

## Current and Past Positions

- 7/2023–Now      Lecturer in [School of Computing, Australian National University](#), Australia.
- 9/2020–7/2023      Lecturer in [Computer Science, Royal Holloway University of London](#), UK.
- 9/2018–9/2020      Research Fellow, [Engineering Systems and Design Pillar, Singapore University of Technology and Design \(SUTD\)](#), Singapore.    Mentor: [Dr. Georgios Piliouras](#)
- 8/2016–8/2018      Postdoctoral Fellow, [Department of Algorithms and Complexity, Max-Planck-Institut \(MPI\) für Informatik](#), Germany.    Direktor: [Prof. Kurt Mehlhorn](#)
- 9/2014–7/2016      Postdoctoral Researcher, [Theory and Applications of Algorithms](#) Research Group, University of Vienna, Austria.    Mentor: [Prof. Monika Henzinger](#)

## Education

- 9/2009–8/2014      PhD in Computer Science. Courant Institute of Mathematical Sciences, New York University (NYU), NY, USA.    Advisor: [Prof. Richard Cole](#)
- 9/2007–8/2009      MPhil in Mathematics. Hong Kong University of Science & Technology (HKUST), Hong Kong.    Advisor: [Prof. Mordecai Golin](#)
- 9/2004–6/2007      BSc, Dual Major in Mathematics and Physics, Minor in Information Technology (with focus on Computer Science). HKUST, Hong Kong.

## Research Interests

<b>General Interests:</b>	Algorithm Design & Analysis General Equilibrium (Market) Theory	Game Theory Discrete Mathematics & Combinatorics
<b>Foci:</b>	Computational Economics Learning-in-Games	Algorithmic Game Theory Graph Theory & Algorithms
<b>Related Areas:</b>	Optimization Machine Learning	Dynamical Systems Artificial Intelligence

## Grant

- Australian Research Council (ARC) Discovery Project, “Interactions of Human and Machine Intelligence in Modern Economic Systems”. Co-Chief Investigator, joint with Prof. Lexing Xie. Fund Amount: AUD \$521K. Period: 2024–2026.

## Awards and Scholarships (Highlights)

- [NeurIPS 2019 Best Reviewer](#), [ICML 2020 Top Reviewer](#).
- [MacCracken Fellowship](#), GSAS, NYU, 2009–2014.
- [4th places \(team member\)](#) at two regional contests of ACM International Collegiate Programming Contest (ACM ICPC), 2007.
- [Academic Achievement Medal](#), awarded by HKUST, 2007.
- [Epsilon Fund Award](#), Department of Mathematics, HKUST, 2006 and 2009.
- Swire International Young Fellows Scholarship, 2006.
- HSBC Hong Kong Scholarship, 2006.
- So Hok Scholarship, 2004.
- University Scholarship, HKUST, 2004 and 2007.
- [Bronze Medal, International Mathematical Olympiad \(IMO\) 2004](#). Representative of Hong Kong team.
- Silver Award (2004) and Bronze Award (2003), Asian Pacific Mathematics Olympiad.
- Third Class Award, Chinese Mathematical Olympiad, 2004. Representative of Hong Kong team (invited foreign team).

