

Minsung Kim

CONTACT INFORMATION

Department of Mathematics,
Kungliga Tekniska Högskolan KTH
Royal Institute of Technology

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RESEARCH INTERESTS

Parabolic dynamics and its connections with geometry and representation theory:
- Deviation of ergodic integrals, cohomological equations, and cocycle rigidity.
Dynamics on nilmanifolds and their probabilistic applications:
- Random walks and limit theorems on nilmanifolds.
Interactions with hyperbolic dynamics:
- Ruelle resonances and applications of transfer operator methods on anisotropic spaces.

ACADEMIC APPOINTMENT

KTH Royal Institute of Technology, Stockholm, Sweden. Oct. 2024 - present
• Post-doc research associate. (Mentor: Professor. Danijela Damjanović, Liviana Palmisano, and co-advised by Marco Martens.)

Scuola Normale Superiore, Pisa, Italy. Oct. 2022 - Oct. 2024.

- Junior visitor in Centro Ennio De Giorgi. (Mentor: Professor. Stefano Marmi.)

Nicolaus Copernicus University, Toruń, Poland. Jan. 2021 - Sep. 2022.

- Research associate. (Mentor: Professor. Krzysztof Frączek.)

EDUCATION

Ph.D. Mathematics, University of Maryland - College Park. Dec. 2020.

- Advisor: Professor. Giovanni Forni.
- Visiting doctorant, Institut de Mathematiques de Jussieu - Paris Rive Gauche.
Oct 2017 - Aug 2018, Jan 2019 - June 2019.

M.S. Mathematics, North Carolina State University. May 2013
(Advisor: Professor. Robert H. Martin, Jr.)

B.S. Mathematics education, Pusan National University. Aug 2011
(Advisor: Professor. Jae Keol Park.)

Exchange student, University of Hawaii at Hilo, Mathematics. Fall 2009 - Spring 2010

PUBLICATIONS AND PREPRINTS

6. Anisotropic spaces and nil-automorphisms (with Oliver Butterley) arXiv:2308.06630

5. Solving the cohomological equation for locally Hamiltonian flows, part II - global obstructions. (with Krzysztof Frączek) arXiv:2306.02340

4. Solving the cohomological equation for locally Hamiltonian flows, part I - local obstructions. (with Krzysztof Frączek)
Advances in Mathematics 446 (2024), 109668.

3. New phenomena for deviation of Birkhoff integrals for locally Hamiltonian flows.
(with Krzysztof Frączek)

Journal für die reine und angewandte Mathematik (Crelle's Journal), vol. 2024, no. 807, 2024, pp. 81-149

2. Effective equidistribution for generalized higher step nilflows.
Ergodic Theory and Dynamical Systems, 42(12), 3656-3715, December 2022

1. Limit theorem for higher rank action on Heisenberg manifolds.
Discrete and Continuous Dynamical Systems - A, Vol. 42, No. 9, September 2022

