Pauline BERNARD

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Associate Professor at the **Centre Automatique et Systèmes (CAS)** of **Mines Paris - PSL** (France) specialized in control and observer design for nonlinear and hybrid systems, with applications in electrical machines.

EDUCATION

Nov 2017	**MINES ParisTech** Centre Automatique et Systèmes (CAS)	**Ph.D.** in **Mathematics and Control** Observer design for nonlinear systems Supervised by L. Praly (CAS) and V. Andrieu (LAGEPP, CNRS)
Sept 2014	**MINES ParisTech**	**Master's in Science and Executive Engineering** Specialization in applied mathematics and control of systems

ACADEMIC EXPERIENCE

2022 - …	CAS, **Mines Paris – PSL**	**Associate Professor** Observer design, hybrid systems, regulation, electrical machines
2019-2022	CAS, **Mines Paris – PSL**	**Tenure Track** Observer design, hybrid systems, regulation, electrical machines
2018-2019 1 year	**University Bologna** CASY	**Post-doctorate** Robust output-feedback and **regulation of nonlinear systems**
2018 4 months	**University California Santa Cruz,** HSL	**Post-doctorate** Observability and **observer design for hybrid systems**
2014-2017 3 years	**MINES ParisTech,** CAS	**Doctorate** **Observer design for nonlinear systems**
2013 3 months	**University California San Diego,** CCSD	**Research internship** in **PDE Control** Adaptive output-feedback control for non-local hyperbolic PDEs
2012-2013 5 months	**MINES ParisTech,** CAS	**Research internship** in **signal processing** (part-time) Resynchronization of periodic signals and study of delayed systems
2010	Bordeaux Pellegrin Hospital	Development of a **mathematical model for blood coagulation** (for research in treatments for thrombotic patients).

INDUSTRIAL EXPERIENCE

2019 - …	Schneider Electric	**Contractual research** in **control and observation of electrical machines**
2017-2018	Schneider Electric	Study on resistance and position estimation for PMSMs
2016-2017	Valéo Vision	Study on the reduction of stroboscopic effects for pulsed polarized vision **Patent FR3105458** "control process and **anti-glaring system for automobile vehicles**"
2014 4 mois	CGG Dpt R&D Marine	**Engineering internship** Modelling and stabilization of ship navigation for seismic campaigns
2010	Pellegrin Hospital Bordeaux	Development of a mathematical model of blood coagulation for research of treatments for thrombotic patients

TEACHING/SUPERVISING

2022 - …	…	**European Doctoral Course (EECI)** on Observer design for continuous-time systems In English, with V. Andrieu and D. Astolfi (LAGEPP, France)
2021 - …	Mines Paris -PSL (CAS)	**PhD student** (Gia Quoc Bao TRAN) on observer design for hybrid systems
2019 - …	Mines Paris -PSL	Differential Calculus & Equations (Lectures & TA), 1st year students Control theory (Lectures & TA): 2nd year students Research internships for 2/3 2nd year students per year
2014-2017	MINES ParisTech	Complex analysis (TA): 11,5 hours (2014, 2015, 2016, 2017), 2nd year students Differential Calculus (TA): 14 hours (2015, 2016), 1st year students Control Theory (TA): 16 hours (2015, 2016), 1st year students
2015-2016	ENSTA ParisTech	Control Theory (TA): 15 hours (2015, 2016), 1st & 2nd year students
2011-2013	Colbert high school Paris	**Tutoring** 2 hours per week

PROJECTS/GRANTS

Jan 2024 – Jan 2028: **JCJC project** granted by ANR entitled *Observer design for nonsmooth and hybrid systems* (223 k€)

Apr – May 2023: FSMP grant for PhD student mobility stay in UC Santa Cruz, USA (beneficiary Gia Quoc Bao TRAN)

Nov 2021 – Nov 2024: PSL grant for PhD student (beneficiary Gia Quoc Bao TRAN)

AWARDS

European PhD Award on Control for Complex and Heterogeneous Systems, 2019

RESPONSABILITIES IN SCIENTIFIC COMMUNITY

Since 2022: Animation of the CT "Observation et synchronisation" of SAGIP (organization of two events per year, gathering 5/6 speakers and around 20 participants)

2019 – 2023: Seminar organization at Centre Automatique et Systèmes; Mines Paris – PSL (one per month)

INVITED TALKS

Nov 2023: Invited Professor for 6-hour course on nonlinear observer design at the Engineering Department of University of Bologna, Italy, as part of a master's course on Automatic Control by Pr. Lorenzo Marconi
Oct 2023: Speaker at the Workshop on EDP, control and observation of systems (EDP-COSy), Toulouse, France
Mar 2023: Seminar at the Institute of Information and Communication Technologies, Electronics and Applied Mathematics, at UCLouvain, Belgium
Jan 2023: Semi-plenary speaker at IFAC NOLCOS
Jun 2022: Speaker at Workshop on Recent Advances of Nonlinear Control at Zhejiang University, Hangzhou, China (remote)
Jun 2022: Speaker at HANDY Workshop, Toulouse, France
May 2022: Seminar at the Department of Electrical, Electronic, and Information Engineering, University of Bologna, Italy
Dec 2021: Speaker at the Workshop on "Lack of observability in nonlinear systems", Nice, France
Jun 2021: Speaker at the Mini-Symposium on Control, Observation and Stabilization, La Grande-Motte, France
Jun 2019: Seminar at the Hybrid Systems Lab, Department of Electrical Engineering, UC Santa Cruz, USA
April 2018: Seminar at the Cyber Center for Control Systems and Dynamics, UC San Diego, USA
Jan 2018: Seminar at the Hybrid Systems Lab, Department of Electrical Engineering, UC Santa Cruz, USA

