

Born: 17/08/1994

PhD in Applied Mathematics obtained in July 2021

**Areas of expertise.** Machine learning, Control theory, Optimization.

**Specialist knowledge.** Kernel methods, Functional analysis, Optimal control, State constraints, Infinite-dimensional convex optimization.

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## Appointments and Education

- Sept 2021 - **Post-doctoral researcher, INRIA SIERRA, Paris.**  
**Kernel methods for constrained optimization problems with A. Rudi, funded by ERC Starting grant REAL**
- Sept 2018 - Aug 2021 **PhD in Applied Mathematics, MINES ParisTech, Paris.**  
**Machine learning and control theory at the CAS laboratory under the supervision of Prof. N. Petit**  
*Estimation and Control under Constraints through Kernel Methods*
- Sept 2017 - Aug 2018 **Master of Public Policy, AgroParisTech and ENPC, Paris.**  
**Banking and macroeconomics, Law, Environmental dialogue**  
*Master focusing on sustainable development and transportation issues designed for the civil servants of Corps des IPEF*
- April 2018 - July 2018 **Master of Public Policy internship, Research and Innovation Division, French Ministry of Ecological Transition (MTES).**  
Theme: AI for the scientific and technical agencies of the ministry
- 2016 - 2017 **Master of Science (M2), ENS Paris-Saclay, Cachan.**  
**Machine Learning and Big Data - Highest honors**  
Specialized in convex optimization and kernel methods  
*Master MVA (Mathematics-Vision-Learning)*
- Mars 2017- Aug. 2017 **MS internship, CBIO, Ecole des Mines.**  
Theme: Gene regulation inference from single-cell RNA sequencing  
Recovering dynamics from a time-labeled point cloud of experimental measurements under the supervision of Prof. J-P. Vert
- Mars 2016 - July 2016 **Research internship, IfA, ETH Zurich.**  
Theme: Modeling of cerebral autoregulation  
Cyclical systems identification under the supervision of Prof. J. Lygeros
- 2013 - 2016 **Master of Science/Engineering diploma, École polytechnique, Palaiseau.**  
**Cycle ingénieur polytechnicien Major: Applied Mathematics**  
Minor: Quantum Physics and (Neuro)biology

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## Journal articles

All the documents (video, pdf and slides) are available at <https://pcaubin.github.io/>. When the text is already online, just click on the title to access it.

- [1] (Under review) PCAF and Alessandro Rudi, *Approximation of optimization problems with constraints through kernel Sum-Of-Squares*, January 2023
- [2] Integral Equations and Operator Theory PCAF and Stéphane Gaubert, *Tropical reproducing kernels and optimization*, 2022 (to be published)
- [3] JMLR PCAF and Zoltán Szabó, *Handling Hard Affine Shape Constraints in RKHSs*, 2022

- [4] Pure and Applied Functional Analysis PCAF and Alain Bensoussan, *The reproducing kernel Hilbert spaces underlying linear SDE Estimation, Kalman filtering and their relation to optimal control*, 2022 (to be published)
- [5] SIAM J. on Control and Optimization PCAF, *Linearly-constrained Linear Quadratic Regulator from the view-point of kernel methods*, 59(4) 2693–2716 2021
- [6] Comptes Rendus. Mathématique PCAF, *Interpreting the dual Riccati equation through the LQ reproducing kernel*, 359(2) 199–204, 2021
- [7] Bioinformatics PCAF and Jean-Philippe Vert, *Gene regulation inference from single-cell RNA-seq data with linear differential equations and velocity inference*, 36(18), 4774–4780, 2020
- [8] Systems & Control Letters PCAF, *Lipschitz regularity of the minimum time function of differential inclusions with state constraints*, 139 104677, 2020

## Conference proceedings

- [1] NeurIPS 22 PCAF, Anna Korba, Flavien Léger, *Mirror Descent with Relative Smoothness in Measure Spaces, with application to Sinkhorn and EM*, May 2022
- [2] IEEE CDC 22 PCAF and Alain Bensoussan, *Operator-valued Kernels and Control of Infinite dimensional Dynamic Systems*, 2022
- [3] IFAC CAO 22 PCAF, *Stability of solutions for controlled nonlinear systems under perturbation of state constraints*, 2022
- [4] ICML 21 (long oral) Anna Korba, PCAF, Szymon Majewski and Pierre Ablin, *Kernel Stein Discrepancy Descent*, 139 5719–5730, 2021
- [5] NeurIPS 20 PCAF and Zoltán Szabó, *Hard Shape-Constrained Kernel Machines*, 33 384–395, 2020
- [6] IFAC WC 20 PCAF, Nicolas Petit and Zoltán Szabó, *Kernel Regression for Trajectory Reconstruction of Vehicles under Speed and Inter-Vehicular Distance Constraints*, 53(2) 15084–15089, 2020
- [7] ECC 20 PCAF and Nicolas Petit, *Data-driven approximation of differential inclusions and application to detection of transportation modes*, 1358-1364, 2020

## Other: Students supervision, Reviewer duties, Invited talks

I have supervised three Master of Science interns: Adrien Chkirate (ENSAE), El Mahdi Khribch (Mines ParisTech), Yuxi Xie (ENSTA). I served as a referee for Bernoulli, JMLR, AMOP, JCOMP, TAC (journals) ICML, AISTATS, NeurIPS, ECC, ACC and CDC (conferences). I have been invited at over 20 national and international conferences, such as the Viennese Conference on Optimal Control and Dynamic Games (ORCOS-VC22), the European Conference on Operational Research (EURO-ESPOO), the French-German-Portuguese conference on optimization (FGP22), SIAM Conference on Control and Its Applications (CT21), and more.