

Marco Mussi | Ph.D. Candidate

+39 345 6955160 • marco.mussi@polimi.it • marcomussi.github.io
in marcomussi95 • marcomussi • 0000-0001-8356-6744

Short Bio

Marco Mussi is a Ph.D. Candidate in Information Technology at the Department of Electronics, Information and Bioengineering of Politecnico di Milano. He received his Master's degree in Computer Science and Engineering at Politecnico di Milano in 2019. After a period as a research fellow in the AIRLab research team, he started the Ph.D. in late 2020 supervised by Prof. Marcello Restelli. His main research topics revolve around artificial intelligence and machine learning, focusing on online learning and reinforcement learning applied to pricing and advertising. He contributed to several industrial research projects funded by both private and public Italian companies.

Education

Ph.D. in Information Technology

Politecnico di Milano

Milano

Nov 2020 – now

Ph.D. in Machine Learning. Focus on Pricing and Advertising Reinforcement Learning solutions

Supervisor: Prof. Marcello Restelli

M.Sc. in Computer Science and Engineering

Politecnico di Milano

Milano

Sep 2017 – Dec 2019

Main focus: Artificial Intelligence and Machine Learning

Scholarship: Tuition waiver for high academic performance

Master thesis: Improving Aerodynamic Load Estimation Algorithms for F1 Racing Cars

Supervisor: Prof. Marcello Restelli

Industrial Partner: Scuderia Ferrari F1

B.Sc. in Computer Science and Engineering

Politecnico di Milano

Milano

Sep 2014 – Jul 2017

High School Diploma in Computer Science

IIS Galileo Galilei

Crema

Sep 2008 – Jul 2014

Experience

Professional

ML cube

AI Researcher

Milano

Nov 2020 – now

Goal: develop algorithms for dynamic pricing and advertising optimization

Academic

Politecnico di Milano

Research Assistant

Milano

Jan 2020 – Oct 2020

Supervisor: Prof. Marcello Restelli

Languages

Italian: Mother Tongue

English: Excellent

Industrial Projects

AD cube Marketing Mix Model

Collaboration with a Politecnico di Milano's spin-off

Milano

Nov 2022 – now

Focus: Budget optimization in advertising, considering advertising campaigns interactions

Data-driven Optimization Marketing Mix Models for Advertising

Collaboration with an Italian marketing agency

Milano

Feb 2022 – Aug 2022

Focus: Implementation of a MMM to solve the attribution problem in digital advertising in contexts with scarce and noisy data

Dynamic pricing for e-commerce

Collaboration with an Italian e-commerce

Milano
Feb 2021 – May 2022

Focus: Implementation of a dynamic pricing model for an e-commerce website managing over 20000 products

AD cube product release

Collaboration with a Politecnico di Milano's spin-off

Milano
Nov 2020 – Feb 2022

Focus: Release of AD cube, a product for advertising optimization in online campaigns

Last-mile delivery optimization

Collaboration with a last-mile delivery company

Milano
May 2020 – Oct 2020

Focus: Delivery allocation using Reinforcement Learning and bikers load estimation using Supervised Learning techniques

Reinforcement Learning in Smart-grids

Collaboration with an Energy Research Center

Milano
Feb 2020 – Oct 2022

Focus: Exploit Reinforcement Learning solutions to preserve the battery State of Health in smart-grids

European Projects

AI4REALNET

Part of the team for the development of foundational algorithms

Politecnico di Milano
Oct 2023 – now

Focus: The scope of AI4REALNET covers the perspective of AI-based solutions addressing critical systems (electricity, railway, and air traffic management) modeled by networks that can be simulated, and are traditionally operated by humans, and where AI systems complement and augment human abilities. It has two main strategic goals: (i) to develop the next generation of decision-making methods powered by supervised and reinforcement learning, which aim at trustworthiness in AI-assisted human control with augmented cognition, hybrid human-AI co-learning and autonomous AI, with the resilience, safety, and security of critical infrastructures as core requirements, and (ii) to boost the development and validation of novel AI algorithms, by the consortium and AI community, through existing open-source digital environments capable of emulating realistic scenarios of physical systems operation and human decision-making.

