Inhyeok Choi

CV updated Nov. 2023

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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, and dynamics of groups acting on spaces.

Positions

03/2023– **Korea Institute for Advanced Study**, Seoul, South Korea
Project research fellow (–07/2023), June E Huh Fellow (08/2023–) (Post-doc)
Mentor: Prof. Sang-hyun Kim

Education

09/2018–02/2023 **Korea Advanced Institute of Science and Technology**, Daejeon, South Korea
M.S. & Ph.D. Integrated Program in Mathematical Sciences
Advisor: Prof. 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

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: Prof. 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. Random walks on groups and superlinear divergent geodesics
With *Kunal Chawla, Vivian He and Kasra Rafi*.
Preprint (2023). arXiv:2310.18506.

2. Genericity of contracting geodesics in groups
With *Kunal Chawla and Giulio Tiozzo.*
Preprint (2023). arXiv:2308.01877.

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

4. Random walks and contracting elements II: Translation lengths and quasi-isometric embedding
Preprint (2023). arXiv:2212.12119.

5. Random walks and contracting elements I: Deviation inequality and limit laws
Preprint (2023). arXiv:2207.06597.

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

7. Pseudo-Anosovs are exponentially generic in mapping class groups
Preprint (2021). To appear in **Geometry & Topology**. arXiv:2110.06678.

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

9. Linear growth of translation lengths of random isometries on Gromov hyperbolic spaces and Teichmüller spaces
With *Hyungryul Baik and Dongryul M. Kim.*
Preprint (2021). To appear in **Journal of the Institute of Mathematics of Jussieu**. arXiv:2103.13616.

10. 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.

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

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

13. 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

Invited Talks

2024.05.13. TBD. *Dynamics of group actions and random walks on groups, Fields Institute.* (Tentative)

2024.05.03. Hyperbolicity of geodesics, counting and random walks. (series of 4 talks) *Riverside Workshop on Geometric Group Theory 2024, UC Riverside.* (Tentative)

2024.04.08. TBD. *Young Geometric Group Theory XII, Bristol, UK.* (Tentative)

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

2023.12.18–20. Hyperbolic Geometry of Numbers, KIAS
2023.09.27–28. The 1st Korea-Chile Workshop on Dynamical Group Theory, Incheon, Korea.

Teaching

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 *Annales Henri Lebesgue*, *Mathematical Reviews*.
- Published a series of math cartoons on KIAS webzine ⟨Horizon⟩ (in Korean)

References

Prof. Hyungryul Baik, KAIST
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Prof. Ilya Gekhtman, Technion
ilyagekh@gmail.com

Prof. Sébastien Gouëzel, Université de Rennes 1
sebastien.gouezel@univ-rennes1.fr

Prof. Kasra Rafi, University of Toronto
rafi@math.toronto.edu

Prof. Giulio Tiozzo, University of Toronto
tiozzo@math.utoronto.ca

(Teaching) Prof. Moon-Jin Kang, KAIST
moonjinkang@kaist.ac.kr