IVAN BESCHASTNYI

Geometry, control, quantum

ABOUT ME

Currently I am a researcher at the Inria Centre Université Côte d'Azur in the team MCTAO. My research mostly splits between quantum control and sub-Riemannian geometry.

EDUCATION AND PREVIOUS POSITIONS

Dec 2024 – present:	**Researcher (CRCN),** Team McTAO, Inria Côte d'Azur, Nice, France;
Dec 2020 – Mov 2023:	**Post-Doc (CIDMA Fellow),** University of Aveiro, Aveiro, Portugal;
Oct 2018 – Nov 2020:	**Post-Doc,** INRIA/Sorbonne University, Team CAGE/LJLL, Paris, France;
Oct 2014 – Sep 2018:	**PhD student,** Mathematical Analysis Modelling and Applications. International School for Advanced Studies, Trieste, Italy;
Sep 2011 – Sep 2014:	**Research Engineer,** Program Systems Institute of RAS, Pereslavl-Zalessky, Russia;
Sep 2006 – Jun 2011:	**Specialist degree** in Automation of industries and technological processes, Kaliningrad Technical State University, Kaliningrad, Russia.

QUALIFICATIONS

The following qualifications from the "Ministre de l'Enseignement Supérieur et de la Recherche Scientifique» (French ministry of higher education and scientific research) to participate to the competitions for maître de conférences have been obtained:

Nov 2019: Qualification aux fonctions de maître de conférences - Section 25 - Mathématiques.

PUBLICATIONS

Accepted papers

[1] **I. Beschastnyi, F. Colombo, S. A. Lucas, I. Sabadini.** The S-resolvent estimates for the Dirac operator on hyperbolic and spherical spaces, *J. Geom Anal,* vol 36, no. 177, 2026.

[2] **I. Beschastnyi, C. Carvalho, V. Nistor, Yu Qiao.** Schrödinger operators with non-integer power-law potentials and Lie-Rinehart algebras**,** *Anal.Math.Phys.* vol. 16, no. 48, 2026.

[3] **S. Baranzini, I. Beschastnyi.** Morse index of block Jacobi matrices via optimal control, *Portugaliae Mathematica*, vol. 81 , no. 1/2, 2024.

[4] **A. Agrachev, S. Baranzini, I. Beschastnyi.** Index theorems for graph-parametrized optimal control problems, *Nonlinearity*, vol. 36, no. 5, 2023.

[5] **I. Beschastnyi.** Closure of the Laplace-Beltrami operator on 2D almost-Riemannian manifolds and semi-Fredholm properties of differential operators on Lie manifolds*, Results in Mathematics*, vol. 78, no. 2, 2023.

[6] **I. Beschastnyi, U. Boscain, E. Pozzoli.** Quantum confinement for the curvature Laplacian $-\Delta +cK$ on 2D-almost-Riemannian manifolds, *Potential analysis*, vol.58, no. 3 2023.

[7] **I. Beschastnyi, K. Habermann, A. Medvedev.** Cartan connections for stochastic developments on sub-Riemannian manifolds*, Journal of Geometric Analysis*, vol 32, no. 13, 2022.

[8] **A. Agrachev, I. Beschastnyi.** Jacobi Fields in Optimal Control: Morse and Maslov Indices, *Nonlinear Analysis*, vol. 214, 2022, 112608.

[9] **I. Beschastnyi, U. Boscain, M. Sigalotti**. An obstruction to small-time controllability of the bilinear Schrödinger equation, *Journal of Mathematical Physics*, vol 62, no. 3, 2021.

[10] **A. Agrachev, I. Beschastnyi.** Jacobi Fields in Optimal Control: One-dimensional Variations, *Journal of Dynamical and Control systems*, vol 26, no. 4, 2020, p. 685-732.

[11] **D. Barilari, I. Beschastnyi, A. Lerario.** Volume of small balls and sub-Riemannian curvature in 3D contact manifolds, *Journal of Symplectic Geometry*, vol 18, no. 2, 2020, p. 355-384.

