Ryan Cory-Wright

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Academic Appointments

Imperial College London, Imperial College Business School — *London, UK*
Assistant Professor of Analytics and Operations — *Jul. 2023-present*
Affiliated Faculty, Imperial-X AI Initiative — *Jul. 2023-present*

IBM Research, MIT-IBM Research Lab — *Cambridge, MA*
Herman Goldstine Postdoctoral Fellow — *Jul. 2022-Jun. 2023*

Education

Massachusetts Institute of Technology, Operations Research Center — *Cambridge, MA*
Ph.D. in Operations Research — *Sept. 2017-May. 2022*
Thesis committee: Dimitris Bertsimas (advisor), Alexandre Jacquillat, Robert Freund
Thesis: Integer and matrix optimization: A nonlinear approach | Link to 5-page summary | GPA: 5.0/5.0

University of Auckland, Faculty of Engineering — *Auckland, New Zealand*
B.E. (1st Class Honors) in Engineering Science — *Feb. 2014-Oct. 2016*
Four-year degree completed in three years via accelerated pathway initiative (extra class per semester)
Thesis: Pricing wind under uncertainty | Advisors: Andy Philpott, Golbon Zakeri
Senior Scholar Award (top of graduating class)

Research Interests

- Optimization: integer, semidefinite, conic, polynomial, under uncertainty
- Machine learning and statistics: interpretability, scientific discovery, cross-validation, low-rank
- Applications: business analytics, energy (decarbonization, pricing schemes), finance

Honors and Awards

2024 **Meritorious Reviewer Award**, INFORMS Journal on Computing
2024 **Outstanding Technical Accomplishment Award**, IBM
2023 Honorable Mention, **Student Paper Award**, MIT ORC (Digalakis Jr.)
2023 Finalist, **Practice-Based Research Competition**, M&SOM Society
2022 **IBM Herman Goldstine Fellowship**, IBM Department of Mathematical Sciences
2021 First place, **Student Paper Award**, INFORMS Data Mining Society
2020 First place, **George Nicholson Student Paper Award**, INFORMS
2020 First place, **Pierskalla Paper Award**, INFORMS Health Applications Society
2019 First place, **Student Paper Award**, INFORMS Computing Society
2017 **Senior Scholar Award** (top of graduating class), University of Auckland
2016 First place, **Student Paper Award**, Operations Research Society New Zealand
2014-16 **Dean's List** (top 5% of cohort), Faculty of Engineering, University of Auckland
2013 **Outstanding Scholar** (top 50 high-school students in New Zealand), NZQA

Journal Papers

J12. *Evolving Scientific Discovery by Unifying Data and Background Knowledge with AI Hilbert*
R. Cory-Wright, C. Cornelio, S. Dash, B. El Khadir, and L. Horesh, **Nature Communications** 15:5922, 2024.
- IBM Outstanding Technical Accomplishment Award (2024)

J11. *Decarbonizing OCP*
D. Bertsimas, R. Cory-Wright and V. Digalakis Jr., **Manufacturing & Service Operations Management**, 2024.

- Finalist, M&SOM practice-based research competition (2023)
- Honorable mention, MIT Operations Research Center Student Paper Award (Digalakis, 2023)

J10. *Sparse Plus Low-Rank Matrix Decomposition: A Discrete Optimization Approach*
D. Bertsimas, R. Cory-Wright and N. A. G. Johnson, **Journal of Machine Learning Research**, 24(267):1–51, 2023.
- First place, INFORMS Data Mining Society Student Paper Award (2021)

J9. *A New Perspective on Low-Rank Optimization*
D. Bertsimas, R. Cory-Wright and J. Pauphilet, **Mathematical Programming**, 202(1-2):47–92, 2023.

J8. *Mixed-Projection Conic Optimization: A New Paradigm for Modeling Rank Constraints*
D. Bertsimas, R. Cory-Wright and J. Pauphilet, **Operations Research**, 70(6):3321–3344, 2022.
- First place, INFORMS George Nicholson Student Paper Award (2020)

J7. *A Scalable Algorithm for Sparse Portfolio Selection*
D. Bertsimas and R. Cory-Wright, **INFORMS Journal on Computing**, 34(3):1489-1511, 2022.

J6. *Solving Large-Scale Sparse PCA to Certifiable (Near) Optimality*
D. Bertsimas, R. Cory-Wright and J. Pauphilet, **Journal of Machine Learning Research**, 23(13):1-35, 2022.

