Bento Natura

Assistant Professor · Columbia University

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Research Interests

Algorithms, optimization, and game theory. Specific interests include linear programming, interior point methods, convex optimization, combinatorial optimization, and circuit geometry of polytopes.

Positions

Assistant Professor in Industrial Engineering & Operations Research (IEOR) *since 2024*
Columbia University, *New York City, NY*

Beerman Postdoctoral Fellow *2022 – 2024*
Georgia Institute of Technology, *Atlanta, GA*
Joint affiliations with ISyE and the College of Computing.

Postdoctoral Research Fellow *Fall 2023*
University of California, Berkeley, *Berkeley, CA*
Long Term Participant, program on *Data Structures and Optimization for Fast Algorithms* at the Simons Institute.

Postdoctoral Fellow *Spring 2023*
Brown University (ICERM), *Providence, RI*
Program: *Discrete Optimization: Mathematics, Algorithms, and Computation*.

Industry & Other

Visiting Associate, The Boston Consulting Group, *Munich, Germany* *2018*
Junior Consultant, TNG Technology Consulting, *Munich, Germany* *2018*
Research Assistant, Research Institute for Discrete Mathematics, *Bonn, Germany* *2014 – 2017*

Education

PhD in Mathematics *2018 – 2022*
London School of Economics and Political Science, *London, UK*
Supervisor: László Végh. Thesis: *Exact Linear Programming: Circuits, Curvature, and Diameter*.

MSc in Mathematics *2012 – 2017*
University of Bonn, *Bonn, Germany*
Thesis: *Algorithms for Routing and Buffer Insertion*. GPA: 4.0/4.0.

Honors & Awards

Richard Rado Prize *Oct 2024*
German Mathematical Society, *TU Berlin*
Biennial prize for the best dissertation in Discrete Mathematics.

Runner-Up for The Doctoral Award *Oct 2023*
The Operational Research Society (UK)

PhD Prize *Jul 2023*
Department of Mathematics, London School of Economics

Dodu Prize ◇ Best Talk of a Young Researcher *Sep 2020*
SMAI-MODE, *Université Paris-Saclay*

Publications

In theoretical computer science, papers are typically first published at peer-reviewed conferences. Authors are ordered alphabetically.

Preprints

[1] **B. Natura**. "Circuit Diameter of Polyhedra is Strongly Polynomial." *Preprint*, 2026. [PDF]

Published

[2] X. Allamigeon, D. Dadush, G. Loho, **B. Natura**, L.A. Végh. "Interior Point Methods Are Not Worse Than Simplex." *SIAM Journal on Computing*, 2025 (FOCS 2022 Special Issue). [arXiv:2206.08810]

[3] D. Dadush, Z.K. Koh, **B. Natura**, N. Olver, L.A. Végh. "A Strongly Polynomial Algorithm for Linear Programs with at Most Two Non-Zero Entries per Row or Column." *STOC*, 2024. [PDF]

[4] D. Dadush, Z.K. Koh, **B. Natura**, L.A. Végh. "On Circuit Diameter Bounds via Circuit Imbalances." *Mathematical Programming*, 2024 (IPCO 2022). [arXiv:2111.07913]

[5] D. Dadush, S. Huiberts, **B. Natura**, L.A. Végh. "A Scaling-Invariant Algorithm for Linear Programming Whose Running Time Depends Only on the Constraint Matrix." *Mathematical Programming*, 2023 (STOC 2020). [arXiv:1912.06252]

[6] S. Jiang, **B. Natura**, O. Weinstein. "A Faster Interior-Point Method for Sum-of-Squares Optimization." *Algorithmica*, 2023 (ICALP 2022). [arXiv:2202.08489]

[7] S. Daboul, S. Held, **B. Natura**, D. Rotter. "Global Interconnect Optimization." *ACM Trans. Design Automation of Electronic Systems*, 2023 (ICCAD 2019). [DOI]

[8] D. Dadush, Z.K. Koh, **B. Natura**, L.A. Végh. "An Accelerated Newton-Dinkelbach Method and its Application to Two Variables Per Inequality Systems." *Mathematics of Operations Research*, 2022 (ESA 2021). [arXiv:2004.08634]

[9] F. Ekbatani, **B. Natura**, L.A. Végh. "Circuit Imbalance Measures and Linear Programming." *Surveys in Combinatorics*, 2022. [arXiv:2108.03616]

[10] **B. Natura**, M. Neuwohner, S. Weltge. "The Pareto Cover Problem." *ESA*, 2022. [arXiv:2202.08035]

[11] D. Dadush, **B. Natura**, L.A. Végh. "Revisiting Tardos's Framework for Linear Programming: Faster Exact Solutions using Approximate Solvers." *FOCS*, 2020. [arXiv:2009.04942]