[12] **I. Beschastnyi, A. Medvedev.** Left-invariant sub-Riemannian Engel structures: abnormal geodesics and integrability. *SIAM Journal on Control and Optimization*, 56 (5), 2018, p. 3524-3537.

[13] **A. Agrachev, I. Beschastnyi.** Symplectic Geometry of Constrained Optimization. *Regular and Chaotic Dynamics*, vol 22, no. 6, 2017, p. 750--770.

[14] **A. Mashtakov, R. Duits, Yu. Sachkov, E. Bekkers, I. Beschastnyi.** Tracking of Lines in Spherical Images via Sub-Riemannian Geodesics in SO(3*), Journal of Mathematical Imaging and Vision*, 58(2), 2017, p. 239-264.

[15] **A. Mashtakov, R. Duits, Yu. Sachkov, E. Bekkers and I. Beschastnyi.** Sub-Riemannian geodesics on the group $\rm SO(3)$ in a problem on tracking blood vessels on spherical images of the retina, *Dokl. Math*., 95, 2017, p. 168–171.

[16] **I. Beschastnyi, Yu. Sachkov.** Geodesics in the sub-Riemannian problem on the group SO(3), *Sbornik: Mathematics*, 207(7), 2016, p. 29-56.

[17] **I. Beschastnyi.** The optimal rolling of a sphere, with twisting but without slipping, *Sbornik: Mathematics*, 205(2), 2014, p. 157-191.

[18] **I. Beschastnyi.** Program to solve the optimal ball reorientation problem (in Russian), *Software & Systems*, no. 3, 2013, p. 252-256.

[19] **A. Ardentov, A. Mashtakov, I. Beschastnyi, Yu. Sachkov, A. Popov, E. Sachkova.** Algorithms for evaluation position and orientation of UAV (in Russian), *Programmnye sistemy: Teoria i Prilozheniya*, 3(12), 2012, p. 23-29.

[20] **A. Ardentov, A. Mashtakov, I. Beschastnyi, Yu. Sachkov.** Interface for the study of sub-Riemannian geodesics on 3D Lie groups (in Russian), *Software & Systems*, 4, 2012, p. 200-203.

[21] **I. Beschastnyi.** A connection in a fiber bundle associated with a dual plane distribution (in Russian), *Differential geometry of Manifolds and Figures*, issue 42, 2011, p. 12-20.

Preprints

[22] **I. Beschastnyi, L. Patel, D. Tinoco.** Hamiltonian engineering via pulses: beyond group averaging, *arXiv:2609.18911*.

[23] **I. Beschastnyi, F. Colombo, S. Andrade Lucas, I. Sabadini.** The S-resolvent estimates for the Spinor Dirac operator on manifolds with boundary conditions, *arXiv:2606.31328*.

[24] **I. Beschastnyi, F. Cattafi, J.N. Mestre.** Sub-Riemannian structures and non-transitive Cartan geometries via Lie groupoids, *arXiv:2603.30041*.

[25] **A. Agrachev, I. Beschastnyi, M. Motta.** Singular extremals of optimal control problems with L^1-cost, *arXiv:2511.21527*.

[26] **I. Beschastnyi, H. Quan.** Self-adjointness criteria and self-adjoint extensions of the Laplace-Beltrami operator on α-Grushin manifolds, *arXiv:2305.08280*.

Articles in collected works

[27] **I. Beschastnyi, C. Carvalho, V. Nistor, Y. Qiao.** Analysis on noncompact manifolds and Index Theory: Fredholm conditions and Pseudodifferential operators, Ghent Methusalem Colloquium, Extended Abstracts 2021/2022. *Trends in Mathematics*, vol 3, 2024.

