

Dario Piga: curriculum vitae

Date and place of birth: 11th December, 1982, Alghero, Italy
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Qualifications

Italian National Scientific **Habilitation as Associate Professor** in Automatic Control (since August 2017).

Current position

March 2017 - today **Researcher** at the Dalle Molle Institute for Artificial Intelligence Research, Scuola Universitaria Professionale della Svizzera Italiana, Lugano, Switzerland.

Previous positions

January 2015 - February 2017 **Assistant Professor** at the IMT School for Advanced Studies Lucca, Lucca, Italy.

April 2014 - December 2014 **Postdoc** at the Scuola Universitaria Professionale della Svizzera Italiana (SUPSI), Lugano, Switzerland.

March 2013 - February 2014 **Postdoc** at the Department of Electrical Engineering, Eindhoven University of Technology, Eindhoven, The Netherlands.

February 2012 - February 2013 **Postdoc** at the Delft Center for Systems and Control (DCSC), Delft University of Technology, Delft, The Netherlands.

January 2009 - December 2011 **PhD student** at the Dipartimento di Informatica e Automatica, Politecnico di Torino, Torino, Italy.

May 2008 - December 2008 **Assistant researcher** at the Dipartimento di Informatica e Automatica, Politecnico di Torino, Torino, Italy.

May 2004 - July 2004 **Internship at RSI Sistemi society, Altran Group**, Torino, Italy.

Visiting positions

November 2017 **Visiting Researcher** at the IMT School for Advanced Studies, Lucca, Italy. Hosted by Prof. Marco Paggi.

October 2012 - February 2013 **Visiting Researcher** at the Control Systems Group, Department of Electrical Engineering, Eindhoven University of Technology, The Netherlands. Hosted by Prof. Paul Van den Hof.

June 2010 - July 2010 **Visiting PhD student** at the Department of Fundamental Electricity and Instrumentation, Vrije Universiteit Brussel, Brussels, Belgium. Hosted by Prof. Johan Schoukens.

Education

Ph.D in Systems and Control Engineering, Politecnico di Torino, January 2009 – December 2011. Date of the PhD degree: 16/04/2012. Dissertation title: “A convex relaxation approach to set-membership identification”. Advisor: Prof. Vito Cerone.

Master of Science Degree in Mechatronics Engineering, Politecnico di Torino, April 2008. Thesis title: “Performance analysis of KiteGen system: high-altitude wind power generation”. Final grade: 110/110 *summa cum laude*. Advisor: Prof. Mario Milanese.

Bachelor of Science Degree in Electronics Engineering, Politecnico di Torino, September 2004. Thesis developed in collaboration with RSI Sistemi society, Altran Group, titled “Nonlinear system modeling from experimental data”. Final grade: 110/110 *summa cum laude*. Advisor: Prof. Mario Milanese.

Research areas

Non-parametric identification of nonlinear dynamical models

Nonparametric identification deals with the problem of data-driven modeling of dynamical systems. Unlike the parametric methods, the structure of the model to be estimated is not a-priori parameterized in this framework. Machine learning tools have been recently developed for nonparametric identification of dynamical systems, under general assumptions on the noise corrupting the observed data. In particular, a nonparametric instrumental variables based approach has been developed in [J14], a frequency-domain formulation for nonparametric identification of time-varying systems is introduced in [C17], and an approach for data-driven model order selection of *linear parameter-varying* systems is proposed in [C18, C16].

Parameter estimation in the set-membership context

Parameter estimation in the set-membership context deals with the identification of a set of all possible parameters of a system consistent with the measurements, the assumed model structure and the hypothesis on the error. Differently from the stochastic identification framework, in the set-membership context the statistical description of the noise on the measurements is not available and the only information on such an error is that its amplitude or energy is bounded. The problem of identifying linear systems when both input and output data are corrupted by bounded noise (bounded errors-in-variables problem) is considered in [J26, J29], while Hammerstein system identification is addressed [J22, J25]. An unified approach for bounding the parameters of Hammerstein-like and Wiener-like structures with backlash is discussed in [C24]. A procedure for set-membership identification of block-structured nonlinear feedback systems is proposed in [J23]. In all the works mentioned above, the identification problem is formulated in terms of nonconvex polynomial optimization and suitable convex-relaxation based on linear matrix inequalities (LMIs) are proposed to efficiently compute guaranteed bounds on the parameters of the considered system.

