

# Renato Ghini Bettiol

*Curriculum vitae*

CUNY Lehman College  
Department of Mathematics  
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## Employment

- 2018 – present Tenure-track Assistant Professor, City University of New York (CUNY), Lehman College, Bronx, NY, USA
- Summer 2019 Visiting scientist, Max Planck Institute for Mathematics, Bonn, Germany
- 2015 – 2018 Hans Rademacher Instructor of Mathematics, University of Pennsylvania, Philadelphia, PA, USA
- Fall 2016 Postdoctoral fellow, Max Planck Institute for Mathematics, Bonn, Germany

## Education

- 2015 Doctor of Philosophy (Ph.D.) in Mathematics, University of Notre Dame, USA
- 2012 Master of Science (M.Sc.) in Mathematics, University of Notre Dame, USA
- 2010 Master of Science (M.Sc.) in Mathematics, University of São Paulo, Brazil
- 2008 Bachelor of Science (B.Sc.) in Mathematics (with honors), University of São Paulo, Brazil

## Research interests

Differential Geometry, Geometric Analysis, Partial Differential Equations

## Grants

- 2019 – 2022 NSF Geometric Analysis: New Perspectives on Four-Dimensional Geometry (DMS-1904342, PI, \$220,855)
- 2019 – 2021 Fapesp SPRINT: Geometry and Dynamics between São Paulo and New York (2019/09045-3, co-PI, \$20,000)
- 2019 – 2020 PSC-CUNY Research Award: Bifurcation and local rigidity in Geometric Variational Problems (PI, \$3,500)
- 2016 – 2018 AMS-Simons Travel Grant (PI, \$4,000)
- Aug 2016 NSF Geometric Analysis: Smoky Great Plains Geometry Conference 2016 (DMS-1630367, co-PI, \$39,812)
- April 2013 NSF Geometric Analysis: Graduate Student Topology/Geometry Conference 2013 (DMS-1307681, \$61,562)

## Awards, fellowships, honors

- 2018 Plenary talk (invited speaker) at the 2018 Australian Mathematical Society National Meeting
- 2016 Good Teaching Award, Department of Mathematics, University of Pennsylvania
- 2014 Member of the American Delegation to the 2nd Heidelberg Laureate Forum, sponsored by NSF/ORAU
- 2011 & 2012 Marilyn Jane Navari Fellowship, University of Notre Dame
- 2009 Graduation Prize for Excellence at Undergraduate Courses, University of São Paulo

## Publications and Preprints

28. *Global bifurcation for a class of nonlinear ODEs* (with P. Piccione)  
submitted, arXiv:2107.08181
27. *Geography of pinched four-manifolds* (with M. Kummer and R. Mendes)  
submitted, arXiv:2106.02138
26. *Full Laplace spectrum of distance spheres in symmetric spaces of rank one* (with E. Lauret and P. Piccione)  
submitted, arXiv:2012.02349
25. *The first eigenvalue of a homogeneous CROSS* (with E. Lauret and P. Piccione)  
J. Geom. Anal., to appear, arXiv:2001.08471
24. *Subspace foliations and collapse of closed flat manifolds* (with A. Derdzinski, R. Mossa, and P. Piccione)  
Math. Nachr., to appear, arXiv:2002.05757

