Alexandre Kirilov

Curriculum Vitae

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Website `http://www.mat.ufpr.br`

Online Research Profiles and Databases

Lattes `http://lattes.cnpq.br/0680699946294408`
Official database for curricula of Brazilian researchers

ORCID `https://orcid.org/0000-0001-5343-488X`
Unique identifier for researchers to ensure proper attribution of academic work

zbMATH `https://zbmath.org/authors/?q=kirilov+a*`
Open platform for mathematical research, by the European Mathematical Society (EMS)

MathSciNet `https://mathscinet.ams.org/mathscinet/MRAuthorID/825118`
Platform for mathematical research, by the American Mathematical Society (AMS)

arXiv `https://arxiv.org/a/kirilov_a_1.html`
Open-access repository for preprints in several scientific fields, including mathematics

Academic Positions

2020–now **Full Professor**, *Department of Mathematics*, Universidade Federal do Paraná, Curitiba, Brazil

2011–2020 **Associate Professor**, *Department of Mathematics*, Universidade Federal do Paraná, Curitiba, Brazil

2002–2011 **Adjoint Professor**, *Department of Mathematics*, Universidade Federal do Paraná, Curitiba, Brazil

1997–2002 **Assistant Professor**, *Department of Mathematics*, Universidade Federal do Paraná, Curitiba, Brazil

1995–1997 **Auxiliary Professor**, *Department of Mathematics*, Universidade Federal do Paraná, Curitiba, Brazil

Academic Background

2010 **Postdoctoral Research in Partial Differential Equations**, *Università di Cagliari*, Cagliari, Italy, Supervisor: Todor Gramchev

1998–2001 **Ph.D. in Mathematics**, *Universidade Federal de São Carlos*, São Carlos, Brazil
Advisor: Adalberto Panobianco Bergamasco Thesis: Global solvability for a class of systems of vector fields on the three-dimensional torus

1995–1996 **M.Sc. in Mathematics**, *Universidade Federal de São Carlos*, São Carlos, Brazil
Advisor: Adalberto Panobianco Bergamasco Thesis: Some remarks on the global hypoellipticity in the n-dimensional torus

1990–1993 **B.Sc. in Mathematics**, *Universidade Federal do Paraná*, Curitiba, Brazil

Administration Charges

2024–2028 **Head of the Department**, Department of Mathematics, UFPR

2020–2022 **Head of the Department**, Department of Mathematics, UFPR

2013–2017 **Coordinator International Cooperation Program PLI-Capes**, *Univ.Coimbra*

2013–2016 **Member of Public Ethics Committee**, *UFPR*

2012–2015 **Coordinator of Mathematics Tutorial Education Program**, UFPR

2011–2012 **Coordinator of the Bachelor and Education in Mathematics Programs**, UFPR

2003–2007 **Coordinator of the Bachelor and Education in Mathematics Programs**, UFPR

Languages

- Portuguese – Native
- Italian – Proficient
- English – Advanced (academic writing proficiency)

Short-term Research Stays

2026 **University of Turin**, Italy (20 days)

2026 **University of Ghent**, Belgium (15 days)

2024 **University of Turin**, Italy (16 days)

2024 **University of Ghent**, Belgium (14 days)

2018 **Imperial College London**, England (14 days)

2017 **Imperial College London**, England (15 days)

2015 **Bulgarian Academy of Sciences**, Bulgaria (12 days)

2015 **University of Cagliari, Sardegna**, Italy (40 days)

2014 **University of Cagliari, Sardegna**, Italy (15 days)

2013 **University of Cagliari, Sardegna**, Italy (30 days)

2012 **University of São Paulo - ICMC, São Carlos**, Brazil (14 days)

2009 **University of São Paulo - ICMC, São Carlos**, Brazil (20 days)

2008 **University of São Paulo - ICMC, São Carlos**, Brazil (30 days)

2007 **University of São Paulo - ICMC, São Carlos**, Brazil (2 months)

2006 **University of São Paulo - ICMC, São Carlos**, Brazil (2 months)

Organized Conferences

2023 **Thematic session 2: Fourier analysis, complex analysis and applications to partial differential equations**, *34th Brazilian Mathematics Colloquium*, Rio de Janeiro, Brazil

