PERSONAL INFORMATION Anton Soppelsa

WORK EXPERIENCE

From 2012

Senior Researcher

Eurac Research

- Development of fuzzy-logic-, machine-learning-based and model predictive controllers for heating and cooling systems;
- Modelling and simulation of dynamic systems, in particular electrical and thermo-hydraulic;
- Development of SCADA and real-time control software to be deployed in production environment;
- Development of the SCADA and real-time control system of the Energy Exchange and Heat Pumps laboratories;
- Development of hardware and software components for heating and cooling systems (Energy Hubs, NRGates).

The guiding principle of my current research is the application of modern automation techniques such as machine learning, expert controls, model predictive control to improve the operativity, maintainability and cost effectiveness of PV and thermal energy systems. One of the possible paths to achieve these goals is increasing the integration between the energy distribution networks and the electrical or thermal systems they serve, exploiting synergies. As an illustrative example, the case of a virtual power plant consisting in many heat pumps connected to a low-temperature district heating and cooling network can be cited, which is an application where I am active together with the colleagues of the research group I belong to. In this setting, the heat-pump technology and an appropriate form of thermal energy storage is the element allowing to bridge the electrical and thermal networks. Coordination between the involved agents and predictive control capabilities are key to achieve specific goals such as shaving off the peaks of the electrical energy demand, helping the electrical grid stability. Energy communities and distributed generation are also topics my colleagues and I are looking at with interest.

2010 – 2012

Research Engineer

National Research Council - Ionized Gas Institute (Consiglio Nazionale delle Ricerche - Istituto Gas Ionizzati)

- R&D in the fields of control engineering, electromagnetic modelling and information technology in the framework of the magnetically-confined thermonuclear fusion;
- Deputy task force leader (participation to the organization of the scientific programme);
- Engineer in charge (in charge, during his/her shift, of the personnel safety and the technical aspects of the experimental session);
- Scientific coordinator (in charge, during his/her shift, of the scientific aspects of the experimental session).

2008 – 2010

Research Engineer

Consorzio RFX - EURATOM/ENEA Association

- R&D in the fields of control engineering, electromagnetic modelling and information technology in the framework of the magnetically-confined thermonuclear fusion.

2004 – 2005

Control Engineer

JET-EFDA Culham Science Centre –United Kingdom

- R&D in the fields of control engineering, electromagnetic modelling and information technology in the framework of the magnetically-confined thermonuclear fusion;
- Contribution to the development of the upgrade of the machine first wall protection system (WALLS code);
- Contribution to the development of the BaseLib software library written in C++.

EDUCATION AND TRAINING

2005 – 2008

Ph.D. Electrical Engineering
University of Padova, Padova, Italy

- Ph. D. dissertation: “Aspects of Electromagnetic Modelling for Multiple-Input-Multiple-Output Control of MHD Modes in RFX-mod”;
- MHD instabilities and their control;
- Bi- and tri-dimensional modelling of cylindrical, toroidal, and poloidal electromagnetic systems;
- Bi- and tri-dimensional discrete Fourier transform in the framework of the unified signal theory.

1997-2004

M.S. Computer Engineering (Laurea in Ingegneria informatica, indirizzo Automatica e Sistemi di Automazione Industriale)
University of Padova, Padova, Italy

- Systems Theory;
- Multivariable Systems;
- Control System Theory and Technologies;
- Operational Research;
- Signals Theory;
- Theoretical Computer Science;
- Commutative Algebra (Algebraic Geometry);
- Electrical Engineering;
- Digital and Analogue Electronics;
- Computer Engineering.

PERSONAL SKILLS

Mother tongue(s) Italian

Other language(s) C1 written and spoken competence in English. Self-assessed.

