Tamás Darvas

University of Maryland
Department of Mathematics
4176 Campus Drive
College Park, MD 20742-4015

Phone: (301) 405-5047
Fax: (301) 314-0827
Email: tdarvas@math.umd.edu
Homepage: www.math.umd.edu/~tdarvas

Research interests

Complex differential geometry, Kähler geometry, partial differential equations, pluripotential theory.

Education

Ph.D. in Mathematics, Purdue University, 2009-2014. Advisor: Prof. László Lempert.

M.Sc. in Mathematics, Babeş-Bolyai University, 2008-2009.

B.Sc. in Mathematics and Computer Science, Babeş-Bolyai University, 2004-2008.

Employment

Associate Professor, University of Maryland, 2021-

Assistant Professor, University of Maryland, 2018-2021.

Postdoctoral Research Associate, University of Maryland, 2014-2018.

Visiting appointments

Visiting scholar, Tor Vergata University, Rome, May-June 2023.

Visiting scholar, Institut Henri Poincaré, Paris, June-July 2019.

Research member, Mathematical Sciences Research Institute, Berkeley, January-May 2016.

Visiting member, Simons Center for Geometry and Physics, Stony Brook, May-June, 2015.

Publications

1. Weak geodesics in the space of Kähler metrics (with L. Lempert), **Math. Res. Lett.** 19 (2012), no. 5, arXiv:1205.0840.
2. Morse theory and geodesics in the space of Kähler metrics, **Proc. Amer. Math. Soc.** 142 (2014), no. 8, 2775-2782, arXiv:1207.4465.
3. Weak geodesic rays in the space of Kähler potentials and the class $\mathcal{E}(X,\omega)$, **J. Inst. Math. Jussieu** 16 (2017), no. 4, 837-858, arXiv:1307.6822.
4. The Mabuchi completion of the space of Kähler potentials, **Amer. J. Math.** 139 (2017), no. 5, 1275-1313, arXiv:1401.7318.
5. Kiselman's principle, the Dirichlet problem for the Monge-Ampère equation, and rooftop obstacle problems (with Y.A. Rubinstein), **J. Math. Soc. Japan** 68 (2016), no. 2, 773-796, arXiv:1405.6548.
6. The Mabuchi geometry of finite energy classes, **Adv. Math.** 285 (2015), 182-219, arXiv:1409.2072.
7. Geodesic rays and Kähler-Ricci trajectories on Fano Manifolds (with W. He), **Trans. Amer. Math. Soc.** 369 (2017), no. 7, 5069-5085, arXiv:1411.0774.

