University of Michigan, Department of Mathematics, 5852 East Hall
530 Church St, Ann Arbor, MI, USA, 48109
✉ shchetka@umich.edu
https://sites.google.com/view/shchetka
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Ekaterina Shchetka

Positions

2020-26 **Graduate Student Instructor and Research Assistant**, *University of Michigan*.
2019-22 **Junior Researcher**, *Steklov Mathematical Institute of the Russian Academy of Sciences*.
2017-22 **Research Assistant**, *Chebyshev Laboratory*, St. Petersburg State University.

Education

2026 **Ph.D. Candidate in Mathematics**, *University of Michigan*.
2022 **M.Sc. in Mathematics**, *University of Michigan*.
2017 **M.Sc. in Mathematical Physics**, *St. Petersburg State University*, graduated with honours.
2015 **B.Sc. in Physics**, *St. Petersburg State University*, graduated with honours.

Research Interests

Dynamical Systems, Ergodic Theory, Functional Analysis, Spectral Theory, Asymptotic Analysis.

Publications

2025 Cohomological equation in anisotropic spaces and analytic regularity of its solutions, in preparation.
- Double exponential mixing for $\mathbb{Z}^k-$ actions by ergodic toral automorphisms, in preparation.
- Double exponential mixing for free semigroup action by Blaschke products on the circle, in preparation.

2022 Difference equations in the complex plane: quasiclassical asymptotics and Berry phase (with A. Fedotov), *Applicable Analysis* (2022), 101:1, 274-296.

2020 The Spectrum and Density of States of the Almost Mathieu Operator with Frequency Represented by a Continued Fraction with Large Elements (with A. Fedotov), *Mathematical Notes* (2020), 107, 1040–1045.

2018 Semiclassical asymptotics of the spectrum of the subcritical Harper operator (with A. Fedotov), *Mathematical Notes* (2018), 104: 6, 948–952.
- Complex WKB method for a difference Schrödinger equation with the potential being a trigonometric polynomial (with A. Fedotov), *St. Petersburg Math. J.* (2018), 29, 363-381.
- Monodromy matrices for Harper equation (with A. Fedotov), *Days on Diffraction. St. Petersburg: IEEE* (2018), 102-106.

2017 The complex WKB method for difference equations in bounded domains (with A. Fedotov), *Journal of Mathematical Sciences (NY)* (2017), 224:1 157-169.
- Berry phase for difference equations (with A. Fedotov), *Days on Diffraction. St. Petersburg: IEEE* (2017), 113-116.

2016 Complex WKB method for difference equations in unbounded domains (with A. Fedotov), *Days on Diffraction. St. Petersburg: IEEE* (2016), 140-143.

Grants, Scholarships, Awards

2025 G. Cleaves Byers Endowment for Collegiate Mathematics Education award, University of Michigan;
- Outstanding Graduate Student Instructor, University of Michigan;

2024 Department of Mathematics Outstanding Teaching Award, University of Michigan;
2022 Edwin Wilkinson Miller Prize, University of Michigan;
2020 President Scholarship in priority areas of technological development of Russia;
2019 Mathematical Progression, "Native Towns" Award for research in mathematics;
2018 Government Scholarship in priority areas of technological development of Russia;

2017 The winner of the competition for students and young researchers «Petropolitan Science (Re)Search»;
- Bocconi Institute of Data Science Award (Milan);
- Deich scholarship for the best master's thesis at the department of Mathematical Physics;

2016 Rokhlin Grant for young mathematicians of St. Petersburg;
- Government Scholarship for high academic achievements;
- St. Petersburg State University Alumni Association Scholarship;

2015 The 2nd place winner of the August Möbius Competition (Moscow);

2013 Government Special Scholarship in the field of mathematics and physics;
- Zarubina Scholarship for high academic achievements.

Teaching Experience

2024, Fall **Calculus I**, *Math 115*, co-coordinator ($\approx$ 2,000 students), University of Michigan.
Mentoring and observing new instructors, running organizational course meetings for instructors, writing original *Inquiry-Based Learning*-type assignments and exams.

2020-23 **Precalculus and Calculus I**, *Math 105, 110, 115*, primary instructor, University of Michigan.
6 full semesters of *Inquiry-Based Learning*-type teaching in sections of 15–25 students.

