Gary Pui Tung CHOI

Department of Mathematics, The Chinese University of Hong Kong

PERSONAL INFORMATION

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EMPLOYMENT

The Chinese University of Hong Kong, Hong Kong
- **Vice-Chancellor Assistant Professor**, Department of Mathematics 2023–Present

Massachusetts Institute of Technology, Cambridge, MA, USA
- **NSF Postdoctoral Fellow and Instructor in Applied Mathematics** 2020–2023
  - Sponsoring Scientist: Jörn Dunkel

EDUCATION

Harvard University, Cambridge, MA, USA
- **Ph.D. in Applied Mathematics** 2016–2020
  - Advisors: L. Mahadevan FRS and Chris Rycroft
  - Dissertation: "Metamaterials, Morphometrics, Morphogenesis, and Mappings"
- **S.M. in Applied Mathematics** 2019

The Chinese University of Hong Kong, Hong Kong
- **M.Phil. in Mathematics** 2014–2016
  - Advisor: Ronald Lok Ming Lui
  - Thesis: "Surface Conformal/Quasi-conformal Parameterization with Applications" (with 2017 New World Mathematics Award, Silver Medal for Master Thesis)
- **B.Sc. in Mathematics** (First Class Honors) 2010–2014
  - Streams: Enrichment Stream in Mathematics, Computational and Applied Mathematics Stream
  - Minors: Computer Science, Earth System Science

RESEARCH INTERESTS

Applied and Computational Geometry, Interdisciplinary Mathematical Modeling, Mechanical Metamaterials, Quantitative Biology, Medical Imaging, Geometry Processing, Scientific Computing

PUBLICATIONS

(*:equal contribution; †:corresponding author; undergraduate/graduate/postdoctoral research advisees are highlighted in purple.)

PREPRINT/SUBMITTED

[77] T. Lau and G. P. T. Choi†, "Exact Schur-Sylvester dimensionality reductions for non-smooth stochastic complexity and manifold sampling." Preprint, arXiv:2606.23867.

[76] G. P. T. Choi*, K. Dao Duc*, S. Faigenbaum-Golovin*, K. Habermann*, E. Hartman*, C. von Tycowicz*, C. Zhang*, W. Zhao*, and F. Zhou*, "Learning the geometry of data: A mathematical review of shape space analysis," preprint, arXiv:2606.17022.

[75] O. Y. L. Chau, R. Bendick, G. P. T. Choi†, and L. Mahadevan†, "How geometry of subduction zones correlates with earthquake dynamics," preprint, arXiv:2606.02520.

[74] Y. Huang, L. M. Lui, and G. P. T. Choi†, "Resolution-free neural surrogates for geometric parameterization and mapping with spatially varying fields." Preprint, arXiv:2605.28551.

[73] T. Lau and G. P. T. Choi†, "The normalized maximum likelihood for regular non-smooth models: Measure-theoretic foundations and geometric sampling." Preprint, arXiv:2605.24477.

[72] H. Li and G. P. T. Choi†, "Planar morphometry via functional shape data analysis and quasi-conformal mappings." Preprint, arXiv:2605.05778.

[71] K. Lau and G. P. T. Choi†, "PhyloSDF: Phylogenetically-conditioned neural generation of 3D skull morphology via residual flow matching." Preprint, arXiv:2604.25371.

[70] S. Yao and G. P. T. Choi†, "Conformal tubular parameterization and toroidal bending of tube-like surfaces." Preprint, arXiv:2605.16305.

[69] K. H. Lai, H. T. Tsang, G. P. T. Choi, and L. M. Lui, "Optimization of constrained quasiconformal mapping for origami design," Preprint, arXiv:2604.20137.

[68] H. H. C. Cheng and G. P. T. Choi†, "Monotile kirigami," Preprint, arXiv:2604.19586.

[67] J. Fang, X. Ding†, and G. P. T. Choi†, "Geometric quantification for nonlinear deformation in knitted fabrics," Preprint, arXiv:2604.19030.

[66] Z. Lyu and G. P. T. Choi†, "Beltrami coefficient and angular distortion of discrete geometric mappings," Preprint, arXiv:2603.19240.

[65] M. Y. L. Yip and G. P. T. Choi†, "Low-distortion planar embedding of rod-based structures," Preprint, arXiv:2602.07789.

[64] K. Lau and G. P. T. Choi†, "Robust parametric estimation of avian cranial morphology," Preprint, arXiv:2511.06426.

[63] T. Lau and G. P. T. Choi†, "Explosive connectivity and mechanical rigidity in cubic lattice structures," Preprint, arXiv:2511.01537.

[62] Q. Jiang and G. P. T. Choi†, "PyKirigami: An interactive Python simulator for kirigami structures," Preprint, arXiv:2508.15753.

[61] Z. Lyu, Q. Chen, G. P. T. Choi, and L. M. Lui, "Volumetric parameterization for 3-dimensional simply-connected manifolds," Preprint, arXiv:2506.17025.

ACCEPTED/PUBLISHED

[60] R. Li and G. P. T. Choi†, "Rigidity control of general origami structures," ***Communications Physics***, 9, 217, 2026.

[59] Z. Lyu, L. M. Lui, and G. P. T. Choi†, "Ellipsoidal density-equalizing map for genus-0 closed surfaces," ***Advances in Computational Mathematics***, 52, 30, 2026.

[58] S. Yao and G. P. T. Choi†, "Toroidal density-equalizing map for genus-one surfaces," ***Journal of Computational and Applied Mathematics***, 472, 116844, 2026.