Master Thesis

Title: *Improving Aerodynamic Load Estimation Algorithms for F1 Racing Cars*

Supervisor: Prof. Marcello Restelli

Industrial Partner: Scuderia Ferrari F1

Short Abstract: The thesis studies the aerodynamic behavior of Formula One cars, aiming to develop effective methodologies for the estimation of aerodynamic forces on the vehicle. Using data-driven techniques coming from the Machine Learning field that exploits the data gathered during the wind tunnel tests, and the measurements from a small set of pressure sensors, this work allows to reconstruct the pressure profile of the entire car. Moreover, this work proposes a method to aggregate the data coming from a set of wind tunnel test, to better generalize the aerodynamic load estimation over newly seen aerodynamic configurations.

Ph.D. Thesis

Title: *Online Learning Methods for Pricing and Advertising*

Supervisor: Prof. Marcello Restelli

Status: Under Review

Short Abstract: Nowadays, when it comes to selling a product online, two of the most significant factors are the pricing strategy and the investments in advertising. When determining the price of a product, it is essential to strike a balance. The price should neither be set too low, as this would result in a reduced revenue from the single sale, nor too high, as it may deter potential buyers. The amount of money we invest in advertising should be balanced to let people know our offer without overspending or reaching people who are not interested. These two aspects are usually handled disjointedly by humans, but this, even if we proceed to optimize for the two components individually, may lead to a suboptimal solution. This work focuses on the adoption of online learning to solve the task of finding the optimal price for a product and how to advertise it properly, offering both theoretical frameworks and practical solutions for addressing the associated challenges.

Teaching

ML/AI Master

Tutor for a Master in AI/ML organized by Politecnico di Milano and Cefriel

30 Hours
Sep 2022 – Jul 2023

Organization of International Events

European Workshop on Reinforcement Learning

Milano

Communication Chair

Communication Chair for the 15th edition of the European Workshop on Reinforcement Learning (EWRL) 2022

Talks and Seminars

DEIB Seminar

Politecnico di Milano

An introduction to Reinforcement Learning in Real World

3 September 2021

RSE Academy Seminar

Ricerca Sistema Energetico

A Data-Driven Method for State of Charge Estimation

23 October 2020

Publications

International Conferences

[C1] Francesco Bacchiocchi*, Gianmarco Genalti*, Davide Maran*, Marco Mussi*, Marcello Restelli, Nicola Gatti and Alberto Maria Metelli. Autoregressive Bandits. Proceedings of the 27th International Conference on Artificial Intelligence and Statistics (AISTATS), 2024. (A Core Ranking - 546/1980, Acceptance rate 27.6%)

[C2] Marco Mussi, Alberto Maria Metelli and Marcello Restelli. Dynamical Linear Bandits. Proceedings of the 40th International Conference on Machine Learning (ICML), 2023. (A* Core Ranking - 1827/6538, Acceptance rate 27.9%)

[C3] Marco Mussi, Gianmarco Genalti, Alessandro Nuara, Francesco Trovó, Nicola Gatti and Marcello Restelli. Dynamic Pricing with Volume Discounts in Online Settings. Proceedings of the Thirty-Fifth Conference on Innovative Applications of Artificial Intelligence (IAAI), 2023. AAAI. Innovative Application of AI Award.

