Curriculum vitæ of Jean-Baptiste Caillau

Born May 24, 1973 (France)
Professor of applied mathematics
Université Côte d'Azur, CNRS, Inria, LJAD
Parc Valrose, F-06108 Nice
`caillau.perso.math.cnrs.fr`

Scientific interests

Optimisation and control: geometry, algorithms, applications

Academic positions

Since September 2017, Professor Univ. Côte d'Azur
Member of the CNRS team DATA & G, LJAD[1]
Member of the Inria team McTAO,[2] Sophia Antipolis
Member of the department Math. Applis & Modélisation, Polytech Nice Sophia

2022-2023	On partial leave (Inria) at Sophia Antipolis
2016-2017	On leave (Inria) at Sophia Antipolis
2013-2014	On leave (CNRS) at Lab. J.-L. Lions, Sorbonne Université
2008-2017	Professor Univ. Bourgogne Franche-Comté
2001-2007	Assistant professor ENSEEIHT, Univ. Toulouse

Education

2006	Habilitation applied math. Univ. Toulouse
2000	PhD applied math. Univ. Toulouse (supervisor J. Noailles)
1997	Master math. Univ. Toulouse
1996	Master scientific comp. Univ. Toulouse
1996	Ingénieur ENSEEIHT[3] applied math. & sci. computing (major)

Distinctions

2022	Prix Défi Défense, Assises des mathématiques du CNRS
2001	Prix Maury, Académie des Sciences de Toulouse
2000	Prix Léopold Escande, Institut National Polytechnique de Toulouse

1 Publications

Journal papers

[1a] Sensitivity analysis for time optimal orbit transfer. *Optimization* **49** (2001), no. 4, 327–350 (with Noailles, J.)

[1] Labo. J. A. Dieudonné
[2] Mathematics for Control, Transport and Applications
[3] École Nationale Supérieure d'Électronique, Électrotechnique, Informatique, Hydraulique et Télécommunications

[2a] Coplanar control of a satellite around the Earth. *ESAIM Control Optim. and Calc. Var.* **6** (2001), 239–258 (with Noailles, J.)

[3a] 3D Geosynchronous Transfer of a Satellite: continuation on the Thrust. *J. Optim. Theory Appl.* **118** (2003), no. 3, 541–565 (with Gergaud, J.; Noailles, J.)

[4a] Geometric optimal control of elliptic Keplerian orbits. *Discrete Contin. Dyn. Syst. Ser. B* **5** (2005), no. 4, 929–956 (with Bonnard, B.; Trélat, E.)

[5a] Energy minimization of single input orbit transfer by averaging and continuation. *Bull. Sci. Math.* **130** (2006), no. 8, 707–719 (with Bonnard, B.; Dujol, R.)

[6a] Averaging and optimal control of elliptic Keplerian orbits with low propulsion. *Systems Control Lett.* **55** (2006), no. 9, 755–760 (with Bonnard, B.; Dujol, R.)

[7a] Second order optimality conditions in the smooth case and applications in optimal control. *ESAIM Control Optim. and Calc. Var.* **13** (2007), no. 2, 207–236 (with Bonnard, B.; Trélat, E.)

[8a] Riemannian metric of the averaged energy minimization problem in orbital transfer with low thrust. *Ann. Inst. H. Poincaré Anal. Non Linéaire* **24** (2007), no. 3, 395–411 (with Bonnard, B.)

[9a] Optimality results in orbit transfer. *C. R. Acad. Sci. Paris, Ser. I* **345** (2007), 319–324 (with Bonnard, B.)

[10a] Geodesic flow of the averaged controlled Kepler equation. *Forum Math.* **21** (2009), no. 5, 797–814 (with Bonnard, B.)

[11a] Conjugate and cut loci of a two-sphere of revolution with application to optimal control. *Ann. Inst. H. Poincaré Anal. Non Linéaire* **26** (2009), no. 4, 1081-1098 (with Bonnard, B.; Sinclair, R.; Tanaka, M.)

[12a] Geometric and numerical techniques in optimal control of two and three-body problems. *Commun. Inf. Syst.* **10** (2010), no. 4, 239–278 (with Bonnard, B.; Picot, G.)

[13a] Convexity of injectivity domains on the ellipsoid of revolution: the oblate case. *C. R. Acad. Sci. Paris, Ser. I* **348** (2010), 1315–1318 (with Bonnard, B.; Rifford, L.)

[14a] Differential pathfollowing for regular optimal control problems. *Optim. Methods Softw.* **27** (2012), no. 2, 177–196 (with Cots, O.; Gergaud, J.)

[15a] Minimum time control of the restricted three-body problem. *SIAM J. Control Optim.* **50** (2012), no. 6, 3178–3202 (with Daoud, B.)

[16a] Minimum fuel control of the planar circular restricted three-body problem. *Celestial Mech. Dynam. Astronom.* **114** (2012), no. 1, 137–150 (with Daoud, B.; Gergaud, J.)

[17a] Riemannian metrics on two-spheres and extensions with applications to optimal control. *ESAIM Control Optim. and Calc. Var.* **19** (2013), no. 2, 533–554 (with Bonnard, B.; Janin, G.)

[18a] Metrics with equatorial singularities on the sphere. *Ann. Mat. Pura Appl.* **193** (2014), no. 5, 1353–1382 (with Bonnard, B.)

