

# Minsung Kim

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## CONTACT INFORMATION

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

Lindstedtsvägen 25,  
SE-100 44 Stockholm, Sweden

**minsung@kth.se**

## 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.  
- Low-dimensional dynamics and renormalizations.

## 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

8. On invariant distributions of  $C^4$  circle diffeomorphisms.  
(with Marco Martens and Liviana Palmisano) preprint available  
7. On rapid mixing for random walks on nilmanifolds.  
(with Dmitry Dolgopyat and Spencer Durham) arXiv:2510.00398  
6. Anisotropic spaces and nil-automorphisms (with Oliver Butterley)  
Revision requested from *Nonlinearity* arXiv:2308.06630  
5. Solving the cohomological equation for locally Hamiltonian flows, part II - global obstructions. (with Krzysztof Frączek)  
*Proceedings of the London Mathematical Society (3) 131 (2025), no. 4.*

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 (30K SEK), The Royal Swedish Academy of Sciences	2025
	Hierta Retzius Foundation fund (30K SEK), Royal Swedish Academy of Sciences	2025
	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
SEMINAR AND CONFERENCE TALKS	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
	<i>Global Mathematics Young Scholars Forum</i> , SUSTech, Shenzhen, China	Nov 2025
	<i>Special talk, Problems in parabolic dynamics</i> , POSTECH, Pohang, Korea	Nov 2025
	Ergodic theory seminar, Nicolaus Copernicus University, Toruń, Poland	Sep 2025
	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, Netherlands	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 Contributed talk, Workshop in Dynamical Systems and Related Topics, PSU      Sep 2019
SUPERVISION	<b>Stage de recherche (Master's research internship at KTH)</b> <ul style="list-style-type: none"> <li>Clara Spector (M1, École Polytechnique, France)      Mar - Aug, 2025  - Fast mixing systems and Central Limit Theorem via transfer operator methods.</li> </ul>
TEACHING EXPERIENCE	<b>Special topics course in dynamical systems. KTH.</b> <ul style="list-style-type: none"> <li>Cohomology in Dynamics, FSF3675 (instructor: Danijela Damjanović)      5 weeks  Lectured on topics in cohomological equations, higher rank actions, and time-change flows.      Spring 2025</li> </ul> <b>Teaching Assistant. UMCP.</b> <ul style="list-style-type: none"> <li>Sole Contact Instructor - <i>Introduction to Probability (MATH 111)</i>      Spring 2014</li> <li>Discussion Leader <ul style="list-style-type: none"> <li>- <i>Calculus II (MATH 141)</i>      Fall 2014, Spring 2015</li> <li>- <i>Differential Equations for Scientists and Engineers (MATH 246)</i>      Sp 2016, 20</li> <li>- <i>Calculus for Life Sciences II (MATH 131)</i>      Spring 2017</li> <li>- <i>Calculus III (MATH 241)</i>      Fall 2018, 2019, 2020</li> </ul> </li> <li>Grader <ul style="list-style-type: none"> <li><i>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)</i>      * for grad course.</li> </ul> </li> <li>Directed Reading Program Mentor <ul style="list-style-type: none"> <li><i>Rebecca Hsu, Riemann mapping theorem.</i>      Summer 2014</li> </ul> </li> </ul> <b>Lecture Assistant. NCSU.</b> <ul style="list-style-type: none"> <li>Instructor - <i>Contemporary Mathematics (MA 103)</i>      Summer II 2012</li> <li>Grader <ul style="list-style-type: none"> <li>- <i>Introduction to Finite Mathematics with Applications (MA 114)</i>      Spring 2013</li> <li>- <i>Calculus for Life and Management Sciences (MA 231)</i>      Fall 2012</li> </ul> </li> </ul>
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)