[57] G. P. T. Choi, C. Liu, S. Yin, G. Séjourné, R. S. Smith, C. A. Walsh, and L. Mahadevan, "Biophysical basis for brain folding and misfolding patterns in ferrets and humans," ***eLife***, 14, RP107141, 2025.
- Featured in Harvard SEAS News.

[56] S. Yin, C. Liu, Y. Jung, G. P. T. Choi, K. Heuer, R. Toro, and L. Mahadevan, "Morphogenesis and morphometry of brain folding patterns across species," ***eLife***, 14, RP107138, 2025.
- Featured in Harvard SEAS News.

[55] Y. Huang, L. M. Lui, and G. P. T. Choi†, "Learning-based density-equalizing map," ***AIMS Mathematics***, 10(11), 25756-25790, 2025.

[54] R. Li and G. P. T. Choi†, "Explosive rigidity percolation in origami," ***Proceedings of the Royal Society A***, 481(2316), 20240826, 2025.

[53] S. Mosleh*, G. P. T. Choi*, and L. Mahadevan, "Data-driven quasi-conformal morphodynamic flows," ***Proceedings of the Royal Society A***, 481(2314), 20240527, 2025.
- Featured as the journal cover article.

[52] G. P. T. Choi† and M. Shaqfa, "Hemispheroidal parameterization and harmonic decomposition of simply connected open surfaces," ***Journal of Computational and Applied Mathematics***, 461, 116455, 2025.

[51] G. Notomista, G. P. T. Choi, and M. Saveriano, "Reactive robot navigation using quasi-conformal mappings and control barrier functions," ***IEEE Transactions on Control Systems Technology***, 33(3), 928–939, 2025.

[50] M. Shaqfa, G. P. T. Choi, G. Anciaux, and K. Beyer, "Disk harmonics for analysing curved and flat self-affine rough surfaces and the topological reconstruction of open surfaces," ***Journal of Computational Physics***, 522, 113578, 2025.

[49] G. P. T. Choi†, "Designing flexible mechanical metamaterials with complex functionalities," ***Nature Materials***, 23(11), 1458–1460, 2024.

[48] Z. Lyu, L. M. Lui, and G. P. T. Choi†, "Spherical density-equalizing map for genus-0 closed surfaces," ***SIAM Journal on Imaging Sciences***, 17(4), 2110–2141, 2024.

[47] G. P. T. Choi†, "Computational design of art-inspired metamaterials," ***Nature Computational Science***, 4(8), 549–552, 2024.

[46] T. Ohmura, D. J. Skinner, K. Neuhaus, G. P. T. Choi, J. Dunkel, and K. Drescher, "*In vivo* microrheology reveals local elastic and plastic responses inside three-dimensional bacterial biofilms," ***Advanced Materials***, 36(29), 2314059, 2024.
- Selected as Editors' Choice.

[45] G. P. T. Choi†, "Fast ellipsoidal conformal and quasi-conformal parameterization of genus-0 closed surfaces," ***Journal of Computational and Applied Mathematics***, 447, 115888, 2024.

[44] Z. Lyu, G. P. T. Choi, and L. M. Lui, "Bijective density-equalizing quasiconformal map for multiply connected open surfaces," ***SIAM Journal on Imaging Sciences***, 17(1), 706–755, 2024.

[43] S. Mosleh*, G. P. T. Choi*, G. M. Musser, H. F. James, A. Abzhanov, and L. Mahadevan, "Beak morphometry and morphogenesis across avian radiations," ***Proceedings of the Royal Society B***, 290(2007), 20230420, 2023.

[42] Y. Guo, Q. Chen, G. P. T. Choi, and L. M. Lui, "Automatic landmark detection and registration of brain cortical surfaces via quasi-conformal geometry and convolutional neural networks," ***Computers in Biology and Medicine***, 163, 107185, 2023.

[41] L. H. Dudte*, G. P. T. Choi*, K. P. Becker, and L. Mahadevan, "An additive framework for kirigami design," ***Nature Computational Science***, 3(5), 443–454, 2023.
- Featured in media outlets including Nature Computational Science News & Views, MIT News, Harvard SEAS News, News 8 Plus, Mirage News, and Tech Xplore.

[40] G. P. T. Choi, L. Liu, and L. Mahadevan, "Explosive rigidity percolation in kirigami," ***Proceedings of the Royal Society A***, 479(2271), 20220798, 2023.

[39] G. P. T. Choi and L. M. Lui, "Recent developments of surface parameterization methods using quasi-conformal geometry," ***Handbook of Mathematical Models and Algorithms in Computer Vision and Imaging***, Springer, Cham, 1483–1523, 2023.

[38] T. Dixit, G. P. T. Choi*, S. Al-Mosleh*, J. Lund, J. Troscianko, C. Moya, L. Mahadevan, and C. N. Spottiswoode, "Combined measures of mimetic fidelity explain imperfect mimicry in a brood parasite-host system," ***Biology Letters***, 19(2), 20220538, 2023.

[37] R. Supekar, B. Song, A. Hastewell, G. P. T. Choi, A. Mietke, and J. Dunkel, "Learning hydrodynamic equations for active matter from particle simulations and experiments," ***Proceedings of the National Academy of Sciences***, 120, e2206994120, 2023.

[36] Z. Zhu, G. P. T. Choi, and L. M. Lui, "Parallelizable global quasi-conformal parameterization of multiply connected surfaces via partial welding," ***SIAM Journal on Imaging Sciences***, 15(4), 1765–1807, 2022.

[35] L. Liu*, G. P. T. Choi*, and L. Mahadevan, "Quasicrystal kirigami," ***Physical Review Research***, 4(3), 033114, 2022.
- Selected as Editors' Suggestion.

