

# Michele Barbato — Ph.D.

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## Personal Data

Place of Birth **Avellino (AV) – Italy**  
Date of Birth **May 17, 1987**  
Citizenship **Italian**  
Contact Address **Via Silvio Pellico 20, 37123 Verona (VR) – Italy**

## Current Position

**Assistant Professor (RTD-A)**, Dip. di Informatica, Univ. degli Studi di Milano,  
Milan - Italy

## Past Positions

2018-2023 **Post-doc**, OptLab, Dip. di Informatica, Univ. degli Studi di Milano, Milan - Italy  
2017-2018 **Post-doc**, DEIO - FCUL - Universidade de Lisboa, Lisbon - Portugal  
2016–2017 **Attaché Temporaire d’Enseignement et Recherche**, ENSIEE, Évry - France  
**Post-doc**, LIPN - Université Paris 13, Villetaneuse - France  
2015–2016 **Attaché Temporaire d’Enseignement et Recherche**, LIPN - Université Paris 13,  
Villetaneuse - France  
2012–2015 **Ph.D. student with teaching activity**, LIPN - Université Paris 13, Villetaneuse -  
France

## Education

October 2016 **Ph.D. in Computer Science**, with grade “*Très honorable*”, Université Paris 13,  
Villetaneuse - France  
February 2012 **Master degree in Mathematics**, with grade *110/110*, Università degli Studi di  
Padova, Padova - Italy  
February 2010 **Bachelor degree in Mathematics**, with grade *106/110*, Università degli Studi di  
Padova, Padova - Italy

## Ph.D. Thesis

Title **A Polyhedral Approach for the Double TSP with Multiple Stacks and Lexico-  
graphical Orders**  
Supervisors R. Grappe., M. Lacroix, R. Wolfler Calvo  
Committee L. Gouveia, R. Grappe, M. Iori (reviewer), M. Lacroix, A. Ridha Mahjoub (president),  
F. Meunier (reviewer), F. Roupin, R. Wolfler Calvo.

## Research Interests

**Design and Experimental Analysis of Optimization Algorithms • Combinatorial Optimization • Graph Theory • Linear Programming • Polyhedral Theory**

## Current Research Activity

*MIP approaches for governance and data protection*: design of MIP-based algorithms for the resolution of problems involving network security and data privacy, with an emphasis on applications to network fortification and data analysis. *Privacy enforcement via MIPs*: design of machine learning methods with strong privacy requirements based on the resolution of suitable MIPs. *Diffusion control with interdiction*: design of ILP/QP models and of heuristic/exact resolution algorithms for the optimal control of diffusive phenomena on networks via network interdiction actions. *Routing problems*: design of ILP models, strengthening inequalities and related resolution methods for problems involving synchronization of routes *Polyhedral Theory*: integrality properties of systems of inequalities associated with combinatorial structures in specific graph classes.

## Publications and Accepted Articles

- Journal **A polynomial-time dynamic programming algorithm for an optimal picking problem in automated warehouses**, with A. Ceselli, G. Righini. In: Journal of Scheduling, (online version published on July 16th, 2024)  
DOI: <https://doi.org/10.1007/s10951-024-00811-2>
- Journal **Mathematical Programming for Simultaneous Feature Selection and Outlier Detection under  $l_1$  Norm**, with A. Ceselli. In: European Journal of Operational Research 316(3), pp. 1070-1084 (2024)  
DOI: <https://doi.org/10.1016/j.ejor.2024.03.035>
- Journal **The Hamiltonian  $p$ -Median Problem: Polyhedral Results and Branch-and-Cut Algorithm**, with L. Gouveia. In: European Journal of Operational Research 316(2), pp. 473-487 (2024)  
DOI: <https://doi.org/10.1016/j.ejor.2024.02.032>
- Journal **Node based compact formulations for the Hamiltonian  $p$ -Median Problem**, with F. Canas, L. Gouveia, P. Pesneau. In: Networks, 82(4), pp. 336-370 (2023)  
DOI: <https://doi.org/10.1002/net.22163>
- Journal **On the impact of resource relocation in facing health emergencies**, with A. Ceselli, M. Premoli. In: European Journal of Operational Research, 308(1), pp. 422-435 (2023).  
DOI: <https://doi.org/10.1016/j.ejor.2022.11.024>
- Journal **Box-Total Dual Integrality and Edge-Connectivity**, with R. Grappe, M. Lacroix, E. Lancini. In: Mathematical Programming, 197, pp. 307-336 (2023).  
DOI: <https://doi.org/10.1007/s10107-021-01743-x>
- Journal **Monopolar Graphs: Complexity of Computing Classical Graph Parameters**, with D. Bezzi. In: Discrete Applied Mathematics, 291, pp. 277-285 (2021).  
DOI: <https://doi.org/10.1016/j.dam.2020.12.023>