Identification of linear-parameter-varying models

Linear parameter-varying (LPV) models belong to the more general class of linear time-varying systems and, roughly speaking, they can be defined as linear systems where, either the matrixes of the state equations or the coefficients of the input-output relation, depend on one or more time varying parameters, whose real-time samples are assumed to be measurable. In [BC1, J21, J13], three different approaches are presented to identify LPV models when both the output data and the scheduling parameters are corrupted by noise. The first two contributions are formulated in the set-membership identification framework, while the latter contribution addresses LPV identification in the stochastic context. Set-membership LPV identification theory is exploited in [J28] to derive an LPV model describing vehicle lateral dynamics, and in [C25] to describe glucose-insulin dynamics in diabetic patients.

Convex-relaxation techniques for robust control

Convex-relation techniques based on the theory moments (or on the dual theory of sum-of-squares) are available in the literature to compute an approximation of the solution of polynomial optimization problems by solving a sequence of semidefinite programming (SDP) problems. Such techniques have been used to tackle challenging robust control problems, like robust pole placement for linear-time-invariant systems with uncertain parameters belonging to a semialgebraic region [J15], the computation of the structured singular value (also called μ) of a matrix w.r.t. a set of structured uncertainties [J10] and \mathcal{D} -stability analysis of uncertain polynomial matrices [J4]. In the latter work, a probabilistic version of the \mathcal{D} -stability analysis problem is also proposed, and among all probability measures satisfying a priori assumptions, the one providing the minimum probability of \mathcal{D} -stability is sought. Finally, an approach based on the theory of sum-of-squares is used in [C20] to compute (an approximation of) the minimum volume polytope containing a nonconvex semialgebraic set. This approach has the potential to efficiently solve robust LMI optimization problems which frequently arise in robust control.

High-altitude wind power generation

The key idea of high-altitude wind power generation is to capture the high-altitude wind flows using tethered airfoils (e.g. power kites used for surfing or sailing), linked to the ground with one or more cables which are employed to control their flight and to convert the aerodynamical forces into mechanical and electrical power, using suitable rotating mechanisms and electric generators kept at ground level. The airfoils are able to exploit wind flows at higher altitudes than those of wind towers (up to 1000 m), where stronger and more constant wind can be found basically everywhere in the world. Each airfoil is equipped with on-board sensors, and other sensors are installed at ground level to monitor the generated energy and the wind conditions. A nonlinear model predictive control (NMPC) strategy has been proposed to maximize the generated energy while explicitly taking into account the state and input constraints, related to actuator limitations and to the need of preventing the airfoil from falling to the ground and the lines from entangling. Obtained results are reported in [J24, J30, C33, C36], including theoretical analyses, numerical simulations and experimental tests with a small-scale prototype built at Politecnico di Torino.

Acquisition of research funds and participation to research projects

Acquired research funds

- *AI-CARES: A remote engineering service for smart monitoring of ammonia synthesis plants using artificial intelligence*, **CTI project**, Swiss Commission for Technology and Innovation,

Main research partner, approved with preliminary work in September 2017 (431.000 CHF).

- *Data-Driven Modeling of High Complexity Nonlinear Systems*, **Van Gogh Grant**, France/Netherlands academy, 2013, renewed for 2014 (5.000 Euro).

Participation to research projects

- EU H2020 project DAEDALUS. From March 2017 to today.
- EU FP7 project SmartH2O. From April 2014 to December 2014. Work Package leader.
- EU FP7 project AUTOPROFIT. From February 2013 to February 2014.
- National project “High power laser in nano-structured fibres”, funded by Piedmont Region. From March 2009 to December 2010.
- National project “Power kites for naval propulsion”, funded by Piedmont Region. From May 2008 to December 2008.

Awards

Italian engineering, architectural and technical economic consulting association (OICE) Studentship as **best Master thesis on renewable energy** for the year 2008.

Technical association memberships and editorial activities

Member (since 2018) of the Conference Editorial Board of the IEEE Control Systems Society.

Member (since 2016) of the Editorial Board of the journal “Mathematical Problems in Engineering”.

Member (since 2017) of the IFAC Technical Committee on Modelling, Identification, and Signal Processing.

Member (since 2013) of the IEEE-CSS Technical Committee on Medical and Healthcare Systems.

Member (since 2013) of the IEEE-CSS Technical Committee on System Identification and Adaptive Control.