8. Tian's properness conjectures and Finsler geometry of the space of Kähler metrics (with Y.A. Rubinstein), **J. Amer. Math. Soc.** 30 (2017), no. 2, 347-387, arXiv:1506.07129.
9. Convexity of the extended K-energy and the large time behaviour of the weak Calabi flow (with R.J. Berman and C.H. Lu), **Geom. and Topol.** 21 (2017), no. 5, 2945-2988, arxiv:1510.01260.
10. Comparison of the Calabi and Mabuchi geometries and applications to geometric flows, **Ann. I.H.P. Anal. Non Lineaire** 34 (2017), no. 5, 1131-1140, arxiv:1602.04309.
11. Regularity of weak minimizers of the K-energy and applications to properness and K-stability (with R.J. Berman and C.H. Lu), **Ann. Sci. Ec. Norm. Super.** 53 (2020), no. 4, 267–289, arxiv:1602.03114.
12. Metric geometry of normal Kähler spaces, energy properness, and existence of canonical metrics, **IMRN** (2017), no. 22, 6752-6777, arXiv:1604.07127.
13. On the singularity type of full mass currents in big cohomology classes (with E. Di Nezza and C.H. Lu), **Compos. Math.** 154 (2018), no. 2, 380-409, arXiv:1606.01527.
14. A minimum principle for Lagrangian graphs (with Y.A. Rubinstein), **Comm. Anal. Geom.** 27 (2019), no. 4, 857-876. arXiv:1606.01527.
15. Monotonicity of non-pluripolar products and complex Monge-Ampère equations with prescribed singularity (with E. Di Nezza and C.H. Lu), **Analysis & PDE** 11 (2018), no. 8, arXiv:1705.05796.
16. Convergence of the Kähler-Ricci iteration (with Y.A. Rubinstein), **Analysis & PDE** 12 (2019), no. 3. 721-735, arXiv:1705.06253.
17. Compactness of Kähler metrics with bounds on Ricci curvature and I functional (with X.X. Chen and W. He), **Calc. Var. and PDE** 58 (2019), no. 4, Paper No. 139. arXiv:1712.05095.
18. L^1 metric geometry of big cohomology classes (with E. Di Nezza and C.H. Lu), **Ann. Inst. Fourier (Grenoble)** 68 (2018), no. 7, 3053-3086, arXiv:1802.00087.
19. Quantization in geometric pluripotential theory (with C.H. Lu, Y.A. Rubinstein), **Comm. Pure Appl. Math.** 73 (2020), no. 5, 1100-1138, arXiv:1806.03800.
20. Log-concavity of volume and complex Monge-Ampère equations with prescribed singularity (with E. Di Nezza and C.H. Lu), **Math. Ann.** 379 (2021), no. 1-2, 95–132. arXiv:1807.00276.
21. Geodesic stability, the space of rays, and uniform convexity in Mabuchi geometry, (with C.H. Lu), **Geom. and Topol.** (2020), no. 4, 1907–1967. arXiv:1810.04661.
22. Geometric pluripotential theory on Kähler manifolds, Advances in complex geometry, 1-104, **Contemp. Math.** 735, Amer. Math. Soc., Providence, RI, 2019, arXiv:1902.01982.
23. The isometries of the space of Kähler metrics, **J. Eur. Math. Soc.** 23 (2021), no. 12, 4091–4108. arXiv:1902.06124.
24. The metric geometry of singularity types (with E. Di Nezza and C.H. Lu), **J. Reine Angew. Math.** 771 (2021), 137–170. arXiv:1909.00839.
25. Griffiths extremality, interpolation of norms, and Kähler quantization (with K.-R. Wu), **J. Geom. Anal.** 32 (2022), no. 7, Paper No. 203. arXiv:1910.01782.
26. The closures of test configurations and algebraic singularity types (with M. Xia), **Adv. Math.** 397 (2022), Paper No. 108198, arXiv:2003.04818.
27. Optimal asymptotic of the J functional with respect to the d_1 metric (with E. George and K. Smith), **Selecta Math.** 28 (2022), no. 2, Paper No. 43. arXiv:2101.02589.
28. The Mabuchi geometry of low energy classes, to appear in **Math. Ann.**, arXiv:2109.11581.
29. The volume of pseudoeffective line bundles and partial equilibrium (with M. Xia), to appear in **Geom. and Topol.**, arXiv:2112.03827.
30. Extremizers of the J functional with respect to the d_1 metric (with A. Benda, S. Bachhuber, B. Christophel), **Anal. Math.** 48 (2022), no. 2, 307-330. arXiv:2304.06323.
31. Twisted Kähler–Einstein metrics in big classes (with K. Zhang), arXiv:2208.08324.

32. A transcendental approach to non-Archimedean metrics of pseudoeffective classes (with M. Xia, K. Zhang), arXiv:2302.02541.
33. Relative pluripotential theory on compact Kähler manifolds (with E. Di Nezza, C. H. Lu), arXiv:2303.11584.
34. Transcendental Okounkov bodies, (with R. Reboulet, M. Xia, D. Witt Nystrom, K. Zhang), preprint, arXiv:2309.07584.

Grants, fellowships and awards

Simons Fellowship, 2024.

NSF Conference Grant DMS-2246362, 2022.

Alfred P. Sloan Fellowship, 2021.

NSF CAREER Grant DMS-1846942, 2019.

NSF Grant DMS-1610202, 2016.

AMS-Simons Travel Grant, 2015.

Purdue Research Foundation Grant, 2013.

Erasmus Fellowship, University of Szeged, Fall 2007.

Conference and workshop talks

3nd Workshop dedicated to the memory of Gabriela Kohr, Babeş-Bolyai University, December 2023.

Analytic Methods in Complex Geometry, University of Münster, August 2023.