2022 **Workshop on Fourier Analysis, Linear PDEs, and Related Topics - Celebrating the 75th birthday of Adalberto Bergamasco**, *São Carlos, Brazil*

2021 **Thematic session 2: Fourier analysis, complex analysis and applications to partial differential equations**, *33th Brazilian Mathematics Colloquium*, Rio de Janeiro, Brazil

2021 **Web Seminar on Linear PDE's and Related Topics - Season 2021**, *Curitiba & São Carlos, Brazil*

2021 **Special Session on Linear Equations**, *ICMC Summer Meeting on Differential Equations - Chapter 2021*, São Carlos, Brazil

2020 **Web Seminar on Linear PDE's and Related Topics - Season 2020**, *Curitiba & São Carlos, Brazil*

2014 **II International Workshop on Global Properties of PDE's on Manifolds**, *Cagliari, Italy*

2010 **International Workshop on Global Analysis on Manifolds**, *Sofia, Bulgaria*

2010 **International Workshop on Global Properties of PDE's on Manifolds**, *Cagliari, Italy*

2007–2026 **Summer Program in Mathematics of UFPR**, *Curitiba, Brazil (annual event)*

Ph.D. Students

2023–current **Pedro Meyer Tokoro**, (joint Ph.D. UFPR - UniTo)
Thesis:
Co-advisor 1: Wagner de Moraes, UFPR, Brazil, and
Co-advisor 2: Sandro Coriasco, University of Turin, Italy

2020–2024 **André Pedroso Kowacs**, (joint Ph.D. UFPR - UGent)
Thesis: Links Between Regularity and Inequalities on Compact Lie Groups
Co-advisor: Michael Ruzhansky, Ghent University, Belgium

2019–2022 **Alexandre Árias Junior**
Thesis: The Cauchy Problem for 3-Evolution Operators with Data in Gevrey and Gelfand-Shilov Type Spaces
Co-advisor: Marco Cappiello, University of Turin, Italy

2017–2021 **Bruno de Lessa Victor**
Thesis: Hypoelliticity in classes of ultradifferentiable function on the torus
Co-advisor: Paulo Cordaro, University of São Paulo, Brazil

2017–2020 **Ricardo Paleari da Silva**
Thesis: Global Analytic Hypoellipticity for a class of Invariant Operators on $\mathbb{T}^1 \times \mathbb{S}^3$

2016–2020 **Wagner Augusto Almeida de Moraes**
Thesis: Global properties for a class of operators on compact Lie groups
Co-advisor: Michael Ruzhansky, Imperial College London, England

2012–2015 **Fernando de Ávila Silva**, *UFPR*
Thesis: Globally Hypoelliptic of Pseudodifferential Operators on Closed Manifolds
Co-advisor: Todor Gramchev, University of Cagliari, Italy

Research Interests

1. **(Pseudo)Differential Operators on Closed Manifolds**
   This research line investigates the existence and regularity of solutions of operators defined on closed manifolds. The main focus is to understand the conditions under which the solutions of these operators are smooth, real-analytic, or ultradifferentiable, with respect to the properties of the input distributions. This involves studying (pseudo)differential operators defined on the space of (ultra)distributions, considering spaces of smooth, real analytic, or ultradifferentiable functions. The aim is to establish necessary and sufficient conditions that guarantee the smoothness, analyticity, or ultradifferentiability of solutions with respect to the input distributions. Additionally, there is interest in identifying conditions for the solvability of equations of the form $Pu = f$, where P is a differential operator and f is a given distribution. These properties are known as global hypoellipticity and global solvability in the sense of $\mathcal{F}(M)$, with M being the closed manifold under consideration. This work contributes to the understanding of the fundamental properties of differential operators in various contexts.

2. **Vector Fields on Lie Groups**
   This project focuses on investigating global properties, such as hypoellipticity and solvability, of vector fields defined on compact Lie groups. It explores the interplay between the geometric structure of Lie groups and the properties of vector fields and systems of vector fields defined on them. The analysis involves understanding conditions that guarantee these global properties, considering various classes of functional regularity. By studying vector fields on Lie groups, this research contributes to the broader understanding of differential operators on structured mathematical spaces and their applications in diverse areas of mathematics and physics.