[19a] L^1-minimization for mechanical systems. *SIAM J. Control Optim.* **54** (2016), no. 3, 1245–1265 (with Chen, Z.; Chitour, Y.)

[20a] Solving chance-constrained optimal control problems in aerospace via Kernel Density Estimation. *Optimal Control Appl. Methods* **39** (2018), no. 5, 1833–1858 (with Cerf, M.; Sassi, A.; Trélat, E.; Zidani, H.)

[21a] Non-integrability of the minimum time Kepler problem. *J. Geom. Phys.* **132** (2018), 452–459 (with Combot, T.; Féjoz, J.; Orieux, M.)

[22a] Maximal determinants of Schrödinger operators. *J. Ec. polytech. Math.* **7** (2020), 803–829 (with Aldana, C.; Freitas, P.)

[23a] Optimal bacterial resource allocation: metabolite production in continuous bioreactors. *Math. Biosci. Eng.* **17** (2020), no. 6, 7074–7100 (with Yabo, A. G.; Gouzé, J.-L.)

[24a] Dynamical analysis and optimization of a generalized resource allocation model of microbial growth. *SIAM J. Appl. Dyn. Syst.* **21** (2022), no. 1, 137–165 (with Yabo, A. G.; Gouzé, J. L.; de Jong, H.; Mairet, F.)

[25a] Singularities of min time control affine systems. *SIAM J. Control Optim.* **60** (2022), no. 2, 1143–1162 (with Féjoz, J.; Orieux, M.; Roussarie, R.)

[26a] Turnpike property in optimal microbial metabolite production. *J. Optim. Theory Appl.* **194** (2022), 365–407 (with Djema, W.; Gouzé, J. L.; Maslowskaya, S.; Pomet, J.-B.)

[27a] Controllability properties of solar sails *J. Guidance Contr. Dyn.* **46** (2023), no. 5, 900–909 (with Herasimenka, A; Dell'Elce, L.; Pomet, J.-B.)

[28a] Stability analysis of a bacterial growth model through computer algebra. *Maths in Actions* **12** (2023), 175–189 (with Yabo, A.; Safey el Dinh, M.; Gouzé, J. L.)

[29a] On the controllability of nonlinear systems with a periodic drift, submitted (with Herasimenka, A; Dell'Elce, L.; Pomet, J.-B.)

[30a] Optimal bacterial resource allocation strategies in batch processing, submitted (with Yabo, A. G.; Gouzé, J.-L.)

[31a] Optimal control of a solar sail, submitted (with Dell'Elce, L.; Herasimenka, A.; Pomet, J.-B.)

Edited volumes

[1b] Special issue in the honor of Bernard Bonnard. Part I and II. *Math. Control Relat. Fields* **3** (2013), no. 3-4 (with Chyba, M.; Sugny, D.; Trélat, E.)

[2b] Special issue on New trends in optimal control. *Discrete Contin. Dyn. Syst. Ser. A* **35** (2015), no. 9 (with Grüne, L.; do Rosario de Pinho, M.; Trélat, E.; Zidani, H.)

[3b] *Variational methods in imaging and geometric control*, Radon Series on Comput. and Applied Math. **18**, de Gruyter, 2017 (with Bergounioux, M.; Peyré, G.; Schnörr, C.; Haberkorn, T.)

[4b] FGS'2019 - 19th French-German-Swiss conference on Optimization *ESAIM Proc. Surveys* **71** (2021) (with Auroux, D.; Duvigneau, R.; Habbal, A.; Pantz, O.; Pronzato, L.; Rifford, L.)

Proceedings and book chapters

[1c] Continuous optimal control sensitivity analysis with AD. *Automatic Differentiation: from Simulation to Optimization*, 109–117, Springer, 2002 (with Noailles, J.) Proceedings of AD'2000, Nice, June 2000.

[2c] Wavelets for adaptive solution of boundary value problems. *Proceedings of the 16th IMACS World Congress*, 1–6, Lausanne, August 2000 (with Noailles, J.)

[3c] Numerical control and orbital transfers. *Sonderforschungsbereich 255: Transatmosphärische Flugsysteme*, 39–49, Hieronymus München, 2002 (with Gergaud, J.; Noailles, J.) Proceedings of the Optimal Control Workshop, Greifswald, October 2002.

[4c] Minimum time control of the Kepler equation. *Unsolved Problems in Mathematical Systems and Control Theory*, 89–92, Princeton University Press, 2004 (with Gergaud, J.; Noailles, J.)

[5c] Computation of conjugate times in smooth optimal control: the `cotcot` algorithm. *Proceedings of the 44th IEEE Conference on Decision and Control and European Control Conference ECC 2005*, 929–933, Seville, December 2005 (with Bonnard, B.; Trélat, E.)

[6c] Introduction to nonlinear optimal control. *Advanced topics in control systems theory*, 1–60, Lecture Notes in Control and Inform. Sci. **328**, Springer, 2006 (with Bonnard, B.)

[7c] Riemannian metric of the averaged controlled Kepler equation. *Systems, Control, Modeling and Optimization*, 79–89, IFIP Int. Fed. Inf. Process. **202**, Springer, 2006 (with Bonnard, B.; Dujol, R.) Proceedings of the 22nd IFIP TC 7 conference, Turin, July 2005.

