# Inhyeok Choi

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## Research Interests

My research lies in the intersection of geometric topology, geometric group theory and probability theory. Research keywords include Teichmüller space, mapping class groups, Outer space, $\mathrm{Out}(F_N)$, Gromov hyperbolic spaces, CAT(0) spaces, random walks, growth problems and counting problems in groups, percolations in vertex-transitive graphs, and dynamics of groups acting on spaces.

## Positions

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| 08/2025- | **Korea Institute for Advanced Study**, Seoul, South Korea <br> KIAS Fellow (On leave) |
| 07/2024-08/2025 | **Cornell University**, Ithaca, NY, United States <br> Harry Kesten Assistant Professor (Post-doc) |
| 03/2023–06/2024 | **Korea Institute for Advanced Study**, Seoul, South Korea <br> Project research fellow (–06/2023), June E Huh Fellow (07/2023–) (Post-doc) <br> Mentor: Sang-hyun Kim |
| 03/2024–06/2024 | **Fields Institute**, Toronto, ON, Canada <br> Marsden Postdoctoral Fellowship (visiting for the program "Thematic program on Randomness and Geometry") <br> Mentor: Giulio Tiozzo |

## Education

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| 09/2018–02/2023 | **KAIST**, Daejeon, South Korea <br> Ph.D. in Mathematical Sciences <br> Advisor: Hyungryul Baik |
| 03/2015–08/2018 | **KAIST**, Daejeon, South Korea <br> B.Sc. in Physics/Mathematical Sciences/Biological Sciences <br> Summa Cum Laude |

## Other Educational Experiences

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| 01/2026-05/2026 | Postdoc at Simons Laufer Mathematical Sciences Institute |
| 07/2024-08/2025 | June E Huh Visiting fellow, HCMC of KIAS |
| 12/2018–02/2019 | Exchange student, Tokyo Institute of Technology |
| 08/2017–02/2018 | Exchange student, École Polytechnique Féderale de Lausanne |
| 12/2015–06/2017 | Undergraduate researcher, **Biomedical Optics Lab, KAIST** <br> Advisor: YongKeun Park |
| 06/2015–08/2015 | Exchange student, University of California, Berkeley |

## Awards and Honors

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|---|---|
| 09/2025 | Sangsan Young Mathematician Award, the Korean Mathematical Society |
| 12/2024 | Dissertation of the Year, S-OIL Science Prodigy and Culture Foundation |
| 02/2023 | Best Thesis Award, 2023, Dept. of Mathematical Sciences, KAIST |
| 08/2022 | Best TA Award, 2022 Spring semester, Dept. of Mathematical Sciences, KAIST |

# Publications & Preprints

1. Classification of horospherical invariant measures in higher rank: The Full Story
   With *Dongryul M. Kim.*
   Preprint (2026), arXiv:2601.22668.

2. Divergence-type semigroups in Kleinian groups and Hausdorff dimension
   Preprint (2025), arXiv:2512.02829.

3. Invariant measures on the space of measured laminations for subgroups of mapping class group
   With *Dongryul M. Kim.*
   Preprint (2025), arXiv:2510.23256.

4. Percolation in acylindrically hyperbolic groups
   With *Donggyun Seo.*
   Preprint (2025), arXiv:2508.08932.

5. Metric weak proper discontinuity for pseudo-Anosov maps
   Preprint (2025), arXiv:2506.21214.

6. Acylindrically hyperbolic groups and counting problems
   Preprint (2025), arXiv:2504.20985.

7. Pivoting technique for the circle homeomorphism group (translation of: *원의 위상동형사상 군의 자유군과 Tits 대안*)
   Preprint (2025), arXiv:2504.02788.

8. Smoothing countable group actions on metrizable spaces
   With *Sang-hyun Kim.*
   Preprint (2024), to appear in the **Proceedings of the Mathematical Society of Japan, Seasonal Institute**. arXiv:2410.06077.

9. Counting pseudo-Anosovs as weakly contracting isometries
   **Inventiones Mathematicae**, Vol. 242, pp. 337-386. (2025) `https://doi.org/10.1007/s00222-025-01358-5`, arXiv:2408.00603.

10. Confined subgroups in groups with contracting elements
    With *Ilya Gekhtman, Wenyuan Yang and Tianyi Zheng.*
    Preprint (2024). arXiv:2405.09070.