[34] S. Chen, F. Giardina, G. P. T. Choi, and L. Mahadevan, "Modular representation and control of floppy networks," ***Proceedings of the Royal Society A***, 478(2264), 20220082, 2022.

[33] G. P. T. Choi†, A. Giri, and L. Kumar, "Adaptive area-preserving parameterization of open and closed anatomical surfaces," ***Computers in Biology and Medicine***, 148, 105715, 2022.

[32] D. Zhang, G. P. T. Choi, J. Zhang, and L. M. Lui, "A unifying framework for n-dimensional quasi-conformal mappings," ***SIAM Journal on Imaging Sciences***, 15(2), 960–988, 2022.

[31] H. Law, G. P. T. Choi, K. C. Lam, and L. M. Lui, "Quasiconformal model with CNN features for large deformation image registration," ***Inverse Problems and Imaging***, 16(4), 1019–1046, 2022.

[30] G. P. T. Choi, Y. Liu, and L. M. Lui, "Free-boundary conformal parameterization of point clouds," ***Journal of Scientific Computing***, 90(1), 14, 2022.

[29] S. Al-Mosleh, G. P. T. Choi, A. Abzhanov, and L. Mahadevan, "Geometry and dynamics link form, function and evolution of finch beaks," ***Proceedings of the National Academy of Sciences***, 118(46), e2105957118, 2021.
- Featured in Harvard SEAS News.

[28] G. P. T. Choi, L. H. Dudte, and L. Mahadevan, "Compact reconfigurable kirigami," ***Physical Review Research***, 3(4), 043030, 2021.

[27] M. Shaqfa, G. P. T. Choi, and K. Beyer, "Spherical cap harmonic analysis (SCHA) for characterising the morphology of rough surface patches," ***Powder Technology***, 393, 837–856, 2021.

[26] L. Liu*, G. P. T. Choi*, and L. Mahadevan, "Wallpaper group kirigami," ***Proceedings of the Royal Society A***, 477(2252), 20210161, 2021.

[25] B. Jarvis, G. P. T. Choi, B. Hockman, B. Morrell, S. Bandopadhyay, D. Lubey, J. Villa, S. Bhaskaran, D. Bayard, and I. A. Nesnas, "3D shape reconstruction of small bodies from sparse features," ***IEEE Robotics and Automation Letters***, 6(4), 7089–7096, 2021.

[24] M. B. Edwards, G. P. T. Choi, N. J. Derieg, Y. Min, A. C. Diana, S. A. Hodges, L. Mahadevan, E. M. Kramer, and E. S. Ballerini, "Genetic architecture of floral traits in bee- and hummingbird-pollinated sister species of *Aquilegia* (columbine)," ***Evolution***, 75(9), 2197–2216, 2021.

[23] L. H. Dudte, G. P. T. Choi, and L. Mahadevan, "An additive algorithm for origami design," ***Proceedings of the National Academy of Sciences***, 118(21), e2019241118, 2021.

[22] G. P. T. Choi†, "Efficient conformal parameterization of multiply-connected surfaces using quasi-conformal theory," ***Journal of Scientific Computing***, 87(3), 70, 2021.

[21] G. P. T. Choi† and C. H. Rycroft, "Volumetric density-equalizing reference map with applications," ***Journal of Scientific Computing***, 86(3), 41, 2021.

[20] A. Giri*, G. P. T. Choi*,†, and L. Kumar, "Open and closed anatomical surface description via hemispherical area-preserving map," ***Signal Processing***, 180, 107867, 2021.

[19] G. P. T. Choi, S. Chen, and L. Mahadevan, "Control of connectivity and rigidity in prismatic assemblies," ***Proceedings of the Royal Society A***, 476(2244), 20200485, 2020.

[18] G. P. T. Choi, D. Qiu, and L. M. Lui, "Shape analysis via inconsistent surface registration," ***Proceedings of the Royal Society A***, 476(2242), 20200147, 2020.

[17] A. Chakrabarti, G. P. T. Choi, and L. Mahadevan, "Self-excited motions of volatile drops on swellable sheets," ***Physical Review Letters***, 124(25), 258002, 2020.
- Featured in media outlets including Harvard SEAS News, Phys.org, Tech Explorist, and N+1 (in Russian).

[16] G. P. T. Choi, Y. Leung-Liu, X. Gu, and L. M. Lui, "Parallelizable global conformal parameterization of simply-connected surfaces via partial welding," ***SIAM Journal on Imaging Sciences***, 13(3), 1049–1083, 2020.

[15] S. Chen*, G. P. T. Choi*, and L. Mahadevan, "Deterministic and stochastic control of kirigami topology," ***Proceedings of the National Academy of Sciences***, 117(9), 4511–4517, 2020.

[14] G. P. T. Choi†, B. Chiu, and C. H. Rycroft, "Area-preserving mapping of 3D carotid ultrasound images using density-equalizing reference map," ***IEEE Transactions on Biomedical Engineering***, 67(9), 1507–1517, 2020.

[13] G. P. T. Choi, H. L. Chan, R. Yong, S. Ranjitkar, A. Brook, G. Townsend, K. Chen, and L. M. Lui, "Tooth morphometry using quasi-conformal theory," ***Pattern Recognition***, 99, 107064, 2020.

[12] A. Pumarola, J. Sanchez-Riera, G. P. T. Choi, A. Sanfeliu, and F. Moreno-Noguer, "3DPeople: Modeling the geometry of dressed humans," ***Proceedings of the IEEE International Conference on Computer Vision (ICCV)***, 2242–2251, 2019.
- Featured in media outlets including AI^3 | Theory, Practice, Business and Synced.

