

## Christopher Thomas Ryan (January 20, 2023)

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CONTACT INFORMATION      2053 Main Mall  
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RESEARCH INTERESTS      Infinite-dimensional optimization, game theory, theoretical economics, discrete optimization, operations management, video games, organizational learning, business history

EMPLOYMENT      **University of British Columbia, Sauder School of Business**  
Associate Professor (with tenure)      July 2021 – present.  
Assistant Professor      September 2019 – June 2021.

**University of Chicago Booth School of Business**  
Associate Professor of Operations Management      July 2016 – August 2019.  
Assistant Professor of Operations Management      July 2010 – June 2016.

**Colibri Learning Foundation ([colibrilearning.org](http://colibrilearning.org))**  
Curriculum development and discussion leadership training (volunteer positions)  
2005 – present.

EDUCATION      **University of British Columbia**  
Ph.D., Sauder School of Business, 2010  
• Dissertation Topic: “Computing solution concepts in games with integer decisions”  
• Advisor: Maurice Queyranne  
B.A. (honors), Mathematics, 2005  
**University of Guelph**  
B. A. (honors), Sociology and Economics, (transferred to UBC in September 2002)

RESEARCH PAPERS      (the labels that follow, e.g., (J-3) refer to the labels of the projects listed below.)  
*Infinite-dimensional optimization:* (J-5), (J-7), (J-14), (J-15), (J-16), (J-17), (J-18), (J-1), (WIP-4), (WIP-8)  
*Discrete optimization:* (J-9), (J-10), (J-19), (J-20), (J-1), (WIP-4)  
*Learning:* (J-3), (C-2), (WIP-7)  
*Game theory and theoretical economics:* (J-9), (J-11), (J-12), (J-19), (J-20), (C-3), (R-1), (R-4)  
*Operations management and revenue management:* (J-6), (S-2), (R-3), (S-3), (WIP-1), (WIP-6), (WIP-9), (WIP-10), (S-1),  
*Video games:* (J-4), (J-2), (R-2), (WIP-5), (C-1), (WP-1),

**Published or forthcoming journal publications**

- (J-1) C.T. Ryan and R.L. Smith. A greedy algorithm for finding maximum spanning trees in infinite graphs. To appear in *Operations Research Letters*.
- (J-2) Y. Li, C.T. Ryan, and L. Sheng. Optimal sequencing in single-player games. To appear in *Management Science*.
- (J-3) Y. Feng, R. Caldentey, and C.T. Ryan (2022). Robust learning of consumer preferences. *Operations Research*, 70(2), 918–962.
- (J-4) L. Sheng, M. Nagarajan, C.T. Ryan, Y. Cheng and C. Tong (2022). Incentivized actions in freemium games. *Manufacturing & Service Operations Management*, 24(1), 275–284.
- (J-5) A. Ghate, C.T. Ryan, and R.L. Smith (2021). A simplex method for countably-infinite linear programs. *SIAM Journal on Optimization*, 31(4), 3157–3183.
- (J-6) T. Dai, R. Ke, and C.T. Ryan (2021). Incentive design for marketing-operations multitasking. *Management Science*, 67(4), 2211–2230.
- (J-7) C.T. Ryan and R.L. Smith (2021). Dual-based methods for solving infinite-horizon non-stationary deterministic dynamic programs. *Mathematical Programming* 187(1), 253–285.
- (J-8) X. Chen, S. He, B. Jiang, C.T. Ryan, and T. Zhang (2021). The discrete moment problem with nonconvex shape constraints. *Operations Research*, 69(1), 279–296.
- (J-9) A. Basu, C.T. Ryan, and S. Sankaranarayanan (2021). Mixed-integer bilevel representability. *Mathematical Programming*, 185(1), 163–197.
- (J-10) A. Basu, K. Martin, C.T. Ryan, and G. Wang (2019). Mixed-Integer Linear Representability, Disjunctions, and Chvátal Functions—Modeling Implications. *Mathematics of Operations Research*, 44(4), 1264–1285.
- (J-11) R. Ke and C.T. Ryan (2018). A general solution method for moral hazard problems. *Theoretical Economics*, 13(3), 1425–1481.
- (J-12) R. Ke and C.T. Ryan (2018). Monotonicity of optimal contracts without the first order approach. *Operations Research*, 66(4), 1101–1118.
- (J-13) Y. Ding, D. Ge, S. He and C.T. Ryan (2018). A non-asymptotic approach to analyzing kidney exchange graphs. *Operations Research*, 66(4), 918–935.
- (J-14) C.T. Ryan, R.L. Smith, and M. Epelman (2018). A simplex method for uncapacitated pure-supply infinite network flow problems. *SIAM Journal on Optimization*, 28(3), 2022–2048.
- (J-15) A. Basu, K. Martin and C.T. Ryan (2017). Strong duality and sensitivity analysis in semi-infinite linear programming. *Mathematical Programming*, 161(1-2), 451–485.
- (J-16) K. Martin, C.T. Ryan and M. Stern (2016). The Slater conundrum: Duality and pricing in infinite dimensional optimization. *SIAM Journal on Optimization*, 26(1), 111–138.
- (J-17) A. Basu, K. Martin, and C.T. Ryan (2014). Projection: A unified approach to semi-infinite linear programs and duality in convex programming. *Mathematics of Operations Research*, 40(1), 146–170.
- (J-18) A. Basu, K. Martin, and C.T. Ryan (2013). On the sufficiency of finite support duals in semi-infinite linear programs. *Operations Research Letters*, 42(1), 16–20.
- (J-19) M. Köppe, C.T. Ryan, and M. Queyranne (2011). Rational generating functions and integer programming games. *Operations Research*, 59(6), 1445–1460.
- (J-20) M. Köppe, M. Queyranne and C.T. Ryan (2010). Parametric integer programming algorithm for bilevel mixed integer programs. *Journal of Optimization Theory and Applications*, 146(1), 137–150.