Proceedings of Conferences and Workshops

[28] **D. Tinoco, C. Babin, I. Beschastnyi, J.-B. Caillau, D. Sugny.** Control of an NV center as a two-qubit system, *IFAC World Congress, 2026.*

[29] **G. Aloui, I. Beschastnyi, L. Sacchelli.** Open qubit parameter identification with bounded pulses, *IFAC World Congress, 2026.*

[30] **I. Beschastnyi, L. Dell'Elce, J.-B. Pomet, L. Sacchelli, D. Tinoco.** Pulse control of affine systems with applications to quantum control, *2025 IEEE 64th Conference on Decision and Control (CDC)*.

[31] **I. Beschastnyi.** Lie groupoids for sub-elliptic operators. Contemporary Mathematic, vol 809, New Trends in Sub-Riemannian Geometry, p. 1-21, 2025.

[32] **I. Beschastnyi, U. Boscain, D. Cannarsa, E. Pozzoli.** Embedding the Grushin cylinder in and Schroedinger evolution, Contemporary Mathematics, New Trends in Sub-Riemannian Geometry, vol 809, p. 1-21, 2025.

[33] **I. Beschastnyi.** Parametrisation of extremal trajectories in the problem of the rigid body rotation (in Russian), Proceedings of XV Annual Scientific-Practical Conference of Pereslavl University, Pereslavl-Zalessky, 12-14 Apr 2013, p. 19--31.

VISITS AND TALKS

Invited talks

17 Jan 2025: «Geometry and analysis on Grushin manifolds», GEMS (GEometry MeetingS), CMUP, University of Porto, Portugal.

08 Jul 2024: «Normal operators of singular PDEs», INDAM Workshop on Future Perspectives on Linear and Nonlinear Modelling of Contact-Type Perturbations, Roma Sapienza, Italy.

28 Jun 2023: «Geometric PDOs and the Laplace-Beltrami operator on higher Grushin manifolds», Conference «Singularities, Asymptotics and Limiting Models», University of Bari, Italy.

28 Mar 2023: «Second Variation and Symplectic Geometry», Conference Geometry and Control in Cortona», Cortona, Italy.

15 Mar 2023: «Stochastic developments on sub-Riemannian manifolds», One day workshop in Geometry and Topology, University of Coimbra, Portugal.

16 Jan 2023: Seminar talk «Motion planning via optimal control», Inria Nice, Nice, France.

22 Nov 2022: «Pseudo-differential calculus adapted to Grushin structures», Singular Perturbations and Geometric Structures, Trieste, Italy.

03 Oct 2022: «Self-adjoint extensions for the curvature Laplacian on Grushin manifolds», Zero-Range and Point-Like Singular Perturbations: For a Spillover to Analysis, PDE and Differential Geometry, Oberwolfach, Germany.

20 Jul 2022: «Lie groupoids for sub-Riemannian geometry», AMS-SMF-EMS Joint International Meeting, Grenoble, France.

06 Apr 2022: «Analysis and Geometry on Almost-Riemannian manifolds», GDEseminar (online), IMPAN, Warsaw, Poland.

31 Mar 2022: «Analysis and Geometry on Almost-Riemannian manifolds», Conference «Geometry and Analysis on Non-Compact Manifolds», CIRM, Luminy, France.

16 Feb 2022: «Constrained variational problems and L-derivatives», Conference on Mathematics of Wave Phenomena, Karlsruhe, Germany.

23 Sep 2021: «Quantum confinement on almost-Riemannian manifolds», Séminaire Théorie de Lie, Géométrie et Analyse, Université de Lorraine, Metz, France.

25 Jun 2021: «Lie groupoids and the minimal domain of the Laplace operator on almost-Riemannian manifolds», Sub-Riemannian seminars, online.

25 Jan 2021: «Strange quantum phenomena on almost-Riemannian manifolds», Complex and Hypercomplex Analysis Seminar, University of Aveiro, Aveiro, Portugal.

07 Jul 2020: «L-derivatives for optimal control», Geometric theory of optimal control, Lomonosov Moscow state University, Moscow, Russia.

16 Jan 2020: «Symplectic methods in optimisation problems», Mathematical colloquia, University of Utrecht, Utrecht, Netherlands.