The Tenth Congress of Romanian Mathematicians, University of Piteşti, Romania, July 2023.

2nd Workshop dedicated to the memory of Gabriela Kohr, Babeş-Bolyai University, December 2022.

Convex & Complex : Perspectives on Positivity in Geometry, Cetraro, Italy, October 2022.

Special Metrics in Complex Geometry, University of Texas, Dallas, May 2022.

AMS Sectional Meeting, Purdue University, March 2022.

Workshop dedicated to the memory of Gabriela Kohr, Babeş-Bolyai University, Romania, December 2021.

Interactions in Complex Geometry, Vanderbilt University, December 2021.

Conference on complex analysis and geometry, Toulouse, France, June 2021.

Trends in Modern Geometry, Beijing, China, July 2019.

Workshop on Kähler Geometry, CUNY, New York, January 2019.

Geometry Program, Oberwolfach, June 2018.

Midwest Several Complex Variables Conference, Syracuse University, May 2018.

SCGAS Winter School, 5 lectures, UC Irvine, January 2018.

Trends in Modern Geometry, Tokyo, Japan, July 2017.

Hayama Symposium on Complex Analysis in Several Variables, Hayama, Japan, July 2017.

International Conference in Current Developments in Kähler Geometry, Univ. of Notre Dame, June 2017.

Complex Analysis and Geometry - XXIII, Levico Terme, June 2017.

Conference in Complex Analysis and Geometry in honor of J.P. Demailly, Grenoble, France, June 2017.

Perspectives in Geometric Analysis Part 2, Xi'an, China, July 2016.

Perspectives in Geometric Analysis Part 1, Beijing , China, July 2016.

Conference on Kähler Geometry, Einstein Metrics, and Generalizations, MSRI, March 2016.

AMS Sectional Meeting, Rutgers University, November 2015.
Toric Kähler Geometry, Simons Center for Geometry and Physics, Stony Brook, October 2015.
Joint International Meeting of the AMS and the RMS, Alba Iulia, Romania, June 2013.
AMS Sectional Meeting, Boston College, April 2013.
AMS Sectional Meeting, University of Akron, October 2012.
MaCS7, Babeş-Bolyai University, Cluj-Napoca, Romania, July 2008.

Colloquium and seminar talks

Seminarul grupului de cercetare de algebră şi geometrie, Babeş-Bolyai University, March 2024.
Analysis Seminar, Jagellonian University, virtual talk, Krakow, Poland, January 2023.
Algebraic Geometry Seminar, University of Michigan, October 2023.
Summer course on Kähler geometry, Tor Vergata University, Rome, Italy, May 2023.
Informal Complex Geometry and PDE Seminar, Columbia University, February 2023.
Colloquium, Rutgers University, Newark, December 2022.
Princeton University, Differential Geometry Seminar, October 2022.
Northwestern University, Northwestern-UIC Complex Geometry Seminar, October 2022
India Institute of Science, Bangalore, virtual talk, Geometry and Topology Seminar, September 2022.
Semiclassical Analysis Seminar, Universität zu Köln, May 2022.
Colloquium, College of the Holy Cross, November 2021.
Topology and Geometry Seminar, Hebrew University, virtual talk, Jerusalem, Israel, April 2021.
Differential Geometry Seminar, virtual talk, UCSD, February 2021.
Analysis Seminar, Jagellonian University, virtual talk, Krakow, Poland, November 2020.
Analysis Seminar, Northwestern University, April 2019.
Analysis Seminar, Indiana University, March 2019.
Analysis Seminar, Syracuse University, February 2019.
Differential Geometry Seminar, UC Berkeley, September 2018.
Differential Geometry Seminar, Harvard University, March 2018.
Differential Geometry Seminar, UCSD, January 2018.
Colloquium and Analysis Seminar, University of Wisconsin, January 2017.
Colloquium, UCSD, January 2017.
Colloquium, University of Oregon, January 2017.
Colloquium, University of Maryland, December 2016.
Colloquium, University of Illinois at Chicago, November 2016.
Seminarul grupului de cercetare de analiză complexă, Babeş-Bolyai University, June 2016.
Differential Geometry Seminar, University of Connecticut, April 2016.
Geometry Seminar, Purdue University, April 2016.
Hopkins-Maryland Complex Geometry Seminar, Johns Hopkins University, March 2016.
Differential Geometry Seminar, UC Irvine, February 2016.
Informal Complex Geometry and PDE Seminar, Columbia University, February 2016.
Differential Geometry and Geometric Analysis Seminar, Princeton University, December 2015.