Invited Talks & Presentations

Selected Invited Lectures

14th Cargese Workshop on Combinatorial Optimization, Corsica, France — *Sep 2025*

Summer School on Linear Program Solvers, Georgia Tech, Atlanta — *Jun 2025*

"A Unified Analytical Approach to Strongly Polynomial Algorithms for Structured Linear Programs"

Oberseminar Discrete Optimization, University of Bonn, Germany — *Jul 2025*

Conference & Seminar Presentations

"A strongly polynomial algorithm for the minimum-cost generalized flow problem"

Foundations of Data Science Seminar, Yale University, CT — *Sep 2024*

Tutte Distinguished Lecture Series, University of Waterloo, Canada — *Sep 2024*

MOPTA 2024, Lehigh University, PA — *Aug 2024*

ICERM, Brown University, Providence, RI — *Aug 2024*

Mixed Integer Programming Workshop (MIP 2024), Lexington, KY — *Jun 2024*

Workshop on Combinatorial Optimization, Aussois, France — *Jan 2024*

Special Seminar, IEOR, UC Berkeley — *Nov 2023*

INFORMS 2023, Phoenix, AZ — *Oct 2023*

Semester Program on Fast Algorithms, Simons Institute, UC Berkeley — *Sep 2023*

"Breaking the quadratic gap for strongly polynomial solvers to combinatorial linear programs"

INFORMS 2024, Seattle, WA — *Oct 2024*

ISMP 2024, Montreal, Canada — *Jul 2024*

ICIAM 2023, Tokyo, Japan — *Aug 2023*

CS Theory Seminar, Columbia University — *Apr 2023*

CGO Seminar, London School of Economics — *Dec 2022*

ACO Seminar, Georgia Institute of Technology — *Nov 2022*

"Recovering strong polynomiality via straight-line-complexity"

Semester Program on Discrete Optimization, ICERM, Brown University — *May 2023*

"Interior point methods are not worse than Simplex"

FOCS 2022, Denver, CO — *Nov 2022*

Young Researchers Workshop, Cornell University — *Oct 2022*

Workshop on Combinatorial Optimization, Cargese, France — *Sep 2022*

"A Faster Interior-Point Method for Sum-of-Squares Optimization"

ICALP 2022, Paris, France — *Jul 2022*

"Circuit imbalance measures and linear programming"

Focused Workshop on Integer Programming, Rényi Center, Budapest — *Aug 2023*

Workshop on Circuits and Optimization, University of Colorado Denver — *May 2023*

Semester Program Seminar, ICERM, Brown University — *Feb 2023*

Theory Seminar, University of Washington — *Mar 2022*

Northwestern Junior Theorist Workshop, Northwestern University — *Dec 2021*

Hausdorff Trimester on Discrete Optimization, University of Bonn — *Oct 2021*

"A scaling-invariant algorithm for linear programming whose running time only depends on the constraint matrix"

SMAI MODE, Université Paris-Saclay — *Sep 2020*

Research Seminar, Columbia University — *Sep 2020*

STOC 2020, Chicago, IL (virtual) — *Jun 2020*

Seminar on Combinatorics, Games and Optimisation, London School of Economics — *Dec 2019*

"Revisiting Tardos's Framework for Linear Programming"

HALG 2021, London School of Economics — *Jun 2021*

FOCS 2020, Duke University (virtual) — *Nov 2020*

Postgraduate Combinatorial Conference, Oxford University — *Jun 2019*

Teaching

Columbia University ◇ Course Instructor

Advanced Optimization (IEOR 3609) — *Spring 2025, 2026*

Convex Optimization (EEOR 6616) *Spring 2026*
Fast Algorithms for Linear Programs (IEOR 8100) *Spring 2025*

London School of Economics ◇ Teaching Assistant

Reinforcement Learning — TA & joint course development *2022*
Foundations of Machine Learning — TA & joint course development *2021, 2022*
Algorithms and Programming *2020*
Programming in C++ *2019*
Operational Research Methods *2019*
Further Mathematical Methods *2018*

University of Bonn ◇ Teaching Assistant

Combinatorics, Graphs and Matroids *2016*
Calculus *2013*

Service

Seminar Organization *since Spring 2025*
Co-organizer, IEOR-DRO Seminar, Columbia University.

PhD Admissions Committee *2025, 2026*
IEOR Department, Columbia University.

Program Committees
SODA 2025.

Reviewing
Conferences: FOCS, ICALP, IPCO, ISAAC, SODA, STOC.
Journals: Discrete Optimization, Journal of the ACM, Mathematics of Operations Research, Networks, SIAM Journal on Optimization.