

## Yota Maeda

Alexander von Humboldt Foundation Postdoctoral Fellow  
Technische Universität Darmstadt

## Education

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Apr 2019- Mar 2023: Ph.D. course in Mathematics, Kyoto University in Japan (Early graduation)  
Advisor: Tetsushi Ito.  
Thesis: Birational geometry and compactifications of modular varieties and arithmetic of modular forms  
Apr 2015- Mar 2019: Undergraduate course in Science, Kyoto University in Japan.

## Affiliations

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Apr 2025 - current: Tohoku University, visiting researcher  
Mar 2025 - current: Technische Universität Darmstadt, Alexander von Humboldt Foundation Postdoctoral Fellow  
Sep 2022 - Feb 2025: Quantum Computing Center, Keio University, researcher.  
Apr 2021 - Feb 2025: Advanced Research Laboratory, Technology Infrastructure Center, Technology Platform, Sony Group Corporation, researcher.

## Others

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Reviewer of zbMATH

## Research Interests

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His research interests widely lie in mathematical science. It ranges from arithmetic geometry (Shimura varieties, Kodaira dimensions and modular forms) to their application to quantum computing and machine learning.

## Grants

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Mar 2025 - current: Alexander von Humboldt Foundation Postdoctoral Fellowship  
Nov 2020 - Mar 2023: Japan Science and Technology Agency, ACT-X: JPMJAX200P (A solution to Kudla's modularity conjecture, a study of Shimura varieties and their applications to the post-quantum cryptography).  
Apr 2021: Japan Society for the Promotion of Science, Research Fellowship for Young Scientist DC1 (declined).

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## Personal

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Japanese: first language  
English: fluent  
Birthdate: March 11, 1997

E-mail address [y.maeda.math@gmail.com](mailto:y.maeda.math@gmail.com)

### Skills

- Programming (C++, Python)
- Research experience on machine learning, cryptography and quantum computing

### Academic Stay in Foreign Countries

- November, 2019 (3 weeks): University of Toronto, Canada
- May and September, 2022 (3 weeks & 2 weeks): Leibniz University Hannover, Germany
- September, 2022 (2 weeks): University of Bath, the UK
- January, 2023 (1 week): National University of Taiwan, Taiwan
- October, 2023 (2 weeks): Mathematisches Forschungsinstitut Oberwolfach, Germany
- January, 2024 (1 week): Taiwan
- February, 2024 (2 weeks): Vancouver
- September, 2024 (1 week): Montreal

### Teaching Experience

2019-2021: Teaching Assistant at Kyoto University

### Outreach activities

JST CREST: Mathematics caravan, expanding Mathematics in Kyoto (2024)

## Work

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### 0 Thesis

- [0.1] [Yota Maeda](#), “*Birational geometry and compactifications of modular varieties and arithmetic of modular forms*”, Ph.D. thesis, Kyoto University (2023).

### 1 Papers

- [1.1] [Yota Maeda](#), Hideaki Kawaguchi, Hiroyuki Tezuka, “*Estimation of mutual information via quantum kernel method*”, Quantum Mach. Intell. 7, 29 (2025).
- [1.2] Klaus Hulek, [Yota Maeda](#), “*Revisiting the moduli space of 8 points on  $\mathbb{P}^1$* ”, Advances in Mathematics 463 (2025): 110126.

- [1.3] [Yota Maeda](#), “*Reflective obstructions of unitary modular varieties*”, J. Algebra, Volume 647 (2024), Pages 341-399.
- [1.4] [Yota Maeda](#), “*Uniruledness of some low-dimensional ball quotients*”, Geometriae Dedicata volume 218, Article number: 3 (2024).
- [1.5] [Yota Maeda](#), “*Irregular cusps of ball quotients*”, Math. Nachr. 2023, 1–29.
- [1.6] [Yota Maeda](#), Yuji Odaka, “*Fano Shimura varieties with mostly branched cusps*”, Springer Proceedings in Mathematics & Statistics (PROMS, volume 409), 2023, 633-664.
- [1.7] [Yota Maeda](#), “*Modularity of special cycles on unitary Shimura varieties over CM-fields*”, Acta Arith. 204 (2022), no. 1, 1–18.
- [1.8] [Yota Maeda](#), “*The modularity of special cycles on orthogonal Shimura varieties over totally real fields under the Beilinson-Bloch conjecture*”, Canad. Math. Bull. 64 (2021), no. 1, 39–53.