**Published peer-reviewed conference proceedings**

- (C-1) O. Hanguir, W. Ma, and C.T. Ryan. Designing Optimization Problems with Diverse Solutions. *IPCO 2023*
- (C-2) W. Guo, Y. Hur, T. Liang, and C.T. Ryan. Online learning to transport with the minimal selection principle. *COLT 2022*.
- (C-3) C.T. Ryan, A. X. Jiang and K. Leyton-Brown (2010). Computing pure strategy Nash equilibria in compact symmetric games. *EC 2010*.

#### **Under revision**

- (R-1) Y.K. Che, J. Kim, F. Kojima, and C.T. Ryan. Characterizing Pareto Optima: Sequential Utilitarian Welfare Maximization. Second round revise and resubmit at *Econometrica*.
- (R-2) C.T. Ryan, L. Sheng, and X. Zhao. Strategic timing and pricing for selling bonus actions in video games. Reject and resubmit at *Management Science*.
- (R-3) R. Chen, B. Jiang, C.T. Ryan, and N. Zhang. A data-driven approach to modeling assortment optimization: The tractable case of similar substitutes. Reject and resubmit at *Management Science*.
- (R-4) S. Kiatsupaibul, G. Pedrielli, C.T. Ryan, R.L. Smith, and Z.B. Zabinsky. Monte Carlo fictitious play for finding a Nash equilibrium of an identical interest game. Revision requested at *INFORMS Journal on Optimization*.

#### **Submitted papers**

- (S-1) J. Han, C.T. Ryan, and X.T. Tong. Algorithms for loot box design.
- (S-2) H.-S. Ahn, C.T. Ryan, J. Uichanco, and M. Zhang. On the performance of certainty equivalent pricing.
- (S-3) M. Zhang, C.T. Ryan, W. Sun, and M. Ettl. Attribute-based pricing: A novel formulation and convergent algorithms.

#### **Working papers**

- (WP-1) C. Lam, C.T. Ryan, and M.W. Wu. Managing the release of consumable digital goods in freemium games.

#### **Work in progress**

- (WIP-1) H.-S. Ahn, C.T. Ryan, J. Uichanco, and M. Zhang. Valuing influence.
- (WIP-2) R. Fu, C.T. Ryan, and M. Zhang. Learn or signal for lean startups.
- (WIP-3) R. Ke and C.T. Ryan. Information trigger contracts.
- (WIP-4) C.T. Ryan, R.L. Smith, and M.A. Epelman. Minimum spanning trees in infinite graphs.
- (WIP-5) Y. Li, C.T. Ryan, L. Sheng, and B. Wong. Optimal world design in video games.
- (WIP-6) S. He, M. Zheng, C.T. Ryan, D. Yao. Operational transparency under competition.
- (WIP-7) V. Nourani and C.T. Ryan. Multi-object social learning and technology adoption in Ghana: Learning from friends and reacting to acquaintances.
- (WIP-8) C.T. Ryan and R.L. Smith. On the definition of infinite-dimensional polytopes.
- (WIP-9) J. Han, T. Huh, and C.T. Ryan. Customer discrimination on two-sided platforms.
- (WIP-10) J. Han, M. Nagarajan, and C.T. Ryan. Optimal rebalancing mechanism for dockless bike-sharing systems.