## Publications (Sorted by Topics)

### (A) Learning/Game/Market Dynamics and Asynchronous Optimization/Systems

- [1] *Stability and Efficiency of Personalised Cultural Markets*  
with Haiqing Zhu and Lexing Xie. [WWW 2023](#).
- [2] *The Evolution of Uncertainty of Learning in Games*  
with Georgios Piliouras and Yixin Tao. [ICLR 2022](#).
- [3] *Market Equilibria and Risk Diversification in Blockchain Mining Economies*  
with Stefanos Leonardos, Georgios Piliouras, Shyam Sridhar. [MARBLE 2022](#).
- [4] *Fully Asynchronous Stochastic Coordinate Descent: A Tight Lower Bound on the Parallelism Achieving Linear Speedup*  
with Richard Cole, Yixin Tao. [Mathematical Programming \(Series A\)](#), Vol. 190, pp. 615–677, November 2021.
- [5] *Parallel Stochastic Asynchronous Coordinate Descent: Tight Bounds on the Possible Parallelism*  
with Richard Cole, Yixin Tao. [SIAM Journal on Optimization \(SIOPT\)](#), Vol. 31(1), pp. 448–460, February 2021.
- [6] *Online Optimization in Games via Control Theory: Connecting Regret, Passivity and Poincaré Recurrence*  
with Georgios Piliouras. [ICML 2021](#).
- [7] *Learning in Markets: Greed Leads to Chaos but Following the Price is Right*  
with Stefanos Leonardos, Georgios Piliouras. [IJCAI 2021](#).
- [8] *Tatonnement Beyond Gross Substitutes? Gradient Descent to the Rescue*  
with Richard Cole, Nikhil R. Devanur. [Games and Economic Behavior](#), Vol. 123, pp. 295–326, September 2020. An earlier manuscript was published in conference [STOC 2013](#).
- [9] *Chaos of Learning Beyond Zero-sum and Coordination via Game Decompositions*  
with Yixin Tao. [ICLR 2021](#).
- [10] *Chaos, Extremism and Optimism: Volume Analysis of Learning in Games*  
with Georgios Piliouras. [NeurIPS 2020](#).
- [11] *Vortices Instead of Equilibria in MinMax Optimization: Chaos and Butterfly Effects of Online Learning in Zero-Sum Games*  
with Georgios Piliouras. [COLT 2019](#).
- [12] *Tracing Equilibrium in Dynamic Markets via Distributed Adaptation*  
with Martin Hoefer, Paresh Nakhe. [AAMAS 2019](#).
- [13] *Multiplicative Weights Updates with Constant Step-Size in Graphical Constant-Sum Games*  
[NeurIPS 2018](#). (single-author paper)
- [14] *Dynamics of Distributed Updating in Fisher Markets*  
with Richard Cole, Yixin Tao. [ACM EC 2018](#). Contributed talk by me in [HALG 2018](#).
- [15] *Amortized Analysis of Asynchronous Price Dynamics*  
with Richard Cole. [ESA 2018](#).
- [16] *Analyzing Tatonnement Dynamics in Economics Markets*  
[PhD Thesis](#), 2014. Chapter 10 is a convergence analysis of tatonnement in general Nested-CES Fisher markets, which generalizes the results in [8].
- [17] *Tatonnement in Ongoing Markets of Complementary Goods*  
with Richard Cole, Ashish Rastogi. [ACM EC 2012](#).

### (B) Algorithmic Game Theory and Mechanism Design

- [18] *Fair Division of Indivisible Goods for a Class of Concave Valuations*  
with Bhaskar Ray Chaudhury, Jugal Garg, Naveen Garg, Martin Hoefer, Kurt Mehlhorn. [Journal of Artificial Intelligence Research \(JAIR\)](#), Vol. 74, pp. 111–142, May 2022. An earlier manuscript was published in conference [FSTTCS 2018](#), with title “On Fair Division for Indivisible Items”.
- [19] *Griefing Factors and Evolutionary (In)-Stabilities in Blockchain Mining Games*  
with Stefanos Leonardos, Georgios Piliouras and Shyam Sridhar. [MARBLE 2022](#).
- [20] *Better Strategyproof Mechanisms without Payments or Prior — An Analytic Approach*  
[IJCAI 2016](#). (single-author paper)
- [21] *Combinatorial Auctions with Conflict-Based Externalities*  
with Monika Henzinger, Martin Hoefer, Martin Starnberger. [WINE 2015](#).

## (C) Graph Sparsification and Partitioning

- [22] *Steiner Point Removal — Distant Terminals Don't (Really) Bother*  
SODA 2018. (single-author paper)
- [23] *Spanning Tree Congestion and Computation of Generalized Győri-Lovász Partition*  
with L. Sunil Chandran, Davis Issac. ICALP 2018. Contributed talk by Davis in HALG 2018.
- [24] *Graph Minors for Preserving Terminal Distances Approximately — Lower and Upper Bounds*  
with Gramoz Goranci, Monika Henzinger. ICALP 2016.  
This paper forms a part of a contributed talk by Gramoz in HALG 2017.

## (D) Analytic Combinatorics and Exact Analysis of Algorithms

- [25] *Divide-and-Conquer Recurrences and the Mellin-Perron Formula*  
with Mordecai Golin. To appear as a chapter in *Collected Works of Philippe Flajolet*.
- [26] *Analyzing a Weighted Digital Sum Variant*  
with Mordecai Golin. AofA 2010.
- [27] *Analysis of Weighted Digital Sums by Mellin Transform*  
MPhil Thesis, 2009. Chapter 6 is an *elementary* analysis of one of the MDC recurrences studied in [28];  
in contrast, the analysis in [28] uses advanced technique of Mellin transform.
- [28] *Multidimensional Divide-and-Conquer and Weighted Digital Sums*  
with Philippe Flajolet, Mordecai Golin, C.Y. James Lee. In ANALCO 2009.