Dec 2017: Speaker at the CARMA Workshop on Mathematical Systems Theory and Applications, Newcastle, Australia
Dec 2017: Seminar at L2S, CNRS, Paris, France

PUBLICATIONS

Book

[B1] P. Bernard, *Observer design for nonlinear systems*, Lecture Notes in Control and Information Sciences, 2018.

Journal

P. Bernard, R. Sanfelice, *Semiglobal High-Gain Hybrid Observer for a Class of Hybrid Dynamical Systems with Unknown Jump Times*, submitted to IEEE Transactions on Automatic Control

P. Bernard, M. Maghenem, *Reconstructing Indistinguishable Solutions Via Set-Valued KKL Observer*, submitted to Automatica

G. Q. B. Tran, P. Bernard, *Arbitrarily Fast Robust KKL Observer for Nonlinear Time-varying Discrete Systems*, To Appear in Transactions on Automatic Control

[J18] L. Brivadis, V. Andrieu, P. Bernard, U. Serres, *Further remarks on KKL observers*, Systems and Control Letters, Vol 172, 2023

[J17] P. Bernard, R. G. Sanfelice, *Observer design for hybrid dynamical systems with approximately known jump times*, Automatica, Vol 141, 2022

[J16] P. Bernard, V. Andrieu, D. Astolfi, *Observer design for continuous-time systems*, Annual Reviews in Control, 2022

[J15] D. Astolfi, P. Bernard, R. Postoyan, L. Marconi, *Constrained state estimation for nonlinear systems: a redesign approach based on convexity*, IEEE Transactions on Automatic Control, 2021 (early access)

[J14] P. Bernard, N. Mimmo, L. Marconi, *On the Semi-Global Stability of an EK-Like Filter*, IEEE Control Systems Letters, Vol 5, No 5, pp 1771-1776, 2021

[J13] V. Andrieu, D. Astolfi, P. Bernard, *Observer design via interconnections of second-order mixed sliding-mode/linear differentiators*, International Journal of Robust and Nonlinear Control, Vol 31, No 9, pp 3631-3657, 2021

[J12] N. Mimmo, P. Bernard, L. Marconi, *Avalanche victim search via robust observers, IEEE Transactions on Control Systems Technology*, Vol 27, No 4, pp 1450-1461, 2021

[J11] M. Bin, P. Bernard, L. Marconi, *Approximate nonlinear regulation via identification-based adaptive internal models*, IEEE Transactions on Automatic Control, Vol 66, No 8, pp 3534 - 3549, 2021

[J10] P. Bernard, L. Praly, *Estimation of position and resistance of a sensorless PMSM : a nonlinear Luenberger approach for a non-observable system*, IEEE Transactions on Automatic Control, Vol 66, pp 481-496, 2021

[J9] P. Bernard, M. Bin, L. Marconi, *Adaptive Output Regulation via Nonlinear Luenberger Observer-based Internal Models and Continuous-Time Identifiers*, Automatica, Vol 122, 2020

[J8] P. Bernard, L. Marconi, *Hybrid implementation of observers in plant's coordinates with a finite number of approximate inversions and global convergence*, Automatica, Vol 111, 2020

[J7] P. Bernard, R. G. Sanfelice, *Hybrid dynamical systems with hybrid inputs: definition of solutions and applications to series interconnections*, International Journal of Robust and Nonlinear Control, pp. 1-25, 2019

[J6] P. Bernard, V. Andrieu, *Luenberger observers for non autonomous nonlinear systems,* IEEE Transactions on Automatic Control, 64(1):270-281, 2019

[J5] P. Bernard, L. Praly, *Convergence of gradient observer for rotor position and magnet flux estimation of permanent magnet synchronous motors,* Automatica, 94:88-93, 2018

[J4] P. Bernard, L. Praly, V. Andrieu, *Expressing an observer in preferred coordinates by transforming an injective immersion into a surjective diffeomorphism*, SIAM Journal of Control and Optimization, 56(3):2327–2352, 2018

[J3] P. Bernard, L. Praly, V. Andrieu, H. Hammouri, *On the triangular canonical form for uniformly observable controlled systems*, Automatica, 85:293-300, 2017.