[11] G. P. T. Choi, L. H. Dudte, and L. Mahadevan, "Programming shape using kirigami tessellations," ***Nature Materials***, 18, 999–1004, 2019.
- Featured as the journal cover article and in media outlets including Harvard SEAS News, Science Daily, Interesting Engineering,Phys.org, Index Hungary (in Hungarian), fabcross (in Japanese), Asahi Shimbun (in Japanese), and Popular Mechanics.

[10] G. P. T. Choi and L. Mahadevan, "Planar morphometrics using Teichmüller maps," ***Proceedings of the Royal Society A***, 474(2217), 20170905, 2018.

[9] C. P. Yung, G. P. T. Choi, K. Chen, and L. M. Lui, "Efficient feature-based image registration by mapping sparsified surfaces," ***Journal of Visual Communication and Image Representation***, 55, 561–571, 2018.

[8] G. P. T. Choi† and C. H. Rycroft, "Density-equalizing maps for simply connected open surfaces," ***SIAM Journal on Imaging Sciences***, 11(2), 1134–1178, 2018.

[7] G. P. T. Choi and L. M. Lui, "A linear formulation for disk conformal parameterization of simply-connected open surfaces," ***Advances in Computational Mathematics***, 44(1), 87–114, 2018.

[6] G. P. T. Choi, Y. Chen, L. M. Lui, and B. Chiu, "Conformal mapping of carotid vessel wall and plaque thickness measured from 3D ultrasound images," ***Medical & Biological Engineering & Computing***, 55(12), 2183–2195, 2017.

[5] G. P. T. Choi, M. H. Y. Man, and L. M. Lui, "Fast spherical quasiconformal parameterization of genus-0 closed surfaces with application to adaptive remeshing," ***Geometry, Imaging and Computing***, 3(1–2), 1–29, 2016.

[4] T. W. Meng, G. P. T. Choi, and L. M. Lui, "TEMPO: Feature-endowed Teichmüller extremal mappings of point clouds," ***SIAM Journal on Imaging Sciences***, 9(4), 1922–1962, 2016.

[3] G. P. T. Choi, K. T. Ho, and L. M. Lui, "Spherical conformal parameterization of genus-0 point clouds for meshing," ***SIAM Journal on Imaging Sciences***, 9(4), 1582–1618, 2016.

[2] P. T. Choi and L. M. Lui, "Fast disk conformal parameterization of simply-connected open surfaces," ***Journal of Scientific Computing***, 65(3), 1065–1090, 2015.

[1] P. T. Choi, K. C. Lam, and L. M. Lui, "FLASH: Fast landmark aligned spherical harmonic parameterization for genus–0 closed brain surfaces," ***SIAM Journal on Imaging Sciences***, 8(1), 67–94, 2015.

RESEARCH FUNDING

- (PI) HKRGC Early Career Scheme #24303625 — 2026/01–2028/12
- (PI) Croucher Tak Wah Mak Innovation Award — 2025/08–2030/07
- (PI) CUHK Faculty of Science Direct Grant for Research — 2025/03–2026/02
- (PI) NSFC Young Scientists Fund #12401503 — 2025/01–2027/12
- (PI) CUHK Faculty of Science Direct Grant for Research — 2024/01–2024/12
- (PI) CUHK Research Data Management Development Fund — 2024/01–2025/12
- (PI) Croucher Foundation Start-up Allowance — 2023/08–2028/07
- (PI) CUHK Research Startup Matching Support — 2023/08–2026/07
- (PI) CUHK VC Early Career Professorship Startup Fund — 2023/08–2026/07
- (Co-I) HKRGC General Research Fund #14306723 — 2024/01–2026/12
- (Co-I) HKRGC General Research Fund #14307622 — 2023/01–2025/12
- (PI) US National Science Foundation MSPRF DMS-2002103 — 2020/07–2023/06

EDUCATIONAL FUNDING

- (PI) Provision of Services for Organising the Competition Participation Trip of the 2026 Hong Kong-Shanghai Mathematical Modelling Competition for Secondary Students and Related Training Programmes for the Representatives of Hong Kong, Education Bureau, HKSAR Government — 2026/01–2026/09
- (PI) Provision of Services for the "Enhanced Programme on Promoting Mathematical Modelling for Teachers and Students in Secondary Schools", Education Bureau, HKSAR Government — 2025/10–2026/08
- (Co-PI) Mathematical and Computational Methods for Artificial Intelligence and Quantitative Finance, Gifted Education Fund — 2025/02–2025/12
- (PI) Provision of Services for Organising the First Hong Kong-Shanghai Mathematical Modelling Competition for Senior Secondary Students and Related Training Programmes for the Representatives of Hong Kong, Education Bureau, HKSAR Government — 2024/12–2025/09
- (PI) Provision of Services for the "Enhanced Programme on Promoting Mathematical Modelling for Teachers and Students in Secondary Schools", Education Bureau, HKSAR Government — 2024/10–2025/08