[8c] Averaging and optimal control of elliptic Keplerian orbits with low propulsion. *Int. J. Tomogr. Stat.* **5** (2007), no. W07, 20–25 (with Bonnard, B.; Dujol, R.) Proceedings of the 13th IFAC Workshop on Control Applications of Optimisation, Paris, April 2006.

[9c] Smooth homotopies for single-input time optimal orbital transfer. *Int. J. Tomogr. Stat.* **5** (2007), no. W07, 26–31 (with Bonnard, B.; Dujol, R.) Proceedings of the 13th IFAC Workshop on Control Applications of Optimisation, Paris, April 2006.

[10c] Smooth approximations of single-input controlled Keplerian trajectories: homotopies and averaging. *Taming heterogeneity and complexity of embedded control*, 73–95, International Scientific and Technical Encyclopedia, 2007 (with Bonnard, B.; Dujol, R.) Proceedings of the Joint CTS-HYCON Workshop on Nonlinear and Hybrid Control, Paris, July 2006.

[11c] Second order optimality conditions in optimal control with applications. *Discrete Contin. Dyn. Syst.* **suppl.** (2007), 145–154 (with Bonnard, B.; Trélat, E.) Proceedings of the 6th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Poitiers, June 2006.

[12c] Remarks on quadratic Hamiltonians in spaceflight mechanics. *Lagrangian and Hamiltonian Methods for Nonlinear Control*, 365–373, Lecture Notes in Control and Inform. Sci. **366**, Springer, 2007 (with Bonnard, B.; Dujol, R.) Proceedings of the 3rd IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control, Nagoya, July 2006.

[13c] On some Riemannian aspects of two and three-body controlled problems. *Recent Advances in Optimization and its Applications in Engineering*, 205–224, Springer, 2010 (with Daoud, B.; Gergaud, J.) Proceedings of the 14th Belgium-Franco-German conference on Optimization, Leuven, September 2009.

[14c] Discrete and differential homotopy in circular restricted three-body control. *Discrete Contin. Dyn. Syst.* **suppl.** (2011), 229–239 (with Daoud, B.; Gergaud, J.) Proceedings of 8th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Dresden, May 2010.

[15c] Energy minimization in two-level dissipative quantum control: the integrable case. *Discrete Contin. Dyn. Syst.* **suppl.** (2011), 198–208 (with Bonnard, B.; Cots, O.) Proceedings of 8th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Dresden, May 2010.

[16c] On the injectivity and nonfocal domains of the ellipsoid of revolution. *Geometric Control Theory and Sub-Riemannian Geometry*, 73–85, INdAM Series **5**, Springer, 2014 (with Royer, C. W.) Proceedings of the INdAM meeting on Geometric Control and sub-Riemannian geometry, Cortona, May 2012.

[17c] On local optima in minimum time control of the restricted three-body problem. *Recent Advances in Celestial and Space Mechanics*, 209–302, Mathematics for industry **23**, Springer, 2016 (with Farrés, A.)

[18c] Approximation by filtering in optimal control and applications. *IFAC PapersOnLine* **50** (2017), no. 1, 1649–1654 (with Dargent, T.; Nicolau, F.) Proceedings of the 20th IFAC world congress, Toulouse, July 2017

[19c] Optimal control of slow-fast mechanical systems. *Proceedings of the Complex Systems Academy of Excellence* (2018), 105–116 (with Dell'Elce; L.; Pomet, J.-B.; Rouot, J.)

[20c] Singular regimes for the maximization of metabolite production. *IEEE Conference on Decision and Control* (2019), 31–36 (with Gouzé, J.-L.; Yabo, A.) Proceedings of the 58th CDC, Nice, December 2019

[21c] Zermelo-Markov-Dubins problem and extensions in marine navigation. *IEEE Conference on Decision and Control* (2019), 517–522 (with Maslovskaya, S.; Mensch, T.; Moulinier, T.; Pomet, J.-B.) Proceedings of the 58th CDC, Nice, December 2019

[22c] Sufficient conditions for time optimality of systems with control on the disk. *IEEE Conference on Decision and Control* (2019), 2405–2409 (with Orieux, M.) Proceedings of the 58th CDC, Nice, December 2019

[23c] Classification and feature selection using a primal-dual method and projection on structured constraints. *IEEE Conference on Pattern Recognition* (2021), 6538–6545 (with Barlaud, M.; Chambolle, A.) Proceedings of the 25th ICPR, Milan, January 2021

[24c] On the convergence of time-optimal maneuvers of fast-oscillating control systems. *European Conference on Control* (2021), 2008–2013 (with Dell'Elce, L.; Pomet, J.-B.) Proceedings of ECC21, Rotterdam, July 2021

[25c] Zermelo-Markov-Dubins problem with two trailers. *IFAC-PapersOnLine* **54** (2021), no. 19, 249–245. (with Sacchelli, L.; Combot, T.; Pomet, J.-B.) Proceedings of the 7th IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control, Berlin, October 2021

[26c] Hierarchical MPC applied to bacterial resource allocation and metabolite synthesis. *IEEE Conference on Decision and Control* (2021), 667–672 (with Gouzé, J.-L.; Yabo, A.) Proceedings of the 60th CDC, Austin, December 2021

[27c] Optimal allocation of bacterial resources in fed-batch reactors. *European Control Conference* (2022), 1466–1471 (with Yabo, A.; Gouze, J.-L.) Proceedings of ECC22, London, July 2022