- Journal **The Schrijver System of the Flow Cone in Series-Parallel Graphs**, with *E. Lancini, R. Grappe, M. Lacroix, R. Wolfler Calvo*. In: *Discrete Applied Mathematics*, 308, pp. 162–167 (2022).  
DOI: <https://doi.org/10.1016/j.dam.2020.03.054>
- Journal **Lexicographical polytopes**, with *R. Grappe, M. Lacroix, C. Pira*. In: *Discrete Applied Mathematics*, 240, pp. 3–7 (2018).  
DOI: <https://doi.org/10.1016/j.dam.2017.04.022>
- Journal **Polyhedral Results and a Branch-and-Cut Algorithm for the Double Traveling Salesman Problem with Multiple Stacks**, with *R. Grappe, M. Lacroix, R. Wolfler Calvo*. In: *Discrete Optimization*, 21, pp. 25–41 (2016).  
DOI: <https://doi.org/10.1016/j.disopt.2016.04.005>
- Proceeding **Synchronized Pickup and Delivery Problems with Connecting FIFO Stack**, with *A. Ceselli, N. Facchinetti*. In: *Graphs and Combinatorial Optimization: from Theory to Applications*. AIRO Springer Series, Vol. 5, pp. 237–249 (2021)  
DOI: [https://doi.org/10.1007/978-3-030-63072-0\\_19](https://doi.org/10.1007/978-3-030-63072-0_19)
- Proceeding **On  $k$ -Edge-Connected Polyhedra: Box-TDIness in Series-Parallel Graphs**, with *E. Lancini, R. Grappe, M. Lacroix*. In: *Proceedings of 6th International Symposium on Combinatorial Optimization (ISCO)*. Lecture Notes in Computer Science, Vol. 12176, pp. 27–41 (2020).  
DOI: [https://doi.org/10.1007/978-3-030-53262-8\\_3](https://doi.org/10.1007/978-3-030-53262-8_3)
- Proceeding **Evaluating Automated Storage and Retrieval System Policies with Simulation and Optimization**, with *A. Ceselli, M. Premoli*. In: *Advances in Optimization and Decision Science for Society, Services and Enterprises*. AIRO Springer Series, Vol. 3 pp 127–137 (2019).  
DOI: [https://doi.org/10.1007/978-3-030-34960-8\\_12](https://doi.org/10.1007/978-3-030-34960-8_12)
- Proceeding **Paths and Matchings in an Automated Warehouse**, with *A. Ceselli, A. Righini*. In: *Advances in Optimization and Decision Science for Society, Services and Enterprises*. AIRO Springer Series, Vol. 3 pp 151–159 (2019).  
DOI: [https://doi.org/10.1007/978-3-030-34960-8\\_14](https://doi.org/10.1007/978-3-030-34960-8_14)
- Proceeding **A Computational Evaluation of Online ATSP Algorithms**, with *A. Ceselli, F. Mosconi*. In: *Advances in Optimization and Decision Science for Society, Services and Enterprises*. AIRO Springer Series, Vol. 3 pp 471–481 (2019).  
DOI: [https://doi.org/10.1007/978-3-030-34960-8\\_41](https://doi.org/10.1007/978-3-030-34960-8_41)
- Proceeding **A Set Covering Approach for the Double Traveling Salesman Problem with Multiple Stacks**, with *R. Grappe, M. Lacroix, R. Wolfler Calvo*. In: *Proceedings of 4th International Symposium on Combinatorial Optimization (ISCO)*. Lecture Notes in Computer Science, Vol. 9849 pp. 260–272 (2016).  
DOI: [https://doi.org/10.1007/978-3-319-45587-7\\_23](https://doi.org/10.1007/978-3-319-45587-7_23)
- Proceeding **Integrating decision support tools in the COD-19 platform**, with *A. Ceselli, C. Carlevaro, G. Confessore, G. De Luca, M. Premoli*. In: *Operations Research for Health Care in Red Zone (ORAHS 2022)*. AIRO Springer Series, Vol. 10 pp 47–57 (2023).  
DOI: [https://doi.org/10.1007/978-3-031-38537-7\\_5](https://doi.org/10.1007/978-3-031-38537-7_5)
- Proceeding **On the Hardness of Edge Coloring Problems Associated with Scheduling**, with *E. Lancini, D. Delle Donne* To appear in: *Proceedings of 7th and 8th AIROYoung Workshops - AIRO Springer Series* (accepted April, 2024).

