

# DAVIDE PREVITALI'S CURRICULUM VITAE

Updated: December 16, 2025

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## CURRENT POSITION

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JUNE 2023 - TODAY

**FIXED-TERM ASSISTANT PROFESSOR (RTD-A)**

University of Bergamo (Italy) - Dipartimento di Ingegneria gestionale, dell'Informazione e della Produzione

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## PREVIOUS POSITIONS

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DECEMBER 2022 - JUNE 2023

**POST-DOCTORAL FELLOW**

University of Bergamo (Italy) - Dipartimento di Ingegneria gestionale, dell'Informazione e della Produzione

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## EDUCATION

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OCTOBER 2019 - SEPTEMBER 2022

**PH.D. IN ENGINEERING AND APPLIED SCIENCES**

University of Bergamo (Italy)

**Orientations:**

- Control systems,
- Artificial intelligence,
- Black-box optimization,
- Preference-based optimization.

**Thesis title:** Surrogate-based methods for black-box and preference-based optimization in control systems

**Supervisor:** Prof. Mirko Mazzoleni

**Co-supervisors:** Prof. Antonio Ferramosca, Prof. Fabio Previdi

**Reviewers:** Prof. Dario Piga (SUPSI-USI, Lugano, Switzerland), Prof. Mario Zanon (Scuola IMT Alti Studi, Lucca, Italy)

**Graduation date:** March 3, 2023

**Final grade:** Excellent

SEPTEMBER 2017 - SEPTEMBER 2019

**MASTER'S DEGREE IN COMPUTER SCIENCE AND ENGINEERING**

University of Bergamo (Italy)

**Thesis title:** Dynamic texture identification and synthesis using data-driven approaches

**Supervisor:** Prof. Mirko Mazzoleni

**Final grade:** 110L/110

SEPTEMBER 2014 - SEPTEMBER 2017

**BACHELOR'S DEGREE IN COMPUTER SCIENCE AND ENGINEERING**

University of Bergamo (Italy)

**Thesis title:** Estimation of the position of an automatic gate using inertial measurements

**Supervisor:** Prof. Fabio Previdi

**Final grade:** 107/110

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## RESEARCH ACTIVITIES

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### BLACK-BOX AND PREFERENCE-BASED OPTIMIZATION FOR CONTROL SYSTEMS

Many control systems applications involve the calibration of a set of parameters that affect the performance of the designed strategy. For example, most control algorithms (such as Proportional-Integral-Derivative, PID, regulators, and Model Predictive Control, MPC, strategies) need to be adequately tuned to achieve desired setpoint tracking and disturbance rejection performance while satisfying application-specific constraints. In this context, the calibration process can be particularly challenging, as performance assessment may involve conducting experiments on the system or running complex simulations, both of which require a non-negligible amount of resources (such as time). Further, in many cases, there are no clear performance indicators, and the quality of a controller calibration is evaluated by a human decision-maker, who expresses their subjective judgment based on their expertise. Black-box and preference-based optimization are particularly suited for control systems calibration, as they aim to find a tuning that either optimizes a given performance indicator or best satisfies the human decision-maker criteria by trying the least amount of calibrations as possible, effectively mitigating the number of experiments/simulations to conduct on the system. The research activity in this area is focused on:

- Designing and extending surrogate-based methods for black-box and preference-based optimization, with a particular focus on convergence guarantees [J4, B2, M1]
- Applications of black-box and preference-based optimization methods [J2, J3]

### DEEP LEARNING FOR SYSTEM IDENTIFICATION

In recent years, there has been a substantial cross-fertilization between traditional system identification and deep learning. Specifically, deep neural network models are now widely used to learn dynamic models from data, especially in the case of nonlinear systems, motivated by their superior predictive power compared to traditional approaches. Nonetheless, there are often shortcomings in applying standard neural network models to system identification tasks, as they may exhibit behaviors that are not consistent with the first principles governing the system under study. Further, standard neural network models usually do not possess important properties (e.g., stability) from a control systems perspective by construction. To tackle this issue, an interesting line of research involves the design of novel neural network architectures better suited to the control systems community, and the creation of training procedures and regularization strategies for deep learning methods that enforce compliance with first principles and desired properties. The research activity in this area follows the just-mentioned line of research:

- Input-to-State Stable (ISS) neural networks [C2]
- Application of neural network models to general system identification tasks [J3]
- Application of neural network models for glucose-insulin dynamics modeling with promotion of physiologically-consistent behaviors [C1]

### LITHIUM-ION BATTERIES

Nowadays, lithium-ion batteries are among the most prominent energy storage devices due to their longer cycle life, lower self-discharge rates, higher operating voltages, and higher energy densities compared to other rechargeable battery chemistries. Applications range from portable electronics to electric vehicles, including also stationary electrical energy storage systems. Despite all these beneficial characteristics, lithium-ion batteries require a combination of hardware and software components, making up the so-called Battery Management System (BMS), to ensure proper operation and, especially, to prevent dangerous scenarios such as thermal runaways.