#### **Permanent working papers**

M. Köppe, M. Queyranne and C.T. Ryan. Implementability of ordinal preferences.

GRANTS, HONORS  
AND AWARDS

Sauder School of Business, CPA Graduate Teaching Award, 2022  
Sauder School of Business, Junior Faculty Research Award, 2020  
Sauder School of Business Exploratory Research Grant, 2020-2022  
Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant, 2020-2025  
Booth School of Business, Faculty Excellence Award for teaching in the Evening and Weekend MBA program, 2018  
Natural Sciences and Engineering Research Council of Canada (NSERC) Postgraduate Scholarship, 2005-2009  
Shelby L. Brumelle Memorial Scholarship, 2008-2009  
E. D. MacPhee Memorial Fellowship, 2005-2009  
NSERC Undergraduate Student Research Award, 2004  
Chancellor's Entrance Scholarship, University of British Columbia, 2002-2005  
Canada Post Corporation Scholarship, 1998-2001  
Board of Governor's Scholarship, University of Guelph, 1998-2001  
Governor General Bronze Medal, 1998. Top graduating student from Penticton Secondary School.

PRESENTATIONS

**Plenaries**

2021: INFORMS Speaker Series Webinar

**Invited seminars**

2022: Penn State (scheduled), Notre Dame (scheduled), Virginia Tech INFORMS student chapter (scheduled)

2021: Arizona State University, University of British Columbia (Institute for Applied Mathematics), Dartmouth Tuck, Shanghai Jiaotong, Xian Jiaotong-Liverpool, NYU Shanghai, National University of Singapore, Virginia Tech INFORMS student chapter, University of Illinois-Chicago, Boston College

2020: CMU Tepper, University of British Columbia (Vancouver School of Economics), University of British Columbia (Sauder)

2019: Washington University in Saint Louis, UT Austin, University of Florida, Chinese Academy of Science, Central University of Finance and Economics, Beijing Normal University, Rice, Columbia (joint IEOR-DRO)

2018: University of Toronto (Rotman), Johns Hopkins (Carey), Harvard Business School, Chinese Academy of Science (Institute for Computational Mathematics), Hong Kong Baptist University (Economics), Minzu University, University of Wisconsin-Madison (Business School and Industrial Engineering), Duke Fuqua, University of Michigan (Ross and IOE), UCLA (Anderson), MIT (IDSS), University of Virginia (Darden), Cornell (Johnson), Wake Forest (Business School), University of British Columbia (Sauder), University of Alberta (Business School)

2017: University of Southern California (ISE), University of British Columbia (Sauder), Simon Fraser University (Mathematics), University of Chicago (Booth)

2016: University of Kansas, University of Washington (IE), University of Waterloo (Management Sciences), University of Toronto (IE), University of British Columbia

2015: Chinese University of Hong Kong (Economics), University of Alberta

2014: New York University, University of California-Irvine, Northwestern University, University of Michigan-Ann Arbor (IOE), Georgia Tech (ISyE), CMU Tepper, Shanghai University of Finance and Economics, Massachusetts Institute of Technology, Haverford College (Mathematics), University of Indiana-Bloomington (Telecommunications), University of Minnesota (ISyE), University of British Columbia-Okanagan (Mathematics)

2012: University of British Columbia, Universidad de Chile, Chinese Academy of Science

2010: University of Southern California, University of Chicago, New York University, MIT

2009: Chinese Academy of Science, Peking University, University of California-Davis

2008: University of British Columbia, Simon Fraser University, University of Washington, University of Magdeburg

### **Invited conference presentations**

2019: POMS, INFORMS Annual Meeting

2018: INFORMS Optimization, POMS, International Symposium of Mathematical Programming (ISMP), INFORMS Annual Meeting

2017: SIAM Conference on Optimization (SIOPT), INFORMS Annual Meeting

2016: International Conference on Continuous Optimization (ICCOPT), INFORMS Annual Meeting

2015: INFORMS Annual Meeting, International Symposium of Mathematical Programming (ISMP)

2014: INFORMS Annual Meeting, Manufacturing and Services Operations Management (MSOM), SIAM Conference on Optimization (SIOPT)

2012: INFORMS Annual Meeting, ISMP

2010: Behavioral and Quantitative Game Theory, INFORMS Annual Meeting

2009: ISMP, American Mathematical Society (AMS) Spring Western Section Meeting, San Francisco, 25–26 April 2009.

2008: American Mathematical Society (AMS) Fall Western Section Meeting

### **TEACHING EXPERIENCE**

#### **University of British Columbia**

*Instructor*

**Mar-Apr, 2022**

Operations (BASC 550). Master's of management required course.