Organizer (with Prof. A. Bemporad) of the invited session “*Hybrid models: challenges and applications*” for the IEEE Conference on Decision and Control, Miami Beach, Florida, 2018.

Organizer (with Dr. R. Tóth) of the invited session “*Data-driven modeling and control of Linear Parameter-Varying systems*” for the 52nd IEEE Conference on Decision and Control, Florence, Italy, 2013.

Reviewer of about 100 papers submitted to international journals and conferences like: IEEE Transaction on Automatic Control, IEEE Transaction on Control Systems Technology, Automatica, IET Control Theory & Applications, Control Engineering Practice, International Journal of Control, IEEE Conference on Decision and Control, American Control Conference, IFAC World Congress, IFAC Symposium on System Identification.

Reviewer of 1 book for IEEE-Wiley.

Institutional activities

Member of the Academic Council at the IMT School for Advanced Studies, Lucca, as a representative of researchers (January 2016 - February 2017).

PhD thesis committee member (Computer Science) at the IMT School for Advanced Studies, Lucca, February 2018, Student: Mogens Graff Plessen.

PhD thesis committee member (Mathematics) at the GSSI Gran Sasso Science Institute, L'Aquila, February 2017, Student: Mutti Ur Rehman.

Invited talks

Maximum-likelihood for regression and classification: an overview, IMT School for Advanced Studies Lucca, Lucca, Italy, November 2017.

Pitfalls and best practices in parametric identification, IMT School for Advanced Studies Lucca, Lucca, Italy, November 2017.

Model-free design of linear parameter-varying controllers: a direct data-driven approach, IMT School for Advanced Studies Lucca, Lucca, Italy, June 2017.

A hierarchical approach for model-free design of Linear Parameter-Varying controllers, Università degli Studi di Bergamo, Dalmine, Italy, November 2016.

Robust and probabilistic \mathcal{D} -stability analysis of uncertain polynomial matrices, Università degli Studi di L'Aquila, L'Aquila, Italy, May 2016.

Encounters between machine learning and Linear Parameter-Varying systems, IMT School for Advanced Studies Lucca, Lucca, Italy, June 2014.

LPV model order selection in an LS-SVM setting, Politecnico di Milano, Milano, Italy, March 2014.

Advancing LPV data-driven modeling and control via LS-SVM, Katholieke Universiteit Leuven, Leuven, Belgium, October 2013.

Bounded-error identification of dynamical systems, Vrije Universiteit Brussel, Brussels, Belgium, June 2010.

Teaching Activities

Identification, Analysis and Control of Dynamical Systems Doctoral course, IMT School for Advanced Studies, 2015/2016, 2016/2017, 2017/2018 (in English).

Robust Control Course for Master's degree, Eindhoven University of Technology, 2013/2014 (in English).

Dynamic programming and model predictive control Course for 2nd level specializing Master in Automatica and Control Technologies, Politecnico di Torino. 2010/2011, 2011/2012 (in English).

Advanced control applications Course for 2nd level specializing Master in Automatica and Control Technologies, Politecnico di Torino, 2010/2011, 2011/2012 (in English).

Model Predictive Control: theory and practice Doctoral course, Politecnico di Torino, 2010/2011 (in English).

Principles of Automatic control Course for Bachelor's degree in Automotive Engineering, Politecnico di Torino, 2010/2011 (in English).

Automatic control Course for Master's degree in Biomedical Engineering, Politecnico di Torino, 2010/2011 (in Italian).

Automatic control Course for Bachelor's degree in Electronics and Informatics Engineering, Politecnico di Torino, 2009/2010, 2010/2011, 2011/2012 (in Italian).

(Co)-supervised students

Valentina Breschi, **PhD student**, IMT School for Advanced Studied Lucca. Co-supervised with Prof. Alberto Bemporad. Graduated on February 2018.

Manas Dilip Mehari, **PhD student**, IMT School for Advanced Studied Lucca. Co-supervised with Prof. Alberto Bemporad. Graduated on July 2018.

Pepijn B. Cox, **PhD student**, project: "Data-Driven Learning of Linear Parameter-Varying Models", Eindhoven University of Technology, Period of supervision: September 2013 - February 2014. Main supervisor: Dr. Roland Tóth.