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## Other Manuscripts

- Under review **Mathematical programming algorithms for convex hull approximation with a hyperplane budget**, with A. Ceselli, R. Messana. *INFORMS Journal on Computing*
- Under review **A polynomial-time dynamic programming algorithm for an optimal picking problem in automated warehouses**, with A. Ceselli, G Righini. Submitted to *Journal Scheduling*
- Under review **Compact Formulations for Sub-Tree Scheduling for Wireless Sensor Networks with Partial Coverage**, with N. Bianchessi. Submitted to *Networks*
- Seminar Note **Cheapest Routes with Integer Linear Programming**, *Univ. degli Studi di Padova*

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## Computer Skills

Optimization Software	<b>CPLEX, Gurobi, JuMP</b>	Programming Languages	<b>C, C++, Python, Julia</b>
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## Languages

English	<b>Fluent</b>	French	<b>Proficiency</b>
Italian	<b>Native speaker</b>	Portuguese	<b>Basic</b>

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## Invited Talks

- November 25, 2016 **Polyhedral Results and a Branch-and-Cut Algorithm for the Double Traveling Salesman Problem with Multiple Stacks**, *Universidade de Lisboa*, Lisbon - Portugal
- October 10, 2014 **Lexicographical Polytopes**, *LIX-École Polytechnique*, Palaiseau - France

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## Talks in Conferences and Workshops

- September 6 2023 **Compact Optimization Models for the Sub-Tree Scheduling of Wireless Sensor Networks with Partial Coverage**, *International Conference on Optimization and Decision Science (ODS 2023)*, Ischia - Italy
- August 31 2022 **Simultaneous Feature Selection and Outlier Detection: New MILP Formulation and an Experimental Study**, *International Conference on Optimization and Decision Science (ODS 2022)*, Florence - Italy
- June 24 2022 **The Hamiltonian p-Median Problem: Polyhedral Results and Branch-and-Cut Algorithm**, *3rd Workshop on Combinatorial Optimization*, online
- June 14 2022 **Multi-Purpose Machine Scheduling: An Application to Smart Cosmetic Manufacturing**, *15th Workshop on Models and Algorithms for Planning and Scheduling (MAPSP 2022)*, Oropa - Italy
- May 18 2022 **The Hamiltonian p-Median Problem: Polyhedral Results and Branch-and-Cut Algorithm**, *7th International Symposium on Combinatorial Optimization*, online
- November 19 2020 **Combining epidemiologic and clustering models to limit the spreading of pandemic diseases**, *ODS 2019 – Meeting of AIRO*, online
- September 14 2020 **Synchronized Pickup and Delivery Problems with Connecting FIFO Stack**, *18th Cologne-Twente Workshop on Graphs and Combinatorial Optimization*, online
- September 7, 2019 **A Computational Evaluation of Online ATSP Algorithms**, *ODS 2019 – 49th AIRO Meeting*, Genova - Italy

- March 28, 2019 **Monopolar Graphs: Complexity of Computing Classical Graph Parameters**, *3rd AIRO Young Workshop*, Rome - Italy
- September 7, 2017 **New inequalities and formulations for the double TSP with multiple stacks**, *Optimization 2017*, Lisbon - Portugal
- July 11, 2017 **A new model and strengthening inequalities for the double TSP with multiple stacks**, *VeRoLog 2017*, Amsterdam - Netherlands
- February 22, 2017 **Polyhedral Results on the Double TSP with Multiple Stacks**, *ROADEF 2017*, Metz - France
- October 14, 2016 **Polyhedral Results and a Branch-and-Cut Algorithm for the Double TSP with Multiple Stacks**, *Workshop "Problèmes d'ordonnancement et de routing intégrés"*, Tours - France
- May 17, 2016 **A Set Cover Approach for the Double Traveling Salesman Problem with Multiple Stacks**, *4th International Symposium on Combinatorial Optimization*, Vietri sul Mare - Italy
- July 30, 2014 **Bounded revlex polytopes**, *Recent Advances in Linear Optimization*, Paris - France
- February 27, 2014 **An exact method for solving the Double Traveling Salesman Problem with two stacks**, *ROADEF 2014*, Bordeaux - France