*Instructor*

**Jan-Apr, 2022**

Advanced Topics in Optimization (COMM 612). Infinite dimensional optimization. PhD course.

*Instructor*

**Nov-Dec 2019, Mar-April 2021, Nov-Dec 2021**

Operations (BASC 550). MBA required course.

*Instructor* **Nov-Dec 2019-2021**  
Supply chain management (BASC 523). Master's of Management Dual Degree required course.

*Instructor* **Sep-Oct 2020, Nov-Dec 2021**  
Operations (BASC 550). PMBA (professional MBA) required course.

*Instructor* **Jan-Mar 2020, Sep-Oct 2020**  
Optimization theory and applications (COMM 616). Convex analysis. PhD course.

*Instructor* **May-June 2009**  
Logistics and Operations Management (COMM 399). Undergraduate.

*Instructor* **Jan - Apr, 2008**  
Applications of Statistics in Business (COMM 291). Undergraduate.

### University of Chicago

*Instructor* **Jan-Mar, Sep-Dec 2017, Apr-June 2019**  
Managing Service Operations (BUS 40110) MBA program.  
• Developed case materials in collaboration with multiple companies for course projects in the course, including with former Booth students with startups.

*Instructor* **Mar-June 2011, 2012, 2013, 2015 Sep-Dec, 2013, 2015**  
Operations Management: Business Process Fundamentals (BUS 40000) MBA program.

*Instructor* **Mar-Apr 2016**  
Combinatorial Optimization (BUS 40610) PhD program.

*Instructor* **Jan-Mar 2012, Apr-June 2014, 2019**  
Optimization in Topological Vector Spaces (BUS 36904 Special Topics in Management Science). PhD program.

### CASE STUDIES

#### In development

ezza Nails (with Kim Marsh and Lindsey Joseph)

Advocate Children's Sleep Network (with Darius Loghmanee, Matthew Balog, and Noah Hamilton)

VOCCEL: Early Childhood Education in Chicago (with Kelly Powers and Victoria Lansdown)

The Minte: Hotel-Style Housekeeping (with Kat Wilson and Melanie Jackson)

BrewBike (with Randy Paris and Hariharan Mahadevan)

Kumwe Harvest: Social enterprise in Rwanda (with Cyril Khamsi and Alex Sanderson)

Susgrainable (with Jeffrey Ma)

## SERVICE

### *Editorial positions*

Associate editor at *Operations Research Letters*

Associate editor at *Management Science*

### *Program Committees*

ACM Conference on Economics and Computation 2018 (ACM-EC'18) Workshop on Operations of People-Centric Systems at EC'21 (ACM-EC'21)

### *Ad-hoc reviewer*

Operations Research, Management Science, Manufacturing & Service Operations Management, Production and Operations Management, Mathematics of Operations Research, Econometrica, Games and Economic Behavior, Mathematical Programming, SIAM Journal on Optimization, INFORMS Journal of Computing, European Journal of Operational Research, International Journal of Game Theory, Networks, Journal of Mathematical Economics, Operations Research Letters, Economics Letters, Journal of Combinatorial Optimization, Workshop in Networks and Economics (WINE), Optimization Letters, Healthcare Management Science

### *NSF panelist (2015)*

### *NSERC Discovery Grant reviewer (2017, 2018, 2021)*

### *PhD students (advisor/co-advisor role)*

Jiangze Han (UBC)

### *PhD committee member*

Vishal Ahuja (Booth), Xiao Wu (Booth), Angelo Mancini (Booth), Matt Stern (Booth), Lifei Sheng (UBC), Yifan Feng (Booth), Mengzhenyu Zhang (UMichigan Ross), Meichuan Lin (UBC)

### *Academic mentor to undergraduate students, with most recent academic position indicated*

Runshan Fu (first academic position, NYU Marketing Assistant Professor), Mengzhenyu Zhang (first academic position, UCL Operations Management Assistant Professor), Jiding Zhang (first academic position, NYU Shanghai Operations Management Assistant Professor), Teng Zhang (graduated with PhD from Stanford MS&E), Wenjia Ba (current PhD student at Stanford GSB), Tongxin Zhou (current PhD student at University of Washington in MIS), Ren Yi (current PhD student at Columbia University in IEOR), Jiazhen Li, Siyue Liu, Benny Wong

### *Conference organization*

Mixed Integer Programming Workshop (local committee, hosted at Gleacher Center, University of Chicago, 2015)

INFORMS-CORS International Conference (program committee, Vancouver, 2022)