Hsuan-Yi Liao

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Current position

Associate Professor, National Tsing Hua University

Research interests

Differential Geometry, Poisson Geometry, Homotopy Algebra, Derived Differential Geometry, Noncommutative Geometry, Mathematical Physics

Education

2012–2018	PhD in Mathematics, Pennsylvania State University, USA
2009–2010	MS in Mathematics, National Tsing Hua University, Taiwan
2006–2009	BS in Mathematics, National Tsing Hua University, Taiwan

Work Experiences

2024–now	Associate Professor, National Tsing Hua University, Taiwan
2021–2024	Assistant Professor, National Tsing Hua University, Taiwan
2018–2020	Research Fellow, Korea Institute for Advanced Study, South Korea
2012–2018	Graduate Assistant, Pennsylvania State University, USA
2011–2012	Research Assistant, National Center for Theoretical Sciences, Taiwan
2010–2011	Military Officer, Army (obligatory militrary service), Taiwan
2008–2010	Teaching Assistant, National Tsing Hua University, Taiwan

Visiting positions

2024	CARMIN visiting position, IHES, Jan 8 - Feb 22
2023	CARMIN visiting position, IHES, Mar 1 - Jul 14
2023	Shapiro visitor, Pann State University, Jan 1 - Feb 28

Publications and preprints

[1] Kai Behrend, Hsuan-Yi Liao, and Ping Xu. On the structure of étale fibrations of L_∞-bundles. *Proc. Lond. Math. Soc. (3)*, 131(6):Paper No. e70115, 2025.

[2] Hsuan-Yi Liao, Mathieu Stiénon, and Ping Xu. Formal geometry and Tamarkin–Tsygan calculi of dg manifolds. *arXiv e-prints (2511.12399)*, November 2025.

[3] Hsuan-Yi Liao and Byungdo Park. A note on finite-to-infinite extensions and homotopy invariance of digraph brown functors. *Axioms*, 14(9), 2025.

[4] Hsuan-Yi Liao, Zachary McGuirk, Dang Khoa Nguyen, and Byungdo Park. Brown functors of directed graphs. *arXiv e-prints (2503.14865)*, March 2025.

[5] Kai Behrend, Hsuan-Yi Liao, and Ping Xu. Differential graded manifolds of finite positive amplitude. *Int. Math. Res. Not. IMRN*, (8):7160–7200, 2024.

[6] Hua-Shin Chang and Hsuan-Yi Liao. Vertical isomorphisms of Fedosov dg manifolds associated with a Lie pair. *J. Geom. Phys.*, 200:Paper No. 105169, 2024.

[7] Hsuan-Yi Liao. Atiyah classes and Todd classes of pullback dg Lie algebroids associated with Lie pairs. *Comm. Math. Phys.*, 404(2):701–734, 2023.

[8] Hsuan-Yi Liao and Seokbong Seol. Keller admissible triples and Duflo theorem. *J. Math. Pures Appl. (9)*, 174:1–43, 2023.

[9] Kai Behrend, Hsuan-Yi Liao, and Ping Xu. Derived Differentiable Manifolds. *arXiv e-prints (2006.01376)*, June 2020.

[10] Hsuan-Yi Liao, Mathieu Stiénon, and Ping Xu. Formality and Kontsevich-Duflo type theorems for Lie pairs. *Adv. Math.*, 352:406–482, 2019.

[11] Hsuan-Yi Liao and Mathieu Stiénon. Formal exponential map for graded manifolds. *Int. Math. Res. Not. IMRN*, (3):700–730, 2019.

[12] Hsuan-Yi Liao, Mathieu Stiénon, and Ping Xu. Formality theorem for differential graded manifolds. *C. R. Math. Acad. Sci. Paris*, 356(1):27–43, 2018.

[13] Hsuan-Yi Liao, Mathieu Stiénon, and Ping Xu. Formality theorem for g-manifolds. *C. R. Math. Acad. Sci. Paris*, 355(5):582–589, 2017.

[14] Hsuan-Yi Liao and Jyh-Haur Teh. Semi-topological Galois theory. *Algebra Colloq.*, 22(4):687–706, 2015.