16 Dec 2019: «Semi-classical obstructions to small time controllability of the Schroedinger equation», Workshop «Quantum day: analysis and control», Sorbonne University, Paris, France.

9-10 Dec 2019: «Semi-classical obstructions to small time controllability of the Schrödinger equation», Workshop «Journée CAGE-McTAO», INRIA, Sofia Antipolis, France.

19 Mar 2019: «Jacobi fields in optimal control», Séminaire Géométrie, analyse et dynamique, Université Nice Sophia Antipolis, Nice, France.

28-29 June 2018: «L-derivatives and singularities of Jacobi curves», Workshop «Sub-Riemannian Geometry and Topoló(gy)», Topol\'o, Italy.

25 Jan 2017: «Sub-Riemannian Engel models», S\'eminaire de G\'eom\'etrie sous-Riemannienne, Institute Henri Poincare, Paris, France.

14 May 2014: «Sub-Riemannian problem on the group SO(3)», Control Theory Seminar, Moscow State University, Moscow, Russia.

14-18 Apr 2014: «Almost-Riemannian Geometry of the Two-Sphere», International youth conference «Geometry and Control», Moscow, Steklov Mathematical Institute of RAS, Moscow, Russia.

Jun 2013: Geometric Control and Metric Spaces Seminar, Sobolev institute, Novosibirsk, Russia.

Contributed talks

11 Dec 2025: «Pulse Control of Affine Systems with Applications to Quantum Control», 2025 IEEE 64th Conference on Decision and Control (CDC), Rio de Janeiro, Brazil.

06 Aug 2023: «Properties of the Laplace operator on Grushin manifolds», Winter school «Geometric, Algebraic and Topological Methods in Quantum Field Theory», Villa de Leyva, Colombia.

20 Jul 2023: «Pseudo-differential calculus adapted to Grushin manifolds», 14th ISAAC Congress, USP, Ribeirão Preto, Brazil.

06 Jun 2023: «Analysis on Almost-Riemannian manifolds», International Conference on Clifford Algebras and Their Applications in Mathematical Physics, Holon, Israel.

2-6 Sep 2019: «Semi-classical obstructions to zero time controllability», XXVIII International Fall Workshop on Geometry and Physics, Spain, Madrid.

12-16 Feb 2018: «Monotone curves and Morse-type theorems», School-Workshop «Recent advances in Hamiltonian dynamics and symplectic topology», Padova, Italy.

9-14 May 2016: «L-derivatives for optimal control problems», Conference «Geometric Analysis in Control and Vision Theory», Voss, Norway.

16-20 Sep 2013: «Sub-Riemannian problems on SU(2) and SO(3)» 34th International Conference on Quantum Probability and Related Topics, Moscow, Russia.

5-9 Jul 2013: «Sub-Riemannian problems on SO(3) and SU(2)», International conference on mathematical control theory and mechanics, Suzdal, Russia.

3-14 Jun 2013: ICTP-SISSA-Moscow School on Geometry and Dynamics. Triste, Italy.

17-24 Jun 2012: 4th traditional youth school «Control, information and optimization», Zvenigorod, Russia.

Jun - Jul 2012: International conference on differential equations and dynamical systems, Suzdal, Russia.

Jul 2012: International school-conference «Control and optimization in nonholonomic systems», Pereslavl-Zalessky, Russia.

Scientific visits

Sep 2025: University of Bari, Bari, Italy, (14 days), collaboration with Marilena Ligabò.

Mar 2025: University of Coimbra, Coimbra, Portugal, (14 days), collaboration with João Mestre and Francesco Cattafi.

Mar 2023: Wurzburg University, Wurzburg, Germany (12 days), collaboration with Francesco Cattafi and João Mestre.

Sep 2021: Sorbonne Université, Paris, France (3 days), collaboration with Ugo Boscain and Mario Sigalotti.