AWARDS AND HONORS

- Stanford/Elsevier's World's Top 2% Scientists 2025 (by single-year impact) — 2025
- Croucher Tak Wah Mak Innovation Award — 2025
  - Featured in Croucher News, CUHK Press Release, Ming Pao News, Sing Tao News and Wen Wei Po News.
- NSFC Young Scientists Fund — 2024
- CUHK Vice-Chancellor Early Career Professorship — 2023
- SIAM Early Career Travel Award — 2022
- NSF Mathematical Sciences Postdoctoral Research Fellowship — 2020–2023
- SIAM Student Travel Award — 2020
- NSF-Simons QuantBio Student Fellowship, Harvard University — 2019–2020
- Silver Medal for Master Thesis, New World Mathematics Award — 2017
- Best Poster Award, Workshop on Applications-Driven Geometric Functional Data Analysis — 2017
- Certificate of Distinction in Teaching, Harvard University — 2017
- Croucher Foundation Scholarship — 2016–2019
- Hong Kong Scholarship for Excellence, HKSAR Government — 2016
- Mr. Ch'ien Mu Postgraduate Scholarship, New Asia College, CUHK — 2016
- Best Teaching Assistant Award, Department of Mathematics, CUHK — 2014–2015

PRESENTATIONS

- Soft Math Symposium, Cambridge, MA, USA — May 2026
  Mathematical and computational design of origami and kirigami metamaterials
- Mathematics and Biology I: Morphometry, Morphogenesis and Mathematics, Cambridge, MA, USA — Mar 2026
  Quantifying shape variation using quasi-conformal geometry
- 2025 International Congress of Basic Science, Beijing — Jul 2025
  Density-equalizing map with applications
- The 26th Conference of the International Linear Algebra Society, Kaohsiung — Jun 2025
  Density-equalizing map with applications
- SIAM Conference on Computational Science and Engineering (SIAM-CSE25), Fort Worth, TX, USA — Mar 2025
  Density-equalizing map with applications
- HKMS-HKSIAM Joint Young Scholars Symposium 2024, Hong Kong — Dec 2024
  Density-equalizing map with applications
- Applied Mathematics Seminar, Harvard University, Cambridge, MA, USA — Aug 2024
  Density-equalizing map for geometry processing
- SIAM Conference on Imaging Science (SIAM-IS24), Atlanta, GA, USA — May 2024
  Geometric design of kirigami metamaterials
- SIAM Conference on Applied Linear Algebra (SIAM-LA24), Paris, France — May 2024
  Kirigami metamaterial design using linear algebra
- CUHK SIAM Student Annual Workshop, Hong Kong — Mar 2024
  Density-equalizing map with applications
- 2024 Joint Mathematics Meetings (JMM 2024), San Francisco, CA, USA — Jan 2024
  Quantifying shape variation using quasi-conformal geometry
- BIRS Workshop on Mathematical Methods for Exploring and Analyzing Morphological Shapes across Biological Scales, Banff, Canada (Virtual) — Sep 2023
  Quantifying shape variation using quasi-conformal geometry
- The 10th International Congress on Industrial and Applied Mathematics (ICIAM 2023), Tokyo, Japan — Aug 2023
  Density-equalizing map with applications
- Geometry and Packing in Materials Science and Biology (GeomPack) (Virtual) — Dec 2022
  Geometric design of kirigami metamaterials
- New England Workshop on the Mechanics of Materials and Structures (NEW.Mech 2022), Cambridge, MA, USA — May 2022
  Additive kirigami
- SIAM Conference on Imaging Science (SIAM-IS22) (Virtual) — Mar 2022
  Geometric design of kirigami metamaterials
- APS March Meeting 2022, Chicago, IL, USA — Mar 2022
  Additive design of origami and kirigami
- APS March Meeting 2021 (Virtual) — Mar 2021
  Reconfigurable kirigami

- SIAM Conference on Imaging Science (SIAM-IS20) (Virtual) Jul 2020
  Quantifying shape variation using quasi-conformal geometry
- The 8th Annual Winter Q-Bio Conference (2020 Winter Q-Bio), Waikoloa Village, HI, USA Feb 2020
  Planar morphometrics via Teichmüller mappings
- MIT Physical Mathematics Seminar, Cambridge, MA, USA Dec 2019
  Geometric and topological control of kirigami
- New England Workshop on the Mechanics of Materials and Structures (NEW.Mech 2019), Amherst, MA, USA Oct 2019
  Geometric and topological control of kirigami
- APS March Meeting 2019, Boston, MA, USA Mar 2019
  Inverse kirigami design
- SIAM Conference on Computational Science and Engineering (SIAM-CSE19), Spokane, WA, USA Feb 2019
  Density-equalizing reference map with applications
- International Conference on Applied Mathematics (ICAM) 2018, Hong Kong Jun 2018
  Density-equalizing maps for simply-connected open surfaces
- New England Workshop on the Mechanics of Materials and Structures (NEW.Mech 2017), Cambridge, MA, USA Oct 2017
  Programming shape using kirigami tessellations
- Workshop on Applications-Driven Geometric Functional Data Analysis, Tallahassee, FL, USA Oct 2017
  Planar morphometrics via Teichmüller mappings (with the Best Poster Paper Award)
- The Third International Conference on Engineering and Computational Mathematics (ECM2017), Hong Kong Jun 2017
  Planar morphometrics via Teichmüller mappings
- Croucher Symposium 2016, Hong Kong Dec 2016
  Geometric problems in biology
- International Conference on Applied Mathematics (ICAM) 2016, Hong Kong Jun 2016
  Spherical conformal parameterization of genus-0 point clouds for meshing
- The Hong Kong Mathematical Society Annual General Meeting 2016, Hong Kong May 2016
  Spherical conformal parameterization of genus-0 point clouds for meshing
- The Hong Kong Mathematical Society Annual General Meeting 2015, Hong Kong May 2015
  Fast Disk conformal parameterization of simply-connected open surfaces
- International Conference on Applied Mathematics (ICAM) 2014, Hong Kong Dec 2014
  FLASH: Fast landmark aligned spherical harmonic parameterization for genus-0 closed brain surfaces
- 2014 Imaging Science Camp, Guangzhou Nov 2014
  FLASH: Fast landmark aligned spherical harmonic parameterization for genus-0 closed brain surfaces
- SIAM Conference on Imaging Science (SIAM-IS14), Hong Kong May 2014
  Fast optimized harmonic registration of genus-0 closed surfaces with landmark constraints