[28c] Controllability test for fast-oscillating systems with constrained control. Application to solar sailing. *European Control Conference* (2022), 2143–2148 (with Herasimenka, A.; Dell'Elce, L.; Pomet, J.-B.) Proceedings of ECC22, London, July 2022

[29c] Two-phase averaging of time-optimal control systems. *IFAC PapersOnLine* **55** (2022), no. 16, 7–12 (best paper award) (with Dell'Elce, L.; Pomet, J.-B.) Proceedings of 18th IFAC Workshop on Control Applications of Optimization, Paris, July 2022

[30c] The ct project: a toolbox for optimal control. *IFAC PapersOnLine* **55** (2022), no. 16, 13–18 (with Cots, O.; Martinon, P.) Proceedings of 18th IFAC Workshop on Control Applications of Optimization, Paris, July 2022

[31c] Efficient clustering using alternating minimization and a projection-gradient method for dimension reduction. *IEEE International Conference on Image Processing* (2022), 176–180 (with Gilet, C.; Deprez, M.; Barbry, P.; Barlaud, M.) Proceedings of 29th ICIP, Bordeaux, October 2022

[32c] An algorithmic guide for finite-dimensional optimal control problems. *Handbook of numerical analysis*, in Numerical Control: Part B **24** (2023), 559–626 (with Ferretti, R.; Trélat, E.; Zidani, H.)

Softwares

[1d] `wasp`: Wavelet Adaptive Solver for boundary value Problems. `apo.enseeiht.fr/wasp`

[2d] `tfmin`: Minimum time orbit transfer. `apo.enseeiht.fr/tfmin`

[3d] `cotcot`: Conditions of Order Two, COnjugate Times. `apo.enseeiht.fr/cotcot` `apo.enseeiht.fr/cotcot` (with Bonnard, B.; Trélat, E.)

[4d] `hampath`: Path following for Hamiltonian boundary value problems. `hampath.org` (with Cots, O.; Gergaud, J.)

[5d] `ct`: Control Toolbox (AMDT Inria Sophia Antipolis) `ct.gitlabpages.inria.fr/gallery` (with Cots, O.; Martinon, P.; Inria Sophia SED team)

2 Teaching and supervision

Undergraduate

Since 1996, I have been teaching mathematics and scientific computing at all levels in various places (grandes écoles and university): ENSEEIHT (Univ. Toulouse), Univ. Bourgogne, ISAE,[4] ENAC,[5] ENSTA[6] ParisTech, Polytech Nice Sophia (Univ. Côte d'Azur), CNAM, classes préparatoires. I regularly deliver talks on mathematics and their applications in high schools or colleges.

Graduate

2007-2008 Univ. Bourgogne, *Carnot Doctoral School*. Contrôle optimal et applications I.

2009-2010 Univ. Bourgogne, *Carnot Doctoral School*. Contrôle optimal et applications II.

2012-2013 *7ème école d'été de Peyresq en traitement du signal et des images*. Contrôle optimal : introduction au cas déterministe en dimension finie.

[4] Institut Supérieur de l'Aéronautique et de l'Espace (previously Supaéro and ENSICA)
[5] École Nationale de l'Aviation Civile
[6] École Nationale Supérieure des Techniques Avancées

2013-2014 Institut Henri Poincaré, *Gravasco trimester*. Introduction to optimal control and application to space mechanics.

2020-2021 Arba Minch University, *CIMPA school Optimal Control and Applications in Engineering*. Geometric and numeric methods in optimal control.

2022-2023 University of the Philippines Diliman, *SEAMS-CIMPA School on modern trends in signal and data processing*. Optimisation for machine learning.

2022-2023 University of Seville, Ulysseus Spring School in PDEs. Optimisation of Sturm-Liouville determinants.

PhD theses and postdocs

2003-2006 Romain Dujol, PhD Univ. Toulouse, (co-supervision B. Bonnard). Supported by French Ministry for Higher Education & Research. Now Lecturer at Cy-tech (Pau).

2008-2011 Bilel Daoud, PhD Univ. Bourgogne (co-supervision J. Gergaud). Supported by French Ministry for Higher Education & Research (grant no. 31716-2008). Now R & D engineer at NCR Corporation.

2009-2012 Olivier Cots, PhD Univ. Bourgogne (co-supervision J. Gergaud). Supported by Conseil Régional de Bourgogne (grant no. 2009-160E-160-CE-160T). Now Lecturer at Univ. Toulouse.

2012-2013 Ariadna Farrés, postdoc Univ. Bourgogne. Supported by Conseil Régional de Bourgogne (grant no. 9201AAO049S0273). Now visiting research scientist at NASA.

2013-2016 Zheng Chen, PhD Univ. Paris-Saclay (co-supervision Y. Chitour). Supported by Chinese Scholarship Council (grant no. 2013 0629 0024). Now Lecturer at Zhejiang Univ.

2013-2016 Achille Sassi, PhD Univ. Paris-Saclay (co-supervision E. Trélat and H. Zidani). Supported by Airbus Safran Launchers. Now Digital Technology Expert chez a2a.

2015-2016 Florentina Nicolau, postdoc Inria Sophia (co-supervision J.-B. Pomet). Supported by CNES (contract no. R-S13/BS-005-012). Now Lecturer at Univ. Cergy-Pontoise.aad

2015-2018 Michaël Orieux, PhD Univ. Paris-Dauphine (co-supervision J. Féjoz). Supported by French Ministry for Higher Education & Research (ENS Cachan). Now postdoc at Universitat Politècnica de Catalunya.

