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RESEARCH INTERESTS

Geometric Analysis, Geometric Flows, Differential Geometry, Partial Differential Equations, Calculus of Variations, Stochastic Analysis, General Relativity

ACADEMIC APPOINTMENTS

Assistant Professor (tenure-track), University of Toronto, 2015 – now
Courant Instructor, Courant Institute of Mathematical Sciences, 2012 – 2015

Teaching Assistant, Department of Mathematics, ETH Zürich, 2008 – 2012
Teaching Assistant, Institute for Theoretical Physics, ETH Zürich, 2008
Junior Tutor, Department of Mathematics, ETH Zürich, 2004 – 2007

EDUCATION

PhD in Mathematics at ETH Zürich (diploma with distinction), 2008 – 2012
MSc in Mathematics at ETH Zürich (diploma with distinction), 2006 – 2008
BSc in Mathematics at ETH Zürich (diploma with distinction), 2003 – 2006

HONORS AND AWARDS

Sloan Research Fellowship, 2018 – 2020
NSERC Discovery Grant, RGPIN-2016-04331, 2016 – 2021
Connaught New Researcher Award, 2016 – 2018
NSF Grant, DMS-1406394, 2014 – 2017
ETH Medal for outstanding doctoral thesis, 2013
Graduate Funding from the Swiss National Science Foundation, 2009 – 2012
Scholarship for the HIM Trimester on Differential Geometry, Bonn, 2011
Silver Medal at the 33rd International Physics Olympiad, Bali, 2002
Silver Medal at the 32nd International Physics Olympiad, Antalya, 2001

ARTICLES AND PREPRINTS (AVAILABLE ON MY WEBSITE AND ON ARXIV)

25. **Ancient asymptotically cylindrical flows and applications** (joint with K. Choi, O. Hershkovits and B. White), 76 pages, preprint.
24. **Ancient low entropy flows, mean convex neighborhoods, and uniqueness** (joint with K. Choi and O. Hershkovits), 74 pages, preprint.
23. **Brownian motion on Perelman's almost Ricci-flat manifold** (joint with E. Cabezas-Rivas), 24 pages, *J. Reine Angew. Math.* (to appear)
22. **Diameter and curvature control under mean curvature flow** (joint with P. Gianniotis), 23 pages, *Amer. J. Math.* (to appear)
21. **The moduli space of two-convex embedded spheres** (joint with R. Buzano and O. Hershkovits), 28 pages, *J. Differential Geom.* (to appear)