Job-related skills Teaching experience

- 2022-2023 (2 A.Y.)
  Programmable Controllers for Industrial Automation (Contract Professor)
  University of Bolzano, Bolzano, Italy
  ING-IND/32
  under-graduate
  English
  60 hours, 6 CFU

- 2020-2022 (2 A.Y.)
  Programmable Controllers for Industrial Automation – Exercises (Contract Professor)
  University of Bolzano, Bolzano, Italy
  ING-IND/32
  under-graduate
  English
  24 hours, 2.4 CFU

- 2016-2018 (2 A.Y.)
  Automatic Control (Teaching Assistant)
  University of Bolzano, Bolzano, Italy
  ING-INF/04
  under-graduate
  English
  16 hours, 5 CFU

- 2009-2012 (4 A.Y.)
  Digital Systems Programming (Contract Professor)
  University of Padova, Padova, Italy
  ING-INF/01
  under-graduate
  Italian
  72 hours, 9 CFU

- 2006-2008 (2 A.Y.)

Introduction to Computer Engineering (Teaching Assistant)
University of Padova, Vicenza, Italy
ING-INF/05
under-graduate

- A.Y. 2007-2008
  Introduction to Programming Languages (Teaching Assistant)
  University of Padova, Padova, Italy
  ING-INF/05
  under-graduate

- A.Y. 2005-2006
  Electrical Engineering (Teaching Assistant)
  University of Padova, Padova, Italy
  ING-IND/31
  under-graduate

- Supervision of 2 Ph.D. students: D. Bettoni, "Design and assessment of optimized control strategies for solar heating and cooling system" 2014; A. Bellini, "Advanced control strategies for HVAC system in residential buildings"

ADDITIONAL INFORMATION

Publications — Scopus H-Index: 20

- **Patent Families**

Anton Soppelsa. 'SISTEMA DI REGOLAZIONE PER UN CIRCUITO TERMOIDRAULICO E METODO DI CONTROLLO'. *Ufficio Italiano Brevetti e Marchi* (8 Aprile 2023). IT202100025670A1, EP4163554B1, US12140977B2.

- **Journal papers**

A.M. Jodeiri, ***A. Soppelsa***, F. Turrin, M. Pipiciello, M. Cozzini, R. Fedrizzi. 'Numerical and experimental investigation of stratified water storage tanks: An enhanced adaptive-grid model'. *Applied Thermal Engineering*, vol. 248, Part A (1 July 2024): 123113. 10.1016/j.applthermaleng.2024.123113.

Pipiciello M; Trentin F; ***Soppelsa A***; Menegon D; Fedrizzi R; Ricci M; Di Pietra B; Sdringola P. 'The bidirectional substation for district heating users: experimental performance assessment with operational profiles of prosumer loads and distributed generation'. *Energy and Buildings*, vol. 305 (15 February 2024): 113872. 10.1016/j.enbuild.2023.113872.

Tim Diller, ***Anton Soppelsa***, Himanshu Nagpal, Roberto Fedrizzi, Gregor Henze. 'A dynamic programming based method for optimal control of a cascaded heat pump system with thermal energy storage'. *Optimization and Engineering*, vol. 25 (2024): 229–251. 10.1007/s11081-023-09853-5.

Mohammad Hossein Fouladfar, ***Anton Soppelsa***, Himanshu Nagpal, Roberto Fedrizzi, Giuseppe Franchini. 'Adaptive thermal load prediction in residential buildings using artificial neural networks'. *Journal of Building Engineering*, vol. 77 (15 October 2023): 107464. 10.1016/j.jobe.2023.107464.

Simone Buffa, ***Anton Soppelsa***, Mauro Pipiciello, Gregor Henze, and Roberto Fedrizzi. 'Fifth-Generation District Heating and Cooling Substations: Demand Response with Artificial Neural Network-Based Model Predictive Control'. *Energies* 13, no. 17 (21 August 2020): 4339. https://doi.org/10.3390/en13174339.