2017-2018 Lamberto Dell'Elce, postdoc Inria Sophia (co-supervision J.-B. Pomet). Supported by CNES (contract no. R-S13/BS-005-012), Inria, UniCA MSI and Thalès Alenia Space. Now Researcher at Inria Sophia.

2018-2021 Agustín Yabo, PhD Univ. Côte d'Azur (co-supervision J.-L. Gouzé). Supported by French Ministry for Higher Education & Research. PhD prize of STIC Doctoral school (ATSI mention, rank 2nd). Now Researcher at INRAE Montpellier.

2019-2020 Sofya Maslovskaya, postdoc Inria Sophia (co-supervision J.-B. Pomet). Supported by CGG and ANR Maximic. Now lecturer Univ. Paderborn.

2020-2023 Alesia Herasimenka, PhD Univ. Côte d'Azur (co-supervision L. Dell'Elce and J.-B. Pomet). Supported by French Ministry for Higher Education & Research. 2022 Pierre Laffitte PhD prize laureate, 2023 L'Oréal-Unesco Jeunes talents price.

2023-2026 Antonin Bavoil, PhD Univ. Côte d'Azur (co-supervision A. Nême). Supported by CNRS.

3 Dissemination of research

Projects

1998-2001 CNES Toulouse (contract no. 86/776/98/CNES/7462), Low thrust orbit transfer I (with J. Noailles and J. Gergaud)

2002-2005 CNES Toulouse (contract no. 02/CNES/0257/00), Low thrust orbit transfer II (with J. Noailles and J. Gergaud)

2004-2005 BQR INP Toulouse, Analysis of multi-fractal signals in electromagnetism (with D. Ruiz)

2005-2008 Thales Toulouse (contract no. 00778), Flight plan optimisation (with J. Noailles and J. Gergaud)

2006-2007 EADS-Astrium Space Transportation Les Mureaux, Min. consumption orbit transfer I (with B. Bonnard, J. Gergaud, E. Trélat and C. Zayane)

2006-2008 CNES Évry, Jacobi approaches for discontinuous extremals (with J. Gergaud and G. Janin)

2009-2010 EADS-Astrium Space Transportation Les Mureaux, Minimum consumption orbit transfer II (with B. Daoud and J. Gergaud)

2009-2012 Conseil Régional de Bourgogne (contract no. 2009-160E-160-CE-160T), programme FABER

2009-2013 ANR programme blanc (project no. NT09 504490), Geometric Control Methods (PI U. Boscain)

2010-2012 ADT Inria, BOCOP optimal control toolbox (PI P. Martinon)

2011-2012 BQR Univ. Bourgogne, Contrôle optimal des spins et applications en imagerie par résonance magnétique nucléaire (PI D. Sugny)

2011-2014 SADCO Initial Training Network (FP7 grant no. 264735-SADCO), Sensitivity Analysis for Deterministic Controller Design (PI H. Zidani)

2014-2017 CNES Toulouse (contract no. R-S13/BS-005-012), Perturbations & averaging for low thrust (with J.-B. Pomet)

2015-2016 AMIES Labex (PEPS), Mathematics for smart energy at home (with C. Prud'homme and an industrial partner)

2016-2017 AMIES Labex (PEPS), Dealing with exclusion constraints in orbital transfer (with Thales Alenia Space Cannes)

2016-2018 PGMO (Fondation Mathématique J. Hadamard) grant no. 2016-1753H on "Metric approximation of minimizing trajectories and applications"

2016-2019 FCT grant no. PTDC/MAT-CAL/4334/2014, Extremal spectral quantities and related problems (PI P. Freitas)

2017-2018 UniCA MSI (PEPS), Effet des résonances sur la moyennisation en contrôle optimal appliqué à la mécanique spatiale (with Inria and Thales Alenia Space Cannes)

2017-2023 ANR Maximic, Optimal control of microbial cells by natural and synthetic strategies (PI H. De Jong)

2018-2019 CGG contract, Trajectory optimisation for marine exploration (with L. Giraldi, J.-B. Pomet)

2019-2022 InriaHUB `ct`, Control Toolbox (with O. Cots, P. Martinon, Inria SED)

2020-2022 PGMO (Fondation Mathématique J. Hadamard) grant on "Extremal determinants" (with Y. Chitour, P. Freitas, Y. Privat)

2020-2024 ESA contract on "Optimal control of solar sails" (with A. Herasimenka, L. Dell'Elce, J.-B. Pomet)

2022-2023 CIMI grant on "Singular control and numerical optimisation in Julia" (with J. Gergaud, O. Cots)

2023-2026 CNRS & AID grant on "Kite Electrical Energy Production" (with C. Jochum, J.-B. Leroux, A. Nême, M. Sacher)

2023-2028 PEPR IA, projet ciblé "PDE-AI: numerical analysis, optimal control and optimal transport for AI" (PI A. Chambolle)

Conference organization

09/2007 Mini-sympos. "Optimal control", *13th Czech-Franco-German conference on Optimization*, Heidelberg (with Gergaud, J.)

01/2008 Séminaire Résonances, *CCT mécanique orbitale*, CNES Toulouse (with Lamy, A.)

06/2008 *Workshop on space and quantum dynamics*, Dijon (with Bonnard, B.; Sugny, D.)