J5. *A Unified Approach to Mixed-Integer Optimization Problems With Logical Constraints*
D. Bertsimas, R. Cory-Wright and J. Pauphilet, **SIAM Journal on Optimization**, 31(3):2340-2367, 2021.
- First place, INFORMS Computing Society Student Paper Award (2019)
- Abridged eight-page version in 2020 INFORMS Computing Society Newsletter [link]

J4. *From Predictions to Prescriptions: A Data-Driven Response to COVID-19*
D. Bertsimas, L. Bouissoux, R. Cory-Wright et al., **Health Care Management Science**, 24:253-272, 2021.
- First place, INFORMS Healthcare Applications Society William Pierskalla Paper Award (2020).

J3. *On Stochastic Auctions in Risk-Averse Electricity Markets With Uncertain Supply*
R. Cory-Wright and G. Zakeri, **Operations Research Letters**, 48(3):376-384, 2020.

J2. *On Polyhedral and Second-Order Cone Decompositions of Semidefinite Optimization Problems*
D. Bertsimas and R. Cory-Wright, **Operations Research Letters**, 48(1):78-85, 2020.

J1. *Payment Mechanisms for Electricity Markets With Uncertain Supply*
R. Cory-Wright, A. Philpott and G. Zakeri, **Operations Research Letters**, 46(1):116-121, 2018.
- First place, Operations Research Society of New Zealand Student Paper Award (2016)
- Preliminary version "Cost-recovering, revenue-adequate single settlement schemes for electricity markets" in Proc. 2016 Joint NZSA and ORSNZ conference.

Working Papers

W4. *Stability-Adjusted Cross-Validation for Sparse Linear Regression*
R. Cory-Wright and A. Gómez, in preparation, early draft available at arXiv 2306.14851.

W3. *Optimal Low-Rank Matrix Completion: Semidefinite Relaxations and Eigenvector Disjunctions*
D. Bertsimas, R. Cory-Wright, S. Lo and J. Pauphilet, submitted.

W2. *Sparse PCA With Multiple Components*
R. Cory-Wright and J. Pauphilet, major revision at **Operations Research**.

W1. *A Stochastic Benders Decomposition Scheme for Large-Scale Stochastic Network Design*
D. Bertsimas, R. Cory-Wright, J. Pauphilet and P. Petridis, major revision at **INFORMS Journal on Computing**.

Articles in Preparation

P6. *Abductive Reasoning in Scientific Discovery via Polynomial Optimization*
K. Srivastava, S. Dash, R. Cory-Wright and L. Horesh, in progress.

P5. *Improving on Representative Days in Renewable Energy Systems*
D. Keenan, R. Cory-Wright and A. Philpott, in progress.

P4. *Thinking Coherently About Interpretability*
R. Cory-Wright and A. Jacquillat, in progress.

P3. *Semidefinite Programming Relaxation for Copositive Dual Pricing*
C. Guo, S. Kelly, L. Henderson, B. Yang, and R. Cory-Wright, in progress.

P2. *A Matrix Generalization of the Goemans-Williamson Algorithm With Application to Orthogonality Constraints*
R. Cory-Wright and J. Pauphilet, in progress.

P1. *A Scalable Approximation Algorithm for Robust and Distributionally Robust Optimization*
L. Meng, R. Cory-Wright, and W. Wiesemann, in progress.

Books in Preparation

Integer and Matrix Optimization: A Nonlinear Approach
D. Bertsimas, R. Cory-Wright, and J. Pauphilet, Dynamic Ideas Press.

Teaching at Imperial

Introduction to Machine Learning in Python (MSc AI Applications and Innovation) *Imperial-X*
INSTRUCTOR *Fall 2024*
Designed a new MSc class that introduces students to machine learning and Python.

Decision Making Under Uncertainty (PhD) *Imperial Business School*
INSTRUCTOR *Spring 2024, 2025*
Designed a new PhD class introducing stochastic optimization, robust optimization, and dynamic programming.
Spring 2024 evaluation: **4.7/5** (overall), **4.6/5** (instructor), **4.7/5** (content). Syllabus available [here]

Data Structures and Algorithms (undergraduate) *Imperial Business School*
INSTRUCTOR *Spring 2024, 2025*
Designed a new class that introduces computational problem-solving via algorithms and data structures in Python.
Spring 2024 evaluation: **4.4/5** (overall), **4.2/5** (instructor), **4.3/5** (content).

