Lan-Hsuan Huang

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Citizenship: Taiwan and USA

Research interests

Mathematical General Relativity and Geometric Analysis

Employment

University of Connecticut

2020–present Professor
2016–2020 Associate Professor
2012–2016 Assistant Professor

Institute for Advanced Study

2018–2019 von Neumann Fellow

Columbia University

2009–2012 Ritt Assistant Professor

Education

2004–2009 **Stanford University**
PhD in Mathematics
Advisor: Professor Richard Schoen

2000– 2004 **National Taiwan University**
BS in Mathematics

Honors and awards

2021 Invited Speaker at International Congress of Mathematical Physics (ICMP) in Geneva, Switzerland
ICMP is the largest research congress in mathematical physics, held every three years
2020-2023 NSF DMS-2005588 "Mass Rigidity and Curvature Problems in Mathematical Relativity" (PI, $250,336)
2018-2019 von Neumann Fellow at Institute for Advanced Study
2018-2019 Simons Fellow in Mathematics awarded by Simons Foundation ($122,378)
2015-2021 NSF CAREER Award (PI, $400,648)
2013-2016 NSF DMS-1308837 "Geometric Partial Differential Equations in General Relativity" (PI, $282,249)
2010–2013 NSF DMS-1005560 (DMS-1301645) "Geometric Problems in General Relativity" (PI, $125,645)

Visiting positions

Spring 2022 The Center of Mathematical Sciences and Applications (CMSA) at Harvard (upcoming)
July 2017 Erwin Schödinger International Institute
Summer 2016 NCTS National Taiwan University
Fall 2013 MSRI Research Member
Fall 2010 Max-Planck Institute for Gravitational Physics, Germany
Fall 2008 Institut Mittag-Leffler, Sweden

Mentorship

PhD students	**Hyun Chul Jang**, PhD 2020, current Britton Post-Doctor at University of Miami
	Daniel Martin, PhD 2018, current tenure-track Assistant Professor at University of Hartford
Post-doctors	**Zhongshan An**, UConn 2019-
	Armando Cabrera, UConn 2016-2017, current post-doctor at University of Tübingen
	Alan Parry, UConn 2013-2016, current tenure-track Assistant Professor at Utah Valley University
Undergraduate thesis advisor	**Filip Dul**, current math PhD student at UMass Amherst
PhD thesis committee	**Malva Asaad, Lisa Naples, Joshua Flynn, Jiangxiong Wang**

Organization Services (selected)

Fall 2024	MSRI Semester-length Program
	"New Frontiers in Curvature: Flows, General Relativity, Minimal Submanifolds, and Symmetry"
Jan 2022	Special Session "Scalar Curvature and Convergence" in Joint Mathematics Meetings in Seattle
2016–present	UConn Geometry Day
April 2019	Special Session on "Convergence of Manifolds" in the AMS meeting at UConn
July 2019	Summer Graduate School in Minimal Surfaces, Flows, and Relativity at UConn
March 2016	Special Session on " General Relativity" in the AMS Meeting at Stony Brook
Fall 2012	Special Semester in Differential Geometry at UConn
2009–2012	General Relativity Seminar at Columbia
2010-2011	Columbia-Stony Brook Joint General Relativity Seminar

Committee Services (selected)

2020–2022	AMS-Simons Travel Grants Committee
2015–present	Department Geometry/Topology Coordinator
various years	Department Advisory Committee
	Department Hiring Committee
	Department Graduate Committee, Graduate Admission Committee, Dissertation Award Committee
	Department Promotion, Tenure and Reappointment Committee
	Department Non-Tenure Track Promotion and Reappointment Committee (Chair)
multiple times	Panelist for NSF and for UConn Office of the Vice Presendent for Research

Teaching and other Broader Impact Activities (selected)

Consecutive years	Provost Recognition for Outstanding Teaching Excellence
October 2020	Plenary speaker in Mathematics Continued Conference at UConn
	One-day conference for undergraduate students to promote equality and diversity in mathematics
2017	Speaker in UConn Early College Experience (for high school teachers)
multiple times	Speaker in SIGMA Seminar (for graduate students) and Math Club (for undergraduate students)
	Panelist in "What is math research?" in Major Exploration Week, "Grants and academic jobs", "Jobs in Academia/Teaching" at UConn