[C4] Marco Mussi*, Gianmarco Genalti*, Francesco Trovó, Alessandro Nuara, Nicola Gatti and Marcello Restelli. Pricing the Long Tail by Explainable Product Aggregation and Monotonic Bandits. Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2022. (A* Core Ranking - Oral Presentation - 54/753, top 7%)

Journals

[J1] Marco Mussi, Luigi Pellegrino, Oscar Francesco Pindaro, Marcello Restelli and Francesco Trovó. A Reinforcement Learning Controller Optimizing Costs and Battery State of Health in Smart Grids. Journal of Energy Storage, 82, 2024. (Q1 Scimago)

[J2] Marco Mussi, Davide Lombarda, Alberto Maria Metelli, Francesco Trovó and Marcello Restelli. ARLO: A Framework for Automated Reinforcement Learning. Expert Systems with Applications, 224, 2023. (Q1 Scimago)

[J3] Marco Mussi, Luigi Pellegrino, Marcello Restelli and Francesco Trovó. An Online State of Health Estimation Method for Lithium-Ion Batteries based on Time Partitioning and Data-Driven Model Identification. Journal of Energy Storage, 55, 2022. (Q1 Scimago)

[J4] Marco Mussi, Luigi Pellegrino, Marcello Restelli and Francesco Trovó. A voltage dynamic-based state of charge estimation method for batteries storage systems. Journal of Energy Storage, 44, 2021. (Q1 Scimago)

Workshops

[W1] Francesco Bacchiocchi*, Gianmarco Genalti*, Davide Maran*, Marco Mussi*, Marcello Restelli, Nicola Gatti and Alberto Maria Metelli. Online Learning in Autoregressive Dynamics. European Workshop on Reinforcement Learning (EWRL). 2023.

[W2] Alessandro Montenegro, Marco Mussi, Francesco Trovó, Marcello Restelli and Alberto Maria Metelli. Stochastic Rising Bandits: A Best Arm Identification Approach. European Workshop on Reinforcement Learning (EWRL). 2023.

[W3] Alessandro Montenegro, Marco Mussi, Francesco Trovó, Marcello Restelli and Alberto Maria Metelli. A Best Arm Identification Approach for Stochastic Rising Bandits. Workshop on New Frontiers in Learning, Control, and Dynamical Systems at International Conference of Machine Learning (ICML). 2023.

[W4] Gianmarco Genalti, Marco Mussi, Alessandro Nuara and Nicola Gatti. Dynamic Pricing with Online Data Aggregation and Learning. European Workshop on Reinforcement Learning (EWRL). 2022. (Oral Presentation - 10/96)

[W5] Marco Mussi, Alberto Maria Metelli and Marcello Restelli. Dynamical Linear Bandits for Long-Lasting Vanishing

Rewards. Complex Feedback in Online Learning Workshop at International Conference of Machine Learning (ICML). 2022.

Under Review

[R1] [Marco Mussi](#), Alessandro Montenegro, Francesco Trovò, Marcello Restelli and Alberto Maria Metelli. Best Arm Identification for Stochastic Rising Bandits. 2023. arXiv preprint arXiv:2302.07510.

[R2] [Marco Mussi](#) and Alberto Maria Metelli. Generalizing the Regret: an Analysis of Lower and Upper Bounds. 2023.

