Pierre-Cyril Aubin-Frankowski

Born: 17/08/1994
PhD in Applied Mathematics obtained in July 2021

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8 Wiedner Hauptstraße, 1040 Wien
pierre-cyril.aubin@tuwien.ac.at
https://pcaubin.github.io/

Areas of expertise. Optimization, Machine learning, Control theory.
Specialist knowledge. Kernel methods, Functional analysis, Optimal control, State constraints, Infinite-dimensional convex optimization.

Appointments and Education

Sept 2023 - **Post-doctoral researcher**, *TU Wien, VADOR*, Vienna
Optimization beyond metric spaces with A. Daniilidis, funded by FWF

Sept 2021 - Aug 2023 **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**, **Cycle ingénieur polytechnicien**, *École polytechnique*, Palaiseau
Major: Applied Mathematics
Minor: Quantum Physics and (Neuro)biology

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 Stéphane Gaubert, *Order isomorphisms of sup-stable function spaces: continuous, Lipschitz, c-convex, and beyond*, 2024

[2] (Under review) PCAF, Yohann De Castro, Axel Parmentier, Alessandro Rudi, *Generalization Bounds of Surrogate Policies for Combinatorial Optimization Problems*, 2024

[3] (Under review) PCAF and Alain Bensoussan, *Reproducing kernel approach to linear quadratic mean field control problems*, 2023

[4] (Under review) Flavien Léger and PCAF, *Gradient descent with a general cost*, 2023

[5] 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*, 2024

[6] Optimization PCAF and Alessandro Rudi, *Approximation of optimization problems with constraints through kernel Sum-Of-Squares*, 2024

[7] International Game Theory Review Aubin, Jean-Pierre, PCAF and Vladimir Lozève, *Reintroducing Time, Money and Constraints: Viability to bridge the economic and monetary theories*, 2024

[8] Integral Equations and Operator Theory PCAF and Stéphane Gaubert, *Tropical reproducing kernels and optimization*, 2024

[9] Communications in Optimization Theory PCAF, Alain Bensoussan and Joe Qin, *Alternating minimization for simultaneous estimation of a latent variable and identification of a linear continuous-time dynamic system*, 2023

[10] JMLR PCAF and Zoltán Szabó, *Handling Hard Affine Shape Constraints in RKHSs*, 2022

[11] SIAM J. on Control and Optimization PCAF, *Linearly-constrained Linear Quadratic Regulator from the viewpoint of kernel methods*, 59(4) 2693–2716 2021

[12] Comptes Rendus. Mathématique PCAF, *Interpreting the dual Riccati equation through the LQ reproducing kernel*, 359(2) 199–204, 2021

[13] 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

[14] Systems & Control Letters PCAF, *Lipschitz regularity of the minimum time function of differential inclusions with state constraints*, 139 104677, 2020

Conference proceedings

[1] NeurIPS 2024 (spotlight) Clément Bonet, Théo Uscidda, Adam David, PCAF, Anna Korba, *Mirror and Preconditioned Gradient Descent in Wasserstein Space*, 2024

[2] CDC 2024 PCAF and Alain Bensoussan, *Reproducing Kernel Approach to Linear-Quadratic Mean Field Control Problems with Additive Noise*, 2024

[3] NeurIPS 22 PCAF, Anna Korba, Flavien Léger, *Mirror Descent with Relative Smoothness in Measure Spaces, with application to Sinkhorn and EM*, May 2022

[4] IEEE CDC 22 PCAF and Alain Bensoussan, *Operator-valued Kernels and Control of Infinite dimensional Dynamic Systems*, 2022

[5] IFAC CAO 22 PCAF, *Stability of solutions for controlled nonlinear systems under perturbation of state constraints*, 2022

[6] ICML 21 (long oral) Anna Korba, PCAF, Szymon Majewski and Pierre Ablin, *Kernel Stein Discrepancy Descent*, 139 5719–5730, 2021

[7] NeurIPS 20 PCAF and Zoltán Szabó, *Hard Shape-Constrained Kernel Machines*, 33 384–395, 2020

[8] 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

[9] ECC 20 PCAF and Nicolas Petit, *Data-driven approximation of differential inclusions and application to detection of transportation modes*, 1358-1364, 2020

Awards

I received the Prix Dodu at SMAI-MODE 2024, and the best post-doc presentation at Lifting Inference with Kernel Embeddings 2022. I got a 5k€ prize as team leader of the best project at hackhaton #DataEnergie 2017.

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 JOTA, SIMODS, SIREV, 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 MeRiOT 2024 in Varenna, One World Optimization Seminar at ESI Wien 2024, the Viennese Conference on Optimal Control and Dynamic Games (ORCOS-VC22), the European Conference on Operational Research (EURO-ESPOO), the French-German-Portugese conference on optimization (FGP22), SIAM Conference on Control and Its Applications (CT21), and more.