20. **The moduli space of two-convex embedded tori** (joint with R. Buzano and O. Hershkovits), *Int. Math. Res. Not.* 2019(2):392–406, 2019.
19. **Minimal 2-spheres in 3-spheres** (joint with D. Ketover), *Duke Math. J.* 168(10):1929–1975, 2019.
18. **Low complexity solutions of the Allen-Cahn equation on three-spheres** (joint with M. Ivaki), *Canad. Math. Bull.* 62(2):287–291, 2019.
17. **Ricci curvature and Bochner formulas for martingales** (joint with A. Naber), *Comm. Pure Appl. Math.* 71(6):1074–1108, 2018.
16. **Characterizations of the Ricci flow** (joint with A. Naber), *J. Eur. Math. Soc.* 20(5):1269–1302, 2018.
15. **Singularities of mean convex level set flow in general ambient manifolds** (joint with O. Hershkovits), *Adv. Math.* 329:1137–1155, 2018.
14. **Mean curvature flow with surgery** (joint with B. Kleiner), *Duke Math. J.* 166(9):1591–1626, 2017.
13. **Mean curvature flow of mean convex hypersurfaces** (joint with B. Kleiner), *Comm. Pure Appl. Math.* 70(3):511–546, 2017.
12. **Ancient solutions of the mean curvature flow** (joint with O. Hershkovits), *Comm. Anal. Geom.* 24(3):593–604, 2016.
11. **Uniqueness of the bowl soliton**, *Geom. Topol.* 19:2393–2406, 2015.
10. **A note on the compactness theorem for 4d Ricci shrinkers** (joint with R. Müller), *Proc. Amer. Math. Soc.* 143(10):4433–4437, 2015.
9. **On Brendle’s estimate for the inscribed radius under mean curvature flow** (joint with B. Kleiner), *Int. Math. Res. Not.* 2015(15):6558–6561, 2015.
8. **Quantitative stratification and the regularity of harmonic map flow** (joint with J. Cheeger and A. Naber), *Calc. Var. PDE* 53(1-2):365–381, 2015.
7. **Dynamical stability and instability of Ricci-flat metrics** (joint with R. Müller), *Math. Ann.* 360(1-2):547–553, 2014.
6. **The stability inequality for Ricci-flat cones** (joint with S. Hall and M. Siepmann), *J. Geom. Anal.* 24(1):472–494, 2014.
5. **Quantitative stratification and the regularity of mean curvature flow** (joint with J. Cheeger and A. Naber), *Geom. Funct. Anal.* 23(3):828–847, 2013.
4. **Perelman’s lambda-functional and the stability of Ricci-flat metrics**, *Calc. Var. PDE* 45(3-4):481–504, 2012.
3. **A mass-decreasing flow in dimension three**, *Math. Res. Lett.* 19(4):927–938, 2012.
2. **A renormalized Perelman-functional and a lower bound for the ADM-mass**, *J. Geom. Phys.* 61(11):2162–2167, 2011.
1. **A compactness theorem for complete Ricci shrinkers** (joint with R. Müller), *Geom. Funct. Anal.* 21(5):1091–1116, 2011.

LECTURE NOTES, CONFERENCE REPORTS, PHD THESIS

13. **Some recent applications of mean curvature flow with surgery** (for the proceedings of the Barrett Lectures), 2018.
12. **The bounded diameter conjecture for two-convex mean curvature flow** (extended abstract), *Oberwolfach Rep.* 15(2):1662–1664, 2018.
11. **Applications of mean curvature flow** (extended abstract), *Oberwolfach Rep.* 14(3):2178–2180, 2017.
10. **Minimal two-spheres in three-spheres** (extended abstract), *Oberwolfach Rep.* 14(2):1939–1942, 2017.
9. **Ricci curvature and martingales** (extended abstract), *Oberwolfach Rep.* 13(3):1977–1979, 2016.

8. **The moduli space of 2-convex embedded spheres** (extended abstract), *Oberwolfach Rep.* 13(2):1604–1606, 2016.
7. **Weak solutions for the Ricci flow** (extended abstract), *Oberwolfach Rep.* 13(2):1524–1526, 2016.
6. **Lectures on mean curvature flow** (lectures from KIAS Seoul and SNS Pisa), arXiv:1406.7765.
5. **Mean curvature flow of mean convex hypersurfaces** (extended abstract), *Oberwolfach Rep.* 10(3):1963–1965, 2013.
4. **Quantitative stratification and the regularity of mean curvature flow** (extended abstract), *Oberwolfach Rep.* 9(3):2258–2260, 2012.
3. **Singularities in 4d Ricci flow** (extended abstract), *Oberwolfach Rep.* 9(2):1668–1671, 2012.
2. **A mass-decreasing flow in dimension three** (extended abstract), *Oberwolfach Rep.* 9(2):1583–1586, 2012.
1. **Stability of Ricci-flat spaces and singularities in 4d Ricci flow**, *PhD-thesis*, 2012.