[J2] P. Bernard, L. Praly, V. Andrieu, *Observers for a non-Lipschitz triangular form*, Automatica, 82:301-313, 2017

[J1] P. Bernard, M. Krstic, *Adaptive output-feedback control for non-local hyperbolic PDEs*, Automatica 50(10): 2692-2699, 2014

Conferences

[C28] R. Orsolle-Tyberg, P. Bernard, P. Combes, *Robust sensorless flux and position estimation for SynRMs*, IECON, 2023

[C27] G. Q. B. Tran, P. Bernard, R. Sanfelice, *Coupling Flow and Jump Observers for Hybrid Systems with Known Jump Times*, IFAC World Congress, 2023

[C26] V. Alleaume, P. Bernard, KKL observer design for non observable systems, IFAC Symposium on Nonlinear Control Systems, 2023

[C25] P. Bernard, T. Devos, A.K. Jebai, P. Martin, L. Praly, KKL Observer Design for Sensorless Induction Motors, IEEE Conference on Decision and Control, 2022

[C24] G. Q. B. Tran, P. Bernard, F. Di Meglio, L. Marconi, Observer Design Based on Observability Decomposition for Hybrid Systems with Linear Maps and Known Jump Times, IEEE Conference on Decision and Control, 2022

[C23] P. Bernard, T. Devos, A.K. Jebai, P. Martin, L. Praly, A Novel Observer for Induction Motors, with an Application to Soft Starters, International Conference on Electrical Machines, 2022

[C22] M. Spirito, P. Bernard, L. Marconi, *On the existence of robust functional KKL observers*, American Control Conference, 2022

[C21] W.P.M.H. Heemels, P. Bernard, K.J.A. Scheres, R. Postoyan, R. G. Sanfelice, *Hybrid Systems with Continuous-time Inputs: Subtleties in Solution Concepts and Existence Properties*, IEEE Conference on Decision and Control, 2021

[C20] V. Andrieu, P. Bernard, *Remarks about the numerical inversion of injective nonlinear maps*, IEEE Conference on Decision and Control, 2021

[C19] P. Bernard, R. G. Sanfelice, *A Local Hybrid Observer for a Class of Hybrid Dynamical Systems with Linear Maps and Unknown Jump Times*, IEEE Conference on Decision and Control, 2021

[C18] I. A. Azzollini, M. Bin, P. Bernard, L. Marconi, *Robust Frequency Estimation of Multi-Harmonic Signals*, European Control Conference, 2021

[C17] P. Bernard, N. Mimmo, L. Marconi, *On the Semi-Global Stability of an EK-Like Filter*, American Control Conference, 2021

[C16] L. Da Costa Ramos, F. Di Meglio, L. F. Figueira Da Silva, V. Morgenthalter, P. Bernard, *Numerical design of Luenberger observers for nonlinear systems*, IEEE Conference on Decision and Control, 2020

[C15] P. Bernard, A-K Jebai, P. Martin, *Higher-order singular perturbations for control design with application to the control of induction motors*, IEEE Conference on Decision and Control, 2020

[C14] P. Bernard, R. Sanfelice, *On the notions of detectability and observers for hybrid systems*, IEEE Conference on Decision and Control, 2020

[C13] P. Bernard, A-K Jebai, *Robust sensorless estimation of the position and magnet flux of PMSMs*, IECON, 2020

[C12] V. Vincent, D. Daniele, P. Bernard, *Mixing sliding mode and linear observers for second and third order systems*, IFAC World Congress, 2020

[C11] N. Mimmo, P. Bernard, L. Marconi*, Avalanche victim search via robust observers*, ICRA, 2020

[C10] M. Bin, P. Bernard, L. Marconi, *Adaptive output regulation using Luenberger observers*, IFAC Symposium on Nonlinear Control Systems, 2019

[C9] D. Astolfi, P. Bernard, R. Postoyan, L. Marconi, *Redesign of discrete-time nonlinear observers with state estimate constrained in prescribed convex set*, IFAC Symposium on Nonlinear Control Systems, 2019

[C8] P. Bernard, R. Sanfelice*, An algorithm to generate solutions to hybrid dynamical systems with inputs and applications to series interconnections*, Submitted to the 2019 American Control Conference.

[C7] P. Bernard, L. Marconi, *Hybrid implementation of observers in initial coordinates with a finite number of approximate inversions and global convergence*, Submitted to the 2019 American Control Conference.

[C6] P. Bernard, R. Sanfelice, *Observers for hybrid dynamical systems with linear maps and known jump times*, Accepted for the 2018 IEEE Conference on Decision and Control

[C5] P. Bernard, *Luenberger observers for nonlinear controlled systems,* IEEE Conference on Decision and Control, 2017

[C4] P. Bernard, L. Praly, *Robustness of rotor position observer for permanent magnet synchronous motors with unknown magnet flux*, IFAC World Congress, 2017

[C3] P. Bernard, L. Praly, V. Andrieu, *Non-Lipschitz triangular canonical form for uniformly observable controlled systems*, IFAC Symposium on Nonlinear Control Systems, 2016

[C2] P. Bernard, L. Praly, V. Andrieu, *Tools for observers based on coordinate augmentation*, IEEE Conference on Decision and Control, 2015

[C1] P. Bernard, M. Krstic, *Adaptive output-feedback control for non-local hyperbolic PDEs*, IFAC World Congress, 2014