Pierre-Cyril Aubin-Frankowski

Civil servant at Corps des Ponts, Eaux et Forêts
PhD graduate in Applied Mathematics

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

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

June 2015-Sept 2015 **R&D internship**, *STMicroelectronics.*
Theme : Aging of high-tension transistors
Mesurements and modelisation at the R&D site of ST at Castelletto, Milano, as part of S.Manzini's team

2013 - 2016 **Master of Science/Engineering diploma**, *École polytechnique*, Palaiseau.
***Cycle ingénieur polytechnicien* Major: Applied Mathematics**
Minor: Quantum Physics and (Neuro)biology

2011 - 2013 **Bachelor of Science**, *Lycée Louis-le-Grand*, Paris.
***Classe préparatoire MPI* Major: Mathematics, Physics**
Minor: Computer sciences

Skills

Programming Languages: Matlab, Python, C/C++, Java, OCaml

Languages: *French - Mother tongue / English - Proficient / Italian - Bilingual / Russian - Reading*

Awards

- AISTATS, Outstanding Reviewer Award, awarded to best 10% of reviewers
- Best post-doc presentation at Lifting Inference with Kernel Embeddings (LIKE22) Bern, January 2022
- Won 5k€ prize as team leader of the best project at hackhaton #DataEnergie organized by energy providers and public bodies in 2017, I then presented the results in front of French ministers.
- *Mention* (among 10 best at national level) at the *Concours général* in Physics and Latin

Reviewer duties

I served as a referee for JMLR, AMOP, JCOMP, TAC (journals) ICML, AISTATS, NeurIPS, ECC, ACC and CDC (conferences).

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 Alain Bensoussan, *The reproducing kernel Hilbert spaces underlying linear SDE Estimation, Kalman filtering and their relation to optimal control*, 2022
[2]	(Under review)	PCAF and Stéphane Gaubert, *Tropical reproducing kernels and optimization*, 2022
[3]	(Under review)	PCAF and Zoltán Szabó, *Handling Hard Affine Shape Constraints in RKHSs*, 2021
[4]	SIAM J. on Control and Optimization	PCAF, *Linearly-constrained Linear Quadratic Regulator from the viewpoint of kernel methods*, 59(4) 2693–2716 2021
[5]	Comptes Rendus. Mathématique	PCAF, *Interpreting the dual Riccati equation through the LQ reproducing kernel*, 359(2) 199–204, 2021
[6]	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
[7]	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

Selected Invited talks

- Viennese Conference on Optimal Control and Dynamic Games, (ORCOS-VC22), Vienna, July 2022
- IFAC Workshop on Control Applications of Optimization , (IFAC CAO22), Paris, July 2022
- European Conference on Operational Research, (EURO-ESPOO), Helsinki, July 2022
- French-German-Portugese conference on optimization, FGP, Porto, May 2022
- Séminaire Parisien d'Optimisation, (SPO), Paris, February 2022
- Groupe de travail en contrôle du Laboratoire Jacques-Louis Lions, (LJLL), Paris, January 2022
- Lifting Inference with Kernel Embeddings (LIKE22), Vienna, January 2022
- Programme Gaspard Monge pour l'Optimisation, PGMO DAYS, Paris, December 2021
- Biennale Française des Mathématiques Appliquées et Industrielles, (SMAI21), Montpellier, June 2021
- SIAM Conference on Control and Its Applications, (CT21), online, June 2021
- Seminar of Learning & Adaptive Systems Group, ETH, Zurich, February 2021
- Séminaire de mathématiques appliquées du CERMICS, ENPC, Paris, October 2020
- Séminaire du DEVI, ENAC, Toulouse, October 2020

Students supervision

May 2022 - September 2022 **MS intern**, *Adrien Chkirate*, from ENSAE.
Theme: Solving discrete-time optimal control through the LQ kernel

May 2020 - September 2020 **MS intern**, *El Mahdi Khribch*, from Mines ParisTech.
Theme: Enforcing constraints in optimal control through kernel methods

May 2019 - September 2019 **MS intern**, *Yuxi Xie*, from ENSTA.
Theme: Applying kernel methods from machine learning to detection of transportation modes

Summer schools attended

- Centre d'Eté Mathématique de Recherche Avancée en Calcul Scientifique (CEMRACS) Luminy, July-August 2021, on *Data Assimilation and Reduced Modeling for High Dimensional Problems*. Worked 5-weeks on research project *Model order reduction by spectral gap optimization* advised by T. Lelièvre and G. Stoltz (ENPC)

- Machine Learning Summer School (MLSS) Tübingen, July 2020 (selected among 180 PhD students over more than 1300 candidates),
- Joint Structures and Common Foundations of Statistical Physics, Information Geometry and Inference for Learning (SPIGL'20), July 2020,

Teaching experience

- 2019/2020 and 2020/2021: Teaching assistant in optimization for 3rd year of undergraduate studies at MINES ParisTech
- 2013/2014: Full-time science teacher (maths/physics) in senior high school in the underprivileged outskirts of Paris with Association Tremplin as part of the mandatory civic service of Ecole polytechnique