Honors and Awards

2024	NCTS Young Theoretical Scientist Award
2018	Raymond and Christine Ayoub Award
2017	Jack and Eleanor Pettit Scholarship in Science
2016	Governmental Scholarship for Study Abroad (Taiwanese government)
2013	Merit Award for early pass of candidacy

2009	Wan-Lin Tsai Fellowship
2009	Chow Hung-Ching Scholarship
2008	Chow Hung-Ching Scholarship
2008	College of Science Young Elite Scholarship
2007	College of Science Young Elite Scholarship

Invited talks

Conference/workshop

Jul 3, 2025	"Brown functors of directed graphs ", Geometry & Topology in Rome, Sapienza University of Rome, Italy.
Jan 14, 2025	"Vertical isomorphisms of Fedosov dg manifolds", 2025 TMS Annual Meeting, National Central University, Taiwan.
Oct 14, 2024	"Derived differentiable manifolds", NCTS Workshop in Symplectic Geometry, National Center for Theoretical Sciences, Taiwan.
Sep 19, 2024	"Atiyah classes of Lie pairs and dg Lie algebroids", Non Commutative Geometry & Higher Structures, Aristotle University of Thessaloniki, Greece.
Mar 11, 2024	"Introduction to dg manifolds and Atiyah classes", NCTS Young Theoretical Scientist Award Ceremony, National Center for Theoretical Sciences, Taiwan.
Dec 2, 2023	"Vertical isomorphisms of Fedosov dg manifolds", Poisson geometry and related topics 23, Ritsumeikan University, Japan.
Jul 4, 2023	"Homotopy fiber product and dg manifolds of finite positive amplitudes", Dg-manifolds in Geometry and Physics, Institut Henri Poincaré, France.
Jan 17, 2022	"Formal exponential maps and Fedosov resolutions", 2021 TMS Annual Meeting, Academia Sinica, Taiwan.
Nov 2, 2021	"Homotopy fiber product of manifolds", The Third Japan-Taiwan Joint Conference on Differential Geometry, National Center for Theoretical Sciences, Taiwan.
May 1, 2021	"A CFO approach to derived differential geometry", 21st Taiwan Geometry Symposium, National Tsing Hua University, Taiwan.
Dec 22, 2020	"A CFO approach to derived differential geometry", 2020 Symposium in Algebraic Geometry, online (Korea Institute for Advanced Study).
Jan 9, 2020	"Kontsevich–Duflo type theorem for dg manifolds", Workshop on Atiyah classes and related topics, Korea Institute for Advanced Study, South Korea
Sep 27, 2019	"Formality theorem for dg manifolds", East Asian Symplectic Conference, National Penghu University of Science and Technology, Taiwan
Jun 28, 2019	"DG manifolds, formality theorem and Kontsevich–Shoikhet conjecture", Poisson geometry, moduli spaces, and applications, Waseda University, Japan
Sep 14, 2017	"Formality theorem for Lie pairs", Noncommutative Geometry and Higher Structures, University of Würzburg, Germany
Aug 1, 2017	"Formality theorem for Lie pairs", GAP XV — State College, Pennsylvania State University, USA
May 6, 2017	"Formality theorem and Kontsevich–Duflo theorem for g-manifolds", Gone Fishing Poisson Geometry Conference, University of Notre Dame, USA
Jun 8, 2016	"Kontsevich-Duflo theorem", NCTS One-Day Workshop on Symplectic and Poisson Geometry, National Tsing Hua University, Taiwan

Mar 13, 2016	"Algebraic exponential maps", Gone Fishing Poisson Geometry Conference, University of Colorado at Boulder, USA
Apr 9, 2016	"Algebraic exponential maps", Cornell–Penn State Joint Symplectic Seminar, Cornell University, USA