TEACHING

The Chinese University of Hong Kong

- **Lecturer**, Department of Mathematics 2023–Present
  - MATH3320 Foundation of Data Analytics, 2026-27 Term 1.
  - MATH4400 Project, 2026-27 Term 1.
  - AISC5020 Mathematics & Statistics for AI, 2026-27 Term 1.
  - AISC5030 Introduction of AI for Science, 2026-27 Term 1.
  - 2025-26 Undergraduate Research Opportunity Project (UROP), Spring 2026 – Summer 2026.
  - MATH2221A Mathematics Laboratory II, 2025-26 Term 2.
  - MATH2221B Mathematics Laboratory II, 2025-26 Term 2.
  - MATH2221C Mathematics Laboratory II, 2025-26 Term 2.
  - MATH3320 Foundation of Data Analytics, 2025-26 Term 1.
  - MATH4400C Project, 2025-26 Term 1.
  - 2024-25 Undergraduate Research Opportunity Project (UROP), Spring 2025 – Summer 2025.
  - MATH2221A Mathematics Laboratory II, 2024-25 Term 2.
  - MATH2221B Mathematics Laboratory II, 2024-25 Term 2.
  - MATH2221C Mathematics Laboratory II, 2024-25 Term 2.
  - MATH4400A Project, 2024-25 Term 1.
  - 2023-24 Undergraduate Research Opportunity Project (UROP), Spring 2024 – Summer 2024.
  - MATH1010 University Mathematics, 2023-24 Term 1.

Massachusetts Institute of Technology

- **Instructor in Applied Mathematics**, Department of Mathematics 2020–2023
  - (Course Administrator) 18.03 Differential Equations, Spring 2023.
  - (Lecturer) 18.085/18.0851 Computational Science and Engineering, Fall 2022. (Student evaluation = 6.2/7.0)
  - (Guest Lecturer) 18.04 Complex Variables with Applications, Spring 2022.
  - (Recitation Instructor) 18.06 Linear Algebra, Spring 2022. (Student evaluation = 6.6/7.0)
  - (Recitation Instructor) 18.03 Differential Equations, Fall 2021. (Student evaluation = 6.2/7.0)

Harvard University

- **Teaching Fellow**, John A. Paulson School of Engineering and Applied Sciences (SEAS) 2017
  - AM205 Advanced Scientific Computing: Numerical Methods, Fall 2017.
    (with *Certificate of Distinction in Teaching*; Student evaluation = 4.71/5.00, SEAS average = 4.29/5.00)

The Chinese University of Hong Kong

- **Teaching Assistant**, Department of Mathematics 2014–2016
  - MATH3220 Operations Research and Logistics, Spring 2016.
  - MATH3080 Number Theory, Fall 2015.
  - MATH3220 Operations Research and Logistics, Spring 2015. (with *2014–15 Best Teaching Assistant Award*)
  - MATH3080 Number Theory, Fall 2014. (with *2014–15 Best Teaching Assistant Award*)
- **Teaching Assistant Leader**, EPYMT 2012–2015

  The Enrichment Programme for Young Mathematics Talents (EPYMT) is an enrichment programme offered by the Department of Mathematics for mathematically gifted secondary school students.
  - SAYT1134 Towards Differential Geometry, Summer 2015.
  - SAYT1134 Towards Differential Geometry, Summer 2014.
  - SAYT1114 Number Theory and Cryptography, Summer 2012.
- **Assistant Mentor**, EPYMT 2011–2013
  - CUSA0114 Enrichment Mentoring Mathematics II, November 2012 – July 2013.
  - CUSA0104 Enrichment Mentoring Mathematics I, October 2012 – July 2013.
  - CUSA0114 Enrichment Mentoring Mathematics II, October 2011 – June 2012.
- **Teaching Assistant**, EPYMT 2011–2012
  - SAYT1134 Towards Differential Geometry, Summer 2012.
  - SAYT1154 Mathematical Analysis: An Overture I, Spring 2012.
  - SAYT1114 Number Theory and Cryptography, Summer 2011.
  - CUSA1014 Geometric Perspectives of Complex Numbers, Summer 2011.

MENTORING

POSTDOCTORAL FELLOWS

- **Zhiyuan LYU** 2024–Present
  - Topic: Density-equalizing maps and quasi-conformal maps

GRADUATE STUDENTS

- **Liguang HOU** (Ph.D. Student, CUHK) 2025–Present
  - Topic: Quantitative biology
- **Hangyu LI** (Ph.D. Student, CUHK) 2025–Present
  - Topic: Biomedical imaging
- **Oscar Yau Lam CHAU** (M.Phil. Student, CUHK) 2025–Present
  - Topic: Applied geometry
- **Shunyu YAO** (M.Phil. Student, CUHK) 2025–Present
  - Topic: Surface parameterization and harmonics
- **Qinghai JIANG** (Ph.D. Student, CUHK) 2024–Present
  - Topic: Computational geometry and metamaterials
- **Yanwen HUANG** (M.Phil. Student, CUHK) 2024–Present
  - Topic: Learning-based mappings (co-supervised with L. M. Lui)
- **Hei Tung TSANG** (M.Phil. Student, CUHK) 2024–Present
  - Topic: Computational origami (co-supervised with L. M. Lui)