2018-22 **Minicourses for graduate students**, *lecturer*.
Koopman, Transfer (Perron-Frobenius) Operators, and Applications, 5 lectures, University of Michigan;
Ruelle Resonances and Trace Formulas in Hyperbolic Dynamics, 5 lectures, University of Michigan;
Introduction to Anderson Localization, 6 lectures, Steklov Mathematical Institute.

2021-24 **Active learning sessions**, lecturer and facilitator.
Engaging lectures and discussions about math and physics for middle and high schoolers and undergrads.
Top Secret Coding: Crafting Bracelet Ciphers, Math Circle, University of Michigan;
Random Graphs, Social Networks, and the Internet, Math Club, University of Michigan;
Bridge Problems. Introduction to Graph Theory, Math Circle, University of Michigan.

Mentorship

2024 **Mentor**, *Directed Reading Program*, Exploring Patterns in Complex Dynamics: From Simple Doublings to Intricate Multibrots, Tia Scarsella, top 3 of 20, presented at Math Club.

2023, Fall **Training for incoming Math instructors**, *Introduction to IBL*, facilitator, University of Michigan.
Training and observing new instructors, leading lecture sessions, and designing *Inquiry-Based Learning*-friendly lesson plans.

2022, Fall **Calculus I**, *Pilot of Joint Sections Program*, mentor, University of Michigan.
Providing support to a new instructor in and outside of class sessions; planning, designing, and leading joint sessions in collaboration with a new instructor.

Seminar Talks

2025 Dynamics seminar, University of Chicago, upcoming
- Geometry, Topology and Dynamics Seminar, University of Illinois Chicago, upcoming
- Dynamical Systems seminar, Northwestern Univesity, upcoming
- Geometry, Dynamics, Topology seminar, University of Michigan

2022 Mathematical Physics and Operator Algebras, Michigan State University, East Lansing
- AMS Student Chapter, IUPUI, Indianapolis

2019 Department of Mathematical Physics Seminar, St. Petersburg State University
- Dynamical Systems Seminar, Higher School of Economics, Moscow

2018 Department of Mathematical Physics Seminar, St. Petersburg State University

2017 Chebyshev Lab Student Colloquium, Chebyshev Laboratory, St. Petersburg State University

2016 St. Petersburg Seminar on Wave Diffraction and Propagation, Steklov Mathematical Institute

- Department of Math. Physics Seminar, St. Petersburg State University

Conference Talks

2021 Workshop "Semiclassical Asymptotics and Nonlocal Elliptic Problems", RUDN University, online

2020 Annual International Conference "Days on Diffraction", Steklov Math Institute, online

- Conference on Spectral Theory and Mathematical Physics, Sirius Mathematics Center, Sochi

2019 St. Petersburg Youth Conference in Probability and Mathematical Physics, Steklov Math Institute

- Conference "Asymptotic Analysis & Spectral Theory", University Paris-Sud, Orsay
- School "Randomness in Physics and Mathematics", ZiF - Center for Interdisciplinary Research, Bielefeld University, Bielefeld
- 4th Russian-Indian Conference in Statistics and Probability, Euler Math Institute, St. Petersburg
- Annual International Conference "Days on Diffraction", Steklov Math Institute, St. Petersburg
- Conference "Nonlinear dynamics and long-time asymptotics", Steklov Math Institute, St. Petersburg
- Conference "Stochastic Models II", Euler International Math Institute, St. Petersburg
- School "Spectral Function Theory", Chebyshev Laboratory, St. Petersburg State University

2018 St. Petersburg Youth Conference in Probability and Mathematical Physics, Steklov Institute

- Conférence "Semi-classical and geometric asymptotics in mathematical physics", Laboratoire CPT, Université de Toulon
- Annual International Conference "Days on Diffraction", Steklov Math Institute, St. Petersburg

2017 St. Petersburg Youth Conference in Probability and Mathematical Physics, Steklov Institute

- International Student Conference "Science and Progress", St. Petersburg State University
- Annual International Conference "Days on Diffraction", Steklov Math Institute, St. Petersburg

2016 Spectral Theory, Differential Equations, and Probability, Johannes Gutenberg Universität, Mainz

- 8th St.Petersburg Conference in Spectral Theory, Euler International Mathematical Institute
- Annual International Conference "Days on Diffraction", Steklov Math Institute, St. Petersburg

2015 International Student Conference "Science and Progress", St. Petersburg State University

- August Möbius Competition, Independent University of Moscow

Poster talks

2019 Coulomb Gas, Integrability and Painleve's Equations, CIRM, Marceille Luminy

Research Visits

2020 March 1-24, STEPS Program, Prof. *H. Katsura*, Department of Physics, University of Tokyo.

Research Projects

2017-21 Developing of asymptotic and spectral investigation methods for periodic and almost periodic differential operators, RSF 17-11-01069.