23. *Sectional curvature and Weitzenböck formulae* (with R. Mendes)  
Indiana Univ. Math. J., to appear, arXiv:1708.09033
22. *Convex Algebraic Geometry of Curvature Operators* (with M. Kummer and R. Mendes)  
SIAM J. Appl. Algebra Geom. 5 (2021), no. 2, 220-228, MR 4252070, arXiv:1908.03713
21. *Nonuniqueness of conformal metrics with constant  $Q$ -curvature* (with P. Piccione and Y. Sire)  
Int. Math. Res. Not. IMRN 2021, no. 9, 6967-6992, MR 4251294, arXiv:1806.01373
20. *Instability and bifurcation* (with P. Piccione)  
Notices Amer. Math. Soc. 67 (2020), no. 11, 1679-1691, MR 4201907
19. *Four-dimensional cohomogeneity one Ricci flow and nonnegative sectional curvature* (with A. Krishnan)  
Comm. Anal. Geom. 27 (2019), no. 3, 511-527, MR 4003002, arXiv:1606.00778
18. *Teichmüller theory and collapse of flat manifolds* (with P. Piccione and A. Derdzinski)  
Ann. Mat. Pura Appl. (4) 197 (2018), no. 4, 1247-1268, MR 3829569, arXiv:1705.08431
17. *Infinitely many solutions to the Yamabe problem on noncompact manifolds* (with P. Piccione)  
Ann. Inst. Fourier (Grenoble) 68 (2018), no. 2, 589-609, MR 3803113, arXiv:1603.07788
16. *Strongly positive curvature* (with R. Mendes)  
Ann. Global Anal. Geom. 53 (2018), no. 3, 287-309, MR 3785699, arXiv:1403.2117
15. *Three-manifolds with many flat planes* (with B. Schmidt)  
Trans. Amer. Math. Soc. 370 (2018), no. 1, 669-693. MR 3717993, arXiv:1407.4165
14. *Deformations of free boundary CMC hypersurfaces* (with P. Piccione and B. Santoro)  
J. Geom. Anal. 27 (2017), no. 4, 3254-3284. MR 3708014, arXiv:1411.0354
13. *Strongly nonnegative curvature* (with R. Mendes)  
Math. Ann. 368 (2017), no. 3-4, 971-986. MR 3673642, arXiv:1511.07899
12. *Four-dimensional manifolds with positive biorthogonal curvature*  
Asian J. Math 21 (2017), no. 2, 391-396. MR 3672264, arXiv:1502.02270
11. *Delaunay-type hypersurfaces in cohomogeneity one manifolds* (with P. Piccione)  
Int. Math. Res. Not. IMRN, 2016, no. 10, 3124-3162. MR 3551832, arXiv:1306.6043
10. *Bifurcation of periodic solutions to the singular Yamabe problem on spheres* (with P. Piccione and B. Santoro)  
J. Differential Geom. 103 (2016), no. 2, 191-205. MR 3504948, arXiv:1401.7071
9. *Flag manifolds with strongly positive curvature* (with R. Mendes)  
Math. Z. 280 (2015), no. 3-4, 1031-1046. MR 3369365, arXiv:1412.0039
8. *On the equivariant implicit function theorem with low regularity and applications to geometric variational problems* (with P. Piccione and G. Siciliano)  
Proc. Edinb. Math. Soc. (2) 58 (2015), no. 1, 53-80. MR 3333978, arXiv:1009.5721
7. *Equivariant deformations of Hamiltonian stationary Lagrangian submanifolds* (with P. Piccione, B. Santoro)  
Mat. Contemp. 43 (2014), 61-88. MR 3426257, arXiv:1302.6970
6. *Equivariant bifurcation in geometric variational problems* (with P. Piccione and G. Siciliano)  
Progress in Nonlinear Differential Equations and Their Applications, Vol. 85 (2014), 103-133, Springer. MR 3330725, arXiv:1308.3268
5. *Deforming solutions of geometric variational problems with varying symmetry groups* (with P. Piccione and G. Siciliano)  
Transform. Groups 19 (2014), no. 4, 941-968. MR 3278856, arXiv:1403.4275
4. *Positive biorthogonal curvature on  $S^2 \times S^2$*   
Proc. Amer. Math. Soc. 142 (2014), no. 12, 4341-4353. MR 3267002, arXiv:1210.0043
3. *Multiplicity of solutions to the Yamabe problem on collapsing Riemannian submersions* (with P. Piccione)  
Pacific J. Math. 266 (2013), no. 1, 1-21. MR 3105774, arXiv:1304.5510
2. *Bifurcation and local rigidity of homogeneous solutions to the Yamabe problem on spheres* (with P. Piccione)  
Calc. of Var. and PDEs 47 (2013), no. 3-4, 789-807. MR 3070564, arXiv:1107.5335