RESEARCH STAFF

- **Richard Sai Yu LEUNG** (Research Assistant, CUHK) 2025–Present
  - Topic: Optimization and control
- **Hugo Hiu Chak CHENG** (Research Assistant, CUHK) 2025–Present
  - Topic: Tilings and patterns
- **Trenton LAU** (Research Assistant, CUHK) 2025–Present
  - Topic: Statistical physics
- **Hangyu LI** (Research Assistant, CUHK) 2024–2025
  - Topic: Biomedical imaging
  - Next position: Ph.D. Student in Mathematics, CUHK

UNDERGRADUATE STUDENTS

- **Hoi Hin CHAN** (CUHK) 2026–Present
  - Topic: Geometric mappings
- **Kimi Kai FENG** (CUHK) 2026–Present
  - Topic: Biological shape analysis
- **Charles Jia Cheng FU** (CUHK) 2026–Present
  - Topic: Surface parameterization
- **Derek Sin Kan MAK** (CUHK) 2026–Present
  - Topic: Mathematical design of metamaterials
- **Issac Chuen Mong SO** (CUHK) 2026–Present
  - Topic: Biological shape analysis
- **Zheng YANG** (CUHK) 2026–Present
  - Topic: Biological shape analysis
- **Jennie Jiani FANG** (CUHK) 2025–Present
  - Topic: Geometry and topology of materials
- **Kai Kwan LAU** (CUHK) 2025–Present
  - Topic: Biological shape analysis
- **Linfeng ZHU** (CUHK) 2025–Present
  - Topic: Biological shape analysis
- **Mark Yan Lok YIP** (CUHK) 2024–Present
  - Topic: Applied geometry
- **Ivan Pak Kiu FONG** (CUHK) 2024–Present
  - Topic: Mappings and Metamaterials
- **Hugo Hiu Chak CHENG** (CUHK) 2025
  - Topic: Tilings and patterns
  - Next position: Research Assistant, CUHK
- **Trenton LAU** (CUHK) 2025
  - Topic: Statistical analysis of materials
  - Next position: Research Assistant, CUHK
- **Oscar Yau Lam CHAU** (CUHK) 2024–2025
  - Topic: Applied geometry
  - Next position: M.Phil. Student in Mathematics, CUHK
- **Rongxuan LI** (CUHK) 2024–2025
  - Topic: Computational origami
  - Next position: Ph.D. Student in Industrial Engineering, University of Southern California
- **Shunyu YAO** (CUHK) 2024–2025
  - Topic: Surface parameterization
  - Next position: M.Phil. Student in Mathematics, CUHK
- **Jerry Jijun CUI** (CUHK) 2023–2025
  - Topic: Functional and shape data analysis
- **Yanwen HUANG** (CUHK) 2023–2024
  - Topic: Density-equalizing maps
  - Next position: M.Phil. Student in Mathematics, CUHK
- **Lucy LIU** (Harvard University) 2019–2022
  - Topic: Beyond grid kirigami
  - Next position: Ph.D. Student in Applied Mathematics, Harvard University

HIGH SCHOOL STUDENTS

- **Hiu Long CHAN** (Baptist Lui Ming Choi Secondary School, Hong Kong) 2022
  - Research project: "On the Coprime Product Series and Its Divergence and Bounds" (with Bock Man Cheung)
  - Award: Gold Award in Mathematics, 2022 S.T. Yau High School Science Award (Asia)
  - Next position: Undergraduate Student in Mathematics, University of Southampton
- **Bock Man CHEUNG** (Baptist Lui Ming Choi Secondary School, Hong Kong) 2022
  - Research project: "On the Coprime Product Series and Its Divergence and Bounds" (with Hiu Long Chan)
  - Award: Gold Award in Mathematics, 2022 S.T. Yau High School Science Award (Asia)
  - Next position: Undergraduate Student in Mathematics, UCLA

SERVICE

- Internal Service, CUHK Mathematics
  - Undergraduate Programme Academic Advisor, 2025–Present
  - Committee on Outreach Activities, 2024–Present
  - Thesis Committee, 2024–Present
    Yuchen Guo (Ph.D. '24), Chenran Lin (Ph.D. '24), Zhiyuan Lyu (Ph.D. '24), Ka Ho Lai (M.Phil. '24), Qiguang Chen (Ph.D. '25), Zhiwen Li (Ph.D. '25), Zhipeng Zhu (Ph.D. '26), Yanwen Huang (M.Phil. '26), Tsz Lok Ip (M.Phil. '26), Hei Tung Tsang (M.Phil. '26)
- Internal Service, MIT Mathematics

- Undergraduate Academic Advisor, 2022–2023
- Graduate Student Teaching Mentor, 2022

■ Conference Organization
- Organizing committee, Soft Math Symposium 2026
- Organizing committee, Hong Kong Society for Industry and Applied Mathematics (HKSIAM) Biennial Conference 2025
- Co-organizer, Minisymposium on "Applied and Computational Geometry for Science and Engineering", SIAM Conference on Computational Science and Engineering (SIAM-CSE25) 2025
- Co-organizer, Minisymposium on "Geometry, Computing and Learning for Science and Engineering", SIAM Conference on Imaging Science (SIAM-IS) 2022