11. Contracting isometries and differentiability of the escape rate
    Preprint (2024). arXiv:2403.09992. To appear in **Probability Theory and Related Fields**.

12. Random walks on groups and superlinear divergent geodesics
    With *Kunal Chawla, Vivian He and Kasra Rafi.*
    **Ergodic Theory and Dynamical Systems**, Vol. 45, no. 5, pp. 1403–1443. (2025) `https://doi.org/10.1017/etds.2024.75`.

13. Genericity of contracting geodesics in groups
    With *Kunal Chawla and Giulio Tiozzo.*
    Preprint (2023). arXiv:2308.01877. **Groups, Geometry, and Dynamics**, online first version. `https://ems.press/journals/ggd/articles/14298985`.

14. Random walks and contracting elements III: Outer space and outer automorphism group
    Preprint (2023). arXiv:2212.12122.

15. Random walks and contracting elements II: Translation lengths and quasi-isometric embedding
    **Groups, Geometry, and Dynamics**, Vol. 19, pp. 1373-1423. (2025) `https://doi.org/10.4171/ggd/831`.

16. Random walks and contracting elements I: Deviation inequality and limit laws
    **Compositio Mathematica**, Vol. 161, pp. 1512-1575. (2025) `https://doi.org/10.1112/S0010437X25007511`.

17. Random walks on mapping class groups (survey paper)
    With *Hyungryul Baik.*
    **EMS Surveys in Mathematical Sciences**, Vol. 9, no. 2, pp. 279–320. (2022) `https://doi.org/10.4171/EMSS/59`.

18. Pseudo-Anosovs are exponentially generic in mapping class groups
    **Geometry & Topology**, Vol. 28, pp. 1923-1955. (2024) `https://doi.org/10.2140/gt.2024.28.1923`.

19. Central limit theorem and geodesic tracking on hyperbolic spaces and Teichmüller spaces
    **Advances in Mathematics**, Vol. 431, 109236. (2023) `https://doi.org/10.1016/j.aim.2023.109236`.

20. Linear growth of translation lengths of random isometries on Gromov hyperbolic spaces and Teichmüller spaces
    With *Hyungryul Baik and Dongryul M. Kim.*
    **Journal of the Institute of Mathematics of Jussieu**, Vol. 23, no. 4, pp. 1751–1795. (2023) `https://doi:10.1017/S1474748023000373`.

21. Simple length spectra as moduli for hyperbolic surfaces and rigidity of length identities
    With *Hyungryul Baik and Dongryul M. Kim.*
    Preprint (2020). arXiv:2012.05652. To appear in **Annales de l'Institut Fourier**.

22. On the surjectivity of the Symplectic representation of the mapping class group
    With *Hyungryul Baik and Dongryul M. Kim.*
    **Topology and its Applications**, Vol. 322, 108334. (2022) `https://doi.org/10.1016/j.topol.2022.108334`.

23. Topological entropy of pseudo-Anosov maps from a typical Thurston construction
    With *Hyungryul Baik and Dongryul M. Kim.*
    **International Mathematics Research Notices**, Vol. 2022, no. 24, pp. 19762–19904. (2022) `https://doi.org/10.1093/imrn/rnab167`

24. Inhyeok Choi, KyeoReh Lee, and YongKeun Park. Compensation of aberration and speckle noise in quantitative phase imaging using lateral shifting and spiral phase integration. **Optics Express**, 25(24) pp. 30771–30779. (2017)

## Research Talks

Lecture series

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|---|---|
| 2024.07.29. | Growth of (sub)groups with hyperbolicity. (3 lectures and 1-week group discussion) *Geometry in Groups 2024. TIFR-ICTS, Bangalore, India.* |
| 2024.05.03. | Hyperbolicity of geodesics, counting and random walks. (4 lectures) *Riverside Workshop on Geometric Group Theory 2024, UC Riverside.* |

