Marco Caoduro

Postdoctoral Research Fellow in Combinatorial Optimization

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Research Experience

Dec 2022 – Dec 2025 **Postdoctoral Research Fellow**, *Sauder School of Business, UBC, Canada.*
Advisors: *Joseph Paat (Sauder School of Business, UBC) and Bruce Shepherd (CS Department, UBC).*

Education

Oct 2019 – Nov 2022 **PhD in Combinatorial Optimization**, *Laboratoire G-SCOP, Univ. Grenoble Alpes (UGA), France*,
PhD Title: *Geometric challenges in Combinatorial Optimization: packing, hitting, and coloring rectangles*,
Supervisors: *András Sebő (Lab. G-SCOP, CNRS) and Matěj Stehlík (Lab. IRIF, Université Paris Cité).*

Oct 2017 – Sep 2019 **Master's degree in Mathematics, 110/110 with honours**, *Department of Computer Science, Università degli Studi di Verona, Italy*,
Thesis Title: *Dypergraph connectivity augmentation: an uncrossing approach*,
Supervisors: Giuseppe Mazzuoccolo and András Frank.

Feb 2019 – Aug 2019 **Erasmus+ for Traineeship**, *Egerváry Research Group on Combinatorial Optimization, ELTE, Budapest, Hungary.*

Sep 2018 – Feb 2019 **Erasmus+ for Studying**, *Facultad de Matemáticas, Universidad de Murcia, Spain.*

Oct 2014 – Sep 2017 **Bachelor's Degree in Applied Mathematics, 110/110 with honours**, *Department of Computer Science, Università degli Studi di Verona, Italy*,
Thesis Title: *A Markov Chain approach to dependent opinions analysis with residuals treatment*,
Supervisor: Luca Di Persio.

Publications

Dec 2024 **Packing, hitting, and colouring squares**,
Journal of Computational Geometry, Volume 15, No.1,
with András Sebő, <u>link</u>.

Oct 2023 **Boxicity and Interval-Orders: Petersen and the Complements of Line Graphs**,
The 31st International Symposium on Graph Drawing and Network Visualization, Isola delle Femmine,
with András Sebő, <u>link</u>.

Sep 2023 **A lower bound for constant-size local certification**,
Theoretical Computer Science, Volume 971, 114068,
Best paper award at Stabilization, Safety, and Security of Distributed Systems (SSS 2022),
with Virginia Ardévol Martínez, Laurent Feuilloley, Jonathan Narboni, Pegah Pournajafi, and Jean-Florent Raymond, <u>link</u>.

Sep 2023 **On the independence number of intersection graphs of axis-parallel segments**,
Journal of Computational Geometry, Volume 14, No. 1,
with Jana Cslovjecsek, Michał Pilipczuk, and Karol Węgrzycki, <u>link</u>.

May 2023 **On the Boxicity of Kneser Graphs and Complements of Line Graphs**,
Discrete Mathematics, Volume 346, Issue 5, 113333,
with Lyuben Lichev, <u>link</u>.

Preprints

Aug 2025 **A polynomial algorithm to compute the boxicity and threshold dimension of complements of block graphs**,
arXiv:2510.02199 (submitted to a conference),
with Will Evans and Tao Gaede, link.

Jan 2025 **On the Boxicity of Line Graphs and of Their Complements**,
arXiv:2501.05049,
with András Sebő, link.

Dec 2024 **A characterization of unimodular hypergraphs with disjoint hyperedges**,
arXiv:2411.10593 (submitted to a journal),
with Meike Neuwohner and Joseph Paat, link.

Nov 2022 **Geometric challenges in combinatorial optimization: packing, hitting, and coloring rectangles**,
PhD Thesis, link.

Teaching Experience

Summer 2024 **Logistics and Operations Management**, *UBC Sauder School of Business, Canada.*

Spring 2022 **Algorithms and Data Structures**, *Master's degree ENSIMAG, Grenoble INP, France.*

Fall 2021 **Graphs and Applications**, *Master's degree PHELMA, Grenoble INP, France.*

Fall 2020 **Algorithms and programming in Python**, *Bachelor's degree PCM-int, Department of Science and Technology Licence, Univ. Grenoble Alpes, France.*

Spring 2018 **Operations Research (practical course)**, *Bachelor's degree in Applied Mathematics, Università degli Studi di Verona, Italy.*

Fall 2017 **Stochastic System (practical course)**, *Bachelor's degree in Applied Mathematics, Università degli Studi di Verona, Italy.*

Student Supervision

Dec 2023 –
Apr 2024 **PIMS Virtual Experimental Mathematics Lab**, *PIMS, Canada*,
Supervised three undergraduate and one graduate students on the project *Exploring Boxicity: Graph Representations in Multidimensional Spaces*.