■ Editorial Boards
- (Guest Editor) AIMS Mathematics, 2025–2026

■ Referee Service
- Journal reviewer
  Nature · Nature Materials · Advanced Materials · Nature Communications · Communications Materials · Communications Physics · npj Computational Materials · Physical Review Applied · Materials Today Bio · Computer Physics Communications · Engineering Applications of Artificial Intelligence · Meccanica · Extreme Mechanics Letters · Thin-Walled Structures · Results in Physics · Mathematical Geosciences · Physica A · International Journal of Legal Medicine · PLOS Computational Biology · PLOS One · IEEE Transactions on Medical Imaging · IEEE Transactions on Visualization and Computer Graphics · IEEE Transactions on Control Systems Technology · SIAM Journal on Imaging Sciences · Journal of Scientific Computing · Journal of Mathematical Imaging and Vision · Computer Aided Geometric Design · Computational Geometry: Theory and Applications · Science China Mathematics · AIMS Mathematics · La Mathematica · Electronic Research Archive · Journal of Computer Languages · Geometry, Imaging and Computing · Mathematics, Computation and Geometry of Data · Current Medical Imaging Reviews
- Conference reviewer
  IEEE International Conference on Soft Robotics (RoboSoft)
  International Conference on Geometric Modeling and Processing (GMP)
- Proposal reviewer
  Dutch Research Council

OUTREACH ACTIVITIES

■ **Project Team Representative and Principal Investigator**, 2024–Present
CUHK Mathematical Modelling Project Team
- Organized teacher and student workshops on mathematical modelling under the Education Bureau programme "Enhanced Programme on Promoting Mathematical Modelling for Teachers and Students in Secondary Schools"
  - 2025/26: Four teacher workshops for over 130 secondary school teachers
  - 2025/26: Eight student workshops for over 600 secondary school students
  - 2024/25: Five teacher workshops for over 200 secondary school teachers
  - 2024/25: Six student workshops for over 380 secondary school students
- Organized the "Mathematical Modelling Competition for Secondary Students (MMCSS)"
  - 2025/26: With over 800 junior and senior secondary school students
  - 2024/25: With over 700 junior and senior secondary school students
- Organized "The First Hong Kong-Shanghai Mathematical Modelling Competition for Secondary Students (HSMMC)" in Summer 2025. [Highlighted by the Secretary for Education (see 1 and 2) and featured in media outlets including HKTKWW and Dot Dot News.]

■ **Invited Speaker**, Baptist Lui Ming Choi Secondary School, Hong Kong 2026
- Topic: Origami, Kirigami, and Mathematics

■ **Invited Speaker**, The 19th Lau Oi Wah Memorial Science Lecture Series, CUHK 2025
- Topic: Origami and Kirigami: Art, Mathematics, Science and Technology

■ **Invited Speaker**, Baptist Lui Ming Choi Secondary School, Hong Kong 2024
- Topic: Mathematics and Nature

■ **Invited Speaker**, Baptist Lui Ming Choi Secondary School, Hong Kong (Virtual) 2021
- Topic: Mathematics of Origami and Kirigami

■ **ICED Epic Innovation Session Presenter**, Innovative Conceptual Engineering Design Program, Nipmuc Regional High School, USA 2019
- Gave a talk about designing shape-shifting structures using kirigami to high school students, teachers, and community members in Massachusetts to promote science, technology and innovation.

■ **Hang Lung Fun Math Tutorial Class Volunteer**, Hang Lung As One Volunteer Team and Department of Mathematics, CUHK, Hong Kong 2016
- Provided free mathematics tutoring service to underprivileged primary school students and organized mathematics-related games to arouse their interest in mathematics.

■ **Mathematics Teacher Volunteer**, Hang Lung As One Volunteer Team and Department of Mathematics, CUHK, Hong Kong 2015
- Provided free mathematics tutoring service to underprivileged primary school students.

SOFTWARE

SURFACE PARAMETERIZATION AND HARMONICS

- Toroidal Density-Equalizing Map 2025
  https://github.com/garyptchoi/toroidal-density-equalizing-map
- Hemispheroidal Parameterization and Harmonics 2025
  https://github.com/msshaqfa/hemispheroidal-harmonics
- Spherical Density-Equalizing Map 2024
  https://github.com/garyptchoi/spherical-density-equalizing-map
- Ellipsoidal Conformal and Quasi-Conformal Map 2023
  https://github.com/garyptchoi/ellipsoidal-map
- Multiply-Connected Quasiconformal Map 2023
  https://github.com/garyptchoi/multiply-connected-quasiconformal-map
- Spherical Cap Harmonics 2021
  https://github.com/eesd-epfl/spherical-cap-harmonics
- Poly-Annulus Conformal Map 2021
  https://github.com/garyptchoi/poly-annulus-conformal-map
- Rectangular Conformal Map 2016
  https://www.mathworks.com/matlabcentral/fileexchange/67117-rectangular-conformal-map
  (also available on GitHub: https://github.com/garyptchoi/rectangular-conformal-map)
- Disk Conformal Map 2015
  https://www.mathworks.com/matlabcentral/fileexchange/65571-disk-conformal-map
  (also available on GitHub: https://github.com/garyptchoi/disk-conformal-map)
- Spherical Conformal Map 2015
  https://www.mathworks.com/matlabcentral/fileexchange/65551-spherical-conformal-map
  (also available on GitHub: https://github.com/garyptchoi/spherical-conformal-map)

IMAGE PROCESSING

- TRIM: Triangulating Image 2018
  https://www.mathworks.com/matlabcentral/fileexchange/68629-trim-triangulating-image
  (also available on GitHub: https://github.com/garyptchoi/TRIM)

METAMATERIALS

- PyKirigami 2025
  https://github.com/andy-qhjiang/PyKirigami
- Additive Kirigami 2022
  https://github.com/garyptchoi/additive-kirigami
- 2D Kirigami Deployment Simulator 2021
  https://github.com/lliu12/kirigami_sim
- Inverse Kirigami Design 2019
  https://github.com/garyptchoi/inverse-kirigami-design

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