## Invited Talks

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| 2026.03.11. | Random subgraphs of the mapping class group. *McGill Geometric Group Theory seminar. McGill University, Montréal, Quebec, Canada.* |
| 2026.02.24. | Random subgraphs of the mapping class group. *OSU Topology Seminar. Ohio State University, Columbus, OH, USA.* |
| 2026.02.18. | Contracting properties and their dynamical consequences. *TGS Seminar at SLMath. CA, USA.* |
| 2026.02.17. | Counting problems on hyperbolic groups and beyond. *UCSB Topology Seminar. CA, USA.* |
| 2026.01.20. | Regularity of the escape rate and the asymptotic entropy for negatively curved groups. *Probability Workshop in Korea 2026. Jeonju, South Korea.* |
| 2026.01.12. | Invariant measures for subgroups of mapping class groups and Anosov groups. *Perspectives in Ergodic theory, Randomness and Geometry. Jagiellonian University, Kraków, Poland.* |
| 2026.01.06. | Exponential synchronization on the circle. *France-Korea workshop on Dynamical Group Theory. Aix-Marseille Université, France.* |
| 2025.11.19. | Statistics in non-positively curved groups. *KIAS Math-HCMC Fall Workshop 2025. Jeongseon, South Korea.* |
| 2025.10.14. | Locally finite invariant measures on measured laminations. *KIAS conference on mapping class groups. KIAS, South Korea.* |
| 2025.09.29. | Nonuniqueness from percolation in acylindrically hyperbolic groups. *Alfred Renyi Insitute, Budapest, Hungary.* |
| 2025.09.22. | Nonuniqueness from percolation in acylindrically hyperbolic groups. *Autumn School on Probability and Dynamics on Groups, University of Münster, Germany.* |
| 2025.09.17. | Metric WPD of pseudo-Anosov maps. *Groups, Dynamics and Surfaces in Paris. IMJ-PRG at Sorbonne, Paris, France.* |
| 2025.08.27. | Many infinite clusters from percolation in many groups. *KIAS-KAIST Workshop on current challenges in mathematics. KIAS, South Korea.* |
| 2025.08.18. | Metric WPD of pseudo-Anosov maps and quasimorphisms. *Algebraic and analytic methods in group theory in Warsaw. IMPAN, Warsaw, Poland.* |
| 2025.08.06. | Dynamics of semigroups of circle homeomorphisms. *One-day Festival of Group actions, Geometry and Dynamics. KIAS, South Korea.* |
| 2025.06.16. | Genericity problem in groups with negative curvature. *Geometric Group Theory and Related Topics. BICMR, Peking University, China.* |
| 2025.05.19. | Counting pseudo-Anosovs and fully irreducibles. *53rd Barrett Lectures: Recent Development in Geometric Group Theory. TN, USA.* |
| 2025.04.15. | Genericity of pseudo-Anosovs and quasi-isometries. *Stanford Topology Seminar. CA, USA.* |
| 2025.04.01. | Genericity of pseudo-Anosovs and quasi-isometries. *Geometry & Topology Seminar. Rutgers New Brunswick, NJ, USA.* |
| 2025.03.14. | Dynamics of semigroups of circle homeomorphisms. *The Scottish Dynamics Network. Heriot-Watt University, Edinburgh, UK.* |
| 2025.03.12. | Genericity of pseudo-Anosovs and quasi-isometries. *Algebra, Geometry, and Topology Seminar. Heriot-Watt University, Edinburgh, UK.* |
| 2025.03.06. | Genericity of pseudo-Anosovs and quasi-isometries. *Binghamton Geometry & Topology Seminar. NY, USA.* |
| 2025.02.14. | Genericity of pseudo-Anosovs and quasi-isometries. *SUNY at Buffalo Geometry & Topology Seminar. NY, USA.* |
| 2024.01.16. | Free discrete subgroups of Homeo(S) and the fine curve graph. *Virtual Seminar in Geometry and Topology (VISGAT), KIAS.* |
| 2024.12.03. | Metric WPD for Homeo(S): loxodromics on the fine curve graph. *KAIST Topology Seminar.* |