Andrea Vescovi, **Master's Thesis**: "Online processing of energy and water consumption data to deliver end use characterization", SUPSI, Lugano, Switzerland, Period of supervision: June 2014 - January 2016. Co-supervised with Prof. Andrea Emilio Rizzoli. Winner of the **Argor-Heraeus prize** 2016 for best Master's Thesis at SUPSI on environmental sustainability.

Nick van der Sanden, **Master's degree Internship**: "Sparse identification in an Instrumental Variable setting", Eindhoven University of Technology, Period of supervision: September 2013 - November 2013. Main supervisor: Dr. Roland Tóth.

René Duijkers, **Master's degree Internship**: "Kernel Variable Selection in Least-Squares Support Vector Machines: Application in LPV system identification", Eindhoven University of Technology, Period of supervision: May 2013 - July 2013. Main supervisor: Dr. Roland Tóth.

Margherita Merio, **Bachelor's Thesis**: "Modeling of the Kitegen system", Politecnico di Torino, Period of supervision: January 2009 - June 2009. Main supervisor: Prof. Carlo Novara.

List of Publications

Journal papers

- [J1] A. Bemporad, V. Breschi, D. Piga, S. Boyd, "Fitting Jump Models", *Automatica*, In press. ISSN 0005-1098.
- [J2] D. Piga, S. Formentin, A. Bemporad, "Direct data-driven control of constrained linear parameter-varying systems: A hierarchical approach", *IEEE Transactions on Control Systems Technology*, Vol. 26, No. 4, 1422-1429, 2018. ISSN 1063-6536.
- [J3] M. Mejari, D. Piga, A. Bemporad, "A bias-correction method for closed-loop identification of linear parameter-varying systems", *Automatica*, Vol. 87, 128-141, 2018. ISSN 0005-1098.
- [J4] D. Piga, A. Benavoli, "A unified framework for deterministic and probabilistic \mathcal{D} -stability analysis of uncertain polynomial matrices", *IEEE Transactions on Automatic Control*, Vol. 62, No. 10, 5437-5444, 2017. ISSN 0018-9286.
- [J5] J. Lataire, R. Pintelon, D. Piga, R. Tóth, "Continuous-time linear time-varying system identification with a frequency domain kernel based estimator", *IET Control Theory & Applications*, Vol. 11, 2017. ISSN 1751-8644.
- [J6] A. Cominola, M. Giuliani, D. Piga, A. Castelletti, A. E. Rizzoli, "A Hybrid Signature-based Iterative Disaggregation algorithm for Non-Intrusive Load Monitoring", *Applied Energy*, Vol. 185, 2017. ISSN 0306-2619.
- [J7] V. Breschi, D. Piga, A. Bemporad, "Piecewise Affine Regression via Recursive Multiple Least Squares and Multicategory Discrimination", *Automatica*, Vol. 73, pp. 155-162, 2016. ISSN 0005-1098.
- [J8] A. Benavoli, D. Piga, "A probabilistic interpretation of set-membership filtering: Application to polynomial systems through polytopic bounding", *Automatica*, Vol. 70, pp. 158-172, 2016. ISSN 0005-1098.
- [J9] S. Formentin, D. Piga, R. Tóth, S. M. Savaresi, "Direct learning of LPV controllers from data", *Automatica*, Vol. 65, pp. 98-110, 2016. ISSN 0005-1098.
- [J10] D. Piga, "Computation of the Structured Singular Value via Moment LMI Relaxations", *IEEE Transactions on Automatic Control*, Vol. 59, No. 11, pp. 2897-2909, 2016. ISSN 0018-9286.
- [J11] D. Piga, A. Cominola, M. Giuliani, A. Castelletti, A. E. Rizzoli, "Sparse optimization for automated energy end use disaggregation", *IEEE Transactions on Control Systems Technology*, Vol. 24, No. 3, pp. 1044-1051, 2016. ISSN 1063-6536.
- [J12] A. Cominola, M. Giuliani, D. Piga, A. Castelletti, A. E. Rizzoli, "Benefits and challenges of using smart meters for advancing residential water demand modeling and management: a review", *Environmental Modelling & Software*, Vol. 72, pp. 198-214, 2015. ISSN 1364-8152.