### Other Attended Conferences and Schools

- 2022 **ISCO Spring School on Quantum Algorithms for Optimization**, on-line
- 2021 **5th AIRO Young Workshop**, on-line
- 2020 **4th AIRO Young Workshop**, Bolzano - Italy
- 2018 **7th Winter School on Network Optimization**, Lisbon - Portugal
- 2017 **International Network Optimization Conference (INOC) 2017**, Lisbon - Portugal
- 2016 **Workshop on Polyhedral Approaches for Combinatorial Optimization**, Paris - France
- ISCO Spring School on Extended Formulations**, Vietri sul Mare - Italy
- 2015 **4th Winter School on Network Optimization**, Lisbon - Portugal
- 2014 **GERAD Spring School on Column Generation**, Paris - France
- 2013 **JPOC8 School on Sub-Modular Functions**, Clermont-Ferrand - France
- Order and Geometry: School on Posets and Discrete Geometry**, Berlin - Germany
- ECCO XXVI**, Paris - France

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## Relevant Teaching Activities

- 2024 Exercise sessions: **Laboratory of C Programming (36 hours)**, University of Milan  
*Lectures and exercise sessions: **Laboratory of Mathematics, data processing, interpretation and elaboration (20 hours)***, Consorzio per la Formazione Professionale e per l'Educazione Permanente, Casalpusterlengo (LO), Italy
- 2016-2017 *Exercise sessions: **Graph Theory (42 hours) • Operations Research (42 hours) • Mathematical Optimization (28 hours)***, ENSIIE, France
- 2015-2016 *Exercise sessions and computer laboratory: **Calculus (27 hours) • Linear Algebra (9 hours) • Imperative Programming (36 hours)***, Université Paris 13, France  
*Computer laboratory: **Combinatorial Optimization (9 hours) • Graph Algorithms (19.5 hours) • Data Structures (12 hours) • Shell Programming (24 hours)***, Université Paris 13, France  
*Lectures and computer laboratory: **UNIX (28.5 hours)***, Université Paris 13, France
- 2012-2015 *Computer laboratory: **Graphical Interfaces (69 hours) • UNIX (30 hours)***, Université Paris 13, France  
*Exercise sessions and computer laboratory: **Imperative Programming (49.5 hours)***, Université Paris 13, France

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## Thesis Advisorship and Co-advisorship

- 2018-present *Thesis advisorship and co-advisorship: **Federico Tabellini** – Computer Science undergraduate thesis: “Optimization Algorithms for Wireless Sensor Networks with Operational Reliability Constraints” (in Italian) • **Massimo Cavagna** – Computer Science master thesis: “Experimenting Data-Driven Constraint Generation in Mathematical Programs” • **Alberto Bertoncini** – Computer Science master thesis: “Experiments on Cutting Planes for the Training of Regression Models” • **Antonio Belotti** – Computer Science master thesis: “Algorithms for Sparse Support Vector Classifiers” (in Italian) • **Andrea G. Staibano** – Computer Science undergraduate thesis: “Algorithms for the real-time optimization of an automated warehouse” (in Italian) • **Nicolas Facchinetti** – Computer Science undergraduate thesis: “Heuristic Algorithms for a Pickup and Delivery Problem with Single Intermediate Stack” (in Italian) • **Antonio Belotti** – Computer Science undergraduate thesis: “Algorithms for Scheduling Problems with Multi-Purpose Machines” (in Italian) • **Filippo Mosconi** – Computer Science undergraduate thesis: “Experimental Analysis of Algorithms for the On-Line ATSP” (in Italian)*

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## Other Activities

- 2023 Main organizer of the [7th AIROYoung workshop](#)
- 2021-2024 Member of AIROYoung board and web curator of the [AY website](#)