## 2 Peer-reviewed conferences

- [2.1] Masakazu Yoshimura, Teruaki Hayashi [Yota Maeda](#), “*MambaPEFT: Exploring Parameter-Efficient Fine-Tuning for Mamba*”, International Conferences on Learning Representations (ICLR 2025).
- [2.2] Hiroshi Yano, [Yota Maeda](#), “*Generalization capacity of singular models in quantum state estimation*”, Quantum Techniques in Machine Learning (QTML 2024).
- [2.3] [Yota Maeda](#), et.al., “*Quantum PC algorithm: data-efficient and nonlinear causal discovery*”, IEEE International Conference on Quantum Computing and Engineering (QCE 2024).

## 3 Preprints

- [3.1] Klaus Hulek, [Yota Maeda](#), “*The Universe of Deligne-Mostow Varieties*”, arXiv:2504.16235, 2025 (23 pages)
- [3.2] Yuta Kambe, [Yota Maeda](#), Tristan Vaccon, “*Geometric Generality of Transformer-Based Gröbner Basis Computation*”, arXiv:2504.12465, 2025 (19 pages)
- [3.3] [Yota Maeda](#) et. al., “*Quantum-enhanced causal discovery for a small number of samples*”, arXiv:2501.05007,(19 pages).
- [3.4] Hiroshi Yano, [Yota Maeda](#), Naoki Yamamoto, “*Statistical inference for quantum singular models*”, arXiv:2411.16396 (57 pages, equally contributed).
- [3.5] Klaus Hulek, [Yota Maeda](#), Shigeyuki Kondo, “*Compactifications of the Eisenstein ancestral Deligne-Mostow variety*”, arXiv:2403.18345 (50 pages).

## 4 Proceedings (with no peer review)

- [4.1] [Yota Maeda](#), “*Volume formulae for algebraic groups*”, Sendai modular form mini workshop at Tohoku (2025).
- [4.2] Hiroshi Yano, [Yota Maeda](#), “*Generalization capacity of singular models in quantum state estimation*” Quantum Techniques in Machine Learning (QTML2024) at Melbourne, Australia (2024).
- [4.3] [Yota Maeda](#) et. al., “*Quantum PC algorithm: data-efficient and nonlinear causal discovery*” IEEE International Conference on Quantum Computing and Engineering at Montréal, Canada (2024).

- [4.4] Hiroshi Yano, Yota Maeda, “A quantum widely applicable information criterion for quantum state estimation”, Joint Symposium on Quantum Computing 2024 at National Taiwan University (2024).
- [4.5] Yota Maeda, “A solution to Kudla’s modularity conjecture, a study of Shimura varieties and its application to the post-quantum cryptography” ACT-X: Debriefing session at Tokyo (2024).
- [4.6] Yota Maeda, “The Kodaira dimension of modular varieties”, Mathsci freshman seminar (2021).
- [4.7] Yota Maeda, “On the Kodaira dimension of unitary Shimura varieties”, RIMS conference “Automorphic forms, Automorphic representations, Galois representations, and its related topics” Kokyuroku (2021).
- [4.8] Yota Maeda, “Uniruledness of some unitary Shimura varieties”, Kinoshita Algebraic Geometry Symposium, Kyoto University Research Information Repository (2020).
- [4.9] Yota Maeda, “On the modularity of special cycles on Shimura varieties”, Mathsci freshman seminar (2020).
- [4.10] Yota Maeda, “On the modularity of special cycles on orthogonal Shimura varieties”, RIMS conference “Analytic, geometric and  $p$ -adic aspects of automorphic forms and L-functions” Kokyuroku (2020).
- [4.11] Yota Maeda, “The local Langlands conjecture for  $GL_n$ ”, Mathsci freshman seminar (2019).