Master's Students Supervision

- Gianmarco Genalti - "A Multi-Armed Bandit Approach to Dynamic Pricing". Co-supervision. Supervisor: Prof. Nicola Gatti (M.Sc. in Mathematical Engineering, Dec 2021)
- Amedeo Cavallo - "A Combinatorial Multi-Armed Bandit Approach to Online Advertising Budget Optimisation". Co-supervision. Supervisor: Prof. Marcello Restelli (M.Sc. in Computer Science and Engineering, Dec 2021)
- Oscar Francesco Pindaro - "Controlling Lithium-Ion Batteries Through Reinforcement Learning". Co-supervision. Supervisor: Prof. Marcello Restelli (M.Sc. in Computer Science and Engineering, Apr 2022)
- Davide Lombarda - "Towards Automated Reinforcement Learning". Co-supervision with Alberto Maria Metelli. Supervisor: Prof. Marcello Restelli (M.Sc. in Mathematical Engineering, Apr 2022)
- Thomas Petrone - "Hidden Markov Model for Single User Response Prediction in Digital Advertising Campaigns". Co-supervision. Supervisor: Prof. Marcello Restelli (M.Sc. in Mathematical Engineering, Jul 2022)
- Alessandro Montenegro - "Best Model Selection via Stochastic Rising Bandits". Co-supervision. Supervisor: Prof. Alberto Maria Metelli (M.Sc. in Computer Science and Engineering, May 2023)
- Andrea d'Silva - "Integrating Behavioral Cloning into a Reinforcement Learning pipeline". Co-supervision. Supervisor: Prof. Francesco Trovò (M.Sc. in Computer Science and Engineering, May 2023)
- Francesco Gonzales - "Stochastic Linear Bandit with Global-Local Structure". Co-supervision. Supervisor: Prof. Francesco Trovò (M.Sc. in Computer Science and Engineering, May 2023)
- Vittorio Arianna - "Multi-Armed Bandits for Joint Pricing and Advertising". Co-supervision. Supervisor: Prof. Nicola Gatti (M.Sc. in Computer Science and Engineering, Oct 2023)
- Marco Bonalumi - "An Online Learning Algorithm for Real-time Bidding". Co-supervision. Supervisor: Prof. Marcello Restelli (M.Sc. in Computer Science and Engineering, Dec 2023)
- Alessandro Contù - "Budget Optimization in Marketing Mix Models". Co-supervision. Supervisor: Prof. Francesco Trovò (M.Sc. in Computer Science and Engineering, Dec 2023)
- Andrea Cerasani - "An Online Dynamic Pricing Algorithm for Complementary Products". Co-supervision. Supervisor: Prof. Marcello Restelli (M.Sc. in Computer Science and Engineering, Dec 2023)
- Valentina Abbattista. Co-supervision. (M.Sc. in Computer Science and Engineering, in progress)
- Federico Mansutti. Co-supervision. (M.Sc. in Computer Science and Engineering, in progress)
- Federico Corso. Co-supervision. (M.Sc. in Automation and Control Engineering, in progress)
- Davide Beretta. Co-supervision. (M.Sc. in Computer Science and Engineering, in progress)

Other Academic Activities

Reviewer Activities

Reviewer for International Conferences and Workshops:

- Neural Information Processing Systems (NeurIPS)
- International Conference on Machine Learning (ICML)
- International Conference on Learning Representations (ICLR)
- International Conference on Artificial Intelligence and Statistics (AISTATS)
- International Conference on Automated Machine Learning (AutoML)
- European Workshop on Reinforcement Learning (EWRL)

Reviewer for International Journals:

- Springer - Machine Learning (Q1)
- IEEE - Transactions on Neural Networks and Learning Systems (Q1)

- IEEE - Robotics and Automation Letters (Q1)
- Elsevier - Engineering Applications of Artificial Intelligence (Q1)

Participation to International Conferences and Workshops.....

- International Conference on Machine Learning (ICML) 2022 and 2023
- ACM International Conference on Knowledge Discovery and Data Mining (KDD) 2022
- European Workshop on Reinforcement Learning (EWRL) 2022 and 2023

Participation to Summer Schools.....

- Reinforcement Learning Summer School (Barcelona, June 2023)
- DeepLearn Summer School (Virtual, July 2021)

Last update: January 20th 2024

Autorizzo al trattamento dati ai sensi del GDPR 2016/679 del 27 aprile 2016

Il sottoscritto, Marco Mussi, consapevole delle sanzioni penali previste dall'art. 76 T.U. N. 445 del 28.12.2000 sulle disposizioni legislative e regolamentari in materia di documentazione amministrativa, nel caso di mendaci dichiarazioni, o esibizione di atti falsi o contenenti dati non rispondenti a verità, dichiara sotto la propria responsabilità che quanto sopra riportato risponde a verità.