03/2011 *SADCO Workshop on aerospace applications of control and optimisation*, Paris (with Cerf, M.; Zidani, H.)

05/2011 Mini-symposium "Optimisation de trajectoires en mécanique spatiale", *Congrès SMAI*, Guidel (with Haberkorn, T.)

09/2011 Mini-symposia "Analytic and geometric optimal control I-II", *IFIP 2011*, Berlin (with Boscain, U.)

03/2012 Session Industrielle, *Journées SMAI-MODE*, Dijon

04/2012 *Spring school and Workshop on Numerical Methods in Control*, Paris, (with Bonnans, J. F.; Trélat, E.; Zidani, H.)

06/2012 *Contrôle optimal géométrique*, Dijon (with Chyba, M.; Sugny, D.; Trélat, E.)

05/2013 Mini-symposium "Optimisation en aéronautique et mécanique spatiale", *Congrès SMAI*, Seignosse

07/2014 *New trends in optimal control (NETCO'2014)*, Tours (with Barles, G.; Briani, A.; Cardaliaguet, P.; Ley, O.; Trélat, E.; Zidani, H.)

11/2014 *Geometric control and related fields*, Linz (with Bergounioux, M.; Haberkorn, T.)

01/2015 *Journée équipe McTAO*, Dijon (with Bonnard, B.; Pomet, J.-B.; Rifford, L.)

06/2015 Mini-symposium "Contrôle et applications", *Congrès SMAI*, Les Karellis

06/2015 *17th British-French-German Conference on Optimization*, London (member of Scientific Committe)

06/2015 *Journée du GT Programmation Mathématique du GdR RO*, Dijon (with Barbara, A.; Cabot, A.; Jourani, A.)

12/2015 *Journées du GdR MOA*, Dijon (with Barbara, A.; Cabot, A.; Jourani, A.; Vaiter, S.)

01/2016 *10th International Young Researcher Workshop on Geometry, Mechanics and Control*, Paris (IHP) (with Gay-Balmaz, F.; Jean, F.; Marco, J.-P.)

01/2016 *Journée équipe McTAO*, Sophia Antipolis (with Bonnard, B.; Giraldi, L.; Pomet, J.-B.; Rifford, L.)

08/2016 *The cut locus: a bridge over differential geometry, optimal control and transport*, Bangkok (with Bonnard, B.; Kondo, K.; Rifford, L.; Tanaka, M.)

10/2016 *Journée équipes MokaPlan-McTAO*, Paris (with Carlier, G.; Pomet, J.-B.)

01/2017 *Première journée SMAI MAS-MODE*, Paris (with Le Pennec, E.)

09/2017 Mini-symposium "Geometric control & applications", *18th French-German-Italian conference on optimization*, Paderborn

11/2017 Mini-symposium "Optimal control & applications to biology", *PGMO days 2017*, Paris Saclay

07/2018 Session on "Optimal Control and PDE Constrained Optimization", *ISMP 2018*, Bordeaux (with Zidani, H.)

09/2018 *The cut locus 2018*, Sapporo (with Kondo, K.; Ohta, S.-I.; Rifford, L.; Sabau, S.; Tanaka, M.)

11/2018 Mini-symposia "Optimal control and applications I and II", *PGMO days 2018*, Palaiseau (with Zidani, H.)

07/2019 Mini-symposium "Computational methods and applications in optimal control", *ICIAM 2019*, Valencia (with Cots, O.; Martinon, P.)

09/2019 *19th French-German-Swiss conference on optimization*, Nice (with Auroux, D.; Duvigneau, R.; Habbal, A.; Malot, C.; Pantz, O.; Pronzato, L.; Rifford, L.; Ruelle, R.; Soresi, C.)

06/2021 *Journées de la Statistique*, Nice (with Auroux, D.; Bouveyron, C.; Burette, S.; Catellier, R.; Corneli, M.; Descombes, S.; Diel, R.; Dreyfuss, P.; Gautero, F.; Laloe, T.; Malot, C.; Mary, D.; Muzy, A.; Precioso, F.; Pronzato, L.; Reynaud-Bouret, P.)

11/2021 SEME / MSGI *AI & companies week*, Sophia Antipolis (with Auroux, D.; Barret, M.; Bouali, A.; Bouveyron, C.; Busé, L.; Descombes, S.)

11/2021 Mini-symposia "Optimal control and applications I and II", *PGMO days 2021*, Palaiseau (with Chitour, Y.)

10/2022 *Journées du GdR MOA*, Nice (with Habbal, A.; Vaiter, S.)

11/2022 Mini-symposia "Optimal control applied to life sciences I and II", *PGMO days 2022*, Palaiseau (with Djema, W.)

01/2023 Half-day on Julia, Inria centre at Université Côte d'Azur (with Veltz, R.)

08/2023 Optimal control: methods and applications, *ICIAM 2023*, Tokyo (with Dell'Elce, L.; Moreau, C.)