The software component of the BMS is of particular interest to the control systems community as it involves the design of strategies to estimate the state of charge, internal temperature, and state of health of the battery, but also the definition of control strategies for thermal management purposes and to modulate battery usage for mitigating degradation. The research activity in this area falls within these topics:

- Design of Kalman-filter-based strategies for state of charge estimation [J2, C4]

#### **CONTROL SYSTEMS APPLICATIONS**

The beauty of control systems techniques is their applicability to different fields, from the manufacturing sector to biological systems (e.g., the artificial pancreas). Throughout the years, partially thanks to several industrial collaborations, I have worked (mostly) on modeling and control design for textile applications and thermal systems<sup>1</sup>. Outcomes that fall within this line of research are:

- Modeling of thermal systems [C2, C8, C10]
- Design of control algorithms for thermal systems [J1, C5, C6, C7, C9, B1]
- Design of control algorithms for yarn feeders used in textile applications [P1]

#### **OTHER RESEARCH ACTIVITIES (WITH AT LEAST ONE PUBLICATION)**

- Identification of dynamic textures [C11]
- Motor test bench design [C3]

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<sup>1</sup>Not including lithium-ion batteries, which I have deemed to be a research activity on its own.

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## TEACHING ACTIVITY

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I am/was **Lecturer** of the following courses at University of Bergamo (Italy):

- February 2025 - June 2025  
**Data Science and Automation** (in English)  
M.Sc. course  
CLASS HOURS: 48h
- February 2024 - June 2024  
**Data Science and Automation** (in English)  
M.Sc. course  
CLASS HOURS: 48h
- February 2023 - June 2023  
**Data Science and Automation** (in English)  
M.Sc. course  
CLASS HOURS: 48h

I am/was **Lecturer Assistant** of the following courses at University of Bergamo (Italy):

- October 2022 - December 2022  
**Fondamenti di Automatica** (in Italian) - Control Systems basics  
B.Sc. course - TEACHER: Prof. Fabio Previdi  
CLASS HOURS: 42h
- February 2022 - May 2022  
**Dynamic Systems Identification** (in English)  
M.Sc. course - TEACHER: Prof. Antonio Ferramosca  
CLASS HOURS: 18h
- October 2021 - December 2021  
**Fondamenti di Automatica** (in Italian) - Control Systems basics  
B.Sc. course - TEACHER: Prof. Fabio Previdi  
CLASS HOURS: 18h
- February 2021 - May 2021  
**Dynamic Systems Identification** (in English)  
M.Sc. course - TEACHER: Prof. Antonio Ferramosca  
CLASS HOURS: 18h
- October 2020 - January 2021  
**Fondamenti di Automatica** (in Italian) - Control Systems basics  
B.Sc. course - TEACHER: Prof. Fabio Previdi  
CLASS HOURS: 18h
- March 2020 - June 2020  
**Dynamic Systems Identification** (in English)  
M.Sc. course - TEACHER: Prof. Valentina Breschi  
CLASS HOURS: 24h
- October 2019 - December 2019  
**Fondamenti di Automatica** (in Italian) - Control Systems basics  
B.Sc. course - TEACHER: Prof. Fabio Previdi  
CLASS HOURS: 18h

I am/was **Advisor** of the following M.Sc. theses at University of Bergamo (Italy):

- June 2024 - March 2025  
**State of Charge Estimation of Cylindrical Lithium-ion Batteries: From Test**

**Bench Development to Virtual Sensor Design** (in English)

STUDENT(S): Lorenzo Fagiani

- September 2023 - July 2024

**Advancing Dynamic System Identification with Input-to-State Stable Recurrent Neural Networks: Theory and Application to Thermal Systems** (in English)

STUDENT(S): Stefano De Carli

I am/was **Co-Advisor** of the following M.Sc. theses at University of Bergamo (Italy):

- September 2023 - September 2024

**Model Predictive Control con iperparametri tarati secondo l'approccio Bayesian Optimization nel contesto di un forno industriale per attività di packaging** (in Italian) - Model Predictive Control with hyperparameters calibrated according to the Bayesian Optimization approach in the context of an industrial oven for packaging activities