Simons Center for Geometry and Physics, 2 lectures, Stony Brook, June 2015.

Geometric Analysis Seminar, Northwestern University, February 2015.

Geometry and Topology Seminar, SUNY at Stony Brook, December 2014.

Geometry and Topology Seminar, University of Maryland, September 2014.

Geometric Analysis Seminar, University of Oregon, April 23 2014.

Geometry Seminar, Purdue University, April 2014.

Graduate Research Day, Purdue University, April 2014.

Hopkins-Maryland Complex Geometry Seminar, University of Maryland, February 2014.

Analysis and PDE Seminar, University of Notre Dame, November 2013.

SCV Seminar, University of Michigan, November 2013.

Informal Geometric Analysis Seminar, University of Maryland, February 2013.

Hopkins-Maryland Complex Geometry Seminar, University of Maryland, October 2012.

Geometric Analysis Seminar, Purdue University, April 2012.

Teaching experience

University of Maryland: MATH430 Euclidean and Non-Eucidean Geometries (Spring 2023), MATH401 Applications of Linear Algebra, (Fall 2022), MATH740 Differential Geometry (Spring 2022), MATH661 Complex Analysis 2 (Fall 2021), MATH868C Complex Geometry (Spring 2021), MATH742 Geometric Analysis (Fall 2020), MATH437 Differential Forms (Spring 2020), MATH135 Calculus for Life Sciences (Fall 2019), MATH740 Differential Geometry (Spring 2019), MATH868C Several Complex Variables (Fall 2018), MATH131 Calculus II for Life Sciences (Fall 2017), MATH868D Pluripotential theory (Fall 2016), MATH401 Applications of linear algebra (Fall 2015), MATH220 Elementary calculus I (Fall 2015), MATH461 Linear algebra for scientists and engineers (Spring 2015), MATH430 Euclidean and Non-Euclidean geometries (Fall 2014, Spring 2017).

Purdue University: MATH153, Algebra and trigonometry (Fall 2011), Recitation instructor for various calculus courses (Spring 2010, Fall 2010, Spring 2011).

Membership, service and outreach

Reviewer for Mathematical Reviews, 2014-

Editorial board member for Geometriae Dedicata, 2023-

Editorial board member for Acta Universitatis Sapientiae, Mathematica, 2021-

Reviewer for Amer. J. Math., Ann. Fac. Sci. Toulouse Math., Annales Polonici Math., Compos. Math., Comm. Math. Helv., Constr. Approx., Crelle's Journal, Duke, Geom. and Topol., IMRN, Invent. Math., J. Amer. Math. Soc., J. Func. Anal., J. Geom. Anal., Math. Res. Lett., Math. Scand., Pacific J. Math., Proc. LMS, etc.

Co-organizer of the "Informal Geometric Analysis" and the "Hopkins-Maryland Complex Geometry" seminars at University of Maryland.

Popular science article "Constant curvature – the special metrics of Kähler manifolds", describing my NSF funded research activity, in Research Features, Issue # 117, November 2017.

Popular science article "The Intricate Connection Between Constant Curvature and Symmetries", Summer 2020 edition of Odyssey.

Co-organizer of the international conference "Maryland Analysis and Geometry Atelier", August 2017, University of Maryland.

Co-organizer of the international conference "Several Complex Variables, Complex Geometry and related PDEs", May 2024, University of Maryland.

Co-organizer of the international conference "Complex Analysis and Geometry", June 2023, Renyi Insitute of Mathematics, Budapest, Hungary.

Co-organizer of the international conference "Geometry Festival", April 2019, University of Maryland.

Instructor and volunteer at the DC Math Circle.

Ph.D. comittee member of Ryan Hunter (UMD, October 2017), Tianyu Ma (UMD, May 2018), Matthew Dellatorre (UMD, June 2019).