# Michele Barbato — Ph.D.

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## Personal Data

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| 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

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| 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**, ENSIIE, 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

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|---|---|
| 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

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| Title | **A Polyhedral Approach for the Double TSP with Multiple Stacks and Lexicographical 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. *Simultaneuous feature and outlier detection via MIPs*: design of MIP-based resolution methods for the sparse linear regression problem in presence of outliers. *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. *Warehouse management*: complexity analysis, design of ILP models and of heuristics for the optimization of automated warehouses. *Routing problems*: design of ILP models, strengthening inequalities and related resolution methods for problems involving synchronization of routes *Polyhedral Theory*: (box-)total dual integrality of systems of inequalities associated with combinatorial structures in specific graph classes (*e.g.,* multicuts in series–parallel graphs, digraph kernels, stable matchings in bipartite graphs).

## Publications and Accepted Articles

Journal **Node based compact formulations for the Hamiltonian p-Median Problem**, *with F. Canas, L. Gouveia, P. Pesneau.* In: Networks (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

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

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

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

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

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

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

## Other Manuscripts

Under review **Mathematical Programming for Simultaneous Feature Selection and Outlier Detection under l1 Norm**, with A. Ceselli. Submitted to European Journal of Operational Research

Under review **The Hamiltonian $p$-Median Problem: Polyhedral Results and Branch-and-Cut Algorithm**, with L. Gouveia. Submitted to European Journal of Operational Research

Under review **From strategic planning to virtual clinics operational support to face emergencies: a COVID-19 case study**, with C. Carlevaro, A. Ceselli, G. Confessore, G. De Luca, M. Premoli. Submitted to Operations Research for Health Care

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

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| In preparation | **Compact Formulations for Sub-Tree Scheduling for Wireless Sensor Networks with Partial Coverage**, with N. Bianchessi |
| In preparation | **Enhancing AS/RS Policies: a Methodology Combining Descriptive and Prescriptive Models**, with A. Ceselli, M. Premoli |
| Seminar Note | **Cheapest Routes with Integer Linear Programming**, *Univ. degli Studi di Padova* |

## Computer Skills

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| Optimization Software | **CPLEX, Gurobi, JuMP** | Programming Languages | **C, C++, Python, Julia** |

## Languages

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| English | **Fluent** | French | **Proficiency** |
| Italian | **Native speaker** | Portuguese | **Basic** |

## Invited Talks

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| 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 |

## Talks in Conferences and Workshops

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| 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

## Relevant Teaching Activities

2018-2020 *Undergraduate student advisor:* **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)

*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

## Other Activities

2023 Main organizer of the 7th AIROYoung workshop

2021-2024 Member of AIROYoung board and web curator of the AY website