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

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

Education

09/2018–02/2023	**Korea Advanced Institute of Science and Technology**, Daejeon, South Korea Ph.D. in Mathematical Sciences Advisor: Hyungryul Baik
03/2015–08/2018	**Korea Advanced Institute of Science and Technology**, Daejeon, South Korea B.Sc. in Physics, Mathematical Sciences, and Biological Sciences Summa Cum Laude

Other Educational Experiences

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** Advisor: YongKeun Park
06/2015–08/2015	Exchange student, University of California, Berkeley

Awards and Honors

02/2023	Best Thesis Award, 2023, Dept. of Mathematical Sciences, KAIST
08/2022	Best TA Award, 2022 Spring semester, Dept. of Mathematical Sciences, KAIST
03/2017	Dean's list, 2016 Fall semester, College of Natural Sciences, KAIST
12/2016	Silver Prize, Korean Undergraduate Mathematics Competition (전국 대학생수학경시대회), Korean Mathematical Society
03/2015–08/2018	Korea Presidential Science Scholarship (대통령과학장학생), Korea Student Aid Foundation
03/2015–08/2018	KAIST Presidential Fellowship

Publications & Preprints

1. Percolation in acylindrically hyperbolic groups
   With *Donggyun Seo*.
   Preprint (2025), draft.

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

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

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

5. 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.

6. Counting pseudo-Anosovs as weakly contracting isometries
   Preprint (2024). arXiv:2408.00603. To appear in **Inventiones Mathematicae**.

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

8. Contracting isometries and differentiability of the escape rate
   Preprint (2024). arXiv:2403.09992.

9. 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`, arXiv:2310.18506.

10. Genericity of contracting geodesics in groups
    With *Kunal Chawla and Giulio Tiozzo*.
    Preprint (2023). arXiv:2308.01877. To appear in **Groups, Geometry, and Dynamics**.

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

12. Random walks and contracting elements II: Translation lengths and quasi-isometric embedding
    Preprint (2023), **Groups, Geometry, and Dynamics**, Online first (2024). `https://doi.org/10.4171/ggd/831`, arXiv:2212.12119.

13. Random walks and contracting elements I: Deviation inequality and limit laws
Preprint (2023). arXiv:2207.06597. To appear in **Compositio Mathematica**.

14. 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`.

15. 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`.

16. 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`.

17. 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. `https://doi:10.1017/S1474748023000373`.

18. 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**.

19. 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`.

20. 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`

21. 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

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

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.*

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.*

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

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

2025.08.29.	2025 2K-GATE One day Geometric Topology Festival (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

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

At KAIST

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*, *Israel Journal of Mathematics*, *Journal of Topology*, *Journal of Topology and Analysis*, *Memoirs of the EMS*, *MathSciNet Mathematical Reviews*.
- Organizer of *Cornell Topology Seminar* for Fall 2024 and Spring 2025.
- Published a series of math cartoons on KIAS webzine ⟨Horizon⟩ (in Korean)

References

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