

Bartolomeo Stellato

Assistant Professor
Princeton University

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EDUCATION

University of Oxford PhD in Engineering Science – Thesis: “Mixed-Integer Optimal Control of Fast Dynamical Systems” – Supervision: Prof. P. Goulart	Oxford, UK 2017
ETH Zürich MSc in Robotics, Systems and Control – Thesis: “Data-Driven Chance constrained Optimization” – Supervision: Prof. B. Van Parys, Prof. J. Lygeros	Zürich, CH 2014
Politecnico di Milano BSc in Automation Engineering	Milano, IT 2012

RESEARCH INTERESTS

Data-driven computational tools for mathematical optimization, machine learning, and control:

- **Research:** Real-time and embedded optimization. Dynamical systems and optimization-based control. Differentiable optimization. Large scale optimization. Machine learning for optimization.
- **Applications:** control of fast dynamical systems, finance, robotics, and autonomous systems.

RESEARCH EXPERIENCE

Princeton University Assistant Professor, Dept. of Operations Research and Financial Engineering – Associated Faculty, Department of Electrical and Computer Engineering – Associated Faculty, Center of Statistics and Machine Learning – Affiliated Member, Robotics at Princeton Initiative – Fellow, Whitman College	Princeton, NJ Jul 2020 – Present
MIT Sloan School of Management Postdoctoral Research Associate – Project: “Machine Learning for Optimization” – Supervision: Prof. D. Bertsimas	Cambridge, MA Jan 2018 – Jul 2020
Stanford University Visiting Student Researcher – Project: “OSQP: An Operator Splitting Solver for Quadratic Programs” – Supervision: Prof. S. Boyd – Open-source software: OSQP (osqp.org). 22 M downloads . Widely used in academia and industry, including at Google, Blackrock, Lyft, etc.	Stanford, CA 2016

University of Oxford

European Union Marie Curie Fellow

- Project: “TEMPO: Training in Embedded Predictive Control and Optimization”
- Supervision: Prof. P. Goulart

Oxford, UK

Sep 2014 – Sep 2017

IMT Lucca

Guest Scholar

- Project: “Mixed-Integer Quadratic Programming using the OSQP Solver”
- Supervision: Prof. A. Bemporad

Lucca, IT

Jan 2017

Siemens, Building Technologies Division

Research Intern

- Project: “Adaptive Superheat Control on HVAC systems”
- Supervision: B. Baumann

Zug, CH

Jul 2013 – Dec 2013

AWARDS

- 2022 Franco Strazzabosco Young Investigator Award
Italian Scientists and Scholars in North America Foundation (ISSNAF) Nov 2022
- Student Paper Award (as advisor)
INFORMS Computing Society Oct 2022
- Metropolis Project on Future Cities and Technologies (co-PI, 100,000\$)
Princeton School of Engineering and Applied Science (SEAS) Feb 2022
- Innovation Award in Data Science (70,000\$)
Princeton School of Engineering and Applied Science (SEAS) Feb 2022
- 250th Anniversary Fund for Innovation in Undergraduate Education (23,000\$)
Princeton University May 2021
- 2020 Best Paper Award
Mathematical Programming Computation Jan 2021
- Pierskalla Best Paper Award
INFORMS Health Applications Society Nov 2020
- 2017 First Place Prize Paper Award (1000\$)
IEEE Transactions on Power Electronics Sep 2018
- Vice-Chancellors’ Fund (3,000£)
University of Oxford May 2017
- Masterclass Award (1,000£)
St Edmund Hall, University of Oxford Apr 2015
- Marie Curie PhD Fellowship (250,000€)
European Commission Sep 2014

TEACHING EXPERIENCE

Princeton University, Principal Lecturer

Fall 2020 – Present

ORF522: Linear and Nonlinear Optimization (PhD level, 50+ students)

- Topics: linear optimization modeling, duality, sensitivity analysis and interior point methods. First order methods for nonlinear optimization, monotone operators theory, real-time optimization and data-driven algorithms.

- Applications: engineering, robotics, autonomous systems, finance, and machine learning.