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| 2024.11.28. | Metric WPD for Homeo(S): loxodromics on the fine curve graph. *Hyperbolic Lunch, University of Toronto.* |
| 2024.10.22. | Genericity of pseudo-Anosovs and quasi-isometries. *CUNY Geometry & Topology Seminar, CUNY.* |
| 2024.10.15. | Genericity of pseudo-Anosovs and quasi-isometries. *Geometry & Topology Seminar, Yale University.* |
| 2024.10.14. | Growth rate of confined subgroups of a discrete group. *Group Action and Dynamics Seminar, Yale University.* |
| 2024.09.24. | Genericity of pseudo-Anosovs and quasi-isometries. *KIAS-Rice Workshop on Geometric Topology, KIAS HCMC.* |
| 2024.09.05. | Genericity of pseudo-Anosovs and quasi-isometries. *Cornell Dynamics Seminar.* |
| 2024.06.25. | Sullivan's conjecture, Myrberg limit set and Hausdorff dimension. *One day workshop with Young Geometric Topologists at KAIST.* |
| 2024.05.13. | Continuity of escape rate of random walks on CAT(0) spaces. *Dynamics of group actions and random walks on groups, Fields Institute.* |
| 2024.04.21. | Confined subgroups and their growth.*Alfréd Rényi Institute. Budapest, Hungary.* |
| 2024.04.08. | Genericity of pseudo-Anosov mapping classes. *Young Geometric Group Theory XII, Bristol, UK.* |
| 2024.04.04. | Genericity of pseudo-Anosovs (and fully irreducibles). *Princeton Topology Seminar.* |
| 2024.04.02. | Genericity of pseudo-Anosov mapping classes. *Brandeis Topology Seminar, Brandeis University.* |
| 2024.03.20. | Random walks, superlinear divergence and quasi-isometry. *UBC Probability Seminar, University of British Columbia.* |
| 2024.03.15. | Growth of normal subgroups of a hyperbolic group. *GT GAPS Seminar.* (Online) |
| 2024.02.29. | Normal subgroups, confined subgroups and growth. *Korea-France Workshop on Dynamical Group Theory, KIAS.* |
| 2024.01.17. | Regularity of the escape rate and the asymptotic entropy of a random walk. *KAIST GT Fair 2024, Busan, Korea.* |
| 2023.11.03. | Genericity of contracting elements in groups. *SNU Rookies Workshop 2023, Yangpeong, Korea.* |
| 2023.10.28. | Generic mapping classes are pseudo-Anosov. *2023 KMS Fall Meeting, SNU.* |
| 2023.10.05. | Genericity of contracting elements in groups. *Tokyo-Seoul Conference in Mathematics 2023, The University of Tokyo.* |
| 2023.09.11. | Random walks on groups without an action on hyperbolic spaces. *Topology seminar, KAIST.* |
| 2023.09.04. | Genericity of contracting elements in groups. *World of GroupCraft III.* (Online) |
| 2023.08.21. | Genericity of contracting elements in groups. *The 4th Korea-France Conference in Mathematics, KIAS.* |
| 2023.07.14. | Geometry and dynamics of a finitely generated group. *Workshop on Quantum Analysis 2023, Sokcho, Korea.* |
| 2023.04.20. | Random walks on non-positively curved spaces: rate of escape, CLT and large deviation principle. *Conference on Probability and PDE, KAIST.* |
| 2023.04.06. | Counting pseudo-Anosov mapping classes. (series of 4 talks) *Virtual Seminar on Geometry and Topology, KIAS.* |
| 2023.02.09. | Asymmetry of a generic outer automorphism of a free group. *The 18th East Asian Conference on Geometric Topology.* (Online) |
| 2022.11.08. | Random subgroup is quasi-isometrically embedded. *Geometry and Topology Seminar, CUNY.* |
| 2022.11.08. | The log-regularity of the hitting measure on the Gromov boundary. *Group actions, Geometry and Dynamics Seminar, Yale University.* |
| 2022.11.02. | Asymmetry of a typical outer automorphism. *Geometry and Topology Seminar, Temple university.* |