May 2021 –
Sep 2021 **Edge-coloring problems for geometric intersection graphs**, *Univ. Grenoble Alpes, France*,
Supervised Thomas Boudier, a Master's Student at IMAG.

Selected Talks

Apr 2025 **PIMS M2PI Case Studies Virtual Seminar**, *University of British Columbia, Canada*,
Title: *Optimizing Phase Balancing in Electric Grids: A Mixed Integer Programming Approach.*

Mar 2025 **Discrete Math Seminar**, *University of Victoria, Canada*,
Title: *Boxicity: Representing graphs with low-dimensional boxes.*

Oct 2024 **2024 INFORMS Annual Meeting**, *Seattle, USA*,
Title: *A characterization of unimodular hypergraphs with disjoint hyperedges.*

Feb 2024 **Institute of Applied Mathematics Seminar**, *University of British Columbia, Canada*,
Title: *Algorithmic Challenges Surrounding Colorful Carathéodory's Theorem.*

Jun 2023 **CanaDAM 2023**, *University of Manitoba and University of Winnipeg, Canada*,
Title: *On the boxicity of the Kneser Graph K(n,2).*

Jul 2022 **11th International Colloquium on Graph Theory and combinatorics (ICGT 2022)**, *Université de Montpellier, France*,
Title: *On the Hitting/Packing Ratio of Axis-Parallel Segments.*

Nov 2021 **Distributed Algorithms and Graphs Seminar**, *Lab. IRIF, Université Paris Cité, France*,
Title: *Hitting and packing squares.*

Nov 2021 **Journées Graphes et Algorithmes**, *French-speaking community of graph theory, ONLINE*,
Title: *Hitting and packing rectangles with a bounded aspect ratio.*

Workshops

May 2025 – Jul 2025   ***PIMS Math to Power Industry 2025***, Workshop connecting graduate students and postdocs with industry partners to solve real-world problems using mathematical sciences. Project: *Smart Access to the BC Building Code via Retrieval-Augmented Generation*, Industry Partner: *Clause Technology*.

May 2024 – Jul 2024   ***PIMS Math to Power Industry 2024***, Co-organizer and participant of the workshop. Project: *Fixing Phase Imbalances in an Awesense Grid: An Integer Programming Approach*, Industry Partner: *Awesense*.

Feb 2023 – Mar 2023   ***Instructional Skills Workshop, UBC***, Participated in the workshop, designing and teaching short lessons with peer feedback, focusing on learner-centred and active learning strategies..

Mar 2021 – Sep 2021   **Teaching education**, *Università degli Studi di Verona, Italy*, Courses: Teaching Methodology, Pedagogy, Anthropology, Psychology.

Certifications

Deep Learning Specialization, *DeepLearning.AI*,
Courses: Neural Networks and Deep Learning, Convolutional Neural Networks, Sequence Models.

Machine Learning Specialization, *DeepLearning.AI and Stanford University*,
Courses: Supervised Machine Learning: Regression and Classification, Advanced Learning Algorithms, Unsupervised Learning, Reinforcement Learning.

Professional skills

Languages   Italian (native), English (IELTS score: $8.0/9.0$), French (fluent), Spanish (intermediate)

Programming   LaTeX, Python, JAX, SageMath

Hobbies

Long-distance Running, Chess, Yoga, and Plant-based Cooking.

References

András Sebő (*andras.sebo(at)grenoble-inp.fr*), Directeur de Recherche, CNRS, Lab. G-SCOP, France
Joseph Paat (*joseph.paat(at)sauder.ubc.ca*), Associate Professor, Sauder School of Business, Canada
Will Evans (*will(at)cs.ubc.ca*), Emeritus Professor, CS Department, UBC, Canada
Bruce Shepherd (*fbrucesh(at)cs.ubc.ca*), Professor, CS Department, UBC, Canada