- [J13] D. Piga, P.B. Cox, R. Tóth, V. Laurain, “LPV system identification under noise corrupted scheduling and output signal observations”, *Automatica*, Vol. 53, pp. 329-338, 2015. ISSN 0005-1098.
- [J14] V. Laurain, R. Tóth, D. Piga, W. X. Zheng, “An Instrumental Least Squares Support Vector Machine for Nonlinear System Identification”, *Automatica*, Vol. 54, pp. 340-347, 2015. ISSN 0005-1098.
- [J15] V. Cerone, D. Piga, D. Regruto, “Characteristic polynomial assignment for plants with semialgebraic uncertainty: a robust diophantine equation approach”, *International Journal of Robust and Nonlinear Control*, Vol. 25, No. 16, pp. 2911-2921, 2015. ISSN 1099-1239. **In this paper the authors are listed in alphabetical order.**
- [J16] D. Piga, R. Tóth, “Bias-corrected estimators for nonlinear systems with output-error type model structures”, *Automatica*, Vol. 50, No. 9, pp. 2373-2380, 2014. ISSN 0005-1098.
- [J17] V. Cerone, J. B. Lasserre, D. Piga, D. Regruto, “A unified framework for solving a general class of conditional and robust set-membership estimation problems”, **Special issue**, *IEEE Transactions on Automatic Control*, Vol. 59, No. 11, pp. 2897-2909, 2014. ISSN 0018-9286. **In this paper the authors are listed in alphabetical order.**
- [J18] M. Canale, V. Cerone, D. Piga, D. Regruto, “Approximation of Model Predictive Control laws for polynomial systems”, *Asian Journal of Control*, Vol. 16, No. 5, pp. 1425-1436, 2014. ISSN 1561-8625. **In this paper the authors are listed in alphabetical order.**
- [J19] D. Piga, R. Tóth, “An SDP approach for ℓ_0 -minimization: application to ARX model segmentation”, *Automatica*, Vol. 49, No. 12, pp. 3646-3653, 2013. ISSN 0005-1098.
- [J20] V. Cerone, D. Piga, D. Regruto, “Fixed-order FIR approximation of linear systems from quantized input and output data”, *Systems & Control letters*, Vol. 62 No. 12, pp. 1136-1142, 2013. ISSN 0167-6911. **In this paper the authors are listed in alphabetical order.**
- [J21] V. Cerone, D. Piga, D. Regruto, “A convex relaxation approach to Set-membership identification of LPV systems”, *Automatica*, Vol. 49, No. 9, pp. 2853-2859, 2013. ISSN 0005-1098. **In this paper the authors are listed in alphabetical order.**
- [J22] V. Cerone, D. Piga, D. Regruto, “Computational load reduction in bounded error identification of Hammerstein systems”, *IEEE Transactions on Automatic Control*, Vol. 58, No. 5, pp. 1317-1322, 2013. ISSN 0018-9286. **In this paper the authors are listed in alphabetical order.**
- [J23] V. Cerone, D. Piga, D. Regruto, “Bounding the parameters of block-structured nonlinear feedback systems”, *International Journal of Robust and Nonlinear Control*, Vol. 23, No. 1, pp. 33-47, 2013. ISSN 1049-8923. **In this paper the authors are listed in alphabetical order.**
- [J24] L. Fagiano, M. Milanese, D. Piga, “Optimization of Airborne Wind Energy generators”, *International Journal of Robust and Nonlinear Control*, Vol. 22, No. 18, pp. 2055-2083, 2013. ISSN 1049-8923. **In this paper the authors are listed in alphabetical order.**

- [J25] V. Cerone, D. Piga, D. Regruto, “Bounded error identification of Hammerstein systems through sparse polynomial optimization”, *Automatica*, vol. 48, n. 10, pp. 2693-2698, 2012. ISSN 0005-1098. **In this paper the authors are listed in alphabetical order.**
- [J26] V. Cerone, D. Piga, D. Regruto, “Set-Membership error-in-variables identification through convex relaxation techniques”, *IEEE Transactions on Automatic Control*, Vol. 57, No. 2, pp. 517-522, 2012. ISSN 0018-9286. **In this paper the authors are listed in alphabetical order.**
- [J27] V. Cerone, D. Piga, D. Regruto, “Enforcing stability constraints in Set-membership identification of linear dynamic systems”, *Automatica*, Vol. 47, No. 11, pp. 2488-2494, 2011. ISSN 0005-1098. **In this paper the authors are listed in alphabetical order.**
- [J28] V. Cerone, D. Piga, D. Regruto, “Set-membership LPV model identification of vehicle lateral dynamics”, *Automatica*, Vol. 47, No. 8, pp. 1794-1799, 2011. ISSN 0005-1098. **In this paper the authors are listed in alphabetical order.**
- [J29] V. Cerone, D. Piga, D. Regruto, “Improved parameters bounds for set-membership EIV problems”, *International Journal of adaptive control and signal processing*, **Special issue**, Vol. 25, No. 3, pp. 208-227, 2011. ISSN 0890-6327. **In this paper the authors are listed in alphabetical order.**
- [J30] L. Fagiano, M. Milanese, D. Piga, “High altitude wind power generation”, *IEEE Transactions on Energy Conversion*, Vol. 25, No. 1, pp. 168-180, 2010. ISSN 0885-8969. **In this paper the authors are listed in alphabetical order.**