2019 Analysis, geometry, mathematical physics and its applications, RSF 19-71-30002.

2017-19 Spectral and scattering theory methods in quantum physics and wave propagation theory, RFBR 17-01-00668;

2017-19 Asymptotic and spectral analysis of quantum systems with underlying periodicity, RFBR 17-51-150008-a;

2017-18 Analysis and algebra in applications and interaction, RSF 14-21-00035.

Mathematical Schools and Programs Attended

2025 Geometry and Dynamics in Higher Rank Lie groups, SLMath

- The Ergodic Method in Group Theory, Northwestern
- Interactions between Harmonic Analysis, Homogeneous dynamics, and Number theory, SLMath
- Midwest dynamics, Northwestern University

2024 From Microlocal to Global Analysis, MIT

- Microlocal Analysis and Quantum Dynamics, Northwestern University
- Dynamical Systems and Related Topics, Brin Mathematics Research Center, University of Maryland
- Dynamical Systems and Related Topics, Pennsylvania State University

2023 Dynamics, Rigidity and Arithmetic in Hyperbolic Geometry, ICERM, Brown University
- Topics in Geometric Flows and Minimal Surfaces, SLMath (MSRI)
- Partial Hyperbolicity, Brin Mathematics Research Center, University of Maryland
- Big Ideas in Dynamics, online semester-length program, American Institute of Mathematics

2022 Random Matrix Theory, University of Michigan
- Hyperbolic dynamics, University of Houston

2021 Asymptotic methods and applications, Isaac Newton Institute for Math Sciences, online
- Moduli Spaces, Combinatorics, and Integrable Systems, Euler International Math Institute, online
- Spectral Theory and Mathematical Physics, Euler International Mathematical Institute, St. Petersburg
- Random Schrödinger operators arising in the study of random Walks Graduate School, online

2019 Zimmer's Conjecture (Arbeitsgemeinschaft), MFO, Oberwolfach Research Institute for Mathematics
- Lectures on Statistical and Condensed Matter Field Theory, Institut Henri Poincaré, Paris
- Randomness in Physics and Mathematics, ZiF Center for Interdisciplinary Research, Bielefeld University
- Coulomb Gas, Integrability and Painleve's Equations, CIRM, Marceille Luminy

2018 Rigidity of Stationary Measure (Arbeitsgemeinschaft), MFO, Oberwolfach Research Institute for Mathematics
- Spectral theory of Quasi-Periodic and Random operators, CRM, Université de Montréal
- Current Topics in Mathematical Physics, The Fields Institute for Research in Mathematical Sciences, Toronto

2017 Discrete Models in Geometry and Mathematical Physics, BMS: Technische Universität Berlin
- Advanced Statistics and Probability: Statistical Causal Learning, Lake Como School of Advanced Studies

2016 Spectral Theory, Differential Equations, and Probability, Johannes Gutenberg Universität, Mainz
- Various Aspects of Mathematical Physics, Euler International Mathematical Institute, St. Petersburg

Outreach and Service

2019-21 **Co-organizer**, *St. Petersburg Conference "Asymptotic Methods in Mathematical Physics" (2021), Annual International Conference "Days on Diffraction" (2020), Conference "Nonlinear dynamics and long-time asymptotics" (2019).*

2020 **Referee**, *St. Petersburg Mathematical Journal.*

Professional Training

2023 UM/AMilBL Workshop, 3 day workshop,*University of Michigan* (UM)

2022 Inquiry-Based Learning Workshop, 1 day workshop, UM

2021 UM/AMilBL Inquiry-Based Learning Workshop, 3 day intensive workshop, UM

2020 Graduate Student Instructor Seminar and Practicum, semester-length course, ELI-UM
- College Teaching in the US: Pedagogy, Culture and Language, 3-week intensive course, ELI-UM