Research Publications

1. *Equality in the spacetime positive mass theorem* (with D. Lee), **Communications in Mathematical Physics** 376 (2020), no. 3, 2379–2407.
2. *Mass rigidity for hyperbolic manifolds* (with H. C. Jang and D. Martin), **Communications in Mathematical Physics** 376 (2020), no. 3, 2329-2349.
3. *Localized deformation for initial data sets with the dominant energy condition* (with J. Corvino), **Calculus Variations and Partial Differential Equations** (2020), no. 1, No. 42.
4. *Existence of harmonic maps into CAT(1) spaces* (with C. Breiner, A. Fraser, C. Mese, P. Sargent, Y. Zhang), **Communications in Analysis and Geometry** 28 (2020), no. 4, 781-835 (Special Issue in Honor of Karen Uhlenbeck's 75th Birthday)
5. *Regularity of harmonic maps from Polyhedra to CAT(1) Spaces* (with C. Breiner, A. Fraser, C. Mese, P. Sargent, Y. Zhang), **Calculus Variations and Partial Differential Equations** 57 (2018), no. 1, Art. 12, 35 pp.
6. *Intrinsic flat stability of the positive mass theorem for graphical hypersurfaces of Euclidean space* (with D. Lee and C. Sormani), **Journal für die reine und angewandte Mathematik (Crelle's Journal)** 727 (2017) 269-299
7. *Geometric inequalities and rigidity theorems on equatorial spheres* (with D. Wu), **Communications in Analysis and Geometry** 25 (2017), no. 1, 185-206
8. *Static potentials and area minimizing hypersurfaces* (with D. Martin and P. Miao), **Proceedings of the American Mathematical Society** 146 (2018), no. 6, 2647–2661
9. *Spacetime positive mass theorem in dimensions less than eight* (with M. Eichmair, D. Lee, and R. Schoen), **Journal of European Mathematical Society**, 18 (2016), no. 1, 83–121
10. *On the validity of the definition of angular momentum in general relativity* (with P.N. Chen, M.-T. Wang, and S.-T. Yau), **Annales Henri Poincaré**, 17 (2016), no. 2, 253–270
11. *Stability of the positive mass theorem for graphical hypersurfaces of Euclidean space* (with D. Lee), **Communications in Mathematical Physics** 337 (2015), no. 1, 151–169
12. *The equality case of the Penrose inequality for asymptotically flat graphs* (with D. Wu), **Transactions of the American Mathematical Society** 367 (2015), 31–47.
13. *Hypersurfaces with nonnegative scalar curvature* (with D. Wu), **Journal of Differential Geometry** 95 (2013) 249–278. (2017 ICCM Best Paper Award)
14. *On the center of mass in general relativity.* **Fifth International Congress of Chinese Mathematicians**. Part 1, 2, AMS/IP Stud. Adv. Math., 51, pt. 1, vol. 2, Amer. Math. Soc., Providence, RI (2012) pp. 575–591
15. *Specifying angular momentum and center of mass for vacuum initial data sets* (with R. Schoen and M. T. Wang), **Communications in Mathematical Physics** 306 (2011), no. 3, 785-803.
16. *Solutions of special asymptotics to the Einstein constraint equations*, **Classical and Quantum Gravity** 27 (2010), no. 24, 245002 (10pp).
17. *Rigidity theorems on hemispheres in non-positive space forms* (with D. Wu), **Communications in Analysis and Geometry** 18 (2010), no. 2, 339-363.
18. *Foliations by stable spheres with constant mean curvature for isolated systems with general asymptotics*, **Communications in Mathematical Physics** 300 (2010), no. 2, 331-373.

19. *On the center of mass of isolated systems with general asymptotics*, **Classical and Quantum Gravity** 26 (2009) 015012 (25pp).