## Synergistic Activities

Program Committee: ACM EC 2023, ACM EC 2021, ACM EC 2020, WINE 2023, AAMAS 2023, AAMAS 2020

Reviewer: NeurIPS 2020, ICML 2020 (Top Reviewer), NeurIPS 2019 (Best Reviewer)

Reviewer for conferences: STOC (x4), FOCS (x1), SODA (x7), ICALP (x4), ESA (x1), WWW (x2), STACS (x1), WINE (x5), SAGT (x3), CIAC (x1)

Referee for journals: Games and Economic Behavior (x4), SIAM Journal on Discrete Mathematics, Operations Research, Machine Learning, Algorithmica, Information Processing Letters (x2)

## Teaching Activities, Administration Activities and Guest Lectures

- Lecturer of the course “[Algorithmic Game Theory And Economics](#)” in Australian Mathematical Sciences Institute (AMSI) Summer School 2024.
- Lecturer of the course “Data Analysis” (Spring 2021–Autumn 2023), “Software Engineering” (Autumn 2023) and “Machine Fundamentals” (Spring 2022) in Royal Holloway University of London.
- Lecturer of the course “[Algorithmic Game Theory, Mechanism Design and Computational Economics](#)” in Max-Planck-Institut für Informatik (advanced course for master students), Winter Semester 2017.
- Administrator of Noon Seminars of the Algorithm and Complexity Department in Max-Planck-Institut für Informatik, August 2017 – June 2018.
- Committee Member for Selection of Master Fellows in Max-Planck-Institut für Informatik, December 2016 – January 2018.
- Guest Lecture in Georgia Institute of Technology on “Market Dynamics – Tatonnement and Proportional Response Dynamics”, 24/2/2014.
- Teaching Assistant in NYU for MS-level required course “Fundamental Algorithms”, 2010.
- Teaching Assistant in HKUST for UG-level courses “Game Theory”, “Combinatorial Analysis” and “Euclidean and non-Euclidean Geometries”, 2007–2009.
- Grader in NYU for PhD-level course “Honors Analysis of Algorithms” and MS-level courses “Fundamental Algorithms” and “Algorithmic and Economic Aspects of the Internet”, 2010–2013.
- Teaching Mathematical Olympiad to gifted students in three high schools in Hong Kong, 2000–2009.

## Academic Activities

- Visitor at Indiana University Bloomington, hosted by Wai Tong Fan, 1–5/7/2019.
- Hosting Hadi Khodabandeh (Sharif University of Technology, Iran) at Max-Planck-Institut für Informatik, 3/8/2017–30/9/2017.
- Visitor at Courant Institute of Mathematical Sciences (alma mater), hosted by Richard Cole, 9–28/7/2016, 26/6/2017–13/8/2017, 15–19/1/2018 and 23/6/2018–14/7/2018.
- Visitor at Goethe-Universität Frankfurt am Main, hosted by Martin Hoefer, 10–14/4/2017 and 6–9/12/2017.
- [Game Theory Workshop](#), Hausdorff Research Institute for Mathematics, 14–17/12/2015.
- [Greece Economic and Algorithmic Theory \(GREAT\) Week](#), 18–24/7/2014.
- Visitor at Simons Institute for the Theory of Computing, hosted by Christos Papadimitriou, 20–24/1/2014.
- Visitor at Microsoft Research Redmond, hosted by Nikhil Devanur, 11–18/3/2012.
- [Memphis-Budapest Summer School in Combinatorics](#), organized by Béla Bollobás, 7–20/8/2011.

## Math Competition and Website Organization

- Organizer and Problem Poser for [Pui Ching Invitational Mathematics Competition](#) (one of the largest mathematics competitions for high school students in Hong Kong), 2004–2012.
- Vice-chairperson (for 2 years) and Secretary (for 1 year) of *Mathematical Database*, which was one of the largest mathematics websites in Hong Kong, 2003–2008. (The website is no longer operating.)