1. *Genericity of nondegenerate geodesics with general boundary conditions* (with R. Giambò)  
Topol. Methods in Nonlinear Anal. 35 (2010), no. 2, 339-365. MR 2676821, arXiv:0910.4175

#### Book

1. *Lie Groups and Geometric Aspects of Isometric Actions* (with M. Alexandrino), Springer, 2015. MR 3362465

#### Invited talks (last 5 years)

- Sep 2021 III Encuentro Matemático del Caribe (Zoom), Plenary Talk. *Minimal 2-spheres in ellipsoids of revolution*
- Sep 2021 3o Encontro em Geometria Diferencial no RS (Zoom). *Minimal spheres in ellipsoids of revolution*
- Jul 2021 Mathematical Congress of the Americas (Zoom), Special Session. *Minimal 2-spheres in ellipsoids of revolution*
- May 2021 University of Chicago (Zoom), Geometric Analysis Seminar. *Minimal 2-spheres in ellipsoids of revolution*
- Apr 2021 Irish Geometry Seminar (Zoom). *Geography of pinched 4-manifolds*
- Apr 2021 Montana State University, USA, Colloquium (Zoom). *Bifurcating minimal spheres in ellipsoids*
- Mar 2021 Bronx Community College, Bronx, USA, S-STEM Seminar (Zoom). *How to recognize the shape of a world from within it?*
- Mar 2021 AMS Spring Eastern Virtual Sectional Meeting, USA (Zoom). *Pinched 4-manifolds*
- Mar 2021 University of Notre Dame, USA, Geometric Analysis Seminar (Zoom). *Geography of pinched 4-manifolds*
- Feb 2021 Federal University of Ceará, Brazil, Geometry Seminar (Zoom). *Minimal 2-spheres in ellipsoids*
- Dec 2020 University of Münster, Germany, Geometry Oberseminar (Zoom). *Pinched 4-manifolds*
- Oct 2020 Virtual Seminar on Geometry with Symmetries (Zoom). *Minimal spheres in ellipsoids*
- Oct 2020 Syracuse University, Geometric Analysis Seminar (Zoom). *Pinched 4-manifolds*
- Oct 2020 Cornell University, Geometric Analysis Seminar (Zoom). *Pinched 4-manifolds*
- Dec 2019 University of São Paulo, Brazil, Geometry Seminar. *Convex Algebraic Geometry of Curvature Operators*
- Nov 2019 University of Pennsylvania, Philadelphia, USA, Geometry-Topology Seminar. *Convex Algebraic Geometry of Curvature Operators*
- Oct 2019 Rutgers University, USA. Geometric Analysis Seminar. *Convex Algebraic Geometry of Curvature Operators*
- Jul 2019 University of Münster, Germany, Workshop on Curvature and Global Shape. *Convex Algebraic Geometry of Curvature Operators*
- Jun 2019 Universität zu Köln, Germany, Oberseminar Geometrie, Topologie, und Analysis. *Convex Algebraic Geometry of Curvature Operators*
- Apr 2019 Institute for Advanced Study (IAS), Princeton, USA, Variational Methods in Geometry Seminar. *Bifurcating conformal metrics with constant  $Q$ -curvature*
- Mar 2019 Chuo University, Tokyo, Japan, Geometric Analysis in Geometry and Topology (Minicourse with 4 lectures). *Bifurcation Theory in Geometric Analysis*
- Dec 2018 University of Adelaide, Australia, AustMS (Plenary Talk). *How to find non-trivial solutions out of trivial ones*
- Dec 2018 University of Adelaide, Australia, AustMS (Differential Geometry Session). *Convex Algebraic Geometry of Curvature Operators*
- Dec 2018 AustMS Early Career Workshop, West Beach, Adelaide, Australia. *Exploring flat worlds*
- Sep 2018 University of Regensburg, Germany, Conference on Analytical problems in conformal geometry and applications. *Non-uniqueness of conformal metrics with constant  $Q$ -curvature*
- Sep 2018 University of Augsburg, Germany, Oberseminar Differentialgeometrie. *A Weitzenböck viewpoint on sectional curvature and applications*
- Jul 2018 University of São Paulo, Brazil, Geometry Seminar. *A Weitzenböck viewpoint on sectional curvature and applications*
- Feb 2018 University of California, San Diego, USA, Joint Geometry Seminar UCSD-UCI-UCR. *A Weitzenböck viewpoint on sectional curvature and applications*
- Feb 2018 University of Kansas, USA, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Jan 2018 Université Catholique de Louvain, Belgium, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Jan 2018 CUNY (Lehman College), Bronx, USA, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Jan 2018 University of California, Riverside, USA, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Jan 2018 Joint Mathematics Meetings, Special Session on Nilpotent and Solvable Geometry, San Diego, USA. *Sectional curvature and Weitzenböck formulae*