INVITED TALKS

116. Conference on Geometry, **Oberwolfach**, Jun 7 – 13, 2020
115. Geometry & Analysis Seminar, **Columbia University**, Jan 31, 2020
114. CMS Winter Meeting, **Toronto**, Dec 6 – 9, 2019
113. Conference on Heat Kernels and Stochastic Processes, **Oberwolfach**, Nov 17 – 23, 2019
112. Colloquium, **University of Illinois at Chicago**, Oct 18, 2019
111. Differential Geometry & Geometric Analysis Seminar, **Princeton University**, Sep 11, 2019
110. Workshop on Curvature and Global Shape, **University of Münster**, Jul 28 – Aug 3, 2019
109. Geometry & Topology Conference, **Lehigh University**, Jun 20 – 22, 2019
108. Geometric Analysis Seminar, **MIT**, Apr. 24, 2019
107. Analysis & Applied Math Seminar, **University of Toronto**, Mar 8, 2019
106. Southern California Geometric Analysis Seminar, **UC San Diego**, Jan 26 – 27, 2019
105. Colloquium, **CMSA Harvard**, Nov 28, 2018
104. Conference on Geometric Analysis, **Rutgers University**, Nov 15 – 16, 2018
103. Minischool on Geometric Analysis (2 lectures), **Rutgers University**, Nov 14, 2018
102. Colloquium, **University of Toronto**, Sep 19, 2018
101. Conference on Differential Geometry, **University of Miami**, Jul 26 – 29, 2018
100. Conference on Geometry, **Oberwolfach**, Jun 10 – 16, 2018
99. Conference on Mean Curvature Flow, **UT Knoxville**, May 29 – Jun 1, 2018
98. Conference on Geometric Analysis, **Tsing Hua University**, May 21 – 25, 2018
97. Conference on Geometry & Analysis on Manifolds, **UC Santa Barbara**, May 4 – 6, 2018
96. Geometry & Analysis Seminar, **Columbia University**, Apr 6, 2018
95. Canadian Geometry & Topology Meeting, **Fields Institute**, Mar 14 – 16, 2018
94. CMS Winter Meeting, **University of Waterloo**, Dec 8 – 11, 2017
93. Geometric Analysis Seminar, **University of Chicago**, Oct 31, 2017
92. Analysis Seminar, **Western University**, Oct 17, 2017
91. Geometric Analysis Colloquium, **Fields Institute**, Sep 27, 2017
90. Metric Measure Spaces and Ricci Curvature (3 lectures), **MPI Bonn**, Sep 11 – 15, 2017
89. Conference on Partial Differential Equations, **Oberwolfach**, Jul 30 – Aug 5, 2017
88. Conference on Differential Geometry, **Oberwolfach**, Jul 2 – 8, 2017
87. Workshop on Advances in Geometric Analysis, **ETH Zürich**, Jun 5 – 9, 2017
86. Geometry Seminar, **Stanford University**, Feb 22, 2017
85. Differential Geometry Seminar, **UC Irvine**, Feb 21, 2017
84. CMS Winter Meeting, **Niagara Falls**, Dec 2 – 5, 2016
83. Probability Seminar, **Fields Institute**, Nov 11, 2016