Princeton University, Principal Lecturer Spring 2021 – Present
ORF307: Optimization (BSc level, 90 students)

- Topics: least squares optimization with multiple objectives and constraints. Linear optimization modeling, duality, the simplex method, interior point methods, and network flow optimization. Integer programming and branch-and-bound algorithms.
- Applications: engineering, finance, and machine learning.

MIT, Teaching & Learning Laboratory Participant Aug 2019
Kaufman Teaching Certificate Program

- Completed teaching program based on eight workshops aimed at developing teaching skills, organizing new courses and interacting with the students.

University of Oxford, Tutor Sep 2015 – Jun 2016
Courses: System Identification; Optimal Control; Linear Dynamical Systems

- Responsible for holding weekly *tutorials*: small interactive teaching sessions with groups of four students with in-depth discussions.

University of Oxford, Laboratory Assistant Jun 2015 — Jun 2017
Laboratories: LEGO Football; Instrumentation and Control; Helicopter

- Co-organized hands-on undergraduate laboratory courses.

SUPERVISION

Postdocs

- Gabriele Dragotto, Princeton (co-advised with Prof. Fernández Fisac) 2022–Present

Graduate students

- Stefan Clarke, PhD Princeton 2022–Present
PhD topic: Data-Driven Multi-Agent Decision Making
- Rajiv Sambharya, PhD Princeton 2021–Present
PhD topic: Learning to Accelerate Optimizers
 - Princeton Graduate School [Excellence in Teaching Award](#) (ORF307 course)
- Vinit Ranjan, PhD Princeton 2021–Present
PhD topic: Performance Certification for Real-Time Optimization
- Irina Wang, PhD Princeton 2021–Present
PhD topic: Learning for Optimization under Uncertainty
 - INFORMS Computing Society [Student Paper Award](#)
- Shuvomoy Das Gupta, PhD MIT (co-supervised with Prof. B. Van Parys) 2019–2022
PhD topic: First-order Methods for Nonconvex Optimization
- Liangyuan Na, PhD MIT (co-supervised with Prof. D. Bertsimas) 2019–2020
PhD topic: Coupled adaptive and robust optimization
- Luca Mingardi, MBAn MIT (co-supervised with Prof. D. Bertsimas) 2019–2021
PhD topic: Hearth disease predictions from ECG data

Senior thesis students (Princeton)

- Anna Glowski 2022–Present
- Nishant Kumar Singhal 2022–Present
- Elliott N. Strahan 2022–Present
- Chen Leon 2022–Present
- Cole Becker 2021–2022
 - Title: “Data-Driven Methods for Decision-Making Under Uncertainty”*
 - John Ogden Bigelow Jr. Prize in Electrical Engineering
 - Princeton SEAS Mueller Prize
- Joyce Luo 2021–2022
 - Title: “Equitable Data-driven Resource Allocation to Fight the Opioid Epidemic: a Mixed-integer Optimization Approach”*
 - [Sigma Xi Book Award](#)
- Diana Zhang 2021–2022
 - Title: “Applications of Deep Implicit Layers and Convex Optimization in Portfolio and Risk Management”*
- Emma Zhao 2021–2022
 - Title: “Don’t Forget The Past: An Analysis Of Dementia Risk Factors Around The World”*
- Holly Cunningham 2020–2021
 - Title: “Differentiable Transportation for On-Demand Transportation Systems”*
- Ava Jiang 2020–2021
 - Title: “A Distributed Framework for Learning Agent Rationality”*
- Max Jun Kim 2020–2021
 - Title: “A Computational Approach to Analyzing Supply Chain Sustainability”*

SERVICE

Review

Mathematical Programming, Operations Research, Mathematics of Operations Research, Management Science, SIAM Journal on Optimization, Mathematical Programming Computation, IEEE Transactions on Automatic Control, ACM Transactions on Mathematical Software, The American Statistician, IEEE Transactions on Power Electronics, Autonomous Robots, INFORMS Journal of Optimization, Optimal Control Applications and Methods, Computers and Operations Research, IEEE Access, IEEE Transactions on Control Systems Technology, IEEE Transactions on Neural Networks and Learning Systems.