Submitted journal papers

- [S1] V. Laurain, R. Tóth, D. Piga, M.A.H. Darwish, “Model Structure Selection learning for LPV-IO identification: An RKHS approach”, submitted.
- [S2] V. Breschi, D. Piga, A. Bemporad, “Online end-use energy disaggregation via jump linear models”, submitted.
- [S3] A. Benavoli, A. Facchini, D. Piga, M. Zaffalon, “Sum-Of-Squares for bounded rationality”, submitted.

Book Chapters

- [BC1] V. Cerone, D. Piga, D. Regruto, “Set-membership identification of input-output LPV models”, In: *Identification of Linear Parameter-Varying Systems* (P. Lopes dos Santos, C. Novara, D. Rivera, J. Ramos and T-P. Perdicoulis, Editors), World Scientific Publishing, 2011. ISBN 9789814355445. **In this paper the authors are listed in alphabetical order.**
- [BC2] V. Cerone, D. Piga, D. Regruto, “Bounded error identification of Hammerstein systems with backlash”, In: *Block-oriented nonlinear system identification, Lecture notes in Control and Information sciences* (F. Giri and E. W. Bai, Editors), Springer, 2010. ISBN 9781849965125. **In this paper the authors are listed in alphabetical order.**

Conference papers

- [C1] V. Breschi, D. Piga, A. Bemporad, S. Boyd, "Prediction error methods in learning jump ARMAX models", *Proc. of the IEEE Conference on Decision and Control*, Miami Beach, Florida, USA, 2018 (accepted).
- [C2] M. Mehari, V. Naik, D. Piga, A. Bemporad "Energy Disaggregation using Piecewise Affine Regression and Binary Quadratic Programming", **Invited Paper**, *Proc. of the IEEE Conference on Decision and Control*, Miami Beach, Florida, USA, 2018 (accepted).
- [C3] V. Breschi, D. Piga, A. Bemporad, "Jump model learning and filtering for energy end-use disaggregation", *Proc. of the 18th IFAC Symposium on System Identification*, Stockholm, Sweden, 2018.
- [C4] M. Mehari, V. Naik, D. Piga, A. Bemporad, "Regularized Moving-Horizon PWA Regression for LPV System Identification", *Proc. of the 18th IFAC Symposium on System Identification*, Stockholm, Sweden, 2018.
- [C5] D. Selvi, D. Piga, A. Bemporad, "Towards direct data-driven model-free design of optimal controllers", *Proc. of the 17th European Control Conference*, Limassol, Cyprus, 2018.
- [C6] V. Breschi, D. Piga, A. Bemporad, "Kalman filtering for energy disaggregation", *Proc. of the IFAC Workshop on Integrated Assessment Modelling for Environmental Systems*, Brescia, Italy, 2018.
- [C7] M. Mehari, D. Piga, A. Bemporad, "LPV Model Order Selection from Noise-Corrupted Output and Scheduling Signal Measurements", *Proc. of the 20th IFAC World Congress*, Toulouse, France, 2017.
- [C8] V. Naik, M. Mehari, D. Piga, A. Bemporad, "Regularized Moving-Horizon Piecewise Affine Regression Using Mixed-Integer Quadratic Programming", **Invited Paper**, *Proc. of the 25th Mediterranean Conference on Control and Automation*, Valletta, Malta, 2017.
- [C9] A. Benavoli, A. Facchini, D. Piga, M. Zaffalon, "SOS for bounded rationality", *Proc. of the 10th International Symposium on Imprecise Probability: Theories and Applications*, Lugano, Switzerland, 2017.
- [C10] V. Breschi, D. Piga, A. Bemporad, "Learning Hybrid Models with Logical and Continuous Dynamics Via Multiclass Linear Separation", *Proc. of the 55th IEEE Conference on Decision and Control*, Las Vegas, Nevada, USA, 2016.
- [C11] M. Mehari, D. Piga, A. Bemporad, "Regularized Least Square Support Vector Machines for Order and Structure Selection of LPV-ARX models", *Proc. of the 15th European Control Conference*, Aalborg, Denmark, 2016.
- [C12] V. Breschi, A. Bemporad, D. Piga, "Identification of Hybrid and Linear Parameter Varying Models via Recursive Piecewise Affine Regression and Discrimination", *Proc. of the 15th European Control Conference*, Aalborg, Denmark, 2016.