82. Differential Geometry Seminar, **Harvard**, Nov 1, 2016
81. The Riemann Conference, **University of Münster**, Oct 4 – 7, 2016
80. Geometry & Topology Seminar, **UQAM Montreal**, Sep 16, 2016
79. Conference on Calculus of Variations, **Oberwolfach**, Jul 10 – 16, 2016
78. Workshop on Geometric Analysis, Metric Geometry & Topology, **Grenoble**, Jun 27 – Jul 1, 2016
77. Conference on Geometry, **Oberwolfach**, Jun 5 – 11, 2016
76. Conference on Nonlinear Evolution Problems, **Oberwolfach**, May 29 – Jun 4, 2016
75. Geometry Seminar, **MSRI Berkeley**, Apr 13, 2016
74. Geometry & Topology Seminar, **University of Toronto**, Mar 28, 2016
73. Geometry and Topology Seminar, **Waterloo**, Mar 4, 2016
72. Conference on Geometric Flows, **QM London**, Jan 5 – 8, 2016
71. Frankfurt-Mainz-Darmstadt Seminar, **Uni Frankfurt**, Dec 11, 2015
70. Differential Geometry Seminar, **MPI Bonn**, Dec 10, 2015
69. Hausdorff Colloquium, **HIM Bonn**, Dec 9, 2015
68. CMS Winter Meeting, **Montreal**, Dec 4 – 7, 2015
67. Colloquium, **McMaster University**, Nov 27, 2015
66. AMS Sectional Meeting, **Rutgers University**, Nov 14 – 15, 2015
65. Analysis & Applied Math Seminar, **University of Toronto**, Nov 13, 2015
64. AMS Sectional Meeting, **California State University**, Oct 24 – 25, 2015
63. Geometry & Topology Seminar, **University of Toronto**, Oct 5, 2015
62. Conference on Differential Geometry, **Oberwolfach**, Jun 28 – Jul 4, 2015
61. Conference on Geometric Analysis and Measure Theory, **MPI Leipzig**, Jun 15 – 17, 2015
60. Workshop on Ricci Curvature, **Northwestern University**, May 28 – 31, 2015
59. Geometry Seminar, **Stanford University**, Apr 29, 2015
58. Differential Geometry Seminar, **UC Berkeley**, Apr 27, 2015
57. Workshop on Geometric Flows, **BIRS Banff**, Apr 12 – 17, 2015
56. Geometric Analysis Seminar, **Rutgers University**, Mar 31, 2015
55. Symposium on Geometric Analysis, **CUNY and Rutgers University**, Mar 27 – 29, 2015
54. Colloquium, **University of Washington**, Jan 20, 2015
53. Colloquium, **University of Toronto**, Jan 12, 2015
52. Colloquium, **UC Irvine**, Jan 5, 2015
51. Colloquium, **HIM Bonn**, Dec 9, 2014
50. Colloquium, **SUNY Binghamton**, Dec 4, 2014
49. Colloquium, **ETH Zürich**, Dec 1, 2014
48. Geometry and Topology Seminar, **Stony Brook**, Nov 4, 2014
47. Colloquium, **UC Santa Cruz**, Oct 28, 2014
46. Geometric Analysis Colloquium, **Fields Institute Toronto**, Oct 17 – 18, 2014
45. Summer School on Geometric Evolution Problems (6 lectures), **SNS Pisa**, Jun 23 – 28, 2014
44. Conference on Geometric Analysis, **Roscoff**, Jun 16 – 20, 2014
43. Summer School on Mean Curvature Flow (6 lectures), **KIAS Seoul**, May 12 – Jun 1, 2014
42. Geometry Festival, **Stony Brook**, Apr 11 – 13, 2014
41. Analysis Seminar, **Fordham University**, Mar 26, 2014
40. Geometry & Topology Seminar, **Duke University**, Feb 25, 2014
39. Workshop on Geometric Variational Problems, **BIRS Banff**, Dec 15 – 20, 2013
38. Differential Geometry Seminar, **CUNY**, Dec 3, 2013
37. Differential Geometry & Geometric Analysis Seminar, **Princeton University**, Nov 8, 2013
36. Nonlinear Analysis Seminar, **Rutgers University**, Nov 5, 2013
35. Geometric Analysis and Topology Seminar, **Courant Institute**, Sep 27, 2013
34. Geometry & Analysis Seminar, **Columbia University**, Sep 19, 2013