## Programming Skills

- Python (most frequently used PL in recent years)
  - CUDA GPU programming (generations of Mastermind/Wordle decision tree, parallelized simulations and numerical analyses of game/market dynamics)
  - tensorflow 2 (implement a GAN for finding optimal mechanisms)
  - experiences with packages: sklearn, pandas, networkx, selenium, bs4
- C++ (most frequently used PL when I was a HKUST representative for programming contests; have been using it since grade 10)
- JAVA (wrote a simulator of concurrent database system)
- OCaml (wrote an interpreter; the first functional PL I learnt)
- git, Amazon AWS, SageMath (with Gurobi), MAPLE, MATLAB, PHP, Ajax+JavaScript

## Languages

Cantonese – Native (see [this WSJ post](#) to know more of the “identity” of Cantonese and Hong Kong)

English – Professional

Mandarin Chinese – Fluent

## Talks and Poster Presentations

- An Optimization Landscape of Dynamics in Economies
  - Talk in University of Oxford Algorithms and Complexity Theory Seminars (9/3/2023)
- Instability and Chaos of Learning-in-Games via Volume Analysis
  - Talk in London School of Economics (LSE) Seminar on Combinatorics, Games and Optimization (16/6/2022)
- Online Optimization in Games via Control Theory

- Talk in SUTD Group Meeting (24/7/2020)
- Vortices Instead of Equilibria in MinMax Optimization: Chaos and Butterfly Effects of Online Learning in Zero-Sum Games
  - Talk and Poster Presentation at COLT 2019 (25/6/2019)
  - Talk in SUTD Group Meeting (26/3/2019)
- Tracing Equilibrium in Dynamic Markets via Distributed Adaptation
  - Talk and Poster Presentation at AAMAS 2019 (16/5/2019)
- Multiplicative Weights Updates with Constant Step-Size in Graphical Constant-Sum Games
  - Poster Presentation at NeurIPS 2018 (5/12/2018)
- Dynamics of Distributed Updating in Fisher Markets
  - Short Talk and Poster Presentation at HALG 2018 (5/6/2018)
- Steiner Point Removal — Distant Terminals Don't (Really) Bother
  - Probability and Related Fields Seminar in Indiana University Bloomington (1/7/2019)
  - Talk at SODA 2018 (8/1/2018)
- Asynchronous Coordinate Descent and Tatonnement
  - Talk at ESA 2018 (22/8/2018)
  - Talk at OR 2016 – International Conference of the German Operations Research Society (2/9/2016)
  - Talk at Hasso Plattner Institute (HPI) (4/2/2016)
  - Talk at Game Theory Workshop, Hausdorff Research Institute for Mathematics (14/12/2015)
  - Talk at Max-Planck-Institut für Informatik (24/2/2015)
  - Talk at University of Vienna (7/11/2014)
  - Talk at Greece Economic and Algorithmic Theory Week (GREAT) 2014 (22/7/2014)
- Graph Minors for Preserving Terminal Distances Approximately — Lower and Upper Bounds
  - Talk at Hong Kong University of Science and Technology (4/7/2016)
  - Talk at Georgia Institute of Technology (29/2/2016)
- Better Strategyproof Mechanisms without Payments or Prior — An Analytic Approach
  - Talk at IJCAI 2016 (14/7/2016)
- Combinatorial Auctions with Conflict-Based Externalities
  - Talk at WINE 2015 (11/12/2015)
  - Joint talk with Martin Starnberger at University of Vienna (19/6/2015)
- Tatonnement Beyond Gross Substitutes? Gradient Descent to the Rescue
  - Talk at Hong Kong University of Science and Technology (4/4/2014)
  - Talk at Georgia Institute of Technology (24/2/2014)
  - Talk at STOC 2013 (2/6/2013)
  - Poster Presentation at NYCE 2012 (3/12/2012)
- Exact Analysis on Multidimensional Divide-and-Conquer
  - Talk at Polytechnic Institute of New York University (31/1/2013)
- Tatonnement in Ongoing Markets of Complementary Goods
  - Talk at ACM EC 2012 (6/6/2012)
  - Poster Presentation at STOC 2012 (20/5/2012) and NYCE 2011 (16/9/2011)
- Analyzing a Weighted Digital Sum Variant
  - Talk at AofA 2010 (2/7/2010)
- Multidimensional Divide-and-Conquer and Weighted Digital Sums
  - Talk at ANALCO 2009 (3/1/2009)