Expository Publications

20. *On the center of mass and constant mean curvature surfaces of an initial data set*, MSRI Summer School lecture notes, to be published by the Cambridge University Press as a book chapter
21. *The Mathematics of Richard Schoen* (with Bray, Minicozzi, Eichmair, Yau, Uhlenbeck, Kusner, Marques, Mese, and Fraser), **Notices of the American Mathematical Society** 65 (2018), no. 11, 1349–1376
22. *Book Review of "Geometric Relativity" by Dan A. Lee*, **Bulletin of the American Mathematical Society** 58, Number 3, July 2021, pages 461–466
23. *Trapped surfaces, topology of black holes, and positive mass theorem* (with D. Lee), submitted to **Notices of the American Mathematical Society**

Submitted preprints

24. *Bartnik mass minimizing initial data sets and improvability of the dominant energy scalar* (with D. Lee), arXiv:2007.00593 [math.DG]
25. *Intrinsic flat convergence of points and applications to stability of the positive mass theorem* (with D. Lee and R. Perales), arXiv:2010.07885 [math.DG]
26. *Existence of static vacuum extensions with prescribed Bartnik boundary data* (with Z. An), arXiv:2103.15887 [math.DG]
27. *Scalar curvature deformation and mass rigidity for ALH manifolds with boundary* (with H. C. Jang), arXiv:2108.12887 [math.DG]

Oberwolfach Reports

- *Bartnik mass minimizing initial data sets and improvability of the dominant energy scalar* (joint work with D. Lee), 2021 Workshop on Mathematical Aspects of General Relativity
- *Existence of static vacuum extensions* (joint work with Z. An), 2021 Workshop on Analysis, Geometry and Topology of Positive Scalar Curvature Metrics
  Report No. 30/2021 DOI:10.4171/OWR/2021/30
- *Spacetime positive mass theorem in dimensions less than eight* (joint work with M. Eichmair, D. Lee, and R. Schoen), 2012 Workshop on Mathematical Aspects of General Relativity
  Report No. 37/2012 DOI: 10.4171/OWR/2012/37

Invited talks

2022 Lectures for Summer School in General Relativity, Mittag-Leffler Institute, June 2022 (upcoming)

2021 General Relativity Seminar, Columbia University, November 2021 (upcoming)
Special Session in AMS Fall Western Sectional Meeting, October 2021 (upcoming)
Mathematical Aspects of General Relativity, Oberwolfach, August 2021 (virtual)
Special session in Mathematical Congress of the Americas, Argentina, July 2021 (virtual)
International Congress of Mathematical Physics (ICMP), Geneva, July 2021 (virtual)
Analysis, Geometry and Topology of PSC Metrics, Oberwolfach, June 2021 (virtual)
Joint Online Mathematical Relativity Colloquium, May 2021 (virtual)
Geometry and Topology Seminar, Cal Tech, April 2021 (virtual)
Collouquium at Brown University, January 2021 (virtual)

2020 Geometric Analysis Colloquium, Fields Institute, November 2020 (virtual)
Seminar at University of Vienna, October 2020 (virtual)
Analysis Seminar at Johns Hopkins, September 2020 (virtual)
Analysis Seminar at Vanderbilt, September 2020 (virtual)
General Relativity Seminar at CMSA Harvard, February 2020
Conference on Geometric Invariance and PDEs, Taiwan, January 2020

2019 General Relativity Seminar at Columbia University, December 2019
Geometric Analysis and Relativity, University of Tokyo, November 2019
2019 Lehigh JDG Conference, June, 2019
8th ICCM (plenary speaker), Tsinghua, China, June 2019
Geometric Analysis and GR, in honor of Huisken, ETH, June 2019
Symposium on Nonlinear Problems in Geometry, CUNY, April 2019
Colloquium, Rutgers-Newark, March 2019
Conference on Geometric Functionals, IAS, March 4-8, 2019
Seminar on Variational Methods in Geometry, IAS, February 5, 2019
Colloquium, Dartmouth, January 2019

2018 ICCM annual meeting, Taipei, December 2018
Mathematical Relativity in Miami in honor of Galloway, December 2018
Geometric Analysis Seminar at Rutgers, November 2018
Emerging Topics Workshop, IAS, October 2018
Alaska Relativity Workshop, May 2018
Mass in General Relativity, Simons Center, March 26-30, 2018
Colloquium, University of Tennessee, January 2018
Geometric Analysis Seminar, University of Tennessee, January 2018