Conferences committees and technical sessions

- Chair of one invited session: INFORMS Annual Meeting 2022
- Chair of two invited sessions: International Conf. on Continuous Optimization (ICCOPT) 2022
- Program committee: 4th Learning for Dynamics and Control Conference (L4DC) 2022
- Program committee: 3th Learning for Dynamics and Control Conference (L4DC) 2021
- Organizer: Princeton Optimization Seminars 2020–Present
- Chair of an invited session: European Conference on Computational Optimization (EUCCO) 2016
- Organizer: Oxford Control and Optimization Seminars 2016–2017

PhD committees

- Zheng Yu, Princeton ECE (advised by Prof. Mengdi Wang) 2022
- Abhishek Cauligi, Stanford Aeroastro (advised by Prof. Marco Pavone) 2021
- Cemil Dibek, Princeton ORFE (advised by Prof. Amir Ali Ahmadi) 2021
- Cemil Dibek, Princeton ORFE (advised by Prof. Amir Ali Ahmadi) 2021
- Zachary Hervieux-Moore, Princeton ORFE (advised by Prof. Alain Kornhauser) 2021
- Sinem Uysal, Princeton ORFE (advised by Prof. John Mulvey) 2021
- Hao Lu, Princeton ORFE (advised by Prof. Mengdi Wang) 2021
- Bachir El Khadir, Princeton ORFE (advised by Prof. Amir Ali Ahmadi) 2020

General examination committees

- Haimin Hu, Princeton ECE (advised by Prof. Jaime Fisac) 2021
- Rajiv Sambharya, Princeton ORFE 2021
- Abraar Chaudhry, Princeton ORFE (advised by Prof. Amir Ali Ahmadi) 2021
- Yu Wu, Princeton ECE (advised by Prof. Mengdi Wang) 2021

Academic advising

- 23 sophomore students, Princeton University, 2020–Present
- 14 freshman students/year, Whitman college, Princeton University 2021–Present

Other committees

- Independent Work grader, Princeton Center for Statistics and Machine Learning 2022
- PhD admissions committee, Princeton ORFE 2022

Open-source software

- CVXPY project maintainer (as part of NumFOCUS) 2021–Present
- OSQP project maintainer (supported by Princeton CSML) 2022–Present

PUBLICATIONS

Journal articles

- [J12] D. Bertsimas and **B. Stellato**, “[Online mixed-integer optimization in milliseconds](#),” *INFORMS Journal on Computing*, vol. 34, no. 4, pp. 2229–2248, 2022.
- [J11] A. Cauligi, P. Culbertson, E. Schmerling, M. Schwager, **B. Stellato**, and M. Pavone, “[CoCo: Online mixed-integer control via supervised learning](#),” *IEEE Robotics and Automation Letters*, vol. 7, no. 2, pp. 1447–1454, 2022.
- [J10] M. Schaller, G. Banjac, S. Diamond, A. Agrawal, **B. Stellato**, and S. Boyd, “[Embedded code generation with CVXPY](#),” *IEEE Control Systems Letters*, vol. 6, pp. 2653–2658, 2022.
- [J9] D. Bertsimas, L. Boussioux, R. Cory Wright, A. Delarue, V. Digalakis, A. Jacquillat, D. Lahlou Kitane, G. Lukin, M. L. Li, L. Mingardi, O. Nohadani, A. Orfanoudaki, T. Papalexopoulos, I. Paskov, J. Pauphilet, O. Skali Lami, **B. Stellato**, H. Tazi Bouardi, K. Villalobos Carballo, H. Wiberg, and C. Zeng, “[From predictions to prescriptions: A data-driven response to covid-19](#),” *Health Care Management Science*, vol. 24, pp. 253–272, Jun. 2021.
- 🏆 **INFORMS Health Applications Society Pierskalla Best Paper Award**