## 5 Talks (conferences)

- [5.1] “Extendability of the period maps on  $M_{0,n}$ ”, Sendai modular form mini workshop, Tohoku, 2024.
- [5.2] “Extendability of the period maps on  $M_{0,n}$ ”, Number Theory Seminar at Kyoto University, Kyoto, 2023.
- [5.3] “Extendability of the period maps on  $M_{0,n}$ ”, Tsuda Seisuron Workshop, Tokyo, 2023.
- [5.4] “Modular interpretation of the moduli spaces of weighted pointed stable rational curves”, Nagoya Algebraic Geometry Seminar at Nagoya University, 2023.
- [5.5] “Modular interpretation of the moduli spaces of weighted pointed stable rational curves”, Number Theory Seminar at Waseda University, Tokyo, 2023.
- [5.6] “Revisiting the moduli space of 8 points on  $\mathbb{P}^1$ ”, Sendai modular form mini workshop, Tohoku, 2023.
- [5.7] “Deligne-Mostow theory and beyond”, International Seminar on Automorphic Forms (Zoom meeting), 2023.
- [5.8] “Deligne-Mostow theory and beyond”, East Asia Core Doctoral Forum in Mathematics, Taiwan, 2023.
- [5.9] “Deligne-Mostow theory and beyond”, a colloquium at Tokyo University of Science, Tokyo, 2022.
- [5.10] “On the geometry of higher dimensional ball quotients”, 21-st Sendai-Hiroshima Workshop on Number Theory, Tohoku, 2022.
- [5.11] “The volumes of unitary groups and geometry of ball quotients”, Number theory & Automorphic forms Seminar, Osaka, 2022.
- [5.12] “The Hirzebruch-Mumford volume of unitary groups and its application to the geometry of ball quotients”, Research Seminar Number Theory and Arithmetic Geometry (Leibniz University Hannover), 2022.
- [5.13] , “The Hirzebruch-Mumford volume of unitary groups and its application to birational types of ball quotients”, Algebraic Geometry Seminar, Nagoya, 2022.
- [5.14] “Big line bundles on ball quotients”, Sendai modular form mini workshop, Tohoku, 2022.
- [5.15] “Irregular cusps and Kodaira dimension of unitary modular varieties”, Number theory Autumn workshop, Kanazawa, 2021.

- [5.16] “*Fano Shimura varieties and special modular forms*”, Algebraic Number Theory in Kyushu (Zoom meeting), 2021.
- [5.17] “*Fano Shimura varieties with mostly branched cusps*”, Friday Tea Time Zoom Seminar (Zoom meeting), 2021.
- [5.18] “*The Kodaira dimension of modular varieties*”, Mathsci freshman seminar 2021 (Zoom meeting), 2021.
- [5.19] “*On the Kodaira dimension of unitary Shimura varieties*”, RIMS conference “Automorphic forms, Automorphic representations, Galois representations, and its related topics” (Zoom meeting), 2021.
- [5.20] “*On the Kodaira dimension of unitary Shimura varieties*”, Hannover algebraic geometry seminar (Zoom meeting), 2020.
- [5.21] “*Uniruledness of some unitary Shimura varieties*”, Kinoshita Algebraic Geometry Symposium 2020 (Zoom meeting), 2020.
- [5.22] “*On the singularities of unitary Shimura varieties and their applications to the Kodaira dimension*”, 19-th Hiroshima-Sendai Workshop on Number Theory (Zoom meeting), 2020.
- [5.23] “*On the modularity of special cycles on Shimura varieties*”, Mathsci freshman seminar 2020, Nagoya 2020.
- [5.24] “*On the modularity of special cycles on orthogonal Shimura varieties*”, RIMS conference “Analytic, geometric and  $p$ -adic aspects of automorphic forms and L-functions”, Kyoto, 2020.
- [5.25] “*On the modularity of the generating series of special cycles on orthogonal Shimura varieties*”, Number Theory Seminar, Kyoto, 2019.
- [5.26] “*The local Langlands conjecture for  $GL_n$* ”, Mathsci freshman seminar 2019, Kyoto, 2019.

## 6 Talks (others)

- [6.1] “*Deligne-Mostow theory and beyond*”, poster presentation at Session “Young Mathematicians Challenges”, Tokyo, 2023.
- [6.2] “*Eichler orders and the Deuring correspondence*”, A number theoretic approach for Post-Quantum Cryptography related to Ramanujan graphs, Kyushu, 2021.
- [6.3] “*Modular varieties and modular forms~intersection of number theory and algebraic geometry~*”, Student Colloquium at Kyoto University (Zoom meeting), 2021.

## 7 Panel discussion

- [7.1] “*Keio Quantum Computing Center and Expectations for Quantum Computers*”, Frontiers of Quantum Computers at Keio Quantum Computing Center, 2023.