Optimisation and Decision Models (online MSc business analytics) *Imperial Business School*
INSTRUCTOR *Spring 2024*
Online class that introduces students to theory and applications of linear, discrete, and nonlinear optimization.
Spring 2024 evaluations: **4.2/5** (overall), **4.3/5** (instructor), **4.5/5** (content).

Teaching at MIT

15.095 Machine Learning Under a Modern Optimization Lens (MBAn/PhD) *MIT*
HEAD TEACHING ASSISTANT *Fall 2019, 2021*
Course which provides a modern treatment of machine learning using convex, robust, and integer optimization.

15.071 The Analytics Edge (MBA) *MIT*
HEAD TEACHING ASSISTANT *Fall 2020*
Course which examines real-world examples of how analytics have been used to transform a business or industry.

15.093 Optimization Methods (MSc/PhD) *MIT*
TEACHING ASSISTANT *Fall 2018*
Course which provides students with an overview of the main algorithms and applications of optimization.

Kaufman Teaching Certificate Program *MIT Teaching and Learning Lab*
PARTICIPANT, eight practice-based workshops on teaching effectiveness *Fall 2021*

15.S60 Computing in Optimization and Statistics (PhD) *MIT*
INSTRUCTOR *Jan 2019, Jan 2020*
Course which provides an overview of software tools used in optimization, including Julia and JuMP.

15.089 Master of Business Analytics Capstone — *MIT*
Capstone Project Mentor — *Summer 2018, Summer 2019*

Student Advising

Doctoral Students

1. Lingjun Meng, *First year MRes/PhD student at Imperial Business School* (co-advised with Wolfram Wiesemann, research on optimization under uncertainty).

Student Co-authors

1. Dominic Keehan, *Third year PhD student at University of Auckland* (advised by Andy Philpott, Andrew Mason).
   - Visiting Imperial Business School July-September 2024.
2. Nicholas Johnson, *Fourth year PhD student at MIT ORC* (advised by Dimitris Bertsimas).
   - Coauthored paper awarded 1st place, 2021 INFORMS Data Mining Student Paper Award.
3. Periklis Petridis, *Third year PhD student at MIT ORC* (advised by Dimitris Bertsimas).
4. Vassilis Digalakis Jr., *PhD ('23) at MIT ORC* (advised by Dimitris Bertsimas).
   - Initial placement: Assistant Professor of Operations Management, HEC Paris.
   - Co-authored job market paper, awarded finalist in 2023 M&SOM practice-based research competition and honorable mention in 2023 MIT ORC student paper competition.
5. Sean Lo, *MBAn ('22) at MIT Sloan* (advised by Dimitris Bertsimas).
   - Initial placement: MIT ORC doctoral program, advised by Alexandre Jacquillat.

Invited Oral Presentations

Invited Presentations at Academic Institutions

Title TBD
- IBM TJ Watson Research Center — *November 2024*

Evolving Scientific Discovery by Unifying Data and Background Knowledge with AI Hilbert
- Imperial College London Artificial Intelligence Initiative — *November 2024*

Optimal Low-Rank Matrix Completion: Semidefinite Relaxations and Eigenvector Disjunctions
- Imperial-X AI Seminar Series — *November 2024*
- Toronto Rotman Young Scholar's Seminar Series — *November 2023*
- Imperial College London Control and Optimization — *November 2023*

A New Perspective on Low-Rank Optimization
- Lehigh Industrial and Systems Engineering — *November 2022*

Mixed-Projection Conic Optimization: A New Paradigm for Modeling Rank Constraints
- Imperial College London AI Cutting Edge Overviews and Tutorials — *August 2024*
- IBM Thomas J Watson Research Center — *August 2022*
- Rice Computational Applied Mathematics and Operations Research — *January 2022*
- CMU Tepper Operations Research — *January 2022*
- USC Viterbi Industrial and Systems Engineering — *January 2022*

- Georgia Tech Industrial and Systems Engineering *January 2022*
- Johns Hopkins Carey Operations Management *January 2022*
- Princeton Operations Research and Financial Engineering *January 2022*
- Imperial College London Analytics and Operations *October 2021*
- University of Auckland Engineering Science *October 2020*

Invited Presentations at Single-Track Workshops

Evolving Scientific Discovery by Unifying Data and Background Knowledge with AI Hilbert