3. **Pseudodifferential Operators on the Torus**
   In this research line, the goal is to establish necessary and sufficient conditions for global hypoellipticity and global solvability of pseudodifferential operators on the torus. This includes studying overdetermined systems of operators and their perturbations, focusing on different classes of functional regularity, such as Gevrey and ultradifferentiability. The project also extends to the analysis of perturbations of globally hypoelliptic operators, exploring conditions for the stability of these properties under perturbations. This research is fundamental for understanding the properties of pseudodifferential operators in a specific context, such as the torus, and their relation to other aspects of functional analysis and partial differential equations.

4. **Strongly Invariant Operators**

This research line addresses global properties, such as hypoellipticity and solvability in Gevrey ultradifferentiable senses, for evolution operators in product spaces of a torus by a smooth manifold. The study considers commutativity with elliptic operators on $L^2(M)$ and investigates conditions to ensure such properties. This includes the analysis of strongly invariant operators, which are operators that commute with an elliptic operator on a closed manifold. The research aims to establish conditions for the existence and regularity of solutions of these operators in spaces of ultradifferentiable functions, such as Gevrey and Komatsu, thus contributing to the understanding of properties of differential operators in a more general context.

Publications

1. F. de Ávila Silva, M. Cappiello, and A. Kirilov. Global Hypoellipticity for Systems in Time-Periodic Gelfand-Shilov Spaces. *J. Funct. Anal.*, Volume 290, Issue 6, 111300, 2026.

2. A. Kirilov, W. A. A. de Moraes, and P. M. Tokoro. Global solutions for systems of strongly invariant operators on closed manifolds. *Proc. Am. Math. Soc.*, Volume 154, Issue 3, pp. 1295-1310, 2026.

3. S. Coriasco, A. Kirilov, W. A. A. de Moraes, and P. M. Tokoro. Global Hypoellipticity for Involutive Systems on Non-Compact Manifolds. *J. Geom. Anal.*, Volume 36, Article 22, 2026.

4. A. Kirilov and A. Kowacs Global Hypoellipticity and Solvability with Loss of Derivatives on the Torus. *J. Funct. Anal.*, Volume 290, Issue 2, 111231, 2026.

5. A. Kirilov, W. A. A. de Moraes, and P. M. Tokoro. Denjoy-Carleman solvability of Vekua-type periodic operators. *Z. Anal. Anwend.*, Voluma 45, N. 1/2, pp. 205–229, 2026

6. P. Dattori da Silva, A. Kirilov and R. Paleari da Silva Diagonal systems of differential operators on compact Lie groups. *Results in Mathematics*, Volume 80, Article 191, 2025.

7. D. Cardona, A. Kirilov, A. P. Kowacs, and W. A. A. de Moraes. On the Sobolev boundedness of vector fields on compact Riemannian manifolds. *J. Pseudo-Differ. Oper. Appl.*, Volume 16, article number 52, 2025.

8. F. de Ávila Silva, M. Cappiello, and A. Kirilov. Systems of differential operators in time-periodic Gelfand-Shilov spaces. *Ann. Mat. Pura Appl.*, 204: 643–665, 2025.

9. A. Kirilov and R. Paleari da Silva Diophantine conditions and global properties for systems of vector fields in tori and spheres. Extended abstracts: Trends Math., Res. Perspect. Ghent Anal. PDE Cent. dedicated to the "PSORT 2024 Conference", vol 8. pp 47-55, 2025.

10. A. Kirilov, A. P. Kowacs, and W. A. A. de Moraes. Global solvability and hypoellipticity for evolution operators on tori and spheres. *Math. Nachr.*, 297: 4605–4650, 2024.

11. A. Kirilov, W. A. A. de Moraes, and P. M. Tokoro. Solvability of Vekua-type periodic operators and applications to classical equations. *Indag. Math., New Ser.*, 35(3):434–442, 2024.