ADVISOR: Prof. Antonio Ferramosca

STUDENT(S): Fabio Filippo Mandalari

- February 2021 - September 2021

**Progettazione del controllore di velocità per alimentatori positivi di filato** (in Italian) - Design of the velocity controller for positive yarn feeders

ADVISOR: Prof. Fabio Previdi

STUDENT(S): Giovanni Del Prete, Simone Carissimi

- October 2019 - April 2020

**Modellistica orientata al controllo di alimentatori positivi per macchine da maglieria** (in Italian) - Control-oriented modeling of positive yarn feeders for knitting machines

ADVISOR: Prof. Fabio Previdi

STUDENT(S): Riccardo Paruta

I am/was **Co-Advisor** of the following B.Sc. theses at University of Bergamo (Italy):

- March 2022 - September 2022

**Implementazione di una procedura di auto-taratura per controllori PID** (in Italian) - Implementation of an auto-tuning procedure for PID controllers

ADVISOR: Prof. Mirko Mazzoleni

STUDENT(S): Pier Luigi Araujo

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## PARTICIPATION IN REGIONAL, NATIONAL, AND INTERNATIONAL RESEARCH PROJECTS

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I am/was involved in the following regional, national, and international research projects:

- December 2022 - Today

**National center for sustainable mobility**

FUNDED BY: Italy National Recovery and Resilience Plan, Next Generation EU (Piano Nazionale Ripresa e Resilienza - PNRR)

ROLE: Researcher on the Work Package 2.4 (battery management system and energy recovery) of the Spoke 5 (active mobility and light vehicles). In particular, within the Work Package 2.4, I am/was task leader of Task T2.4.1 (analysis of the state of the art on Li-ion batteries, battery aging and battery management systems), Task T2.4.2 (battery characterization and aging tests), and Task T2.4.3 (battery management system)

AT: University of Bergamo (Italy)

- March 2021 - June 2021

**Workload-reduction mAchine vision-based TeChnology Hub for MANufacturing (WATCHMAN)**

FUNDED BY: European Regional Development Fund (ERDF 2014-2020), in conjunction with the Lombardy region

ROLE: Researcher on the Work Package 3 (intelligence)

AT: University of Bergamo (Italy)

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## INDUSTRIAL COLLABORATIONS

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I am/was involved in the following industrial research projects:

- March 2023 - March 2025  
**Controllo di velocità di alimentatori negativi** (in Italian) - Design of the velocity controller for negative yarn feeders  
FUNDED BY: L.G.L. S.p.A. (Gandino (BG), Italy)  
ROLE: Researcher and co-supervisor  
AT: University of Bergamo (Italy)
- March 2022 - July 2024  
**Metodi avanzati di controllo per forni bizona** (in Italian) - Design of advanced control algorithms for multi-zone industrial ovens  
FUNDED BY: SMI Group S.p.A. (San Giovanni Bianco (BG), Italy)  
ROLE: Researcher and co-supervisor  
AT: University of Bergamo (Italy)
- October 2019 - September 2021  
**Progetto di un algoritmo per la reiezione di disturbi di carico nel controllo di temperatura di forni per confezionatrici in film termoretraibile** (in Italian) - Design of a disturbance rejection algorithm for the temperature controller of film shrink wrappers  
FUNDED BY: SMI Group S.p.A. (San Giovanni Bianco (BG), Italy)  
ROLE: Researcher and co-supervisor  
AT: University of Bergamo (Italy)
- October 2019 - September 2021  
**Studio di algoritmi di controllo avanzati per alimentatori positivi di filato** (in Italian) - Design of advanced control algorithms for positive yarn feeders  
FUNDED BY: L.G.L. S.p.A. (Gandino (BG), Italy)  
ROLE: Researcher and co-supervisor  
AT: University of Bergamo (Italy)

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## PARTICIPATION IN SCIENTIFIC EVENTS

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I have attended the following **international congresses and conferences**:

- **51st Annual Conference of the IEEE Industrial Electronics Society (IECON 2025)**, Madrid (Spain), October 14-17, 2025  
PURPOSE: presentation of the contribution [C4]
- **23rd European Control Conference (ECC 2025)**, Thessaloniki (Greece), June 24-27, 2025  
PURPOSE: chair of the invited session “Modeling and Process Control”, presentation of the contribution [C6], author of the contributions [C6, C2, C5]
- **20th IFAC Symposium on System Identification (SYSID 2024)**, Boston (Massachusetts, USA), July 17-18, 2024  
PURPOSE: author of the contributions [C10, C8]
- **12th IFAC Symposium on Advanced Control of Chemical Processes (AD-CHEM 2024)**, Toronto (Canada), July 14-17, 2024  
PURPOSE: co-chair of the invited session “Modeling and Control of Energy Processes”, presentation of the contribution [C9]
- **21st IFAC World Congress**, July 11-17, 2020 (virtual)  
PURPOSE: presentation of the contribution [C11]