- Dec 2017 Journée de Géométrie, Université Paris-Est Créteil, Paris, France. *Non-uniqueness of conformal metrics with constant  $Q$ -curvature*
- Dec 2017 Rowan University, USA, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Nov 2017 University of Queensland, Australia, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Nov 2017 University of Melbourne, Australia, Colloquium. *Bifurcation Theory in Geometric Analysis*
- Nov 2017 CUNY (Graduate Center), New York, USA, Geometric Analysis Seminar. *Sectional curvature and Weitzenböck formulae*
- Oct 2017 University of Chicago, USA, Geometric Analysis Seminar. *Non-uniqueness of conformal metrics with constant  $Q$ -curvature*
- Aug 2017 Vanderbilt University, XXVII Southeast Geometry Seminar. *Cohomogeneity one Ricci Flow and  $\sec \geq 0$*
- Aug 2017 Pacific Rim Mathematical Association (PRIMA) Congress (Differential Geometry Session), Oaxaca, Mexico. *Non-uniqueness of solutions to the Yamabe problem*
- Aug 2017 Oberwolfach, Germany, Analysis, Geometry and Topology of Positive Scalar Curvature Metrics. *Non-uniqueness of solutions to the Yamabe problem on compact and noncompact manifolds*
- Jul 2017 University of Münster, Germany, Workshop on Curvature and Global Shape. *Non-negative sectional curvature and Weitzenböck formulae*
- Jun 2017 Dartmouth College, USA, Conference on Lie Group Actions in Riemannian Geometry. *Cohomogeneity one Ricci flow and nonnegative sectional curvature*
- Jun 2017 Temple University, Philadelphia, USA, Graduate Student Conference in Algebra, Geometry, and Topology (Plenary Talk). *Deforming flat manifolds and flat orbifolds*
- May 2017 Brown University, Providence, USA, Geometric Analysis Seminar. *Bifurcation of CMC Hypersurfaces*
- Apr 2017 Temple University, Philadelphia, USA, Geometry Seminar. *Weitzenböck formulae and sectional curvature*
- Apr 2017 Michigan State University, East Lansing, USA, 15th Graduate Student Topology and Geometry Conference (Young Faculty Session). *Weitzenböck formulae and sectional curvature*
- Apr 2017 Dartmouth College, USA, Mathematics Colloquium. *Deforming flat manifolds and flat orbifolds*
- Apr 2017 Dartmouth College, USA, Geometry and Topology Seminar. *Non-uniqueness results for the Yamabe and  $Q$ -curvature problems*
- Mar 2017 Lafayette-Lehigh Geometry-Topology Seminar, Lafayette, USA. *Deforming flat manifolds and flat orbifolds*
- Mar 2017 Lehigh University, USA, Geometry Seminar. *Ricci Flow and nonnegative sectional curvature*

## Teaching experience

### CUNY Lehman College

- Fall 2021 Real Analysis
- Spring 2021 Probability
- Fall 2020 Real Analysis
- Spring 2020 Vector Calculus; Probability
- Fall 2019 Vector Calculus
- Spring 2019 Calculus I; Calculus II
- Fall 2018 Calculus I