- [C13] D. Piga, A. Cominola, M. Giuliani, A. Castelletti, A. E. Rizzoli, "A convex optimization approach for automated water and energy end-use disaggregation", *36th IAHR World Congress Proceedings*, The Hague, The Netherlands, 2015.
- [C14] A. Cominola, M. Giuliani, D. Piga, A. Castelletti, A. E. Rizzoli, "Modelling residential water consumers' behaviours by feature selection and feature weighting", *36th IAHR World Congress Proceedings*, The Hague, The Netherlands, 2015.
- [C15] S. Formentin, D. Piga, R. Tóth, S. M. Savaresi, "Nonparametric LPV data-driven control", *1st IFAC Symposium on Linear Parameter Varying Systems*, Grenoble, France, 2015, pp. 146-151, 2015.
- [C16] R. Duijkers, R. Tóth, D. Piga, V. Laurain, "Shrinking Complexity of Scheduling Dependencies in LS-SVM Based LPV System Identification", **Invited Paper**, *Proc. of the 53rd IEEE Conference on Decision and Control*, Los Angeles, California, USA, 2014.
- [C17] J. Lataire, D. Piga, R. Tóth, "Frequency-domain least-squares support vector machines to deal with correlated errors when identifying linear time-varying systems", *Proc. of the 19th IFAC World Congress*, Cape Town, South Africa, 2014.
- [C18] D. Piga, R. Tóth, "LPV model order selection in an LS-SVM setting", *Proc. of the 52nd IEEE Conference on Decision and Control*, Florence, Italy, 2013.
- [C19] S. Formentin, D. Piga, R. Tóth, S. M. Savaresi, "Direct data-driven control of linear parameter-varying systems", **Invited Paper**, *Proc. of the 52nd IEEE Conference on Decision and Control*, Florence, Italy, 2013.
- [C20] V. Cerone, D. Piga, D. Regruto, "Polytopic Outer Approximations of Semialgebraic Sets", *Proc. of the 51st IEEE Conference on Decision and Control*, Maui, Hawaii, USA, 2012. **In this paper the authors are listed in alphabetical order.**
- [C21] V. Cerone, D. Piga, D. Regruto, R. Tóth, "Fixed Order LPV Controllers Design for LPV Models in Input-Output Form", **Invited Paper**, *Proc. of the the 51st IEEE Conference on Decision and Control*, Maui, Hawaii, USA, 2012. **In this paper the authors are listed in alphabetical order.**
- [C22] V. Cerone, D. Piga, D. Regruto, R. Tóth, "Input-output LPV model identification with guaranteed quadratic stability", **Invited Paper**, *Proc. of the 16th IFAC Symposium on System Identification SYSID*, Brussels, Belgium, 2012. **In this paper the authors are listed in alphabetical order.**
- [C23] V. Cerone, D. Piga, D. Regruto, "FIR approximation of linear systems from quantized records", **Invited Paper**, *Proc. of the 16th IFAC Symposium on System Identification SYSID*, Brussels, Belgium, 2012. **In this paper the authors are listed in alphabetical order.**
- [C24] V. Cerone, D. Piga, D. Regruto, "Bounded-Error Identification of Linear Systems with Input and Output Backlash", **Invited Paper**, *Proc. of the IFAC Symposium on System Identification SYSID*, Brussels, Belgium, 2012. **In this paper the authors are listed in alphabetical order.**

- [C25] V. Cerone, D. Piga, D. Regruto, S. Berehanu, “LPV identification of the glucose-insulin dynamics in Type I diabetes”, **Invited Paper**, *Proc. of the 16th IFAC Symposium on System Identification SYSID*, Brussels, Belgium, 2012. **In this paper the first three authors are listed in alphabetical order.**
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