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| 2022.10.27. | Simple length spectrum of a hyperbolic surface. *Hyperbolic lunch, University of Toronto.* |
| 2022.10.24. | Mapping class group, Teichmüller space and Bers' proof of Nielsen-Thurston's classification. *Dynamics Seminar, University of Toronto.* |
| 2022.05.12. | Typical behavior of random mapping classes and outer automorphisms. *Fudan Topology Seminar.* (Online) |
| 2022.04.11. | Limit laws beyond hyperbolic spaces. *AIM Workshop "Random walks beyond hyperbolic groups", San Jose, CA United States* |
| 2021.12.03. | Limit laws for random walks on mapping class groups. *Conformal Dynamics and Groups Seminar, BICMR.* (Online) |
| 2021.11.29. | Random walks on mapping class groups favor pseudo-Anosovs. *Dynamics Seminar, University of Toronto.* (Online) |
| 2021.11.18. | Random walks, counting problems and genericity of loxodromics. *Geometry and Topology Seminar, Technion.* (Online) |
| 2021.10.06. | Random walks on Gromov hyperbolic spaces and Teichmüller spaces. *Tokyo Tech Topology Seminar.* (Online) |
| 2021.07.22. | Random walks on Gromov hyperbolic spaces and Teichmüller spaces. *Pacific Dynamics Seminar.* (Online) |
| 2021.02.03. | Simple length spectra of a generic hyperbolic surface determine its isometry class. *Virtual Seminar on Geometry and Topology.* (Online) |

### Contributed Talks

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| 2022.05.31. | Frequently contracting geodesics and random mapping class. *PK2 Topology Workshop.* |
| 2022.04.25. | Limit laws and their consequences on MCG and Out(Fn). 5-min lightning talk, *IHP Conference "Mapping Class Groups and Out(Fn)".* |
| 2022.01.18. | Random mapping classes are pseudo-Anosov. *The 17th East Asian Conference on Geometric Topology.* (Online) |
| 2021.01.26. | Rigidity of length Identities of hyperbolic surfaces. *The 16th East Asian Conference on Geometric Topology.* (Online) |
| 2020.10.30. | Random walks and mapping class groups. 10-minute talk at *Geometric Group Theory in East Asia.* (Online) |

# Conference organization

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| 2026.06.07. | Young Geometric Group Theory (yGGT) XIV, KIAS (with Carl-Fredrik Nyberg Brodda, Yu-Chan Chang, Giovanni Italiano, Annette Karrer, Sang-hyun Kim, Sanghoon Kwak and Amelia Pompilio) |
| 2025.11.26. | Dynamical Group Theory VII (with KyeongRo Kim, Sang-hyun Kim, Seonhee Lim and Donggyun Seo) |
| 2025.08.29. | 2025 2K-GATE One day Geometric Topology Festival, KIAS (with Hyungryul Baik and Sang-hyun Kim) |
| 2023.12.18–20. | Hyperbolic Geometry of Numbers, KIAS (with Sang-hyun Kim and Ser-Peow Tan) |
| 2023.09.27–28. | The 1st Korea-Chile Workshop on Dynamical Group Theory, Incheon, Korea. (with Sang-hyun Kim) |

# Teaching

### At Cornell

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| 2025S | Instructor, MATH 3040 Prove It! |
| 2024F | Instructor, MATH 1110 Calculus I |

## At KAIST

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| 2022F | TA, MAS102 Calculus II & MAS430 Combinatorial Topology |
| 2022S | TA, MAS109 Linear algebra and Applications & MAS201 DE and Applications |
| 2021F | TA, MAS201 DE and Applications & MAS441 Lebesgue Integration Theory |
| 2021S | TA, MAS109 Linear algebra and Applications & MAS331 Topology |
| 2020F | TA, MAS102 Calculus II & MAS441 Lebesgue Integration Theory |
| 2020S | Head TA, MAS201 DE and Applications |
| 2019F | TA, MAS201 DE and Applications & MAS441 Lebesgue Integration Theory |
| 2019S | TA, MAS201 DE and Applications & MAS331 Topology |
| 2018F | TA, MAS355 Mathematical Statistics |
| 2017S, 2018S | Undergraduate TA, MAS101 Calculus I |

# Service & Outreach

- Refereed for *Advances in Mathematics*, *Annales Henri Lebesgue*, *Annales de l'IHP (B)*, *Compositio Mathematica*, *Discrete & Continuous Dynamical Systems*, *Duke Mathematical Journal* (quick opinioin), *Forum of Mathematics, Sigma* (quick opinion), *Geometry & Topology*, *Israel Journal of Mathematics*, *Journal of Topology*, *Journal of Topology and Analysis*, *Memoirs of the EMS*, *Transactions of AMS*, *MathSciNet Mathematical Reviews*.

- Organizing VISGAT.

- Organizing *Cornell Topology Seminar* for Fall 2024 and Spring 2025.

- Published a series of math cartoons on KIAS webzine ⟨Horizon⟩ (in Korean)