- [J8] D. Bertsimas, L. Mingardi, and **B. Stellato**, “Machine learning for real-time heart disease prediction,” *IEEE Journal of Biomedical and Health Informatics*, vol. 25, no. 9, pp. 3627–3637, 2021.
- [J7] D. Bertsimas and **B. Stellato**, “The voice of optimization,” *Machine Learning*, vol. 110, pp. 249–277, 2 Feb. 2021.
- [J6] D. Bertsimas, G. Lukin, L. Mingardi, O. Nohadani, A. Orfanoudaki, **B. Stellato**, H. Wiberg, S. Gonzalez-Garcia, C. L. Parra-Calderon, K. Robinson, M. Schneider, B. Stein, A. Estirado, L. a Beccara, R. Canino, M. Dal Bello, F. Pezzetti, and A. Pan, “COVID-19 mortality risk assessment: An international multi-center study,” *PLOS One*, Dec. 2020.
- [J5] **B. Stellato**, G. Banjac, P. Goulart, A. Bemporad, and S. Boyd, “OSQP: An operator splitting solver for quadratic programs,” *Mathematical Programming Computation*, vol. 12, no. 4, pp. 637–672, Oct. 2020.
 🏆 **Mathematical Programming Computation Best Paper Award**
- [J4] G. Banjac, P. Goulart, **B. Stellato**, and S. Boyd, “Infeasibility detection in the alternating direction method of multipliers for convex optimization,” *Journal of Optimization Theory and Applications*, vol. 183, no. 2, pp. 490–519, 2019.
- [J3] **B. Stellato**, T. Geyer, and P. Goulart, “High-speed finite control set model predictive control for power electronics,” *IEEE Transactions on Power Electronics*, vol. 32, no. 5, pp. 4007–4020, May 2017.
 🏆 **First Prize Paper Award IEEE Transactions on Power Electronics**
- [J2] **B. Stellato**, S. Ober-Blöbaum, and P. Goulart, “Second-order switching time optimization for switched dynamical systems,” *IEEE Transactions on Automatic Control*, vol. 62, no. 10, pp. 5407–5414, Oct. 2017.
- [J1] **B. Stellato**, B. P. Van Parys, and P. Goulart, “Multivariate chebyshev inequality with estimated mean and variance,” *The American Statistician*, vol. 71, no. 2, pp. 123–127, 2017.

Conference proceedings

- [C10] J. Ichnowski, P. Jain, **B. Stellato**, G. Banjac, M. Luo, F. Borrelli, J. E. Gonzales, I. Stolica, and K. Goldberg, “Accelerating quadratic optimization with reinforcement learning,” in *Advances in Neural Information Processing Systems 35*, Dec. 2021.
- [C9] T. Seyde, I. Gilitschenski, W. Schwarting, **B. Stellato**, M. Riedmiller, M. Wulfmeier, and D. Rus, “Is bang-bang control all you need? solving continuous control with bernoulli policies,” in *Advances in Neural Information Processing Systems 35*, Dec. 2021.
- [C8] A. Agrawal, S. Barratt, S. Boyd, and **B. Stellato**, “Learning convex optimization control policies,” in *Proceedings of the 2nd Conference on Learning for Dynamics and Control*, ser. Proceedings of Machine Learning Research, vol. 120, PMLR, Jun. 2020, pp. 361–373.
- [C7] A. Cauligi, P. Culbertson, **B. Stellato**, D. Bertsimas, M. Schwager, and M. Pavone, “Learning mixed-integer convex optimization strategies for robot planning and control,” in *IEEE Conference on Decision and Control (CDC)*, Dec. 2020.

- [C6] A. Cauligi, P. Culbertson, **B. Stellato**, M. Schwager, and M. Pavone, “Coco: Learning strategies for online mixed-integer control,” in *Learning Meets Combinatorial Algorithms at NeurIPS2020*, Dec. 2020.
- [C5] **B. Stellato**, V. V. Naik, A. Bemporad, P. Goulart, and S. Boyd, “Embedded mixed-integer quadratic optimization using the OSQP solver,” in *European Control Conference (ECC)*, Jul. 2018.
- [C4] G. Banjac, **B. Stellato**, N. Moehle, P. Goulart, A. Bemporad, and S. Boyd, “Embedded code generation using the OSQP solver,” in *IEEE Conference on Decision and Control (CDC)*, Dec. 2017.
- [C3] **B. Stellato** and P. Goulart, “High-speed direct model predictive control for power electronics,” in *European Control Conference (ECC)*, Jul. 2016, pp. 129–134.
- [C2] **B. Stellato** and P. Goulart, “Real-time FPGA implementation of direct MPC for power electronics,” in *IEEE Conference on Decision and Control (CDC)*, Dec. 2016, pp. 1471–1476.
- [C1] **B. Stellato**, S. Ober-Blöbaum, and P. Goulart, “Optimal control of switching times in switched linear systems,” in *IEEE Conference on Decision and Control (CDC)*, Dec. 2016, pp. 7228–7233.