33. Workshop on Curvature and Global Shape, **University of Münster**, Jul 21 – 27, 2013
32. Conference on Differential Geometry, **Oberwolfach**, Jun 30 – Jul 6, 2013
31. Workshop on Minimal Surfaces and 3-Manifold Topology, **MIT**, Apr 26 – 28, 2013
30. Colloquium, **McMaster University**, Mar 8, 2013
29. Geometry and Topology Seminar, **McMaster University**, Mar 7, 2013
28. Geometry Seminar, **Stanford University**, Feb 6, 2013
27. Analysis Seminar, **Johns Hopkins University**, Nov 26, 2012
26. Conference on Calculus of Variations, **Oberwolfach**, Jul 22 – 28, 2012
25. Geometric Analysis and Gravitation Seminar, **AEI Potsdam**, Jul 6, 2012
24. Analysis Seminar, **University of Warwick**, May 31, 2012
23. Conference on Geometry, **Oberwolfach**, May 20 – 26, 2012
22. Conference on Nonlinear Evolution Problems, **Oberwolfach**, May 13 – 19, 2012
21. Geometry and Analysis Seminar, **Imperial College**, Feb 2, 2012
20. Analysis Seminar, **University of Warwick**, Jan 31, 2012
19. Trimester Seminar, **HIM Bonn**, Nov 17, 2011
18. Geometry Seminar, **Stanford University**, Oct 26, 2011
17. Geometry & Topology Seminar, **Duke University**, Oct 20, 2011
16. Differential Geometry Seminar, **CUNY**, Oct 18, 2011
15. Analysis Seminar, **Cornell University**, Oct 17, 2011
14. Geometric Analysis and Topology Seminar, **Courant Institute**, Oct 14, 2011
13. Geometry & Analysis Seminar, **Columbia University**, Oct 13, 2011
12. Nonlinear Analysis Seminar, **Rutgers University**, Oct 11, 2011
11. Geometric Analysis Seminar, **MIT**, Oct 5, 2011
10. Trimester Seminar, **HIM Bonn**, Sep 22, 2011
9. Geometric Analysis and Gravitation Seminar, **AEI Potsdam**, Sep 13, 2011
8. Workshop on Curvature and Global Shape, **University of Münster**, Jul 25 – 30, 2011
7. Oberseminar in PDEs, **University of Konstanz**, Jun 9, 2011
6. Oberseminar in Differential Geometry, **University of Münster**, May 9, 2011
5. Workshop on Geometric Flows in Mathematics and Physics, **BIRS Banff**, Apr 17 – 22, 2011
4. Conference on Ricci Solitons, **SNS Pisa**, Apr 4 – 8, 2011
3. Geometry Seminar, **UC San Diego**, Jan 24, 2011
2. Analysis Seminar, **ETH Zürich**, May 18, 2010
1. Calculus of Variations Seminar, **SNS Pisa**, Nov 25, 2009

TEACHING EXPERIENCE

at UofT:

- MATD46, Partial Differential Equations (winter 20)
- MAT1502, Topics in GA: Brownian motion on manifolds (fall 18)
- MATC37, Introduction to Real Analysis (winter 17, winter 18, winter 19)
- MATA36, Calculus II for Physical Sciences (winter 18)
- MAT1062, Topics in PDE: Mean Curvature Flow (fall 17)
- MAT1000/MAT457, Real Analysis I (fall 16)
- MAT1061, Partial Differential Equations II (winter 16)
- MATA32, Calculus I for Management (fall 15)

at NYU: Discrete Mathematics (spring 15), Introduction to Mathematical Analysis (fall 14), Differential Geometry II (spring 14), Calculus I and II (fall 12, fall 13), Abstract Algebra (spring 13).

at ETH Zürich: Teaching Assistant for Calculus I and II (fall 04, spring 07, fall 08, fall 10), Linear Algebra I and II (spring 05, fall 05, spring 06, fall 06), Differential Geometry II (spring 11), Quantum Mechanics II (spring 08); Organizer of a Seminar in Geometric Analysis (fall 09); Instructor for Summer Courses on Calculus and Linear Algebra (summer 05, 06, 09).