12. F. de Ávila Silva and A. Kirilov. Global hypoellipticity for time-periodic evolution equations: insights from eigenfunction expansions Extended abstracts: Trends Math., Res. Perspect. Ghent

Anal. PDE Cent. dedicated to the conference "Analysis and PDE in Latin America", vol 10, pp. 41-48, 2024.

13. A. Kirilov, W. A. A. De Moraes, and M. Ruzhansky. Global properties of vector fields on compact Lie groups in Komatsu classes. II: Normal forms. *Commun. Pure Appl. Anal.*, 21(11):3919–3940, 2022.

14. W. A. Cerniauskas, P. L. Dattori da Silva, and A. Kirilov. Semiglobal solvability for a class of first order operators. *Mat. Contemp.*, 52:54–70, 2022.

15. A. Kirilov, W. A. A. de Moraes, and M. Ruzhansky. Global hypoellipticity and global solvability for vector fields on compact Lie groups. *J. Funct. Anal.*, 280(2):39, 2021.

16. A. Kirilov, W. A. A. de Moraes, and R. Paleari. Global analytic hypoellipticity for a class of evolution operators on $\mathbb{T}^1 \times \mathbb{S}^3$. *J. Differ. Equations*, 296:699–723, 2021.

17. A. Kirilov, W. A. A. de Moraes, and M. Ruzhansky. Global properties of vector fields on compact Lie groups in Komatsu classes. *Z. Anal. Anwend.*, 40(4):425–451, 2021.

18. A. Kirilov and W. A. A. de Moraes. Global hypoellipticity for strongly invariant operators. *J. Math. Anal. Appl.*, 486(1):14, 2020.

19. A. Kirilov, W. A. A. de Moraes, and M. Ruzhansky. Partial Fourier series on compact Lie groups. *Bull. Sci. Math.*, 160:27, 2020.

20. F. de Ávila Silva, R. B. Gonzalez, A. Kirilov, and C. de Medeira. Global hypoellipticity for a class of pseudo-differential operators on the torus. *J. Fourier Anal. Appl.*, 25(4):1717–1758, 2019.

21. F. De Ávila Silva and A. Kirilov. Perturbations of globally hypoelliptic operators on closed manifolds. *J. Spectr. Theory*, 9(3):825–855, 2019.

22. A. Arias Junior, A. Kirilov, and C. de Medeira. Global Gevrey hypoellipticity on the torus for a class of systems of complex vector fields. *J. Math. Anal. Appl.*, 474(1):712–732, 2019.

23. F. de Ávila Silva, T. Gramchev, and A. Kirilov. Global hypoellipticity for first-order operators on closed smooth manifolds. *J. Anal. Math.*, 135(2):527–573, 2018.

24. A. P. Bergamasco, C. de Medeira, A. Kirilov, and S. L. Zani. On the global solvability of involutive systems. *J. Math. Anal. Appl.*, 444(1):527–549, 2016.

25. A. P. Bergamasco, A. Kirilov, W. V. L. Nunes, and S. L. Zani. Global solutions to involutive systems. *Proc. Am. Math. Soc.*, 143(11):4851–4862, 2015.

26. A. P. Bergamasco, P. L. Dattori da Silva, R. B. Gonzalez, and A. Kirilov. Global solvability and global hypoellipticity for a class of complex vector fields on the 3-torus. *J. Pseudo-Differ. Oper. Appl.*, 6(3):341–360, 2015.

27. A. P. Bergamasco, A. Kirilov, W. V. L. Nunes, and S. L. Zani. On the global solvability for overdetermined systems. *Trans. Am. Math. Soc.*, 364(9):4533–4549, 2012.

28. R. DeLeo, T. Gramchev, and A. Kirilov. Global solvability in functional spaces for smooth nonsingular vector fields in the plane. In *Pseudo-differential operators: analysis, applications and computations*, pages 191–210. Basel: Birkhäuser, 2011.

29. W. A. Cerniauskas and A. Kirilov. C^k solvability near the characteristic set for a class of vector fields of infinite type. *Mat. Contemp.*, 36:91–106, 2009.

30. A. P. Bergamasco and A. Kirilov. Global solvability for a class of overdetermined systems. *J. Funct. Anal.*, 252(2):603–629, 2007.