I have attended the following **national congresses and conferences**:

- **Automatica.it 2022**, Cagliari (Italy), September 1-3, 2022  
PURPOSE: presentation of the extended abstract titled “A surrogate-based scheme for black-box and preference-based optimization with a controller calibration application”

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## PUBLICATIONS

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### JOURNAL PAPERS

- [J1] Leandro Pitturelli, **Daide Previtali**, Fabio Previdi, and Antonio Ferramosca. “Optimizing industrial oven temperature uniformity: A model predictive control framework with rapid control prototyping”. In: *Control Engineering Practice* 164 (2025), p. 106409. ISSN: 0967-0661. DOI: <https://doi.org/10.1016/j.conengprac.2025.106409>.
- [J2] **Daide Previtali** and Fabio Previdi. “Optimal calibration of Kalman filters for state of charge estimation of lithium-ion cells”. In: *Journal of Energy Storage* 139 (2025), p. 118753. ISSN: 2352-152X. DOI: <https://doi.org/10.1016/j.est.2025.118753>.
- [J3] Matteo Scandella, **Daide Previtali**, and Alessio Moreschini. “Are Artificial Neural Networks suitable for data-driven moment matching?” In: *European Journal of Control* 85 (2025), p. 101360. ISSN: 0947-3580. DOI: <https://doi.org/10.1016/j.ejcon.2025.101360>.
- [J4] **Daide Previtali**, Mirko Mazzoleni, Antonio Ferramosca, and Fabio Previdi. “GLISp-r: a preference-based optimization algorithm with convergence guarantees”. In: *Computational Optimization and Applications* (2023), pp. 1–38. DOI: <https://doi.org/10.1007/s10589-023-00491-2>.

### CONFERENCE PAPERS

- [C1] Stefano De Carli, Nicola Licini, **Daide Previtali**, Fabio Previdi, and Antonio Ferramosca. “Integrating Biological-Informed Recurrent Neural Networks for Glucose-Insulin Dynamics Modeling”. In: *IFAC-PapersOnLine* 59.2 (2025). 1st IFAC Workshop on Engineering Diabetes Technologies EDT 2025, pp. 91–96. ISSN: 2405-8963. DOI: <https://doi.org/10.1016/j.ifacol.2025.06.016>.
- [C2] Stefano De Carli, **Daide Previtali**, Leandro Pitturelli, Mirko Mazzoleni, Antonio Ferramosca, and Fabio Previdi. “Infinity-norm-based Input-to-State-Stable Long Short-Term Memory networks: a thermal systems perspective”. In: *2025 European Control Conference (ECC)*. 2025, pp. 911–916. DOI: <https://doi.org/10.23919/ECC65951.2025.11187211>.
- [C3] Marcello Minervini, Paolo Giangrande, Filippo Cortinovis, Lorenzo Mantione, and **Daide Previtali**. “Design and Implementation of a Test Bench for Regenerative Braking Evaluation on E-Bike Motor”. In: *2025 IEEE Workshop on Electrical Machines Design, Control and Diagnosis (WEMDCD)*. 2025, pp. 1–6. DOI: <https://doi.org/10.1109/WEMDCD61816.2025.11014138>.
- [C4] **Daide Previtali**, Daniele Masti, Mirko Mazzoleni, and Fabio Previdi. “A virtual sensor fusion approach for state of charge estimation of lithium-ion cells”. In: *IECON 2025 – 51st Annual Conference of the IEEE Industrial Electronics Society*. 2025, pp. 1–7. DOI: <https://doi.org/10.1109/IECON58223.2025.11221520>.
- [C5] **Daide Previtali**, Mirko Mazzoleni, Nicholas Valceschini, and Fabio Previdi. “Data-driven mixed-sensitivity structured control of SISO multi-model systems with application to a reconfigurable industrial oven”. In: *2025 European Control Conference (ECC)*. 2025, pp. 886–891. DOI: <https://doi.org/10.23919/ECC65951.2025.11187191>.