Sep 2021: University of Utrecht, Utrecht, Netherlands (3 days), collaboration with Álvaro del Pino Gómez, Marius Crainic and Gil Cavalcanti.

Jan 2020: University of Utrecht, Utrecht, Netherlands (7 days), collaboration with Álvaro del Pino Gómez and Francisco Torres de Lizaur.

Nov 2016: École Polytechnique, Paris, France (20 days), collaboration with Ugo Boscain.

Dec 2013: Sobolev institute, Novosibirsk, Russia (27 days), collaboration with A. Agrachev.

Mar 2013: Technical University Eindhoven, Netherlands (7 days), collaboration with R. Duits.

Popularization talks

2018: Lecture «Mathematica d'amore» (Mathematics of Love), SISSA Student's Day, Trieste, Italy.

2016: Lecture «Neurogeometria» (Neurogeometry), Trieste NEXT, Piazza Unita', Trieste, Italy.

2015: Lecture «Geometria del sistema visivo» (Geometry of the visual system), SISSA Open Day, Trieste, Italy.

2015: Lecture «Giochi e invarianti» (Games and invariants), SISSA For Schools, Trieste, Italy.

2015: Lecture «Che cos'è un Flexagon?» (What's a Flexagon?), SISSA Open Day, Trieste, Italy.

ORGANIZATION OF EVENTS

28-30 Sep 2026: Organizer of the conference « Nonlinear and Optimal Control on the Côte d'Azur », Centre Inria d'Université Côte d'Azur

29-30 Sep 2025: Organizer of the workshop «Journées niçoises : Théorie spectrale et analyse sur les variétés», Université Côte d'Azur

16-17 Oct 2024: Organizer of the workshop «New trends in Quantum Control», Université Côte d'Azur

05 May 2022: Organizer of One day workshop in Differential Geometry, University of Aveiro, Portugal.

2021 - 2022: Organizer of the Analysis and Differential Geometry International Seminar (with P. Cerejeiras and U. Kähler), University of Aveiro, CIDMA, Aveiro, Portugal.

2013: Member of the organizing committee of the workshop: «Control and Optimization of Nonholonomic Systems», 10--14 July 2013, Pereslavl-Zalessky, Russia.

FUNDED RESEARCH PROJECTS AND FINANCIAL SUPPORT

As a PI:

2026-2027: Joint project Pessoa together with CIDMA and University of Aveiro, 1947€

2024-2026: IdEx Welcome package from Univeristé Côte d'Azur, 50000€

2025: Projet Crédits Scientifiques Incitatifs COSQUO, 5000€

2025: CALISTA COST action travel grant, 1560€

2024: QuantAzur conference organization financial support, 500€

As a participant:

2025-2026: CNRS Programme Intern Blanc project "Contrôle théorique et expérimental des centres NV" (PI J.-B. Caillau)

2024: PEPS JCJC 2024 project: «Small-time controllability of bilinear PDEs on boundaryless Riemannian manifolds» (PI E. Pozzoli)

2012-2014: Member of the Russian project «Geometric control theory and analysis on metric spaces». Contract No. 14.B25.31.0029 (PI A. Agrachev).

2012-2013: Member of the Russian FCPK-project «New methods for studying optimal control problems on smooth manifolds and Lie groups with applications to robotics, quantum and classical mechanics, image processing and UAV control», Grant No. 2012-1.1-12-000-1003-049 (PI Yu. Sachkov).

TEACHING

Teaching Formation

2022: PhD Supervision Excellence Training for Academic Staff, e-NOTE consortium, 20-24 June 2022

Teaching Experience

2025: Teaching assistant for the course «Introduction à l'analyse» L1, Université Côte d'Azur, Nice, France (38 hours).

2025: Teaching assistant for the course «Linear algebra» L1, Université Côte d'Azur, Nice, France (38 hours).

2024-2025: Responsible for Masters' projects MAM4 on quantum engineering, M1, Université Côte d'Azur, Nice, France (10 hours).