SEMINAR/COLLOQUIUM

May 20, 2025	"Brown functors of directed graphs ", BIMSA Topology Seminar, online.
Nov 6, 2024	"Graphs in deformation quantization", Colloquium, National Sun Yat-sen University, Taiwan.
Aug 27, 2024	"Atiyah classes of Lie pairs and dg Lie algebroids", GAP Seminar, Penn State University, USA.
Apr 25, 2024	"Atiyah classes of Lie pairs and of dg Lie algebroids", NCTS Differential Geometry Seminar, National Center for Theoretical Sciences, Taiwan.
Oct 30, 2023	"Vertical isomorphisms of Fedosov dg manifolds", Geometry Seminar, Korea Institute for Advanced Study, South Korea.
Jan 31, 2023	"Atiyah class, Todd class and formality morphisms for differential graded manifolds", GAP Seminar, Penn State University, USA.
Jan 17–30, 2023	"Differential graded manifolds and applications (I–III)", GAP Seminar, Penn State University, USA.
Jan 10, 2023	"Homotopy fiber product of manifolds", GAP Seminar, Penn State University, USA.
Sep 20, 2022	"A graphical formula in deformation quantization", Colloquium, Tamkang University, Taiwan.
May 3, 2022	"Graphs in deformation quantization", Colloquium, National Yang Ming Chiao Tung University, Taiwan.
Feb 24, 2022	"Homotopy fiber product of manifolds", Global Poisson Webinar, online (University of Geneva).
May 10, 2021	"Formal exponential maps for graded manifolds", NCTS Seminar on Geometry and Topology, National Tsing Hua University, Taiwan.
May 3, 2021	"A CFO approach to derived differential geometry II", NCTS Seminar on Geometry and Topology, National Tsing Hua University, Taiwan.
Oct 29, 2020	"Homotopy fiber product of differentiable manifolds", Geometry Seminar, Chungbuk National University, South Korea
Dec 16, 2019	"Homotopy fiber product of manifolds", Colloquium, National Tsing Hua University, Taiwan
Dec 12, 2019	"Homotopy fiber product of manifolds", Geometry Seminar, Korea Institute for Advanced Study, South Korea
Sep 16, 2019	"Three W's Seminar: Deformation of algebra and Hochschild cochains", Three W's Seminar, Korea Institute for Advanced Study, South Korea
Apr 02, 2019	"Formality theorem for differential graded manifolds", GAP seminar, Penn State University, USA
Feb 28, 2019	"DG Seminar: Lie groupods/algebroids, dg manifolds II", Geometry Seminar, Korea Institute for Advanced Study, South Korea
Jan 24, 2019	"DG Seminar: Lie groupods/algebroids, dg manifolds", Geometry Seminar, Korea Institute for Advanced Study, South Korea
Oct 31, 2018	"Introduction to Kontsevich formality theorem III", Geometry Seminar, Korea Institute for Advanced Study, South Korea
Oct 31, 2018	"Introduction to Kontsevich formality theorem II", Geometry Seminar, Korea Institute for Advanced Study, South Korea
Oct 29, 2018	"Introduction to Kontsevich formality theorem I", Geometry Seminar, Korea Institute for Advanced Study, South Korea
Oct 15, 2018	"Formality theorem for differential graded manifolds", New Member Seminar, Korea Institute for Advanced Study, South Korea

Sep 20, 2018	"Formality theorem for differential graded manifolds", Taipei Postdoc Seminar, Academia Sinica, Taiwan
Sep 13, 2018	"Formal exponential maps", NCTS Seminar on Geometry-Physics-Symmetry, National Taiwan University, Taiwan
Dec 4, 2017	"A formality theorem for differential graded manifolds", Special Geometry Seminar, University of British Columbia, Canada
Nov 27, 2017	"Formality and Kontsevich-Duflo theorem for Lie pairs", Algebra Seminar, Temple University, USA
Oct 16, 2017	"Formality and Kontsevich-Duflo theorem for Lie pairs", Symplectic Seminar, University of Toronto, Canada
Sep 27, 2017	"Formality theorem and Kontsevich-Duflo theorem for Lie pairs", Higher Differential Geometry Seminar, Max Planck Institute for Mathematics, Germany
Sep 22, 2017	"Formality theorem and Kontsevich–Duflo theorem for Lie pairs", Séminaire 'Groupes de Lie et espaces des modules', University of Geneva, Switzerland
Sep 19, 2017	"Formality theorem for Lie pairs", Geometry Seminar, Université libre de Bruxelles, Belgium
Sep 18, 2017	"Formal exponential maps", Seminar Geometry, University of Leuven, Belgium
Sep 6, 2017	"Formal exponential maps", University of Göttingen, Germany
Jul 3, 2017	"Formality theorem for g-manifolds", Geometry Seminar, University of Hong Kong, Hong Kong
Jun 9, 2017	"Formality theorem for g-manifolds", NCTS Seminar on Geometry-Physics-Symmetry, National Taiwan University, Taiwan
May 24, 2017	"Formality theorem for g-manifolds", NCTS and NTHU Joint Geometry and Topology Seminar, National Tsing Hua University, Taiwan
May 22, 2017	"Formality theorem for g-manifolds", NCTS Algebraic Geometry Seminar at NCKU, National Cheng Kung University, Taiwan
Mar 2, 2017	"Algebraic exponential maps", Geometry and Topology Seminar, Washington University in St. Louis, USA
Feb 22, 2017	"Algebraic exponential maps", Deformation Seminar, University of Pennsylvania, USA
May 30, 2016	"Algebraic exponential maps", Colloquium, National Tsing Hua University, Taiwan