SUPERVISION

- Beomjun Choi (postdoc), “Geometric Flows” (joint with Robert McCann), 2019 – now
- Daniel Stern (postdoc), “Nonlinear partial differential equations” (joint with Yevgeny Liokumovich), 2019 – now
- Cameron Martin (BSc), “The Feynman-Kac formula on manifolds”, 2019
- Xincheng Zhang (MSc), “Stochastic analysis on manifolds”, 2019
- Salim Deaibes (BSc), “Closed geodesics and minimal two-spheres”, 2019
- Wenkui Du (PhD), “Mean curvature flow”, 2018 – now.
- Jianhui Gao (BSc), “Approximation schemes for the reaction-diffusion equation”, 2018.
- Anmol Bhullar (BSc), “Curve shortening flow”, 2018.
- Christopher Kennedy (PhD), “Ricci curvature and stochastic analysis”, 2017 – now.
- Mohammad Ivaki (postdoc), “Geometric flows and convex geometry” (joint with Almut Burchard), 2017 – now.
- Christian Ketterer (postdoc), “Ricci curvature and metric measure spaces” (joint with Vitali Kapovitch), 2017 – now.
- Panagiotis Gianniotis (postdoc), “Ricci flow and Mean Curvature Flow”, 2017 – 2018.
- Eva Kopfer (visiting PhD student), “The Harnack inequality on path space”, 2017.
- Ilyas Khan (visiting PhD student), “Lagrangian mean curvature flow”, 2017.
- Keegan Dasilva Barbosa (MSc), “Singularity models for mean curvature flow”, 2017.
- Nicolau Sarquis Aiex (postdoc), “Min-max theory” (joint with Alex Nabutovsky), 2016 – 2017.
- Or Hershkovits (PhD), “Mean Curvature flow: smoothing, regularity and isoperimetric properties” (joint with Bruce Kleiner), 2013 – 2016.
- Daniel Sigal (MSc), “Approximation schemes for the heat equation on time-dependent backgrounds”, 2016.
- Mona Sayehban (MSc), “Mean curvature flow of entire graphs”, 2016.
- Justin Ko, Andrew Colinet, Ahmed Ellithy (supervisory committee), Tim Carson (external reviewer)

SERVICE

Organizer of a Workshop on Geometric Flows (joint with R. Bamler, J. Streets, G. Tian), BIRS Banff, Mar 29 – Apr 03, 2020

Organizer of a Workshop/School on Geometric Analysis (joint with R. Jain, C. Ketterer, C. Sormani), McGill University, Jul 23–27, 2018

Organizer of a Major Thematic Program on Geometric Analysis (joint with S. Alexakis, W. Craig, S. Karigiannis, A. Naber, M. Wang), Fields Institute, Toronto, Jul – Dec, 2017

Organizer of a Workshop & Minischool on Mean curvature flow and Ricci flow (joint with J. Lott, A. Naber), Fields Institute, Toronto, Nov 4–10, 2017

Organizer of a Summer School on Geometric Analysis (joint with W. Craig), Fields Institute, Toronto, Jul 10–21, 2017

Organizer of the Geometry and Topology Seminar, University of Toronto, 2016 – now

Organizer of the Geometric Analysis Colloquium, Fields Institute, Toronto, 2015 – now

Organizer of the Analysis and Applied Math Seminar, University of Toronto, 2015 – 2016

Colloquium committee member, 2017 – 2018

Faculty search committee member, 2017– 2019

Teaching search committee member, 2018

Postdoc search committee member, 2015–2017

Graduate committee member, 2016–2017, 2018–2020

Banting fellowship committee at UTSC, 2019

Reviewer for DFG, 2019

Panelist for the US National Science Foundation, 2015

Organizer of the Geometric Analysis and Topology Seminar, NYU, 2012 – 2015

Organizer of a Workshop on Geometric Flows, HIM Bonn, Nov 22 – 25, 2011

Organizer of the Zürich Graduate Colloquium, ETH and Uni Zürich, 2010 – 2012

Referee for Acta Mathematica, Advances in Mathematics, Annals of Mathematics, American Journal of Mathematics, Annali SNS, Bulletin of the AMS, Calculus of Variations and PDE, Communications in Analysis and Geometry, Communications on Pure and Applied Mathematics, Compositio Mathematica, Crelle, Duke Mathematical Journal, Geometry & Topology, IMRN, Inventiones Mathematicae, Journal of Differential Geometry, JAMS, JEMS, JFA, Journal of Geometric Analysis, Mathematical Research Letters, Mathematische Zeitschrift, Proceedings of the AMS, Transactions of the AMS