2024: Teaching assistant for the course «Introduction à l'analyse» L1, Université Côte d'Azur, Nice, France (38 hours).

2023: Lecturer for the course «Introduction to Lie groupoids and Lie algebroids», PhD, Aveiro, Universidade de Aveiro, Aveiro, Portugal, (20 hours).

2023: Lecturer for the course «Riemannian Geometry», M1, Aveiro, Universidade de Aveiro, Aveiro, Portugal, 2021 (36 hours).

2022: Lecturer at the «Lie groupoid week in Coimbra», PhD, Coimbra, Portugal (5 hours).

2021-2022: Responsible for the Masters' seminar on Algebra and Geometry, M1, Universidade de Aveiro, Aveiro, Portugal, (72 hours).

2021: Lecturer for the course «Calculus of variations», PhD, Universidade de Aveiro, Aveiro, Portugal (36 hours).

2020: Teaching assistant for the course «Systémes Dynamiques: Analyse et Stabilité», L3, ENSTA, Palaiseau, France (16 hours).

2019: Teaching assistant for the course «Matématiques pour les études scientifiques I», L1, Sorbonne Université, Paris, France (52 hours).

2019: Teaching assistant for the course «Systémes Dynamiques: Analyse et Stabilité», L3, ENSTA, Palaiseau, France (6 hours).

2018: Teaching assistant for the Probability theory and Statistics, University of Trieste, L2, Italy, 2018 (20 hours).

2013-2014: Teaching assistant for Analysis I-III, L1-L2 University of Pereslavl-Zalessky, Russia, 2013-2014 (132 hours).

STUDENT SUPERVISION

PhD students

Ghaieth Aloui: «Quantum speed limits via geometric control theory». Joint supervision with J.-B. Pomet and L. Sacchelli. Expected date of defence: October 2029.

David Tinoco: «Nearly optimal pulse control of quantum systems». Joint supervision with J.-B. Caillau. Expected date of defence: October 2027.

Stefano Baranzini: «Spectral properties of the Second Variation of an optimal control problem», SISSA, Trieste, Italy. Joint supervision with A. Agrachev. Date of defense: 08 Nov 2022.

Master students and interns

Zhiayuan Xu: «Small-time controllability of left-invariant systems on 3D unimodular Lie groups», Centre Inria d'Université Côte d'Azur, Biot, France, 2026.

Lucah Patel: «Dynamical decoupling for quantum control systems», Centre Inria d'Université Côte d'Azur, Biot, France, 2026.

Marwan Ksiks: «Simulation of quantum electric circuits», Université Côte d'Azur, Nice, France, 2025.

Ghaieth Aloui: «Identification of parameters of quantum systems», Université Côte d'Azur, Nice, France, 2025.

António Mendes: «Motion planning of a mobile robot via geometric control theory», University of Aveiro, Portugal, Jun 2024.

Miguel Nuno Pereira Santiago: «Mean value property in SR geometry», MSc student, University of Aveiro, Portugal, Jun 2023.

Ana Catarina Tavares Cirne Valente: «Mathematical economics of video games», MSc student, University of Aveiro, Portugal, Jun 2023.

Simão Andrade Lucas: «Chern-Gauss-Bonnet Theorem for Grushin Manifolds», MSc student, University of Aveiro, Portugal, Jun 2023.

ADMINISTRATION

Administrative services

2017-2018: Representative of the Math. Department in the Students Council, SISSA, Trieste, Italy.

Affiliations to mathematical groups

2015, 2021-2022: INDAM. Affiliation to the group GNAMPA;

2016-2017: INDAM. Affiliation to the group GNSAGA;

2021-2022: Individual member of European Mathematical Society.

Reviews for journals

SIAM: Journal on Control and Optimization, Journal of Dynamical and Control systems, Applied Mathematics and Computation, Sbornik: Mathematics, Math Reviews.

Reviews for grant bodies

FONDECYT (Fondo Nacional de Desarrollo Científico y Tecnológico), Chile

Nice

01/10/2026