Services to profession

Conference/workshop (co-)organizer

Jun, 2025	Symmetry, Discrete Geometry, and Mathematical Physics, Scalea, Italy
Jan, 2025	NCTS workshop on groupoids and quantization, National Tsing Hua University, Taiwan
Dec, 2024	2024 Taiwan conference on geometry and quantization, National Center for Theoretical Science, National Taiwan University, Taiwan
Sep, 2024	GAP XIX — Rome, *"Moduli spaces and higher structures"*, Sapienza University of Rome, Italy
May, 2023	Higher Structures on Saturday, Institut Henri Poincaré, France
May, 2023	GAP XVIII — Paris, *"Homotopy algebras and higher structures"*, Institut Henri Poincaré, France
Dec, 2022	2022 NCTS Workshop on Geometry and Physics, National Tsing Hua University, Taiwan
May, 2022	GAP XVII — Vancouver, *"Deformations and higher structures"*, University of British Columbia, Canada
Jan, 2020	Workshop on Atiyah classes and related topics, Korea Institute for Advanced Study, South Korea

2022–now   Student Geometry Seminar, National Tsing Hua University, Taiwan
2021–2022   Colloquium, National Tsing Hua University, Taiwan
2019–2020   KIAS Topology Seminar, Korea Institute for Advanced Study, South Korea
2013–2014   Student Geometric Functional Analysis Seminar, Penn State University, USA

Teaching experiences

Present and past students under my guidance

2025-now   Tai-Fu Tu (master's program)
2024-now   Cheng-Yi Hung (master's program)
2023-now   Jun-Shuo Chen (PhD program)
2023-now   Hsiao-Wen Liu (undergraduate research program & master's program)

2022-2024   Dang Khoa Nguyen (master's program):
             Thesis title: Path cohomology of digraphs as a Brown functor
2022-2023   Chien-Te Lu (undergraduate research program)
2022-2023   Lin-Hsiang Weng (undergraduate research program)
2022-2023   Sicheng Liu (undergraduate research program)
2022-2024   Jhih-You Syu (master's program):
             Thesis title: Hochschild cohomology of differential graded coalgebras
2021-2024   Hua-Shin Chang (undergraduate research program):
             Achievement: A joint paper, titled "Vertical isomorphisms of Fedosov dg manifolds associated with a Lie pair," published in J. Geom. Phys.

Instructor, National Tsing Hua University

Spring 2026   Calculus (II) for Mathematics Majors
Fall 2025   Geometric Models for Noncommutative Algebras
Fall 2025   Calculus (I) for Mathematics Majors
Spring 2025   Homological Algebra
Spring 2025   Calculus (II)
Fall 2024   Calculus (I)
Spring 2024   Algebraic Topology
Spring 2024   Calculus II
Fall 2023   Calculus I
Fall 2022   Advanced Linear Algebra
Fall 2022   Calculus I
Spring 2022   Complex Analysis
Fall 2021   Algebraic Topology
Spring 2021   Calculus I

Special programs

2023–2024   2023 NCTS Undergraduate Research Program
2022–2023   2022 NCTS Undergraduate Research Program
2022–2023   NSTC Undergraduate Research Program (Student: Hua-Shin Chang)

Summer 2022	2022 NCTS Undergraduate Summer Research Program
2021–2022	2021 NCTS Undergraduate Research Program

Instructor, Pennsylvania State University

Spring 2018	MATH 220 – Matrices (3 sections)
Spring 2017	MATH 220 – Matrices (4 sections)
Fall 2016	MATH 220 – Matrices (2 sections)
Spring 2016	MATH 220 – Matrices (2 sections)
Fall 2015	MATH 220 – Matrices (3 sections)
Spring 2015	MATH 251 – Ordinary and Partial Differential Equations
Fall 2014	MATH 220 – Matrices (2 sections)
Fall 2013	MATH 220 – Matrices (3 sections)

Grader, Pennsylvania State University

Fall 2013	MATH 527 – Metric and Topological Spaces
Fall 2013	MATH 535 – Linear Algebra
Spring 2013	MATH 403H – Honors Classical Analysis I

Teaching Assistant, National Tsing Hua University

Spring 2010	Advanced Calculus II (differentiation, integration, etc.)
Fall 2009	Advanced Calculus I (metric spaces, limits, continuity, etc.)
Spring 2009	Calculus II
Fall 2008	Calculus I

Other experiences

Python — programming

2017–2019	A program for computing the deformation complex of Gerstenhaber operad (joint with Vasily Dolgushev).
2017	A program for computing Koszul signs and Christoffel symbols.

Badminton

2006–2012	Awarded in several tournaments
2008–2009	Departmental team head
2009	Tournament organizer

GO — a 2500-year-old strategy game

current rank	5-th Dan Rank (qualified by GO association of R.O.C.)
2002–2006	Awarded in several tournaments
2002–2006	GO tutor