Preprints

- [P2] I. Wang, C. Becker, B. Van Parys, and **B. Stellato**, “Mean robust optimization,” *arXiv e-prints*, Sep. 2022. arXiv: [2207.10820](https://arxiv.org/abs/2207.10820).
 **INFORMS Computing Society Student Paper Award**
- [P1] S. Das Gupta, **B. Stellato**, and B. P. G. Van Parys, “Exterior-point optimization for non-convex learning,” *arXiv e-prints*, Dec. 2021. arXiv: [2011.04552](https://arxiv.org/abs/2011.04552).

Theses

- [T2] **B. Stellato**, “Mixed-integer optimal control of fast dynamical systems,” PhD thesis, University of Oxford, 2017.
- [T1] **B. Stellato**, “Data-driven chance constrained optimization,” MSc thesis, ETH Zürich, 2014.

SELECTED INVITED TALKS

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| • Mechanical Engineering Seminar, <i>UC Berkeley</i> , CA | Nov 2022 |
| • Future of OR Workshop at INFORMS Annual Meeting, <i>Indiana</i> , IN | Oct 2022 |
| • DEIB Seminar, <i>Politecnico di Milano</i> , IT | Jun 2022 |
| • Cornell ORIE Seminar, <i>Cornell Tech</i> , NY | Mar 2022 |
| • NASA JPL Multi-Agent Tech Talks, <i>Virtual</i> , Zoom | Mar 2022 |
| • INFORMS Annual Meeting, <i>Anaheim</i> , CA | Oct 2021 |
| • Joint Princeton Robotics and Optimization Seminar, <i>Virtual</i> , Zoom | May 2021 |
| • Raytheon Technologies Research Center, <i>Virtual</i> , Zoom | Jan 2021 |
| • Invited Session at the INFORMS Annual Meeting 2020, <i>Virtual</i> , Zoom | Nov 2020 |

- Mathematics of Data and Decisions at Davis (MADDD) Seminars, *UC Davis*, CA Jun 2020
- Fields Institute Focus Program on Data Science and Optimization, *Fields Institute*, CA Nov 2019
- IEOR Seminars, *UC Berkeley*, USA Oct 2019
- SISL Seminars, *Stanford*, USA Oct 2019
- Invited Session at the INFORMS Annual Meeting 2019, *Seattle*, USA Oct 2019
- Operations Research Center IAP Seminar, *MIT*, USA May 2019
- IDSS Seminar on Algebra Statistics and Optimization, *MIT*, USA Jan 2019
- Intl. Symposium of Mathematical Programming (ISMP), *Bordeaux*, France Jul 2018
- Mathematical Institute, *University of Oxford*, UK Nov 2017
- Control Systems Group, *Cambridge University*, UK Jun 2017
- Operations Research Center, *MIT*, USA Jun 2017
- DYSCO Research Group, *IMT Lucca*, Italy Jan 2017
- MPC Laboratory, *UC Berkeley*, USA Oct 2016
- European Conf. on Computational Optimization (EUCCO), *KU Leuven*, Belgium Sep 2016

TECHNICAL SKILLS

- **Programming:** Python, Julia, C/C++
- **Web design:** HTML, CSS, Javascript, React
- **Tech/Tools:** Git, Docker, SLURM
- **Embedded design:** Xilinx FPGA

LANGUAGES

- **Italian:** Mother tongue
- **English:** Fluent (C2)
- **French:** Intermediate (B1)
- **German:** Basic (A2)

INTERESTS AND ACTIVITIES

- Music, Collection and playing
 - Piano diploma (5th year), *Istituto Superiore di Studi Musicali “F. Vittadini”*, *Pavia, Italy*, Grade 8.50/10
 - Music theory and solfeggio diploma, *Istituto Superiore di Studi Musicali “C. Monteverdi”*, *Cremona, Italy*, Grade 9.60/10
- MITaly, Member of the MIT Italian Association Board.
 - Organized large events in collaboration with Italian communities and the Consulate General of Italy in Boston.
 - Organized seminar series with Italian professors at MIT and Harvard.
 - Developed the association main website (mitaly.mit.edu).