### University of Pennsylvania

- Spring 2018 Calculus II; Differential Geometry
- Fall 2017 Calculus II
- Spring 2017 Calculus III; Topics in Riemannian Geometry (Graduate course)
- Spring 2016 Linear Algebra II; Calculus I for the Wharton Business School - Active learning format, "flipped classroom"
- Fall 2015 Introduction to PDEs/Calculus IV

### Training and Certification

- *Good Teaching Award 2016*, Department of Mathematics, University of Pennsylvania
- *Striving for Excellence in College and University Teaching Certificate*, Kaneb Center for Teaching and Learning, University of Notre Dame
- *Mathematics Teaching Seminar* (semester-long training program), University of Notre Dame

## Committee work and institutional service

### CUNY

- 2020-present CUNY Lehman College Senate Representative for the Department of Mathematics
- 2019-present Chair of the Calculus Committee at Lehman College (Calculus coordinator)
- 2018-present Co-organizer of CUNY Geometric Analysis Seminar

### University of Pennsylvania

- 2017-2018 Teaching Assistant Recruitment and Training Committees
- 2015-2017 Organizer of the Penn Graduate Student Geometry and Topology Seminar
- 2016-2017 Graduate Preliminary Exam Committee and Penn Math Club Committee
- 2015-2016 Penn Math Club Committee

## Academic and professional service

### PhD Thesis Examiner

- Sep 2021 Bruno Caldeira Carloti de Souza, Universidade Federal de São Carlos, Brazil (remotely)
- Dec 2020 Leonardo Cavenaghi, University of São Paulo, Brazil (remotely)
- Jul 2020 Boris Stupovski, Scuola Superiore di Studi Avanzati (SISSA), Italy (remotely)
- Apr 2020 Dan Gregorian Fodor, "Alexandru Ioan Cuza" University of Iași, Romania (remotely)
- Dec 2019 João Nunes de Araújo Neto, University of São Paulo, Brazil (in person)
- Jun 2019 Timothy Buttsworth, University of Queensland, Australia (remotely)

### Referee service (multiple times for certain journals/publishers)

Annali di Matematica Pura ed Applicata, Annals of Global Analysis and Geometry, Archiv der Mathematik, Bulletin of the London Mathematical Society, Boletín de la Sociedad Matemática Mexicana, Calculus of Variations and PDEs, Communications in Analysis and Geometry, Communications in Contemporary Mathematics, Compositio Mathematica, Contributions to Algebra and Geometry (Beiträge zur Algebra und Geometrie), CRC Press, Taylor & Francis Group, Differential Geometry and Applications, Documenta Mathematica, Illinois Journal of Mathematics, Journal of Geometric Analysis, Journal of Geometry and Physics, Journal of Mathematical Physics, Journal of Topology and Analysis, Michigan Mathematical Journal, Nonlinear Analysis, Oxford University Press, Science China Mathematics, Tohoku Mathematical Journal, Transactions of the American Mathematical Society

### Reviewer service

- 2015-present Mathematical Reviews (MathSciNet)
- 2011-present Zentralblatt Math (zbMATH)

### Panel service

- 2020 NSF Division of Mathematical Sciences

### Organization of events

- 2018 Co-organizer of the 33rd Annual Geometry Festival, in honor of Eugenio Calabi's 95th birthday, at the University of Pennsylvania, Philadelphia, PA, USA (with NSF support)
- 2016 Co-organizer of the 3rd Smoky Great Plains Geometry Conference, "Reflections on Global Riemannian Geometry", in honor of Karsten Grove's 70th birthday, in Townsend, TN, USA (with NSF support)
- 2013 Co-organizer of the 11th Graduate Student Geometry and Topology Conference (with NSF support)

## Memberships

- American Mathematical Society (AMS), member since 2010
- Brazilian Mathematical Society (SBM), member since 2007
- National Alliance for Doctoral Studies in the Mathematical Sciences (Math Alliance), mentor since 2018