

## Kuan-Wen Lai

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## Empolyment

Academia Sinica, Taiwan

Postdoc, September 1, 2023–present

Universität Bonn, Deutschland

Postdoc, September 1, 2021–August 31, 2023; part of the ERC Synergy Grant [HyperK \(ID: 854361\)](#).

University of Massachusetts Amherst, USA

Visiting Assistant Professor, September 1, 2018–August 31, 2021

Taida Institute for Mathematical Sciences, Taiwan

Research Assistant, August 2012–July 2013

R.O.C. (Taiwan) Army, Taiwan

Obligatory military service, August 2011–July 2012

## Education

Brown University, USA

Ph.D. Mathematics, May 27th, 2018. Thesis: *Cremona transformations and rational parametrizations inspired by Hodge theory*, supervised by Brendan Hassett

Rice University, USA

Graduate student, August 2013–July 2015. Transferred to Brown University with Brendan Hassett.

National Taiwan University, Taiwan

M.S. Mathematics, June 4th, 2011. Thesis: *The Gromov-Witten Theory of  $\mathbb{P}^1$* , supervised by Hui-Wen Lin

B.S. Physics, minor in Mathematics, June 7th, 2009

## Research Interests

Algebraic geometry, especially cubic fourfolds, Cremona transformations, and holomorphic symplectic manifolds.

## Preprints

- Fourier–Mukai numbers of K3 categories of very general special cubic fourfolds (with Yu-Wei Fan), <https://arxiv.org/abs/2307.14486>.
- On the irrationality of moduli spaces of projective hyperkähler manifolds (with Daniele Agostini and Ignacio Barros), <https://arxiv.org/abs/2307.07391>.

- Nielsen realization problem for derived automorphisms of generic K3 surfaces (with Yu-Wei Fan), <https://arxiv.org/abs/2302.12663>.
- Frobenius nonclassical hypersurfaces (with Shamil Asgarli and Lian Duan), <https://arxiv.org/abs/2207.11981>.
- Transverse linear subspaces to hypersurfaces over finite fields (with Shamil Asgarli and Lian Duan), <https://arxiv.org/abs/2008.11306>.

## Publications

1. New rational cubic fourfolds arising from Cremona transformations (with Yu-Wei Fan), [Algebraic Geometry](#) 10 (4) (2023), 432–460.
2. On the irrationality of moduli spaces of K3 surfaces (with Daniele Agostini and Ignacio Barros), [Transactions of the American Mathematical Society](#) 376 (2023), No. 2, 1407–1426.
3. Bijective Cremona transformations of the plane (with Shamil Asgarli, Masahiro Nakahara, and Susanna Zimmermann), [Selecta Mathematica, New Series](#) 28, 53 (2022).
4. Uniform potential density for rational points on algebraic groups and elliptic K3 surfaces (with Masahiro Nakahara), [International Mathematics Research Notices](#) 2022, no. 23, 18541–18588.
5. Decompositions of Lagrangian classes on K3 surfaces (with Yu-Shen Lin and Luca Schaffler), [Mathematical Research Letters](#) 28 (2021), no. 6, 1739–1763.
6. Transverse lines to surfaces over finite fields (with Shamil Asgarli and Lian Duan), [manuscripta mathematica](#) 165, 135–157 (2021).
7. Cremona transformations and derived equivalences of K3 surfaces (with Brendan Hassett), [Compositio Mathematica](#) 154 (2018), no. 7, 1508–1533.
8. New cubic fourfolds with odd degree unirational parametrizations, [Algebra & Number Theory](#) 11 (2017), 1597–1626.

## Other Writings

- A tour of the rationality problem of cubic fourfolds — an expository article written for the Proceedings of ICCM 2020 as well as a series of lectures from July 28 to August 3, 2021, at Academia Sinica.