- [C6] **Daide Previtali**, Leandro Pitturelli, Antonio Ferramosca, and Fabio Previdi. “Disturbance-rejection-oriented temperature control of shrink tunnels under varying grid voltage”. In: *2025 European Control Conference (ECC)*. 2025, pp. 2874–2881. DOI: <https://doi.org/10.23919/ECC65951.2025.11187036>.
- [C7] Leandro Pitturelli, **Daide Previtali**, Antonio Ferramosca, and Fabio Previdi. “Towards energy-efficient shrink tunnels by means of Economic Model Predictive Control”. In: *2024 IEEE 20th International Conference on Automation Science and Engineering (CASE)*. 2024, pp. 39–44. DOI: <https://doi.org/10.1109/CASE59546.2024.10711337>.
- [C8] **Daide Previtali**, Leandro Pitturelli, Antonio Ferramosca, and Fabio Previdi. “Grey-box modelling and identification of the industrial oven of a shrink tunnel”. In: *IFAC-PapersOnLine* 58.15 (2024). 20th IFAC Symposium on System Identification SYSID 2024, pp. 55–60. ISSN: 2405-8963. DOI: <https://doi.org/10.1016/j.ifacol.2024.08.504>.
- [C9] **Daide Previtali**, Leandro Pitturelli, Antonio Ferramosca, and Fabio Previdi. “Model-based design of the temperature controller of a shrink tunnel”. In: *IFAC-PapersOnLine* 58.14 (2024). 12th IFAC Symposium on Advanced Control of Chemical Processes AD-CHEM 2024, pp. 49–54. ISSN: 2405-8963. DOI: <https://doi.org/10.1016/j.ifacol.2024.08.312>.
- [C10] **Daide Previtali**, Matteo Scandella, Leandro Pitturelli, Mirko Mazzoleni, Antonio Ferramosca, and Fabio Previdi. “Continuous-time identification of grey-box and black-box models of an industrial oven”. In: *IFAC-PapersOnLine* 58.15 (2024). 20th IFAC Symposium on System Identification SYSID 2024, pp. 175–180. ISSN: 2405-8963. DOI: <https://doi.org/10.1016/j.ifacol.2024.08.524>.
- [C11] **Daide Previtali**, Nicholas Valceschini, Mirko Mazzoleni, and Fabio Previdi. “Identification of dynamic textures using Dynamic Mode Decomposition”. In: *IFAC-PapersOnLine* 53.2 (2020), pp. 2423–2428. DOI: <https://doi.org/10.1016/j.ifacol.2020.12.045>.

## BOOKS AND BOOK CHAPTERS

- [B1] **Daide Previtali**, Leandro Pitturelli, Fabio Previdi, and Antonio Ferramosca. “Temperature Control of a Shrink Tunnel with Multiple Heating Zones”. In: *Control Systems Benchmarks*. Ed. by José M. Maestre and Carlos Ocampo-Martinez. Cham: Springer Nature Switzerland, 2025, pp. 45–61. ISBN: 978-3-031-76312-0. DOI: [https://doi.org/10.1007/978-3-031-76312-0\\_4](https://doi.org/10.1007/978-3-031-76312-0_4).
- [B2] **Daide Previtali**. “Surrogate-based methods for black-box and preference-based optimization in control systems”. ISBN: 9788897413936. PhD thesis. University of Bergamo, 2024. DOI: <https://doi.org/10.13122/978-88-97413-93-6>.

## PREPRINTS AND MISCELLANEA

- [M1] **Daide Previtali**, Mirko Mazzoleni, Antonio Ferramosca, and Fabio Previdi. “A unified surrogate-based scheme for black-box and preference-based optimization”. In: *arXiv preprint arXiv.2202.01468* (2022). DOI: <https://doi.org/10.48550/arXiv.2202.01468>.

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## PATENTS

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[P1] Fabio Previdi, **Davide Previtali**, Giorgio Bertocchi and Mirko Ruggeri. “Metodo di controllo della tensione del filato per alimentatori di filato positivi motorizzati”. *Brevetto d’invenzione industriale italiano* (Italian patent). Patent number: 102021000025076, filed: 30 September 2021, issued: 02 November 2023.

**Extension(s):** the aforementioned patent has been extended to the following countries:

- *Europe*. “Method for controlling yarn tension for motorized positive yarn feeders”. Patent number: EP4159655A1, filed: 28 September 2022, issued: 05 April 2023.
- *China*. “Method for controlling yarn tension for motorized positive yarn feeders”. Patent number: CN115893110A, filed: 28 September 2022, issued: 04 April 2023.

In compliance with the GDPR and the Italian Legislative Decree no. 196 dated 30/06/2003, I hereby authorize the recipient of this CV to use and process my personal details contained in this document.