathematics
- Alan John Allis Prize in Mathematics 2016,2017
  Awarded by *Department of Mathematics, The University of Hong Kong*
  to not more than *five* undergraduates who have just completed their 1st or 2nd year of study
- Dean's Honours List 2016,2017
  Awarded by *Faculty of Science, The University of Hong Kong*
- HKSAR Government Scholarship 2015-2019
- B.Sc. Class of 1971 Prize 2018
- Talent Development Scholarship 2018
- HKUAA Ontario Student Exchange Scholarships 2017
- Second Prize in National High School Mathematics Competition (Provincial) 2014
- First Prize in High School Mathematics Competition of Zhejiang Province 2013,2014

COMPUTER SKILLS

Programming Languages: Python, MATLAB

MAJOR COURSES

Category	Course	Grade
Analysis	Introduction to Mathematical Analysis	A+
	Analysis I	A-
	Functional Analysis	A+
	Real Analysis (Graduate Course)	A+
Calculus	University Mathematics I	A+
	Multivariable Calculus	A
	Functions of Complex Variables (at U of Toronto)	A+
Algebra	Linear Algebra I	A+
	Linear Algebra II	A+
	Algebra I (Abstract Algebra)	A
Differential Equations	(Ordinary) Differential Equations	A
	Introduction to Partial Differential Equations	Pending
Applied Mathematics	Discrete Mathematics	A
	Applied Linear Programming (at U of Toronto)	A+
	Algorithmetic Game Theory (at U of Toronto)	A+
	Network models in Operations Research	Pending
	Introduction to Optimization	Pending
Probability and Statistics	Probability and Statistics I	A
	Probability I (at U of Toronto)	A+
	Stochastic Processes	Pending
Economics and Finance	Introductory Microeconomics	A+
	Introductory Econometrics	A
	Corporate Finance	A
	Financial Derivatives	A
	Mathematical Finance	A