SCHOLARSHIP, GRANT	Stiftelsen Magnusons fund (50K SEK), The Royal Swedish Academy of Sciences 2024 Hierta Retzius Foundation fund (30K SEK), Royal Swedish Academy of Sciences 2024 Scholarship from Carl Trygger's Foundation for Scientific Research 2024-26 Grant for experienced researchers from abroad, Nicolaus Copernicus University. 2021 Excellence Center 'Dynamics, Analysis and Artificial Intelligence'. Dean's Fellowship, University of Maryland. 2013-14
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SEMINAR AND CONFERENCE TALKS	HCMC topology seminar, KIAS, Seoul, Korea Aug 2025 <i>Job talk, Problems in parabolic dynamics</i> , Yonsei University, Korea July 2025 Ergodic theory and Dynamical systems, POSTECH, Pohang, Korea May 2025 <i>Workshop on Dynamics and Related Topics</i> , NUS, Singapore Mar 2025 <i>Winter Annual Conference on Dynamical Systems 2024</i> , Fukuoka, Japan Jan 2025 Dynamics seminar, Seoul National University, Seoul, Korea Dec 2024 Mathematics RIT seminar series, Great Bay University, Dongguan, China Dec 2024 Geometry and Topology seminar, National University of Singapore (NUS) Aug 2024 <i>New Frontiers in Parabolic Dynamics and Renormalization</i> , Bologna, Italy June 2024 Dynamics and Number Theory seminar, Uppsala University, Sweden Mar 2024 Dynamics seminar, KTH Royal Institute of Technology, Stockholm, Sweden Feb 2024 Mini-workshop, Chern Institute of Mathematics, Tianjin, China Jan 2024 Dynamics (Dagger) seminar, University of Warwick, Warwick, U.K. Dec 2023 Probability/Dynamics seminar, Leiden University, Leiden, Netherland Nov 2023 Mini-workshop, <i>Group actions and rigidity theory</i> , Nankai University Oct 2023 <i>Regular and Stochastic Behaviour in Dynamical Systems</i> , CRM, Italy June 2023 Short talk in conference, <i>Anosov Dynamics</i> , CIRM, Luminy, France Apr 2023 Geometry seminar, IBS-Center for Geometry and Physics, Pohang, Korea Jan 2023 Ergodic theory seminar, Nicolaus Copernicus University, Toruń, Poland Dec 2022 Special seminar for new junior visitors, Scuola Normale Superiore, Pisa Nov 2022 Zoominar in Dynamical Systems at Porto, Portugal June 2022 Ergodic theory and Dynamical systems, POSTECH, Pohang, Korea May 2022 Dynamics seminar, Centro De Giorgi(Scuola Normale Superiore), Pisa Apr 2022 Dynamics seminar, IMPAN(Polish Academy of Sciences), Warsaw, Poland Mar 2022 Probability seminar, IMPAN(Polish Academy of Sciences), Sopot, Poland Nov 2021 Analysis seminar, Saitama University, Saitama, Japan Oct 2021 Ergodic theory and Dynamical systems, POSTECH, Pohang, Korea Sep 2021 Seminar in Ergodic theory and Dynamical systems, KIAS, Seoul, Korea Aug 2021 Ergodic theory and Dynamical systems, Nicolaus Copernicus University Mar 2021 (2 talks) Toruń, Poland Feb 2021 Workshop in Dynamical Systems and Related Topics, Penn State University Sep 2019
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SUPERVISION

Stage de recherche (Master's research internship at KTH)

- Clara Spector (École Polytechnique, France) Mar - July, 2025
 - Fast mixing systems and Central Limit Theorem via transfer operator methods.

TEACHING
EXPERIENCE

Special topics course in dynamical systems. KTH.

Spring 2025

- Cohomology in Dynamics, FSF3675 (instructor: Danijela Damjanović) 5 weeks
Lectured on topics in cohomological equations, higher rank actions, and time-change flows.

Teaching Assistant. UMCP.

- Sole Contact Instructor - *Introduction to Probability (MATH 111)* Spring 2014
- Discussion Leader
 - *Calculus II (MATH 141)* Fall 2014, Spring 2015
 - *Differential Equations for Scientists and Engineers (MATH 246)* Sp 2016,20
 - *Calculus for Life Sciences II (MATH 131)* Spring 2017
 - *Calculus III (MATH 241)* Fall 2018, 2019, 2020
- Grader

Advanced Calculus 1,2 (MATH 410, 411), Introduction to Dynamics and Chaos (MATH 452), Introduction to Topology (MATH 432), Differential Forms and Their Applications (MATH 437), Real Analysis I (MATH 630), Dynamical systems I* (MATH 642), Differential Geometry* (MATH 740)* * for grad course.
- Directed Reading Program Mentor

Rebecca Hsu, Riemann mapping theorem. Summer 2014

Lecture Assistant. NCSU.

- Instructor - *Contemporary Mathematics (MA 103)* Summer II 2012
- Grader
 - *Introduction to Finite Mathematics with Applications (MA 114)* Spring 2013
 - *Calculus for Life and Management Sciences (MA 231)* Fall 2012

SERVICE

Refereed journals: Communications in Mathematical Physics.

EXPERIENCE

Organizer, Dynamical system seminar, KTH Royal Institute of Technology 2024-25
 Organizer, seminari di Sistemi Dinamici, Scuola Normale Superiore - Uni.Pisa 2023
 Student Dynamics Seminar Organizer, University of Maryland Fall 2015 - Fall 2016
 Math tutor, University of Hawaii at Hilo Fall 2009 - Spring 2010
 Republic of Korea Army, completion of military service July 2006 - July 2008

LANGUAGE

Korean (native), English (fluent), French, Italian (elementary), Polish (beginner)