## Research Talks

- 2024 Taiwanese Mathematical Society (TMS) Annual Meeting, National Chengchi University, January 22–23
- Taipei Postdoc Seminar, Academia Sinica & National Center for Theoretical Sciences (NCTS), January 03
- 2023 Student Geometry Seminar, National Tsing Hua University, November 16
- Algebraic Geometry in East Asia, Korea Institute for Advanced Study (KIAS), November 06–10
  - NCTS Seminar in Algebraic Geometry, National Center for Theoretical Sciences (NCTS), September 22

- Algebra, geometry and number theory seminar, Universiteit Leiden, April 26
  - Higher Dimensional Algebraic Geometry Workshop, National Center for Theoretical Sciences (NCTS), March 20–24
  - Colloquium, National Central University, March 16
  - Colloquium, National Cheng Kung University, March 09
- 2022 Birational Complexity of Algebraic Varieties, Simons Center for Geometry and Physics (SCGP), December 12–16
- Géométrie Algébrique et Géométrie Complexe, Centre International de Rencontres Mathématiques (CIRM), November 28–December 02
  - Algebraic and Arithmetic Geometry Seminar, Universität Bielefeld, June 01
  - Colloquium, National Tsing Hua University, March 21 (Online)
- 2021 Arithmétique et géométrie algébrique, Université de Strasbourg, December 09
- Seminar Algebraic Geometry, Universität Bonn, November 18
  - A tour of the rationality problem of cubic fourfolds, Academia Sinica, Taipei, Lecture series during July 28–August 03
  - Seminar of Algebraic Geometry in East Asia, April 16 (Online)
- 2020 International Congress of Chinese Mathematicians (ICCM) at the University of Science and Technology of China, December 27–29 (Online)
- Mathematical Physics Seminar, Center of Mathematical Sciences and Applications (CMSA), April 20 (Online)
  - Geometry, Physics, and Representation Theory Seminar, Northeastern University, January 23.
  - Colloquium, National Central University, Taiwan, January 09.
- 2019 Front Range Algebraic Geometry and Number Theory (FRAGMENT) seminar, Colorado State University, December 12.
- Algebra and Number Theory Seminar, Dartmouth College, September 17.
  - A Summer Day on Algebraic Geometry, Center for Advanced Study in Theoretical Sciences (CASTS), July 01.
  - Valley Geometry Seminar, UMass Amherst, March 08.
  - NT & AG Seminar, Boston College, February 07.
- 2018 Valley Geometry Seminar, UMass Amherst, October 05.
- Workshop on Moduli Spaces and Related Problems, Shanghai Center for Mathematical Sciences (SCMS), September 17–21.
  - Valley Geometry Seminar, UMass Amherst, March 02.
- 2017 Mini-talk at Georgia Algebraic Geometry Symposium (GAGS), University of Georgia, March 03–05.
- Yale Algebraic and Tropical Geometry, Yale University, February 16.
  - Princeton Algebraic Geometry Seminar, Princeton University, February 14.
  - Algebra and Algebraic Geometry Seminars, Brown University, February 10.

2016 Algebra and Algebraic Geometry Seminars, Brown University, October 14.

2013 Algebraic Geometry and Number Theory Seminar, Rice University, December 03.

## **Other Activities**

I have invited and hosted speakers for the following seminars:

- Seminar Algebraic Geometry, University of Bonn, Winter 2021–Summer 2023
- Valley Geometry Seminar, UMass Amherst, Fall 2018–Spring 2021

I have also helped organize the conference:

- Algebraic Geometry Northeastern Series, UMass Amherst, March 22–24, 2019

I have been invited to review papers or give quick opinions for Canadian Mathematical Bulletin, Crelle's Journal, European Journal of Mathematics, Geometry & Topology, Journal of Differential Geometry, Mathematische Zeitschrift, Selecta Mathematica, and some proceedings.

## **Teaching Experience**

### **Universität Bonn**

2022 Summer Semester, Birational Geometry of Algebraic Varieties

### **UMass Amherst**

2021 Spring, Fundamental Concepts of Mathematics (Two sections)

2020 Fall, Independent Study on Algebraic Geometry, Andrew Tawfeek

- Fall, Fundamental Concepts of Mathematics (Two sections)
- Spring, Independent Study on Algebraic Geometry, Andrew Tawfeek
- Spring, Fundamental Concepts of Mathematics
- Spring, Multivariate Calculus

2019 Fall, Multivariate Calculus (Two sections)

- Spring, Calculus II (Two sections)

2018 Fall, Calculus I (Two sections)

### **Brown University**

2017 Fall, Intermediate Calculus

2015 Fall, Introductory Calculus I

### **Rice University**

2015 Summer, Single Variable Calculus II