D. Bettoni, ***A. Soppelsa***, R. Fedrizzi, and R. del Toro Matamoros. 'Analysis and Adaptation of Q-Learning Algorithm to Expert Controls of a Solar Domestic Hot Water System'. *Applied System Innovation* 2, no. 2 (25 April 2019): 15. https://doi.org/10.3390/asi2020015.

Menegon, D., ***A. Soppelsa***, and R. Fedrizzi. 'Development of a New Dynamic Test Procedure for the Laboratory Characterization of a Whole Heating and Cooling System'. *Applied Energy* 205 (2017): 976–90. https://doi.org/10.1016/j.apenergy.2017.08.120.

Manduchi, G., A. Luchetta, ***A. Soppelsa***, and C. Taliercio. 'From Distributed to Multicore Architecture in the RFX-Mod Real Time Control System'. *Fusion Engineering and Design* 89, no. 3 (2014): 224–32. https://doi.org/10.1016/j.fusengdes.2013.07.002.

———. 'The New Feedback Control System of RFX-Mod Based on the MARTe Real-Time Framework'. *IEEE Transactions on Nuclear Science* 61, no. 3 (2014): 1216–21. https://doi.org/10.1109/TNS.2014.2321185.

Olofsson, K.E.J., ***A. Soppelsa***, T. Bolzonella, and G. Marchiori. 'Subspace Identification Analysis of RFX and T2R Reversed-Field Pinches'. *Control Engineering Practice* 21, no. 7 (2013): 917–29. https://doi.org/10.1016/j.conengprac.2013.03.004.

Barp, M., R. Cavazzana, G. Marchiori, ***A. Soppelsa***, and L. Zanotto. 'Closed Loop Control of Reversal Parameter in RFX-Mod'. *Fusion Engineering and Design* 86, no. 6–8 (2011): 1000–1004. https://doi.org/10.1016/j.fusengdes.2011.03.048.

Bettini, P., F. Blanchini, R. Cavazzana, G. Marchiori, S. Miani, and ***A. Soppelsa***. 'Adaptive Plasma Current Control in RFX-Mod'. *Fusion Engineering and Design* 86, no. 6–8 (2011): 1005–8. https://doi.org/10.1016/j.fusengdes.2011.03.049.

Piron, L., L. Grando, G. Marchiori, L. Marrelli, P. Piovesan, ***A. Soppelsa***, and D. Terranova. 'Dynamic Decoupling and Multi-Mode Magnetic Feedback for Error Field Correction in RFX-Mod'. *Nuclear Fusion* 51, no. 6 (2011). https://doi.org/10.1088/0029-5515/51/6/063012.

A. Soppelsa, A. Luchetta, and G. Manduchi. 'Assessment of Precise Time Protocol in a Prototype System for the ITER Neutral Beam Test Facility'. *IEEE Transactions on Nuclear Science* 57, no. 2 PART 1 (2010): 503–9. https://doi.org/10.1109/TNS.2009.2037814.

- **Conference papers**

Menegon, D., ***A. Soppelsa***, and R. Fedrizzi. 'Clustering Methodology for Defining a Short Test Sequence for Whole System Testing of Solar and Heat Pump Systems'. In *ISES Solar World Congress 2017 - IEA SHC International Conference on Solar Heating and Cooling for Buildings and Industry 2017, Proceedings*, 435–45, 2017. https://doi.org/10.18086/swc.2017.08.03.

A. Soppelsa, G. Marchiori, N. Marconato, P. Piovesan, and F. Villone. 'Modeling of Spatial Harmonic Transfer Functions and Its Application to the Decoupling of the RFX-Mod Active Control System'. In *38th EPS Conference on Plasma Physics 2011, EPS 2011 - Europhysics Conference Abstracts*, 35 2:1712–15, 2011. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84867638518&partnerID=40&md5=c10d878236ae0d0a2003a3a8969b5a05.

According to law 679/2016 of the Regulation of the European Parliament of 27th April 2016, I hereby express my consent to process and use my data provided in this CV