June 27, 2025

RYOSUKE SHIMIZU

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Employment

Assistant Professor, Graduate School of Informatics, Kyoto University   Apr. 2025—Present

Junior Researcher (Assistant Professor) · JSPS Research Fellow PD, Waseda Research Institute for Science and Engineering, Waseda University   Oct. 2023—Mar. 2025

Education

Ph.D. in Informatics, Kyoto University. (Supervisor: Jun Kigami)   Apr. 2020—Sep. 2022
MInf, Kyoto University. (Supervisor: Jun Kigami)   Apr. 2018—Mar. 2020
B.Sc., Faculty of Science, Kyoto University.   Apr. 2014—Mar. 2018

Award

MSJ Takebe Katahiro Prize for Encouragement of Young Researchers 2024   Sep. 2024

Publications and Preprints

• *Construction of self-similar energy forms and singularity of Sobolev spaces on self-similar Laakso-type spaces* (with Riku Anttila and Sylvester Eriksson-Bique), preprint (2025).

• Characterizations of Sobolev functions via Besov-type energy functionals in fractals, *Potential Anal.* (to appear).

• Finite dimensionality of Besov spaces and potential-theoretic decomposition of metric spaces (with Takashi Kumagai and Nageswari Shanmugalingam), *Ann. Fenn. Math.* (to appear).

• Korevaar–Schoen p-energy form and associated p-energy measures on fractals (with Naotaka Kajino), *Tohoku Series in Mathematical Sciences* (to appear).

• *Contraction properties and differentiability of p-energy forms with applications to nonlinear potential theory on self-similar sets* (with Naotaka Kajino), preprint (2025); submitted.

• p-Energy forms on fractals: recent progress (with Naotaka Kajino), From Classical Analysis to Analysis on Fractals: A Tribute to Robert Strichartz, Volume 2, Applied and Numerical Harmonic Analysis, *Birkhäuser, Cham* (to appear).

• First-order Sobolev spaces, self-similar energies and energy measures on the Sierpiński carpet[*] (with Mathav Murugan) , *Comm. Pure Appl. Math.* (to appear).

• Construction of p-energy and associated energy measures on Sierpiński carpets, *Trans. Amer. Math. Soc.* **377** (2024), no.2, 951–1032.

• Parabolic index of an infinite graph and Ahlfors regular conformal dimension of a self-similar set; in *Analysis and Partial Differential Equations on Manifolds, Fractals and Graphs, edited by Alexander Grigor'yan and*

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[*]A detailed version of this paper is available at arXiv:2308.06232v3 (long version). Several statements and proofs have been removed from the detailed version.

Selected Talks

• *Singularity of Sobolev spaces on self-similar Laakso-type spaces* (Keynote speaker), Cornell Conference on Analysis, Probability, and Mathematical Physics on Fractals, Cornell University, Ithaca, New York, the U.S., June 16, 2025.

• *Self-similar p-energy form and p-energy measures on the Sierpinski carpet*, The 3rd Hong Kong/Kyoto Workshop on Fractal Geometry and Related Areas, The Chinese University of Hong Kong, Hong Kong, March 22, 2025.

• *On singularity of p-energy measures among distinct values of p for some p.-c.f. self-similar sets*, Geometric Analysis Seminar, University of Jyväskylä, Jyväskylä, Finland, October 2, 2024.

• *Construction of Korevaar–Schoen p-energy forms and associated p-energy measures* (short presentation), Recent Developments in Dirichlet Form Theory and Related Fields, Oberwolfach, Germany, September 17, 2024.

• *First-order Sobolev spaces and self-similar energies on the Sierpinski carpet*, Geometric Analysis Seminar, University of Jyväskylä, Jyväskylä, Finland, March 11, 2024.

• *Construction of a canonical p-energy on the Sierpiński carpet for all p > 1*, Geometric and Stochastic analysis on metric spaces, Kyoto University, Kyoto, Japan, March 13, 2023.

• *Nonlinear potential theory on the Sierpiński carpet* (25 minutes talk), Analysis and geometry of fractals and metric spaces: Recent developments and future prospects, Bankoku Shinryokan, Okinawa, Japan, March 9, 2023.

• *Construction of a canonical p-energy on the Sierpiński carpet* (short talk), Smooth Functions on Rough Spaces and Fractals with Connections to Curvature Functional Inequalities, Banff International Research Station, Banff, Canada, November 24, 2022.

• *Construction of a canonical p-energy on the Sierpiński carpet*, Quasiworld, UCLA (zoom), October 20, 2021.

• *Generalized resistance metrics on graphs* (30 minutes talk), Kobe Workshop on Probabilistic Potential Theory and Related Fields, Kobe, Japan, May 7, 2019.

Fellowship

JSPS Research Fellow (PD) for Young Scientists, Waseda University	Apr. 2023—Apr. 2025
JSPS Research Fellow (PD) for Young Scientists[*], Kyoto University	Sep. 2022—Mar. 2023
JSPS Research Fellow (DC1) for Young Scientists, Kyoto University	April 2020—Sep. 2022

Grant

JSPS, Grant-in-Aid for JSPS Fellows, 23KJ2011	Apr. 2023—Mar. 2026
JSPS, Grant-in-Aid for JSPS Fellows, 20J20207	Apr. 2020—Mar. 2023

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[*]The category was changed from (DC1) because I obtained the doctral degree.