

Gabriele Iommazzo, PhD

Researcher in Mathematical Optimization and Machine Learning

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Education

PhD in Mathematical Optimization and Machine Learning | **École Polytechnique, France** 2021

- **Topics:** mixed-integer linear/nonlinear programming, statistical learning, machine learning-based optimization

MSc Computer Science (110/110 cum Laude) | **Università di Pisa, Italy** 2017

- **Coursework:** convex optimization, linear programming, numerical analysis, operations research, logistics, machine learning, data mining, databases, discrete mathematics, applied numerical linear algebra, algorithms & data structures

BSc Business Administration and Management (104/110) | **Università di Roma Tor Vergata, Italy** 2013

- **Coursework:** statistics, financial mathematics, econometrics, financial accounting, business economics

Experience

Researcher Numerical Optimization | **Zuse Institute Berlin, Germany** 2022-2025

- designed first-order methods for convex optimization (Frank-Wolfe), analyzed their convergence, tested them on large-scale problems involving matrix completion, maxCut, SDP, quantum nonlocality. Tech: Julia, Matlab, Python, R, SLURM
- co-developed column generation solver for vehicle routing planning, using GNNs to forecast the solution of pricing subproblems. Tech: Julia, Python
- supervised 6 students (BSc to PhD), coordinated 1 research internship, organized 4 international workshops/conferences

PhD Candidate Optimization and Machine Learning | **École Polytechnique, France** 2017-2021

- created mixed-integer nonlinear models for distance geometry, tested them on large, graph-based, protein structure reconstruction problems, improved their solution accuracy by up to 7% w.r.t. SotA. Tech: AMPL, Bash, Python
- designed and implemented approach for tuning optimization solver parameters, via mathematical programming and regression-based statistical learning, achieved 93% more accurate solutions than default solver on power plant scheduling problem. Tech: AMPL, Bash, Python
- taught 1 course: C++ for big data, École Polytechnique, France

Research Intern | **CNRS LIX, École Polytechnique, France** 2017

- **Projects:** developed framework that embeds supervised learning predictions into a discrete nonlinear optimization problem, and solves it via exact mixed-integer programming techniques. Tech: AMPL, Bash, Python

Other projects

- **Marketing-mix modeling (2025):** implemented Bayesian marketing mix model to measure advertisement ROI, and incorporating adstock and diminishing return effects. Tech: Python (PyMC, ArviZ)
- **Capacitated network design (2017):** modelled a telecommunication network design problem via mixed-integer linear programming, generated synthetic instances and solved them with open-source and commercial solvers optimization solvers. Tech: C++, AMPL, Cbc, CPLEX
- **Customer Segmentation & Revenue Trend Analysis (2016):** implemented customer profiles and analyzed revenue trends, by segmenting purchasing behavior and clustering customer groups, to support the market positioning strategies of a regional supermarket. Tech: Python, SQL, KNIME

Achievements

PhD Fellowship École Polytechnique (€64k, 2017-2020); Research Fellowship Università di Pisa, Italy (€21k, 2021); PhD thesis prize “Premio di tesi Lorenzo Brunetta 2019-2021” (2k€, 2022); MISTI Seed Fund “Learning-symbolic programming” for collaboration with MIT, USA and Università di Pisa, Italy (\$9k, 2023); MATH+ Post-doctoral Member, Berlin Mathematics Research Center (2022-2024)

Technical skills

Languages: AMPL, bash, C/C++, **Julia** (JuMP, Polyhedra, FrankWolfe), Matlab, **Python** (scikit-learn, NumPy, Pandas, SciPy, PyTorch, Pyomo), SQL

Deployment/Testing: Git, Jupyter, SLURM

Solvers: CPLEX, Gurobi, GLPK, SCIP, Baron, Bonmin, Ipopt

Typesetting: L^AT_EX, Microsoft Office

Languages

ITALIAN (native), ENGLISH (fluent), FRENCH (fluent), SPANISH (advanced), GERMAN (beginner)

Publications

Preprints

G. Iommazzo, D. Martínez-Rubio, F. Criado, E. Wirth and S. Pokutta (2025). *Linear Convergence of the Frank-Wolfe Algorithm over Product Polytopes*

P. Dvurechensky, G. Iommazzo, S. Shtern and M. Staudigl (2025). *A conditional gradient homotopy method with applications to Semidefinite Programming* (to appear in IMA Journal of Numerical Analysis)

Conference proceedings

G. Iommazzo, C. D'Ambrosio, A. Frangioni and L. Liberti (2021), *A Learning-based Mathematical Programming Formulation for the Automatic Configuration of Optimization solvers*. In: Nicosia, G., et al. Machine Learning, Optimization, and Data Science. **LOD 2020**. Lecture Notes in Computer Science, vol 12565. Springer, Cham.

L. Liberti, G. Iommazzo, C. Lavor and N. Maculan (2020), *A Cycle-based Formulation for the Distance Geometry Problem*. In: Gentile, C., Stecca, G., Ventura, P. (eds) Graphs and Combinatorial Optimization: from Theory to Applications. **CTW 2020**. AIRO Springer Series, vol 5. Springer, Cham.

G. Iommazzo, C. D'Ambrosio, A. Frangioni, L. Liberti (2020), *Learning to Configure Mathematical Programming Solvers by Mathematical Programming*. In: Kotsireas, I., Pardalos, P. (eds) Learning and Intelligent Optimization. **LION 2020**. Lecture Notes in Computer Science, vol 12096. Springer, Cham.

International journals

S. Designolle, G. Iommazzo, M. Besançon, S. Knebel, P. Gelß, S. Pokutta (2023), *Improved Local Models and New Bell Inequalities via Frank–Wolfe Algorithms*. In **Phys. Rev. Research** 5, 043059, 6 p. American Physical Society

L. Liberti, G. Iommazzo, C. Lavor, N. Maculan (2023), *Cycle-based Formulations in Distance Geometry*. **Open Journal of Mathematical Optimization**, Volume 4, article no. 1, 16 p.

Book chapters

G. Iommazzo, C. D'Ambrosio, A. Frangioni, L. Liberti (2023), *The Algorithm Configuration Problem*, In: Pardalos, P.M., Prokopyev, O.A. (eds) **Encyclopedia of Optimization**. Springer, Cham.

PhD Thesis

[Iom21]: G. Iommazzo (2021), *Algorithmic Configuration by Learning and Optimization*.