2017 Geometric Analysis Seminar, University of Chicago, February 7, 2017
Conference on Geometric Analysis and Relativity, Vienna, July 2017

2016 Workshop on Aspects of General Relativity, Harvard, May 2016
Geometric Analysis and General Relativity, Banff, July 2016
Seminar at National Taiwan University, July 2016
Seminar at Fudan University, China, June 2016

2015 Workshop at Imperial College London, July 15-17, 2015
Pacific Northwest Geometry Seminar, U. Washington, Oct 17-18, 2015
General Relativity and Gravitation, Penn State, June 2015
University of Oregon AWM Distinguished Speaker Series, May 7-8, 2015

2014 Princeton-Rutgers Joint Geometric PDEs Seminar, October 8, 2014
Conference on Geometric Analysis and Relativity, Hefei China, July 2014
2013 Taiwan International Conference on Geometry, Taipei, December 2013
Workshop on Initial Data and Evolution in GR, MSRI, November 2013
Workshop on Mathematical Relativity, MSRI, September 2013
Connections for Women: Mathematical Relativity, MSRI, Sep 2013
Summer School on Math Relativity, Cortona, Italy, August 2013
Pacific Northwest Geometry Seminar, Portland State, May 2013
Workshop on Geometric Analysis and Nonlinear PDEs, Rutgers, May 2013
Tsinghua Sanya International Math Forum, Sanya China, January 2013
2012 Mathematical Aspects of General Relativity, Oberwolfach, July 2012
Graduate Workshop on Mathematical Relativity, MSRI, July 2012
Colloquium, Duke University, February 2012
Colloquium, University of Wisconsin-Madison, February 2012
Univ of Wisconsin-Madison, PDE and Geometry Seminar, Feb 2012
Colloquium, University of Connecticut, February 2012
Colloquium, University of North Carolina at Chapel Hill, January 2012
Colloquium, University of Minnesota, January 2012
Colloquium, University of Colorado at Boulder, January 2012
Johns Hopkins University, Special Analysis Seminar, January 2012
2011 Ohio State University, Geometry and PDE Seminar, November 2011
AWM Anniversary Conference at ICERM, Providence, September 2011
MIT, Geometric Analysis Seminar, October 2011
University of Miami, Geometry and Physics Seminar, October 2011
Duke, Geometry and Topology Seminar, September 2011
Workshop on Differential Geometry, Fudan Univ, China, June 2011
Topology/Geometry Seminar, Capital Normal Univ, China, June 2011
Summer Program in Mathematical Relativity, Beijing China, June 2011
Conference on Complex Analysis, Dynamical Systems, Akko, Israel, May 2011
Lafayette-Lehigh, Geometry and Topology Seminar, March 2011
Brown University, Geometry and Topology Seminar, March 2011
2010 Workshop on Geometric Analysis, Zhejiang University, China, December 2010
Fifth ICCM, Beijing, December 2010
Columbia-Stony Brook joint General Relativity Seminar, Nov 2010
Geometric Analysis Seminar, AEI at Golm, Germany, Oct 2010
Mathematical Relativity, ICMS, Edinburgh, UK, September 2010
Joint Meeting of the AMS and the Sociedad Matemática, Berkeley, June 2010
Geometry Seminar, Academia Sinica, Taiwan, May 2010
Columbia Undergraduate Mathematics Society, April 2010
Southeast Geometry Seminar, Georgia Institute of Technology, April 2010
Johns Hopkins University, Analysis Seminar, February 2010
Workshop on Relativity and Geometric Analysis, Monash, January 2010

2009 Bronx Community College of CUNY, November 2009
Princeton Geometric Analysis Seminar, October 2009
CUNY Graduate Center, Differential Geometry Seminar, October 2009
Stony Brook, Geometry/Topology Seminar, October 2009
Duke University, Geometry/Topology Seminar, September 2009
Columbia University, Geometry/Analysis Seminar, September 2009
Sino-France Summer Institute on Geometric Analysis, Beijing, July 2009
UC Irvine, Geometry Seminar, May 2009
Workshop in String Theory, Relativity and PDEs, Harvard, May 2009

2008 The Ninth Pacific Rim Geometry Conference, Taipei, December 2008
Geometry Seminar, National Taiwan University, June 2008