- Summer Workshop on Innovations in Management Science *July 2024*

Optimal Low-Rank Matrix Completion: Semidefinite Relaxations and Eigenvector Disjunctions

- Mixed Integer Programming Workshop *May 2023*

Conference Presentations and Guest Lectures

Evolving Scientific Discovery by Unifying Data and Background Knowledge with AI Hilbert

- INFORMS Optimization Society *March 2024*

Optimal Low-Rank Matrix Completion: Semidefinite Relaxations and Eigenvector Disjunctions

- International Symposium on Mathematical Programming *July 2024*
- INFORMS Annual Meeting *October 2023*
- SIAM Conference on Optimization *June 2023*

Decarbonizing OCP

- M&SOM Practice-Based Research Competition Finalists *June 2023*
- M&SOM Africa Session *June 2023*

Sparse PCA With Multiple Components

- INFORMS Annual Meeting *October 2022*

A New Perspective on Low-Rank Optimization

- ICCOPT *July 2022*
- INFORMS Optimization Society *March 2022*
- INFORMS Annual Meeting *October 2021*

Mixed-Projection Conic Optimization: A New Paradigm for Modeling Low-Rank Constraints

- Mixed Integer Programming Workshop (Poster) *May 2021*
- INFORMS Annual Meeting Nicholson Finalists *November 2020*

Solving Large-Scale Sparse PCA To Certifiable (Near) Optimality

- MIT 15.095 *Machine Learning Under a Modern Optimization Lens* Guest Lecture *November 2021*
- Mixed Integer Programming Workshop (Poster) *May 2020*
- INFORMS Optimization Society Conference (cancelled, COVID-19) *March 2020*

A Unified Approach to Mixed-Integer Optimization Problems With Logical Constraints

- INFORMS Annual Meeting *October 2019*
- ICCOPT *August 2019*

A Scalable Algorithm for Sparse Portfolio Selection

- Mixed Integer Programming Workshop (Poster) *May 2019*
- INFORMS Annual Meeting *November 2018*

Payment Mechanisms and Risk-Aversion in Electricity Markets With Uncertain Supply

- International Symposium on Mathematical Programming *July 2018*
- ORSNZ Young Practitioner's Prize Finalists Session *December 2016*

Other Academic and Industry Experience

OCP Group and MIT Operations Research Center *Cambridge, MA*
Research Assistant *Jul. 2021-May 22*

University of Auckland, Department of Engineering Science *Auckland, New Zealand*
Research Assistant *Dec. 2016-Jul. 17*

SUEZ Smart Solutions *Auckland, New Zealand*
Assistant Optimization Engineer *Dec. 2014-Feb. 2016*

Activities and Service

Organizing seminars and workshops

2024- Co-initiator and co-organizer, London Operations Research Day (LORD) [web link],
Various Session chair, INFORMS Annual Meeting, ICCOPT, IOS, SIOPT, other conferences
2019 Co-initiator and co-coordinator, MIT ORC student seminar series

External

2024 Judge, M&SOM Student Paper Competition,
2017- Member, INFORMS (Main, Computing Society, Optimization Society)
Member, Mathematical Optimization Society

Imperial

2024-25 Thesis committee member, Aras Selvi
2024- Program co-lead, Imperial-X executive education,
2024 PhD early stage assessment committee, Zhongze Cai, Yanwei Sun

MIT

2020 MIT MBAn capstone project matching, Wrote software to allocate 60 masters students to industry projects, accounting for student preferences
2019 MIT ORC qualifying exam, tester and proctor

Peer Review

Reviewer for major academic journals, including: *Operations Research (OR), Management Science (MS), Manufacturing and Service Operations Management (M&SOM), Mathematical Programming (MAPR), Journal of Machine Learning Research (JMLR), Mathematics of Operations Research (MOOR), Integer Programming and Combinatorial Optimization (IPCO), Foundations of Computational Mathematics (FOCM), INFORMS Journal On Computing (IJOC), INFORMS Journal on Optimization (IJOO), SIAM Journal on Optimization (SIOPT), Transportation Science (TS), SIAM Journal on Matrix Analysis and Applications (SIMAX), SIAM Journal on Mathematics of Data Science (SIMODS), Operations Research Letters (ORL), European Journal of Operational Research (EJOR), etc.*

- 2024 Meritorious Reviewer Award, INFORMS Journal on Computing.