Talks

06/1998	*Séminaire CESAME*, Leuven
06/1999	*Nonlinear Sciences on the Border of Milleniums*, Saint-Petersburg
10/1999	*6th International Conference on Parametric Optimization and Related Topics*, Dubrovnik
03/2000	*Journées SMAI-MODE*, Toulouse
05/2000	*Nonlinear Analysis 2000*, New-York
02/2001	*Séminaire MIP*, Toulouse
05/2001	*3rd Workshop on Stability and Sensitivity of Optimal Control Problems*, Burg
01/2002	*Journées Commande*, Orléans
12/2003	*23rd Interdisc. Meeting on Anti-infectious Chemotherapy (RICAI)*, Paris (with Augot, A.; Bernier, M.; Noailles, J.; Philippon, A.)
07/2004	*First joint Canada-France meeting of the mathematical sciences*, Toulouse (with Dujol, R.; Gergaud, J.; Haberkorn, T.; Martinon, P.; Noailles, J.; Preda, D.)
05/2005	*Congrès SMAI*, Évian
03/2006	*Séminaire Équa. diff. et contrôle*, Dijon
03/2007	*Séminaire ERIM*, Nouméa
04/2007	*Séminaire Équa. diff. et contrôle*, Dijon
05/2007	*Workshop on Control, Optimization and Stability of Non-linear Systems: Geometric and Analytic Methods*, Trieste
06/2007	*Mathematical Control Theory and Mechanics*, Suzdal
09/2007	*13th Czech-Franco-German conference on Optimization*, Heidelberg
05/2008	*Journées Bordeaux-Pau-Toulouse*, Anglet
05/2008	*Aerospatial dynamics and Optimal Control*, Paris
06/2008	*Differential equations and topology (dedicated to the centennial anniversary of L. S. Pontryagin)*, Moscow
11/2008	*Séminaire Astronomie et Systèmes Dynamiques*, Observatoire de Paris
03/2009	*Journées math. Besançon-Dijon*, Dijon
09/2009	*14th Belgium-Franco-German conference on Optimization*, Leuven
03/2010	*Colloquium Institut math. de Bourgogne*, Dijon
02/2011	*Séminaire Commands*, Paris
06/2011	*New Trends in Astrodynamics and Applications VI*, New-York
07/2011	*SIAM Control*, Baltimore (with Cerf, M.; Daoud, B.)
08/2011	*Equadiff*, Loughborough
09/2011	*25th IFIP TC 7 Conference on System Modelling and Optimization*, Berlin
10/2011	*Conférence du Laboratoire International Associé Franco-Maghrébin du CNRS*, Nice
03/2012	*Journées SMAI-MODE*, Dijon
02/2013	*Groupe de travail Contrôle*, Paris
03/2013	*Séminaire de géométrie hamiltonienne*, Paris
04/2013	*Séminaire Parisien d'Optimisation*, Paris
09/2013	*Workshop on optimal and model predictive control*, Bayreuth
09/2013	*CELMEC VI*, Viterbo (with Farrés, A.)
12/2013	*Séminaire Stats, Contrôle, Opti. et Probas*, Dijon
12/2013	*Séminaire Lab. J.-L. Lions*, Paris

03/2014	*Journées SMAI-MODE*, Rennes
05/2014	*Séminaire de géométrie sous-Riemannienne*, Paris
05/2014	*Séminaire ROMA de l'ISAE*, Toulouse
07/2014	*10th AIMS Conference on Dynamical Systems, Differential Equations and Applications*, Madrid
07/2014	*12th EUROPT Workshop on Advances in Continuous Optimization*, Perpignan
09/2014	*Séminaire "Temps et espace" de l'Observatoire*, Paris
11/2014	*Workshop "Non-holonomic Mechanics and Geometric Optimal Control"*, *IHP trimester on "Geometry, Analysis and Dynamics on Sub-Riemannian Manifolds"*, Paris
06/2015	*17th British-French-German Conference on Optimization*, London
06/2015	*Rencontres mathématiques de Rouen*, Rouen
07/2015	*SIAM Conference on Control and its applications*, Paris
09/2015	*Séminaire SPOT*, Toulouse
03/2016	*Séminaire Dynamique et géométrie*, Nice
04/2016	*Séminaire de géométrie hamiltonienne*, Paris
05/2016	*Emerging Trends in Applied Mathematics and Mechanics*, Perpignan
06/2016	*Alicante-Limoges-Elche Meeting on Optimization*, Cartagena
08/2016	*The cut locus: a bridge over differential geometry, optimal control and transport*, Bangkok
09/2016	*Séminaire Astrogéo*, Sophia Antipolis
11/2016	*PGMO Days 2016*, Paris Saclay
02/2017	*Séminaire ENAC*, Toulouse
06/2017	*Mathematical Control Theory*, Porquerolles
07/2017	*New Horizons on Optimal Control*, Porto
09/2017	*68th International Astronautical Congress*, Adelaide (with Dargent, T.; Nicolau, F.)
09/2017	*CELMEC VII*, San Martino (with Dell'Elce, L.; Pomet, J.-B.)
11/2017	*PGMO Days 2017*, Paris Saclay (with Barlaud, M.; Gilet, C.)
12/2017	*10th NIPS Workshop on Optimization for Machine Learning*, Los Angeles (with Barlaud, M.; Deprez, M.; Gilet, C.)
01/2018	*UniCA Complex days*, Nice
02/2018	*Recent advances in Hamiltonian dynamics and symplectic topology*, Padova
03/2018	*Journées SMAI-MODE*, Autrans (with Dell'Elce, L.; Pomet, J.-B.; also with Barlaud, M.; Deprez, M.; Gilet, C.)
06/2018	*20th European Conference on Mathematics for Industry*, Budapest (with Dollé, G.; Prud'homme, C.)
11/2018	*PGMO Days 2018*, Palaiseau (with Antonini, M.; Barlaud, M.; Zhou, Y.)
12/2019	*Learning week*, Air France Sophia
02/2020	*Groupe de travail Calcul scientifique et machine learning*, Nice
09/2020	*Journées SMAI-MODE*, Paris-Saclay
02/2021	*Dynamic Control and Optimization*, Aveiro
11/2021	*PGMO Days 2021*, Palaiseau (with Chitour, Y.; Freitas, P.; Privat, Y.)
05/2022	*FGP 2022*, Porto (with Chitour, Y.; Freitas, P.; Privat, Y.)
06/2022	*Journées SMAI-MODE*, Limoges (with Gouzé, J.-L.; Yabo, A.)

06/2022	*Workshop on optimal control theory*, Rouen (with Chitour, Y.; Freitas, P.; Privat, Y.)
09/2022	*LJAD Colloquium*, Nice
11/2022	*PGMO days 2022*, Palaiseau
05/2023	*Optimization and Control in Burgundy*, Dijon
06/2023	*Journée contrôle optimal et applications*, Marseille
06/2023	*25th Euro AD Workshop*, Sophia
07/2023	*JuliaCon 2023*, Cambridge
08/2023	*ICIAM 2023*, Tokyo
10/2023	*Julia optimization day*, Paris
11/2023	*Aspects mathématiques de la mécanique céleste et newtonienne*, Avignon
12/2023	*New trends and challenges in optimization theory applied to space engineering*, L'Aquila

Outreach

05/2011	*Lycée Stephen Liégeard*, Brochon
04/2012	*Lycée Eiffel*, Dijon
06/2013	Stage MathC2+ "Trop fort les maths", Institut math., Dijon
03/2014	*Lycée Hyppolite Fontaine*, Dijon
03/2015	*Lycée de Gaulle*, Dijon
05/2015	*Lycée Antoine*, Chenove
03/2016	*Lycée de Gaulle*, Dijon
06/2017	Stage MathC2+, Inria Sophia Antipolis
10/2017	*Lycée Amiral*, Grasse
07/2019	*Gymnase Bern-Neufeld*, en visite à Nice
12/2019	Stage collège, Inria Sophia Antipolis
01/2020	*Collège Klein*, La Colle sur Loup
02/2020	*Lycée Rouvière*, Toulon
03/2020	*Collège International de Valbonne*, Valbonne
03/2020	*Journée formation rectorat*, Nice
10/2020	*Remise prix Olympiades*, Nice
03/2022	"Regards de géomètre", *École Toreille*, Vence
04/2023	*Collège La Sine*, Vence
01/2024	*Collège La Sine*, Vence

Short notes in "Mathématiques de la planète terre":

- *Tout autour de la terre*
  `breves-de-maths.fr/tout-autour-de-la-terre`
- *Un ellipsoïde peut en cacher un autre*
  `breves-de-maths.fr/tout-autour-de-la-terre-2nde-partie`
- *De la terre à la lune*
  `culturemath.ens.fr/breves/de-la-terre-a-la-lune`

4 Academic service

Scientific

1999-2000	Conseil Scientifique Univ. Toulouse IV
2005-2007	Conseil de laboratoire IRIT
2010-2013	Comité direction Institut math. Bourgogne, responsable financier
2010-2013	Bureau Commission de proposition (math.) Univ. Bourgogne
2010-2017	Conseil de laboratoire Institut math. Bourgogne
2010——	Comités de sélection 26ème section (Dijon, Marseille, Nice, Orléans, Paris, Toulouse...)
2011-2017	Groupe SMAI-MODE, responsable (2013-2016)
2012-2013	Séminaire Contrôle, Optimisation, Transport, Institut math. Bourgogne, organizer
2013-2016	Labex AMIES, industrial correspondent

2015-2017	Équipe CNRS Statistique, Probabilités, Optimisation & Contrôle, Institut math. Bourgogne, joint head
2016-2018	Séminaire de géométrie hamiltonienne de Sorbonne Université, co-organizer
2016-2019	Conseil scientifique de l'Institut de Mécanique Céleste et de Calcul des Éphémérides (Observatoire de Paris)
2016-2020	Conseil scientifique du GdR Calcul
2017-2023	Conseil scientifique PGMO, Fondation Mathématique Jacques Hadamard
2017——	Centre Spatial Universitaire UniCA (projet CubeSat)
2018	Jury du prix de thèse PGMO
2019——	Conseil Scientifique 3IA Université Côte d'Azur
2020——	Editorial board of ESAIM: M2AN
2022——	Labo. J. A. Dieudonné colloquium, co-organizer
2022——	Commission de Développement Technologique Inria Sophia, member
2024——	Conseil de l'école doctorale STIC, UniCA, member
2024——	Conseil Académique Université Côte d'Azur, elected member

Pedagogical

2005-2007	3ème année math. ENSEEIHT internships, responsable
2006-2007	2ème année majeure math. ENSEEIHT, responsable
2009-2013	L2 math. Univ. Bourgogne, responsable
2014-2016	L1 math. Univ. Bourgogne, responsable
2014-2016	Master 2 math. applis Univ. Bourgogne, responsable
2014-2016	Conseil UFR Math. & Info. Univ. Paris I
2014-2017	Conseil pédagogique département math. Univ. Bourgogne
2018-2020	Jury de l'agrégation de mathématiques
2018-2022	Département de Mathématiques Appliquées & Modélisation Polytech Nice Sophia, directeur